



REIMAGINING DUTCH POST-WAR NEIGHBOURHOODS

Utilizing Urban Design Principles for Urban Renewal

*Master Thesis Environmental Infrastructure Planning
Faculty of Spatial Sciences*



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Reimagining Dutch Post-War Neighbourhoods: Utilizing Urban Design Principles for Urban Renewal

by

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Abstract

This thesis explores how Jan Gehl's urban design principles can be used to enhance Dutch post-war neighbourhoods, ultimately improving the quality of life for the residents. By analysing Gehl's theories and principles, the research aims to develop recommendations for these neighbourhoods. The study focuses on the case study of Vinkhuizen, a post-war neighbourhood in the city of Groningen.

The research strategy aligns with the Urban Planning Process. The framework of the Urban Planning Process involves a continuous cycle of engagement, objective establishment, issue identification, plan-making, and evaluation (Marasinghe et al., 2023).

Both quantitative and qualitative data were gathered through surveys among residents of Vinkhuizen and interviews with experts Jan Gehl and Theo Adema (Municipality of Groningen). Survey data and interview insights were separately analysed to identify recurring themes and patterns. The responses on the surveys were varied. Some statement indicated a diversity of opinions among the participants. However, other statements revealed a clear consensus on certain aspects of the neighbourhood. Experts shared their findings and critics. Gehl pointed out that Vinkhuizen is a neighbourhood with potential for revitalization.

The results provided information about the opportunities and challenges that the neighbourhood is facing. These findings informed the Objective Establishment stage, where specific, actionable objectives were developed to enhance Vinkhuizen's urban environment based on Jan Gehl's principles. The establishment objectives included enhancing accessibility, incorporating mixed-use functions, improving safety in traffic, enhancing indoor-outdoor connectivity, and creating inviting public spaces. The objectives served as a guide for applying Gehl's design principles into a new design made for a street in Vinkhuizen (Opaalstraat), including potential improvements in liveability based on community and expert feedback.

The study concludes that Gehl's principles offer a robust framework for revitalizing Dutch post-war neighbourhoods and have the potential to guide urban renewal projects across the Netherlands, promoting human-scale urban planning and addressing diverse neighbourhood challenges.

1. Introduction

Cities are crucial in tackling global challenges through thoughtful planning, design, and management. This recognition has grown since 2007, a milestone when urban populations worldwide exceeded rural populations. It underscores the importance of cities adapting to changing environmental, social, and economic conditions (UN-Habitat, 2022). Everywhere around the world, the city attracts attention. Social and economic activities are increasingly taking place in large urban agglomerations. Policymakers and researchers even speak of an 'urban age' in which social and economic activities are increasingly concentrated in large urban agglomerations. Urban regions function as cores for innovation and entrepreneurship, where citizens, businesses, educational institutions, and governments come together and benefit from each other's knowledge and creativity (Nabielek & Hamers, 2015).

Design plays a crucial role in organizing the environment. In addition to the design of buildings, urban planning involves organizing the space between buildings and all elements that are part of the environment, such as streets, squares, green areas, and water (Blom et al., 2004). For urban design, it is essential to consider the relationships between the environment (natural and built) and people. This concept is illustrated in Figure 1. The figure shows the interactions among the core elements in urban design: people, the built environment, and the natural environment. These relationships involve spatial organization between the various elements, as well as the interactions between these elements and their users (Matan, 2011).

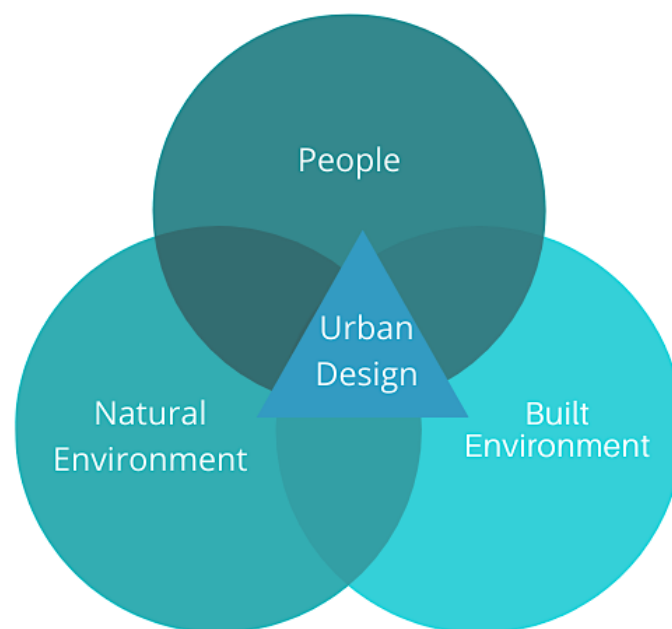


Figure 1 Diagram illustrating interactions among the core elements in urban design. Adapted from Matan (2011).

Urban planning involves both preparing for future challenges and responding to current issues. Sometimes, planners anticipate and develop solutions for problems that have not yet occurred. Other times, they react to pressing issues that demand immediate attention (Levy et al., 2009). Studying and understanding urban history provides valuable lessons that can guide current decisions and strategies concerning urban issues. An example is understanding the development of Dutch post-war neighbourhoods, which hold a unique place in the housing history of the Netherlands (Ewen, 2016; Rijk, 2005). This era offers valuable lessons for contemporary challenges in the development of post-war neighbourhoods in the Netherlands and the issues that have emerged in these areas over time. After the Second World War, the Dutch government faced challenges due to a significant housing shortage. To address this, a ministry for public housing was established. This new ministry focused on reconstruction and resolving the housing crisis. The primary goal of the public housing policy was to ensure an adequate supply of quality housing (van Dijk et al., 2019). From 1945 to 1970, the number of homes in the Netherlands grew from 1.5 million to 3.5 million. Modern principles like light, air, and space were key in the design of Dutch post-war neighbourhoods (Mens, 2019). However, prioritizing quantity over quality compromised the living standards of residents in these neighbourhoods (Rijk, 2005). As post-war neighbourhoods got older, their bad reputation grew worse due to poor maintenance and declining public spaces (Mens, 2019).

