

What a Waste:

Redefining the Private-, Collective-, and Public Space Towards a Circular System for Food and Consumer Goods in the Domestic Sphere

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Colofon

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* *Image on the front page (figure 1), made by author*

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This project is dedicated to my two grandfathers who died during the time span of this project. Both would have very much enjoyed this final product of my studies.

Frits Duijnhouwer who always wanted to study Architecture but who was not allowed to by his parents. Therefore, he was living his dream through my stories.

Jan Wouter Tulp who never through away anything, and had the most creative ways to repair his sailing boat.

Contents

01. Introduction
01.1 Abstract 11
01.2 Problem Field 12
01.3 Glancing Forward 28

02. Methodology
02.1 Problem Statement 32
02.2 Conceptual Framework 34
02.3 Location 36
02.4 Research Approach 37
02.5 Research Questions & Aims 38
02.6 Research Methods 40
02.7 Research Flow Diagram 42

03. Urban Analysis
03.1 Introduction 46
03.2 Greenery 52
03.3 Connectivity 58
03.4 Typology 60
03.5 Local, Bottom-Up Initiatives 76

04. Urban Metabolism
04.1 Global & National 84
04.2 System 86
04.3 Regional & Municipal 92
04.4 Indische Buurt 96
04.5 Literature on Consumer Behavior 108

05. Governance Analysis
05.1 Introduction 114
05.2 Netherlands - Introduction 116
05.3 Netherlands - Circularity 117
05.4 Amsterdam - Circularity 120
05.5 Amsterdam - Waste 123
05.6 Amsterdam - Spatial Strategy 124
05.7 Indische Buurt - Stakeholders 126

06. Design Approach
06.1 Vision 132
06.2 Design Principles 134
06.3 Spatial Framework 136
06.4 Supporting Maps 142
06.5 Urban Metabolic System 144
06.6 Location for Design 146

07. Spatial Design
07.1 Introduction 150
07.2 'Refuse'-street 158
07.3 'Re-use & Repair'-street 168
07.4 'Refurbish, Remanufacture, Repurpose'-street 174
07.5 'Rethink'-square 182
07.6 Collective 190
07.7 Private 192
07.8 Overview 194
07.9 Urban Metabolic System 196
07.10 Tube System 198

08. Governance Framework
08.1 Introduction 202
08.2 Objectives 203
08.3 Framework 204
08.4 Relation to Design 210
08.5 Incorporate Current Initiatives 212
08.6 Needed Changes 216
08.7 Stakeholders 218

09. Evaluation
09.1 Assessment Based on R-Strategies 222
09.2 Overall Improvement 226
09.3 Reduction of Household Waste 228

10. Conclusion & Reflection
10.1 Conclusion 232
10.2 Reflection 236

11. Bibliography
11.1 Literature 242
11.2 Images 246

12. Appendix
12.1 Food Production in Flevopark? 250
12.2 Learning from Case Studies 251
12.3 Shopping in Amsterdam 254
12.4 Do it Yourself - Implementing My Own Thesis 257
12.5 Hand-out 'Implement it Yourself' 258

This chapter starts with the abstract of this thesis. Where after the topic of this thesis is addressed, the (importance of) the transition towards a circular economy. Multiple frameworks for circularity is explained. Next to the this, the research gap is touched upon. Lastly, the scope of this thesis and the structure of this thesis is explained.

01.1 Abstract
01.2 Problem Field
01.3 Glancing Forward

01. Introduction

Abstract

The scarcity of resources is increasing, resulting in the transformation of entire regions. People take a lot of the resources on Earth for granted. This calls for a transition from the current 'throw-away'-economy to a 'circular' economy. The constant circulation of materials and products in this type of system preserves the value of materials. Academics and practitioners are addressing this transition, but they frequently ignore its social and spatial aspects. A socio-spatial framework for reorganizing a district towards a circular system is proposed in this thesis. The solution presented is fundamentally utopian, aiming to challenge established ideas about the current system. In this thesis, the public space's redesign serves as an entry point to the private and communal spaces.

The design location for this thesis is the Indische Buurt. This district is located in east of Amsterdam. With a large proportion of social housing, the area's primary use is residential. Additionally, there are a few shopping streets nearby. The approach used in this thesis was context-specific. The three main approaches used were literature reviews, field research, and 'research by design'.

According to the analysis, residents are crucial in deciding whether and how to dispose of things. But at the moment, the area doesn't have many resources supporting circular behavior. The issue of waste disposal in public areas is one of the effects. In addition, the district has a high proportion of minima-households, little greenery, and roadways that are mostly occupied by parked cars. The primary observation about governance analysis is the lack of emphasis on the spatial implications necessary for the shift to a circular system.

The district is reorganized using a spatial framework that was constructed using the R-ladder. The R-ladder is a circularity model made up of ten R-strategies for reducing the amount of materials and resources used in product chains. The higher up the strategy is on the ladder, the more value is retained. Following that, a spatial design for a square and its surrounding streets is proposed. The visibility of circularity is prioritized in this design to enhance public awareness. Furthermore, the design aims to maximize the value retention of materials or products by selecting the solution that best retains value. In addition to the design, recommendations will be made to the governance of the Netherlands and Amsterdam. This will improve the existing circular strategy and policy.

key words: *circularity, household waste, spatial, Indische Buurt, Amsterdam*



Figure 2: Waste Belt (Masterplan voor betere recycling, 2016)

A Global Problem

Currently, we live in a society which is very focused on consuming. You could say that we globally maintain the ‘take-make-dispose’-model, or ‘linear economy’. In which we take the resources we need; make products of these; and dispose the products when we do not see the use for them anymore (Elisha, 2020; Ellen MacArthur Foundation, 2013).

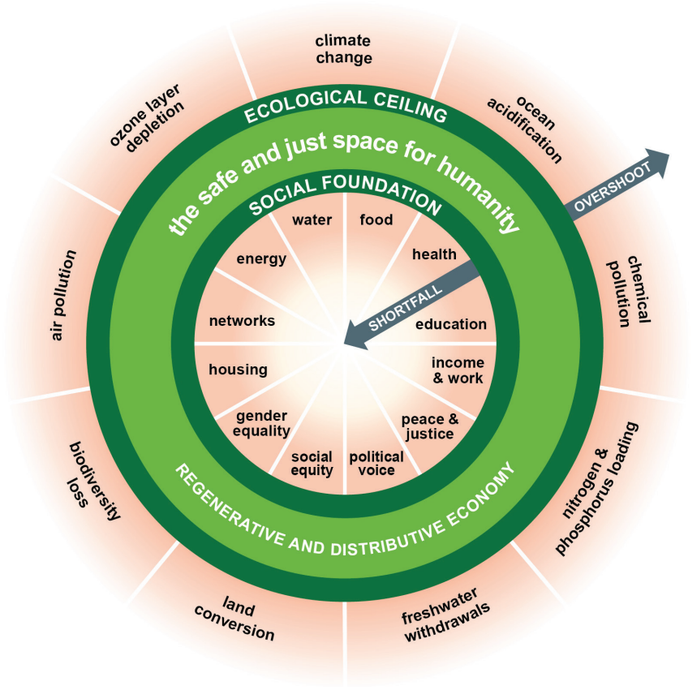


Figure 3: Doughnut Economy (Raworth, 2018)

The Doughnut Model

Humanity is taking resources from the Earth with a much faster pace than the Earth is producing them. This results in the exceeding of Earth's 'planetary boundaries': the limits to use the planet in a sustainable way (Raworth, 2018). These boundaries are not only related to materials but also, for example, to the huge emissions of greenhouse gases produced by humanity.

This problem of exceeding the planetary boundaries is addressed in a model by Raworth (2018), named by 'Doughnut Economy', in which the challenge to meet all the (societal) needs to ensure that no one is left behind is addressed (see the figure 3 at the left). This theory is illustrated as a doughnut in which the inner circle represents the societal needs, and the outer circle represents the planetary boundaries. In between the two circles a safe, sustainable world can be reached (Raworth, 2018), while outside of the planetary boundary the Earth is harmed.

To live on and with our Earth in a sustainable way, change is needed. Humanity needs to move away from the linear approach, and they need to adopt a new approach towards consumption and production.
A concept that is now clearly emerging in research and practice is adopting a 'circular economy'. The Ellen MacArthur Foundation, one of the leading organizations regarding this topic, define circular economy as 'an industrial system that is restorative by intention' (Ellen MacArthur Foundation, 2013, p. 22). 'Circular economy' will be discussed in more detail later in this chapter, but for now, having a basic grasp on the concept is helpful to comprehend the rest of this sub-chapter.

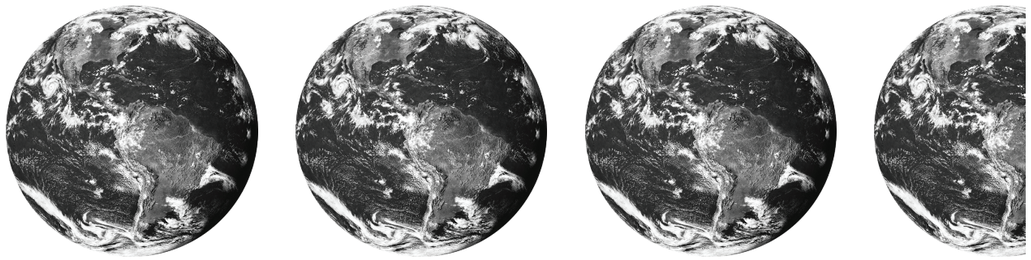


Figure 4: Dutch Overshoot (Earth, 2016)

The Dutch Context

The problem of exceeding of Earth's planetary boundaries is also very visible in the context of the Netherlands. It would require, in terms of resources, 3.6 Earths if everyone on the earth lived like the Dutch (figure 4) (The Global Footprint Network, 2019).
In 2020, the Netherlands was only 24,5% was circular (de Wit et al., 2020). This is higher than the average in world (8,6%) (The Circularity Gap Report, 2020). The Netherlands is also in the top three of Europe in terms of recycling rate. This is mainly because of its efficient waste reuse and recycling system. However, the municipal and food waste per person is still very high (CBS, 2020 & Hervey, 2018). This calls for actions in urban areas, and on the individual scale.
The Dutch government signed agreements such as the European Green Deal, aiming to be the first carbon-neutral continent, the United Nations Sustainable Development Goals, and the Paris Agreement (de Wit et al., 2020). Next to this, they set the goal to be 50% circular by 2030 and 100% circular by 2050 (Rijksoverheid, 2016). With only seven more years until the first target, even if the Netherlands may be considered a front-runner in the world, there are still many steps to be taken.

This thesis and the (spatial) interventions it will propose could help contribute to reaching the aims of the Netherlands.



Figure 5: Malaysian Rainforest (Butler, 2016)

Individual Perception of Waste

Individual people also significantly contribute to the linear economy and the exceeding of Earth's planetary boundaries; thus, it is important to look for the issue on an individual scale as well as a global and national one. People are currently estranged from the environmental impact their actions have. This phenomenon is known as Karl Marx's 'metabolic rift' (Dinarès, 2014). This is partly because the effect of their behavior is far from their own front door. An example of this is when someone in the Netherlands buys a phone, the indirect effect is (often) not seen. To produce a phone, minerals are needed, which results in huge extraction sites (in Latin America) and the degradation of that land (see figure 5).

Another issue is the mindset of people towards waste. Waste is seen as something that you need to get rid of. However, a substance is only waste when it is labeled as such (Dijkema, 2000). Many opportunities could be discovered when this mindset would change. When people's mindset towards waste changes and people become more aware of the environmental impact they have, many opportunities could be found. Resources can be used to their full potential and the transition towards a circular approach for household waste could be made.

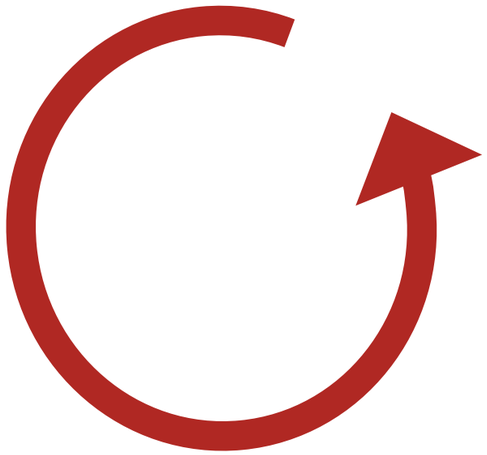


Figure 6: Circular Economy (made by author)

Circular Economy

As stated before, a change is needed in the current (linear) system to live on this planet sustainably. Humanity depends a lot on the Earth's resources, but this pace of resource extraction cannot be sustained in the future because (several) resources become scarce. We need to move away from the current (linear) economy and move towards a more sustainable model, a 'circular economy'.

A circular economy is an alternative model which revolves around cycling resource flows to maintain the utility and value of materials, components, and products as high as possible, and the concept of waste is eliminated (Dokter, 2021).

The Ellen MacArthur Foundation, one of the leading research institutions, states that to reach a 'circular economy', every facet of the process needs to be re-thought (Ellen MacArthur Foundation, 2013).

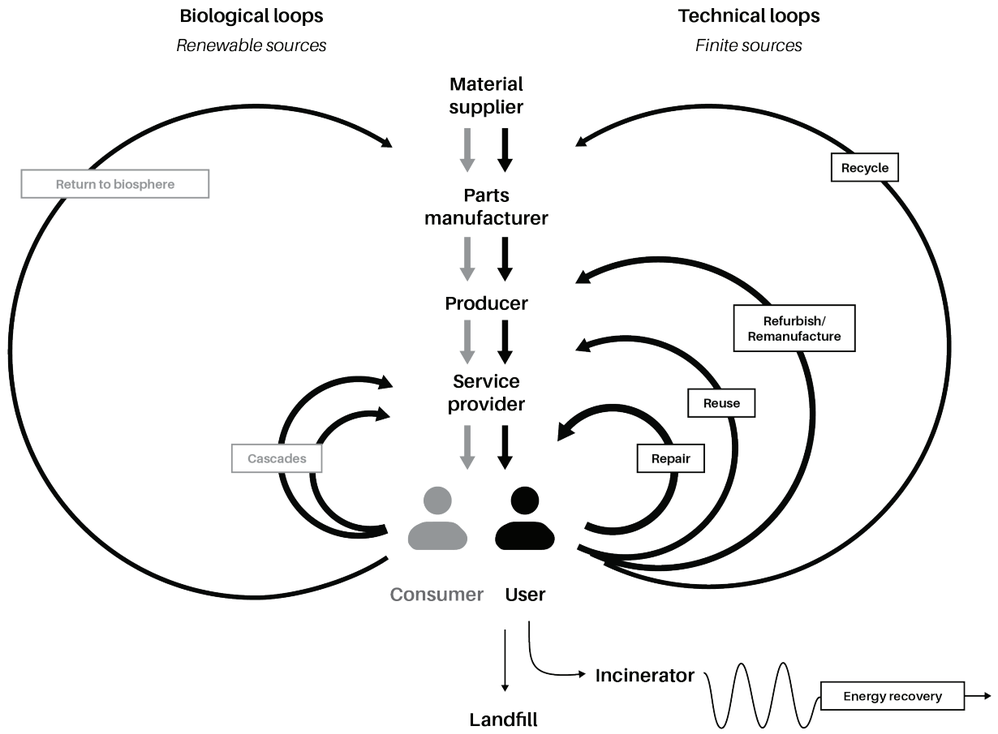


Figure 7: Circular Economy (adapted from Dokter, 2021 (based on Ellen MacArthur Foundation, 2013))

Butterfly-diagram

One of the most used frameworks to reach a 'circular economy', especially by businesses, is the ReSOLVE framework of the Ellen MacArthur Foundation. This framework describes multiple actions (Ellen MacArthur Foundation, 2015):

Regenerate: regenerate the health of the ecosystems, ex. by shifting to renewable energy and resources
Share: maximize the use of products by sharing
Optimize: increase performance and efficiency
Loop: close the loops of components and resources
Virtualize: dematerialize by switching to virtual replacements
Exchange: switching to new technologies or new ways of doing

In the figure on the left (7), the Ellen MacArthur Foundation visualized this approach. In this butterfly diagram the functionality of the system of a circular economy is illustrated. Technical and biological cycles are distinguished in this diagram. In this system, the 'end-of-life' concept is replaced, and the life cycle (of products) is prolonged by, amongst others, repairing, reusing, and refurbishing (Dokter, 2021).

Limitations of the ReSOLVE-framework

Williams (2019) discovered multiple shortcomings of this model when applied to cities. The RESOLVE-framework is designed for creating a (more) circular economic system (for the industrial sector or businesses), yet quite often cities use this framework to guide their approach towards a circular system (Williams, 2019).

Williams (2019) explains two limitations that are not mentioned in the framework, both of which are overarching principles of an urban system. The first limitation is the complexity of a city, which consists of a wide range of actors operating in various sectors, on different scales, and with different motivations. These actors consume and produce resources within the city. This plurality requires different actions compared to an industrial or commercial actor that operates solely in one sector. These various actors are interdependent, such as producers and consumers, which makes a city a complex urban system. Furthermore, cities are dynamic in nature and have the ability to adapt to changes (Williams, 2019). The section on the 'conceptual framework' provides further elaboration on both *'complexity'* and *'urban metabolism'*.

Another limitation of the ReSOLVE-framework is that it focuses on production instead of consumption, but in cities both production and consumption are of equal importance. To transition towards a circular system, it is crucial to change the habits of residents. The use of circular goods and services and the execution of circular behavior by residents are essential for the delivery of a circular system. The ReSOLVE-framework typically concentrates on organizations that operate within one industrial sector of provision. This approach fails to consider the complex system of provision across multiple sectors that occurs in cities, as well as the interaction between these systems and the various lifestyles of residents. Lifestyles not only influence the consumption patterns of residents but also the likelihood of adopting circular behavior. To create a circular urban system, changes in both lifestyle choices as in system provision is needed (Williams, 2019).

Limitations of other frameworks

Not only the ReSOLVE-framework has its limitations. Current frameworks for the circular economy, including the butterfly-model of the Ellen MacArthur Foundation, represent product and material flows conceptually and superficially and do not adequately address social issues (Prendeville et al., 2017). This may result in the approach being ineffective in bringing about the desired change in behaviour, or in (some) social groups being left behind.
In addition to this, Coenen et al. (2012) state that, in transition literature, the spatial dimension and the dynamics that take place are often overlooked (Coenen et al., 2012). It is important to consider the spatial dimension, as (small) spatial changes could have a significant impact on people's behaviour and therefore on the transition to a circular economy.
Lastly, Marin & de Meulder (2018) remark, underlining what Williams (2019) argued, that most circular economy initiatives use policy or business frameworks, and multi-dimensional circular city design frameworks are still lacking (Marin & de Meulder, 2018).
To address these research gaps, this thesis will address the spatial- and social dimension of the transition towards a circular economy. The lenses that will be used and the scope of the research will be explained in the next sections.

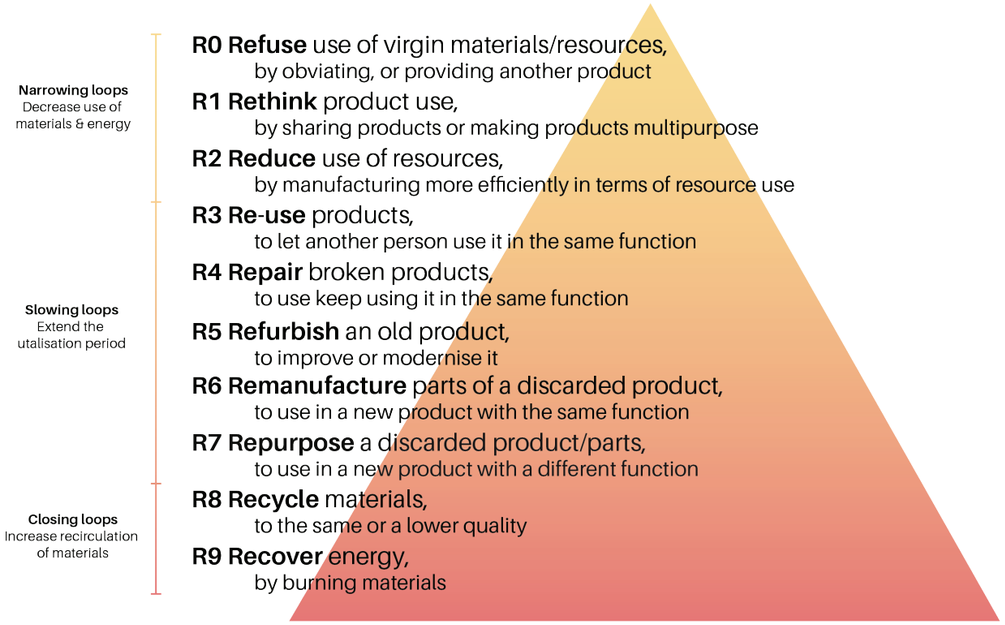


Figure 8: R-ladder (made by author, based on Schut, 2019)

R-ladder

Underlying to the 'circular economy'-concept are a couple of circularity strategies. These are often grouped and conceptualized in various frameworks, from 3R's up to 10R's. These R-strategies are placed in a hierarchy. The strategy that retains the most value of the resource is placed at the top (Dokter, 2021).
In the figure on the left (8), the R-pyramid that will be used in this thesis is illustrated. The first three strategies focus on decreasing the amount of consumption, and creating a more efficient, less resource-consumption manufacturing chain ('narrowing loops' (Dokter, 2021)). Strategy R3 to R7 focus on extending the lifetime of the product ('slowing loops', (Dokter, 2021)). The last two strategies focus on getting the most value out of the discarded resource ('closing loops' (Dokter, 2021)). The detailed explanation of the various strategies can be read in the figure on the left (based on Schut, 2019).

Multiple organizations use this tool to define their approach to reducing resources and/or the circular economy. The Dutch government also uses this ladder in the national circular policy (Rijksoverheid, 2016). In contrast to its use in making policies, the pyramid is not yet used as a tool for spatial design or spatial planning.

The Thesis' Scope & Focus

A Spatial Project

In previous (academic) research the spatial effects of the transition are often neglected (Prendeville et al., 2017; Coenen et al., 2012). This thesis will therefore tackle this research gap and contribute to the transition towards a circular economy by proposing a spatial design. Decisions made in the spatial design are underpinned by research into both the context and the circular economy.

The Scale of the District

Cities are identified as important drivers in the transition towards a circular economy because of the combination of complex systems they consist of. These include (flows of) people, companies, infrastructure, natural systems, and governance (IRP, 2018). Next to this, cities are home to more than half the world's population. The prediction is that this will rise to 70% of people in 2050 (United Nations, 2023). Change in the way we live in cities is therefore very much needed.

Interventions and initiatives on the local scale are of great importance to help stimulate people to act. Levoso et al. (2020) state that interventions on the local scale will lead to the empowerment of cities and its citizens. It can, among other things, encourage proactive behavior and enable a shift in consumer behavior (Levoso et al., 2020).

The scale that was chosen is the 'district'. This combines the importance of the city and the local scale (both explained above).

The Disposal of Household Waste

This thesis focuses on the handling of household waste. In the Netherlands still a lot of household waste is produced, around 520 kg per person per year (Hervey, 2018 & The Global Footprint Network, 2019). Still a lot can be improved to follow the lowest rate in Europe, Romania, which is 261 kg per person per year (Hervey, 2018). Other types of waste, such as industrial waste, have not been examined in this thesis.

The focus of this thesis is the disposal of products of materials. This focus is chosen because many options to shop online are currently present. So even when all the physical shops are phased out, people still have the possibility to buy products. Spatial interventions do not have an effect on this type of shopping. People will be stimulated to think twice about disposing something and buying something new. This is also apparent in the proposed spatial design.

An Eye-Opening Project

It is essential to note that this thesis presents a novel perspective. Even though the proposed design might not be feasible at the moment, it could be in the future. It is important to show a project like this that disrupts the business-as-usual planning and opens up the view of people of how it "should" look like. This project could guide the Netherlands into a circular state.

The aim of this work is to encourage individuals to reflect on our urban lifestyles and the things we take for granted, such as waste management. Often these types of infrastructures are invisible because they are either hidden underground or located on the outskirts of cities. Next to this, the current system makes it very convenient to buy brand new items without much thought. How this affects the climate, and the natural landscape is rarely considered. This implies a fundamental need for changes in individual behavior and urban design in response to these emerging challenges.

Structure of this Document

Following this introduction, a chapter is dedicated to the methodology of the project. This involves the problem statement, choice for the location, research questions, and methods.
Chapter 3 is focused on urban analyses of the district. The lay-out and characteristics of the district are addressed. Some issues to consider are the large number of low-income households, the big Flevopark that lays adjacent to the district, and the fact that parking defines the street-scape.
The next chapter dives deeper in the urban metabolism, one of the lenses (discussed in 02.2). Information is provided in a systematic way and on multiple scale levels, including global, national, municipal, and on district level. The behavior of the consumer appears to be of great importance. Next to this, the Indische Buurt has a problem of disposal of waste in the public space.
Chapter 5 analyses the governance. This involves the circular strategies of both the Netherlands and Amsterdam; the environmental vision of Amsterdam; and the stakeholders that are involved. The most apparent thing is that the spatial effect that are required for the transition towards a circular economy are not addressed in the documents. This chapter closes the analyses section of this document.

The design section of this thesis starts with a chapter that involves the vision of the design and the spatial framework for the whole district.
The chapter that follows dives deeper in the spatial design of the Javaplein and the streets that connect to this square.

Next is the chapter including the governance framework. Changes and additions regarding the governance are proposed in this chapter.

After this, the proposed design is assessed based on the R-strategies, which are leading the proposed design. Next to this, limitations of this thesis are discussed.

Lastly, conclusions are made and a reflection is presented.

In this chapter, the methodology of this thesis is discussed. This includes the problem statement, conceptual framework, research approach, research questions and methods. In addition to this, the choice of (design) location is explained.

02.1 Problem Statement
02.2 Conceptual Framework
02.3 Location
02.4 Research Approach
02.5 Research Questions & Aims
02.5 Research Methods
02.6 Research Flow Diagram

02. Methodology



Change is Needed!!

Figure 9: Kalverstraat (NOS, 2015)

Problem Statement

Humanity is currently exceeding Earth's planetary boundaries, which results in climate change and resource scarcity (Raworth, 2018). The system should **transition from a 'take-make-dispose'-economy to a circular economy**, changing consumption- and production patterns (Elisha, 2020; Ellen MacArthur Foundation, 2013). Because of this, the Netherlands set the goal of being completely circular by 2050 (Rijksoverheid, 2016), which is still far from the 24,5% of circularity in the year 2020 (de Wit et al., 2020). Therefore, urgent action is required!

The transition to a circular economy requires systemic change. Changes in how materials are managed, how people behave and how urban areas are designed and planned. The design of the urban environment must support people and communities in the transition to a circular system. Spatial design can make people more aware of the importance of circular behavior and make it more logical.

[knowledge gap] Academia and practitioners are already researching how a transition towards a circular system should look like, but the **social- and spatial dimension are currently overlooked** (Prendeville et al., 2017; Coenen et al., 2012). Therefore, this thesis has a context-specific approach with the district as focus point. The local scale was chosen because interventions on the local scale encourage people to adopt a proactive attitude (Levoso et al., 2020).

[scope] **The disposal of household waste** is the focus in this thesis. Firstly, because a lot can be improved by the Netherlands in the management of this type of waste (CBS, 2020 & Hervey, 2018). And secondly, households are at the center of the transition, towards a circular system, because they are both consumers and producers of resources (Savini, 2019). Due to the limited effect of the urban planner on online shopping, the focus of this thesis is on the disposal of resources.

[aim] The goal of this thesis is to **propose a spatial design, for the private-, collective-, and public space, that increases the awareness of people, and encourages people to do their part in the transition** towards a circular domestic food and consumer goods system.

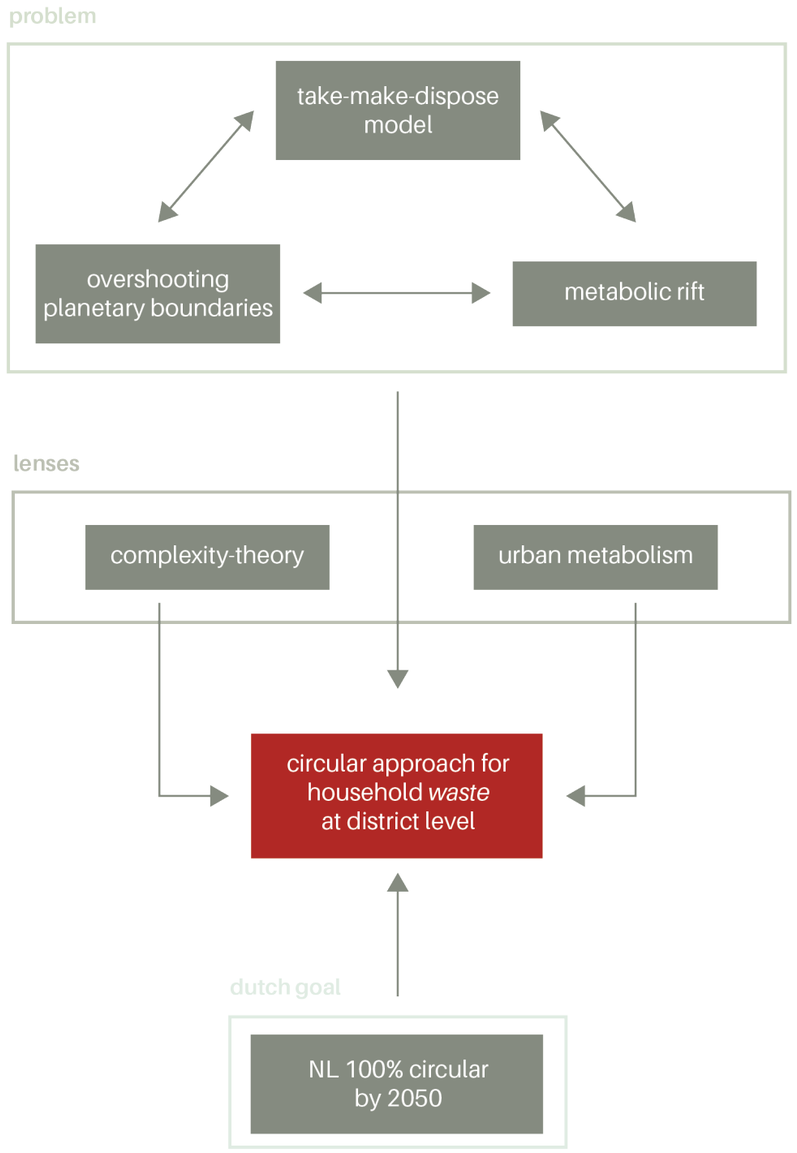


Figure 10: Conceptual Framework (made by author)

Conceptual Framework

The conceptual framework (figure 10) illustrates the relation between the problem field, theoretical background, and aim of this thesis.

The problem field is formed by three interconnected elements: the current 'take-make-dispose' economy; the fact that humanity is exceeding Earth's planetary boundaries; and fact that humanity is estranged from the environmental impact their actions have (metabolic rift).

To live on and with our planet in a sustainable way, change is needed! We need to move from a linear to a circular economy, where resources are used as efficient as possible. The government of the Netherlands is aware of the change which is needed, and therefore aims to be 100% circular by 2050.

In current academic literature and practice, tackling the transition to a circular economy, a research gap is present. Often the social- and spatial dimension is not accounted for in studies about the application of circularity (Prendeville et al., 2017; Coenen et al., 2012), as well as the various actors and interactions between them (Williams, 2019). This thesis will tackle this by implementing a context-specific approach, using the concept of 'urban metabolism' and 'complexity'-theory as lenses. These two terms are explained in the following section.

Location and specific conditions matter according to 'complexity' theory. 'Complexity'-theory is a way to look at the (development of) urban systems by considering the various actors and systems it consists of. 'Complexity'-theory, according to Wagenaar (2007), is the density and dynamics of the numerous interactions between system components (Wagenaar, 2007). The system is said to be complex when the interconnections are strong, and the likelihood of later events is influenced by the current events (Axelrod & Cohen, 1999).
Systems that start in a similar condition will develop in a completely other direction because of the adaptation of the system to the context (Sammut-Bonnici, 2015). Due to these interactions the outcome(s) in this system cannot be controlled, however it can be understood and harnessed (Wagenaar, 2007). Due to these interactions, a complex system is constantly in flux (Edelenbos et al, 2018). The unpredictability of the development of urban system underlines the importance to context-specific approaches to circularity. A solution for one place might not work, or work differently, in another location.

Next to the first notion of looking at an urban system through the lens of 'complexity'-theory, another lens will be used in this thesis. This lens is called 'urban metabolism'. This is 'the sum total of the technical and socio-economic processes that occur in cities, resulting in growth, production of energy, and elimination of waste' (Kennedy et al., 2007, p. 44). It can be noted that this approach involves looking at the social dimension, a dimension which is often not addressed in circular approaches (Prendeville et al., 2017). 'Urban metabolism' looks at the city as an ecosystem and examines the various input and output flows. In a circular city every flow needs to work together, just like in the human body (Metabolic, 2018). Using this lens results in a deep understanding of the context and the systems it consists of. Therefore, it can underpin the proposed (spatial) interventions better.

Selection of the Location

This thesis will use a context-specific approach with the focus on the district scale. It will focus on making residents aware and engage them to act in the transition towards a circular system, through the design of the public-, collective-, and private space.

Amsterdam was chosen to conduct this research for because the city already has a circular strategy. This consists mainly of rules and aims on the governance level. This strategy will be used to build upon. This strategy will be assessed and be enriched by input from design and literature. Improvements for the strategy of Amsterdam will be found to accelerate the transition towards a circular system even faster. The circular approach of the City of Amsterdam can serve as an example for other cities to look at and copy.

A couple requirements were established to choose a district which is suitable to conduct this research for:

- The district is (**mainly**) **focused on residents**. This is crucial because residents themselves are the ones who can change the consumption and production patterns of household waste.
- In the district also **another social issue is present**. According to Abujidi et al. (2021), this creates a higher support to make changes in the district. This social issue could for example be a high number of unemployment, many low-income-households, or a high level of loneliness among residents.
- In the district **also other functions are present** than only living. Therefore, synergies can be found in the various resource flows.
- The district has both **private-, collective- , and public spaces**, to be able to propose design interventions for all.

After the exploration of multiple districts in Amsterdam, the Indische Buurt has been chosen. The Indische Buurt is split up into two (administrative) 'wijken' (districts). In this research the author has chosen to look both at the Indische Buurt-Oost as -West. This choice is based on the assumption that residents do not see the Molukkenstraat as a hard boundary, as the author did not as well during the field trip (May 1, 2023). On the west side the main shopping area is located and on the east side more public (green) spaces is located. By making the choice to look at these two administrative districts, more synergies can be found.

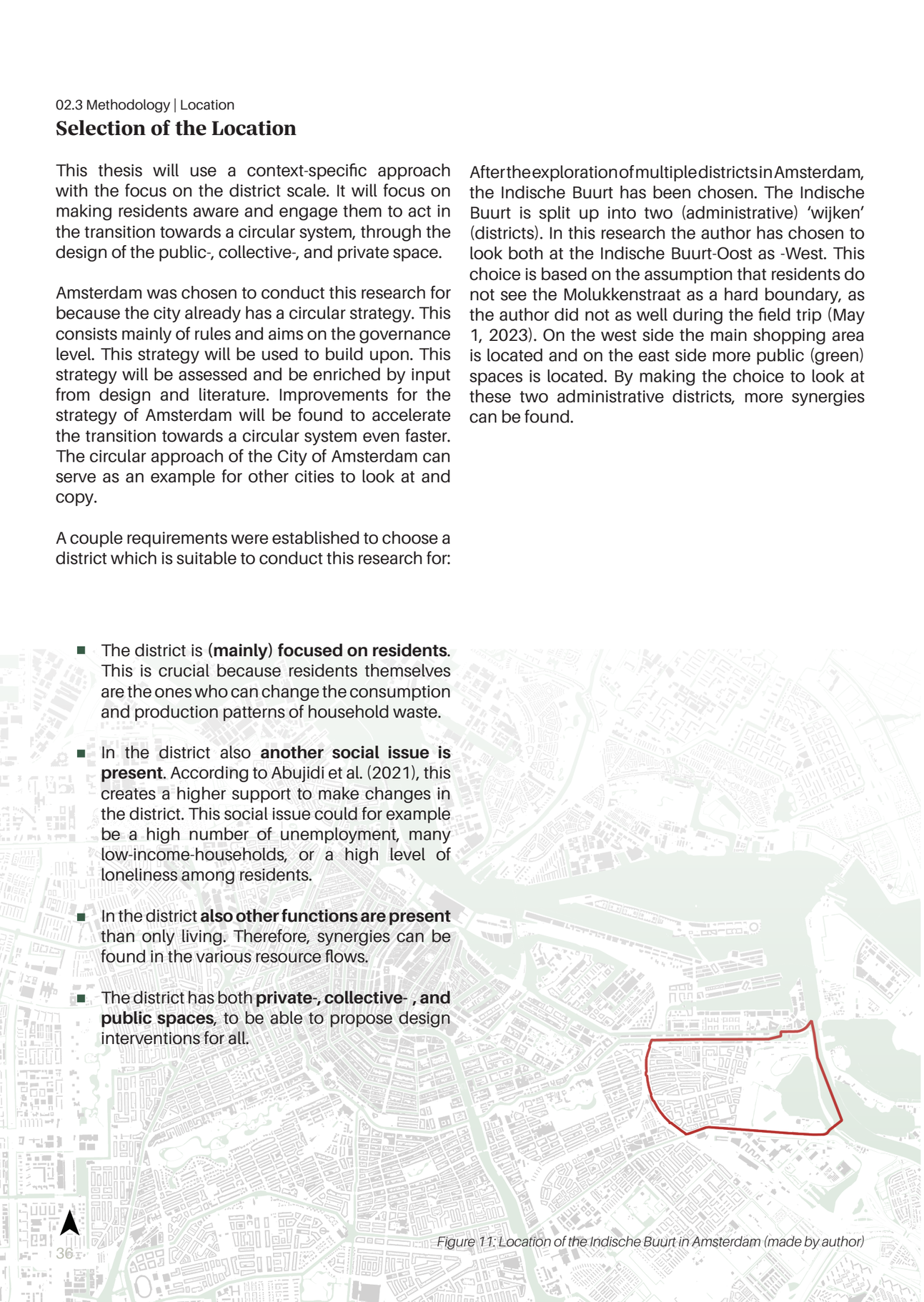


Figure 11: Location of the Indische Buurt in Amsterdam (made by author)

Research Approach

As stated before this thesis will have context-based approach. Therefore, the design plays an important role in this thesis. During the whole development of this thesis, research and design will develop parallel to each other. As illustrated in the diagram below (12), both the research and the design will have an influence on each other. Research will influence the way the design interventions will look like; and the design will influence what topics will be researched.

The way design and research are used during the process is written down in gray. In terms of the design, it will first be used to test and come up with new ideas. Later in the process, a spatial design will be made.

At the start, the research will be quite broad. For example, to write the problem statement. During the process designing will spark the need for specific research into a certain topic.

The red line in the diagram illustrates where the final outcome is positioned. The final outcome will be a context-specific spatial design. Recommendations will be done for the governance to better integrate the spatial interventions.

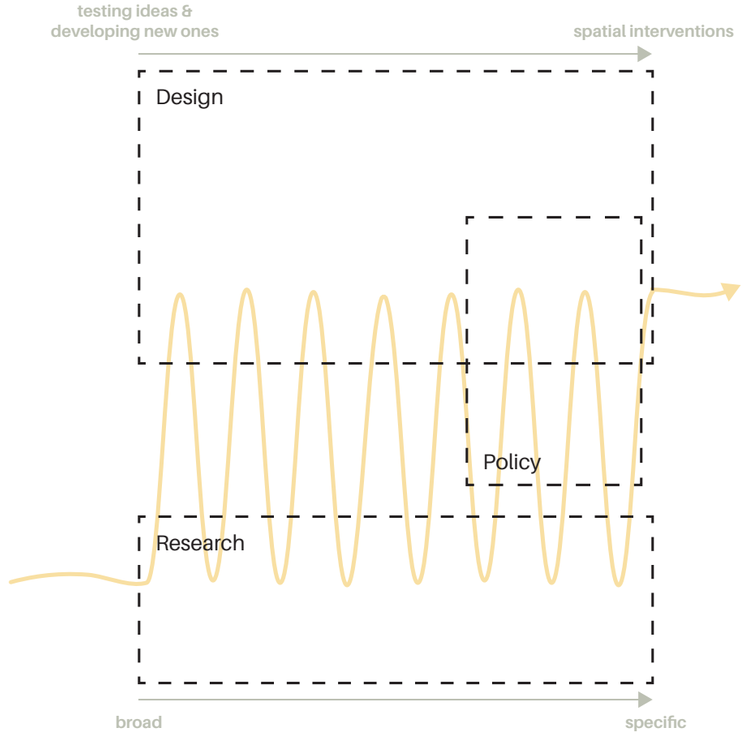


Figure 12: Research Approach (made by author)

Research Questions & Aims

How can spatial design interventions in the public, collective, and private space support and facilitate the shift to a circular domestic use of food and consumer goods in the Indische Buurt (in Amsterdam)?

[aim] The aim of this thesis is to explore how the Indische Buurt (Amsterdam) should **change spatially** to implement a system in which the **domestic use of food and consumer goods** is circular.
The design will help to increase the awareness of citizens and engages people to do their part in this circular system. Spatial interventions will be proposed in three domains: the **private-, collective- and public space**. The public space is the entry point for the design of the private- and collective space.

[outcome] The outcome of this thesis will be a **spatial framework** for the whole neighborhood and a **detailed design** for the area around the Javastraat and Javaplein. Interventions in the private, collective, and public spaces will be made. Next to this, a **governance framework** will be drawn up to make recommendations to modify the present municipal- and national-level strategy and policy to better integrate the suggested intervention(s) within the context.
In the conceptual framework below (figure 13) the outcomes are positioned in relation to the conceptual framework.

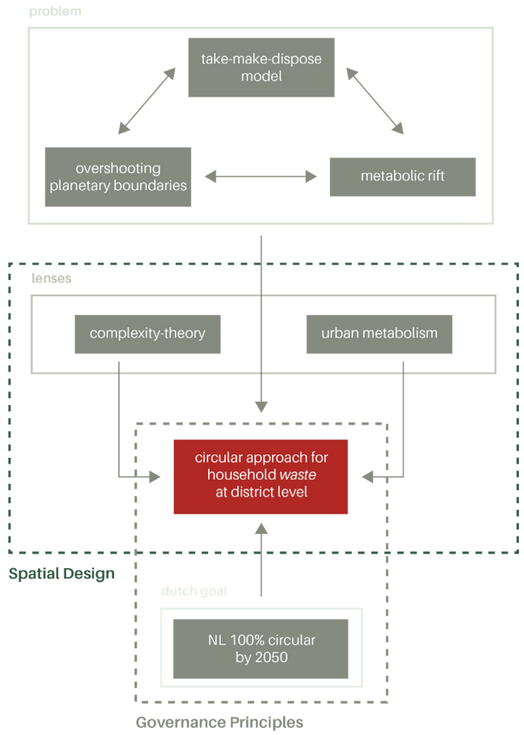


Figure 13: Conceptual Framework, including outcomes (made by author)

Sub Research Questions

1. What are the spatial and social characteristics of the Indische Buurt?

SV IN MA SA

2. What improvements could be identified in the current production-consumption system of the Indische Buurt to reach a circular domestic use of food and consumer goods?

IN MA LR SA

3. What behavioral aspects (of residents) should be considered when making a spatial design to transition towards a circular domestic consumption of food and consumer goods?

RD LR

4. What changes are needed in the governance of the Netherlands and the municipality of Amsterdam to integrate the proposed spatial interventions, needed for a circular domestic use of food and consumer goods?

IN RD LR SA PA

Aim

UNDERSTAND the specific **characteristics** of the Indische Buurt and therefore acknowledge the opportunities and issues

IMPROVE the **domestic use of food and consumer goods** in the Indische Buurt

IDENTIFY behavioral aspects which are important, regarding the consumption of food and consumer goods and exhibiting circular behavior, to enrich the spatial design

ADVANCE the current **governance** of the Netherlands and the municipality of Amsterdam to support the proposed (spatial) intervention(s) in a better manner

Methods

Site Visit SV
(Unstructured) Interview IN
Mapping MA
Research by Design RD
Literature Review LR
Stakeholder Analysis SA
Policy Analysis PA

Methods

SV Site visit(s)
Type: Qualitative

Gain an understanding of the district, by observing, describing, and concluding the characteristics. To propose well-founded interventions in the district, the author needs to have a thorough understanding of the district and the challenges (and opportunities) at hand.
In this thesis this method is applied by walking and cycling through the district, making pictures, and having conversations with residents.

Themes that are addressed:
- Spatial lay-out,
  ex. building blocks and
  public-, collective- and private spaces
- Waste collection and litter in the public space
- Type of people who live or use the district

Sources: own observation

Sub-question(s): 1

MA Mapping
Type: Qualitative & Quantitative

Visualize, connect and/or reflect on certain observations. Maps are about different themes, spatial structures, or systems. Maps will be used in the beginning as an analytical tool and closer to the end as a visualization tool for the design proposal.

Themes that are addressed:
- Spatial: ex. district lay-out, greenery & connectivity
- Material: waste collection points & flows

Sources: QGIS, Google Maps, Gemeente Amsterdam

Sub-question(s): 1, 2

LR Literature Review
Type: Qualitative & Quantitative

Read and review scientific papers to broaden and deepen the understanding of the topic. This will underpin and enrich the (design) choices that will be made.

Themes that are addressed:
- Theoretical background
- Types, numbers and flows of domestic waste
- Aspects to change behavior

Sources: Google Scholar, TU Delft Library

Sub-question(s): 2, 3, 4

PA Policy Analysis
Type: Qualitative & Quantitative

Review policy documents to create an understanding of the municipal and national current and future policies. Thereafter, the policies will be held alongside the other findings and (spatial) interventions, and shortcomings will be described and resolved.

Themes & Scales:
- Municipal & national (scales)
- Transition towards a circular economy (thematic)
- Environmental vision (thematic)

Sources: Gemeente Amsterdam & Rijksoverheid

Sub-question(s): 4

IN (Unstructured) Interview
Type: Qualitative

Collect context-specific information about the district, the city, and the community initiatives. This is done by having an open talk with an expert. The author has prepared questions but is led by the direction in which the conversation goes.

Who & Why:
- Employees City of Amsterdam (Waste & Resources)
  Information about what the municipality is already doing & how they see the current and future implementation of a circular system for household waste.
- Volunteers Buurtbuik (neighborhood initiative)
  Information about the (purpose of) the initiative & general information about the issues in the district.
- 'Gebiedsmakelaars' (see glossary for explanation)
  Information about the challenges of the district & the degree in which the residents are currently aware of the necessity of the transition to a circular system for household waste.

Sources: knowledge of interviewees

Sub-question(s): 1, 2, 4

RD Research by Design
Type: Qualitative

Get (new) insights about possible solutions by projecting a design (proposal) onto the context. The outcome of this method are (eye-level) sketches, maps, principles, or recommendations for policy documents.

Scales:
- Building
- Block
- District
- Municipal (only for policy)
- National (only for policy)

Sources: own imagination

Sub-question(s): 3, 4

SA Stakeholder Analysis
Type: Qualitative & Quantitative

Identify the various stakeholders and their relations with each other to create a good understanding of the context. These actors will be examined on their power and interest. This is important to know for proposing design- and policy recommendations.

Scale:
- District

Sources: own thinking, underpinned by literature

Sub-question(s): 1, 2, 4

Research Flow Diagram

The research flow diagram shows how different methods are used to answer a certain research question. Next to this, the relation between the different research questions is shown, and their influence on each other. A (preliminary) result of one question can influence the approach of another question.

Due to the strong connection between the different research questions, the questions will not be answered one after another. The answers to these questions will be developed simultaneously.

RQ

How can spatial design interventions in the public, collective, and private space support and facilitate the shift to a circular domestic use of food and consumer goods in the Indische Buurt (in Amsterdam)?

Sub-RQ 1

How is the Indische Buurt organized socially, spatially, and organizationally?

SV IN MA SA

Sub-RQ 2

What improvements could be identified in the current production-consumption system of the Indische Buurt to reach a circular domestic use of food and consumer goods?

IN MA LR SA

Sub-RQ 3

What behavioral aspects (of residents) should be considered when making a spatial design to transition towards a circular domestic consumption of food and consumer goods?

RD LR

Sub-RQ 4

What changes are needed in the governance of the Netherlands and the municipality of Amsterdam to integrate the proposed spatial interventions, needed for a circular domestic use of food and consumer goods?

IN RD LR SA PA

Figure 14: Analytical Framework (made by author)

Outcome

The outcome of this thesis will be a spatial framework for the Indische Buurt, and a detailed design for the Javaplein and the surrounding streets. Interventions for the public-, collective- and private space will be proposed.
Next to this, a governance framework will be drawn up to improve the governance on the municipal and national level.

Methods

Site Visit	SV
(Unstructured) Interview	IN
Mapping	MA
Research by Design	RD
Literature Review	LR
Stakeholder Analysis	SA
Policy Analysis	PA

In this chapter, various analysis are made of the Indische Buurt. These analyses include social-, economic-, and spatial aspects. This shows the characteristics of the district, and therefore also introduces the current situation that will be worked with in the proposed design. These analysis are important for the spatial design which will be proposed. Topics that will be touched upon include: characteristics of the inhabitants, typology of buildings, and the (circular) initiatives that already exist.