1.1 Background of the research

The post-war neighbourhoods, built during the reconstruction period (1945-1975), form a significant part of the country's housing stock (Mens, 2019; Rijk, 2005). Post-war neighbourhoods were heavily influenced by the socioeconomic conditions and urban planning ideologies of that time (Rijk, 2005).

Sixty years later, many post-war neighbourhoods are confronted with socioeconomic and societal challenges along with physical decline and need renovation (Blom, 2012). Household compositions and housing preferences have changed, and so have standards for comfort and sustainability (Mooi NL, 2024). The current state of these neighbourhoods does not meet today's housing standards (Mens, 2019). However, post-war neighbourhoods do present opportunities. The presence of light, air, and space remains an important factor in housing choices today. These qualities, along with their location within cities, may present opportunities for addressing the challenges (Rijk, 2005).

Revitalizing their original qualities and embracing innovative design principles can help these places regain their significance and develop into vibrant and inclusive communities in modern times (Drontmann, 1997).

Architect and urban designer Jan Gehl advocates with his design principles for human-centric urban planning that prioritizes pedestrian-friendly environments, promotes social interaction, and fosters sustainable urban development (Gehl, 2010). This research focuses on applying Jan Gehl's design principles to enhance Dutch post-war neighbourhoods. By applying these principles, the research aims to address the challenges of these neighbourhoods and help them grow into vibrant, modern places that meet today's community needs.

Functionalist neighbourhoods

Post-war neighbourhoods are known as 'modernist' or 'functionalist'. However, functionalist neighbourhoods in the Netherlands date back to the 1930s. These neighbourhoods represented the mass expression of the emerging idealism of the 1920s and 1930s when social-democratic city officials and architects sought to provide the working class with spacious, healthy, and green living environments (Lörzing and Harbers, 2009).

In the mid-1920s, there was a shift where aesthetic innovation began to be increasingly associated with, or even replaced by, social goals. Especially in residential architecture, builders started aligning their practices with emerging municipal and national welfare agendas (Kuchenbuch, 2016). Many progressive architects emphasized their ability to apply scientific methods. They felt constricted to do so to provide the masses with clean and affordable housing (Haan & Haagsma, 1981). Architects were moving away from the idea of architecture as solely art. Instead, they positioned themselves as social experts. To achieve this, social housing based on standardized components and adapted to industrial production methods was developed. The significant impact of this rationalization is evident in the overflow of building manuals published in the 1930s. These manuals often included statistical data on norms and standards, as well as body measurements of men and women. These aimed to enhance both the efficiency of architects' practices and the spaces they designed. One notable example is Ernst Neufert's "Bauentwurfslehre" (Figure 2), providing comprehensive guidelines and principles for a systematic approach to architectural design and planning. The guide is still widely used today (Kuchenbuch, 2016).

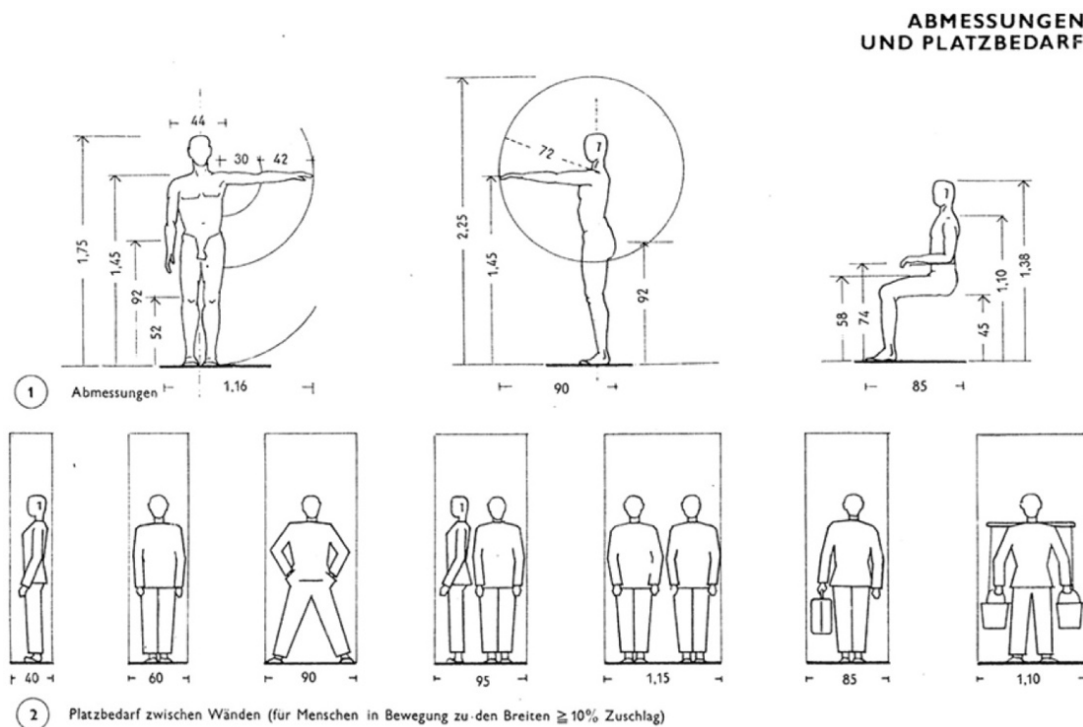


Figure 2 Bauentwurflehre by Ernst Neufert (Kuchenbuch, 2016)

From 1928 onwards, international conferences on urban renewal were held (Haan & Haagsma, 1984) when CIAM (Congrès Internationaux d'Architecture Moderne) was founded by European functionalist architects including Le Corbusier (Mumford, 2019).

Various ideas of CIAM were influenced by Ebenezer Howard's Garden City Movement (Domhardt, 2012). His idea pursued healthier living by integrating urban and rural elements. Garden Cities promoted village-like areas with generous green spaces and private gardens to reconnect people with nature (Kullberg, 2006; van Hellemond, 2021). Inspired by Howard's ideas, CIAM members adopted the concept of integrating green spaces into urban environments as a functional element within the urban setting, but primarily for recreation, without ecological or organic integration like in the Garden City (Rijk, 2005). For the first time in European history, greenery became a determining factor for the urban design (van Eesteren Museum, 2023). Moreover, unlike Howard's holistic blending of urban and rural elements, CIAM prioritized functional zoning (van Hellemond, 2021). Le Corbusier's principles, laid out in the Charte d'Athènes (1933), emphasized the need for air, light, and space in homes, advocating for open high-rise buildings surrounded by green spaces. CIAM's vision included segmented urban functions and standardized living spaces to maximize efficiency. While the Garden City Movement concentrated on human-scale improvements, the functionalist approach emphasized the collective aspects of urban development. Post-war neighbourhoods reflect these transformative functionalistic principles, particularly those advocated by CIAM (Rijk, 2005).

Between the 1930s and 1950s, CIAM ideology further influenced urban planning, particularly in urban extensions. The approach involved dividing the new city into zones where a specific function predominated. Often, this division relied on statistical analysis, determining the percentage of each demographic group based on age and family structure. Each zone was designated for a primary function, such as residential, industrial, recreational, or infrastructural. Between the different zones, urban green spaces were positioned (Komossa and Aarts, 2019). Despite the good intentions of the designers, using the same elements repeatedly, focusing too much on everyone living the same way, and not mixing different activities made the neighbourhoods predictable. The characteristics of the functionalist neighbourhood led to uniformity within the districts (Lörzing and Harbers, 2009).

Organic City Growth

By the 1960s, a new movement emerged against the limitations of Functionalism, criticizing its overly simplistic approach to urban complexity and social dynamics (Rijk, 2005). Functionalism did not take the diverse and unpredictable nature of human life into account. This resulted in a shift towards more flexible and adaptable urban designs (Matan, 2011). Jane Jacobs and Jan Gehl played prominent roles in this movement. In contrast to the structured zoned urban landscapes of Functionalism, Jacobs and Gehl advocated for an organic approach to urban planning, focusing on human-scale and vibrant street life (Hirt & Zahm, 2012). In her work *The Death and Life of Great American Cities* (1961), Jacobs criticized modernist planners for overlooking the complexities of everyday urban life. She argued that functionalist designs, which separated residential, industrial, and recreational areas, hindered the natural interactions and diversity crucial for vibrant urban environments (Gehl, 2011). Jacobs blamed standardized

design and building codes for the decline of American cities (Masemann, 2024). Jacobs focused on creating neighbourhoods with a mix of functions, aiming to foster lively, connected communities instead of isolated functional zones (Rosenberg, 1994). Jan Gehl shares similar ideas with Jane Jacobs regarding the importance of human scale. In *Life Between Buildings* (1971), Gehl advocated for designing cities that prioritize pedestrians and social interactions. His work emphasizes the need for urban spaces on human scale (Gehl, 2011). This also aligns with the concept of the organic city, where urban development evolves naturally to meet the inhabitants' needs. This perspective contrasted sharply with Functionalism and Le Corbusier's belief that urban design was too important to be left to residents and required top-down planning. The organic city evolves from individual decisions of residents. Le Corbusier viewed the organic city as outdated and lacking systematic organization (Matan, 2011).

The reinvention and appreciation of the organic city marked a significant shift in urban planning. Moving away from the uniformity and predictability of functionalist designs, planners began to embrace the complexity and dynamism of cities as evolving ecosystems. Sociologists suggested that people thrive more in neighbourhoods that have grown organically, rather than those designed top-down (Reinders, 2013). This organic approach recognizes the interconnectedness of urban elements (Kolkman, 2012). Jacobs and Gehl's insights have been crucial in redefining urban planning, emphasizing the importance of human-scale design and the integration of diverse urban functions (Matan, 2011).

The Relevance of Post-war Neighbourhoods

After World War II, there was a significant increase in functionalist buildings and urban planning in the Netherlands, particularly during the reconstruction period starting in 1945 (Lörzing and Harbers, 2009). The increased focus on spatial policy was driven by the post-war reconstruction, population growth, and the transition from farming to industry. Government initiatives started to involve experts from various fields to shape spatial policies, focusing on urban renewal to strengthen city centres (van Dijk et al., 2019). Standardized construction methods facilitated rapid and affordable housing development, which was essential for addressing the severe housing shortage (Reinders, 2013). Initially, these neighbourhoods were attractive to new inhabitants who were drawn to their modern appeal, including wealthy families escaping city congestion (Posthumus et al., 2012). However, by the mid-20th century, negative perceptions emerged about these city outskirts. The suburbs started to be seen as declining and neglected. The areas had transformed into havens for marginalized groups—people with low incomes and few housing choices (Reinders, 2013).