03.1 Introduction
03.2 Greenery
03.3 Connectivity
03.4 Typology
03.5 Local, Bottom-Up Initiatives

03. Urban Analysis



Figure 15: Javastraat (made by author)



Figure 16: Molukkenstraat (made by author)



Figure 17: Insulindeweg (made by author)

Introduction to the Indische Buurt

The Indische Buurt is in the east of Amsterdam. It was built around the turn of the 20th century (Gemeente Amsterdam, 2023). In 2022, around 22.000 residents lived in the district. From the ~11.800 dwellings around 75% are rentals, ~60% of which are owned by housing cooperation's (CBS, 2022). Next to the high number of social housings, quite of lot residents are vulnerable. The district has a higher percentage (in relation to the rest of Amsterdam) of minima-households; vulnerable 66+ inhabitants; inhabitants with a poor health; and inhabitants with a low education level. In addition to this, Indische Buurt-Oost is seen as not child-friendly (Gemeente Amsterdam, n.d.-c).
In the last couple of years, also well-educated people move there resulting in a division (Gemeente Amsterdam, 2023).

As stated before, the Indische Buurt-Oost and -West are separated by the Molukkenstraat (figure 16). On this street are some shops but mainly houses. Another major (car) road, the Insulindeweg (figure 17), is situated in the east-west direction. This road is quite difficult to cross for pedestrians and bicycles due to the small number of crossings.
The Javastraat (figure 15) is the main shopping street of the district. Also, a lot of restaurants are located here. In this street is a mixture of local, non-western shops and trendy restaurants or shops. This is visualized in sub-chapter 04.3 'Javastraat'. The author noticed that this street has a lot of car traffic, both local traffic as delivery of goods.
The district consists of (almost) only multi-storey apartments. Multiple building ages and styles can be seen, ranging from before 1915 to newly built (see figures 38-41).

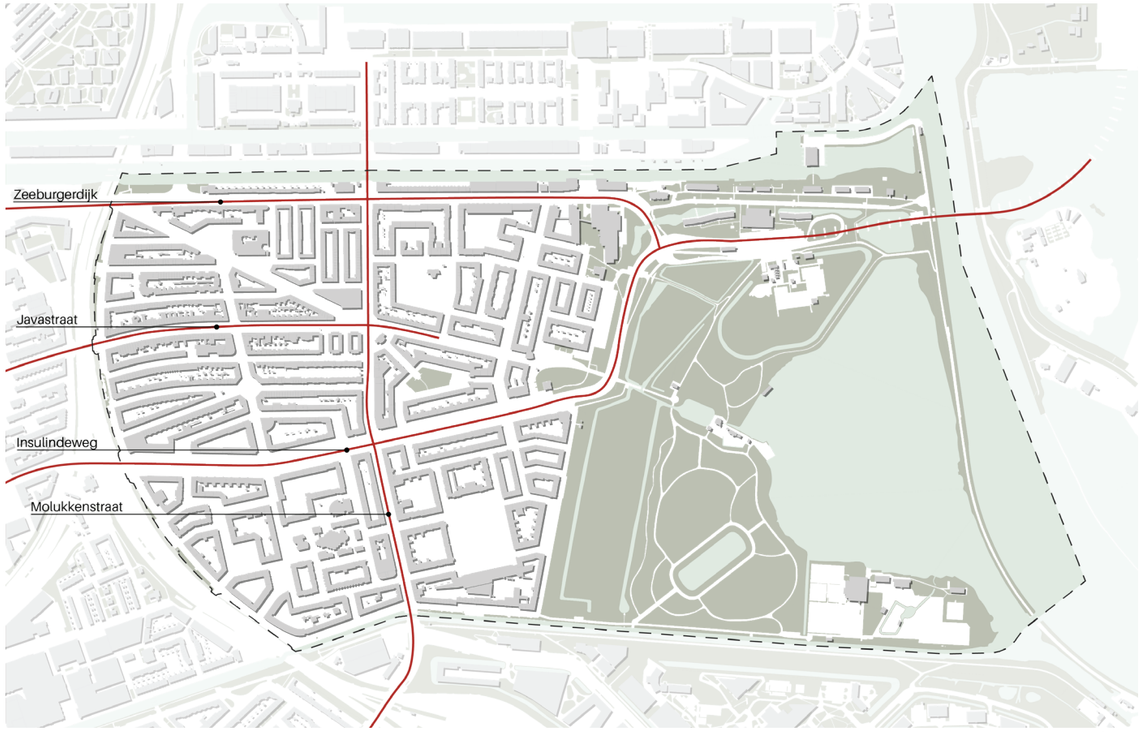


Figure 18: Indische Buurt, with main axes (made by author)

Pyramid of Maslow

As mentioned in the introduction of the district, quite a lot of people are part of a minima-household (Gemeente Amsterdam, n.d.-c), and therefore worry whether they get around in terms of money. This is underlined by one of the 'Gebiedsmakelaars' of the Indische Buurt. He said money is a big motivation point among residents to act on an issue. In addition to this, he stated that many residents of the district are not (yet) taking actions for the transition towards a circular system because they are occupied with meeting their basic needs ('Gebiedsmakelaar', personal communication, May 22, 2023). The pyramid of Maslow explains this. Maslow states that to have the desire to develop oneself, the other needs must be satisfied first (Eelants, 2020). The desire, or feeling the need, to do one's bit for the transition towards a circular resource system can be seen as development of oneself. In the Indische Buurt, many people do not have the space in their heads to think about this, because they need to feel (financial) safe first.

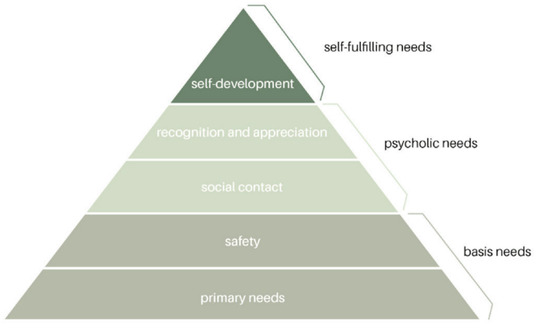


Figure 19: Pyramid of Maslow (reprinted from Eelants, 2020)

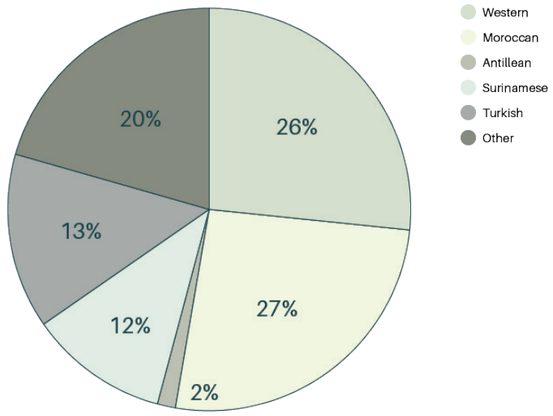


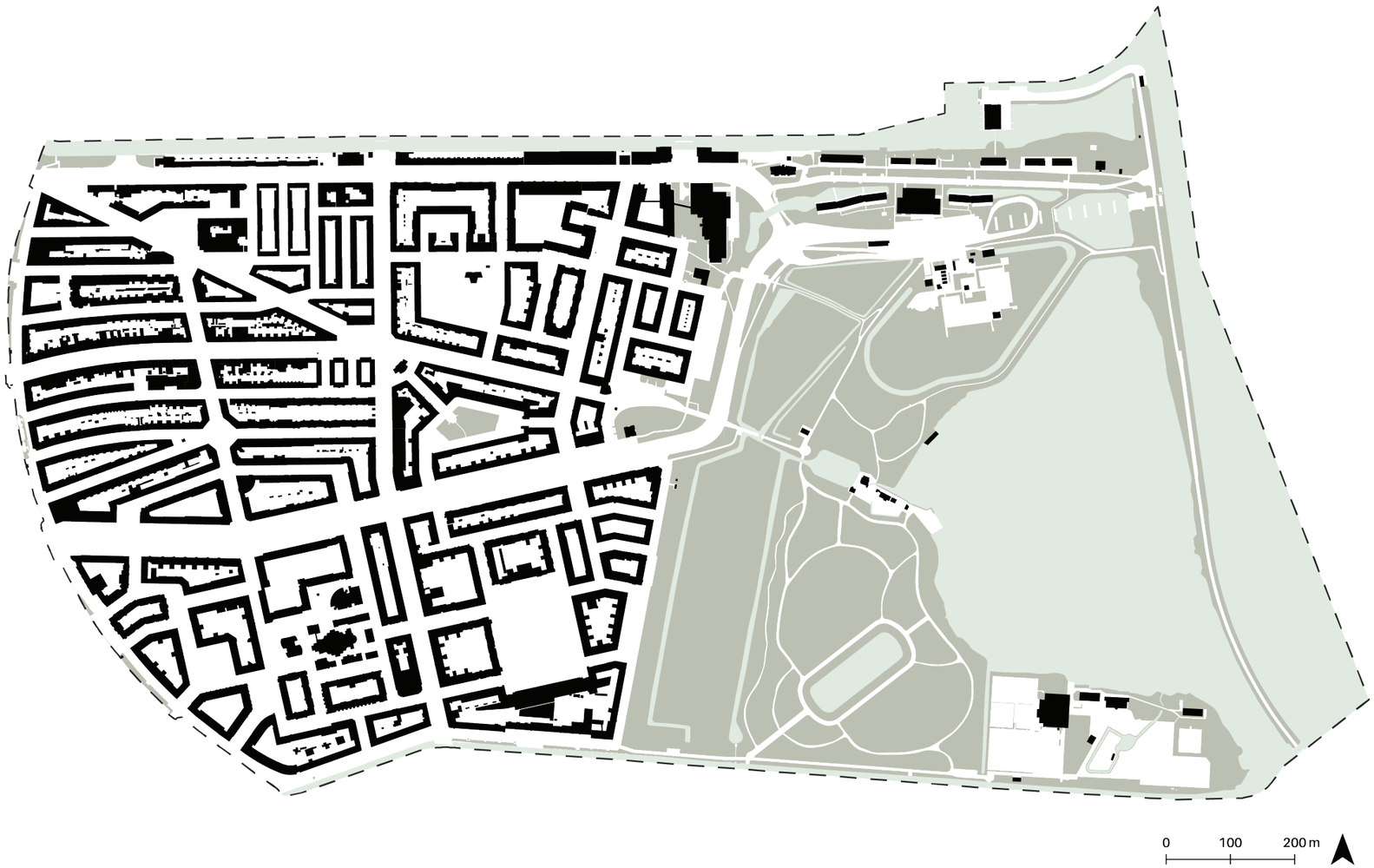
Figure 20: Nationalities district (made by author, based on Wijk Indische Buurt-Oost, 2022 & Wijk Indische Buurt-West, 2022)

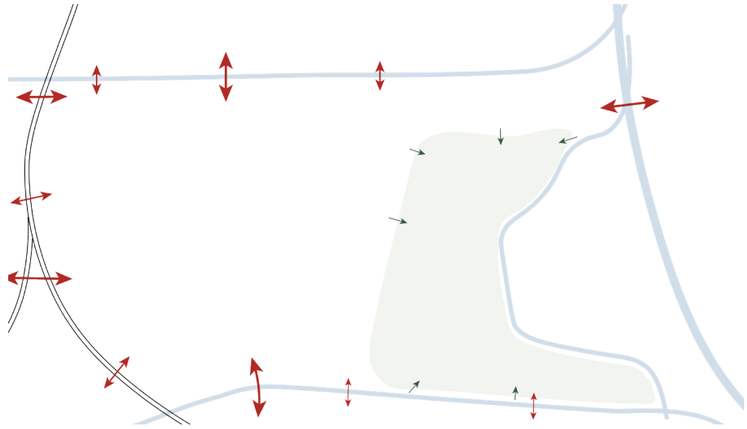
Scala of Nationalities

As can be seen in the figure at the left (20) a big part of the residents of the Indische Buurt have a migration background. This thesis focuses on two districts ('wijken'), the Indische Buurt-Oost and -West, therefore the numbers in the diagram are an average of the separate numbers. This was done because the numbers are comparable to each other.
Moroccan people are the most strongly represented, followed by Western people. Surinamese and Turkish people also are represented quite strongly (Wijk Indische Buurt-Oost, 2022 & Wijk Indische Buurt-West, 2022). When developing a design for the district, it is important to consider the many ethnicities, cultures, norms, and values that go along with them.
The diversity of the residents should be taken into account in making recommendations for the policy. Dutch might not be their mother tongue, and information might be more difficult to understand. Therefore ways needs to be found to effectively address them as well.

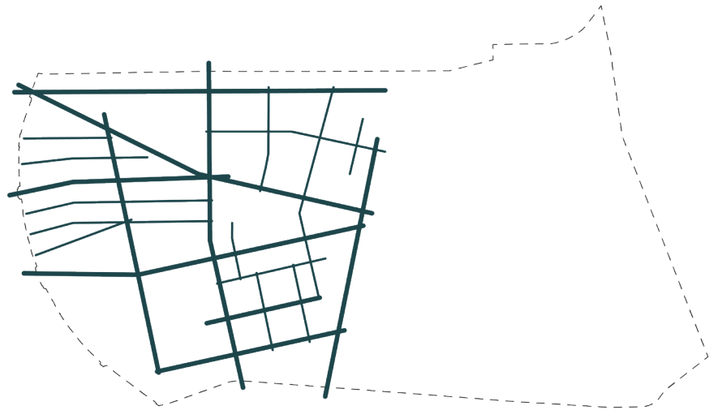


Figure 21: Local residents (made by author)





The Indische Buurt as Island



Sight-lines

03.1 Urban Analysis | Introduction

Comprehensible But Closed Off

The Indische Buurt has a limited amount of access points (figure 23), due to the train tracks and water-bodies surrounding it.
The movements within the district are quite comprehensible. Almost everywhere in the district can be reached within 15 minutes. The adjacent Flevopark is not reachable by foot within 15 minutes. This is mainly because there are only a limited amount of entrances, so one needs to make a detour to reach it.
Due to the street pattern with many continuous lines, sight-lines are visible and one can orientate oneself quite easily (see figure 24).

Figure 22 (left): Morphology (made by author)
Figure 23 (right, above): Conceptual drawing "island" (made by author)
Figure 24 (right, below): Conceptual drawing "sightlines" (made by author)

Green in Amsterdam

In this image the main green structures in and around Amsterdam are illustrated. It is apparent that, in the context of all of Amsterdam, the greenery of Flevopark is a significant portion.
This should be taken into account when developing a spatial design. It is likely that people from the surrounding districts also use the park. It would therefore be preferable if its function as a park was retained.



Figure 25: Greenery in Amsterdam (made by author)



Figure 26: Flevopark (made by author)



Figure 27: Javaplein (made by author)

Fifty Shades of Grey

In the map below (figure 28), the space division can be seen. The area which is not illustrated in gray (the building blocks) is the public space in the district. As can be seen, not a lot of greenery is present in the district. Expect for the Flevopark in the east. Only 3% of the Indische Buurt-West is green space, and 29% of the Indische Buurt-Oost.

The high amount of paved area in the district causes heat stress ('Gebiedsmakelaar', personal communication, May 22, 2023). In general terms this can create problems related to health, livability, and (pressure on) outdoor spaces (Kennisportaal Klimaatadaptatie, n.d.). In the Indische Buurt, especially in the summer, it creates problems with bad smell and rotting rubbish on the streets ('Gebiedsmakelaar', personal communication, May 22, 2023). Therefore, it is important for the health of the residents that more greenery is created in the public space.

In the pictures on the right and on the previous pages not a lot of qualitative greenery is illustrated.







Figure 28 (left): Green in the public space (made by author)
Figure 29 (right, above): Makassarplein (made by author)
Figure 30 (right, below): Boniplein (made by author)

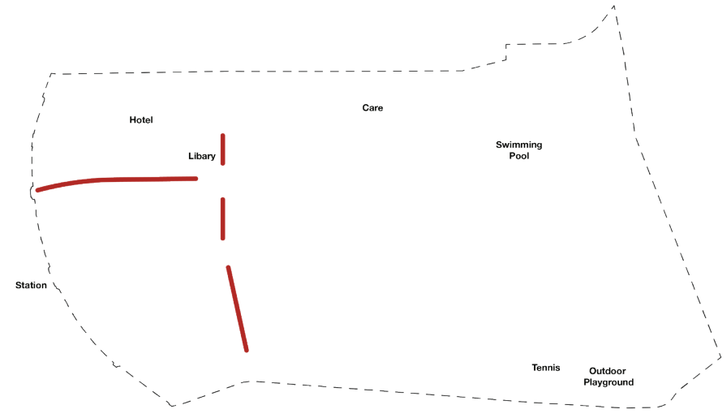
Space-Syntax

In the figure below (31), the space-syntax of the district can be seen. A couple things stand out. The most connected streets in the district are the Molukkenstraat and part of the Insulindeweg. This is due to their centrality in relation to other streets. The street enclosing the district to the north and the one leading to the Javaplein are the second-most connected. As mentioned earlier in this report, the Indische Buurt has quite clear sightlines. Most of these are quite well connected.
One of the areas which is the least connected, is the Flevopark. This is due to the limited number of access point to the park. Next to this, the area in the north-east is also not well connected. In the west of the district and east from the Molukkenstraat are also areas which are not well-connected.



Figure 31: Space-syntax (made by author)





Conceptual Diagram

03.4 Urban Analysis | Typology

Primarly Residential

The main function of the indische Buurt is housing (blue). In some cases the ground floor of a building is used for a different function, but from the first floor onwards it is used for housing (blue striped).
The shops are foremost located in the Javastraat and the Molukkenstraat (illustrated in red in the drawing on the right). Scattered around the district are some gathering- and other (special) functions. Some of them are noted in the drawing on the right.

Figure 32 (left): Functions buildings (made by author)
Figure 33 (right): Conceptual drawing "functions" (made by author)



Figure 34: Sumatraplantsoen (made by author)



Figure 35: Makassarstraat (made by author)



Figure 36: Tweede Atjehstraat (made by author)



Figure 37: Molukkenstraat (made by author)

Facades

In the Indische Buurt almost exclusively multi-family buildings are located. This means that these households, except for people living on the ground floor, share an entrance and staircase. Most of the homes have a small balcony.
On these pages four of the buildings are illustrated. In the image caption also the size of the homes is noted.

When creating a spatial design for the district, it should be taken into account that a lot of people have shared entrances, small dwellings, and the fact that few people have gardens.

Figure 38-41 (from left to right): Facade Semarangstraat I, Semarangstraat II, Bataviastraat, Balistraat (made by author)



Semarangstraat *(sizes 46, 71 & 82 m²)*



Semarangstraat *(sizes 69-84 m²)*



Bataviastraat *(sizes 46 & 76 m²)*



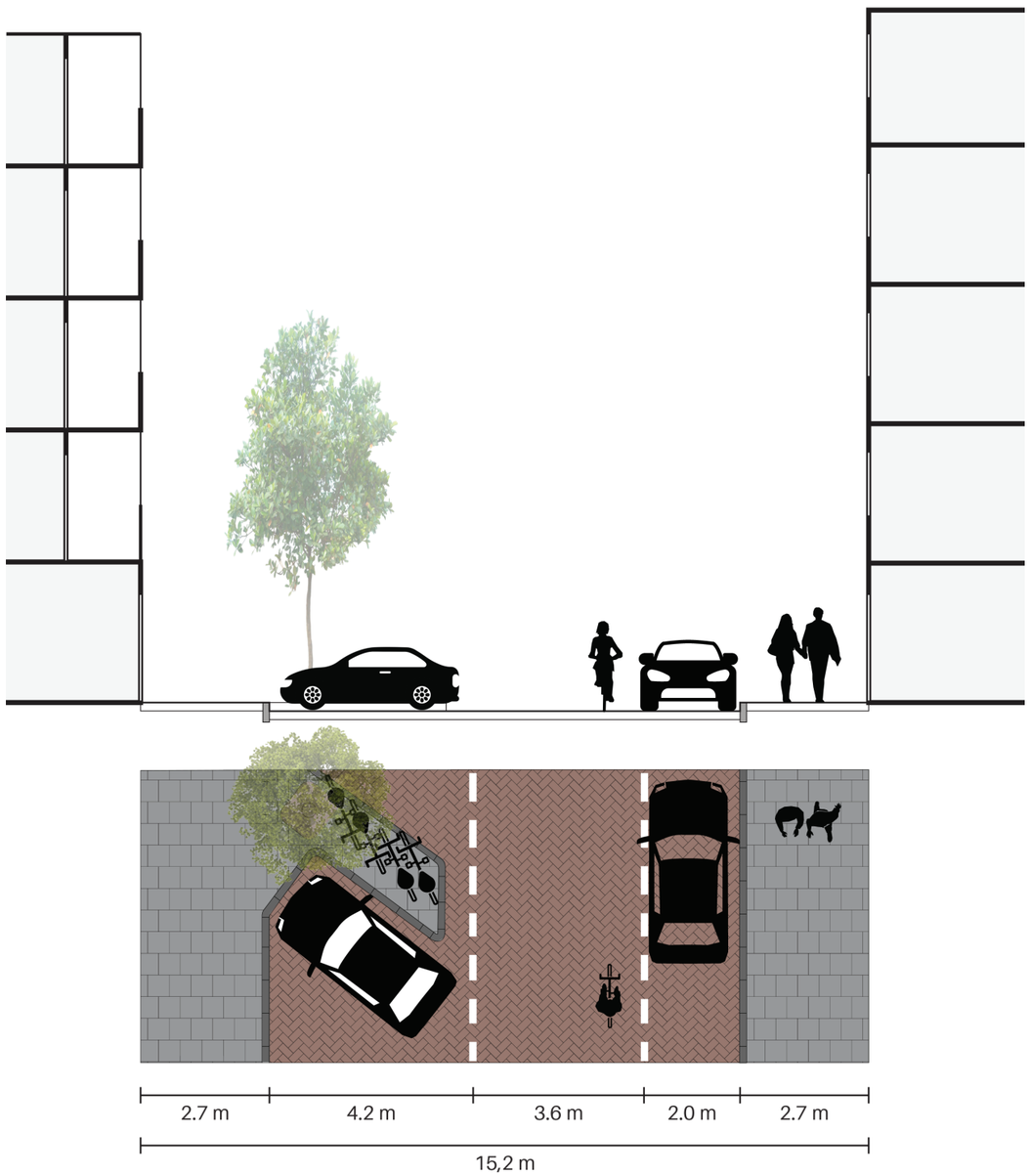
Balistraat *(sizes 80 & 104 m²)*

Parking is Prominent

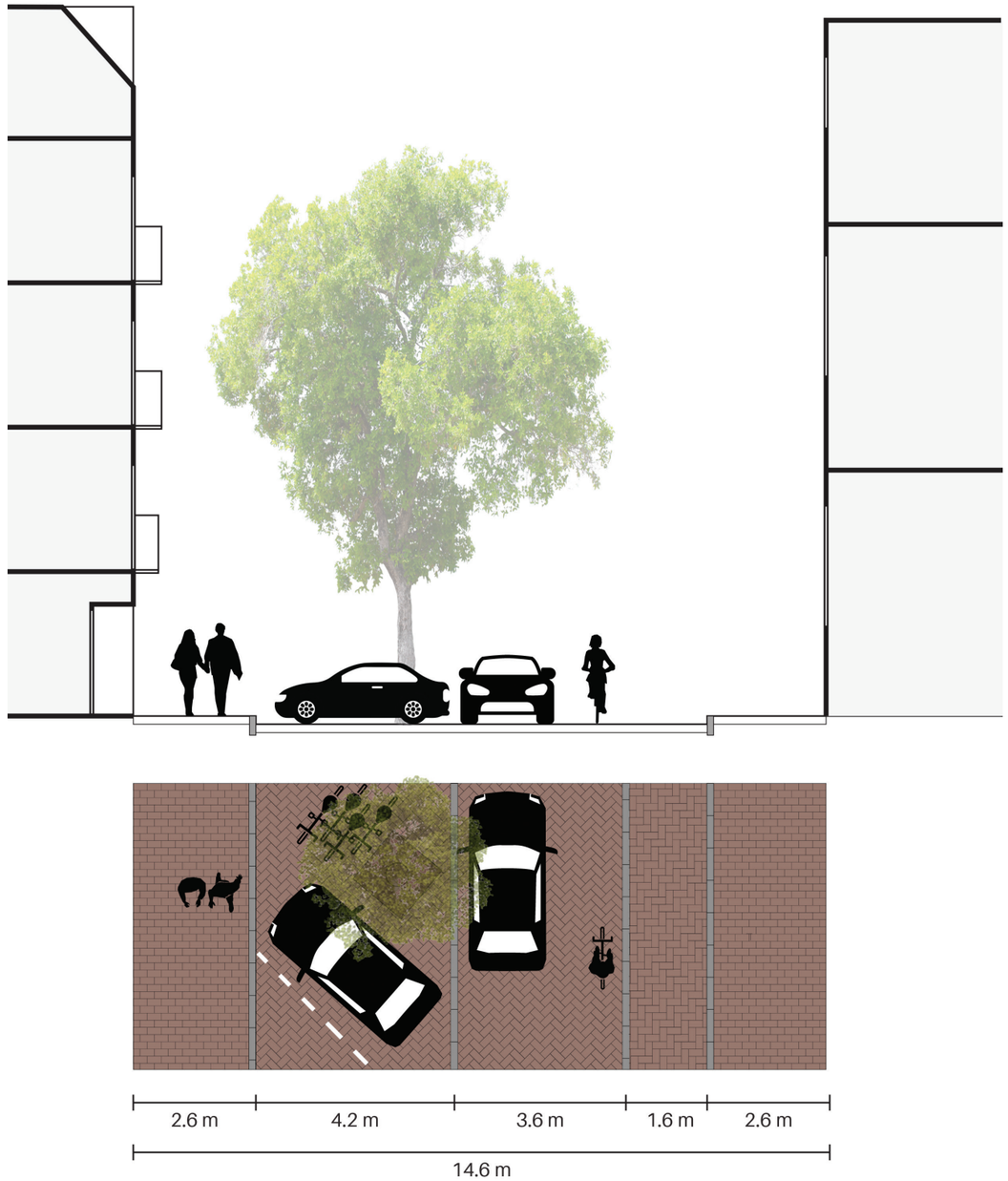
In these sections can be seen that not a lot of green is present on the streets of the Indische Buurt. Next to this, car parking is very prominent on the streets. The numbers correspond with the location on the map on the next page.

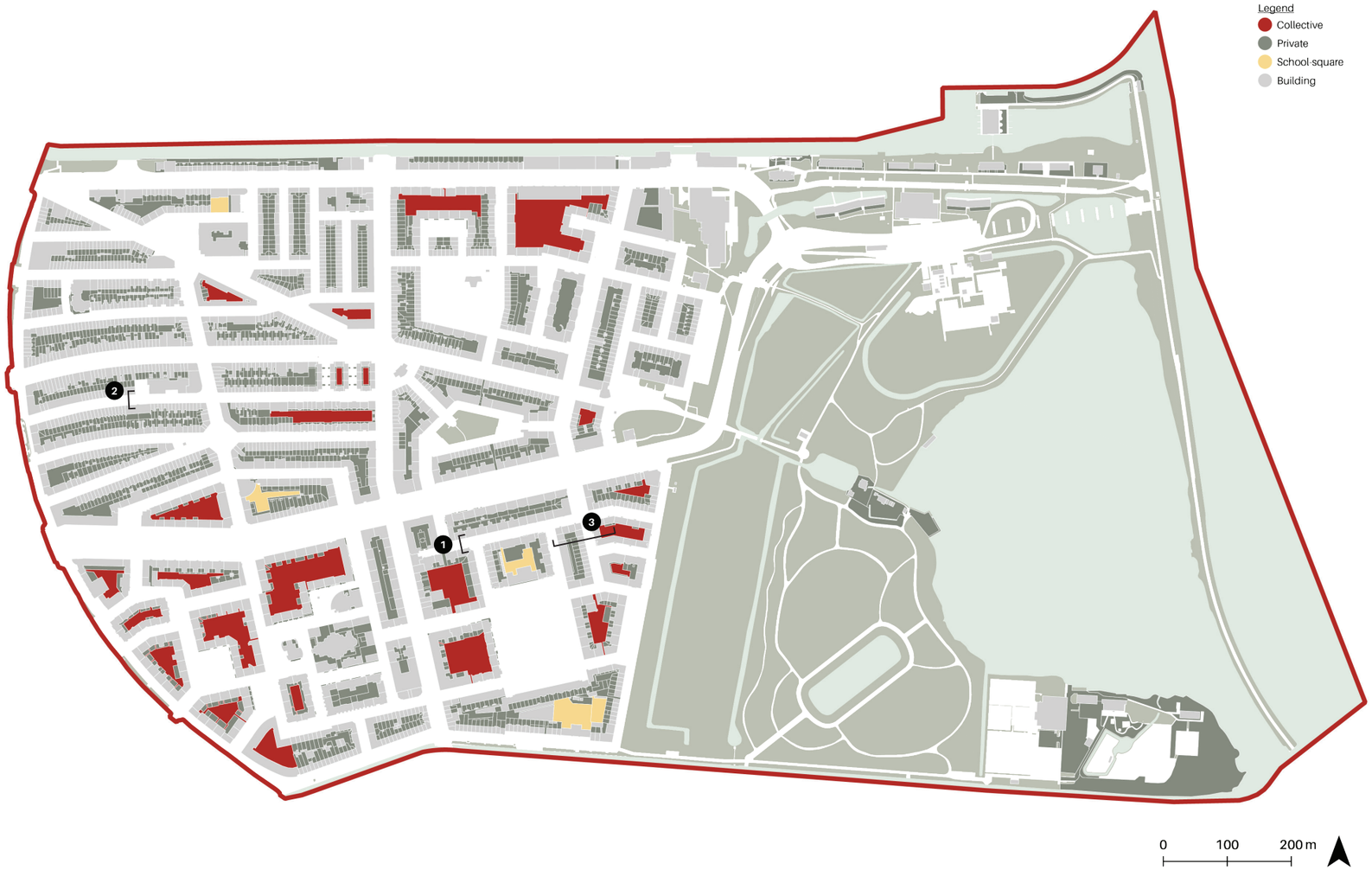
Figure 42 (left): Section Bataviastraat (made by author)
Figure 43 (right): Section Balistraat (made by author)

Bataviastraat (1)



Balistraat (2)





03.4 Urban Analysis | Typology

Collective & Private Gardens

In the figure above (44) the ownership of courtyards is analyzed. The courtyards highlighted in red are currently collectively used and owned. This means that the residents living adjacent to it can use the space. The threshold to start a community initiative in this space is lower since the space is already available (for the residents). Negotiations with the municipality can be omitted here.
The yellow areas are used by schools. Because the use is neither completely private or collective, this is defined as a separate category.

Figure 44: Collective & Private Gardens (made by author)

Collective & Private Gardens

Figure 45: Section Semarangstraat (made by author)

Semarangstraat (3)

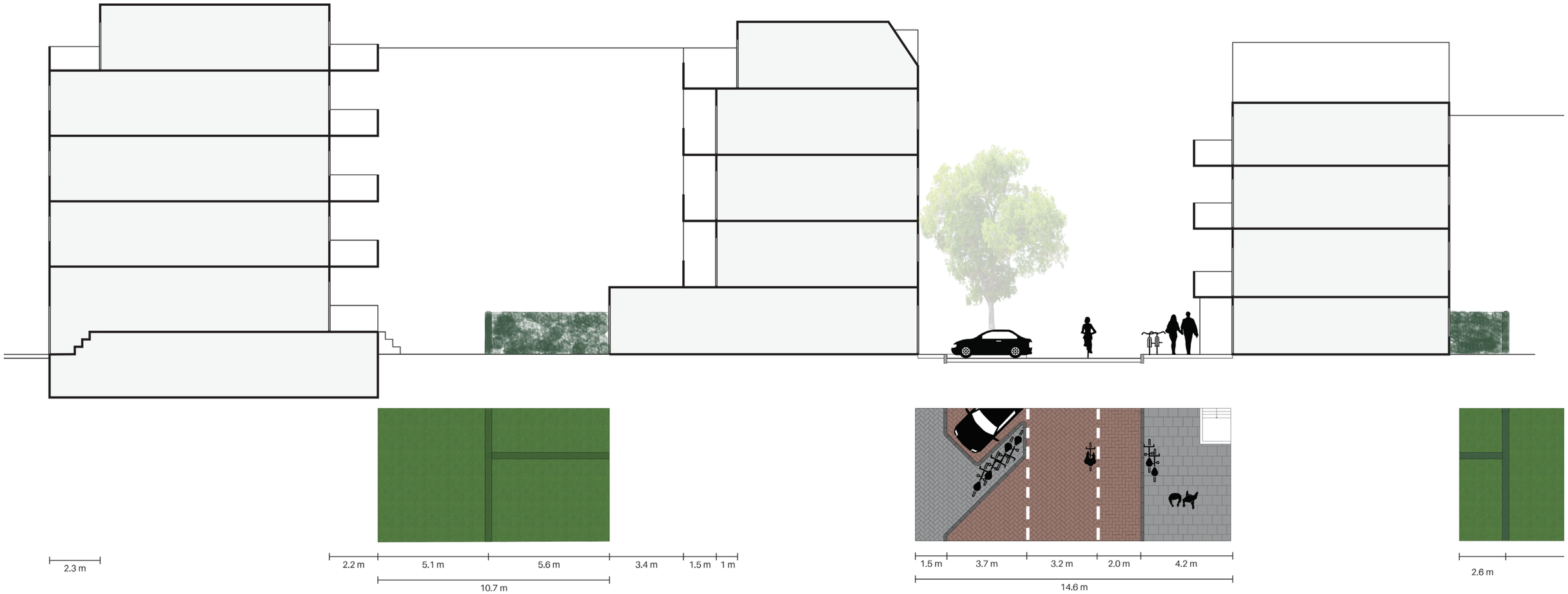


Figure 46: Ownership of buildings (made by author)

Ration Private- and Corporation Ownership

The fast majority of the housing in the Indische Buurt are owned by social housing corporations. Only the gray houses are owned privately. This means that these corporations are an important stakeholder in the district.



A Socially Active District

In the Indische Buurt multiple initiatives (for the transition towards a circular system for domestic disposal of food and consumer goods)are present. On the following pages, the initiatives are explained and the (organizational) structure is visualized.

In the figure below (47), the location of the various initiatives can be seen. It can be observed that a lot of them are located near the Javastraat or next to the Flevopark.

It can be observed that a lot of initiatives tackle multiple issues with their solution. Often a societal issue is combined with another one.
An example of this is 'Buurtbuik'. They tackle the issue of food waste and hand out free food for the ones in need.

Note about the diagrams of the organizational structure: the circles are stakeholders; the squares are locations; the arrows represent the resource flow; the dashed arrows represent the interactions (which are explained by the text).

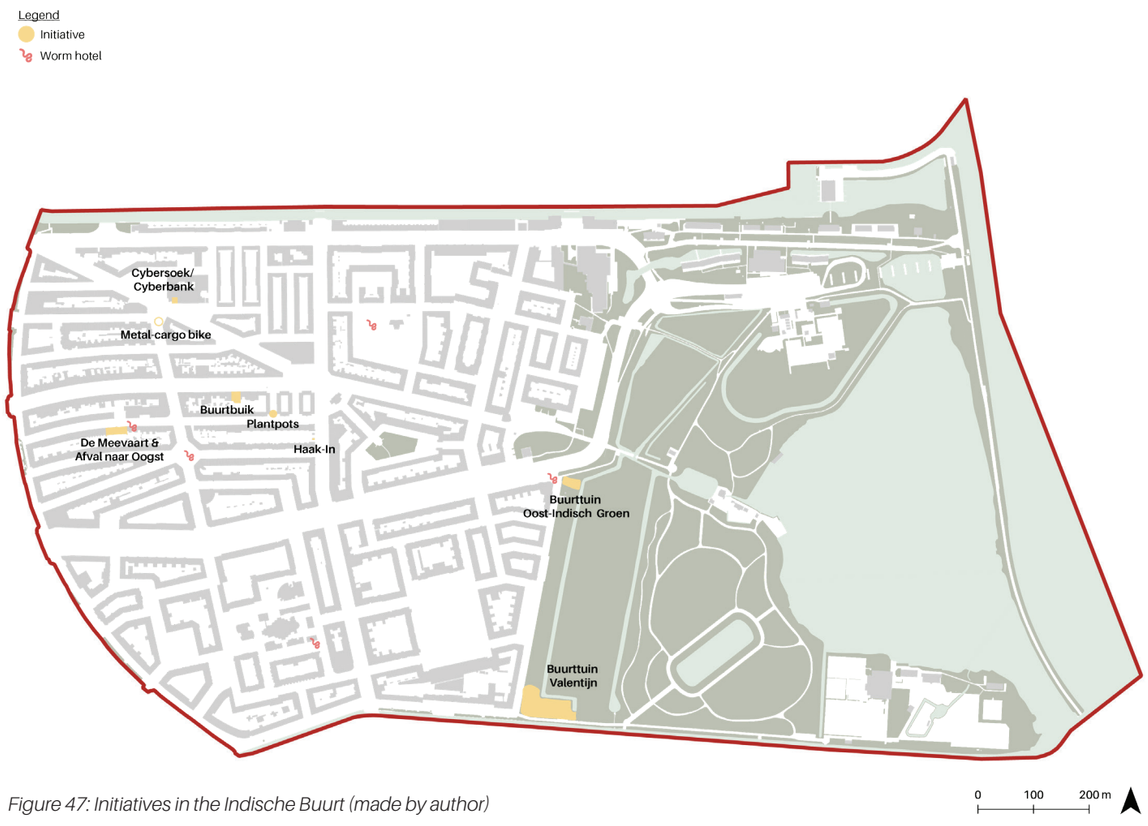


Figure 47: Initiatives in the Indische Buurt (made by author)

Organic Waste



Figure 48: Buurtbuik (Buddelmeijer, 2023)

Buurtbuik
Buurtbuik is an initiative which tackles food waste by collecting food what is left from restaurants, companies, and supermarkets. With this food a three-course-meal is created by volunteers; residents can join and get a free meal. Some residents come here to have social interaction, but most people cannot afford a meal (everyday). The volunteers are a combination between people who like cooking, and people who need the voucher they receive. Per hour one gets one "makkie", this voucher serves as a discount for several shops and services in the area (Ed (coordinator Buurtbuik), personal communication, May 1, 2023). The initiative is in a church which is empty during the time they cook and serve food. Besides the reduction of food waste and the free meals they provide, the building is also used very efficient by combining different uses. The author has also volunteered here a couple of times in the last months.

Explanation figure:
B (Businesses), S (Supermarkets), R.h (Resident, helper), R.x (Resident, in need of free food OR a social talk)

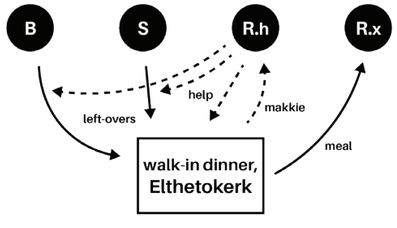


Figure 49: Organizational structure, Buurtbuik (made by author)



Figure 50: Afval naar Oogst (Doe meel, n.d.)

Afval naar Oogst (Waste to Harvest)
Afval naar Oogst is an initiative which makes compost out of organic waste that would otherwise end up in the waste bin. They work together with several green initiatives across the city. One collection point is at De Meevaart. Residents can sign up and join this initiative. The only thing they need to do is separate their waste and bring it to the collection point. This initiative reduces organic waste and gives it a useful destination (Afval naar Oogst – Over ons, n.d.).

Explanation figure:
CI.a (Circular Initiative, 'afval naar oogst'), CI.m (Circular Initiative, Meevaart), R.w (Resident, waste disposer)

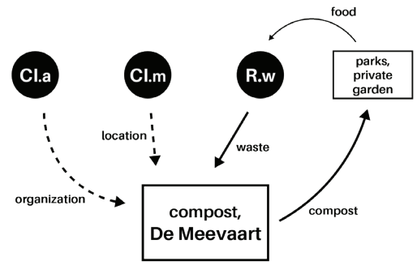


Figure 51: Organizational structure, Afval naar Oogst (made by author)



Figure 52: Worm hotel (made by author)

Worm hotel
In a worm hotel, organic waste can be composted and thereafter be used as fertilizer for soil (in gardens). In the Indische Buurt a couple of them are already present. Ownership is in the hands of residents. Most of the time, access need to be granted from the owner to contribute to the worm hotel with one's own organic waste (Gemeente Amsterdam, n.d.-e). At some worm hotels, a little window is created where one can see how the process works.

Explanation figure:
R.c (Resident, coordinator of one specific wormhotel), R.w (Resident, waste disposer)

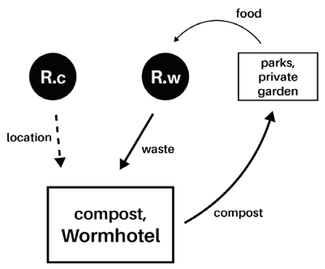


Figure 53: Organizational structure, Wormhotel (made by author)



Figure 54: Buurttuin Valentijn (made by author)

Buurttuin Valentijn
This community garden has two ways of participating. The first one is vegetable gardens which can be adopted and maintained by individuals. The second one is the possibility to join on the second Saturday of the month and help maintain the public part of the garden. The vegetables, fruit and spices which are not part of the individual gardens can be harvested (with respect) by everyone (Van Amsterdamse Bodem - Buurttuin Valentijn, n.d.).

Explanation figure:
R.w (Resident, waste disposer), CI (Circular Initiative), R.o (Resident, owner of private garden), R.h (Resident, helper), R.f (Resident, harvest food)

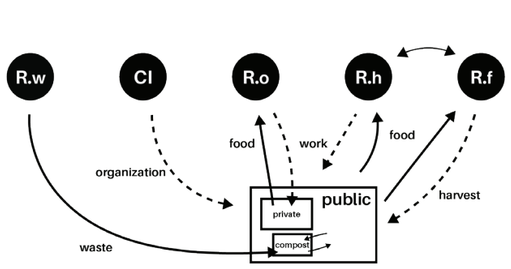


Figure 55: Organizational structure, Buurttuin Valentijn (made by author)



Figure 56: Buurttuin Oost-Indisch Groen (made by author)

Buurttuin Oost-Indisch Groen
This community garden was established to inspire residents in the field of urban gardening; create a place to gain experience; and to realize their own (green) ideas (Oost Indisch Groen – Buurttuin, n.d.). The initiator of the garden stated that it turned out to be an easy way of social cohesion, to talk about what plants one has in their garden. Next to this, he stated that wonder arises because city dwellers are not in contact with nature anymore (IBTV Indische Buurt, 2023).

Explanation figure:
CI.a (Circular Initiative), R.h (Resident, helper), R.i (Resident, that visits & gets inspired)

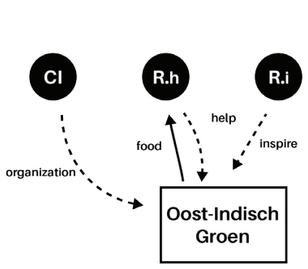


Figure 57: Organizational structure, Buurttuin Oost-Indisch Groen (made by author)

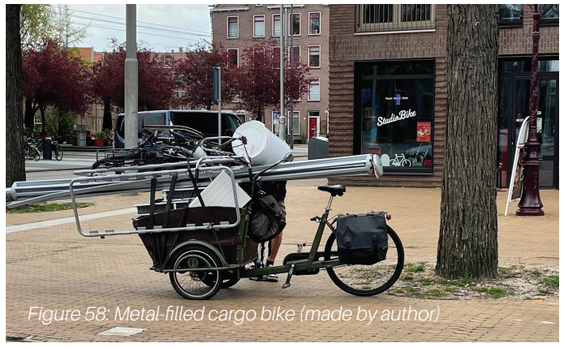


Figure 58: Metal-filled cargo bike (made by author)

'Morning star'
When the author was conducting a field-trip on May 1st (2023), she came across an Italian man with a cargo bike filled with metal. When asked about the purpose, he said that he collects metal waste and sells that to a recycling company in the harbor (Italian man, personal communication, May 1, 2023). Another resident the author later talked to, said that they call these people 'Morgensterren' (translation: morning stars). They collect valuable materials at the dusk of dawn, and sell these or use them themselves (for their company). Not only metal is collected, but also for example wood (painter, personal communication, May 22, 2023).

Explanation figure:
R.w (Resident, waste disposer), MS (Morning Star), Rec (Recycling Company)

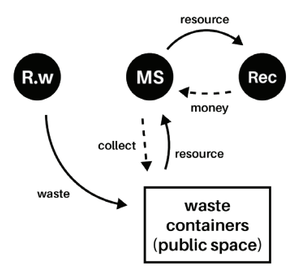


Figure 59: Organizational structure, Morning-Star (made by author)

Other Initiatives, tackling a R-strategy



Figure 60: Haak-In
(Sieder potje past een dekseltje, 2021)

Haak-In
This initiative was established to raise awareness about the importance of recycling. Plastic bags are used in a creative way to create (new) products, such as necklaces. Next to the main goal, increasing social interaction, and thus improving people's Dutch, is also part of the initiative (Haak In – Doel en Missie, n.d.).

Explanation figure:
CI (Circular Initiative), R.w (Resident, waste disposer), R.b (Resident, that buys a product)

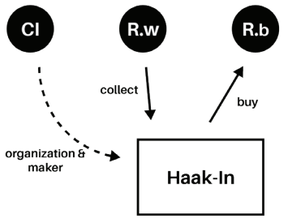


Figure 61: Organizational structure, Haak-In (made by author)



Figure 62: Meevaart (Repair Cafe De Meevaart)

Meevaart
The Meevaart is a community center in the Indische Buurt, which organizes various activities to participate, learn, meet each other, and put ideas into practice. A couple of examples are (music) festivals, cooking workshops, diners, and repairs cafes (De Meevaart, n.d.). The last one is particularly interesting for this thesis. By repairing products (household devices, toys, clothing, etc.) less of them are disposed and the life span of these are extended.
Next to this, De Meevaart is a location of the 'Waste to Harvest'-initiative and it rents out tools.

Explanation figure:
CI.m (Circular Initiative, Meevaart), R.h (Resident, helper/volunteer), R.o (Resident, owner product)

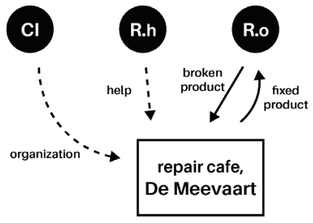


Figure 63: Organizational structure, Repair Cafe (made by author)



Figure 64: Cybersoek (Screenshot maken, n.d.)

Cybersoek & Cyberbank
Cybersoek is an initiative where people can go to ask (digital) questions. The initiative already exists for 20 years and has multiple locations in Amsterdam. The Cybersoek helps with questions about computers or other devices; organizes thematic lessons, for example making back-ups; and provides homework assistance (Cybersoek, n.d.).
Next to this, the Cyberbank collects (from companies and individuals), repairs (assisted by youth with a distance to the labor market), and raffles laptops to people who need it. This contributes to more social equality, but also to less waste (Cyberbank – Wat we doen, n.d.).

Explanation figure:
B (Businesses), R (Resident), CI (Circular Initiative), R.h (Resident, helper/volunteer), R.x (Resident, that needs a device)

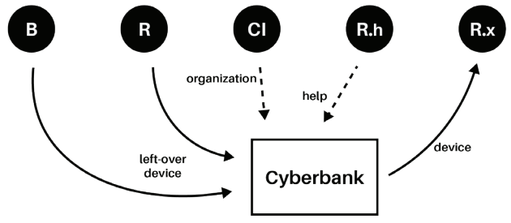


Figure 65: Organizational structure, Cyberbank (made by author)

Social Initiatives

Buurthulp Oost (translated: 'district help East')
This is an organization which connects people who are willing to help with people who need help. This ranges from getting help with grocery shopping because one is not able to do it themselves, to help with feeding your pet bird because you are in the hospital. They have a Whats-app group and have a walk-in-hour on Wednesdays. They offer help and a listening ear to people. (Buurthulp-Oost, n.d. & Evelien, personal communication, September 2th, 2023).

Luistergroep (translated: 'listening group')
This is an initiative that originates from Brazil, based on the principle that a lot of (social) issues can be fixed when someone is listened to. One can tell the "listening group" their issue/problem and the others talk about their experiences, hoping that this comforts and helps someone (Evelien, personal communication, September 2th, 2023).
Multiple of these groups are organized in Amsterdam, in the Indische Buurt this is located in the Eltheto-kerk.

Makkie
In 2012, the makkie-system is developed as a district initiative in the Indische Buurt. One can earn makkies by volunteering at a (social) organization in the Indische Buurt, Dapperbuurt or Transvaalbuurt.
With the saved makkies, one can get discount at local shopkeepers and organizations. In this way one can help the district, and themselves. The organization is currently looking to extend the system even further (Makkie Amsterdam, 2022).

The urban metabolism is analyzed in this chapter. Urban metabolism looks at the city as an ecosystem and examines various input and output flows. This is done on multiple scales: global, national, regional, municipal, and on district level. Also, the system of production, consumption, and discarding is mapped out. The last section of this chapter is dedicated to consumer behavior regarding circular actions.

04.1 Global & National
04.2 System
04.3 Regional & Municipal
04.4 Indische Buurt
04.5 Literature on Consumer Behavior

04. Urban Metabolism

Intertwined Global Consumption System

In the Netherlands, the consequences of our consuming habits go beyond national borders. A global perspective should be taken into account when trading goods and materials due to the great interconnectedness of various countries. Resources used by one nation for manufacturing may be recovered by another nation. Large inequities are created by the current global trading system. Value is accumulating in the Global North, while negative social- and environmental impacts are accumulating in the Global South. Examples of this, are deforestation, and child labor due to the low income of farmers.
The Netherlands is an example of this. The greenhouse emissions and negative effects of the Dutch consumption pattern happens outside of its borders, while the Dutch manufacturing- and food industry adds value to the imported products and therefore gain the Dutch economy gains from this (Circle Economy Foundation, 2022).

Next to this, countries in the Global South are increasingly reliant on the import of products. The reason for this is that some products are cheaper on the world market then when they would grow them themselves. Another reason that adds to this, is that they earn money by growing certain crops. Examples of this are cacao, coffee, and tobacco. These are crops which are mainly sold to the Global North. The choice to produce these crops results in the fact that less land is available to produce food for the local population (Circle Economy Foundation, 2022).

The handling of waste is also a global issue. The Netherlands, including many other high-income countries, export its plastic waste to other countries. High-value plastics are sent to nearby countries to be recycled. In the case of the Netherlands these are other countries in the European Union. Whereas plastics of lower quality are sent to, among others, Turkey, Indonesia, and Malaysia. These three account for 57% of the Netherlands' plastic waste export (26,3 kilo tons per year). The export of plastics to lower-income countries often results in the burning of waste due to the lack of the proper facilities. This has a negative effect on the human- as well as the environmental health (Circle Economy Foundation, 2022).
Another related issue is occurring now. High-income countries, including the Netherlands, become more aware of the fact that materials become scare. Therefore, they process their high-value waste products, such as computers, themselves. This has just occurred after the countries it was shipped to discover a successful method of processing it (Circle Economy Foundation, 2022).

Food (In)dependency

Biomass (3,9 Mton in 2018) is the Metropolitan Region of Amsterdam's main import source. Minerals (1,6 Mton) and metals (0,7 Mton), in addition to the large flows of natural gas, electricity, and water (which are outside the purview of this thesis), also account for a sizeable portion (FABRICATIONS, 2018).

The Netherlands imports around 75% of its total food consumption and 68 % of its dairy consumption (PBL). This results in big environmental impacts globally. Firstly because of the carbon emissions due to transportation. Next to this, land is being depleted in other parts of the world for the consumption of the Netherlands.
Currently one and a half times the agriculture of the Netherlands is needed to sustain its food consumption pattern. A large amount of this is imported. However, in theory, the Netherlands could sustain itself and produce enough food. A big shift in consumption patterns is needed then. For example, coffee should be banned (Circle Economy Foundation, 2022).

Besides the big import, the Netherlands also exports a lot. Around 70 % of the agriculture products the Netherlands produces is exported. In terms of horticulture is the biggest in 2019 (9,5 billion). Followed by meat, dairy and vegetables (AD, 2020).



Figure 66: Division Global South & Global North (division based on: Arlitsch et al., 2020; basemap: World Map, 2018)

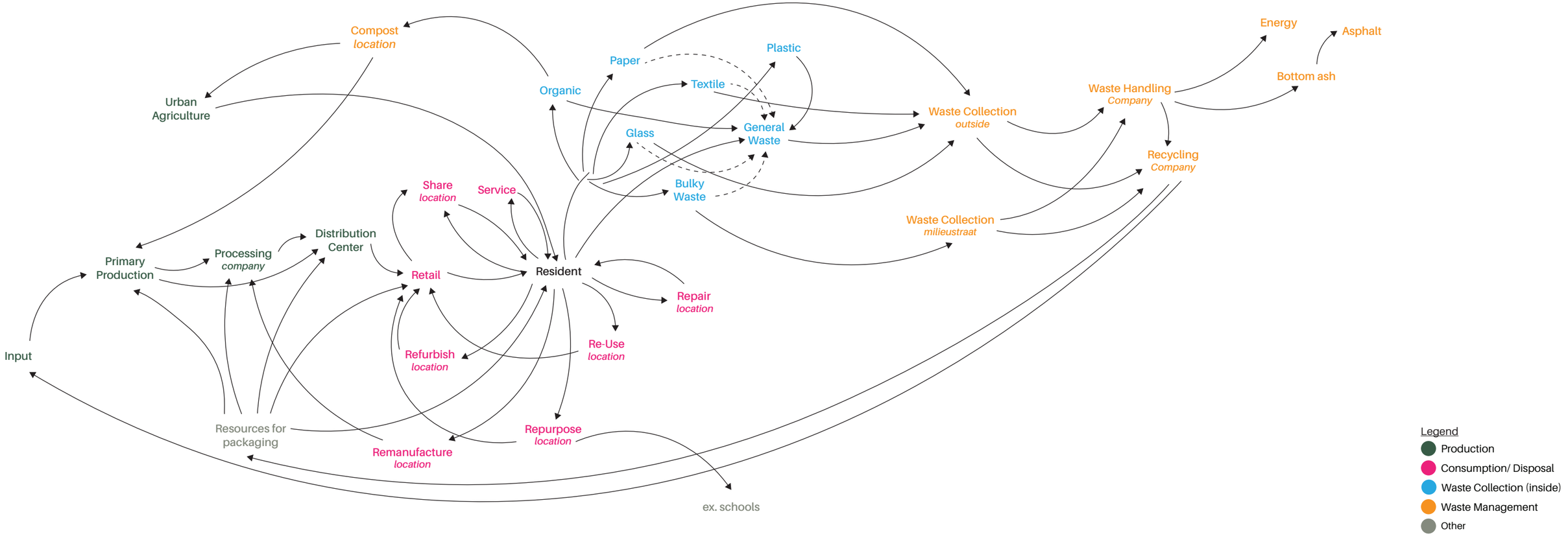
Production-Consumption System

In figure 67 the system of consumption is illustrated. From material input to the consumer, and eventually to the recycling company. The system will be explained from the left to the right, following the production-consumption flow. Although the system for food production and the system for consumer goods are similar, they will be explained separately to be able to go deeper into them.

In this image, one can see that the consumer has a central role. It is their choice if and how they dispose a product. Not only can this be taken from this image. It is only underpinned by literature.

Residents are at the center of the transition: they consume, dispose, separate, and repair goods and resources. Next to producers of waste, they are also the consumers of products made of repurposed waste (Savini, 2019). The notion of the centrality of households, in the transition towards a circular economy, illustrates the importance of involving them in the transition. This is applicable on multiple levels, such as increasing their awareness but also their involvement in it.

Figure 67: Urban metabolic system (made by author)



Food & Organic - Current

On the right, also the beginning of the production chain, is the input. Next to water and land, seeds are needed. The primary producer grows the product, for example a tomato. If the tomato is the end-product, it will be transported to a distribution center. If tomato is the input of the secondary product, for example ketchup, the tomatoes will first be transported to a processing company. For transportation, package material (made of glass, plastic, and/or paper) and a type of mobility is needed. From the primary producer or the processing company, the products will be transported to the distribution center. From where they will be distributed and transported to various retail organizations (such as retail centers, shops, or markets). Here consumers can buy the products. In some cases, the processing companies and/or distribution centers are skipped in the chain. Consider, for example, a farmers' market.

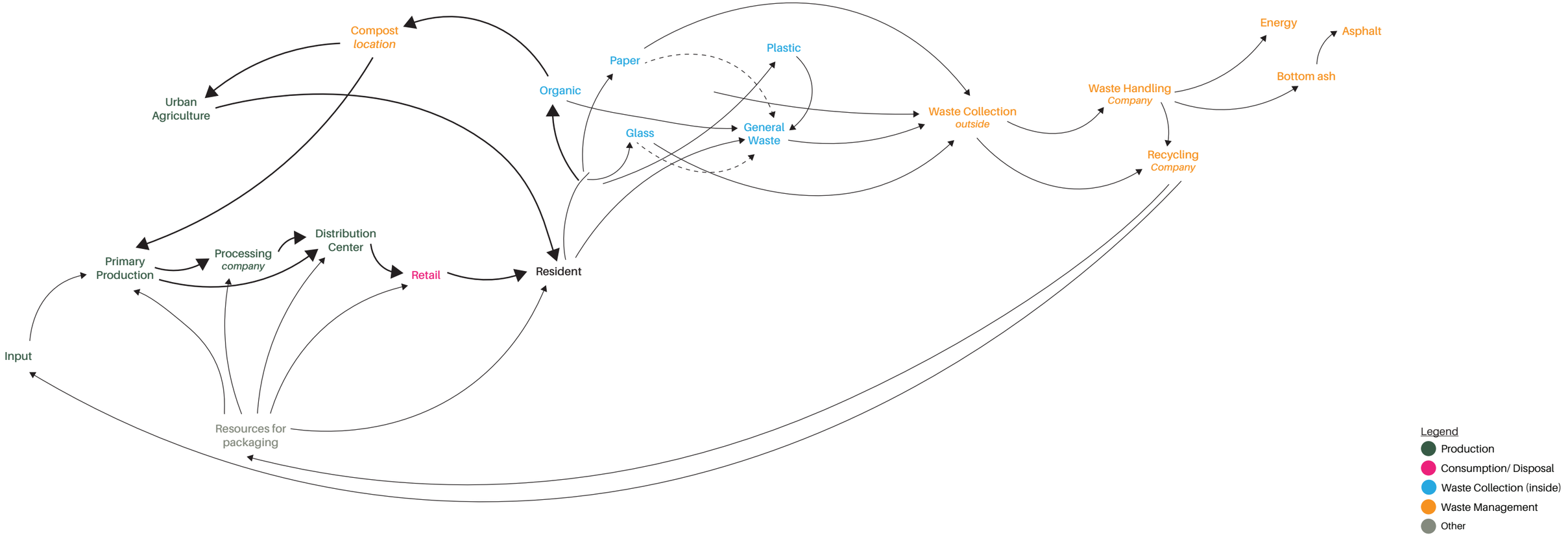
The consumer buys products, often plastic or bags are involved to put the products in. The flow of package materials will be explained further when 'consumer goods' are discussed.
In the city of Amsterdam, organic waste is not separated at the source, so consumers need to throw it in the residual waste bin. Consumers bring their waste from their bin inside their house to a container in the public space. From there the waste is collected by a company, employed by the municipality, and transported to the waste processing company (AEB in Amsterdam's case). Here some materials are recovered (ex. plastic and metals) to be recycled. The rest of the waste is burned to produce energy. The residual ashes are used for asphalt for roads.

Figure 68: Urban metabolic system, food & organic (made by author)

Food & Organic - Potential

The most evident, and maybe the most important, is to separate the organic waste at the source in households. The municipality of Amsterdam wants to reinforce this again. By 2050 the whole city of Amsterdam should separate their organic waste (Circle Economy & Gemeente Amsterdam, 2020). This involves ensuring that the infrastructure to do so is sufficient.
This separated organic waste can be composted. Both composting at city level, at local level, or a combination are possibilities. When this happens at city level, the municipality should employ people and companies to collect and process this. When composting will happen at the local scale, wormhotels (on squares) or compost piles (in community gardens) are possibilities.

These two changes are at the end of the chain, when it is already considered "waste". One of the changes at the front of the chain could be to start urban agriculture. This means that food is produced in urban areas. This can be ground-based, but also on roof tops or in the form of vertical farming. Consumers can buy their products directly at the source. Instead of the product having to undergo multiple steps, such as the distribution center. By skipping multiple production steps, package materials and CO2-emission of transport mobility can be avoided. In addition to this, the leaves of products or/and the crops which are not well enough to sell can be (locally) composted.
Another change at the front of the chain, is to combine multiple steps into one company. For example, the combination of the primary production, the processing company, and the distribution company. This also limits the amount to package materials. Next to this, it might improve the efficiency and therefore limits the amount of wasted organic waste.



Consumer Goods - Current

Consumer goods is a quite broad term which includes a lot of products. Therefore, the resources which serve as input are also quite different from each other. Examples of input resources are metals, minerals, and fossil fuels. This input resources are processed in a primary production company. From where it can be transported to a secondary (or tertiary) processing company, or directly to a distribution center. This depends on the product which is made in the production chain. For example, to make a computer a big number of components are needed. To move the component or product from one company to another, transportation and (often) package materials are needed. In some cases, it can occur that products move directly from the primary production company to a retail company.

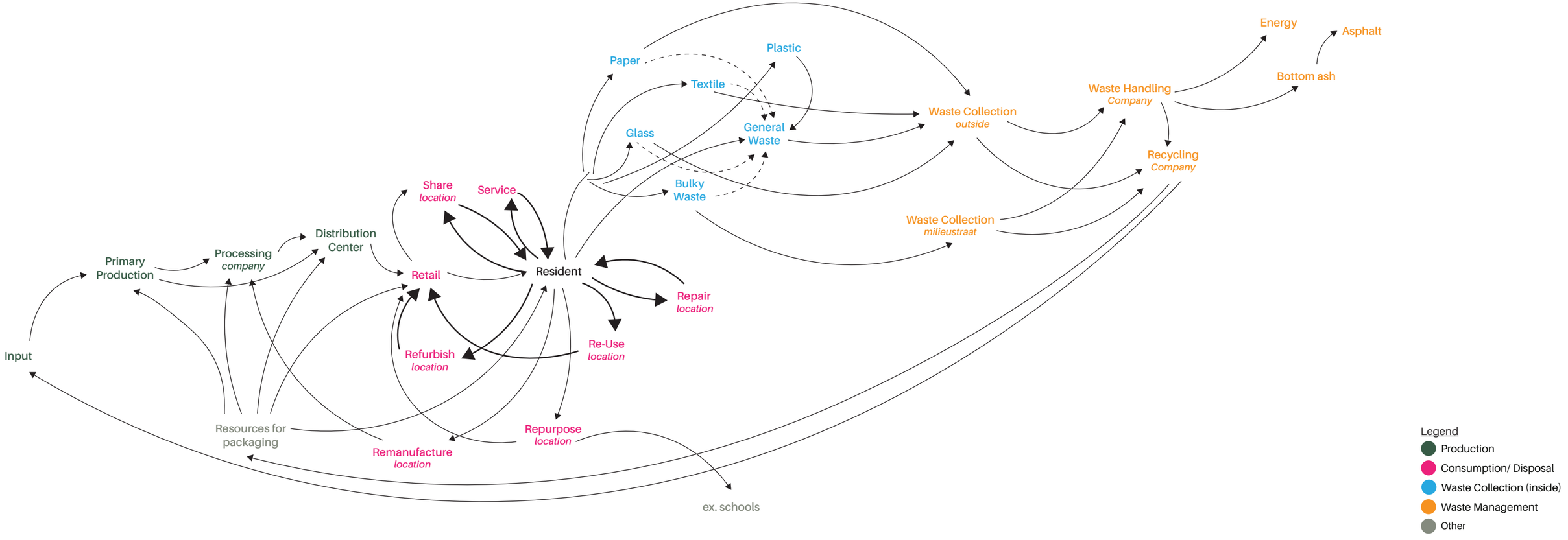
The products are bought by consumers at retail companies. This often goes hand in hand with buying a plastic or paper bag to store it in. After consumption, the consumer could separate and recycle the products in different waste bins. First inside the house, and after that in the waste bins in the public space. But often, (organic) waste ends up in the general waste bin. Which means that the waste in this bin can be processed less well, because of the contamination.
The general waste is, just as explained in the previous section, to the waste processing company (AEB in Amsterdam). Some materials are recovered (such as plastic and metals), but the most part is burned to produce energy (and asphalt).
Products which can not fit in the waste containers can be brought to the 'milieustraat' or a service can be called, and they pick it up. This service can be used a couple of times a year for free.
The separated waste from the containers is transported to different recycling companies to be transformed into new materials, and therefore input for (new) products.

Figure 69: Urban metabolic system, consumer goods (made by author)

Consumer Goods - Potential

The most important step to take cannot be illustrated in this figure (69). To really influence the reduction of waste and scarce materials, a reduction of the consumption of (new) products need to take place. The consumer is in this the main actor.
In addition to this, a change needs to happen in the mindset of people. The disposal of products, and therefore considering it as "waste", needs to be the last action. Actions higher up the R-ladder need to be taken first by consumers. The products can be brought to a re-use facility (such as a second-hand shop); products can be repaired; or the components can be used to make (new) products.

Another change that could be made is trying to reduce the use of different materials in products and packaging. A reason for this, is that it is hard to recycle some products. Next to this, it can cause confusion for consumers. Often paper packaging is wrapped around a plastic container. And does the crust of the cheese need to go in the plastic bin, or the organic bin?
Lastly, as also mentioned in the section about the potentials for food & organic waste, various steps could be combined into one company. This will limit the amount of packaging materials and transportation.



Size of Flows

In figure 70 the size of the various flows of resources used and waste produced is illustrated. This was done to get a better understanding of the amount we are talking about. In the Metropolitan Region of Amsterdam, households consume 2400 ton of food, 2200 ton of fuel, and 1200 ton of food. After consumption, 1100 ton of waste is produced in total by all households. This is five times lower than the consumption due to the consumption of 85% of the food, the burning of fuel, and the fact that some goods are added to the "stock" (FABRICATIONS, 2018).

A study by Metabolic shows that in the city of Rotterdam 35% of the consumed goods consists of packaging (Metabolic, 2019). The number for the city of Amsterdam will not be, assumingly, very different.

In the Municipality of Amsterdam 358 kg waste per person per year is produced. The City of Amsterdam works with two systems. On one hand, the municipality asks citizens to separate waste in their home: source separation. This is applicable for glass, paper, and textile. This needs to be put in containers (in the public space) in most areas.

On the other hand, they work with subsequent separation of waste which happens in the waste treatment plant. Plastic bottles and drinking containers are separated in this way (Gemeente Amsterdam, 2020). Only 31% of the waste produced in the City of Amsterdam is separated (in 2019) (Gemeente Amsterdam, 2020). The precise numbers of how many kilograms is separated per source can be found in appendix 12.3.

The residual waste is treated by the Afval Energie Bedrijf (AEB) (translated 'Waste Energy Company). This company produces energy and heat by burning waste. This produces 628 kWh electricity and 208 kWh heat per ton of waste. One of the products of the burning process is bottom ash (200 kilograms is produced per ton). This can be used for asphalting roads.

Next to this, AEB separates resources from the residual waste. Per ton of waste: 9 kilograms of paper, 80 kilograms of plastics, 16 kilograms of iron, and 3 kilograms of metals are separated (AEB, 2022). Per year approximately 1300 kilotons company- and residential waste is treated in this facility (AEB, 2022).

After the subsequent separation, conducted by AEB, a lot of potential is still there. The City of Amsterdam states that there is a lot of potential in the residual waste of the inhabitants. This can be seen in the last column of the diagram. The most apparent resource types that can be separated are organic waste, paper, and bulky waste (such as furniture).

As stated before, the City of Amsterdam uses subsequent separation for plastic bottles and drinking containers. Avalex, a Dutch waste collection company, states that source separation has advantages over subsequent separation when it is done correctly. Such as, cleaner resources and it is cheaper. Next to this, the awareness of citizens increases when they separate at the source (Avalex, n.d.).

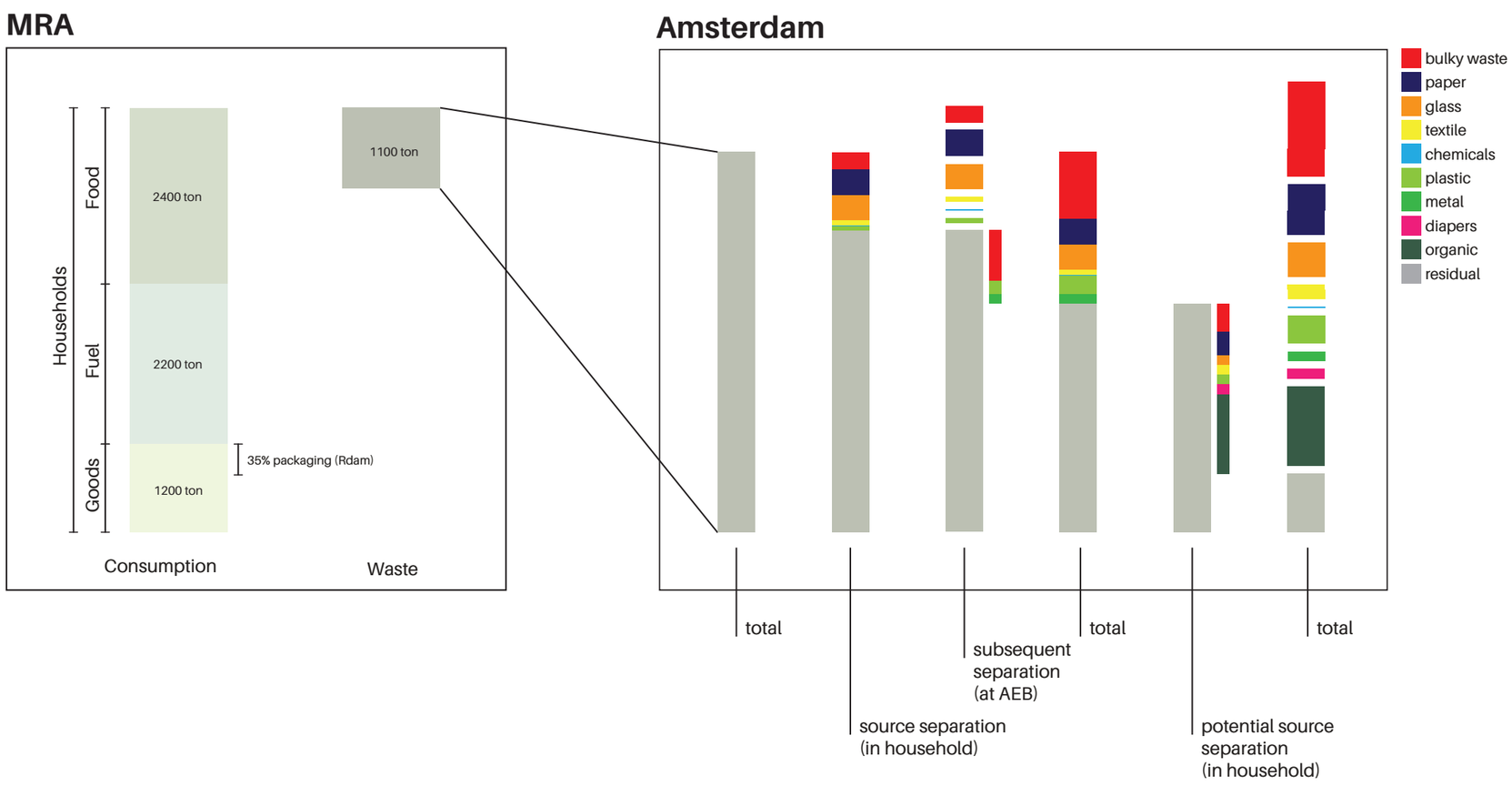


Figure 70: Size Waste Flows (made by author)

Organic Waste

Organic waste is an important waste flow to tackle and propose a solution for. This is because of two reasons. The first one is that organic waste has a big potential to be separated better. A better separation of organic waste can lead to a more efficient way of handling it. Organic waste could, for example, be turned into compost and used as a fertilizer for gardening. The main reason that organic waste is not separated well in Amsterdam yet, is because the Municipality of Amsterdam only offers the infrastructure and service to a couple of areas in Amsterdam but not all yet Gemeente Amsterdam, n.d.-a).
A city-wide initiative which is tackling this problem, is 'Afval naar Oogst' (translation: waste to harvest). Inhabitants can bring their organic waste to one of their locations, where it is processed to compost. This compost is used for several community gardens. One of them is in the Indische Buurt (Afval naar Oogst, n.d.).

The second reason why the separation of organic waste needs to be improved is that it comprises around 35% of the total household waste produced in the City of Amsterdam (Gemeente Amsterdam, 2020). A big impact could be achieved when the consumption pattern of food and the handling of it will be changed. The Dutch nutrition center did a study about food waste. They concluded that each person wastes 33,4 kg food per year, which is 8,9% of the total bought (Voedingscentrum, 2022). One might think of peels and stumps and meal leftovers, but these only count for 8,6 kg and 0,2 kg. The five most wasted product groups are: bread and pasta (6.2 kg), vegetables (4.4 kg), fruit (4.3 kg), potatoes (2.8 kg), and dairy (2.8 kg)
It is interesting to note that consumers themselves claim to waste 19,7 kg of food, of which 2,1 kg 'meal leftovers' (Voedingscentrum Annex, 2022). Both numbers are far from the measured figures. This could be a topic of education for residents (Steenhuisen, 2019).

Celestino (2022) states that a lot of food waste can also be avoided when the underlying problems are solved. These are, inter alia, the failure of consumers to plan; the influence of marketing strategies; the absence of knowledge how to reuse leftovers; and cultural factors (Celestino, 2022). Some of these are (individual) psychological factors, on these will be elaborated more in sub-chapter 04.5 'Literature on Consumer Behavior'.

Shopping in Amsterdam

In the figure below (71), the types of shops in Amsterdam are visualized. This was done to place the shops in the Indische Buurt in relation to the rest of Amsterdam. These types where chosen because the consumption of residents is central in this thesis.
The map underneath shows a combination of every type that was analyzed. The separate maps of each type can be found in appendix 12.3 'Shopping in Amsterdam'.

It can be concluded from this image that in the Indische Buurt quite a lot of shops are concentrated. Especially in the Javastraat this concentration is apparent. It is therefore likely that people from other areas of Amsterdam come to shop in the Indische Buurt.
If someone wants something of a specific brand, they may need to buy it outside of the Indische Buurt. Next to this, the district does not have every type of specialized food store.

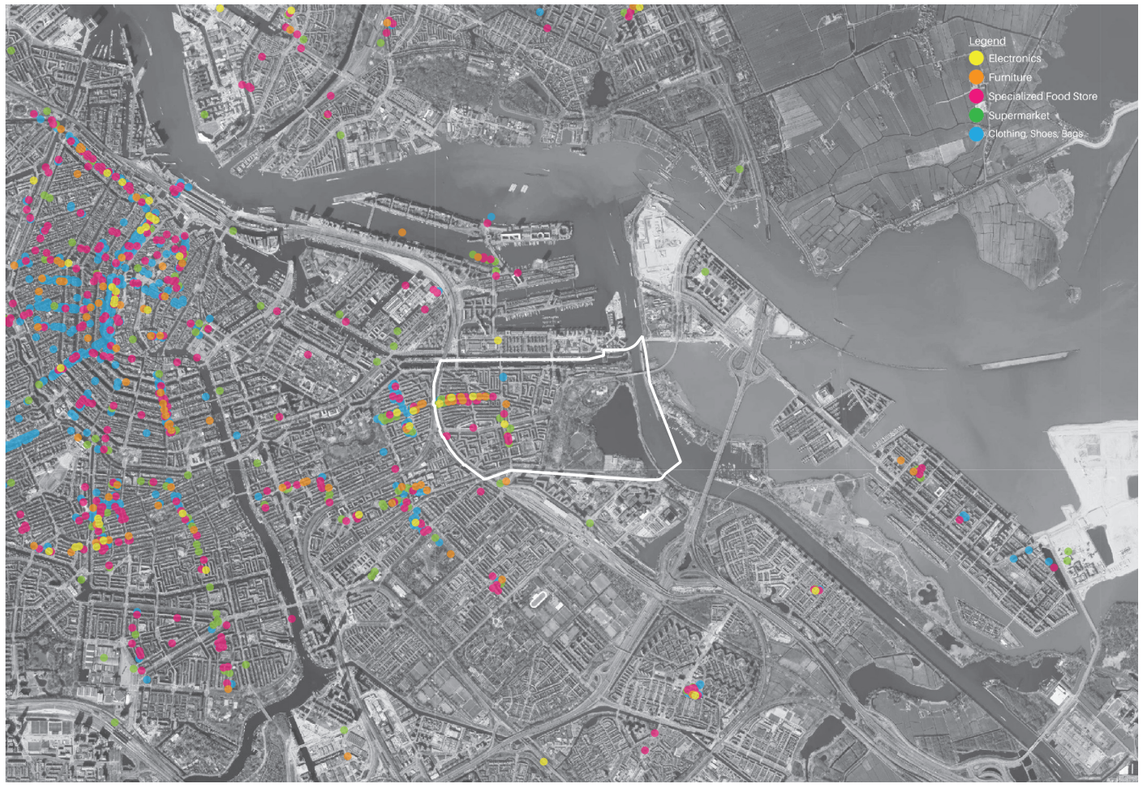


Figure 71: Shopping in Amsterdam (made by author, data from QGIS, 2023)

Javastraat

In the Indische Buurt, most of the shops and restaurants are clustered in the Javastraat. In this street the mix of diverse residents and visitors can be noticed. In the Javastraat a mixture is present of local (foreign) supermarkets; high-end (clothing) shops; and both trendy as non-western restaurants. This is visualized in the figure below (72). The diversity is important to acknowledge to understand the urban metabolism of the district and propose well-suited interventions.



Figure 72: Collage Javastraat (made by author)

Javastraat (1)

In the Javastraat, the car is clearly present. It has quite lot of space both for driving as for parking. In this street, big side walks are present. Their main function is to facilitate the people who shop there. On the sidewalks also bicycle parking is facilitated.

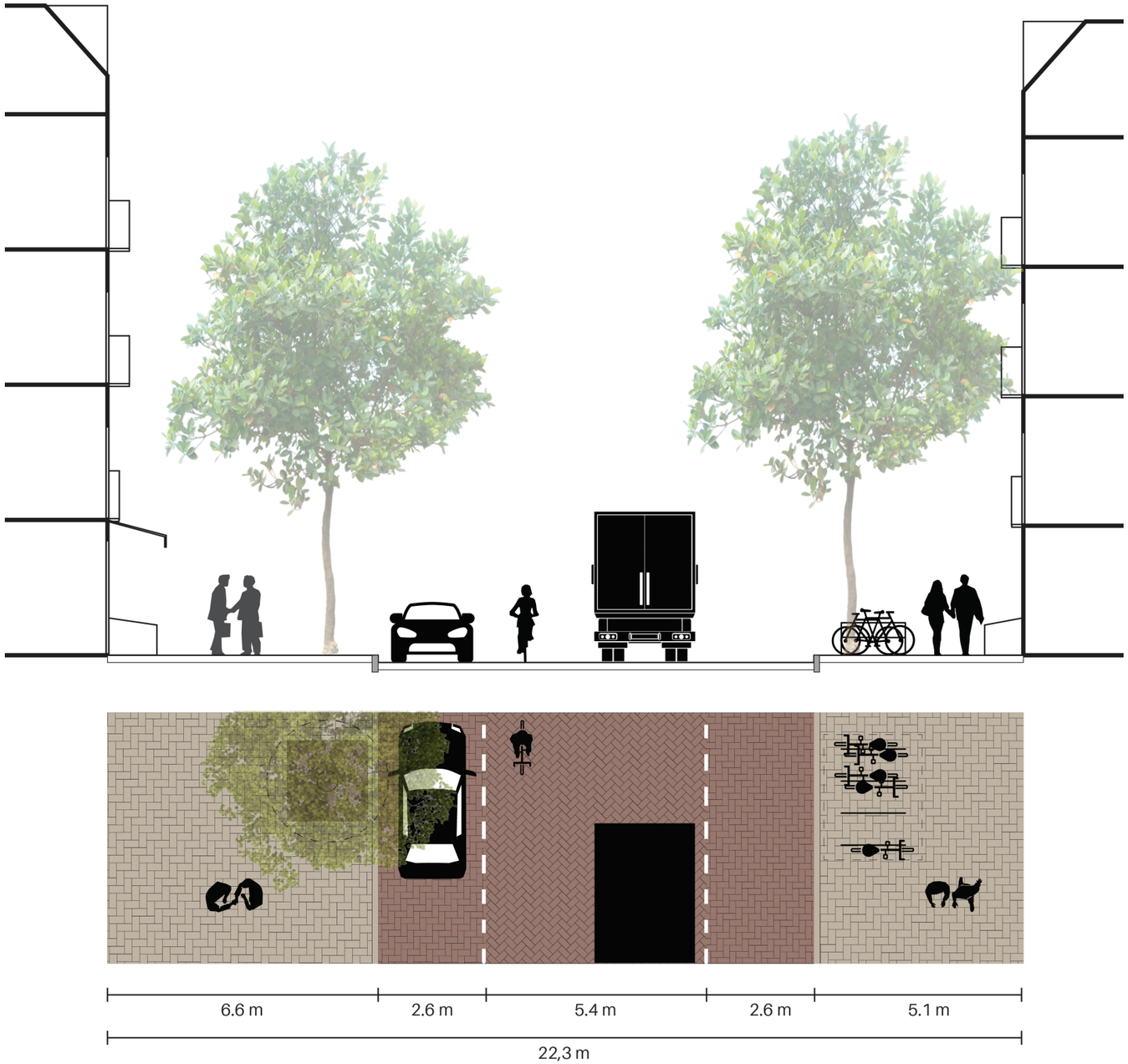


Figure 73: Section Javastraat (made by author)

Figure 73-87: Waste on multiple location (made by author)



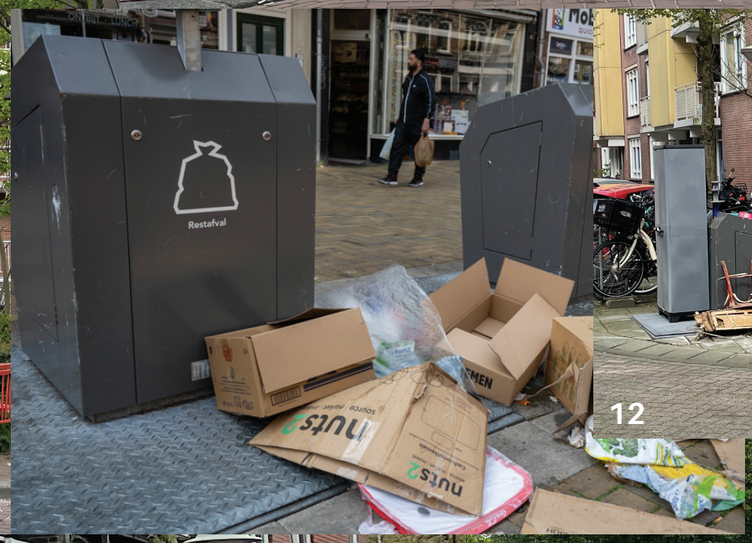






















Waste Containers in the Public Space

In the Indische Buurt waste is collected in containers in the public space. As shown in the figure below (88) containers are distributed across the whole district. General waste containers have the biggest share, followed by paper and glass containers. In the district are few containers for textile, and no containers for organic waste and plastics. This is because of the municipal strategy for waste collection.

One of the aims of this thesis is to reduce the amount of waste produced and discarded in the district, in particular the amount of general waste.
Therefore, in the future only several general waste containers are needed because residents produce very little waste and separate their waste efficiently. A solution will be needed for organic waste and plastics, possibly in the form of containers.
There is a problem of fine and coarse litter (in the public space) in the area. In the Indische Buurt-Oost this problem is above average, compared to the rest of Amsterdam. In the Indische Buurt-West the problem does not differ much from the rest of Amsterdam (Gemeente Amsterdam, n.d.-c), but is still not optimal. In the pictures (figures 73-87) on the previous pages, this problem is seen.

Image 15 (on the previous pages) shows one of the rats that were on the play ground. These rats are probably there because of the litter which is thrown on the street.

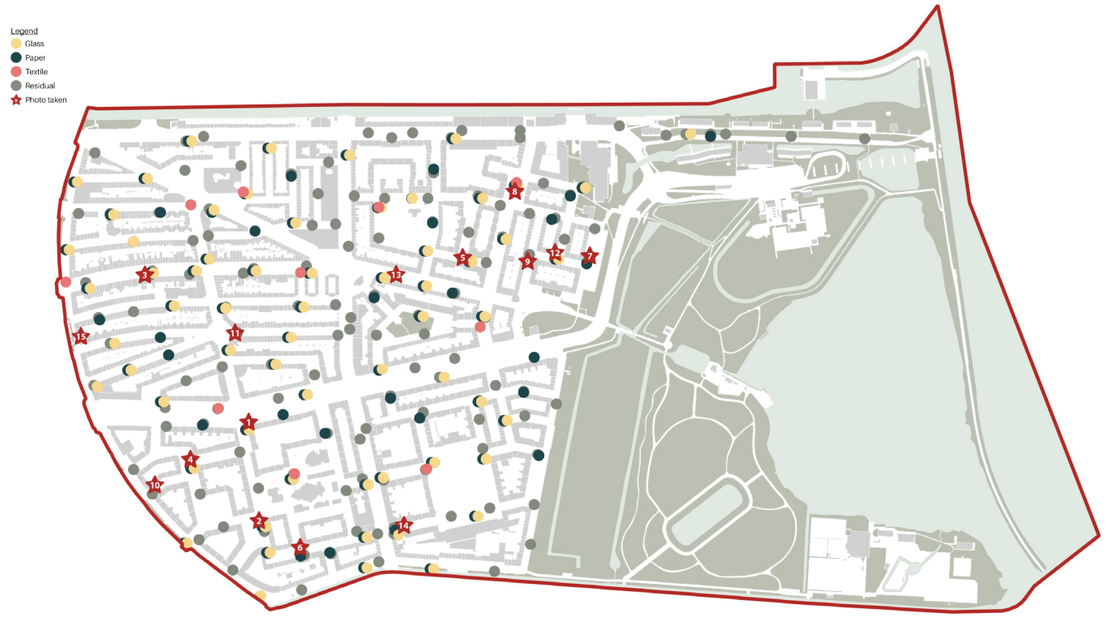


Figure 88: Waste containers (made by author, based on Gemeente Amsterdam, n.d.-a)

Adoption Containers

In the municipality of Amsterdam is the possibility for residents to adopt a waste container. The municipality provides, among other things, a package with different cleaning supplies and meetings with other adopters. The resident takes care of the specific container: they throw waste lying next to the container inside; sweep the area around it; and if they wish explain neighbors how waste needs to be thrown away.
As can be seen from the figure below (89), some of the containers are already adopted. However, quite a lot still could be adopted.

As can be seen on the previous pages, in the south-east part of the district not a lot of waste is disposed outside of the containers. A possible explanation of this could be that more containers are adopted in that area.
Joke, a Buurtbuik-volunteer, told the author that some adopters put plants around the containers to dissimulate people to put waste next to the container (Joke (volunteer Buurtbuik), personal communication, May 1, 2023). This can be seen in picture 11 on the previous page.



Figure 89: Adoption containers (made by author, based on Gemeente Amsterdam, n.d.-b)

Overview - Current Situation

In the image on the right, an overview map is drawn of the aspects and flows related to the 'urban metabolism' of the district.

In the area two shopping streets are located, the Javastraat and the Molukkenstraat (highlighted in dark green). These streets are important for both the residents of the district as the residents of other districts in Amsterdam (as can be seen in the map in section 04.3).

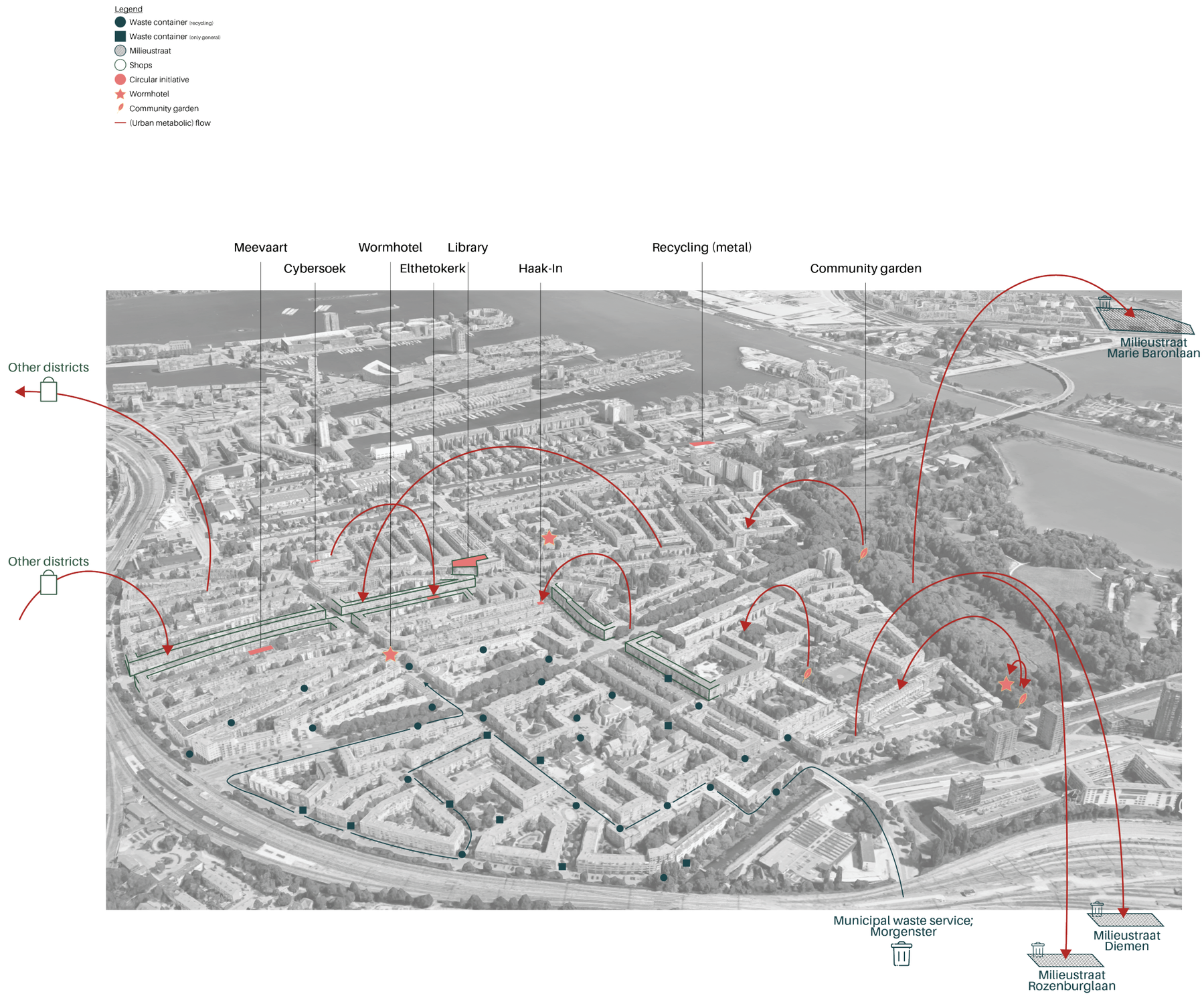
In the area, multiple (circular) initiatives are present. The goal of each initiative can be read in section 03.5. A couple of community gardens are present in the area. These produce some fruit and vegetables for residents. Other (circular) organizations are for example the second hand shops and 'buurtbuik'.
Also some 'worm hotels' are located in the district, where residents can dispose their organic waste and compost is made. One needs to register before one can use it.

Household waste is collected in containers which are located all across the district (see previous pages). The municipal waste collection service collects the waste from these. Next to this, the district has multiple 'morgensterren' (translation: morning stars) (painter, personal communication, May 22, 2023). They collect valuable materials which are placed next to the containers and sell them to recycling - or building companies.
Illustrated as squares in the image are the locations of waste containers that includes only general waste containers. The locations illustrated as circles in the diagram are location that includes at least on waste container for recyclable resources (ex. papers).

Shops need to have a separate contract with the municipality to dispose their waste. However, sometimes they dump it illegally because otherwise they need to pay more money ('Gebiedsmakelaar', personal communication, May 22, 2023).

If one want to dispose electronics are big items (such as furniture), one can drive to the surrounding 'milieustraten' or put it on the streets on Monday or Fridays.

Figure 90: Current urban metabolism in Indische Buurt (made by author, background Google Maps, n.d.-e)



Overview - Needed Changes

In the image on the right (figure 91), a couple of changes are highlighted. These were identified by studying the 'urban metabolic' system.

Change purpose of visitors
Currently, the Javastraat attracts a lot of visitors due to the large amount of shops located in this street. In a circular economy, this function has to change. One should (preferably) not buy new, but extend the lifetime of a product. Therefore the function of the Javastraat (and the other shopping streets) has to change. It should attract visitors due to its 'front runner'-identity.

Remove solely 'residual waste' containers
At the moment a lot of locations in the district only have a residual waste container, instead of a combination between a recycling-container and a residual one. This lowers the threshold to put all waste, both recyclable and residual, in the residual waste container. Therefore less waste is recycled.

Collect organic waste
The Municipality of Amsterdam does not separate organic waste. As stated before, the separation of this has a big potential due to the big environmental effect of food production and large amount of organic waste.
The separated collection of organic waste could be done by placing more municipal containers and/or making more wormhotels.

Incorporate & extend function of (circular) initiatives in district
As stated before, the district has quite a lot of (circular) initiatives. These already do a great job, however this role could be extended by for example giving more education on the topic. Next to this, these initiatives could be better integrated in the overall strategy of Amsterdam. This allows them to be used more effectively. The way these can be incorporated and the role they could play is elaborated on in sections 08.5 & 08.6.

Integrate 'milieustraat' in district
Currently, it is quite a drive when one wants to dispose something at the 'milieustraat'. Therefore, a lot of items are placed on the streets which results in a degradation of the public space. When items can be disposed in the districts itself, the threshold to do so it lower and less items will be placed on the streets.

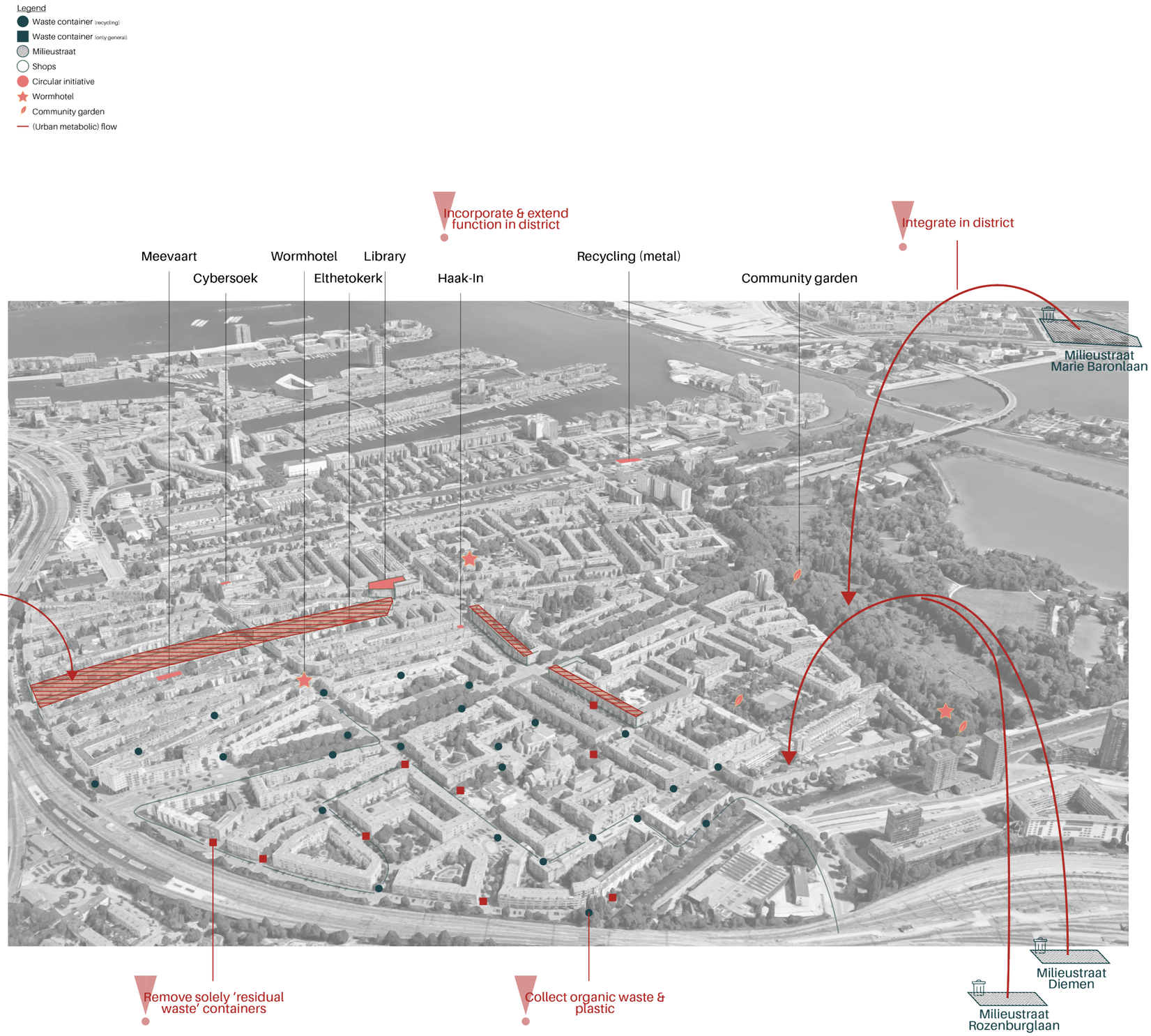


Figure 91: Changes needed in urban metabolism in Indische Buurt (made by author, background Google Maps, n.d.-e)

Consumer Behavior

In this subsection, key learnings from a literature review will be explained. These findings will help to propose well-thought-of spatial design and recommendations for the policies.

Behavioral Change

If we want to reach a circular economy, a change in the behavior of people is crucial. Multiple models are available to better understand the way how behavior works. One of the most used, is the Behavioral Change Wheel of Mitchie (2011). It states that three factors determine which behavior someone executes: capacity, opportunity, and motivation. Two other researchers, Ölander & Thøgersen (1995), have developed a similar model. They talk about three drivers: motivation; ability; and opportunity. Their approach will be explained in combination below.

Motivation
Motivation includes their own beliefs and their attitude towards the behavior. But also, the social norm. This is defined by what other people in their surrounding do. Neighbors who separate their waste very accurately, for example, can have a stimulating effect on others (Ölander & Thøgersen, 1995). Next to this, the feeling of doing good, for example by handing in batteries separately, can also have a stimulating effect (Ministerie van Infrastructuur en Waterstraat, 2023).

However, research states that making a 'sustainable' choice is often not the decisive factor to choose a circular alternative. This means that awareness is not going to lead to changes in behavior on the large scale. Youth, for instance, more often buys a second-hand piece because it is unique (Ministerie van Infrastructuur en Waterstraat, 2023). These factors are important to identify to make use of them.