Since the 1980s, these neighbourhoods have increasingly been confronted with social issues like an aging population, out-migration, and urban decay, confirming the concerns raised by critics in the 1950s and 1960s (Mens, 2019).

Gehl and the Post-war Neighbourhoods

Among these critics was Jan Gehl, who advocated for people-centric design. He noticed that modern design focused on making pretty patterns from above, but it did not think about what people actually needed or wanted in cities. Gehl attributes the decline of liveable streets and the diminishing sense of community in cities to the well-intentioned efforts of modernists like Le Corbusier. Gehl argues that Functionalism disrupted urban spaces because its ideas were out of touch with reality. Instead of creating pleasant areas with nature or quiet spots, it focused too much on practical things like parking (Matan & Newman, 2016). The creation of large, multistorey modernist residential complexes with significant distances between various functions, has led to the decline of street life and the disappearance of intimate gathering spaces. Similarly, the spread-out nature of low-density, single-family suburbs have reduced outdoor communal activities due to the wide dispersal of people and events (LeGates & Stout, 2011). This is evident in Dutch post-war neighbourhoods as well. Currently, liveability lags in these neighbourhoods compared to the city-centres. The residential areas built after World War II are typically characterized by functionalist architecture, car-oriented planning, and a lack of emphasis on the human scale and quality of life (Havinga et. al., 2020).

Nonetheless, this does not mean post-war neighbourhoods are all failures. Gehl admits that modernism did some good things, like giving everyone access to sunlight and being able to build things quickly and in large numbers (Dickinson, 2022). There are still qualities in these neighbourhoods that contribute to their significance and resilience (Lörzing and Harbers, 2009). Many opportunities exist to transform these areas into appealing alternatives to inner-city living, but they are often overlooked. As Gehl argues, a way to decrease the pressure on the (inner)city is to ensure that the suburbs are pleasant places (Baggerman, 2021). His principles and theories that prioritize people and their needs and well-being in urban design (Gehl, 2011), offer a valuable framework for reshaping post-war neighbourhoods into more vibrant and liveable spaces.

1.2 Research gaps and relevance

The research on revitalizing Dutch post-war neighbourhoods through applying Jan Gehl's urban design principles has significant relevance in the urban development discourse. Jan Gehl emphasizes the importance of human-scale design in neighbourhoods, arguing that well-designed spaces can inspire and uplift inhabitants, whereas poorly designed environments can negatively impact citizens (Gehl, 2011).

Dutch post-war neighbourhoods are often characterized by a certain uniformity and repetition of urban planning elements which leads to recurring problems and shortcomings across these neighbourhoods. Studying these places provides insight into broader patterns and structural issues related to urban development and improvement, which is crucial for developing effective revitalization strategies. These insights can be applied to enhance the liveability and quality of various post-war neighbourhoods (Drontmann, 1997).

Furthermore, these neighbourhoods are a significant part of the housing stock (Mens, 2019). Due to their organized layout and features such as uniformity, there is potential to expand and speed up this transition process. This is necessary because the Netherlands is facing a transition challenge. Climate change, demographic shifts, emerging societal trends, and technological advancements demand a new approach to how to shape the country (Mooi NL, 2024). Additionally, the Netherlands deals with challenges due to being one of the most densely populated and urbanized countries in the world (van der Valk, 2002). The increasing lack of space requires innovative solutions to accommodate multiple functions within a limited area. The transition from a focus on quantity to an emphasis on quality in public housing highlights the importance of prioritizing factors such as social well-being, accessibility, and aesthetically pleasing public spaces over sheer quantity. This transition is essential to address the changing needs and preferences of modern urban residents, which are characterized by a preference for high-quality living environments (van Dijk et al., 2019). In environments with limited space, overcrowding risks, and a demand for high-quality living conditions, Jan Gehl's principles offer valuable solutions. Gehl's understanding of how we interact with our surroundings provides important tools for improving the design of public spaces, resulting in enhancing the quality of life in cities. He advocates for well-planned, human-scale public areas that are sustainable, healthy, safe, and vibrant. A sense of community and well-being are central in his design (Gehl, 2011). Densifying local areas allows for the creation of new housing units and creates safer, more attractive living environments. This is consistent with the often-overlooked idea that functionalist neighbourhoods have potential when approached with thoughtful urban design strategies (Lörzing and Harbers, 2009).

In conclusion, the research on revitalizing Dutch post-war neighbourhoods using Gehl's urban design principles presents an approach to address contemporary urban challenges that are being faced in the Netherlands due to the increasing shortage of space and housing. While existing research highlights the potential benefits of Gehl's principles, it mainly addresses general applications and lacks empirical evidence on Dutch post-war neighbourhoods. Empirical research is needed to evaluate the practical outcomes, challenges, and opportunities of applying Gehl's principles in these contexts. This study aims to fill this gap, by providing empirical insights into how Gehl's principles can be implemented in Dutch post-war neighbourhoods.

This research seeks to offer practical insights that can inform and guide revitalization efforts, focusing on the potential of creating more liveable, inclusive, and environmentally conscious urban places.