Opportunity
People need to have the opportunity to execute the preferred behavior, ex. a (physical) place where they can buy secondhand clothes (Mitchie et al., 2011; Ministerie van Infrastructuur en Waterstraat, 2023).
Ölander & Thøgersen state that opportunity is both a subjective as an objective (facilities & conditions) phenomenon. Perceived control is an example of a subjective phenomenon, and the facilities and conditions are an example of an objective phenomenon. The municipal source separation infrastructure, and the cleanness of it, is an example of an objective one. It is important to note that every individual perceives conditions differently (Ölander & Thøgersen, 1995).

Capacity/Ability
This is the knowledge and skills set people need to execute the preferred behavior. An example of this is knowing how to use an online platform to share tools (Mitchie et al., 2011; (Ministerie van Infrastructuur en Waterstraat, 2023). According to Ölander & Thøgersen ability include habits and task knowledge. They state that it is easy to resort to an old habit when attention has waned. An example that they give is the separation of waste, and the possibilities of failures when people need to use a new system (Ölander & Thøgersen, 1995). Therefore, it is important to guide people well to a new habit.

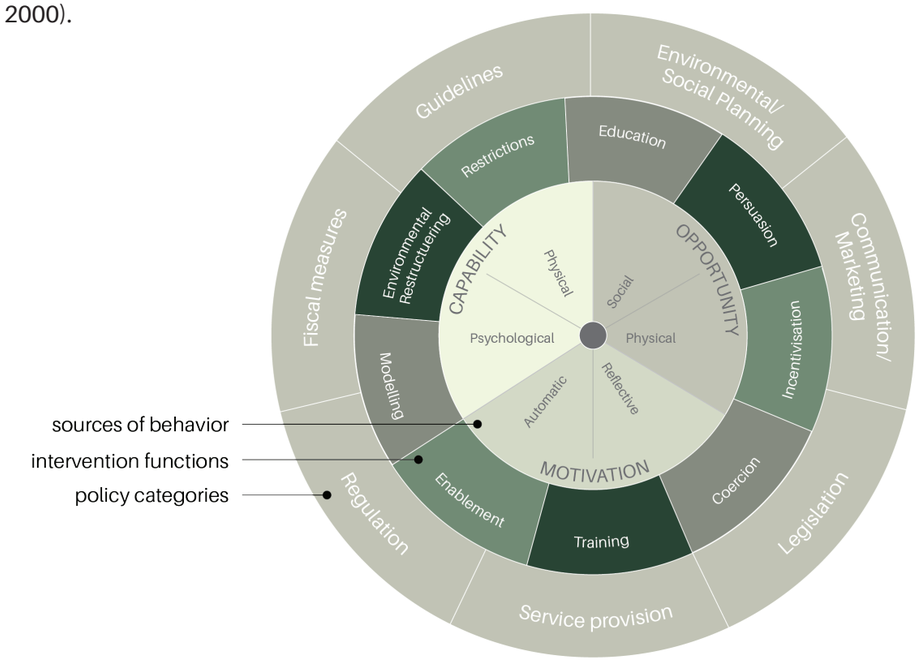
Daniel Kahneman underlines the difference between conscious and unconscious choices. He describes a fast system where we decide things unconsciously because it is a habit. And a slow system where we are conscious and take time to decide things. For example, changing your job or buying a car. Often daily activities (in the circular economy) play into the unconscious and automatic decision making. Therefore, is it more effective to play into this type of decision making. For example, by making the more sustainable choice easier (Kahneman, 2013; (Ministerie van Infrastructuur en Waterstraat, 2023).

Figure 92 (above): Pyramid of Maslow (reprinted from Eelants, 2020)
Figure 93 (below): Behavioral Change Wheel (reprinted from Mitchie et al. 2011)

Consumption Related to the Pyramid of Maslow

As earlier mentioned in this report, consumer behavior and the pyramid of Maslow are connected to each other. The lowest part of the pyramid is the need to 'survive'. This relates to consumptions like food and housing. The need for 'safety' follows, buying a house in a "good" neighborhood is an example of that. After that, 'social contact' is mentioned. Humans are social animals. A lot of consumption responds to this by saying "buy something and you will not be alone". Examples of this are going to the theater or a bar. 'Love & belonging' or 'recognition & appreciation' relates to buying something which is in fashion or is the latest version of a product. People do this to fit in. Giving gifts is also an example of 'love & belonging'. Consumer behavior which relates to the highest step 'self-esteem' or 'self-development' is buying products which separate us from the rest. For example, buying a car for the symbol of status (Csikszentmihalyi, 2000).





Consumption due to lack of purpose

Not all consumer behavior can be related to the pyramid. Csikszentmihalyi (2000) states that the self-esteem of people lowers when they have nothing to do. People 'have a need to (...) to keep consciousness in an organized state, focused on some activity that requires attention' (Csikszentmihalyi, 2000, p. 270). Being in a state of 'experimental vacuum leads to depression and despair' (Csikszentmihalyi, 2000, p. 270). This need to keep busy is more applicable to one's free time than during one's work, because a clearer goal is present there. Activities that require attention do not have to be difficult. Examples are walking the dog or doing the dishes. However, people often fill their free time with passive entertainment (such as watching TV). The need to keep busy and have a goal often results in consumer behavior. Shopping is a good example because it has a clear goal, to buy something (Csikszentmihalyi, 2000).

"In general, people report being happier when they are actively involved with a challenging task, and less happy when they are passively consuming goods or entertainment." (Csikszentmihalyi, 1997)

The gained knowledge can be applied in the design. The public space design needs to draw to do physical activities. As a results, people are likely to consume less and use less passive entertainment sources (which also often requires consumption of devices). Opportunities to do things like gardening; playing sports; or reading a book need to be created.

Types of (Active) Recreation

In a study of NBTC-NIPO Research (2018), called Continu Vrije TijdsOnderzoek (translated 'Continuous Free Time Research'), different kinds of recreation are researched. It examines the extent to which a particular activity is undertaken by a specific population group. In the figure below (94) a couple of them are illustrated. Next to this, the composition of the neighborhood (both age groups and social classes) is shown.
Based on this research some types of recreation could be implemented in the district. A walk for recreation can be implemented for each social class, and people aged 25 to 74 years. Therefore, it can be implemented well in the Indische Buurt. Recreating in parks and/or running has the biggest potential of succeeding in the west of the district due to the social classes living there. Creating community garden has the biggest support base in the east, due to the social classes living there. It is important to note that, in reality, it is more nuanced. The relation is not so black and white.
It is noticeable that each social class and people aged 25 to 64 years, which is the main age-group of the district, participate in shopping in the city center. This type of recreation needs to be addressed to transition towards a circular economy.

Social Class

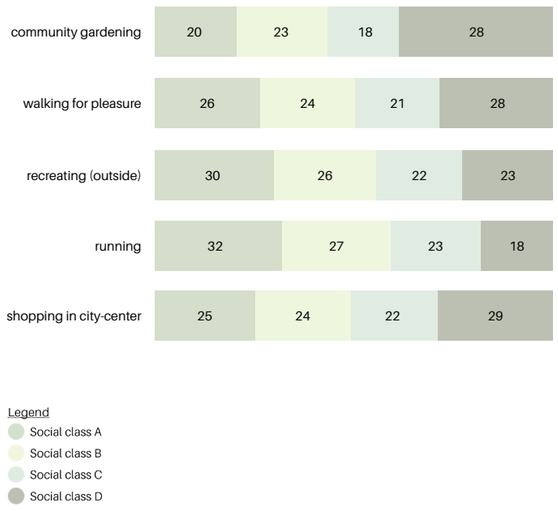
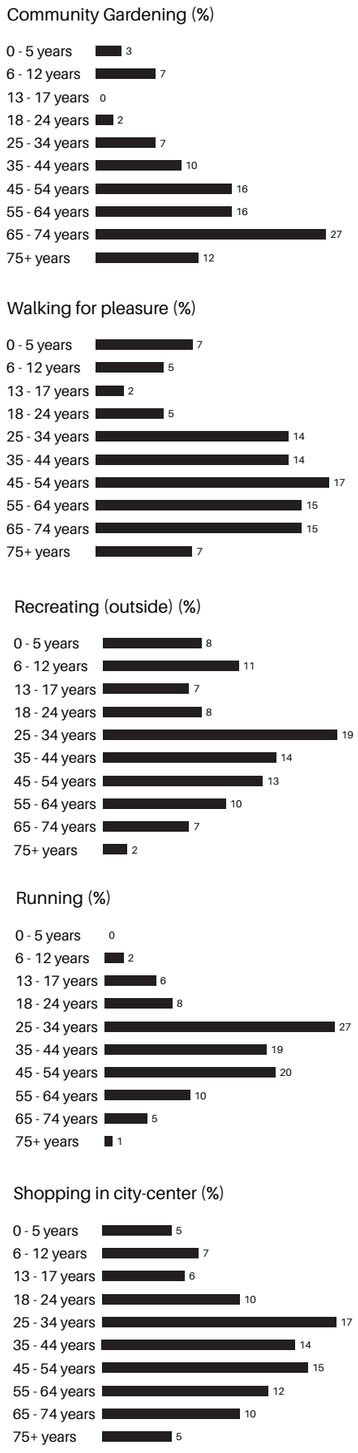


Figure 94 (left): Performed activities, arranged by social class (based on NBTC-NIPO Research, 2018)
Figure 95 (right): Performed activities, arranged by age (based on NBTC-NIPO Research, 2018)

Age Groups



Individual Factors of Waste Separation

The degree of involvement differs from person to person and depends on various factors. Different researchers have explored this topic. The most important psychosocial factors, defined by Celestino (2022) & Knickmeyer (2020), are social norms, perceived convenience, and level of education. It is important to note that the proposed factors cannot be scientifically proven because of the great complexity of the overall factors (Celestino, 2022).

The first factor, social norms, is a determinant behavioral factor since it refers to the expressed (dis) approval of others (Knickmeyer, 2020). People may be motivated and influenced by their neighbors (Celestino, 2022).

The next factor, perceived convenience, consists of several things. The first one is the physical distance to a separation point (Chen & Gao, 2020). Next, the difficulty of and space for storing recyclable inside of the residence. For example, organic waste is perceived difficult to store (Borrello et al., 2020).

Lastly, the level of education, can be split up into two interventions. The first are communication campaigns. This can increase and improve awareness and understanding. A side note to this, is that campaigns are more effective if they are specific instead of overly broad (Celestino, 2022). It is important to make these campaigns accessible, understandable, and communicated through the proper channels (Knickmeyer, 2020).

Another type of campaign is the education campaign, there is a relative consensus that this stimulates prevention and separation behavior. It is important to use different kind of institutions, for example social organizations. Also essential is to raise awareness before and during the adoption of a new collection system (Celestino, 2022).

Horlings (2015) state that people's values and beliefs, which are rooted in culture, are important to understand what they 'appreciate, feel responsible for and are willing to commit to in the context of their own place' (Horlings, 2015, p. 260). In a multicultural district such as the Indische Buurt, it is important to take this into account.

The circular policy and strategy on national and municipal level is assessed in this chapter. Next to this, the environmental vision of Amsterdam is assessed. At the end of the chapter, the stakeholders that play a role in the district are mentioned.

05.1 Introduction
05.2 Netherlands - Introduction
05.3 Netherlands - Circularity
05.4 Amsterdam - Circularity
05.5 Amsterdam - Waste
05.6 Amsterdam - Spatial Strategy
05.7 Indische Buurt - Stakeholders

05. Governance Analysis

Overview

This chapter assesses the circular economy policy documents of the Netherlands and Amsterdam; the environmental vision of Amsterdam; and the involved stakeholders. On the right side of these pages (figure 96), the overview and relation between the assessed documents can be viewed.
The assessment of the policy and environmental vision was done by looking for key words in the documents. Which key words were used, is mentioned in the related sections.

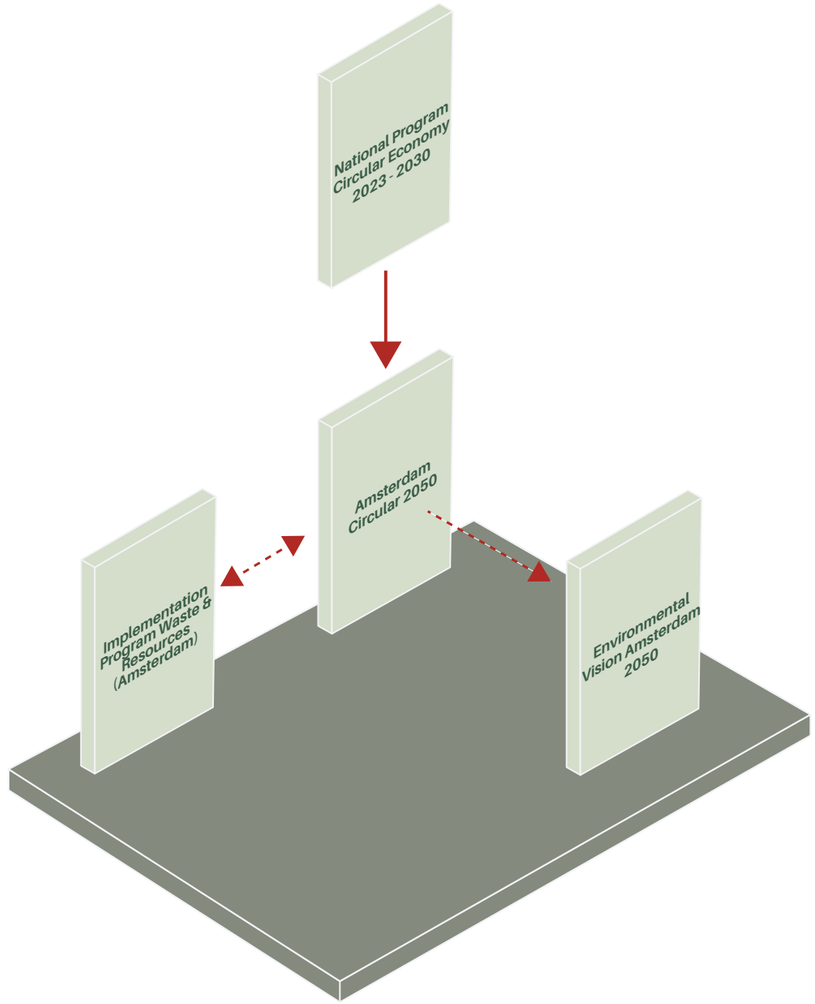


Figure 96: Overview governance document (made by author)

Dutch Governance

Network Governance

Since the 1990s, there has been a shift from centrally organized governance to the local scale in terms of organizing public affairs at the city level. This shift changes the way the Netherlands governs, resulting in a change in the distribution of responsibilities. A term often used for this is 'network governance'. Although the debate is still ongoing if this type of governance is better than the previous one. Most people agree that this type can better respond to the plurality of society (Leclerq & Smit, 2023).
This renewed focus on the local scale is partly because civil society is becoming more empowered and can organize themselves better, partly because of digitalization (Leclerq & Smit, 2023). This results in civil society becoming more self-sufficient and self-organizing (Edelenbos et al., 2018). This is related to the growing distrust and critics towards the government among citizens (Uitermark, 2015).

Participation Society

The Dutch government increasingly relies on the self-organizing nature of its citizens for, among other things, social change, and moves towards a 'participation society'. The government portrays itself as inflexible and expensive and citizens as creative and flexible. This shift in responsibilities asks a lot of citizens and it needs to be acknowledged that this is challenging for people (Uitermark, 2015). Both citizens and the government should find their roles in this new play-field (Leclerq & Smit, 2023), where the government should adopt a supporting role to help citizens to organize better and faster (Uitermark, 2015).
The interaction between the initiative and the government can differ from case to case (Edelenbos et al., 2018). This depends on the degree of agency of the initiative. Sub-chapter 04.6 'Theoretical Input for Design' elaborates on this more.

Self-Organization

This governmental shift highlights the importance of local initiatives, which is a form of self-organization. Self-organization can be defined as the process through which complex urban systems arrange themselves. It emerges from interactions between individual agents. The results of these interactions are frequently unpredictable on a regional scale. Although they cannot be controlled, they can be guided and/or encouraged. Often self-organization is used to describe all the 'unplanned' activities in an urban system (Partanen, 2014).
Self-organized actions arise often from the discontent of the current situation. Alternatives to governmental proposals can be addressed, but also (market) shortfalls in meeting the needs of citizens. An example of this is energy poverty (Edelenbos et al., 2018).

Circular Strategy Netherlands

The Development of Dutch Circular Policy

The Dutch strategy for the transition towards a circular economy starts in 2016. The Dutch government draws up a program with the aim to have a circular economy by 2050 ('Rijksbrede programma Nederland Circulair in 2050').

On January 1st, 2017, the Resource Agreement ('Grondstoffenakkoord') is signed by 180 parties, among others governmental, commercial, and environmental parties. This contains agreements to make the Dutch economy run on renewable resources. This is an intention agreement, so no rights are enforceable.

Together with the different parties who signed, transition agendas for five sectors are composed in 2018. In such an agenda how and with what actions the sector can transition towards a circular one. The five sectors are: plastics; consumer goods; built environment; manufacturing; and biomass and food. The activities regarding biomass and food are included in the transition towards a circular agriculture ('kringlooplandbouw').

In 2019, concrete steps and projects for the different sectors are presented in an execution program ('Uitvoeringsprogramma Circulaire Economie 2019-2023'). This program covers 2019 until 2023. In 2020 and 2021, this program is updated and adjusted.

A new execution program was drawn up in 2023, leading up to 2030 ('Nationaal Programma 2023-2030'). In this year the Netherlands aims to use 50% fewer primary a-biotic raw materials, such as metals and fossils.

In this thesis the National Program 2023-2030 is looked at most thoroughly because this is the most recent governance document. In addition to this, the transition agendas related to households are studied.

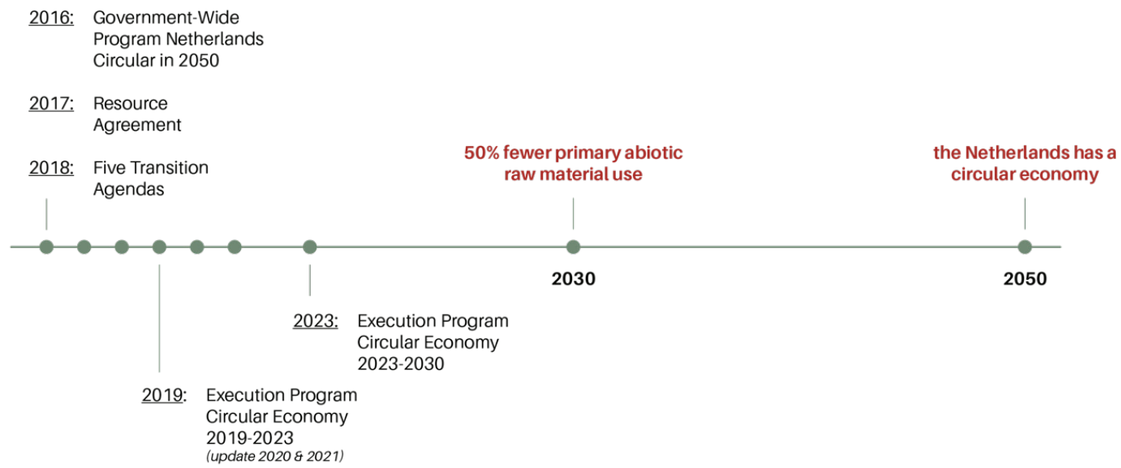


Figure 97: Timeline circular policy (made by author)

National Program Circular Economy 2023-2030

This section of the report includes a critical assessment of the national policy on the circular economy of the Netherlands ('Nationaal Programma Circulaire Economie 2023-2030'). The overall approach of the Netherlands is examined. In addition to this, the document is analyzed by searching for several keywords which are related to the proposed design.

Overall Approach

The Netherlands aims to be completely circular by 2050. Until now most of the measures were voluntarily and non-binding. However, to reach the set goals more directional and binding measures are needed. A mix will be found between stimulating and normative measures.
In earlier policy documents, the focus was mostly on the back of the chain. Now the Dutch government will also take more measures regarding the input-side, such as circular design and the behavior of consumers.
A lot of (the negative effects of the) production for the Dutch market occurs outside of the borders of the Netherlands. Therefore, the government state that international agreements need to be in place to tackle this problem. In addition to this, the government tries to find synergies between the transition towards a circular economy and the climate-, environment- and biodiversity challenges.

The Dutch government identifies four 'knobs' that circular economy policies can turn to make our resource use more circular. These knobs are based on the R-ladder (Rijksoverheid 2016).

1. Reducing resource use,
   by producing and buying less products, sharing these, and make them more efficient.

2. Substitution of raw materials,
   by replacing primary resources by secondary ones, sustainable bio-resources, or using resources with lower environmental effects.

3. Lifetime extension,
   by using products longer and more intensively to lower the demand for new materials.

4. High-quality processing,
   therefore closing the loop through recycling of resources. In 2050, the burning of recyclable waste needs to be history.

Next to this, concrete goals for specific product groups are discussed. The products involve: consumer goods, plastics, construction, and making industry. Measurements for the biomass and food group are discussed in another document, about the transition towards circular agriculture.
In addition to this, supporting measurements are drawn up. This involves mostly increasing the knowledge about the (importance of the) circular economy. For example, by implementing it in education and learning modules for companies. Also, 'Versnellingshuis Nederland Circulair!' is a key player in the change of behavior.

A lot of actors are involved in the transition towards a circular economy. Companies, governments, citizens, and educational institutes: everyone is needed in the transition.
Both private as public means are needed to transition. The government also aims to allot financial funds. Measures which are legislative, both national as European, will have an impact on enforcement, implementation, and monitoring, including financially.

Critical assessment, through keywords

The first couple of keywords are related to the main challenge of this report, thinking of the spatial consequences of transitioning towards a circular economy. Public space ('openbare ruimte') and public ('openbaar') do not occur in the Dutch policy document.

Space ('ruimte') occurs a couple of times. It is noted that it is important to think of the future spatial occupancy of the circular economy. A precise conclusion is not mentioned, only that a study will be done about this by the ministries of IenW and BZK. Next to this, the document states that a couple of innovation subsidies can already be applied for and a circular vision for construction and spatial planning will be created. The measures listed above cannot directly be translated spatially.
Physical space ('fysieke ruimte') is mentioned in the vision for 2050. The government states that cities will be full of circular craft centers by that time which focus on repairing and maintaining. Next to this, the government consider themselves in charge to 'design the economic, physical, and social environment in such a way that it becomes logical, easy, and fair for companies and citizens to choose sustainable, circular products' (Rijksoverheid, 2016, p.27). The way in which they will manage this is not clear to the author. The document only states that more guiding and coercive measures are needed and a more concrete implementation. At this moment the circular economy policy is based on voluntarism. To conclude, the government clearly acknowledges that the way the circular economy translates to the (public) space is important. However, in the policy document no clear adjustments and/or measures are stated. Only one is mentioned, cities will be full of circular craft centers. It is important that these are located in cities, yet it is important to also focus on other things in the public space. Since it cannot be guaranteed that people use these centers.

The focus scale of this thesis is the neighborhood level. Therefore, also the words 'neighborhood' ('buurt') and 'district' ('wijk') are searched for. These words are both not mentioned in the policy document. It is in itself not strange that these are not mentioned because the document is focused on the national level.

However, the author feels like that this scale is of great importance for the transition towards a circular economy. Directives of how it could look like could be useful, this is also related to the section above about the spatial impact.

Measures on the local level are often made by the municipality. Therefore, the word municipality ('gemeente') was also looked for. The first action of the government is providing a subsidy for creating a circular craft center, as stated above, with the aim of creating a national covering network in 2030. Next to this, the government draws up uniform lists what items need to be recycled and in what bin. They make efforts to ensure that every municipality and waste handling company uses these.
In addition to these concrete measurements, the government strives towards municipalities that stimulate inhabitants to separate their waste by providing suitable recycling options and through communication, behavioural influence, and financial incentives. The manner in which municipalities should or could do that is not identified. However, the implementation of this could have a (direct) spatial effect.

In figure 67, the systemic overview of the product-consumption chain, it is apparent that the consumer has a central role. Changing the mindset and behavior of the consumer is therefore crucial. This is also acknowledged by the Dutch government, the word behavior ('gedrag') is mentioned quite a lot. Their aim for 2050 is that the behavior of the consumer has changed. Circular behavior, such as re-use and reparation, should (again) be the norm in the Netherlands. Most of the measurements are focused on informing and educating citizens, to stimulate knowledge, skills and behavior fitting the circular economy. This will be done by campaigning. Next to this, various research will be done on (circular) behavior and their drivers and obstacles. Lastly, as stated before, circular craft centers will be realized; the physical, social, and economic environment will be changed to make circular behavior easy, logical, and fair; and municipalities stimulate their residents. What stands out is the fact that the government only uses stimulative strategies regarding behavioral change. There are none prescriptive or pricing strategies (Rijksoverheid, 2016).

Amsterdam Circular 2050

The City of Amsterdam is aware of the importance of transitioning towards a circular economy and has developed a strategy to tackle this. Together with Kate Raworth, the author of the book 'Doughnut Economy', they developed a doughnut model for the city of Amsterdam. The doughnut shows how a just and thriving society can be reached (Circle Economy & Gemeente Amsterdam, 2020).

The City of Amsterdam addresses this with the help of its seven urban districts, neighborhood initiatives, commercial parties, educational institutions, and residents. The City of Amsterdam has a 'learning by doing'-approach, which means they constantly research, implement and innovate. Next to this ambition, they have the concrete ambition of reducing its use of primary raw materials by 2050 and being 100% circular in 2050 (Circle Economy & Gemeente Amsterdam, 2020).

In the National Raw Materials Agreement five value chains are identified: food & organic waste streams, consumer goods, the built environment, manufacturing industry, and plastics. The City of Amsterdam has chosen the first three value chains to focus on (Circle Economy & Gemeente Amsterdam, 2020). These value chains are chosen because of several reasons.
The main strategic interventions implemented by the municipality of Amsterdam are discussed below, organized by value chain. After that, there is an enumeration of the ambitions and courses of action of the municipality of Amsterdam.

Food and organic waste streams
This value chain is seen as important because it has a big ecological impact, due to the use of land, water and resources. Next to this, many possibilities are available to preserve the value. For example, food waste could be re-used for bio-diesel or composting. A couple of strategic interventions are explained more thoroughly.

Firstly, the municipality focuses on implementing urban agriculture in the city (and the consumption of regional products). One of the reasons for this strategy is to bring food production closer. In this way they hope that inhabitants are more aware of their food consumption and appreciate it more, and therefore waste less. Next to this, the production chains are shorter and therefore less CO_2 is emitted.
Another strategy is to increase the awareness of inhabitants regarding lowering the amount of food waste and changing their eating habits. This could be done by campaigns.
Lastly, they want to improve the infrastructure which is used to separate (food) waste. This will make it easier and more appealing to separate food and organic waste (Gemeente Amsterdam, n.d.-d).

Consumer goods
Consumer goods include electronics, textiles, and furniture. This chain is chosen because of its contribution to the depletion of raw materials, environmental pollution and poor work conditions they cause. The possibilities for this are sharing and trading at the front, and good collection and reuse at the back.
A couple of ambitions are defined here. Firstly, the City itself will set the example (by purchasing fewer new products and supporting new developments).
Next to this, the City focuses on lower their material footprint. They will seek the dialogue with companies and stimulate innovation; advertise in the public space to encourage more sharing, repairing and reusing; and the spatial planning policy provides spaces for circular actions.
Lastly, the infrastructure (including implementing new clusters for handling discarded products) will focus on retaining the value of products (Gemeente Amsterdam, n.d.-d).

Built environment
The value chain 'built environment' was chosen because the municipality decides on the design of the public space and is an important user of buildings in Amsterdam. A lot can be gained by constructing buildings circularly and using sustainable materials in the public space (Circle Economy & Gemeente Amsterdam, 2020). The municipality focuses on combining and sharing circular knowledge between different institutions. Next to this, they will draw up criteria for circular construction and stimulate activities which are happening (Gemeente Amsterdam, n.d.-d).

The ambitions (X.0) and courses of action (0.X), as defined by the municipality of Amsterdam, in the circular strategy can be read on the right (Gemeente Amsterdam, n.d.-d).

Some of the courses of actions are highlighted in red. These are the most important for this thesis, taking into account the scope and the spatial focus.

Actions V1.1, V3.4, C2.3 and C3.1 have an (direct) effect on the configuration of the (public) space. Including urban agriculture in the city; improving organic waste collection and processing; clusters for circular services; and 'waste to new'-clusters.

Actions V1.3, V2.1, V2.3, V3.3 and C2.2 are focused on the change in behavior of the consumer and other actors. These actions mostly contain involving multiple stakeholders and making inhabitants more aware (and engaging) by campaigning. Although these are good targets, a concrete implementation is missing.

Food & organic waste streams

V1. Short food chains provide a robust sustainable food system

1.1 Food production will have a place in the city
1.2 The City purchase regionally produced food
1.3 Sustainable chain parties will collaborate more in order to increase the consumption of regional food

V2. Healthy and sustainable food for the people of Amsterdam

2.1 The people of Amsterdam change their eating habits
2.2 The City is committed to reducing food waste
2.3 Initiatives against food waste and for more efficient production of food will be supported

V3. High-quality processing of organic waste streams

3.1 Working together to ensure the best approach for each city district
3.2 The City sets the right example
3.3 The people of Amsterdam are made aware of the importance of separating waste for uncontaminated waste streams
3.4 Amsterdam creates room and generates opportunities for reusing waste streams

Consumer Goods

C1. The City sets the right example by reducing its consumption

1.1 The City purchases fewer new products and instead adopts a policy of access over ownership
1.2 The City supports the development of new circular products and services

C2. Caring for our natural resources together

2.1 Working together for better products in Amsterdam
2.2 Increased awareness of the need to consume less and share more
2.3 Sharing and repairing made easy, accessible, and affordable

C3. Amsterdam makes the most of discarded products

3.1 The City, business and knowledge institutions work together to extract value from discarded items
3.2 The business community helps the people of Amsterdam to appreciate the value of their goods
3.3 Amsterdam treats discarded but useful goods with respect

Built Environment

G1. The transition to circular development requires a joint effort

1.1 Lower limit: use recycled and bio-based materials as much as possible
1.2 Insight: determine the value of the current built environment
1.3 Defining and safeguarding the circular ambition at the city- and district levels
1.4 Knowledge: joint knowledge as a starting point
1.5 New forms of value assessment

G2. The City sets the right example by formulating circular criteria

2.1 Extent the useful life: use what's available
2.2 Tighten internal municipal processes: encourage circularity
2.3 Organize market research: stimulate innovations
2.4 Municipal assets: what are they worth?

G3. A circular approach to the existing city

3.1 Agreements on circular ambitions: invite extra-municipal parties to the table
3.2 Made-to-measure knowledge: the City provides targeted knowledge and data services
3.3 Affordable and scalable: the City stimulates innovation projects"

(Gemeente Amsterdam, n.d.-d)

The City of Amsterdam follow both a top-down approach as a bottom-up approach. This combination ensures that they can be as specific as possible but also leave room for possible new developments (Circle Economy & Gemeente Amsterdam, 2020).

In figure 96, the different policy instruments of the Municipality of Amsterdam are listed. They are organized by regulatory & legislative instruments; economic instruments; and soft instruments. In the value chain 'food & organic waste streams', spatial planning can play a role by, inter alia, creating physic space for collection, reuse, and appointing places for food production. Soft instruments such as information campaigns can be used to increase awareness (Gemeente Amsterdam, n.d.-d).

The transition towards a circular economy is not only influenced by the policy of the City of Amsterdam. A lot of matters are regulated on national and European level. This creates a level playing field for everyone. The disadvantage of this, inter alia, that the ambition of front-runners is slowed down because the rules are complicated or remain behind. The City wants to lobby by national and European authorities on, among others, these topics:
- Put a tax on raw materials and energy instead of labor, due to the fact that repairing something involves more man hours.
- Regularly evaluating and tightening (outdated) legislation in terms of reuse, construction, and development, to stimulate front-runners and clarify to the market.
- Increase the number of products with 'extended producer responsibility', for example add furniture and clothing to the list.

(Circle Economy & Gemeente Amsterdam, 2020).

Policy Instruments

Regulatory & Legislative Instruments	**Regulations**	Strategy & objectives Spatial planning Environmental assessment & permits Monitoring & enforcements	**Economic Instruments**	**Fiscal frameworks**	Positive financial incentives Negative financial incentives	**Soft instruments**	**Knowledge, advice & information**	Research activities Educational programmes Information campaigns Capacity building
	Legislation	Prohibitory provisions Performance standards Technical standards Labels Other legislation		**Direct financial support**	Subsidies Circular procurement & infrastructure Debt financing		**Collaboration, platforms & infrastructure**	Data and information exchange platforms Matchmaking platforms Participation platforms Living labs
				Economic frameworks	Tradable permits Strong producer responsibility Public-private partnerships		**Governance**	Institutional design Public-private partnerships Voluntary agreements Lobbying

Figure 98: Policy instruments Gemeente Amsterdam (reprinted from Gemeente Amsterdam, n.d.-d)

Implementation Programme Waste & Resources – Amsterdam

This document is about how the City of Amsterdam will tackle their waste management.
The City strives towards a waste-free and clean Amsterdam, by offering the right facilities which contribute to the right offering behavior, so that they can process raw materials with the highest possible quality (Gemeente Amsterdam, 2020).

The most important actions are listed below:

Facilities:
I. Change waste rules from businesses
II. Less waste on the street by improving the facilities and increasing the enforcement

Behavior:
I. Separate plastics in the waste handling center, separate organic waste at home
II. Increase the amount of bringing one's own waste to the recycling center

Materials
I. Items get a second life in a circular craft center

The City of Amsterdam wants to achieve this by working area-specific; appointing co-managers (such as the adoption of containers); making frameworks for implementation; deploying a digital strategy; lobbying (in terms of municipal waste and producer responsibility); and developing in the organization and governing role of the municipality (Gemeente Amsterdam, 2020).

Environmental Vision Amsterdam

This In this section the omgevingsvisie (translated ‘environmental vision’) will be discussed to assess whether the municipality of Amsterdam names spatial measure connected to the circular economy. This was done by searching for various keywords.

The first key word which was looked for was ‘circular economy’. The City of Amsterdam acknowledges that it is an important issue to tackle, which requires a change in mindset and an extra demand for space. Since more space is needed for waste handling and energy production. Next to this, the uncertainty of the future needs to be considered.

The main action regarding transitioning to a circular economy is the creation of a circular hub in the harbor of Amsterdam. Companies handling fossil fuels will be phased out and new circular practices will replace those. In the harbor, environmental space is reserved. Therefore, no housing can be located there.
Beside the plans for the harbor, the municipality wants to retain and intensify the current making industry and create new space in productive districts (such as Buiksloterham) for small industrial – and logistic companies. Also, they want to keep enough space for circular ambitions in new districts. Although these plans are beneficial for the transition towards a circular economy, nothing is stated about the other current districts of Amsterdam.

Next to this, the municipality states that they want to facilitate spaces and initiatives which experiment with circular economy. These are places where sustainability is accessible and tangible. In addition to this, they will give circular business priority above others. In the document the way that the municipality is planning on stimulating this, is still lacking.
The author assumed that financial stimulators are the most logical, and therefore looked at the subsidies which can be applied for. It is quite unclear which subsidy is the right one to apply for when you want to set up a circular company/initiative. The ones which are the most logical, in the author’s opinion are: ‘Room for Sustainable Initiative - Sustainable Projects and Programmes’; ‘Business Investment Zones (BIZ)’; ‘Economic Structure and Reinforcement of the Labour Market’; and ‘Innovation grant’ (Gemeente Amsterdam, n.d.-f). Whether these would actually be issued the author cannot say for sure. To stimulate the establishment of circular companies and initiatives, this needs to be simplified.

In this thesis, two value chains are at the center: food and consumer goods. Regarding consumption goods the importance of repair companies are noted. However, this is focused on the possible employment of people, the spatial implication it requires is not stated.
The interventions regarding food are more spatial. For instance, room for city agriculture; eatable green in the public space; and room for innovative production of food; and fighting unhealthy food (at schools). Concrete measures for that are also lacking.



The locations for urban agriculture are, for example, not illustrated on the vision map.
In the spatial plan of Amsterdam, it is apparent that they mostly focus on the city as a whole. For example, creating an extra bridge to connect two areas better. This is logical because the plan is for the whole city. However, it would be valuable to note how this will change the districts. The argument is also applicable on the spatial measures needed for the transition towards a circular economy.

Another addition to this plan would be to state (restrictive) changes in the public space and program of the commercial functions. An example of this would be to say that more repair shops will be present in the district. The municipality could of course not force this kind of companies to settle in the district, but they could make measure to stimulate it.

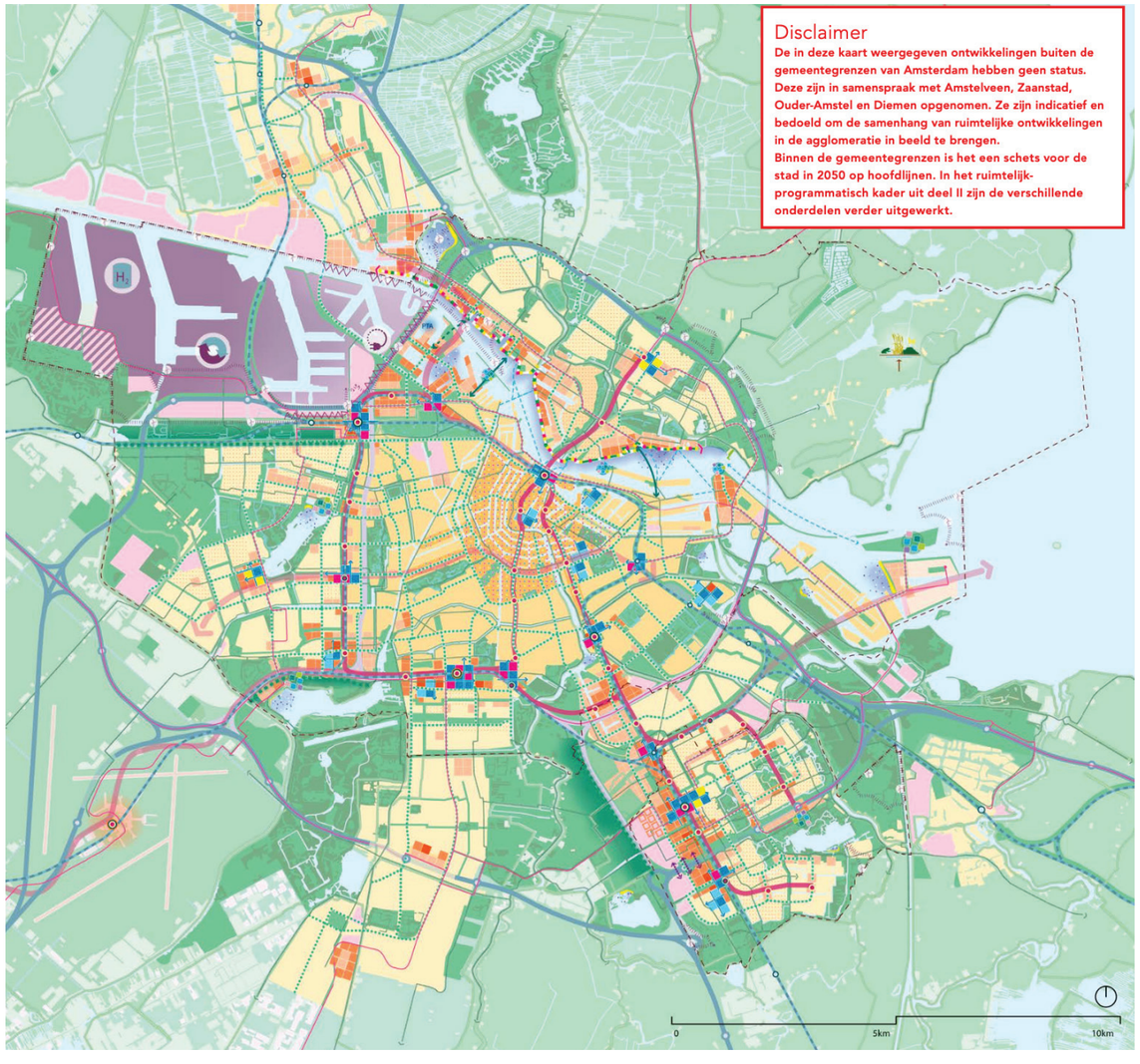


Figure 99: Environmental Vision Amsterdam 2050 (Gemeente Amsterdam, 2021)

Stakeholders Scheme

The stakeholders of the district are mapped in the power-interest matrix on the right (figure 96). For each stakeholder, the power they have to make changes and the interest they have in the transition towards circular system is defined.
The circles that are made a bit transparent are at the moment less prevalent at the moment.

On the next pages, the role of each stakeholder is explained more thoroughly.

Stakeholders:

EU	European Union
NL	Government NL
A	Amsterdam
GM	Gebiedsmakelaar
WC	Waste Collectors
WH	Waste Handling Company
SH	Shop
SU	Supermarket
MO	'Makkie'-organization
MS	'Morgenster'
CI	Circular (district) Initiative
SC	Social-Cultural Institution
EI	Educational Institution
R	Resident (disposer)
Ret	Rethink-location
Re-u	Re-use-location
Repa	Repair-location
Ref	Refurbish-location
Rem	Remanufacturing-location
Rep	Repurpose-location
Rec	Recycling-location

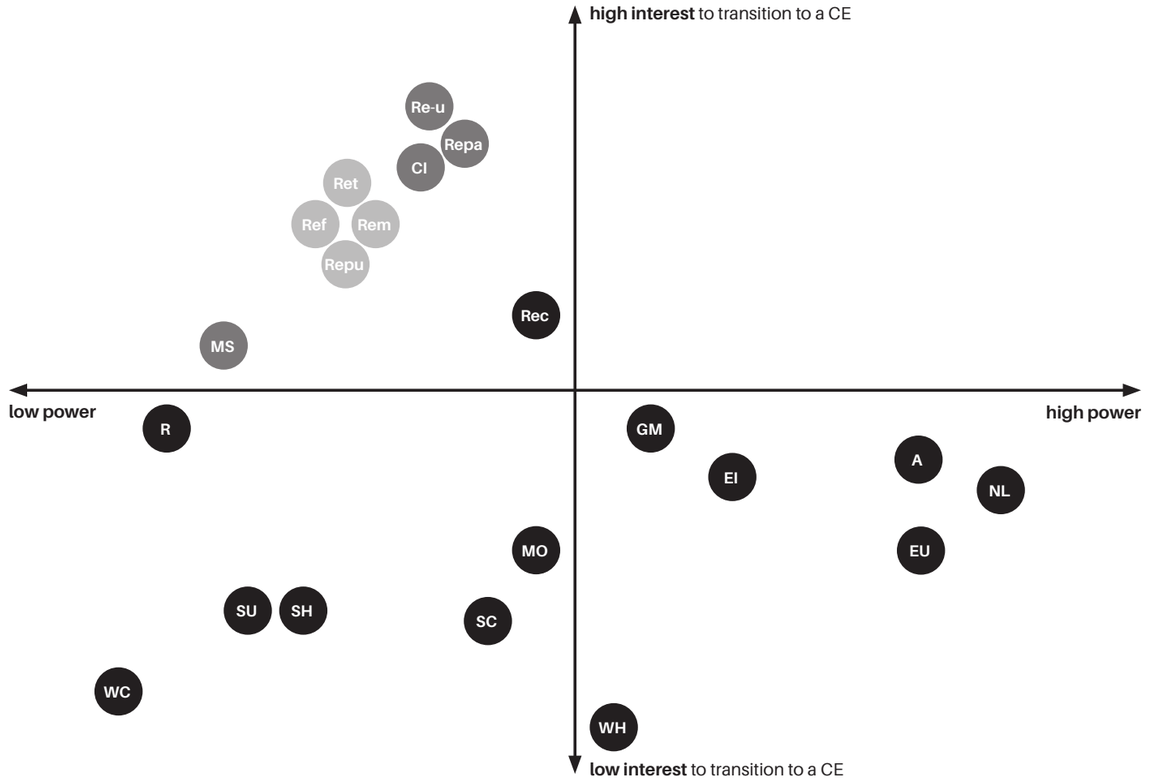


Figure 100: Power-Interest Matrix (made by author)

Explanation of Stakeholders

European Union (EU)
The European Union sets the aims/goals, in terms of the transition to a circular economy, for countries in the European Union. They also make agreements with different nations and draw up regulations to meet the targets.

Government of the Netherlands (NL)
The Dutch government sets the aims/goals, in terms of the transition to a circular economy, for the whole of the Netherlands. To reach these aims, they delegate tasks to the municipalities. In addition to this, they talk to other (European) countries to make agreements.

Municipality of Amsterdam (AM)
The municipality sets the aim for the city regarding the transition towards a circular economy. They both draw up regulations and execute those. This is in relation to the transition towards a circular economy, but also in general.
The municipality also makes a spatial strategy for the city of Amsterdam and make a vision in what direction Amsterdam should change.
Amsterdam owns the main waste handling facility that handles the waste of Amsterdam (Amsterdam Energie Bedrijf).
Lastly, they have a connection with a lot of stakeholders. Mostly regulating, however they are also the employer of, among others, the waste collectors, the maintainers of the public space and the Gebiedsmakelaars.

Gebiedsmakelaar (GM)
This person is the link between the municipality and the residents/organizations in the district. He/she talks to residents/organizations about the wishes they have and communicate this to the municipality. And the other way around, he/she communicates the plans (to change something) of the municipality to the residents/organizations in the district. They talk to a lot of stakeholders (for example residents, shop owners, and housing cooperation's).Therefore he/she has a good overview of the district (in terms of issues and challenges).
As stated before, he/she is employed by the municipality of Amsterdam.

Waste Collectors (WC)
They drive around and empty the waste containers in the public space.

Waste Handling Company (WH)
They process the inflow of waste. They remove the materials from the waste that can be recycled into new materials. The burn the rest of the waste and recover energy by doing this.

Rethink-organization (Ret)
This location provides the service of 'rethinking'. The aim of this is to limit material use, by decreasing consumption of products.

Re-use-organization (Re-u)
This location provides the service of 're-using. The aim of this is to limit consumption of new products, by stimulating using a disposed by product of someone else.

Repair-organization (Repa)
This location provides the service of 'repairing'. The aim of this is to limit consumption of new products, by repairing broken products.

Refurbish-organization (Ref)
This location provides the service of 'refurbishing'. The aim of this is to limit material use, by modernizing disposed products.

Remanufacturing-organization (Rem)
This location provides the service of 'remanufacturing'. The aim of this is to limit material use, by using components of old products for a new one.

Repurpose-organization (Repu)
This location provides the service of 'repurposing'. The aim of this is to limit material use, by repurposing disposed components for a new use.

Recycling-organization (Rec)
This location provides the service of 'recycling'. The aim of this is to limit new material use, by making materials from disposed ones.

Shop owners (SH)
They sell any type of product to consumers. The size of the shop is not specified, this could be chain or a local shop.

Supermarket owners (SU)
They sell food to consumers. The size of the shop is not specified, this could be chain or a local shop.

'Makkie'-organization (MO)
They provide a platform that stimulates doing something (socially) good for the neighborhood.

'Morgenster' (MS)
They informally collect waste from the public space. Thereafter, they sell the products/materials to (recycling) companies.

Circular (district) Initiative (CI)
They help a (good) cause. This ranges from cooking free meals with food waste, to crocheting items with disposed plastic bags. Next to this, they are a hot-spot for people to meet.

Social-Cultural Institution (SC)
This organization is a hot-spot for people to meet. Most of the time, they organize various activities for people to do.

Educational Institution (EI)
This institution provides education to children and/or adults. Next to this, they are a hot-spot for people to meet.

Resident (disposer) (R.d)
As stated, before in this thesis, the resident is crucial in the transition towards a circular system. Firstly, they make the choice if and when it is time to dispose something. They ask themselves questions like: Is it needed to buy something new or can the old products get a new life? Is it needed to throw the left-over food in the waste bin, or is it still edible?
Next to this, if they decide to dispose something, they make the choice what to do with it. They could bring it to a re-use location and let others use it. They can repair the item at hand. They can (let someone) refurbish a product they want to modernize or update (ex. paint it a new color). They can bring a product to a remanufacture or repurpose-location, so the components can be used as efficient as possible. They can recycle a product/material to make new materials from it. Or they can put their waste in the general waste container. The waste handling facility can recover energy from it in this way.

This chapter concludes the analysis part of this thesis and the design part begins. The vision of this project; the overarching planning tool and design principles; and the spatial framework of the whole district are explained. Lastly, the location for the more detailed design is described.

06.1 Vision
06.2 Design Principles
06.3 Spatial Framework
06.4 Supporting Maps
06.5 Urban Metabolic System
06.6 Location for Design

06. Design Approach

Indische Buurt

The Indische Buurt serves as a blueprint for a circular approach to domestic consumption practices. The residents of the Indische Buurt played a crucial role in facilitating this transition. This pioneering planning principle, based on R-strategies, will set an example for other districts to follow.

The visibility and centrality of the R-strategies within the district effectively lowered the threshold for executing circular behaviors. Residents regularly encounter the various locations demonstrating different R-strategies, facilitating their understanding of their importance.

Residents of the Indische Buurt think twice about what products they are going to buy. If residents possess a product, they carefully assess the most sustainable method of disposal.

Borrowing products is considered before buying, and if necessary, purchasing items that utilize minimal resources. Residents in Indische Buurt are familiar with ways to extend the lifespan of products and know where to access these locations in the district and beyond.

They are aware of the various recreational options available and frequently make use of them. The outdoor space in the neighborhood provides residents with multiple opportunities for recreation. The residents are conscious of the positive effects those activities have on the environment, as well as on people's physical and mental health.



Figure 101: Future image of the Javastraat (made by author)

The R-ladder as planning tool

The district is reorganized by using the R-strategies as planning tool. For clarity, the R-ladder is inserted once more. The higher the R-strategy is placed in the pyramid, the more value (of the product or material) is retained.

Three overarching concepts are drawn up to underpin this planning tool, and to further guide the (spatial) interventions. These can be seen on the right (figure 103-105).

The spatial framework, that is illustrated on the next pages, serves as an overarching plan for the district. The higher the R-strategy in the pyramid, the more central this strategy is placed in the district.

This placement is not done literally, but is based on the space-syntax of the neighborhood. A space-syntax is a figure that shows the degree of use of the various streets in the district. This map can be found on pages 58-59 in subsection 'Urban Analysis | Connectivity - Space-Syntax'.
Therefore, the highest R-strategies are placed on the most used streets.

The spatial framework is illustrated on the next pages. After that, the different interventions are explained and a brief repetition of the different R-strategies is given.

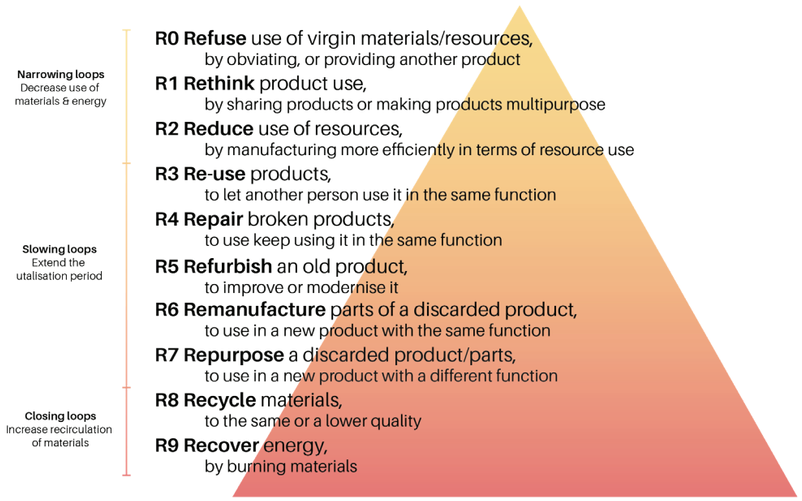


Figure 102 (on the left): R-ladder (made by author, based on Schut, 2019)

Figures 103-105 (on the right): Overarching conceptual drawings (made by author)

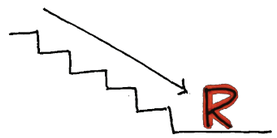
concepts:



R at the heart of the community



make R's visible



lower threshold to execute a R-strategy

R-ladder as planning tool

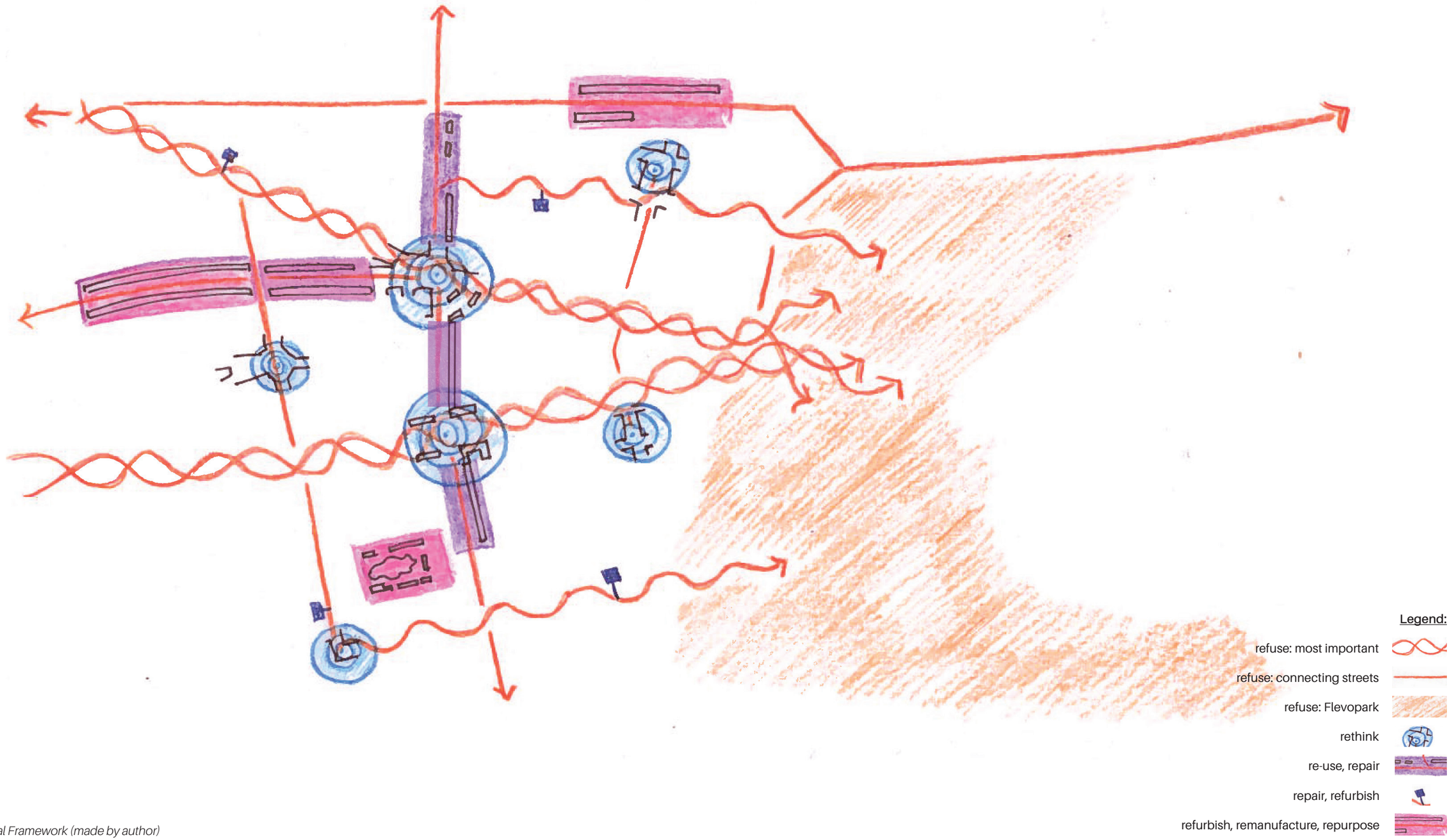


Figure 106: Spatial Framework (made by author)

R-ladder as planning tool

Refuse

Using as few resources as possible is the goal of refuse. In this framework, 'refuse' is implemented by providing residents with opportunities for active recreation. As explained in the section about consumer behavior (section 04.5), people have the need to keep busy and have a goal (Csikszentmihalyi, 2000). People will be encouraged, with this intervention, to engage in active recreation instead of passive recreation through the creation of more available options. By creating various active recreation options, residents are less drawn to consumerism. The public space facilitates to do other activities than, for example, shopping or watching television. Instead activities such as playing games, taking a walk, and gardening are among the activities recreation options that are facilitated.

Axes that promote physical recreation without the need for consumption are developed. The axes connect the district to the Flevopark. This leads to easier and more enjoyable ways to get to the Flevopark and engage in (active) recreation there.

The streets that connect to the Flevopark and are frequently used (based on the space-syntax) have been selected for this intervention. The two most significant in this are the Borneostraat-Javastraat and the Molukkenstraat (illustrated in the image as double curving lines). More locally, two smaller roadways link the various quarters to the Flevopark.

Rethink

Rethink is understood as referring to product sharing. This can involve using items on site or borrowing products to take home. The threshold for doing so must be low. As a result, several spots are created all around the district. The two largest ones are located on the district's most significant intersections. One may be found at the Javaplein, which is the intersection of the Javastraat and the Molukkenstraat, while the other one is made at the junction of the Insulindeweg and the Molukkenstraat. In the urban fabric of the four quarters, smaller sports for sharing are created. These are more convenient for often used things because they are typically located nearer to one's home.

A wide variety of goods can be exchanged. For example, you may be able to borrow clothes or tools to take home. Sewing machines and irons are two examples of items that could be utilized on location.

Reduce

This thesis does not specifically address reduce because this R-strategy is more concerned with production process optimization. Nevertheless, 'reducing' resources will be an indirect consequence of using other R-strategies. Consumers have a big say in what they are consuming, and therefore have also an influence on market parties: demand is supply. When citizens are more aware, they may choose (more) circular products and therefore pressure the market to also make changes in the production process.

Reuse & Repair

These two R-strategies are the most obvious for many individuals. Reusing means giving your discarded product another chance to be used (by taking it to a second-hand store, for example). A broken product's lifespan can be increased by repair. One way to do this is to take your shoes to a shoemaker to have the sole fixed.

The Molukkenstraat is the street where these two R-strategies come together. Since this street is in the center of the district, everyone is within proximity. This street is one of the busiest ones right now. The reuse- and repair locations will replace the old function in the commercial buildings that are already there.

Repair & Refurbish

Many residents of the district live in rather modest homes, which means they do not have a lot of space inside. Furthermore, they frequently do not have a big budget (Gemeente Amsterdam, n.d.-c).

Four locations within the spatial framework are designated for the construction of pavilions where individuals will be able to repair and refurbish objects themselves. For instance, they are able to paint or fix a broken furniture. These pavilions have the equipment and space needed to make that happen. They resemble a smaller version of the model located in the Architecture building.

It could be difficult to transfer some large objects there. For this reason, it is possible to borrow cargo bikes and trolleys.

Refurbish, Remanufacture & Repurpose

Although the methods and objectives of these three R-strategies differ, they are remarkably similar to many individuals. 'Refurbish' refers to modernizing a product. The most common example is a refurbished phone that has a fresh battery. 'Remanufacturing' is the process of creating a new product out of the parts of an old one. 'Repurpose' refers to giving a product a new purpose, such as turning discarded strainers into lamps. The same building, which is organized by item type, combines these three R-strategies. As an illustration, in one location one can bring their used electronics and in another one can bring their used furniture.

The purpose of this is to facilitate residents' understanding of where to take their stuff. Employees at these places decide whether to refurbish, remanufacture, or repurpose the delivered item. Another reason to combine these three strategies is when a product category is in one location, more product components can be swapped between them.

Recycling

Recycling is quite a low R-strategy. Some items, like plastic packaging, do not fit into a higher plan, which is why this strategy is not phased out. In order to encourage the implementation of a higher R-strategy (for products that are appropriate for it), the recycling bins are positioned next to other R-strategies. In order to keep the recycling threshold from being too high, a few more recycling containers are positioned across the district in areas that are not close to other interventions. The abundance of recycling bins might lead to rubbish being unintentionally disposed of in public areas. These extra bins are frequently positioned close to the entrances to the district. People can dispose of their rubbish here strategically while commuting to work.

Recover

Waste can be burned to recover energy. The district does not contain this R-strategy. However, a waste treatment facility will receive and burn the remaining waste that is collected from the district. The amount of leftover waste will be reduced in the future thanks to the planned interventions in the district. As a result, less energy can be created. An alternative (green) energy source needs to be found for the homes that rely on this.

Three-dimensional

The conceptual spatial framework, from the previous pages, is visualized more precisely and into 3D in this image. A better idea of the spatial consequences of the interventions can therefore be formed.

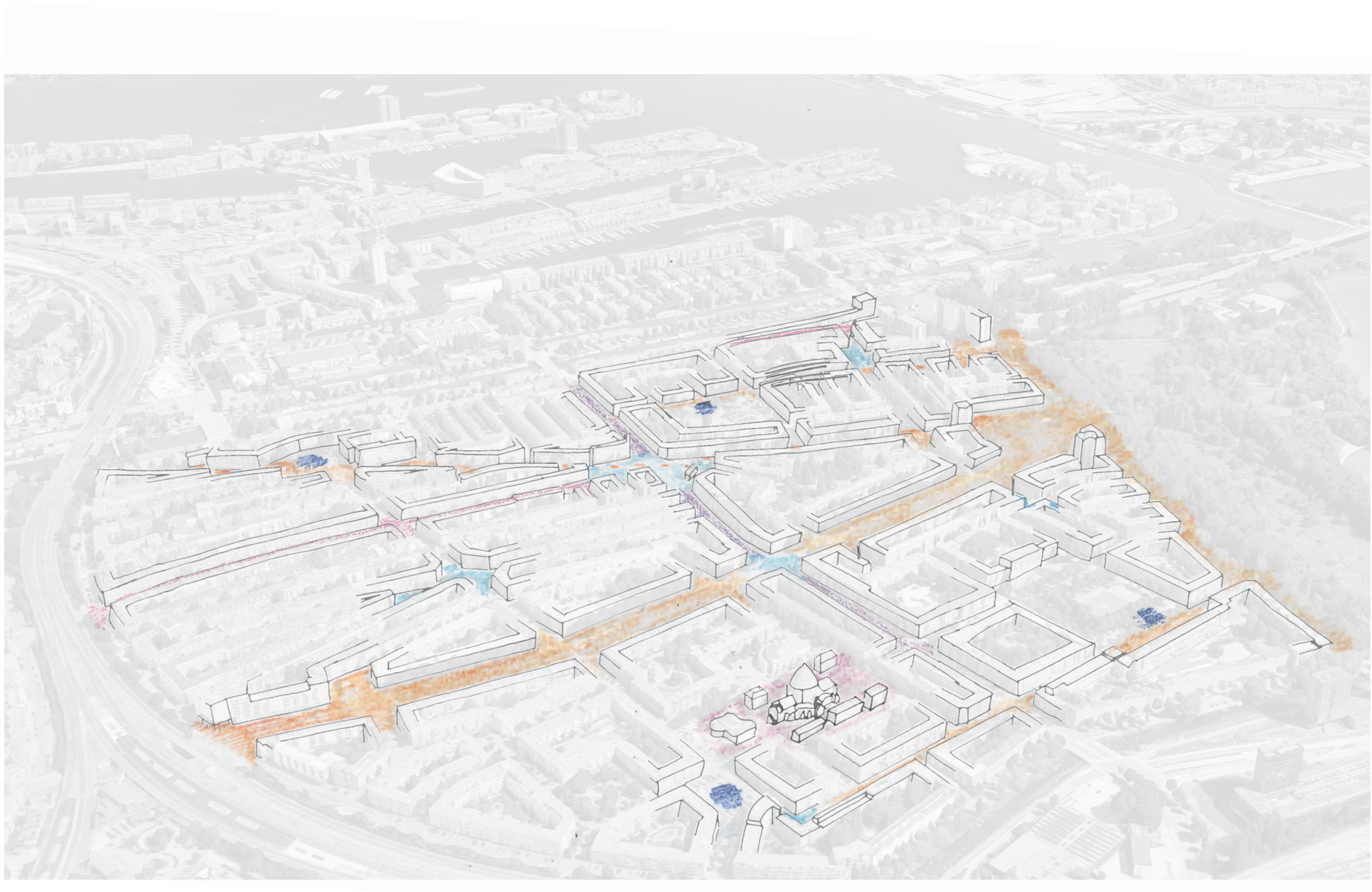


Figure 107: Spatial Framework, threedimensional (made by author)

Recycling

As stated in the explanation of the conceptual spatial framework, recycling stations are placed near other R-strategies. This stimulates people to execute, when possible, a higher R-strategy. However, not everything fits in a high R-strategy (for example plastic packaging). Therefore, recycling is not phased out.
At some places in the district, the interventions based on the R-strategies are quite far away. Therefore, preventing a high threshold to recycle, extra locations are created. These are most of the time located near the entry points of the district.



Figure 108: Recycling Map (made by author)

Mobility

In a circular district, individual car ownership is in a thing of the past. Therefore, locations for shared mobility, such as cars and cargo bikes, should be created in the district. These sharing stations are located on the most used roads and surrounding them. This ensures that the usage of the roads, and therefore the hierarchy of them, will stay the same. This was done because the implementation of the various R-strategies is based on the hierarchy of the roads.
In the image could also be seen that more connections to the Flevopark are created. This results in an easier access to the park, and therefore potentially more (active) recreation in the park.

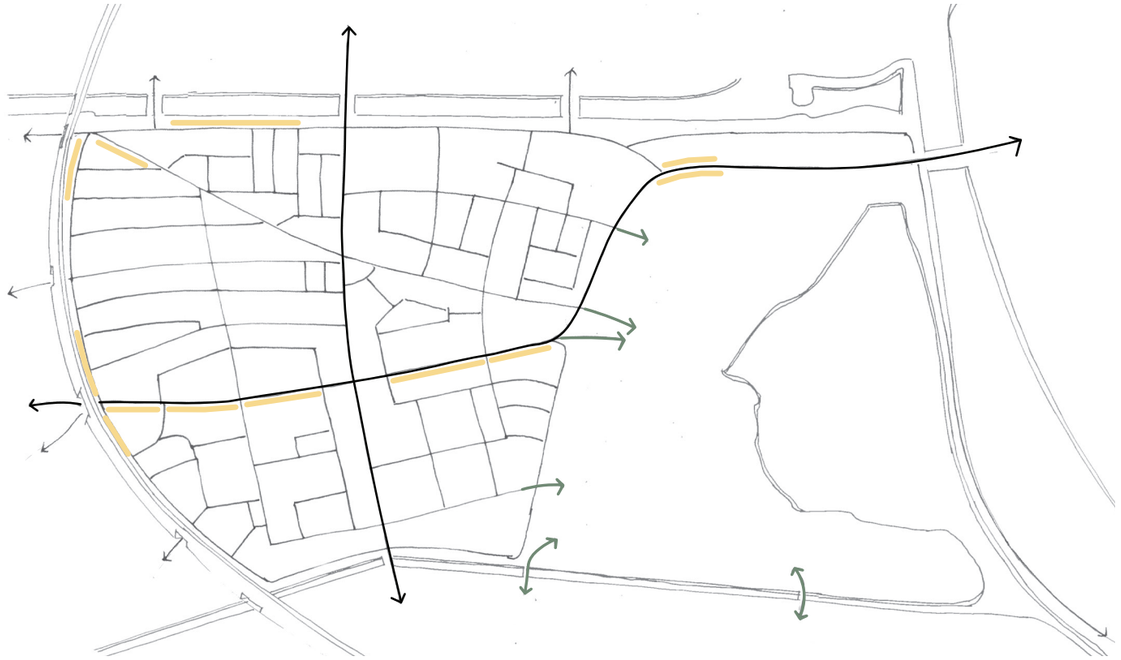


Figure 109: Mobility Map (made by author)

R-strategies

In the figure below (110), the multiple R-strategies are placed in the production chain. It is apparent that the consumer has a central role. It is their choice to buy something or not, and what to do with their products after consumption. They can discard it and throw it in the residual waste bin, or maybe they recycle the elements. But they can also make more sustainable choices like bringing it to a re-use shop or repair something.

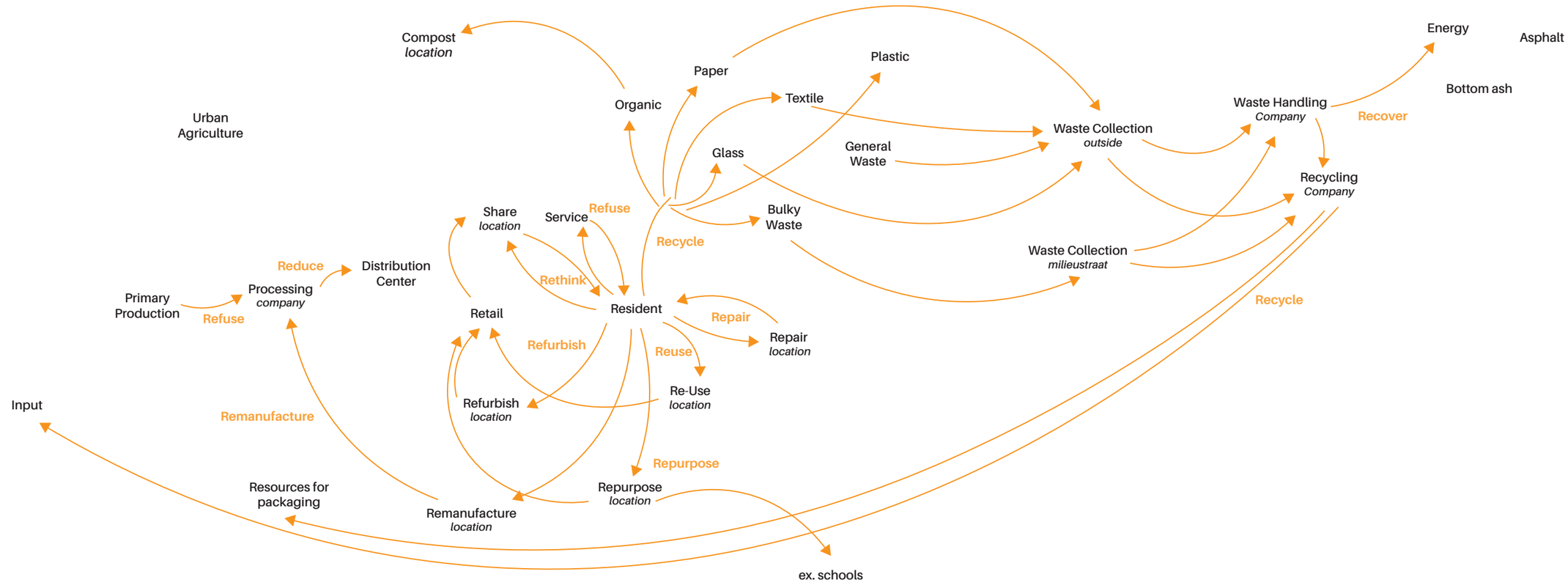


Figure 110: Urban Metabolic system, R-strategies (made by author)

Location in Spatial Framework

Choice Design Location

The Javaplein and its surrounding street have been chosen as the focus of a detailed design plan. This location was chosen due to the convergence of various R-strategies, making it an interesting site for a design proposal.

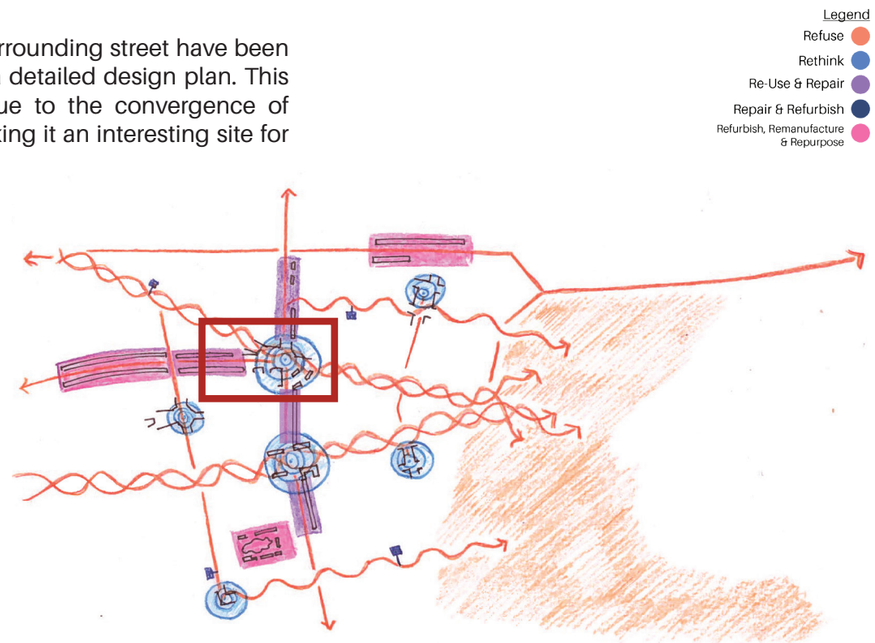


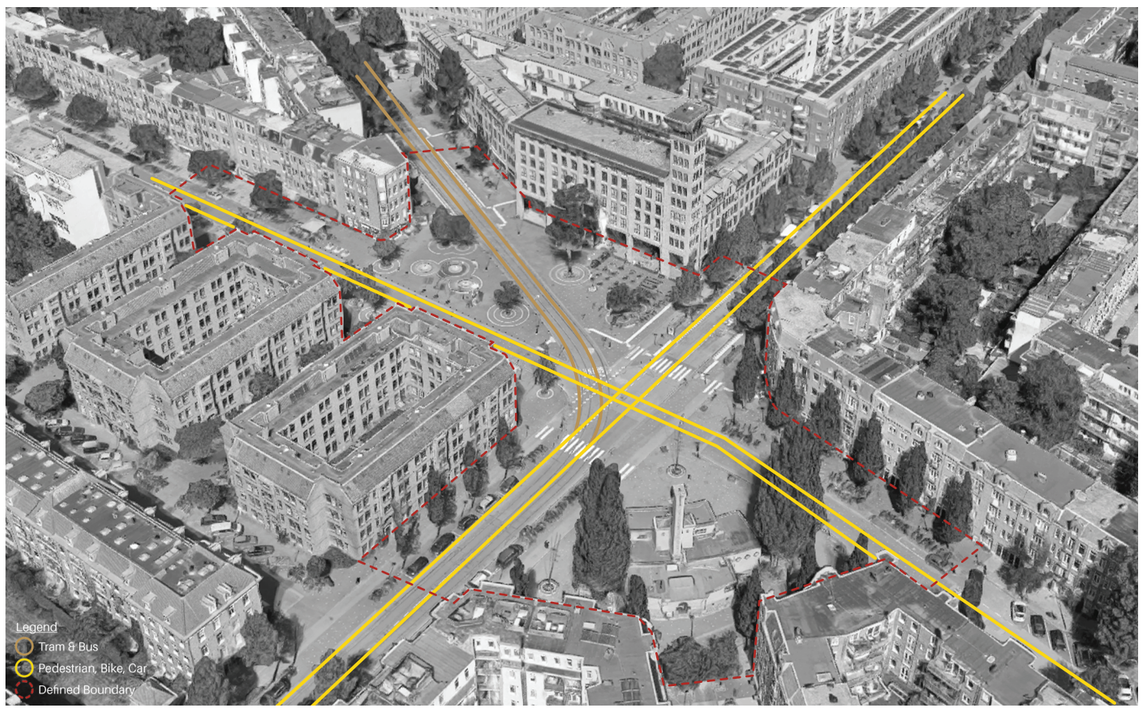
Figure 111: Location in spatial framework (made by author)

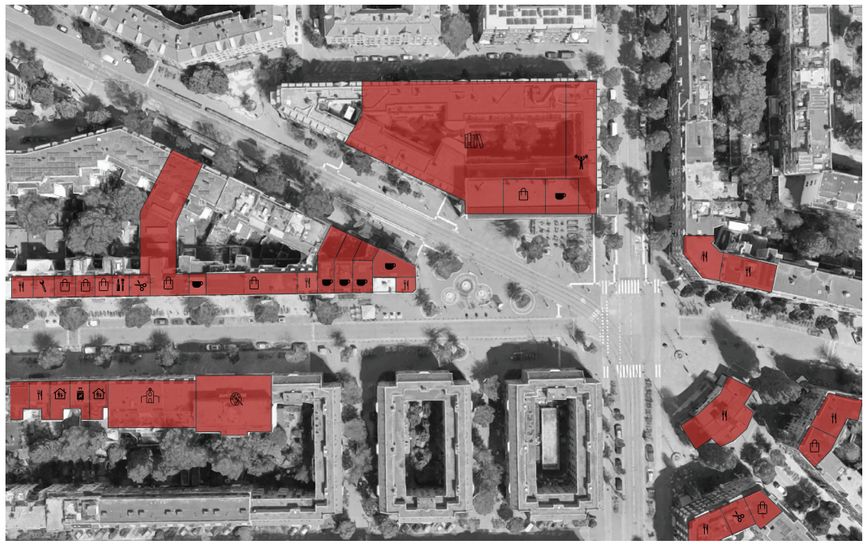
Information Design Location

The Javaplein, the main square in the district, is now defined by the mobility flows that are present (see the top right figure 113). The less bright yellow represent the trams and buses that ride there. The brighter yellow represent the mixed flow of pedestrians, bikers, and cars. Due to the presence on these mobility flows, the “square” does not feel like a square. In order to make a design, the boundaries need to be defined again.

In the images at the bottom on the right page, the functions on the ground floor that are not housing are marked.
Some social places were discovered (figure 110). The first one is the Eltheto-kerk: where free meals are given out by for example Buurtbuik. The second one is the library, where books can be borrowed and read at the reading table. Lastly, the Badhuis. This is a former bathing house for people who didn’t have a bathroom. This building has lost its social function for a couple years now but plans to turn this around are in place.

Figure 112 (above): Mobility flows (made by author; image, Google Maps, 2023)
Figure 113 (below): Function of ground floor around Javaplein (made by author; image, Google Maps, 2023)





In this chapter the spatial design for the Javaplein and the streets connected to it will be presented. This will involve spatial plans, sections, eye-view perspectives, and materials.

Firstly, the design for the various streets, each tackling an other R-strategy, will be explained and visualized.
Thereafter, the spatial design for the Javaplein, and how the streets will meet in the square, will be explained and visualized.

Lastly, the urban metabolic system and the tube system supporting this are explained.

07.1 Introduction
07.2 'Refuse'-street
07.3 'Re-use & Repair'-street
07.4 'Refurbish, Remanufacture & Repurpose'-street
07.5 'Rethink'-square
07.6 Collective
07.7 Private
07.8 Overview
07.9 Urban Metabolic System
07.10 Tube System

07. Spatial Design

Introduction

In this chapter the spatial design for the Javaplein and the adjacent streets will be explained. At the Javaplein five different streets, with three different R-strategies, come together. A design is made for the three types of streets and the square.

First, an explanation is given about which R-strategies come together in this area and the functions on the ground floor that connect to this. After that, the four different parts of the design will be explained in more detail. This will involve some conceptual atmospheric images. Next to this, the interventions in the collective and private sphere are explained.
Following this, the overall design is presented. Lastly, the urban metabolic system is explained in more detail.

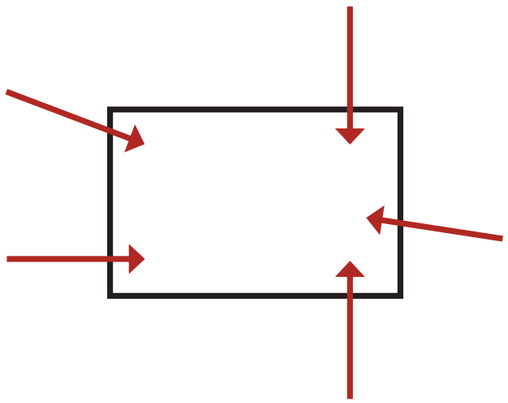


Figure 114: Conceptual image design task (made by author)

In figure 112 on the top right, the multiple R-strategies that come together in this area are visualized. The square itself has the function of 'rethinking'. This means that functions are placed there that focus on sharing goods. This ranges from tools and recreational items to co-working places (see figure 113).
One of the 'refuse'-axes flows through the Javaplein. This axis is focused on providing active recreational options and creating a pleasant route to the Flevopark. The intersection of the 'rethink'-square and the 'refuse'-axis provides a place to borrow recreational items (such as tennis rackets) and a place to borrow gardening tools (and do gardening-workshops).
The 'reuse & repair'-street is also connected to the square. The locations where tools can be borrowed is connected to the location where tools can be repaired to optimize the collaboration.
Lastly, the 'refurbish, remanufacture & repurpose'-street is connected to the square.

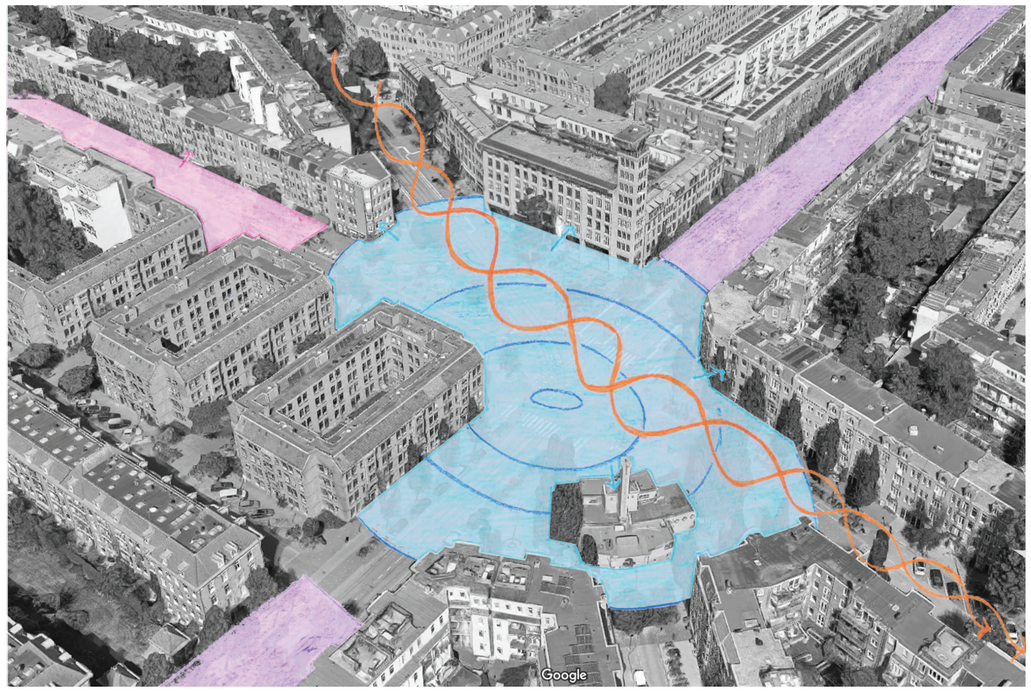


Figure 115: R-principles for design location (made by author)

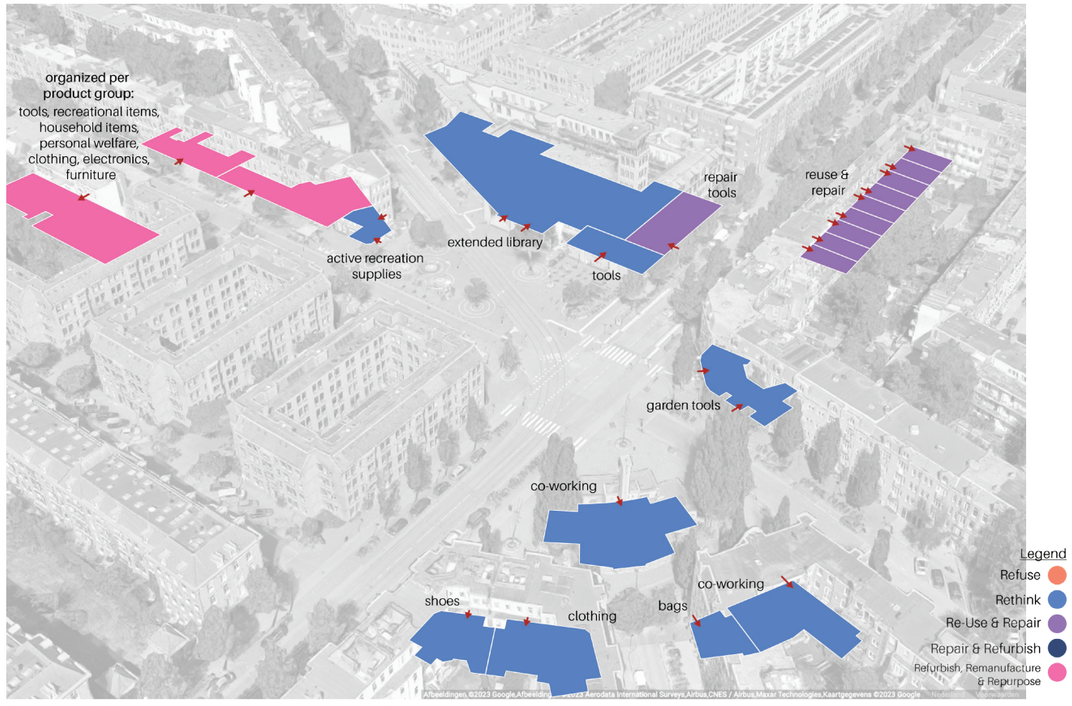


Figure 116: Ground floor functions. related to R-principles (made by author)

Javastraat, ‘Refuse’-street

Figure 117: Javastraat, ‘refuse’-street (made by author)

Javaplein, ‘Rethink’-square



Figure 118: Javaplein, ‘rethink’-square (made by author)



Figure 119: Javaplein, ‘rethink’-square (made by author)

Molukkenstraat,
‘Re-use & Repair’-street



Figure 120: Javastraat, ‘reuse & repair’ street (made by author)

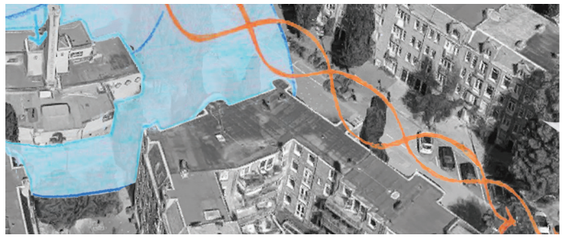
Javastraat,
‘Refurbish, Remanufacture & Repurpose’-street



Figure 121: Javastraat, ‘refurbish, remanufacture & repurpose’ street (made by author)

Refuse

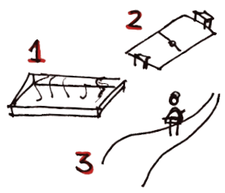
In the diagrams below, the most important design interventions for the ‘refuse’-street are explained. The aim of this street is to limit the consumption of goods by creating active recreation options.





Bring greenery to people

It is often difficult to stimulate people to go outside (Schouten, 2016). Therefore, this street design brings greenery to people. This is done by creating more green structures.



Options for active recreation

People need a goal in life, something to stay busy with. Often this results in consumption. Examples of activities are shopping for clothes, or watching television (Csikszentmihalyi, 2000). To decrease the amount of consumption, active recreation is offered in the public space. Multiple options are created to offer something for everyone.



Uninterrupted walking paths

It has been proven that one enjoys walking more when one has access to walking paths that are not interrupted (De Ingenieur, 2020). Therefore walking paths flow through the whole district.



Room for slow traffic flows

In this street more room is created for slow traffic to make it a pleasant environment for everyone that is using the public space. Next to this, walking and biking is stimulated in this way, which are both types of active recreation.

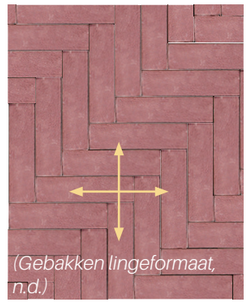
Figure 122 (above): Location of ‘refuse’-street (made by author)
Figure 123-126 (concepts): Conceptual drawings (made by author)
Figure 127-136: Materials public space (multiple sources)

Pavement

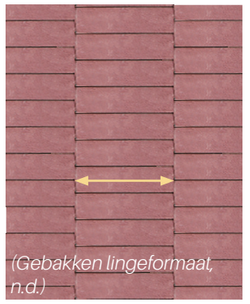
In the whole design, the current bricks (left) are reused in order to correspond with the circularity goal. Only the patterns of the bricks differ.

Left, walking path: two directions of bricks, to stimulate walking forward & also look around.
Middle, walking path: green is growing besides the tiles, to add to the green character of the street

Right, bike path: emphasis is on looking to the sides (where the greenery is)


(Gebakken lingeformaat, n.d.)


(Karen, 2022)


(Gebakken lingeformaat, n.d.)

Greenery

Left & Middle: Wild greenery with flowers


(Garden Landscape Design, 2023)

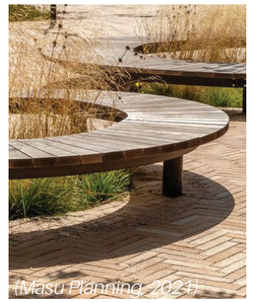

(Landscape Design, 2023)

Furniture

Left & Middle: Planters and benches from wood. This was chosen because of the peaceful atmosphere in this street.

Wood is used **in the whole design** because it has one of the lowest environmental impacts.


(Veggie Garden, 2023)


(Masu Planning, 2023)

Others

Left: lightning next to the walking path, to highlight the way towards the park and stimulate walking

Middle: example of recreation types, jeu de boule


(Spread | Olev, 2021)


(Dazuma, n.d.)

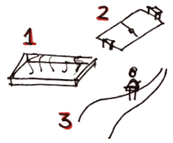

(Grace Design, n.d.)

Refuse

On the next two pages, the design is visualized in more detail. Next to this, the water drainage and lightning is indicated.
The main aim of this street is to bring greenery to the residents to stimulate active outside recreation.
Three green stretches are created in this street.
On the one in the middle the (cargo) bike parking is located and the main walking path. Small light poles are placed at both sides of the main path to underline the importance.

The two stretches on the sides can be used for gardening or picnicking. In addition to the main walking path, smaller paths are created to cross the street. Between the green stretches a wide biking path is created. In case of an emergency an ambulance can drive there as well.







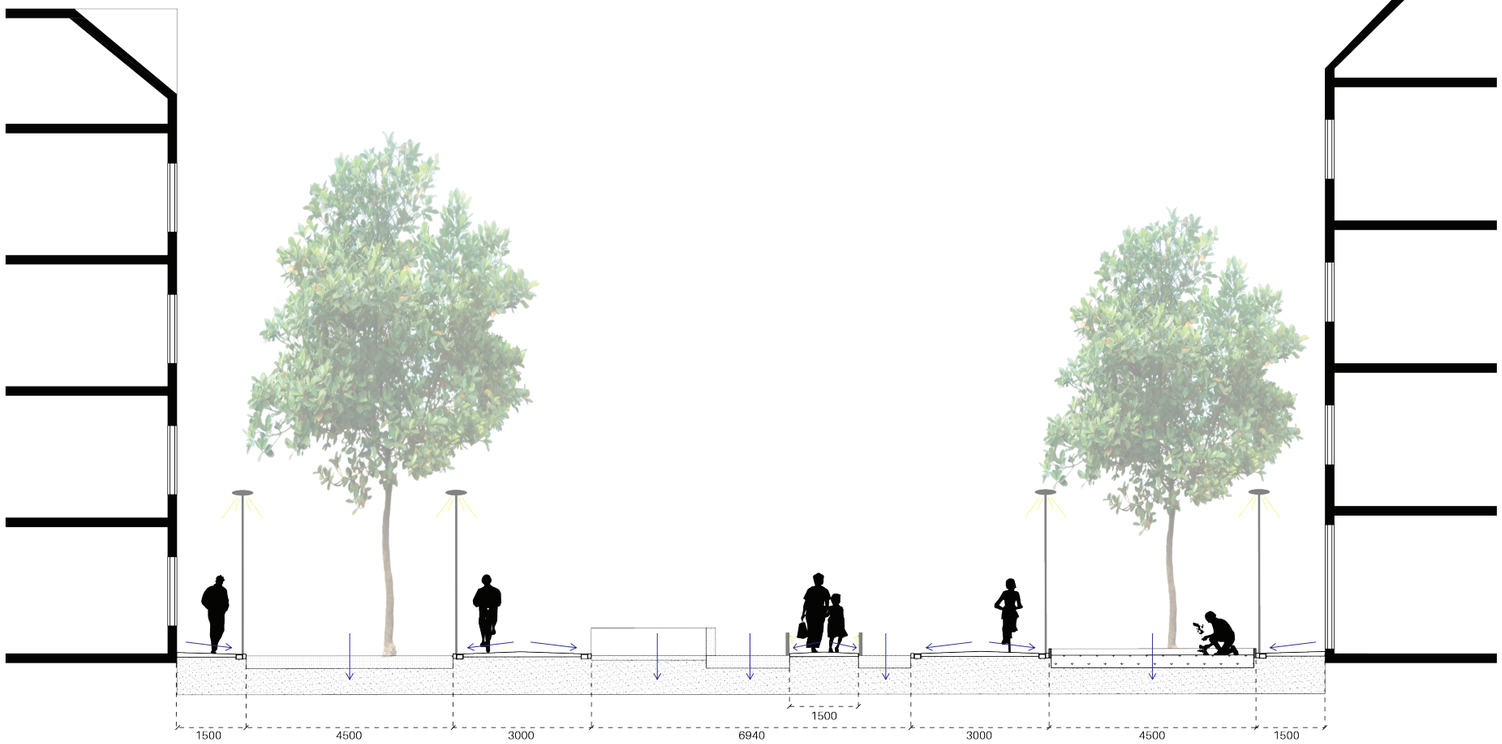


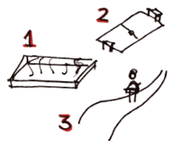
Figure 123-126: Conceptual drawings (made by author)
Figure 137: Section ‘refuse’-street (made by author)

scale 1:133
(75% of 1:100)

Refuse

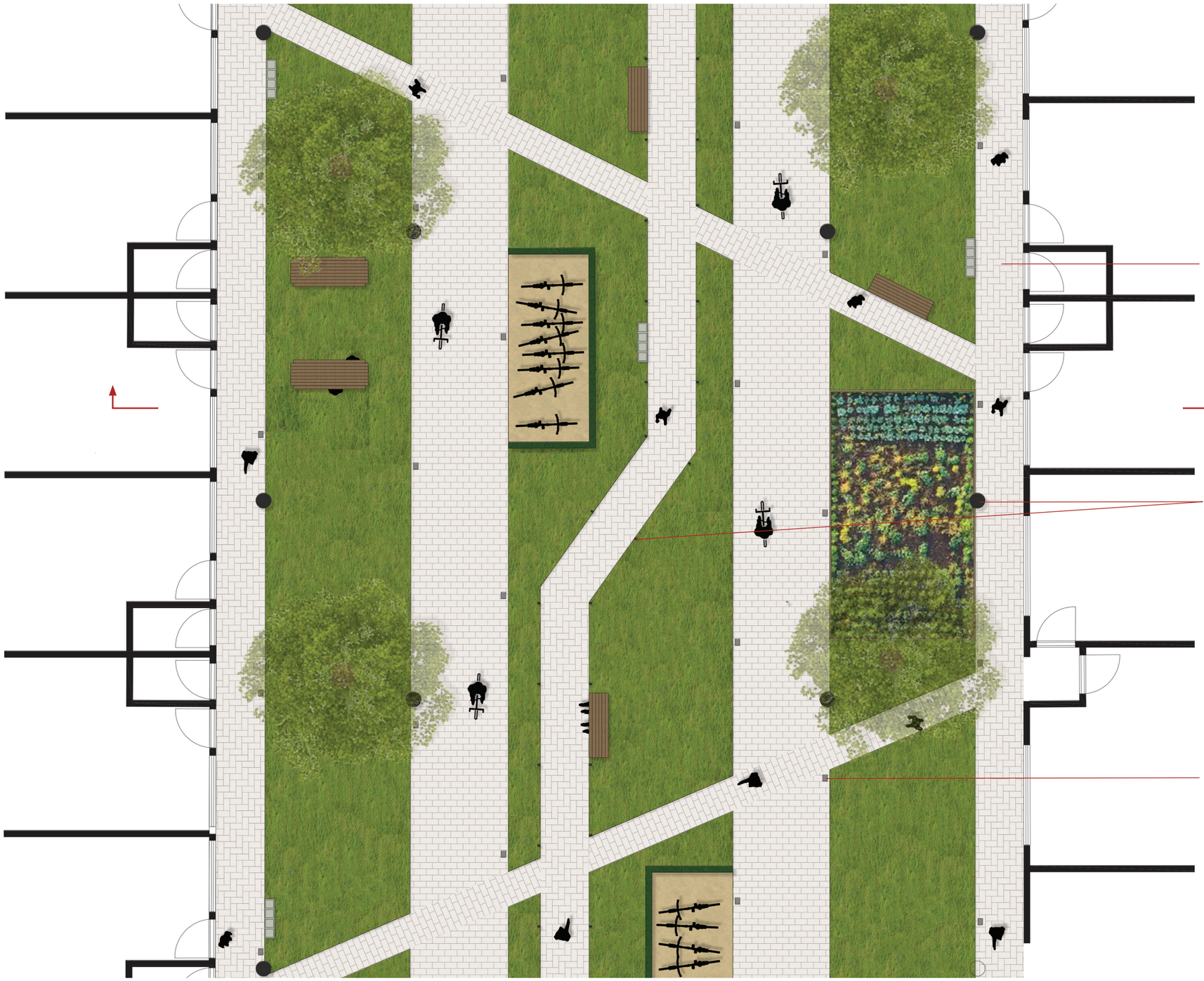
Figure 123-126: Conceptual drawings (made by author)
Figure 137: Plan ‘refuse’-street (made by author)
Figure 138-140: Materials public space (multiple sources)











waste bin

lighting (ltr)



(Dazuma, n.d.)



(Spread | Olev, 2021)

water drainage (ltr)



(Wijnen, n.d.)

scale 1:133
(75% of 1:100)

Figure 141: Perspective 'refuse'-street, day (made by author)

Refuse (day-time)



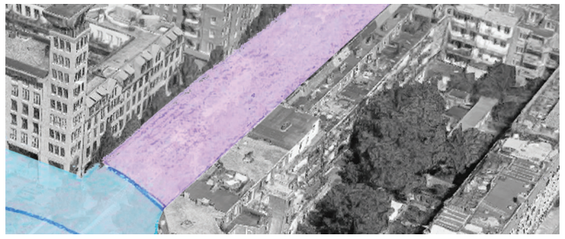
Figure 142: Perspective 'refuse'-street, night (made by author)

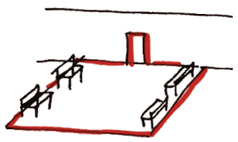
Refuse (night-time)



Re-use & Repair

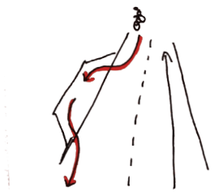
In the diagrams below, the most important design interventions for the ‘re-use & repair’-street are explained. The aim of this street is to make re-using and repairing products more easy.