1.3 Objective and research question

The research aims to explore how Jan Gehl's urban design principles can be used to enhance Dutch post-war neighbourhoods, ultimately improving the quality of life for the residents. By analysing Gehl's theories, the research seeks to develop recommendations for these neighbourhoods. The focus is on understanding how Gehl's principles can be applied to suit the specific context and challenges of the Dutch post-war neighbourhoods. Based on this research objective, the following research question will be central:

How can the urban design principles of Jan Gehl be concretely applied into practice in the specific context of the Dutch post-war neighbourhood 'Vinkhuizen' to enhance residents' quality of life?

The question focuses on the factors and conditions that need to be considered and addressed to enhance the quality of life in these neighbourhoods. To increase the visibility of applying these design principles, a neighbourhood design will be developed, drawing directly from insights gained through the research. This design aims to explore the potential application of these principles in Dutch post-war neighbourhoods.

The following sub-questions will be discussed in the thesis to answer the central research question above:

1. What are the key urban design principles advocated by Jan Gehl?
2. What defines the characteristics and presents challenges for the quality of life in the Dutch post-war neighbourhoods?
3. What are the potential barriers and opportunities expected to arise during the implementation of these principles?
4. How would a concrete neighbourhood design, informed by Jan Gehl's principles, be envisioned, and developed for Dutch post-war neighbourhoods?
5. What strategies or interventions could be used to effectively integrate Gehl's principles into the design and planning process of Dutch post-war neighbourhoods?

1.4 Thesis outline

Figure 3 shows a flowchart with an overview of the different steps taken in this research. Chapter 2 discusses the key urban principles advocated by Jan Gehl and the concepts relating to these principles such as human-scale design and sense of community. Furthermore, the different characteristics and challenges of post-war neighbourhoods will be discussed. This literature research results in the foundation of the principles of Gehl that are used in this research. Chapter 3 entails an explanation of the research strategy and the research methods. Surveys and interviews were conducted and are the key components of the data collection. A description of the case study of Vinkhuizen is included in Chapter 4. In Chapter 5, the findings of the data collection will be presented. The findings form the foundation for developing the neighbourhood's design, which is presented in Chapter 5 as well. Chapter 6 will discuss the findings and provide a conclusion. Chapter 8, Reflection, covers the limitations and possible future research.