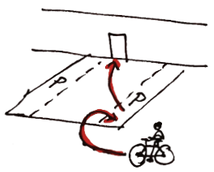
Create places to stay near entrances

People are stimulated by seeing the actions of others (Knickmeyer, 2020 & Celestino, 2022). Therefore, places where people can sit are created in front of the entrances to the reuse & repair locations. If someone else brings in a broken product, the person sitting on the bench might be stimulated to also do that.



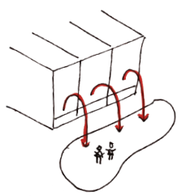
Create side road

The Molukkenstraat is quite a busy road. Therefore an side road and area where one can calmly park their (cargo) bike is created. This stimulates the ease with which someone can park and go to the reuse/ repair location.



Parking near entrances

Parking is created near the entrances of the re__ location. Therefore one does not have to carry their goods far, and is the threshold to execute a R-strategy lower.



Give back public space to people

Currently many streets are focused on parking cars or providing space for shopping people. The public space can not be used by the residents who live in the street itself. This spatial intervention will return the use of the public space to the residents.

Figure 143 (above): Location of ‘re-use & repair’-street (made by author)
Figure 144-147 (concepts): Conceptual drawings (made by author)
Figure 148-154 (right): Materials public space (multiple sources)

Pavement

Left: paths,
straight to underline the functionality

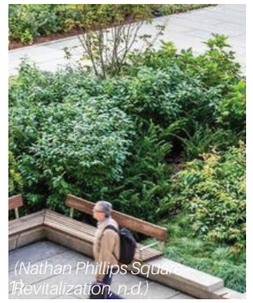
Middle: paving square,
pattern flows both ways, to guide towards the reuse/repair shop and at the same time stimulate to sit on the benches on the side


(Gebakken lingeformaat, n.d.)


(Gebakken lingeformaat, n.d.)

Greenery

Left & Middle: High plants in and besides the barriers, to form a barrier from the road

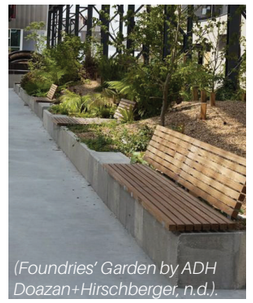

(Nathan Phillips Square Revitalization, n.d.)

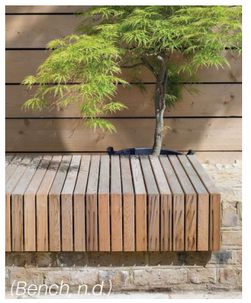


Furniture

Left & Middle: Benches made of brick and wood, the bricks will be reused from the current streets & the wood will be reused from somewhere else. It was decided to add wood to make it a more pleasant sitting area. Therefore, also a back rest is added.

Right” The barriers are also made of bricks.


(Foundries’ Garden by ADH Doazan+Hirschberger, n.d.).


(Bench, n.d.)


(Brick vegetable garden, n.d

Re-use & Repair

On the next two pages, the design is visualized in more detail. Next to this, the water drainage and lightning is indicated.
In this street the focus is on bringing products to the reuse & repair locations. A side road is created where one can calmly park their bike. Squares are created in front of the entrances to let people be inspired by the actions of others.

The road moves from side to side because the commercial functions are either on one side of the road or the other. Never at two sides at the same time.
The green stretches in this street can be used by residents however they like, such as having a coffee or a picknick. A barrier from the road is created to make it more pleasant for people to stay on the green stretches.

This street is and will be an important axis in the connectivity of the district. However, the cars will be mostly replaced by bicycles.

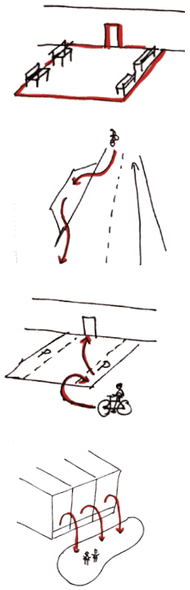


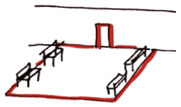


Figure 144-147: Conceptual drawings (made by author)
Figure 155: Section ‘reuse & repair’-street (made by author)

scale 1:133
(75% of 1:100)

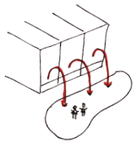
Re-use & Repair

Figure 144-147: Conceptual drawings (made by author)
Figure 156: Plan ‘reuse & repair’-street (made by author)
Figure 157-161: Materials public space (multiple sources)









waste bin

water drainage (ltr)



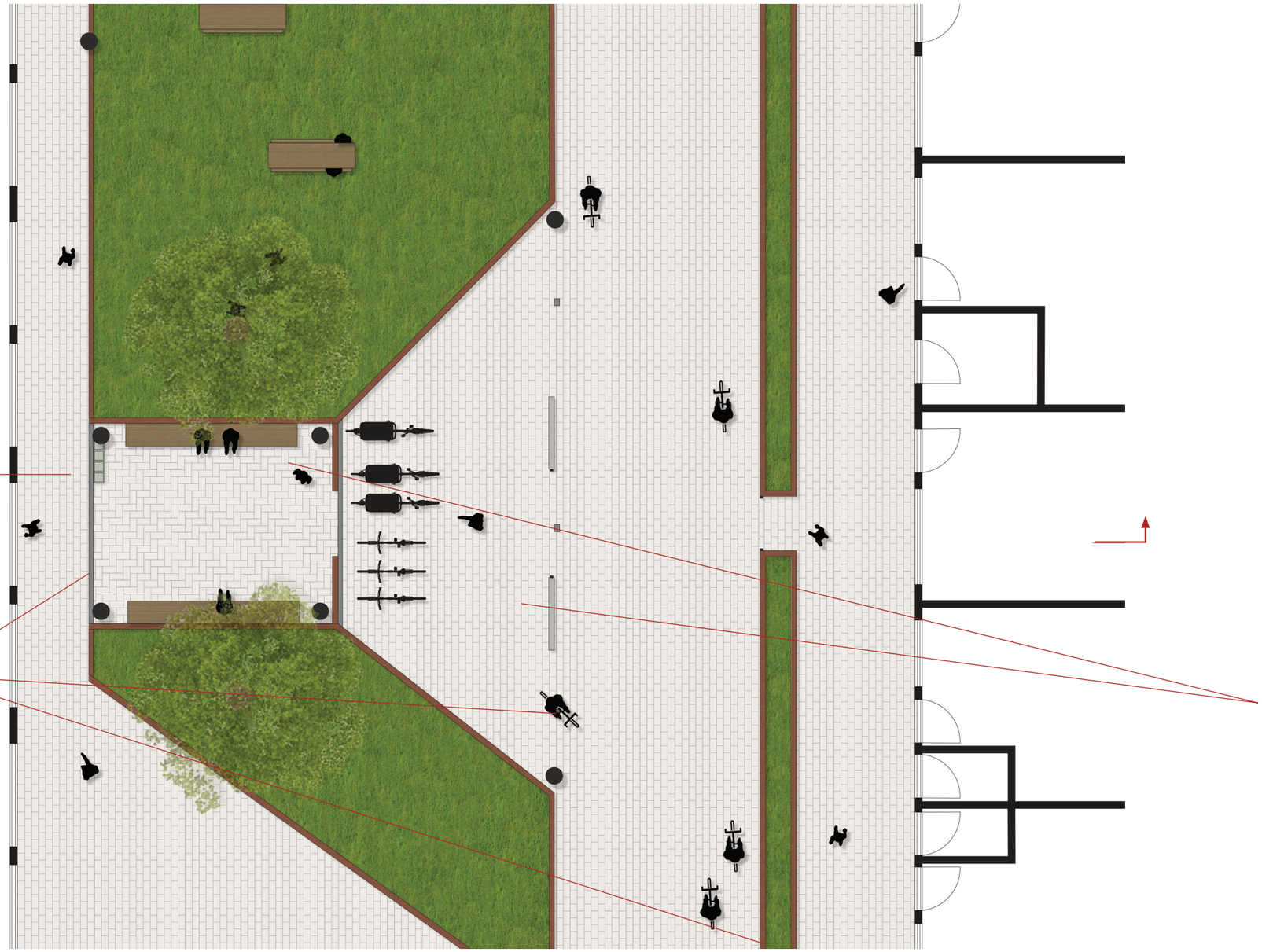
(Ultra Drain, n.d)



(Wijnen, n.d.)



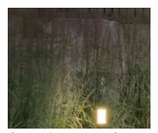
(Wijnen, n.d.)



lighting (ttb)



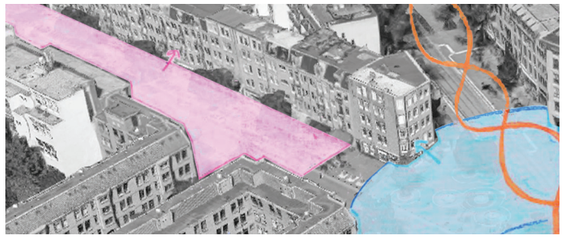
(Dazuma, n.d.)



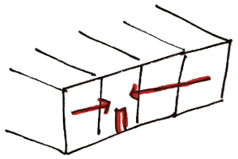
(Nenchoo, 2023)

scale 1:133
(75% of 1:100)

Refurbish, Remanufacture, Repurpose

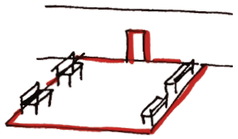


In the diagrams below, the most important design interventions for the 'refurbish, remanufacture & repurpose'-street are explained. The aim of this street is to encourage bringing products to this street instead of throwing them away.



Combine buildings for clarity

As stated in the spatial framework, three R-strategies are combined (refurbish, remanufacture and repurpose) to clarify it for residents. These functions will therefore be located in one building. Each location has a specific specialization. One is specialized in lamps and another one in computers.



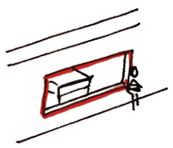
Create places to stay near entrances

People are stimulated by seeing the actions of others (Knickmeyer, 2020 & Celestino, 2022). Therefore, places where people can sit are created in front of the entrances to the refurbish, re-manufacture and re-purpose locations. If someone else brings in a broken product, the person sitting on the bench might be stimulated to also do that.



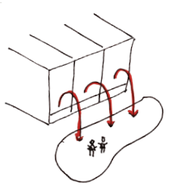
Conveyor above public space

A conveyor belt is created above the public space. On this belt, components can be exchanged between the different locations. Next to this, the presence of this belt in the public space show the make-ability of products and increase the awareness of people.



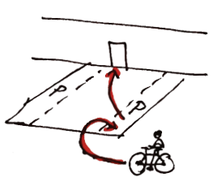
Display how items are re___

The display windows will have a new function in this street. Instead of encouraging buying new products, it will show the re-production process that is needed to transform the items. This will show the make-ability of products and increase the awareness of people.



Give back public space to people

Currently many streets are focused on parking cars or providing space for shopping people. The public space can not be used by the residents who live in the street itself. This spatial intervention will return the use of the public space to the residents.



Parking near entrances

Parking is created near the entrances of the re__ location. Therefore one does not have to carry their goods far, and is the threshold to execute a R-strategy lower.

Figure 162 (above): Location of 'refurbish, remanufacture & repurpose'- street (made by author)
Figure 163-168 (concepts): Conceptual drawings (made by author)
Figure 169-177 (right): Materials public space (multiple sources)

Pavement

Right: paths & roads, industrial character

Middle: basketweave patterned pavement on squares and underneath picknick tables

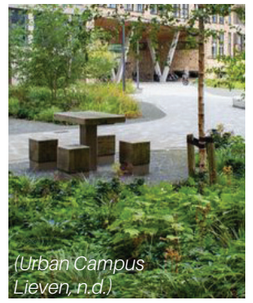

(Gebakken lingeformaat, n.d.)


(Gebakken lingeformaat, n.d.)

Greenery

Left: planting in green areas

Middle: grass in green areas


(Urban Campus Lieven, n.d.)

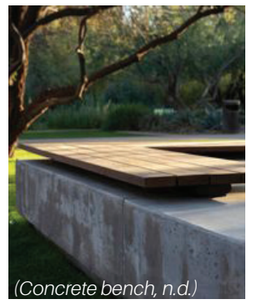

(Landschapstuin Sint-Jans-Molenbeek | Buro Buiten, n.d)

Furniture

Left: bench with a combination between brick (the concrete will not be there) and wood

Middle: brick planters

Right: both these furniture pieces have cladding to give it a more industrial feeling

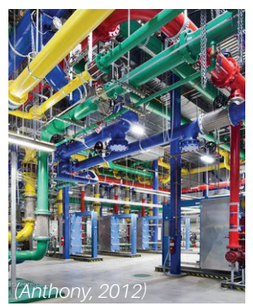

(Concrete bench, n.d.)


(Modern House, n.d.)


(Ramen, n.d.)

Others

Left & middle: System above ground with red, transparent tubes to transport components


(Anthony, 2012)



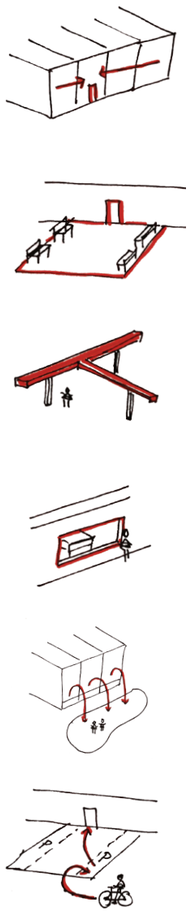
(Morby, 2018)

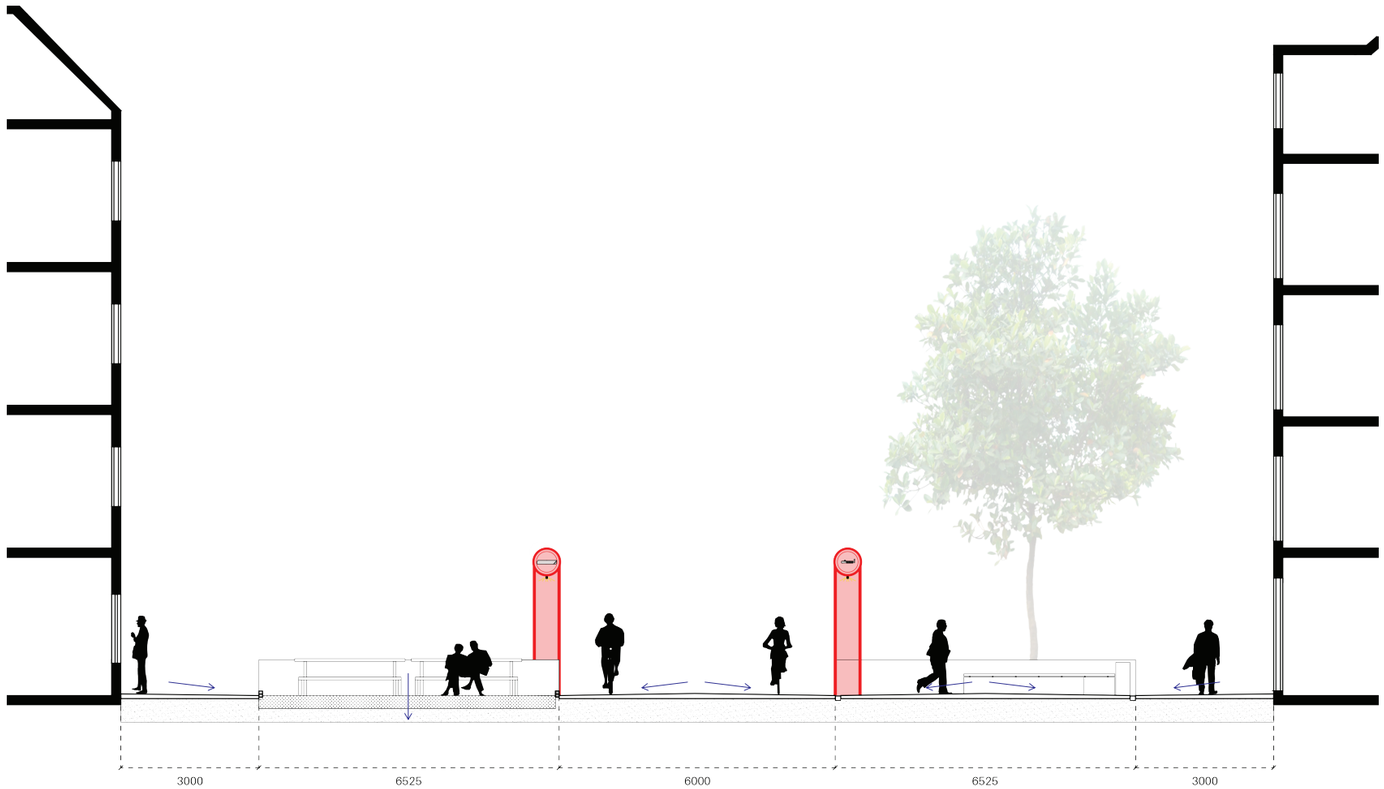
Refurbish, Remanufacture, Repurpose

On the next two pages, the design is visualized in more detail. Next to this, the water drainage and lightning is indicated.
The main function of this street is to bring products to the ‘refurbish, remanufacture, repurpose’-locations. Places to sit are created in front of the entrances to inspire people through the actions of others.

Multiple current buildings are combined into one to make it clearer for residents where they can go with their products. These locations each have a different expertise, for example one for electronics and another one for furniture.
Parking is near the entrances to make it as easy as possible to people to bring their disposed products.
The tube above the ground stands out. This is done to exchange items from one location to another. It is placed above ground to increase the awareness of residents.

The shop windows have a different function.
Instead of promoting consumption, they show the production process. A zig-zag-pattern is apparent in the street to underline the connectivity of the various locations.
On the grass areas, in between the squares, tables and benches are placed. Residents can use those or bring their own picknick blanket.





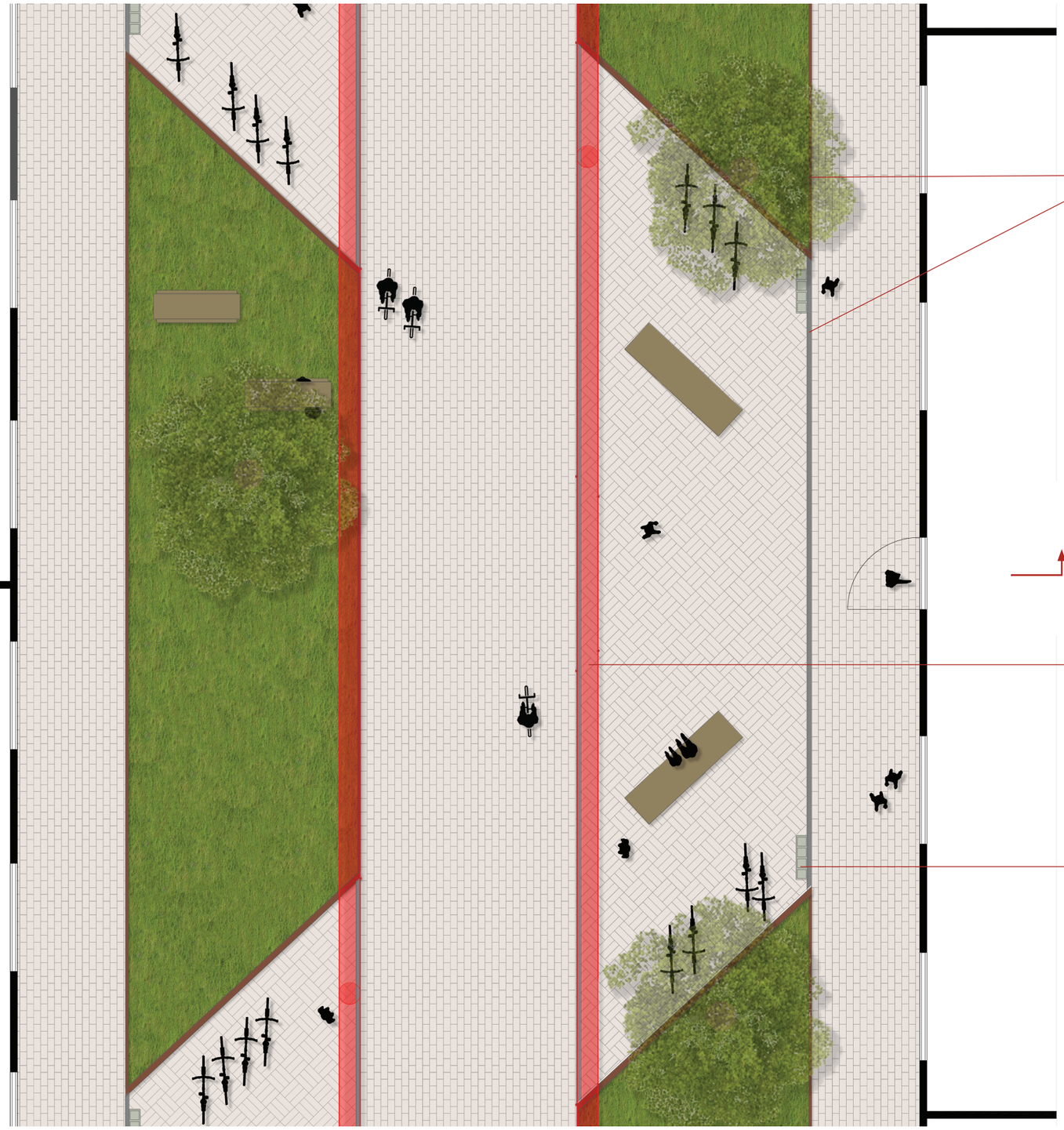
scale 1:133
(75% of 1:100)

Figure 163-168: Conceptual drawings (made by author)
Figure 178: Section ‘refurbish, remanufacture & repurpose’-street (made by author)

Refurbish, Remanufacture, Repurpose

Figure 163-168: Conceptual drawings (made by author)
Figure 179: Plan ‘refurbish, remanufacture & repurpose’-street (made by author)
Figure 180-182: Materials public space (multiple sources)





water drainage (ltr)



(Wijnen, n.d.)



(Ultra Drain, n.d)

lighting (underneath tube)



(Plastic stratosfera, n.d.)

waste bin

scale 1:133
(75% of 1:100)

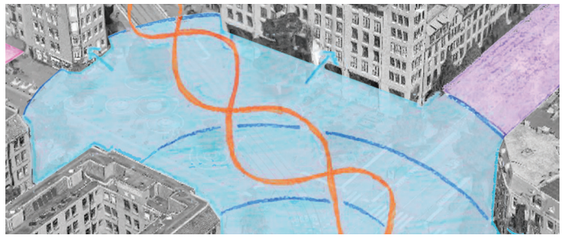
Figure 183: Perspective image of 'refurbish, remanufacture & repurpose'-street (made by author)

07.4 Spatial Design | 'Refurbish, Remanufacture, Repurpose'-street - Perspective

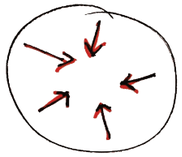
Refurbish, Remanufacture, Repurpose



Rethink & Convergence of the R-streets



In the diagrams below, the most important design interventions for the 'rethink'-square are explained. The main aim is to rethink the ownership of products by sharing. Next to this, multiple R-streets come together here.



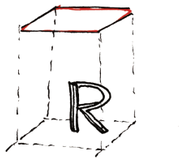
Collectiveness

In the spatial framework, the Javaplein is appointed as a 'rethink'-location. This means that collectiveness is important on the square. The functions around the square and the furniture on the square are designed with this principle in mind.



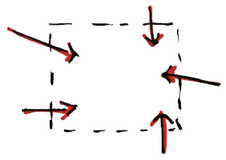
Create awareness

The Javaplein is visited by a lot of people. Therefore it is an ideal place to use to increase the awareness, of the importance of the transition towards a circular system, of residents. This is done by the tubes above the public space and the see-throughs in the pavement.



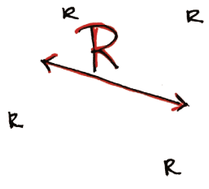
implicit centrality of R-strategy

One of the concepts of the spatial framework, and thus the overall design, is to 'place R central in the district'. This concept is translated quite literally here, by creating a waste handling center underneath the square. However, it is only visible implicit by the see-throughs in the pavement.



Confluence of different streets

Around the Javaplein multiple different street profiles are present (designed based on the R-strategies). On this square, a confluence is found.



highest R is most central

Two 'refuse'-streets surround the Javaplein. Refuse is the highest strategy and is focused on consuming less resources. Thus these are very important. In the design of the square, this axis is the most present.

Figure 184 (above): Location of 'rethink'-square (made by author)
Figure 185-189 (concepts): Conceptual drawings (made by author)
Figure 190-198 (right): Materials public space (multiple sources)

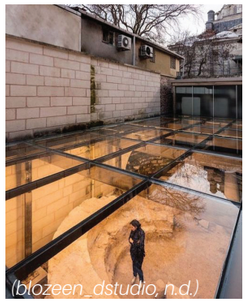
Pavement

Left: paving square,
to clear paving direction to not favor one direction over another one & to guide towards the R-principles around the square

Middle & left: round components with glass in the middle to see what is underneath


(Gebakken lingeformaat, n.d.)

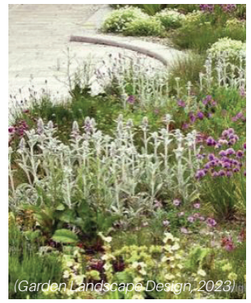


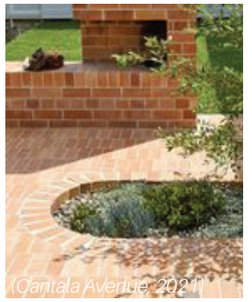

(blozeen_dstudio, n.d.)

Greenery

Left: wild plants with flowers (same as 'refuse'-axis)

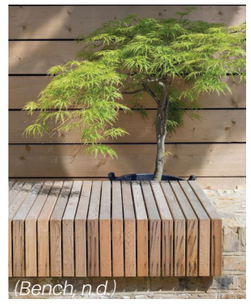
Middle: brick detail


(Garden Landscape Design, 2023)


(Cantala Avenue, 2021)

Furniture

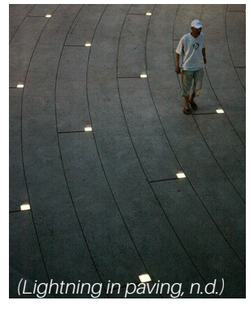
Left: brick and wood benches

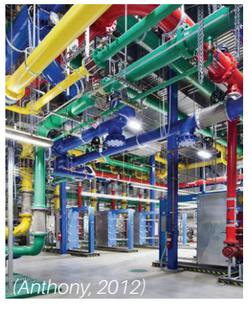

(Bench, n.d.)

Others

Left: lights in pavement that refer to the transportation tubes

Middle & right: System above ground with red, transparent tubes to transport components


(Lightning in paving, n.d.)


(Anthony, 2012)



(Moby, 2018)

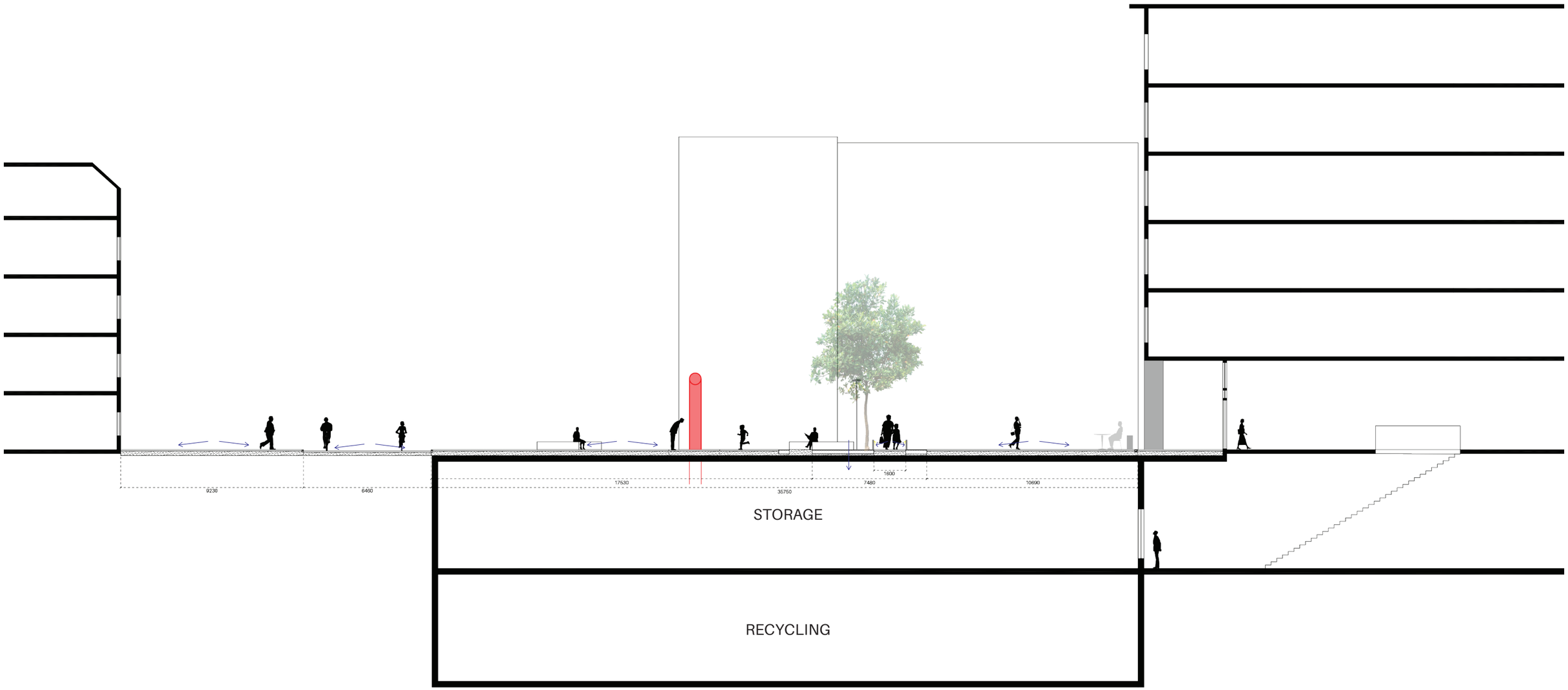
Figure 185-189: Conceptual drawings (made by author)
Figure 199: Section 'rethink'-square (made by author)

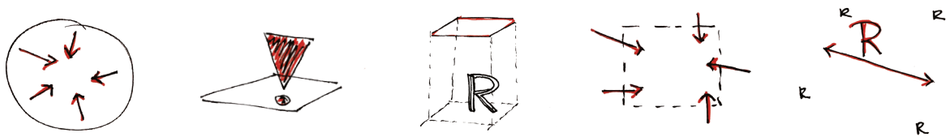
Rethink & Convergence of the R-streets

On the next two pages, the design is visualized in more detail. Next to this, the water drainage and lightning is indicated.
This is the main square of the district. It is located in between different street that are each dedicated to another R-strategy. Therefore, the square combines these streets with the highest R-strategy as priority. The green stretch is therefore clearly visible.

The square is dedicated to 'rethink'. This means that collectivity is important. Multiple sharing options are created on the ground floors of the buildings surrounding the square.
Underneath the square a storage facility is created where components can be stored. Tubes connect this facility to the various R-locations. The facility and the tube system optimize the exchange of components.

Also, a recycling location is located under the square. One can see through the windows, that are created on the square, down to the storage facility. This increases the awareness of people.

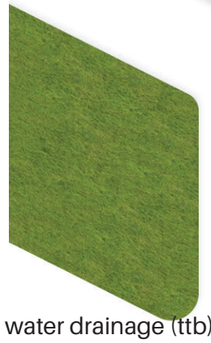




scale 1:200

Rethink & Convergence of the R-streets

Figure 185-189: Conceptual drawings (made by author)
Figure 200: Plan 'rethink'-square (made by author)
Figure 201-205: Materials public space (multiple sources)



water drainage (ttb)



(Ultra Drain, n.d)



(Wijnen, n.d.)

waste bin

lighting (light underneath tube; poles (same as refuse); & street lamps)



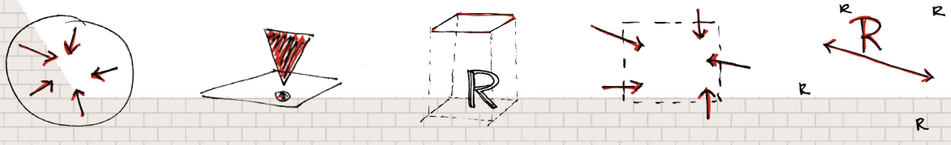
(Lightning in paving, n.d.)



(Spread | Olev, 2021)



(Dazuma, n.d.)



scale 1:200

Figure 206: Perspective image of 'rethink'-square (made by author)

Rethink & Convergence of the R-streets



Collective Sphere | Inside of Berlageblok

Two different scenarios are developed. One needs small adjustments from the current situation (left), and the other one needs bigger changes in the current situation (right).

Minimal scenario:

reduce, rethink, recycle

- collective gardens are created, where food can be grown (people use less packaging materials: reduce)
- multiple seating options are made
- a small shed is created where tools can be borrowed, to use in the garden or use inside the home (rethink). Also items that are not being used by a household can be placed here to be reused by someone else (reuse)
- compost for organic waste (recycle)

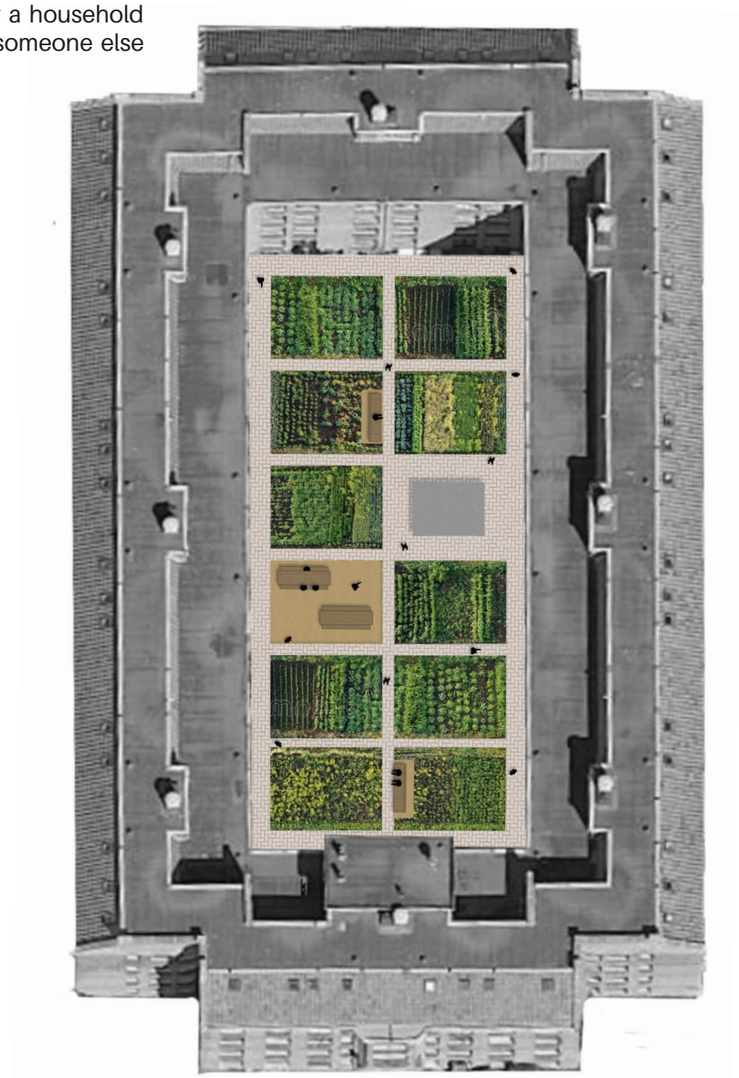


Figure 207: Minimalist scenario, collective buildings (made by author)

Maximalist scenario:

refuse, rethink, repair, refurbish, repurpose, recycle

- tubes for waste disposal from the homes, inside the courtyard, connecting to the underground system. Therefore a situation similar to Centre Pompidou is created. (recycle) (see figure 202 for illustration)
- a shed and tables are placed where people can repair and refurbish items themselves (repair & refurbish) The tools that are needed are provided in the shed (rethink). Also, workshops can be given (for kids) to repurpose items into something new (repurpose). Doing these (creative) R-activities, gives people a goal. Therefore less passive recreation items have to be bought (refuse)

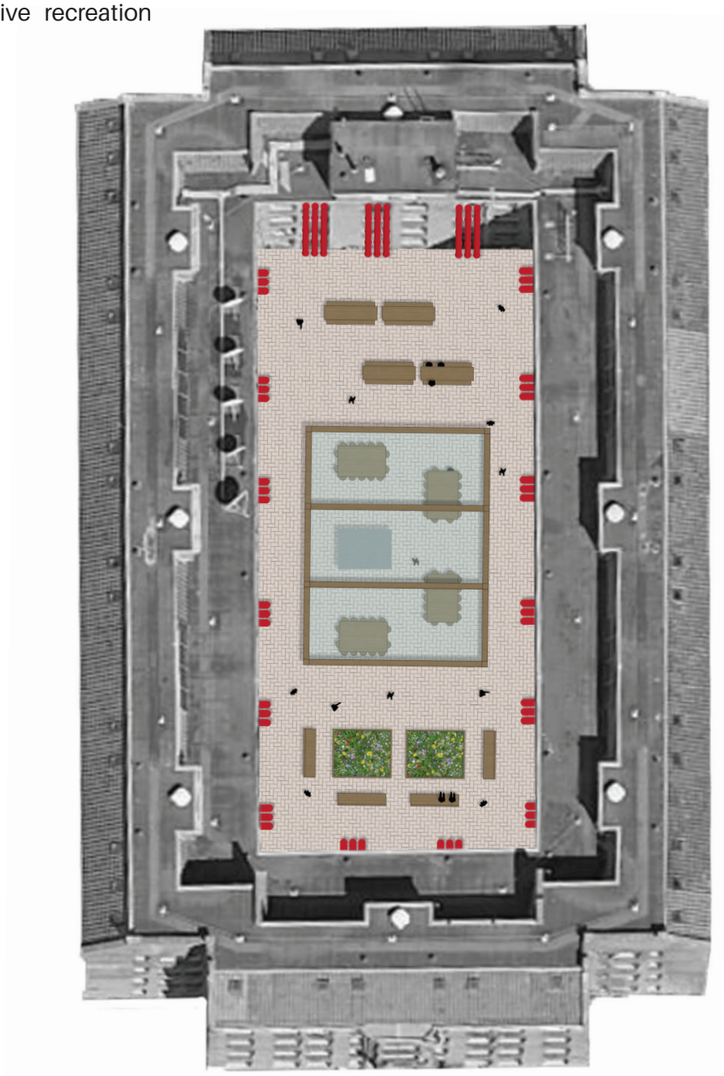


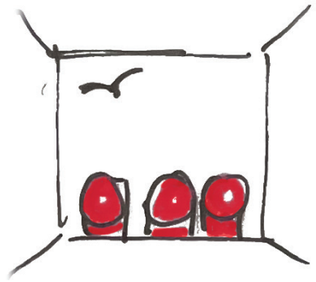
Figure 208: Maximalist scenario, collective buildings (made by author)

Interventions in the Private Sphere

Throw-away waste from window *(figure 202)*

recycle

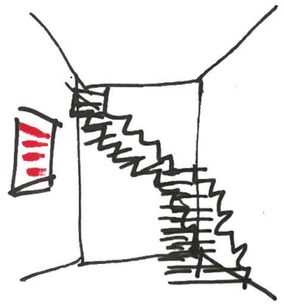
This lowers the threshold for people to separate their waste. They can throw it into one of the three tubes. Plastic because it takes up a lot of space to collect it (& people have small houses). Glass because it is heavy to bring somewhere. And organic waste because it can produce a smell. These tubes need to be cleaned on a regular basis. Next to this, a smart system is integrated in these tubes to check if people only throw materials into these tubes that do not fit in a higher R-strategy.
Paper need to be brought down because this is often very big. And, residual waste also needs to be brought down to not facilitate throwing valuable materials in the residual waste tube.



Advertisement in the hallway

rethink, reuse

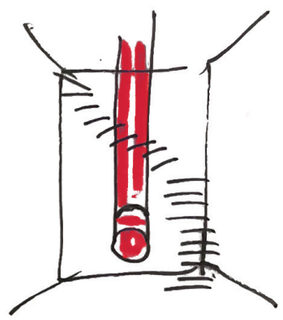
People can advertise, to other residents who live there, if they have food left or spare items they do not use anymore (for some money).



Shaft in stair case

recycle/recover

Where possible a shaft in the stair case can be made in order to make it easier to transport waste bags down. You can throw it in at your own floor, and can collect it downstairs.



Figures 209-211 (left): Conceptual images private sphere (made by author)
Figure 212 (right): Collage waste disposal tubes(made by author, based on images: Langkatstraat 16 [funda], n.d. & Cheng, 2019)



Figure 213: Three-dimensional image (made by author)

07.8 Spatial Design | Overview

Bird-Eye Perspective



Urban Metabolic System

In this scheme, the cooperation between the different R-strategies is visualized. Underneath the Javaplein a ‘rearrange’-location is created, where components of products and/or materials can be stored. These items can later be used by the same R-strategy or another one. By doing this, the system is more efficient and the value is retained as much as possible. The ‘repair’-locations and the ‘refurbish, remanufacture & repurpose’-locations are connected to this ‘rearrange’-location.

When choosing whether a tube is placed under- or above ground, a trade-off between creating the most efficient system and increasing the awareness of people. Most of the exchange flows between the different R-strategies (via the central square) are done underground. This is done to optimize the efficiency of the exchange. The transportation can flow as uninterrupted as possible and more space above ground is left for residents to use how they like.

In the’ refurbish, remanufacture & repurpose’-street however was chosen to place the tubes above ground. In this street, the awareness took the upper hand. This choice also underlines the ‘makeable’-character of the street.
The choice was made to not connect the rethink- and the reuse-locations to the tube system. Doing this, results in movement between these locations and the repair- and/or ‘refurbish, remanufacture & repurpose’-locations. This movement stimulates the social norm. Social norm is the fact that people get inspired by the actions of others.

The houses at the top of the drawing represent the actions of the residents. In blue the reason for this action is noted. When two arrows go to and from the same icon, this means that one household/ resident is involved in the action. At some actions, two household are involved (for example at a reuse-location).

Lastly, multiple former shops are combined into one ‘refurbish, remanufacture & repurpose’-location to make it easier for residents to know where to go.

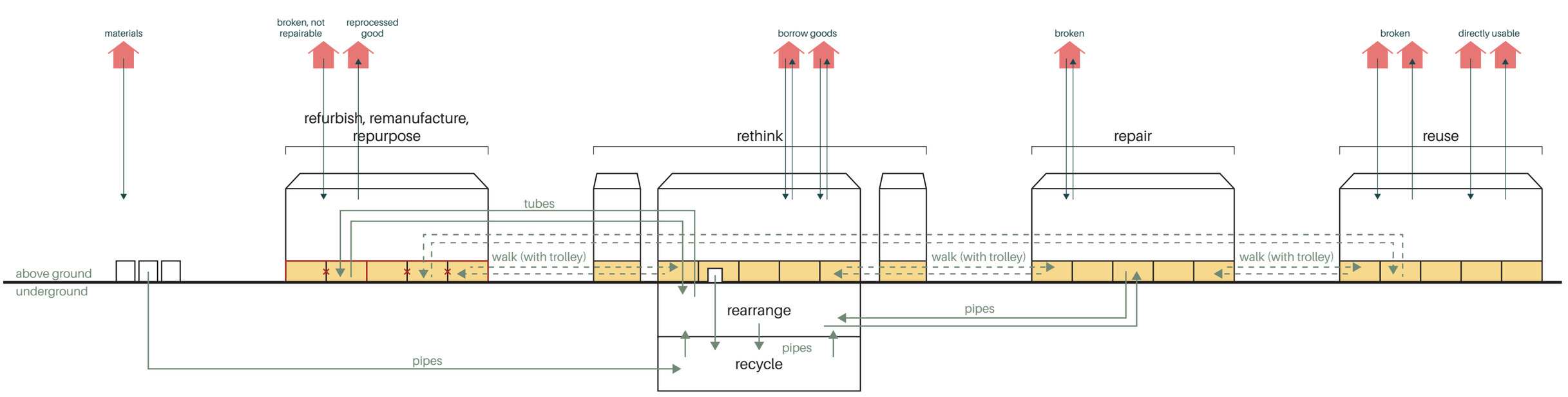


Figure 214: Urban Metabolic System Javaplein and surroundings (made by author)

System of Tubes

The tube system is illustrated in the figure below. Dashed lines represent underground tubes.

The tubes above the public space are illustrated on the right. Transporting from the 'refurbish, remanufacture, repurpose'-locations to the 'rearrange'-locations is done by typing in the product on the display on the tube and closing the door. The vacuum system sends it to the right storage location.

Pods that are send to the 'refurbish, remanufacture, repurpose'-location are stacked up in the tube and can be retrieved from here by scanning a badge. Two items can be retrieved at the same time. Assuming that no more than two pods are retrieved at the same time, no problems arise. The telephone number of the pod owner can be seen on the display, when a problem arises with retrieving the desired pod.

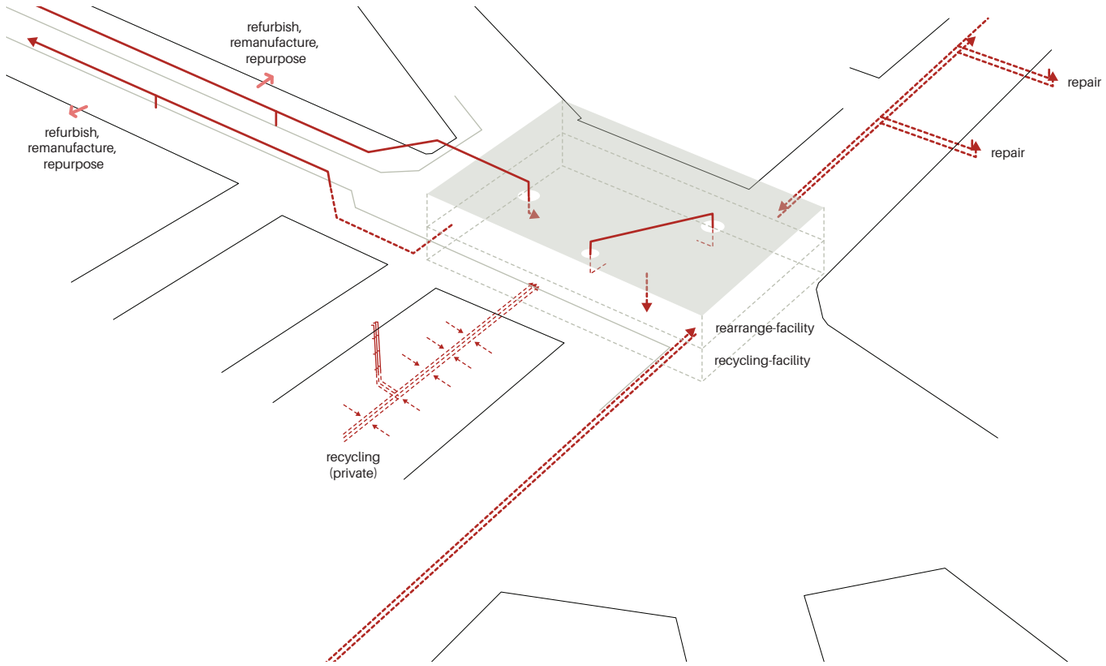


Figure 215 (left): Tube System, Javaplein and surroundings (made by author)
Figures 216-223 (right): Process of Refurbishing, Remanufacturing & Repurposing (made by author)

Process of Refurbishing, Remanufacturing & Repurpose

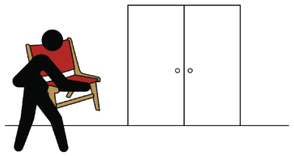
Figure X - X visualises the path a product takes when it is refurbished, remanufactured, or repurposed. The product is brought to one of the locations in the 'refurbish, remanufacture, repurpose' street, where it is dismantled and its components are placed in a pod. The pod is then sent to the storage underneath the square, where the components remain until they are needed for the manufacturing process of another product.

The process at the repair locations is similar. However, there are two differences. Firstly, the tube system is located underground. Secondly, only components are used to replace faulty parts, rather than replacing the entire product.

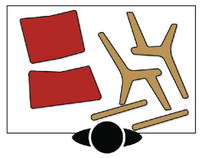
I. transport disposed product



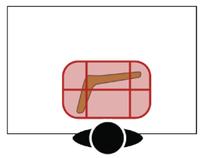
II. bring disposed product



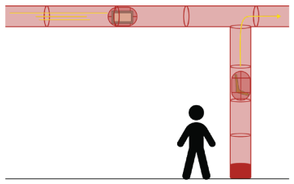
III. dismantle product



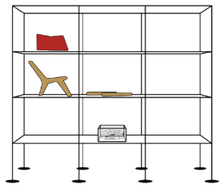
IV. place component in pod



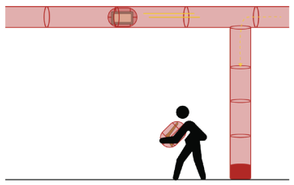
V. pod travels to storage



VI. component sits in storage till use



VII. pod travels to its use



VIII. component is used in new product



08.1 Introduction
08.2 Objectives
08.3 Framework
08.4 Relation to Design
08.5 Incorporate Current Initiatives
08.6 Needed Changes
08.7 Stakeholders

08. Governance Framework

This chapter presents the governance framework. This framework proposes changes in the governance regarding the transition towards a circular economy. Changes for the national- and the municipal governance are done.
The governance framework is placed in relation to the proposed design.
The next section explains how the current initiatives could be incorporated in the design, and what other changes need to happen.
Lastly, the change in stakeholders (by the proposed design and governance changes) is visualized.

Aim High!

The objective of this thesis is to increase awareness and to encourage people to do their part in the transition towards a circular domestic food and consumer goods system. To achieve this, in addition to implementing the spatial changes described before, changes in governance are required. A governance framework is established to show the changes needed and the connections between them. Changes need to be made in national and municipal policies, financial incentives, and (spatial) strategies.

The overarching goal is to 'aim high!'. It is okay to not achieve the best possible scenario, but we need to strive to do so. Linking this back to the R-strategies. The aim needs to be to engage people to consume less (refuse) instead of optimizing the handling of waste and producing energy out of it (recover). Quite some solutions in the national and municipal policy documents tackle low R-strategies, although it would be more effective for the transition towards a circular system to aim higher in the R-pyramid.

Related to governance, five objectives are established. Interventions, some with examples, are linked to these objectives. Some interventions connect to multiple objectives. Overall, the objectives and interventions resonate with sources found in (academic) literature and policy documents. Next to this, some ideas are based on analyzed case studies (see Appendix 12.2 for more information).

First, the objectives are explained. Followed by the image of the governance framework. And lastly, the interventions and examples are explained.

Objectives

Everyone is included in the transition
The transition towards a circular economy requires everyone to do their part. Therefore, it is important that everyone can participate. Whatever the boundary might be. They might speak another language, they might have a low income, or have another issue that toughen their ability to participate. It is important that people are addressed in the most suitable way for their situation. It is important that they all understand the importance of the issue and the way in which they can help to tackle it. Next to this, they should be financially able to participate.

Education as first step towards circularity
The transition towards a circular economy requires a lot of adjustments in the behavior of people. The behavior of people depends on three aspects: motivation, opportunity, and capacity/ability. As discussed before, it is important for the 'capacity' of people that they have the needed knowledge and skill set to execute the preferred behavior (Mitchie et al., 2011; Ölander & Thøgersen, 1995). Next to this, people quickly resort to an old habit. Therefore, it is important to guide them towards a new one (Ölander & Thøgersen, 1995).
Also Celestino (2022) and Knickmeyer (2020) state that both communication- and education campaigns are important to increase the separation of waste (Celestino, 2022; Knickmeyer, 2020). The author believes that this is applicable for more R-strategies than only recycling. In these campaigns it is important to consider that these need to be specific instead of overly broad; and understandable and communicated through the proper channels (Celestino, 2022; Knickmeyer, 2020).

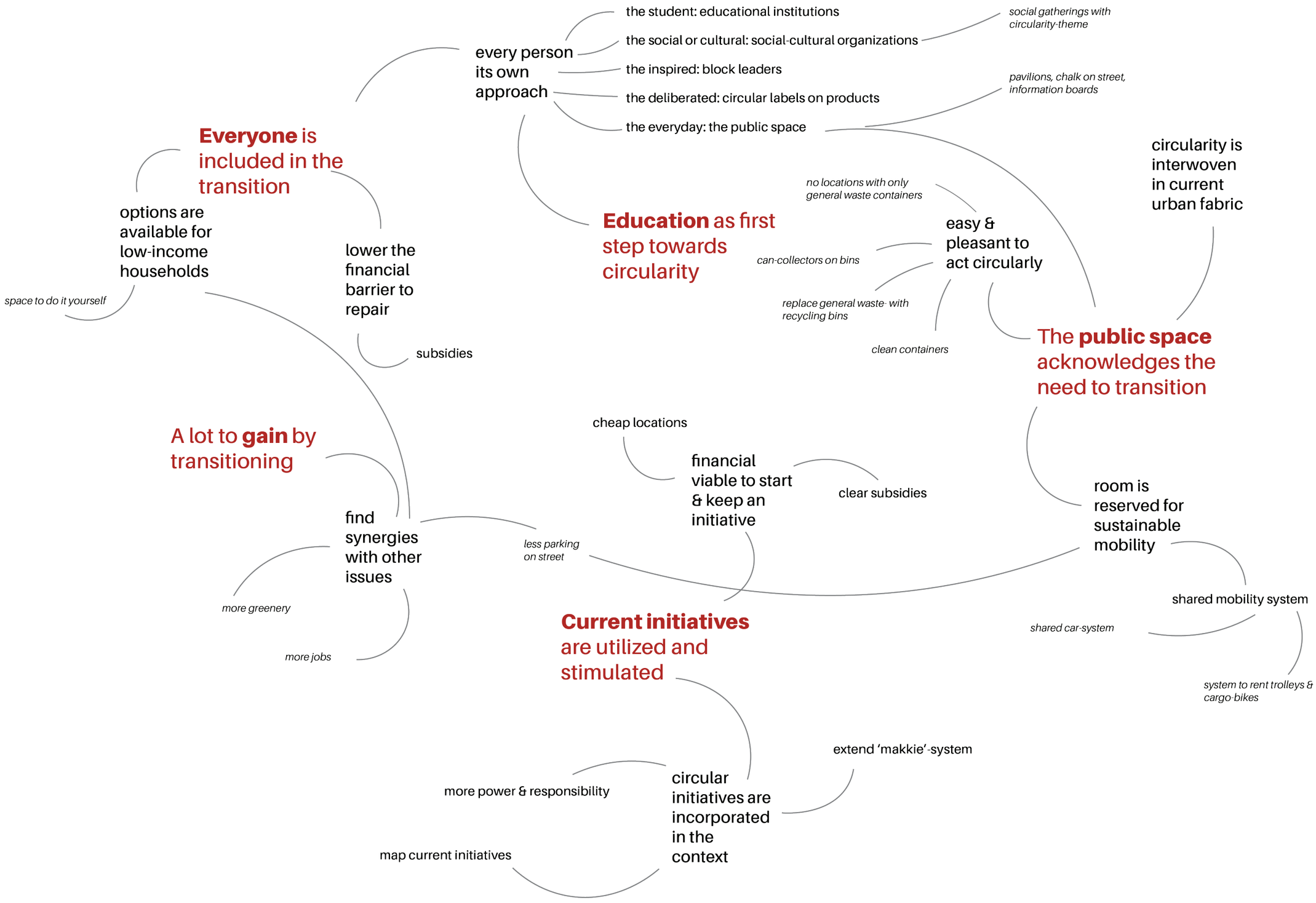
The public space acknowledges the need to transition
Currently, every type of infrastructure (in terms of circularity) is hidden from citizens. Examples of this are the electricity cables in the ground, but also the production of a sweatshirt. This invisibility results in people being out of touch with the effects of their actions. Leaving the light on does not have a direct effect, the effect is only (indirectly) apparent when the electricity bill arrives.
If circularity is visible and acknowledged in the public space, the author believes that residents will be more aware of the result of an action.

A lot to gain by transitioning
In society, and in this case in this district, circularity is not the only issue that needs to be tackled. The transition towards a circular economy and the (spatial) changes that it requires could be a good steppingstone to tackle other issues as well. (Spatial) changes will have more sense and more supporting base from local residents (Abujidi et al., 2021) if they tackle more issues than only one.

Current initiatives are utilized and stimulated
Initiatives from residents can be a good way to help the transition towards a circular economy. Initiatives can come in a wide variety of shapes and hues. The initiator interpreters the outside world in a certain way and defines the problem in their own way (van Dam et al., 2014). This broad range of solutions can support the wide variety of issues involved in the transition. Next to this, initiatives often lay close to the value of the initiators (and the people around them). This makes them extra motivated to act for their cause, and therefore in the circularity transition.
In conclusion, supporting and incorporating current initiatives is crucial due to the wide range of solutions available and the high level of motivation to act among residents.

Aim High!

Figure 224: Governance Framework (made by author)



Interventions

In the following section, an explanation is given for all the interventions and the examples that are proposed in the spatial framework on the previous pages.

Three different font types can be distinguished:

Main intervention
Intervention
Example (of the intervention)

Next to this, colored squares are added which refer to a type of intervention:

- policy
- financial
- strategic (general)
- strategic (spatial)

Options are available for low-income households

The transition to a circular economy should not leave anyone behind. It should be possible for anyone to make a sustainable choice. This calls for providing multiple options to execute the preferred behavior.

Example: Location where residents can execute a R-strategy themselves, to save money
An example of this is creating a space where people can repair and/or refurbish their product themselves, when they do not have a lot of space inside their home. This will cut costs for these people.

Lower the financial barrier to repair

Currently, it is often easier and cheaper for people to dispose a product than repair it. This encourages people to buy something new instead of executing circular behavior, and repairing it.

Implement subsidy on repairing
France introduced a subsidy-system to stimulate the repair of products. Each manufacture-company pays a kind of tax which flows into a fund. When a consumer repairs a product at a company, one gets (for example) a discount of 25 euros. This company can make a claim on the fund and get the money back (*De wegwerpmaatschappij*, n.d.).

Every person its own approach

In order to transition towards a circular economy, the behavior of everyone needs to change. However, everyone is different and a strategy that is adequate for one person might not be effective for someone else. Therefore, multiple approaches need to be in place to reach everyone.
An example is people who do not have Dutch as their mother tongue. They might not understand educational campaigns (made by the government and/or municipality). This results in the fact that they are left behind from this information and could result in unsustainable behavior. Providing information needs to be done in other ways, for example by making use of social-cultural institutions.

Educate through educational institutes
Children are the future; it is therefore important that they are learn it properly. Schools and other institutions for children (for example after-school care) can play an important role in educating children. In a positive scenario, the children's knowledge will be passed on to their parents.

Use social-cultural institutions to increase awareness
In the Indische Buurt, but also in general, a lot of people are members of a social-cultural institution. For example, a group focused on one nationality or a club for painting. When these institutions would educate people on the (importance of) the transition towards a circular economy, many people could be reached. Another argument for this strategy would be the different target group that is reached (Celestino, 2022).

Example: Social gatherings with circularity-theme
An example could be to organize an event that educates people about (the transition towards) a circular economy in a social setting. People might be more likely to come to such an event.

Appoint 'block leaders'
People are influenced by the actions of others/ neighbors. The municipality can appoint a couple of residents as 'block leaders', possibly stimulated with money or other benefits. Those people can then be the first to set the example and more people will follow (Knickmeyer, 2020; Celestino, 2022).

Put circularity label on products
France has drawn up a policy that mandates companies to put a label on their product that states the extent to which the product can be repaired. This results in more conscious behavior of consumers and a bigger likeliness of consumers choosing a product which can be well repaired (*De wegwerpmaatschappij*, n.d.).

Educate in the public space
People are in the public space every day. They might cycle to their work, walk to the grocery store, or go for a run. Therefore, the public space is the ideal place to educate people on the importance of the issue, and the things they can contribute to the transition.

Example: Pavilion/Chalk on streets/ Information boards
Educating people in the public space can take a wide variety of forms. Building an informational pavilion, making art works of chalk on the streets, or putting boards with information on it are just a couple of examples.

Easy and pleasant to act circularly

The organization of the public space should encourage executing circular behavior by making it easy and pleasant. This includes the arrangement of spatial components for disposing waste, including waste bins and waste containers.

Example: Place 'can-collector' on waste bins
In both Helsinki and Stockholm, a collection system for cans (with deposit money) is placed on the side of waste bins. This stimulates people to not throw their cans in the general waste bin and therefore they can be recycled. In addition to this, people who need the money can pick up the cans and earn some money. This creates a 'win-win' situation.

Example: Swap the general waste bins for recycling bins
A stimulation for the recycling of individual waste is providing bins that offer recycle-options in the public space. This increases the amount of separated waste. The city of Delft already has some of these type of bins in the city center.

Example: No more locations with only general waste containers
Currently at many places in the Indische Buurt, only general waste can be thrown away. These bins might be closer to the home of certain people. The threshold to separate their waste and recycle it in the correct bin is higher than throwing it all in the general waste container. This should be the other way around. Throwing away general waste should be more difficult than throwing away separated waste (such as paper or plastics).

Example: Keep containers clean
It is important that people do not suffer from executing sustainable behavior. It needs to be pleasant to execute it. One of the barriers that people feel when recycling their waste is the dirtiness of the waste containers (Borrello et al., 2020). This is therefore important to tackle. More (municipal) cleaning services need to be implemented to keep the containers clean.

Circularity is interwoven in current urban fabric

Currently the circular strategy and the environmental vision of Amsterdam do not mention a specific strategy for the current urban districts of the City of Amsterdam. They mention specific things for new districts and the harbor, but do not mention the current district. Next to this, they mention goals (such as implementing urban agriculture) but do not mention where in the city this should be created.
Although, the municipality cannot force the change of functions in commercial building. They could stimulate the change of a buildings' function by drawing up certain financial incentives and/or change the zoning plans. In the public space they own, they could implement certain interventions.

Find synergies with other issues

(Spatial) changes need to try to find solutions that help the transition towards a circular economy and in the meantime also tackle other issues. A solution for one problem could also solve another problem.

Example: Create (circular) jobs, ex. in refurbishment business
For the transition to a circular economy, a lot of new companies (for example refurbish- and remanufacture businesses) need to be established. This can create new jobs (for unemployment people).

Example: Create more greenery
One of the main aims of this thesis is to encourage residents to recreate actively instead of passively. An example of this, is taking a walk instead of watching something on the television. Less products will be consumed in this way. Greenery, that people can use for active recreation, is therefore implemented in the area. The implementation of greenery can have beneficial effects such as lower the urban heat island effect and the rain water infiltration.

Example: Repurpose parking places
Repurposing parking places in the district dissimulates people to use a car because less space is available to park it. Another advantage is created by phasing out car usage, more space is available in the public space for residents. In this emptied space, one can for example place a picknick table or a community garden. The car will not define the street-scape anymore.

Financial viable to start & keep an initiative

Circular initiatives (managed by residents) could be very valuable in the transition towards a circular system. Every step towards a circular system should be embraced. Next to this, they often tackle other parts of the transition than public systems could. However, these initiatives could run into (financial) problem to maintain them. If it is easier to start and maintain them, circular initiatives are further stimulated.

Provide free/cheap locations for circular initiatives
The threshold to start up a new circular initiative is lower when cheap and/or free locations are provided (MilieuCentraal, 2022). In this way, people are more likely to start up an initiative themselves.

Create subsidy for (new) circular initiatives
Currently it is quite unclear which subsidy can be applied for when one starts a circular initiative. The ones that tackle tangents are: 'Room for Sustainable Initiative - Sustainable Projects and Programmes'; 'Business Investment Zones (BIZ)'; 'Economic Structure and Reinforcement of the Labour Market'; and 'Innovation grant' (Gemeente Amsterdam, n.d.-f). None of the above is specifically for the transition towards a circular economy.
A subsidy that tackles specially the transition towards a circular economy could stimulate people to also start their own one.

Circular initiatives are incorporated in the context

Various circular initiatives are already present, however they are now not included in the overall strategy of Amsterdam. If this would be the case, the initiatives and Amsterdam as a whole can mutually benefit from each other.

Map (current) circular initiatives
Already quite a lot of circular initiatives are present in the municipality of Amsterdam. However, these stand on their own and often are not integrated in the overall circular policy of Amsterdam. A big potential could exploit when these would be integrated. Manpower, money, and tools to help the initiatives need to be provided by the municipality.
Floor Kuiper (department of 'Waste & Resources', Municipality of Amsterdam) stated that working together with initiatives is currently quite difficult, because the initiators often want to stay in control and are quite context specific (Floor Kuiper, personal communication, March 28, 2023). A solution for this might be to not impose things, but to think along and provide solutions.

Give circular initiatives more power and responsibility
Currently initiative do not have a lot of decision-making power because they are restricted by the rules of the municipality. If these are given more power and responsibility, they will be more prone to commit fully to the goal and engage other residents to do the same.

Extend the 'makkie'-system
In the Indische Buurt, one can earn a 'makkie' by (socially) engaging in the district (for example cooking at the 'Buurtbuik'). This provides people who walk in with a free meal and the volunteers get a voucher. These vouches can be redeemed for a discount on groceries, some people depend on this, or a free trip to the movies. This system can be extended to, for example, the 'informal' material collection system. The municipality could distribute these 'makkies' (per kilogram).

Room is reserved for sustainable mobility

A circular system also requires changes in mobility. Individual car ownership is a thing of the past. However, the transportation of products will be very important. Therefore, place need to be made for sustainable mobility.

Shared mobility system
Carbon-intensive mobility will be phased out. To offer people a possibility when they need a bigger vehicle than a bike, a shared mobility system will be created. Vehicles do not need to be owned to use them with a system like this in place. This limits the resources that need be used to produce them. Next to this, it is useful to have a shared mobility system in place since the circular economy requires items to be moved more regularly. For instance, to repair a coffee machine it needs to be brought to the repair location.

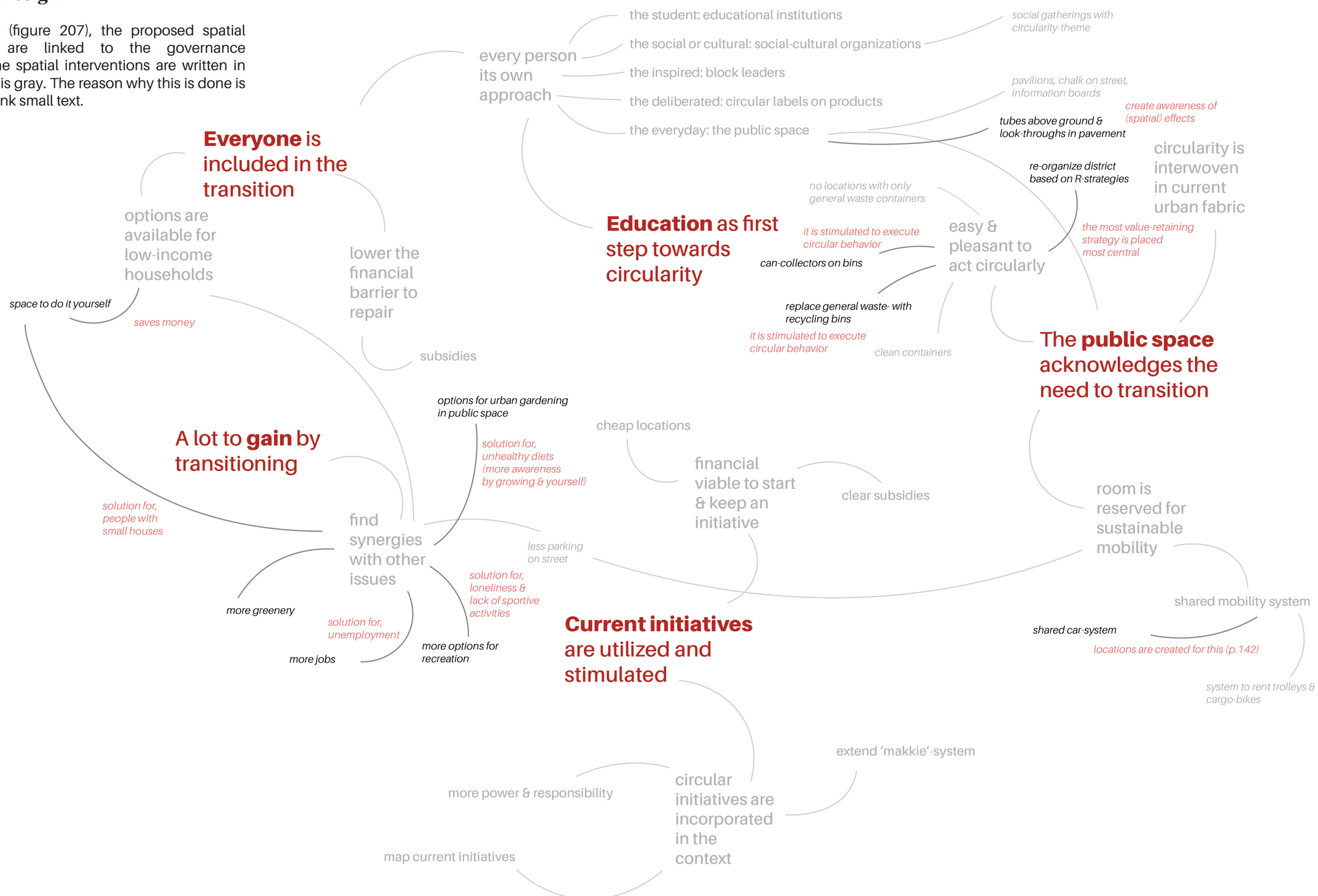
Example: Shared car system
A system could be created for sharing cars. A couple of locations to take them from and bring them to can be designated in the district. A website or app can be created to organize who borrows it at what time. Cars could be borrowed to reach locations that do not have a public transport connection and/or move big items such as furniture.

Example: System to rent trolley and cargo bikes
As stated before, items need to be moved more regularly in a circular economy. For some (big) items it is handy to rent a trolley and/or cargo bike to be able to move it. These can be borrowed from the system that will be in place.

Relation to Design

In this image (figure 207), the proposed spatial interventions are linked to the governance framework. The spatial interventions are written in black, the rest is gray. The reason why this is done is noted in the pink small text.

Figure 225: Governance Framework, related to design (made by author)



Incorporate Current Initiatives

In the district various circular initiatives are already present. These are explained in '03.5 Urban Analysis | Local, Bottom-Up Initiatives'. The transition towards a circular system can make good use of the already present initiatives. Therefore these need to be incorporated in the spatial design.
For each initiative, the needed changes are explained. Some of these are in the spatial domain and others need changes in the governance.

Buurtbuik (reuse)
More businesses and supermarkets could be added to the collection system. Next to this, residents can also bring ingredients that is nearly over the due date. When more food is collected, more locations where the meals are cooked and handed out can be added.

Explanation figure:
R.w (Resident, waste disposer), B (Businesses), S (Supermarkets), R.h (Resident, helper), R.x (Resident, in need of free food OR a social talk)

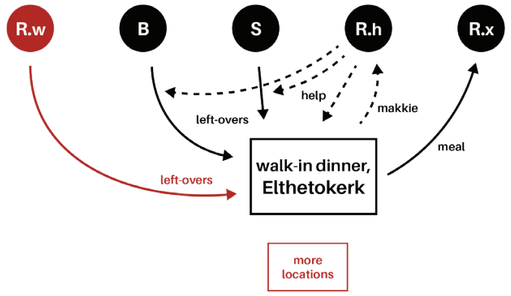


Figure 226: Changed organizational structure, Buurtbuik (made by author)

Afval naar Oogst (recycle)
More residents could be stimulated to also bring their organic waste to the compost location. The compost could be used in the new urban gardening locations in the refuse-streets. When is done, the food cycle is closed on a local scale (the district).

Explanation figure:
Cl.a (Circular Initiative, 'afval naar oogst'), Cl.m (Circular Initiative, Meevaart), R.w (Resident, waste disposer)

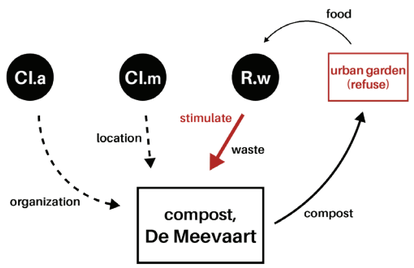


Figure 227: Changed organizational structure, Afval naar Oogst (made by author)

Buurttuin Valentijn (refuse, reduce & recycle)
More residents can dispose their organic waste at the compost in this garden. This compost can be used in this garden or another (new) urban gardening location. The organization could take charge of the organization of other locations as well.

Explanation figure:
R.w (Resident, waste disposer), CI (Circular Initiative), R.o (Resident, owner of private garden), R.h (Resident, helper), R.f (Resident, harvest food)

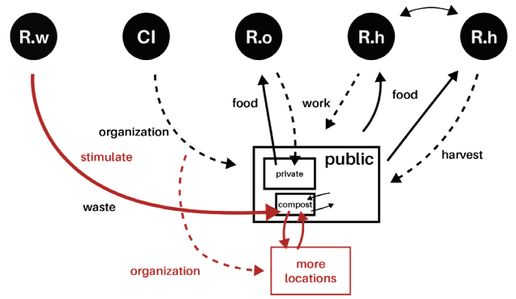


Figure 228: Changed organizational structure, Buurttuin Valentijn (made by author)

Morning Star (recycle)
The service the 'morning star' provides could be extended to private households. They could collect recyclable waste from residents (who are disabled or do not have a lot of time). The 'morning star' can gain something from this by making money.

Explanation figure:
R.x (Resident, who does not have time or the ability to dispose waste), R.w (Resident, waste disposer), MS (Morning Star), Rec (Recycling Company)

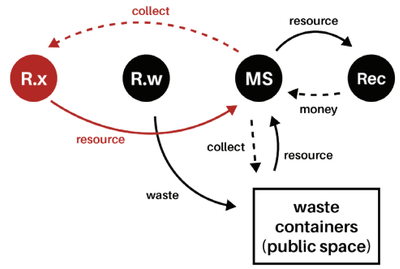


Figure 229: Changed organizational structure, Morning Star (made by author)

Haak-In (repurpose)
Residents can be stimulated to collect waste from the streets by getting a makkie for each kilogram of waste they collect and bring to 'Haak-in'. If the first location has too much waste to handle, more locations can be added.

Explanation figure:
CI (Circular Initiative), R.w (Resident, waste disposer), R.b (Resident, that buys a product)

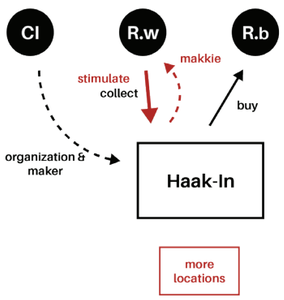


Figure 230: Changed organizational structure, Morning Star (made by author)

Repair cafe (repair)

Residents can be stimulated to go to the repair cafe by making clear that they can save money by going there and they can learn to fix it themselves in the future. Next to this, knowledge can be shared between the repair cafe and repair locations.

Explanation figure:
CI.m (Circular Initiative, Meevaart), R.h (Resident, helper/volunteer), R.o (Resident, owner product)

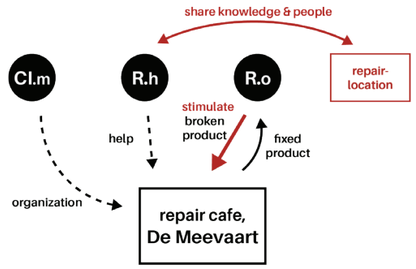


Figure 231: Changed organizational structure, Buurtbuik (made by author)

Cyberbank (reuse & repair)

Residents need to be made aware that they can also 'do good' and give their old devices to a good cause. Next to this, a certain percentage of the collected items in the 'reuse'-location can go to this good cause. A subsidy from the municipality might be needed to make it financial feasible. Also, knowledge can be shared about repairing between this initiative and the 'repair'-locations.

Explanation figure:
B (Businesses), R (Resident), CI (Circular Initiative), R.h (Resident, helper/volunteer), R.x (Resident, that needs a device)

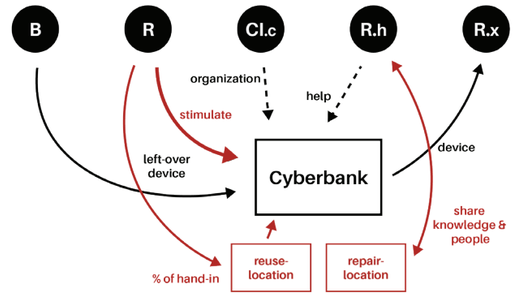


Figure 232: Changed organizational structure, Afval naar Oogst (made by author)

Needed Change

To implement the proposed interventions, multiple actions are beneficial to accelerate the transition. In the section below these actions are noted (underlined) and the stakeholder that is accountable (**bold**).
As stated, before in this thesis, the consumer is central in the transition towards a circular system, due to their role in both the consumption as disposal of products. It is therefore crucial that the behavior of consumer will change.

Subsidies
Behavior can be changed by making circular options cheaper. This could be done the **national government and/or municipality** by implementing subsidies. However, subsidies on products may not reach the people who need it the most. An example of this, is that solar panels are subsidized now, but it is still a product only brought by the rich. A better option could be to give subsidies to specific shops to make their practice more circular. Another option could be to implement targeted subsidies. These subsidies are only issued to people who are under a certain income level.

Education/Awareness
The change in behavior should also come from the **residents** themselves of course. Currently, residents still lack awareness of why this transition is needed and the education to do their part. Both things could be supported by the help of different organizations in the district.
Social-cultural institutions and **educational institutions** (such as school) could educate people. These both have a different target group and therefore reach a wide range of people.
The current **circular initiatives** could show people what is possible in terms of circular behavior.
Next to this, they can give other people, who want to start a circular initiative, tips.
Lastly, the **'makkie'-organization** could be extended. A reward could not only be obtained by doing an action that is beneficial socially but also in terms of circularity.

Change in Offer
The first actor that can support the change in the offer of shops is the **municipality**. They can draw up specific zoning plans: which (building) function should be placed in which place.
In addition to this, **shop owners** are also important in the transition. They can be stimulated by subsidies are the zoning plans in place. In addition to this, the **municipality** could also start up programs for current shop owners that guide them in the transition. This could involve certain trainings to change the offer of the shop and the skills that are required for that. A lot of R-principles require quite specific skills. Therefore, it is important that the shop owners know how to execute this. Next to this, the shop owners could be given money (by the **municipality and/or national government**) for the transformation. This could have a stimulating effect on the shop owners.

Housing Corporations as Stimulator
In the Indische Buurt a lot of buildings are owned by **housing corporations**. Therefore, these can play an important part in the transition. Firstly, they can supply their residents with information on the importance but mostly on how to dispose their products in a circular way. In addition to this, they can implement services to collect these products.
Next to this, they can set up a mechanism (in collaboration with the **municipality or a foundation**) that give residents a reduction on their rent. It could apply to shop owners who want to change the offer of their shop, or to residents who are front-runners in the execution of circular behavior.

Financial Support
The proposed transition requires money. One option for financial support could be a **foundation**. The purpose of the foundations could be social and/or environmental in nature. The proposed spatial changes will improve the resource handling in the district/city but will also improve the living environment for (minima) households.
The storage- and recycling facility underneath the square could be financed by **private companies** who work in this field. A company such as Ikea could be an example that would be interested in investing in the storage-facility. Ikea changed their vision in a more circular one and is already working towards repairing, refurbishing, and remanufacturing more products.
The **national government and/or municipality** could also be a potential investor. The Indische Buurt could be seen as a testing ground for the spatial transition towards a circular system. This district could show the way for other districts to follow. The (front-runners-position of the) **current circular initiatives** could play a role in convincing the national government and/or municipality to invest in this area.

A Prominent Role for the Morgensterren
Morgensterren already collect recyclable materials from the streets in the district. Currently their practice is informal in nature. Their role could be made formal, and a collection service could be added to their job description. This service could pick up materials and/or products from the homes of people. This service could target, for example, elderly people who have difficulty to bring their waste to the nearest waste container. In the future this role could be future extended, for example by collecting and transporting other products from the district and/or city.

Change in Power-Interest Matrix

The power and interest of some stakeholders will change. Due to the design interventions, the recommendations for the governance, and the changes that are mentioned in the previous section. In the figure on the right (208), this is illustrated. Following an explanation is given about what causes these changes. The changes are numbered for a clearer explanation. However, this is not based on the importance of the changes.

I. As explained in the governance framework, circular initiatives are given more responsibility to make their own decisions. Next to this, they are integrated in the overall strategy of the municipality to transition towards a circular economy.

II. In the future, materials will be more valuable because they will get scarer. Therefore, 'morning stars' are more encouraged to collect the waste. Next to this, they will get a more important (and formal) role in collecting waste.

III. Recycle-companies will get less power because more circular organizations (which retain more value) will enter the playing field.

iV. Residents will get more aware of the importance of the transition and will act according to it. They will also be stimulated more due to the prescriptive and/or pricing strategies of the municipality and the government.

V. Gebiedsmakelaar will get slightly more power and interest in the transition, because more stakeholders are in the playing field. This ensures that they become more important because they need to maintain the more connections with stakeholders.

VI. The educational institutions will get slightly more power and interest because they will get appointed a function from the government to educate people about the important and what actions they can take. Therefore they will also increase their own knowledge and be more interested.

VII. The makkie-organization will also be involved in the strategy of the municipality. This system will get extended. Therefore they will have more power.

VIII. Due to the pricing and/or prescriptive strategies from the government, supermarkets will be stimulated to become more circular. They could for example do so by implementing a reusable packaging system.

IX. (Some) current shops will see the need to transition towards a circular alternative (dotted line). If they do not so, the shop will because less important in the district (line).

X. Social-cultural organizations will be appointed to role (from the government) to organize educational activities for their target groups. Due to this, they will have more power.

XI. Waste handling facilities will see the need to become more circular (dotted line). If they do not do so, their role in the waste handling system will become less important.

XII. Re-use and repair locations will be integrated better in the district. Therefore they will be used more by residents.

XIII. These R-locations are crucial in the transition towards a circular system, and are at the heart of the district with the proposed spatial interventions.

XIV. The municipality, national government and European Union will have slightly less power because part of their power will be transfered to other parties.

Stakeholders:

EU	European Union
NL	Government NL
A	Amsterdam
GM	Gebiedsmakelaar
WC	Waste Collectors
WH	Waste Handling Company
SH	Shop
SU	Supermarket
MO	'Makkie'-organization
MS	'Morgenster'
CI	Circular (district) Initiative
SC	Social-Cultural Institution
EI	Educational Institution
R	Resident (disposer)
Ret	Rethink-location
Re-u	Re-use-location
Repa	Repair-location
Ref	Refurbish-location
Rem	Remanufacturing-location
Rep	Repurpose-location
Rec	Recycling-location

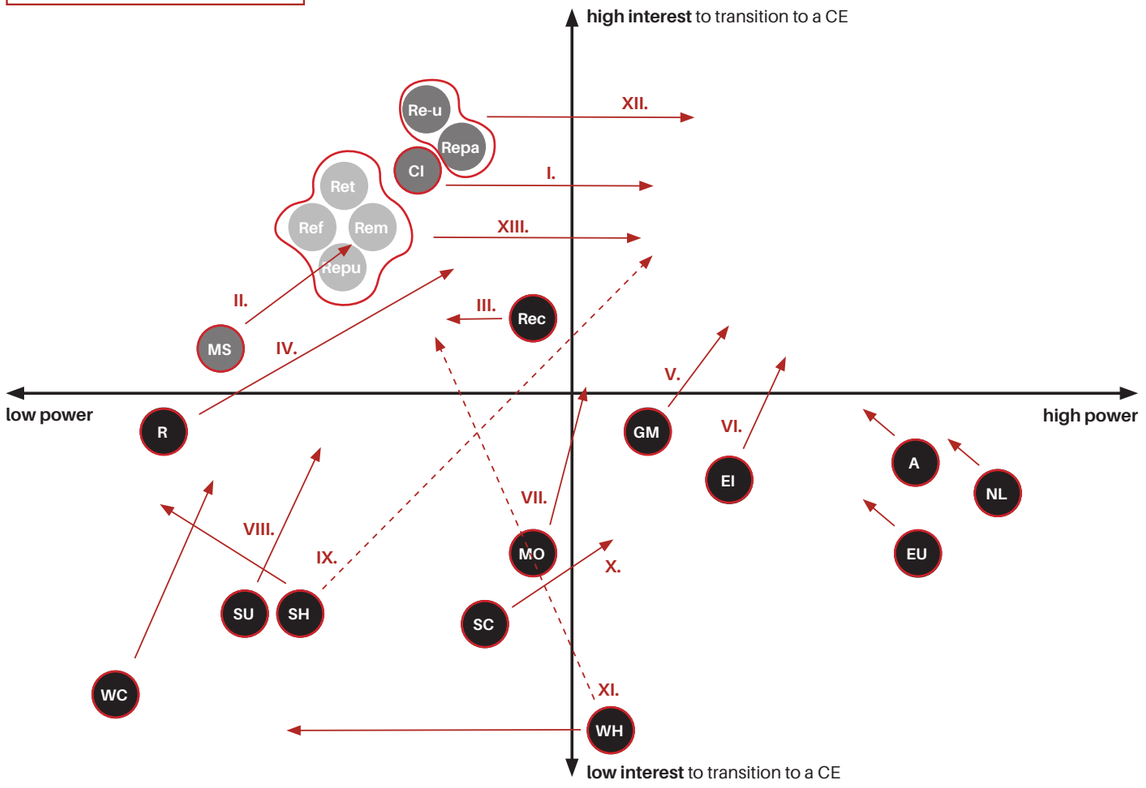


Figure 233: Changed Power-Interest Matrix (made by author)

The assessment of the design is split into two sections. Firstly the separate design interventions (the three streets and the square) will be assessed based on the R-strategies. This is done because of the centrality of the R-strategies in this thesis.
After that, an assessment of the whole district is made to see if and how the area is improved. (Social) issues that are tackled (next to the transition) are assessed.

09.1 Assessment Based on R-Strategies
09.2 Overall Improvement
09.3 Reduction of Household Waste

09. Evaluation

Javastraat, Refuse

Refuse: More green and wider walking paths are created in order to stimulate taking a walk outside (instead of consuming something). Next to this, multiple recreational options are created.

Rethink: Due to stimulating being outside, people might rethink the amount of items they (need to) own and buy.

Reduce: One of the active recreation options is the implementation of urban gardening. People can produce their own food and therefore they need less packaging materials (given out in stores).

Recycle & Recover: In the public space, the regular bins are replaced by bins for recycling. Residual waste can still be thrown away, therefore recover is also touched upon. The residual bin is smaller than the recycle-bins, to stimulate the circular choice.



Figure 234: Assessment 'Refuse' (made by author)

Javaplein, Rethink

Refuse: The green axis from the 'refuse'-street leads through the square. Therefore, people can actively recreate on this axis.

Rethink: Multiple sharing options are created in the commercial functions are the square. People can borrow items from these locations. Also, a co-working space is located around the square where desks and computers can be borrowed.

Re-use & Repair; and Refurbish, Remanufacture & Repurpose: These are tackled because the square leads to these functions and are visible from the square. Next to this, the 'rearrange'-location that is created underneath the square functions as a storage location and is the link between the different R-strategies. See-through windows are also made in the pavement in the square.

Recycle: A location underneath the square is created where materials can be recycled. Old materials will be transformed into new ones.
Besides the replacement of normal waste bins by recycle-bins, also eye-catching recycle bins are placed on the square.

Recover: Residual waste is also collected in the waste bins, therefore recover is also covered. The residual bin is smaller than the recycle-bins, to stimulate the circular choice.

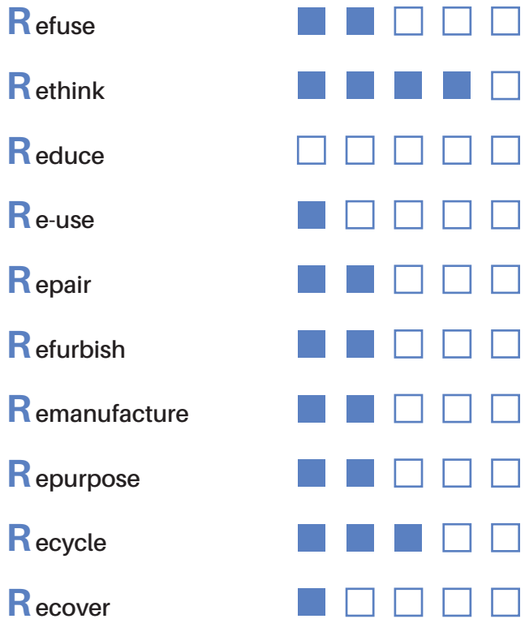


Figure 235: Assessment 'Rethink' (made by author)

Molukkenstraat, Reuse & Repair

Refuse: Options for recreation are created for residents in the public space. For example tables to have a pick-nick and benches to sit on.

Re-use & Repair: The locations to execute this behavior are located in this street.

Recycle & Recover: In the public space, the regular bins are replaced by bins for recycling. Residual waste can still be thrown away, therefore recover is also touched upon. The residual bin is smaller than the recycle-bins, to stimulate the circular choice.



Figure 236: Assessment 'Reuse & Repair' (made by author)

Javastraat, Refurbish, Remanufacture & Repurpose

Refuse: Options for recreation are created for residents in the public space. For example tables to have a pick-nick and benches to sit on.

Refurbish, Remanufacture & Repurpose: The locations to execute this behavior are located in this street.

Recycle & Recover: In the public space, the regular bins are replaced by bins for recycling. Residual waste can still be thrown away, therefore recover is also touched upon. The residual bin is smaller than the recycle-bins, to stimulate the circular choice.

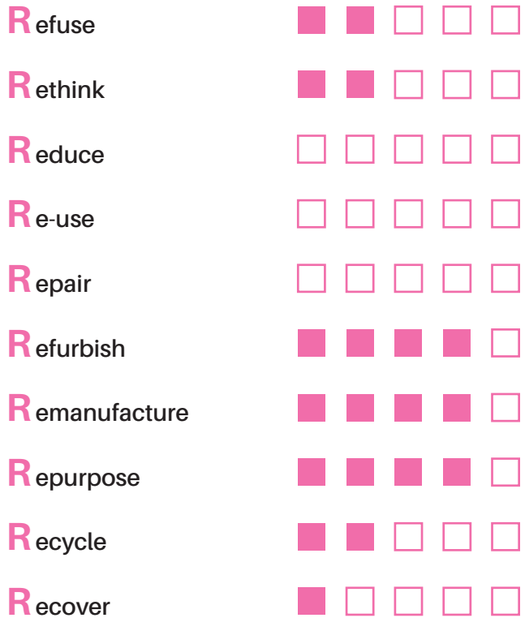


Figure 237: Assessment 'Refurbish, Remanufacture, Repurpose' (made by author)

Indische Buurt

In the Indische Buurt, more issues are present than "just" how the transition towards a circular economy is realized. These issues are touched upon in the analysis part of this thesis. The improvement of these issues is assessed here.

Low-incomes:
Pavilions are created for people to repair and refurbish themselves. All the space and tools that are needed can be found here. Next to this, people can grow their own food in the multiple urban gardening options in the 'refuse'-streets.

Unemployment:
Jobs are created by creating R-locations. These locations to execute circular behavior require more man-power than the current shops.

Loneliness:
Across the whole district, various seating- & recreation options are created. Next to this, walking is stimulated in the district by creating nicer walking paths. The 'refuse'-streets are a good example of that. All the interventions above stimulate social contact.

Unhealthy diets:
More urban gardening is implemented in the area. Therefore people come across more vegetables and fruit. This potentially stimulate their to eat more vegetable and fruit themselves.
Next to this, eating vegetables and fruit becomes more affordable by growing it themselves.

Lack of sportive activities:
More recreational options are created in the public space, some of them sportive. Also, walking and biking is stimulated in the district.
Next to this, borrowing sports equipment is facilitated by the location next to square. This will increase the ease that sports can be played, items do not have to be bought anymore.

Lack of greenery:
As can be seen in the design, a lot of greenery is added in the district by the new designs of the different streets and the square.

Waste in the public space:
The threshold to dispose your products and materials (in an efficient way) will be lowered. Therefore, less waste shall be put next to the containers.
Next to this, the recycling containers will not get full because of the underground system that is provided.

Streets defined by parking:
Parking will be eliminated in almost every street. Only a couple of locations are appointed that function as shared mobility hubs.



Figure 238: Assessment Overall Design (made by author)

Reduction of Household Waste

This section provides an estimation of how much waste can be reduced by implementing the proposed interventions. The estimation is done based on the author's assumptions.

On the right page, four figures can be seen. These figures illustrate the composition of the household waste in Amsterdam per person per year.
Each square represents 1 kg of waste.

The figure on the top shows an estimation of the reduction of household waste that could happen after implementing the proposed interventions.

The figure on the bottom on the left illustrates the current composition. Next to it, the potential composition is shown. This is defined by the municipality of Amsterdam. On the right, at the bottom, the reduction of household waste, in relation to the potential, is shown.

Below, the reduction per material group is discussed:

Bulky waste
This category is reduced the most in this plan. This is due to the large amount of interventions in the design that tackle consumer goods (which is called 'bulky waste').
The proposed design encourages people to consume less and dispose their products in a circular way. In this scheme every R-strategy above recycling is not considered as "waste", therefore not noted in this scheme.
Bulky waste can not be eliminated completely because sometimes materials and components can not be used in a high R-strategy (because the value is lost). In this case it needs to be recycled.

Paper
Quite a lot of a household's paper consumption is related to buying new products. (Almost) every product one buys is packaged in paper.
In the proposed plan one will consume less new products, and therefore the amount of disposed paper will be reduced.

Glass
In the future glass pots and bottles will be reused more frequently because it can be assumed that supermarkets will implement refill-stations (for example for refilling rice or wine).

Plastic, Metal, Drink Cartons
In the future, less plastic will be used for packaging food. Therefore less plastic waste will be produced. Next to this, people will grow more food themselves and therefore use less packaging from the supermarket.
In addition to this, a lot of new products one buys are packaged in plastic. This will be reduced when one buys less new items.

Textile
Textile will be reduced because one will buy less new clothing, and will repair it when possible. If that is not possible, first higher R-strategies will be executed before disposing it in the recycling bin.

Organic waste
People will become more conscious about their disposal of food. Therefore less food will be thrown away. Their awareness will increase by seeing the cultivating of food in the public space.
However, more green/garden waste will be produced in the district because more green will be added in the area.

'Other' waste
In sources it is not clear what 'other waste' includes, however it can be assumed that products will be better demountable in the future. This results in a better recycling rate of this category.

Overall, the assumption is that waste can be reduced to 207 kg per person. This is a reduction of around 40%.

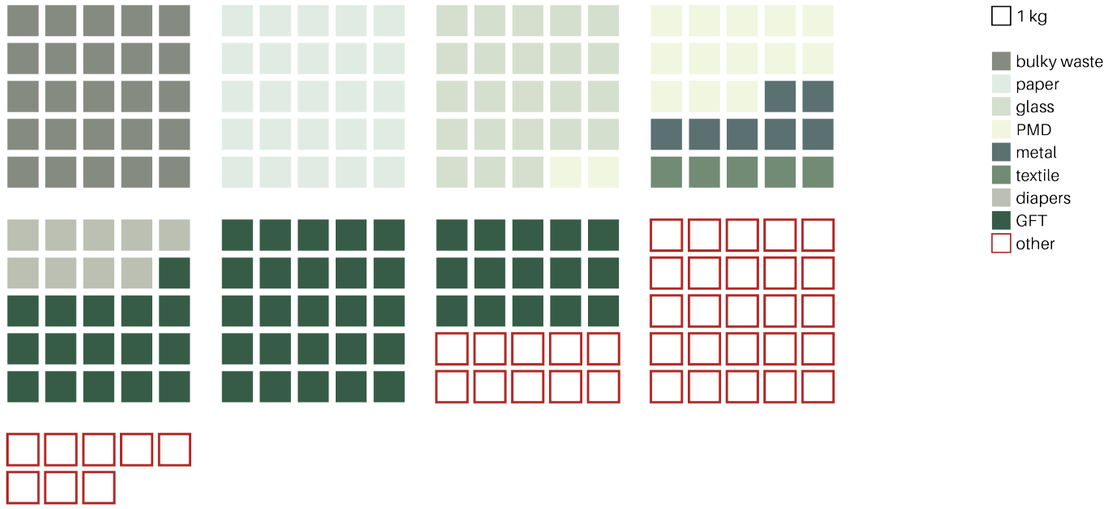


Figure 239: Potential composition of household waste, based on the proposed interventions (made by author)

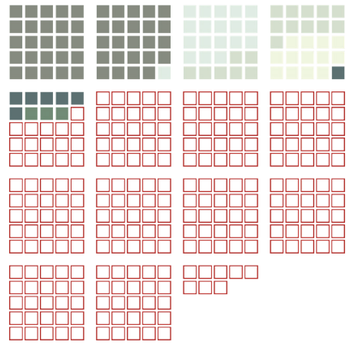


Figure 240: Current composition of household waste

(made by author, based on Gemeente Amsterdam, 2020)

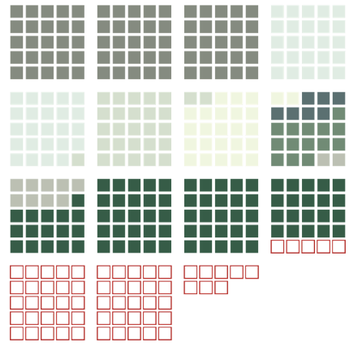


Figure 241: Potential composition of household waste defined by the Municipality of Amsterdam

(made by author, based on Gemeente Amsterdam, 2020)

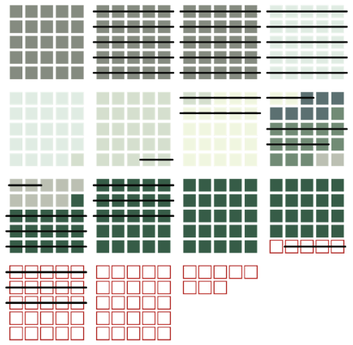


Figure 242: Reduction of household waste, based on the proposed interventions

(made by author)

This chapter starts with answering the research questions that were posed at the beginning of this document.
After that, it reflects on the (process of the) thesis, and the role of the author in it.

10.1 Conclusion
10.2 Reflection

10. Conclusion & Reflection

Conclusion

In this section, the multiple research questions will be answered. Starting with the sub-research question since these are the basis for answering the main research question.

Sub-question 1: What are the spatial and social characteristics of the Indische Buurt?

This question was mainly addressed in chapter 3 'Urban Analysis'.

Social characteristics of the district that need to be included in the design are the large number of low-income households in the district and the diverse range of nationalities. The design should incorporate options for circular behavior that do not cost a lot, and communication should be more inclusive than solely communication in Dutch.
Next to this, the district's social organizations that are already tackling the circular economy (see 03.5 local, bottom-up initiatives) should be included in the overall circular strategy.