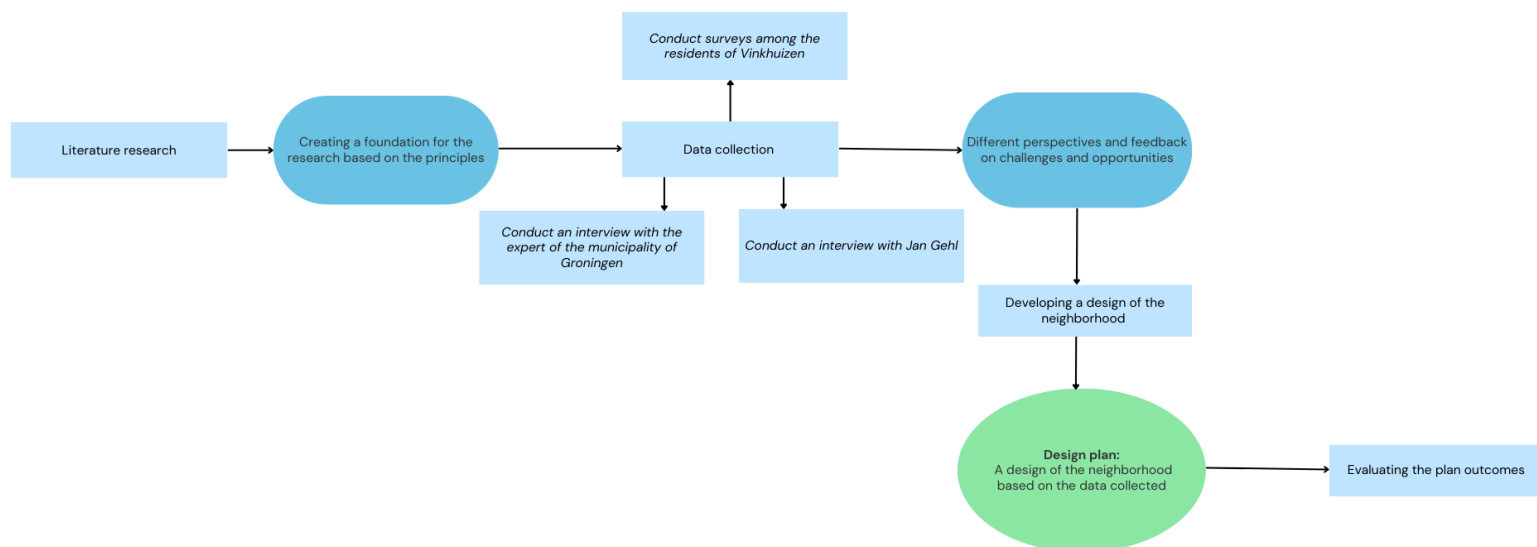


Figure 3 Flowchart of different steps within the research process

2. Theoretical framework

2.1 The Dutch Post-War neighbourhood

Dutch post-war neighbourhoods, developed between 1945 and 1965, were planned with a functionalist approach including a clear planning method based on socioeconomic and demographic research (Harbers, 2009; Reinders, 2013). Characterized by a stripe-and-stamp structure, they were designed for quick and cost-effective construction, crucial for tackling the severe housing shortage of the time (Dalhuisen, 2006; Reinders, 2013). The planning prioritized the separation of functions, organizing living, working, traffic, and leisure into distinct areas (Kolkman, 2012). The layout included plenty of green spaces and a hierarchical network of roads and paths (Dalhuisen, 2006; Harbers, 2009). The architecture avoided decorative elements, aiming for simplicity and functionality, which often resulted in monotonous environments (Lörzing & Harbers, 2009). The new areas featured a straightforward, logical design, contrasting sharply with the cluttered 19th-century European city (Reinders, 2013). Post-war neighbourhoods feature a mix of mid-rise flats (known as portiekflats), single-family houses, and high-rise flats, resulting in symmetry and clear boundaries. The neighbourhoods demonstrated that complete residential areas could be quickly built using stripe-and-stamp methods (Dalhuisen, 2006). To understand the development of post-war neighbourhoods, it is important to place them in their historical context and link them to significant societal changes (Mooi NL, 2024). During the war, many dwellings were destroyed: 86,400 were demolished (including 25,000 in Rotterdam), 43,500 were severely damaged, and 293,000 suffered light damage. Additionally, uninhabited houses, especially those of the Jewish population, were stripped of materials during the final winter of the war (Blom et al., 2004).

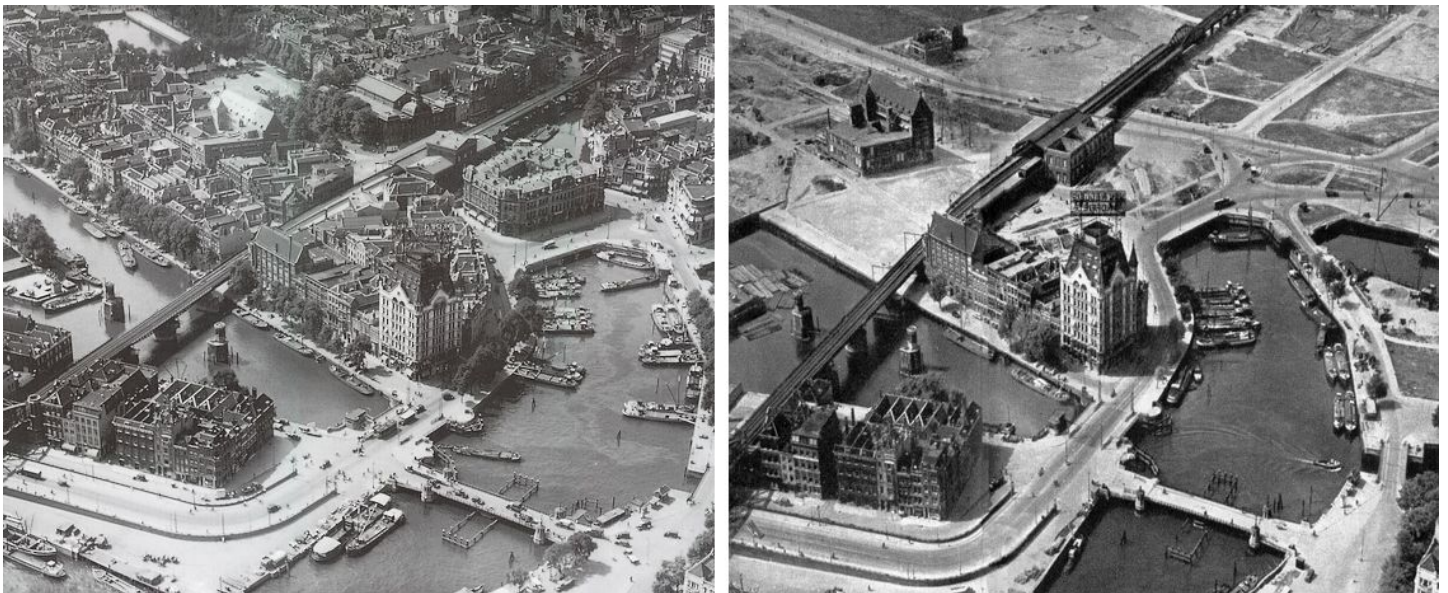


Figure 4 The city of Rotterdam before and after the bombs of 1940 (Wagenaar, 2023)

After World War II, there was a period of rapid technological advancements and demographic shifts (Haan & Haagsma, 1981). Blom (2012) describes this period as one of scarcity and optimism, positioned between the economic difficulties of the 1930s and the outbreak of war, and the movements for democratization and emancipation of the late 1960s. A population explosion occurred marked by an increased birth rate, decreased infant mortality, and an aging population. Societal changes like smaller family sizes and the early independence of youth further shaped demographics, contributing to a housing shortage (Haan & Haagsma, 1981). Solving this shortage became a top priority. Several ministers labelled the crisis as 'Public Enemy No. 1' and committed to scaling up the construction (Blom et al., 2004). The urgent need for housing puts pressure on the construction industry. To meet this demand, the industry had to quickly shift from traditional craftsmanship to industrialized building methods (Haan & Haagsma). Despite these efforts and progression, housing shortages persisted due to material shortages, skilled labour deficits, and lagging construction technology (Blom et al., 2004). Nevertheless, these bottlenecks encouraged modernization, technological advancement, and professionalization (Blom, 2012). Within a few decades, the construction industry transitioned from centuries-old craftsmanship to industrialized methods (Haan & Haagsma)