Regarding the spatial characteristics that must be considered in the Indische Buurt. The Indische Buurt serves mostly as a residential area. A significant portion of those are social housing units, with the majority of the homes being modest multi-story apartments. Adjacent to this, the area has a few shopping streets. The Indische Buurt is surrounded by several bodies of water and a train track, creating the impression of an island with several ports of entrance. The Insulindeweg and Molukkenstraat are the busiest streets.
The Indische Buurt's streets provide a lot of parking. Apart from the Flevopark, there is also a lack of greenery throughout the area's public spaces. Inside of the building blocks are multiple collective gardens, used by the residents surrounding it.

Sub-question 2: What improvements could be identified in the current production-consumption system of the Indische Buurt to reach a circular domestic use of food and consumer goods?

This question was mainly addressed in chapter 4 'Urban Metabolism'. Most of these points are summarized in an image (see 04.3 'Overview Needed Changes').

In Amsterdam, there's considerable room for enhancing household waste separation. Currently, many recyclable materials end up in the residual waste bin, indicating a need for better sorting practices. Another improvement would be the separate collection of plastic and organic waste. Implementing this could significantly boost overall separation rates and reduce the volume of recyclables in the residual waste stream.
Areas within the district where only residual containers are available contribute to improper waste disposal. Eliminating these locations and ensuring access to recycling containers can deter the disposal of valuable resources in general waste bins.
Currently, the placement of 'milieustraten' (environmental streets) outside the city poses a logistical challenge. Relocating these facilities closer to the city center could streamline waste disposal and encourage more residents to participate in recycling efforts.

The purpose and lay-out of the Javastraat, the main shopping street, must change. Currently the spatial configuration is focused on consuming, for example by the wide sidewalks and the parking places. Next to this, the display windows encourage people to consume.

The consumer has a central role in the disposal of products; therefore, it is important that their mindset towards disposing waste changes. Their choices in consumption and disposal profoundly impact waste management. They hold the power to adopt circular instead of simply discarding items into the general waste bin.
Another action that the residents are responsible for, is the placement of waste next to waste containers. When this is no longer done, the public space would be more attractive again.

Sub-question 3: What behavioral aspects (of residents) should be considered when making a spatial design to transition towards a circular domestic consumption of food and consumer goods?

This question refers to '04.5 Consumer Behavior'.

The Behavioral Change Wheel (Mitchie et al., 2011) is addressed. Behavior is composed out of three things: 'motivation', 'opportunity' and 'capacity'.
Motivation includes the beliefs of the person itself, and the social norm. Social norm is influenced by the behavior of others. This can be addressed by creating good visibility and therefore people can see what others do (Ölander & Thøgersen, 1995). In addition to this, it is stimulating for people when they have the feeling that they are 'doing good' with their actions (Ministerie van Infrastructuur en Waterstraat, 2023).
Opportunity can be spatially translated to the location where a type of behavior can be executed. In addition to this, it refers to the infrastructure system and the cleanness of the waste containers. If this is all in place and pleasant to use, it is more likely that sustainable behavior will be executed. Next to this, the perceived control by the residents is important. People should believe that they have the control to execute a certain behavior. Education regarding the specific subject is therefore important (Mitchie et al., 2011; Ministerie van Infrastructuur en Waterstraat, 2023, Ölander & Thøgersen, 1995).
Capacity refers to the necessity that people have the knowledge and skill set to execute a certain type of behavior. Therefore, it is important that there is proper education, and this is understandable for everyone. To prevent people falling back to old habits, it is beneficial to guide people to new behavior (Mitchie et al., 2011; Ministerie van Infrastructuur en Waterstraat, 2023, Ölander & Thøgersen, 1995).
Celestino (2022) & Knickmeyer (2020) define a couple of aspects that are important for waste separation. The social norm (the behavior of others), perceived convenience (physical distance, difficulty of recycling, and space inside of the home), and level of education (both awareness & prevention campaigns are important in this).

Based on the pyramid of Maslow, another aspect for executing certain behavior is the number of money/ resources one has. The primary needs of someone need to be arranged first (ex. having enough money to provide food on the table). After that one can start to think about making sustainable choices (see section 03.1) (Eelants, 2020). In the Indische Buurt, quite a lot of people have limited resources. Therefore, it is more difficult for them to think of executing circular behavior.
Lastly, consumption is also still a symbol of status in our society (Csikszentmihalyi, 2000). Changes in how society looks at product ownership need to happen in order to really make a change.

Sub-question 4: What changes are needed in the governance of the Netherlands and the municipality of Amsterdam to integrate the proposed spatial interventions, needed for a circular domestic use of food and consumer goods?

In chapter 5 the governance is analyzed. In chapter 8, a governance framework is presented in which the changes below are (direct or indirect) addressed.

The most apparent observation is that the spatial effect of the transition towards a circular system is barely mentioned in the documents, about the transition to a circular economy, of the municipality of Amsterdam and the Netherlands. Therefore, this thesis addresses the spatial consequences.
Governmental aspirations of making circular choices 'logical, easy, and fair' remain without a concrete solution. This thesis attempts to bridge this gap through proposed designs and practical implementations.
While the government prioritizes the establishment of circular craft centers, it's uncertain whether these will effectively encourage widespread circular behavior. Diversifying strategies beyond these centers is crucial for fostering circularity.
It is also apparent that the government only implements stimulative strategies to change behavior, instead that they could also implement prescriptive or pricing strategies.

In the environmental vision of Amsterdam, it is apparent that they do not state anything about the changes that are needed in the current urban fabric. They only mention the transformation of the harbor into a circular hub and the ambitions for new districts.

Existing circular initiatives are not incorporated in the circular strategy of Amsterdam. Aligning these initiatives with the city's strategy could accelerate the transition toward a circular economy. In addition to this, subsidies for new initiatives are currently quite unclear. This could be made easier and therefore the creation of new initiatives can be stimulated.

Main research question: How can spatial design interventions in the public, collective, and private space support and facilitate the shift to a circular domestic use of food and consumer goods in the Indische Buurt (in Amsterdam)?

This question was answered by proposing a spatial framework for the district and the spatial design for the area around the Javaplein.

Public
The district is re-organized by using the R-ladder. The strategy that retains the most value of resources is placed the most central in the district. Therefore, existing commercial functions are transformed to accommodate the new functions (related to the R-ladder). It is made easy to execute the various R-strategies in the district, due to their centrality in the district and the good connection to them. The created R-locations work together due to the creation of an efficient tube system to share materials and components.

People are more aware of the importance of the transition and what it takes to transition, due to the visibility of the R-strategies (in the public space) and the elements that are related (such as the tubes). Outside (active) recreation is stimulated in the district. This is done in the 'refuse'-streets by implementing more greenery and recreation options. Also, more space is given back to the residents in the 'reuse and repair'-street and the 'refurbish, remanufacture, and refurbish'-street. Therefore, people will be more stimulated to recreate outside, instead of passive recreation inside that requires consumption of products (such as TVs and tablets).
Multiple locations are created in the urban fabric where people can go to borrow products ('rethink'-locations), such as a hammer.

Locations where solely residual waste containers are located now are removed. This is done to not stimulate the disposal of recyclable materials in the residual waste containers. Residual waste containers still exists but always recycle-containers (such as paper and/or plastics) are placed next to those. Also, recycle containers are located next to higher R-strategies to stimulate executing a higher R-strategy when possible.

Collective
Two options for collective gardens are proposed. The first one stimulates urban gardening and therefore using less package materials. Next to this, an organic waste compost is created and a small shed where products can be shared.
The other one is focused on productivity. Tubes (for waste disposal) that connect the homes with the recycling system are created at the facades. Next to this, multiple tables are created where people can repair and refurbish products themselves. Also, a shed with tools to use is created. Next to this, workshops for children could be organized there to craft with disposed materials (and therefore 'repurpose').

Private
A couple of interventions are proposed for the private domain. The first intervention that connects to the private domain is the creation of pavilions where one can repair and refurbish themselves. This is done since a lot of people have very small homes.
Another intervention are the tubes outside of the homes of people where waste can be thrown in. This makes it easier for people to recycle their waste. The shaft in the staircase also makes it easier for people to transport their waste to the recycling bin.
On the advertisement board in a hallway, people can state if they have food and/or products left to share.

Reflection

Relation topic, track and master programme

This thesis looked at how the district of the Indische Buurt needs to be changed spatially to stimulate people to be aware of the importance and act to transition towards a circular approach to household "waste". This connects to the topic of the 'Design of the Urban Fabric'-studio because, as their name reveals, their focus is on the design of the urban fabric. Next to this, the thesis' context-specific approach also aligns with the approach of this studio. The aim of the Urbanism track, as can be read on the TU-website, 'to advance, share and apply knowledge on how to adapt the built environment to societal and environmental changes; and to apply contextual design, planning and engineering strategies and interventions with impact for a better society.' (Urbanism, n.d.). This aligns with the topic this thesis tackled because the (spatial) transition towards a circular economy (regarding household waste) needs both societal and environmental changes. The context- specific design is also mentioned here.
The approach of the master programme MSc AUBS is 'blending knowledge and skills from design practice, from the physical and social sciences, technology and engineering, this programme explores innovative ways to create more sustainable development.' (MSc Architecture, Urbanism and Building Sciences, n.d.). This thesis connects to this because the proposed design helps, supported with new technologies & engineering developments, transition towards a more sustainable environment.

Academic value

As described in the research gap (in the methodology chapter), there is currently very little research on what the social and spatial effects of the transition to a circular economy are (Prendeville et al., 2017; Coenen et al., 2012). However, I believe that the spatial aspect is very important for the transition towards a circular system. Currently, many proposed solutions are technical. This is beneficial to increase the efficiency of the system, but in my opinion the behavior of residents should also change. The spatial environment can facilitate this change of behavior.

By thinking of the transition towards a circular economy from a spatial perspective as starting point, new ideas were identified. The identification of new ideas was supported by combining systemic methods (such as using 'complexity'-theory) with design-orientated methods (like 'research by design'). A limitation of combining these methods is the various trade-offs and contradictions that arise. An example of a trade-off is the choice to create the most efficient waste handling system or making circularity visible and therefore increasing the awareness of residents. Deciding whether the waste handling tubes were placed above or under the ground is an example of this.
A suggestion for future work is to further explore the theory of consumer behavior and its impact on spatial design. This recommendation was identified during the research process. Understanding the reasons behind consumer behavior can provide valuable insights for design.

In addition to the spatial approach, this thesis also proposed a future scenario. The project functions as a conversation starter among academics and practitioners. This stimulates them to think of the possible spatial effects of the transition towards a circular economy.

Societal value

The awareness of the need to transition towards a circular system is growing, both amongst governmental institutions and citizens. Although the awareness is increasing, the action which is taken still lag behind. The only way to reduce the overshooting of the planetary boundaries is if everyone in society will do their part. This requires a societal change which will be apparent in consumption and waste disposal patterns.
This thesis opens the conversation on what our districts could look like in the future. This thesis shows that we do not have to compromise on the spatial quality of the district in a circular economy. I think the (spatial) quality of the neighborhood can even be increased.
This thesis shows a concrete example of how this transition towards a circular system, which is often abstract for residents, could look like.
Next to this, this thesis can improve the current (urban) circular strategies of municipalities and national governments. This will support the transition towards a circular system (in Amsterdam).

Ethical consideration

To reflect on the ethics of this project is quite difficult because an utopia is presented in this thesis. This project was meant as a vision to illustrate where we need to (and can) go in the long-term. The project was not meant to propose a design that could be implemented in the short time, due to the fact that it also requires systemic and behavioral changes.

By proposing this utopia, the view of people may be opened up regarding the 'throw-away'-economy in which we are currently.
An urban planner or the municipality cannot change the spatial organization of a district in this way. This plan requires that all existing commercial functions in the district will get a new function (based on the R-strategies). And if they could, it would not be ethically correct to impose this to the residents without involving them in the decisions.

Regarding the ethical consideration of the (spatial) transition to a circular system in general. In my opinion, the transition requires a combination between a top-down and bottom-up approach. This will require both stimulating and/or normative rules drafted by governmental agencies and initiatives from the resident/neighborhood organizations. In my opinion, a circular economy will not happen if one of the two is missing. The extent to which one of the two is focused on is a trade-off and a way must be found in this.

One notion I would like to make here is that the final design presented in this thesis came from my own sketches. It is based on ideas I formed about how space could (and should) change if we want to ensure the transition to a circular economy. These ideas have emerged from the research but are also colored by my worldview and views. By this I mean to say that there are plenty of other possibilities if others were to create a spatial design for the same topic.

Research Approach: relation research and design

The first six months of the project were mainly focused on research. This led to the first design ideas. As the project progressed, research and design became more intertwined. A piece of information from my research could lead to a new design idea. Conversely, I regularly needed more information about something when coming up with a design idea. A good example is when research revealed that food is a major source of waste in a household and has many effects on the environment. Initially, this led me to the idea of using Flevopark as a food forest to feed the district. Research revealed that this was naive thinking. After all, Flevopark can only feed 2% of the entire Indische Buurt (see appendix 12.1).

Context-specific approach & methods

This thesis had a context-specific approach with corresponding methods. In the next section, some of the methods are further explained.

The context-specific approach encouraged me to often go to the district and experience it. This gave me an idea of what is going on in the district; who lives in the district; and what problems there are. The fact that there is a lot of rubbish next to the containers in the public space was of course visually visible during the field-trips. Not everything could be learned by conducting field-trips. The fact that many people are lonely and/or have no one to tell their story to I discovered by talking to several district organizations.

Following this, in this thesis, gathering information through (unstructured) interviews was very important. During my thesis project, I talked to several people. Residents and municipal employees as well as lecturers from TU Delft. By talking a lot with others about my project, I gained many new insights. In my opinion, this has enriched my project.

Another method that was very important was 'Research by Design'. Throughout the process, I did a lot of sketching (at different scales) to come up with (new) concepts. I really got to know the value of 'Research by Design 'during my thesis research. In the beginning, I was hesitant to pick up my fine-liner because I felt I didn't have a good enough idea to draw it out yet. As I was sketching more, I found that drawing out an idea often leads to others coming up with it. It is easy to go into a kind of freeze mode while designing but by doing it regularly it progressed steadily, and a design eventually emerged.

Transferability

This thesis takes a context-specific approach. As a result, a lot of research has been done on the Indische Buurt and the solutions are focused on this district specifically. However, elements of the design are transferable to other districts. For example, using the R-ladder as a planning tool. I expect this could work in more districts than just the Indische Buurt. However, one should look at the configuration of the commercial functions in the district, and if it is possible to reorganize based on the R-strategies. An example of a difficulty could be when the district has only a shopping center and surrounding it are houses.

In addition, creating more space for residents to recreate (for example, reading a book or organizing a picnic) by redesigning shopping streets could be transferred to other places. This encourages the use of shopping streets for functions other than shopping. It also gives residents more space and reduces the stimulus to consume.

Another idea that could be transferred is to better connect existing parks with the surrounding districts. A better connection makes it easier for people to use the park. This increases the amount of active recreation that residents engage in.

Additionally, the spatial design addresses the issue of loneliness by creating more outdoor space for residents to use and focusing on slow traffic. The ideas presented in this proposal could be transferred to other areas, as loneliness is an increasing problem in many European cities. These solutions tackle multiple issues at once, including social concerns and the transition towards a circular system. It is important to find more solutions like these.

Limitations & Recommendations

A study on the circular economy is very complex. As a result, choices were made regarding the scope of the research and the time spent on certain parts.

First, the scope of the research is discussed. This thesis focuses only on household waste. Because of this limitation, commercial waste and industrial waste, for example, were not included. This could also be included in a follow-up study. By doing so, a more complete picture will be formed, and more aspects are considered.

The decision to focus only on household waste has also led to the fact that the consumer/resident has become very important. The resident is in control of what to do with a product when it is no longer wanted. Also, this focus has made my research a very social issue. When focusing on other types of waste as well, the transition is more systematic in nature. A challenge for follow-up research is to include all types of waste while not forgetting the social aspect.

Following the above limitation, this thesis focuses on “waste”. Meaning a product discarded/no longer wanted. For a more complete study, the resident’s buying behavior could also be included.

Another example for future studies would be to address the exact urban metabolism of the area more thoroughly. It could be interesting to know the (amount of) materials businesses in the area need and how much (and what type of) waste they produce. When one knows this, more synergies can be found.

The main research question is about the spatial interventions for the private, collective, and public space. Although the private and collective are tackled, the public space was the starting point for proposing interventions in these domains. During the project these went a bit to the background. The choice to reorganize the district based on the R-strategies was, in my opinion, the reason why this happened. This planning regime focuses on the organization of the public space. The private and collective domain were not forgotten, the interventions connect to these spheres. An example is the creation of the ‘repair and refurbish’-pavilions. However, not a lot of interventions were created especially for these domains. A future study could take the private and/or collective domain as starting point. This could create interesting new solutions.

Lastly, I would like to address the limitation of the method I have used in the governance analysis: ‘key-words search’. The down-side of this assessment method is that conclusions are made based on limited information. It could occur that something is mentioned in a section of the document that was not read.

How will the proposed utopian view influence the behavior of people, and the future plans for the transition towards a circular system?

I believe that many people do not reflect on how much waste one produces. This research part of this project can give people this realization. A concrete example is the fact that we throw away 33 kg food per year, mostly already cooked. I believe that the first step in the transition is that people become more aware, the next step is that people do something with this knowledge.

Next to knowledge, I believe that this project can also show people that the spatial quality of a district does not have to go down when we transition towards a circular system. The quality of the space can be improved, and for instance more greenery can be created. Next to this, new elements can be added to the current public space, for example resource-transporting tubes, which makes it a more interesting place.

Regarding the professional field, this project can stimulate urban planners to think beyond the boundaries they normally set. Progress does not happen when small adjustments of the current system are implemented. The whole system needs to be rethought and this project can be a stimulator for that.

In my personal life, I have noticed that by working on the topic of waste disposal and circularity for a whole year my own awareness of the topic has very much be reinforced. A moment I remember is when I wanted a new color of bed sheets but did not buy one because I thought it would be a waste to have three of them. Another example is making my wooden bench outside winter-proof (more information can be found in appendix 12.4). Next to this, I have started to use lunch boxes instead of plastic bags. These events might not solve the waste production problem but are a step in the right direction.

The people that surround me, for example my roommates and friends, also said to me that they are more aware now and try to make sustainable choices.

How can my project be implemented in a realistic way? Are changes needed in the proposed plan?

This project is utopian, a project to open the current view of people. However, aspects of the plan can be adjusted and be used in the future. The idea to reorganize the district based on the R-ladder is in essence not such a weird plan. The municipality can make it more attractive for current and future shop owners to settle in a certain location when they tackle a certain R-strategy. They can do so by creating subsidies or by changing the zoning plan of that area/street. Next to this, shop owners could be given (financial) benefits if they transform their shop to a circular alternative.

I expect that it is not necessary (to create an efficient waste handling system) to make a resource storage and/or recycling station in each district, whether above or below ground. Such a location could be shared by multiple districts (or a whole city). When one location is used by multiple districts, the efficiency might also increase. The range of products that is disposed will be bigger, and therefore more synergies can be found in exchanging components. This thesis lacks an estimation of how many facilities are needed in Amsterdam. This could be done in a future study into this topic.

Next to sharing one facility with multiple district, money can also be saved on the tube system (from the waste containers to the square. This could be skipped (as a first step) and (electric) trucks could still collect the waste and transport it to the square. An elevator in the square needs to be integrated then.

11.1 Literature
11.2 Images

11. Bibliography

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12.1 Food Production in Flevopark?
12.2 Learning from Case Studies
12.3 Shopping in Amsterdam
12.4 Do it Yourself - Implementing My Own Thesis
12.5 Hand-out ‘Implement it Yourself’

12. Appendix

Food Production in Flevopark?

One of the design ideas could be to produce all the food consumed in the Netherlands within its borders. This would make the Netherlands less reliant on other countries and keep the negative impacts involved in food production within national borders.
A study by Terluin et al (2013) shows that it is possible to produce all food in the Netherlands, on the already existing agriculture land. However, that would require dietary changes. Examples are that we could eat almost no meat, only as a residual product of milk production. In addition, we would have to eat different kinds of bread, because the wheat used for it cannot be grown in the Netherlands (Terluin et al., 2013).
The Indische Buurt is, of course, home to Flevopark. At first, this seems like a large amount of land and seems to have potential to feed many people. Upon examination, this falls short of the expectations. If all the land area (46 ha) of the Flevopark were used, it could feed 230 people in their current diet (0.2 ha per person) or 460 people on a vegan diet (0.1 ha per person) (Rijksoverheid, 2022). Figure 209 illustrates that 460 people is a very small proportion of the entire Indische Buurt (21,990 inhabitants (Wijk Indische Buurt-Oost, 2022 & Wijk Indische Buurt-West, 2022)).

The idea of producing food in the city is not depreciated but food production will be used mainly to raise awareness. People will (hopefully) become more aware of the number of resources, labor, and land food production requires. It hopefully impacts the amount of food people thrown away. The Municipality of Amsterdam also notes this, in their circular policy, as a reason to incorporate food production in the city (Gemeente Amsterdam, n.d.-d). Next to this, it might also help to show people what products are in season and adapt their diets to it.

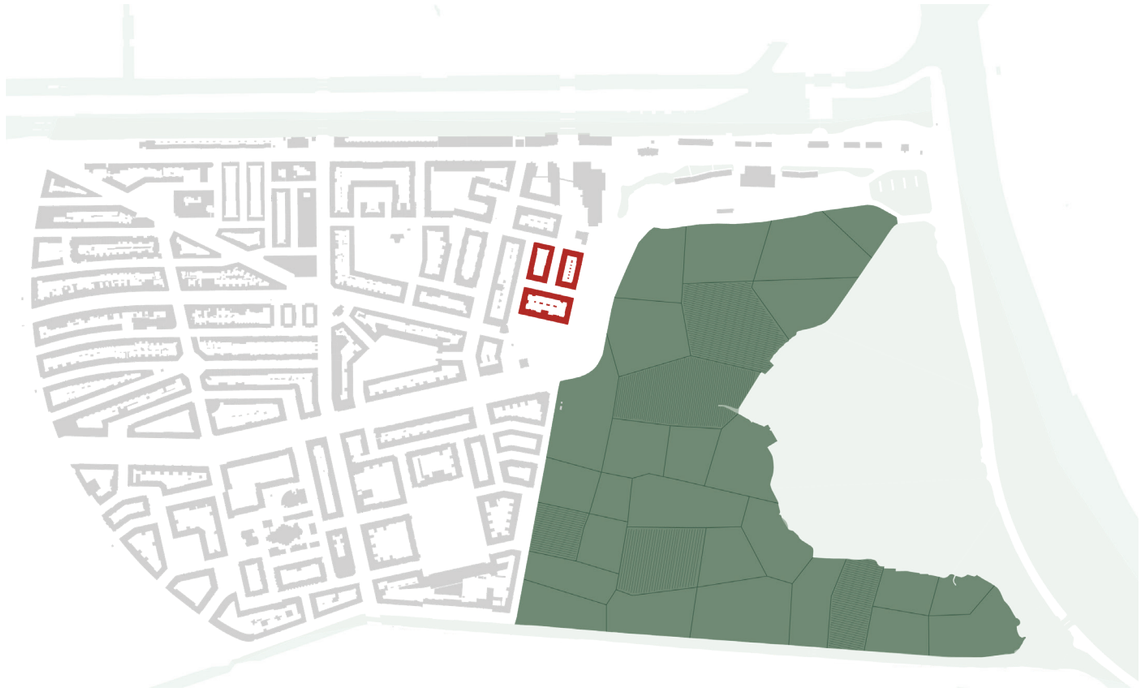

Figure 243: Food Production in Flevopark (made by author)

Learning from Case Studies

In the following sub-chapter multiple case studies will be explained, and lessons are drawn from them. The lessons are made bold in the text and summarized, organized by dimension, at the end of this sub-chapter. Next to this, the implementation on the Indische Buurt is shortly described.

<u>De Groene Hub, Holendrecht (Amsterdam, Netherlands)</u>
Cocratos, the International Institute for Inclusive Science, established 'Doughnut Deals'. These are based on the 'Doughnut Economy'-model of Kate Raworth (2018). The idea behind these deals is to tackle at least one environmental issue, act with at least two parties, and tackle at least three social issues. By giving these requirements they stimulate to think of tackling more than one issue at a time (Cocratos, 2022; New Energy TV, 2022). This kind of **'selection menu'** can help with the invention of new ideas/ interventions. The Doughnut Deals were applied to 'De Groene Hub' in Holendrecht (Amsterdam) but can also be applied to other locations.

An example is the Doughnut Deal: 'share green gas by collecting organic waste in a mini fermenter & eliminating rat'. In this case the requirements were met and transcended. The issues which were tackled are highlighted in figure 244. The focus of this deal is reducing climate change and strengthening the social foundation of the southeast of Amsterdam. Nine partners are part of this deal, amongst others a housing cooperation, the community center, and a primary school (Cocratos, 2022).
'De Groene Hub' in collaboration with Cocratos tried to make the interventions **tangible and with added value** for the residents who participate. An example of this is that they promoted to sew your own curtains to save money. Next to the saving of money, it also decreases the use of fossil fuels, and therefore the emission of greenhouse gases (Cocratos, 2022).

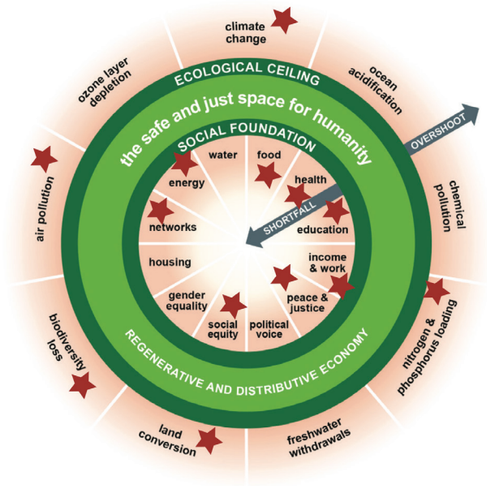

Figure 244: Tackled challenges by collecting organic waste (made by author, based on Cocratos, 2022)

Another thing 'De Groene Hub' does, is setting up a **program which stimulates people** to think about where their skills lay and what they can add to the district. Nancy was part of this program. She started to host cooking classes and make videos to reduce food waste. She started this because she loves cooking (New Energy TV, 2022).

'De Groene Hub' got funding from the municipality for two years, but to sustain this initiative they **looked for partnerships and funding right away**. One of the employees of Cocratos underlined the importance of this to establish a sustainable initiative (New Energy TV, 2022).

Minalesh Tera, Addis Ababa (Ethiopia)

In Addis Ababa (Ethiopia) the waste collection system is completely different from the system in the Netherlands. They do not have either a formal or an informal strategy for waste collection. The government is only fixing the transportation from the collection points to the dump site (Heisel & Kifle, 2016).

This lack of collection strategy in combination with the absence of (affordable) products on the market is the reason the emergence of an informal system. It is a complex system which starts with people, called **'Korales'**, who walk around in districts and ask residents if they have something they want to get rid of (Heisel & Kifle, 2015). To maximize the profit and effectiveness the districts are divided between the different Korales (Heisel & Kifle, 2016). If residents have something they do not use anymore, the Korales buy from them and sell it to collectors, who sell it then to traders or artisans. In this system 10 to 20 people are involved per item (Heisel & Kifle, 2015). As can be seen in the figure below (245), the system is complemented by other actors such as foragers and trash scavengers.

As stated before, one of the reason this system emerged was the absence of certain products on the market. A lot of people who live in Addis Ababa migrated from (more) rural areas in Ethiopia. In these areas, people have traditions that require **specific products**. These could not be bought in the city. Because of this (informal) system in place a lot of these are now made with recycled materials (Heisel & Kifle, 2016).

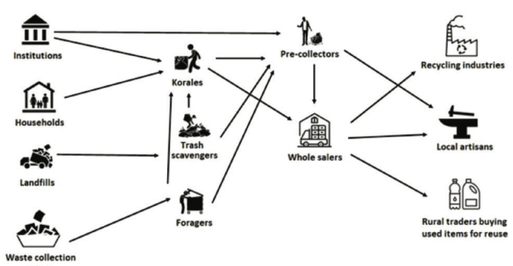

Figure 245: System Minalesh Tera (UNDP, 2020)

Oumi Library, Helsinki (Finland)

In the public library in Helsinki (Finland), a **'modern library'** is integrated in the buildings' program. One can use multiple machines and facilities free of charge. Examples of this are: A3 scanners and laser cutters, acoustic instruments studio, PCs, sewing machines, and a photo- and video studio.

Next to the fact that this is valuable to the community and (might) increase the social cohesion, it also efficiently limits the consumption of (new) products and therefore the extraction of (virgin) materials. Many of the machines and facilities this library offers are not needed to be bought by everyone themselves, because these products are not used on a daily base.

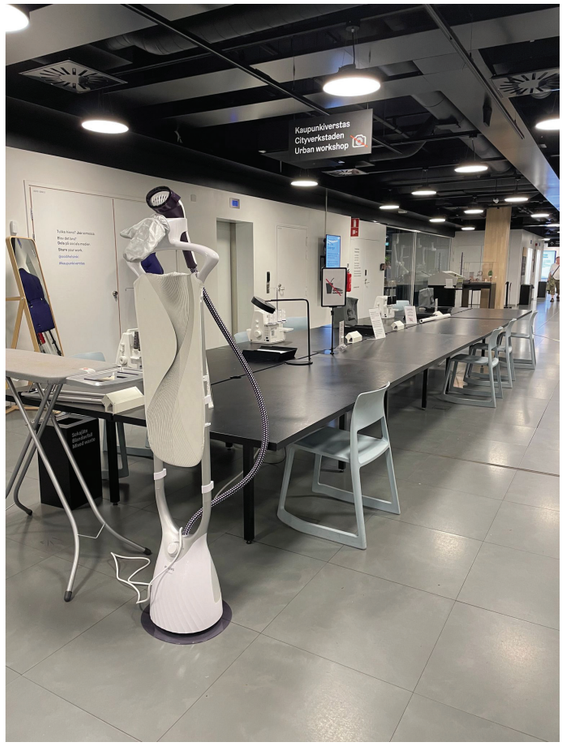

Figure 246: Oumu library, Finland (made by author)

'Statiegeld' next to the waste bin (Finland) & Can-collectors in (Stockholm, Sweden)

In Finland regular waste bins are extended with a section where you can put in your cans or bottles. People who want to supplement their income can walk past the waste bins and deposit these cans and bottles and receive money in return.

In addition to this, the author noticed that in Stockholm people walk around public parks with big bags in which they collect empty cans and bottles as well. They come up to you while you are sitting and/or picnicking in a park and ask if they can have your cans and bottles. Most people are happy to give them to these people because they must dispose less waste in this way. At the same time the collectors are also happy. Developing ideas for the transition towards a circular economy should involve more **win-win situations** like this.



Figure 247: Tube on waste bin, Finland (made by author)

Shopping in Amsterdam

On the next few pages, the location of various types of shops in Amsterdam are illustrated. These analyses were done to place the shops in the Indische Buurt in relation to the rest of Amsterdam. Is it likely that people from other neighborhoods come to shop in the Indische Buurt? And, are residents of the Indische Buurt likely to shop in their own neighborhood or in others?
These types were chosen to analyze because these are the main products households consume. Either it is a consumer good or food-related.

It can be concluded that in the Indische Buurt quite a lot of shops are concentrated. Especially in the Javastraat this concentration is apparent. It is therefore likely that people from other areas of Amsterdam come to shop in the Indische Buurt.
If someone wants something of a specific brand, they need to buy it outside of the Indische Buurt. Next to this, the district does not have every type of specialized food store.

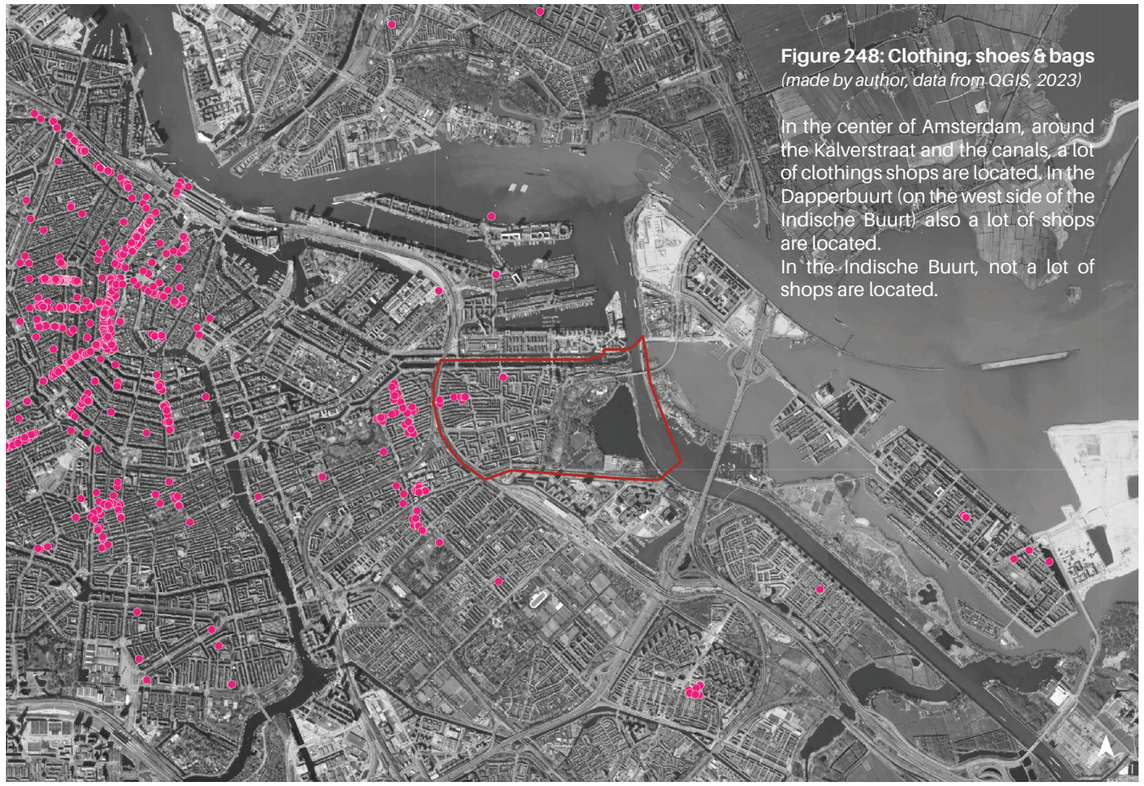

Figure 248: Clothing, shoes & bags
(made by author, data from QGIS, 2023)

In the center of Amsterdam, around the Kalverstraat and the canals, a lot of clothings shops are located. In the Dapperbuurt (on the west side of the Indische Buurt) also a lot of shops are located.
In the Indische Buurt, not a lot of shops are located.

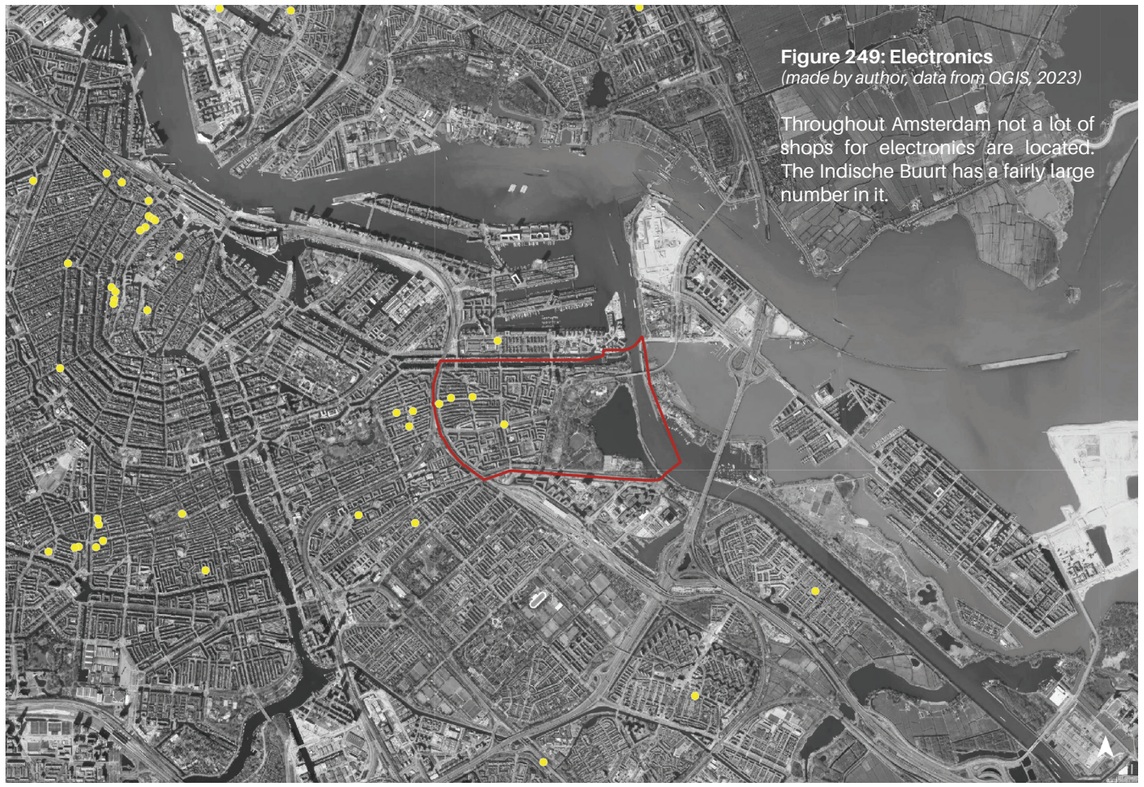

Figure 249: Electronics
(made by author, data from QGIS, 2023)

Throughout Amsterdam not a lot of shops for electronics are located. The Indische Buurt has a fairly large number in it.

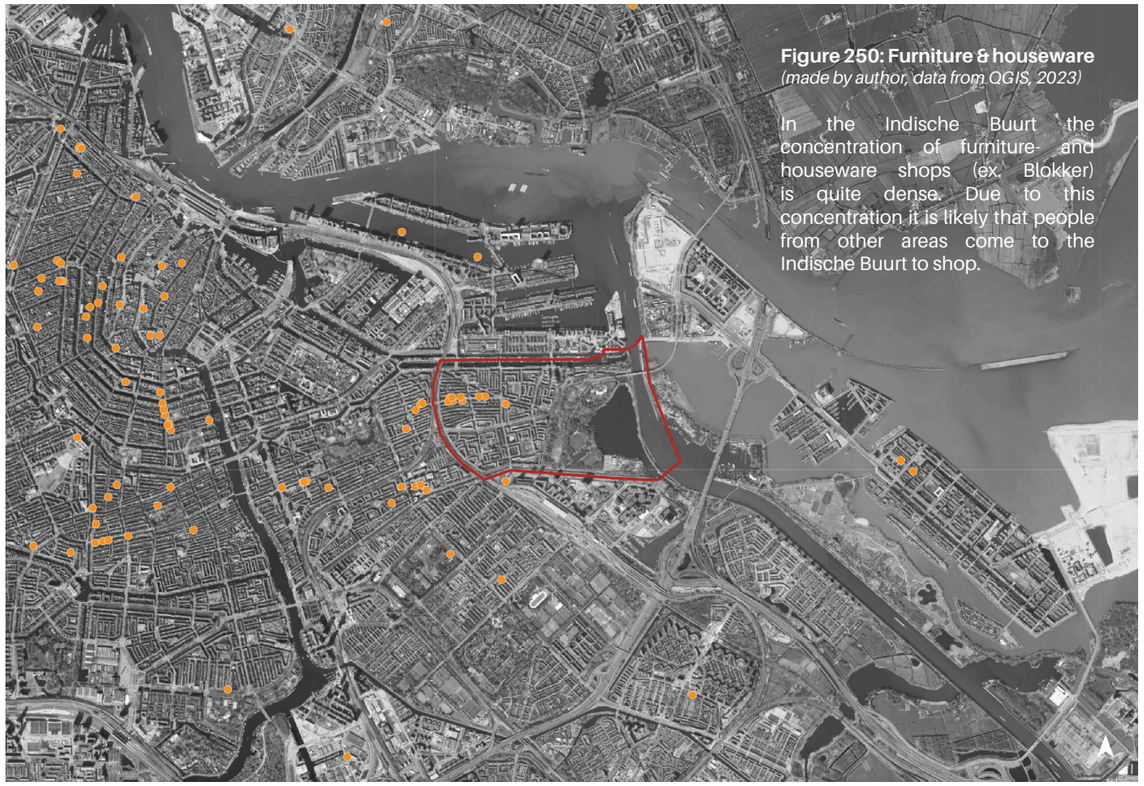

Figure 250: Furniture & houseware
(made by author, data from QGIS, 2023)

In the Indische Buurt the concentration of furniture and houseware shops (ex. Blokker) is quite dense. Due to this concentration it is likely that people from other areas come to the Indische Buurt to shop.

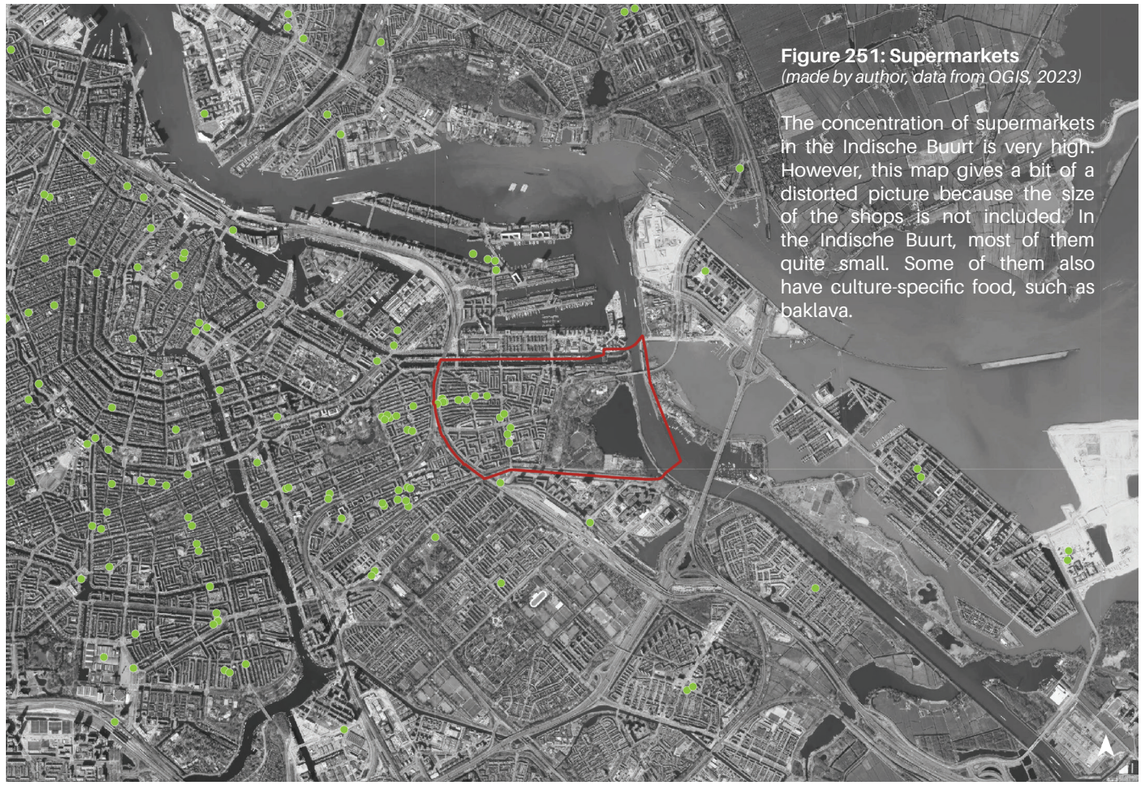

Figure 251: Supermarkets
(made by author, data from QGIS, 2023)

The concentration of supermarkets in the Indische Buurt is very high. However, this map gives a bit of a distorted picture because the size of the shops is not included. In the Indische Buurt, most of them quite small. Some of them also have culture-specific food, such as baklava.

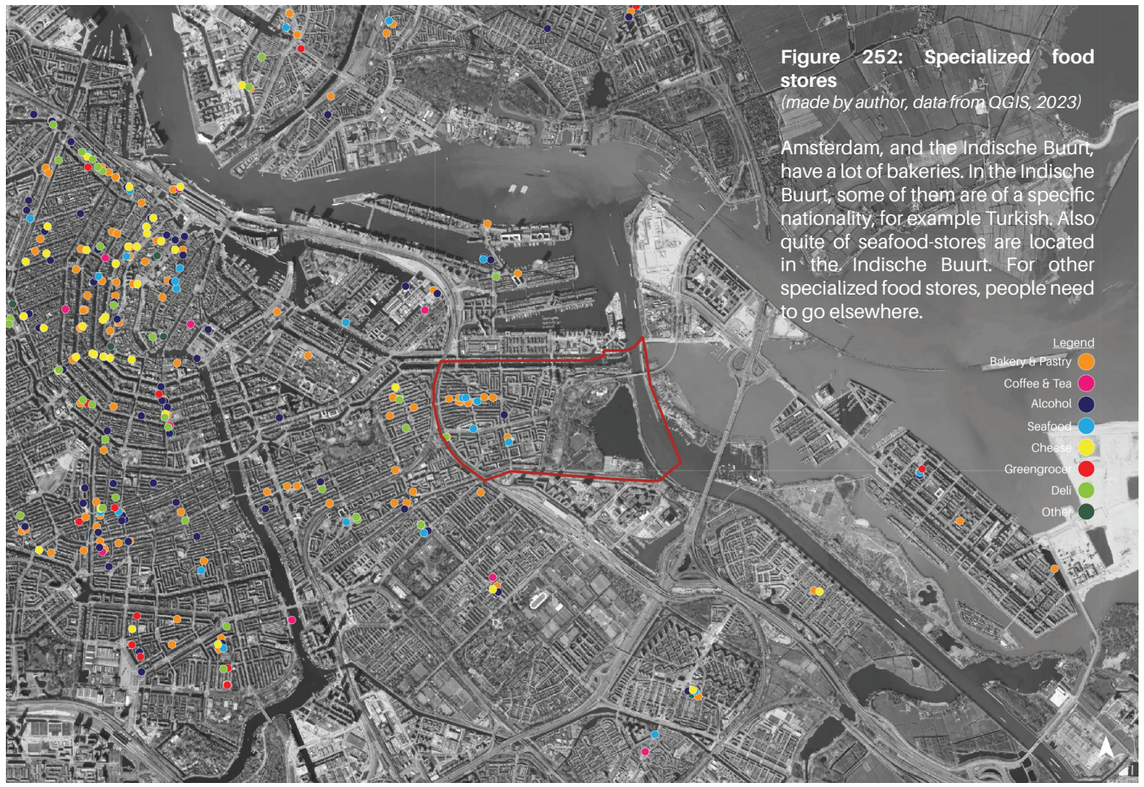

Figure 252: Specialized food stores
(made by author, data from QGIS, 2023)

Amsterdam, and the Indische Buurt, have a lot of bakeries. In the Indische Buurt, some of them are of a specific nationality, for example Turkish. Also quite of seafood-stores are located in the Indische Buurt. For other specialized food stores, people need to go elsewhere.

Implementing My Own Thesis

On Saturday September 7th, I decided to stain the bench which is outdoor in front of my home. I bought this bench awhile ago at Marktplaats, and the lacquer came off. I stained it again to protect the bench from the rain and snow that was coming. Therefore I can enjoy it for a longer time, and can postpone the moment that I need to buy a new one.
The space inside my home is limited. Therefore I decided to stain it on the sidewalk, on one of the last sunny days this year. I experienced that it increased the social interaction I have had in my street. One of my neighbors borrowed me his sander; another neighbor really liked the end results. And, a woman who passed by advised me to stain it two times and sand it in between, 'to enjoy it for many years to come'.

What I also noticed, is the fact that I now have some kind of "connection" with this bench. Due to the amount of time I have spend to take care of it, I think I will now keep it for longer.

Altogether, I am really happy with the end result and hope to own it for a long time to come!



Figure 253: Before (made by author)



Figure 254: After (made by author)



Figure 255: Process (made by roommate)

Hand-Out ‘Implement It Yourself’

At the end of my P5-presenation, I have distributed a hand-out to the audience. This is printed on the backside of old drawings I have used during the process of my thesis. This idea behind it is to stimulate the audience to be aware of their behavior, and implement the R-strategies in their daily lives.

EN

Refuse

Think twice if you need an extra garment.

Take a walk, go gardening, or play squash instead of a day full of shopping day with a friend.

Try not to have too much rice/pasta/potatoes to cook but just enough. These foods are among the most thrown away in the Netherlands.

Rethink

Don't buy your own hedge trimmer, but ring your neighbour's doorbell. Then you will also have a chat with him/her again.

Too little change? Create a common shed (or app group) with other street residents where items can be shared.

Reduce

Opt for a product manufactured circularly and/or with fewer materials.

Re-use

Don't throw away items that are still usable; take them to a second-hand shop; put them on *‘marktplaats’*; or give them to a friend or neighbour.

Repair

Many places organise 'repair cafes' these days, google that! You can go there with a broken product & learn how to fix it yourself next time.

Don't put that one lamp in the rubbish but get the cord repaired or do it yourself!

If you choose to buy a new (or refurbished) phone, hand in your old phone so it can get a new lease on life.

Refurbish

Remanufacture

Hand in old and/or unnecessary items, so components of these can be used for a new product.

Repurpose

Make something new with the old paper or plastic packaging. Crochet with plastic bags, like in the Indische Buurt (‘*Haak-In*’)?

Recycle

Separate & recycle all the material you want to get rid of, that way the value can be preserved as best as possible.

Recover

Rather we skip this step, but.... if you do have residual waste, we just hope the waste plant will burn the waste and generate energy from it.