Initially, the post-war neighbourhoods were popular. The quality of the houses was relatively high compared to most pre-war houses. Furthermore, the residents had a clear view of nearby greenery where children could play safely. However, today, many of these neighbourhoods have lost their former prestige and are often described as dull and monotonous due to the absence of historical charm found in old city centres (Harbers, 2009; Blom, 2012). They are characterized by unappealing apartment buildings and gallery flats, where safety concerns discourage people from walking at night (Blom et al., 2004). The ground floors often consist of garages or blank walls, limiting interaction with the living environment. Moreover, the extensive building capacity contributes to neighbourhoods appearing monotonous, with few variations in housing types. This is worsened by the poor maintenance of public spaces and the separation of functions that transformed post-war neighbourhoods into primarily residential areas, lacking vibrant community life (Harbers, 2009). Many post-war neighbourhoods face socioeconomic and societal challenges along with physical decline (Blom, 2012). This contributes to issues like vandalism and feelings of insecurity among residents. Therefore, when renewing these areas, particular attention must be paid to addressing social problems. Municipalities and property owners are concerned about the monotonous structure of post-war neighbourhoods, with some areas having a low status and being less desirable for prospective residents. Households with limited housing options tend to move into these neighbourhoods since there is a higher proportion of social rental housing (Drontmann, 1997). In 2015, 47% of the housing in these areas was owned by housing corporations, compared to a national average of 30%. By the end of 2016, over 7% of residents in these neighbourhoods received welfare benefits, which is significantly higher than the national average of 3%. Additionally, the over 710 thousand inhabitants of these neighbourhoods often live near the poverty line (CBS, 2017). Structural issues such as urban layout, underutilized green spaces, traffic problems, and outdated amenities are deeply embedded in the framework of these areas, often characterized by functional zoning (Drontmann, 1997).

Despite these challenges, Dutch post-war neighbourhoods present unique opportunities for revitalization. Urban renewal efforts show that these areas can be improved by further developing their existing qualities and utilizing these better (Harbers, 2009). Post-war neighbourhoods combine historical context with urban planning principles, featuring mature green and water structures, spacious layouts, and generous green spaces that enhance their appeal to residents and urban planners (Lörzing & Harbers, 2009). Compared to later developments such as the VINEX neighbourhoods, post-war neighbourhoods offer more (semi)-public green space (Blom et al., 2004). Other positive aspects are the clear structural design and proximity to city centres, coupled with the flexibility to modernize individual blocks (Blom, 2012).

These neighbourhoods are often located in prime locations and have good connections to the city centre, and primary road networks (Dalhuisen, 2006). This design, while efficient for urban integration, can lead to issues such as noise from nearby highways. However, the presence of reliable public transport links to the city centre, including trams, trains, and metro lines, helps mitigate these challenges and enhances connectivity (Blom et al., 2004; Drontmann, 1997). Additionally, the neighbourhoods feature a high percentage of single-family homes (Blom et al., 2017). Despite the relatively modest size, the housing offers good value for money (Blom et al., 2004).

These different qualities of these neighbourhoods are important, yet often overlooked. Unfortunately, residents do not always fully benefit from these features (Harbers, 2009). By utilizing this potential in urban renewal projects, neighbourhoods can become more attractive, highlighting their heritage while integrating into the modernization process

Over time, appreciation for the architecture and urban planning of this period has grown, especially among historians, architects, and urban planners. The post-war reconstruction period is recognized as crucial to the recent history of the Netherlands, motivating efforts to preserve valuable parts of these neighbourhoods (Blom, 2012). After all, post-war neighbourhoods represent a unique mix of historical context, urban planning principles, and opportunities for revitalization, contributing to urban diversity (Drontmann, 1997).

2.2 Gehl's principles

Young urban residents are increasingly viewing post-war neighbourhoods as steppingstones in their housing careers, while the immigrant middle class sees opportunities here. This trend underscores the importance of careful management and listening to residents who are invested in the future of these neighbourhoods (Blom et al., 2017). Applying Gehl's principles can help unlock this potential.

To answer the question of how the urban design principles of Jan Gehl can be concretely applied into practice in the Dutch post-war neighbourhood 'Vinkhuizen' to enhance residents' quality of life, these design principles were investigated. This chapter discusses the theoretical foundation of Gehl's design philosophy, examining the core principles underlying his vision for urban spaces. By examining Gehl's principles through a theoretical lens, an attempt was made to clarify their conceptual foundations and implications for urban planning and design practice. Five planning principles are highlighted. In the book *Cities for People* (2010), Gehl discusses these five principles. According to Gehl (2010), an understanding of these basic planning principles is essential for considering the human aspect of urban design. The overview in Figure 5 presents the different principles, demonstrating how each one is connected to the central concept of urban design on human scale.

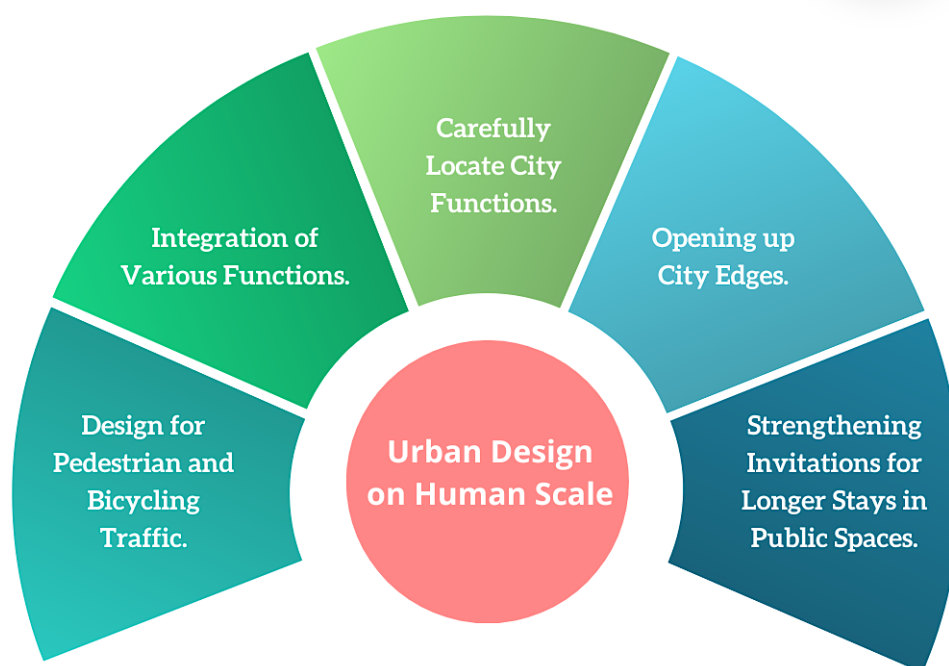


Figure 5 The design principles related to human-scale urban design (Gehl, 2010)

2.2.1 Distances

Carefully locate the city's functions to ensure shorter distances between them and a critical mass of people and events (Gehl, 2010, p. 151).

The first principle argues that the functions of cities should be carefully located, to minimize distances between the residents, events, and various functions (Gehl, 2010).

At the microscopic level, the width of spaces designated for human activity, movement, and engagement is essential. Gehl critiques modern urban designs, which often include paths and streets that are excessively wide compared to their actual usage. He advocates for reducing the dominance of motor vehicles and promoting activities that are on the human-scale, such as walking and cycling. Designing a street in such a manner can foster a dynamic and appealing environment (Musselwhite, 2022). The Human-Scale development approach, as advocated by economist Manfred Max-Neef and collaborators emphasizes the centrality of discussions on human well-being in development discourse (Cruz et al., 2009). At its core, the concept of "human-scale" embodies a nuanced perspective, focusing on the relationship between the human body and its immediate surroundings (Ye et al., 2019). This entails recognizing concrete elements that are directly perceivable and influential in people's daily lives. Max-Neef's proposal, made in the 1980s, aimed to empower grassroots movements and communities. This proposal focused on three core principles: fostering self-sufficiency, equitable relationships among individuals, institutions, and governance structures, and the satisfaction of basic needs (Guillen-Royo, 2018). Emphasizing a shift from narrow monetary pursuits, the Human-Scale development approach advocates for a holistic understanding of well-being, ultimately striving for enhanced overall welfare (Cruz et al., 2009).

Throughout the history of architecture, urban planning, and landscape architecture, theories concerning the human-scale urban environment have predominantly emerged from social science methodologies like surveys or subjective intuition and practical experience. Here, Human-Scale indicates a level of detail closely aligned with the dimensions of the human body and its immediate surroundings, directly visible, touchable, and relevant to everyday life (Long and Ye, 2019). Exploration of human-scale urban form—the shapes, layouts, and constructions of built environments—and its impacts have persisted since the 1960s. Early urban theorists like Jane Jacobs and Henri Lefebvre challenged modernist planning and design ideals, emphasizing the attributes of human-scale urban form and its positive influence on social and cultural dynamics (Long and Ye, 2019). The term 'human-scale' reflects a crucial ambition: to blend conflicting rationalities through social engineering. Recent studies describe it as an effort to apply modern technical and scientific approaches to reshape daily life towards a vision of a traditional, harmonious, and more humane society (Kuchenbuch, 2016).

Jan Gehl and other advocates have contributed to portraying human-scale urban form and its role in fostering vibrant centres of activity. In addition to qualitative insights, quantitative investigations have explored the relationship between physical human-scale forms and perceived quality (Long and Ye, 2019).

2.2.2 Functions

Integrate various functions in cities to ensure versatility, wealth of experience, social sustainability, and a feeling of security in individual city districts (Gehl, 2010, p. 151).

The distribution of activities across a wide geographical area is a common feature in the post-war suburban areas of high-income countries. Leading often to lifeless empty spaces, even though there might be good design features in the spaces. These "non-spaces" can become hubs for criminal activities, a phenomenon noted by both Jane Jacobs (1961) in her seminal work "The Death and Life of Great American Cities" and Oscar Newman (1973) in "Defensible Space."

Gehl advocates for integrating activities wherever possible. This can foster a mix of diverse activities occurring in nearby. The segregation of residential, public service, commercial, and work/study areas has led to environments where individuals rely on vehicles to access each separate location.

Jane Jacobs argues that urban diversity, characterized by varied combinations of land use and activities, fosters a socially and culturally vibrant environment, thereby enhancing the quality of citizens' lives. This concept of diversity has significantly influenced disciplines such as urban planning, community design, and urban studies (Yoshimura et al., 2022). In his book (Gehl, 2010), Gehl talks about integration which allows various activities and groups of people to function together or side by side. Segregation, on the other hand, implies a separation of functions and groups that differ from one another. Segregation-oriented planning is illustrated by a functionalistic city structure, in which the goal is to separate functions, resulting in monofunctional areas (Gehl, 2011). According to Kumakoshi et al. (2021), the link between high population density and a limited variety of activities in an area suggests that just having lots of people does not always make it lively. In monofunctional areas, groups of people or social functions are isolated from each other, leading to reduced contact with the surrounding society and a less diverse environment. While this approach may have improved systematic planning processes, reduced distances between similar functions, and increased efficiency, it has also led to decreased interaction with the surrounding society, resulting in a less vibrant and more homogeneous environment. An alternative approach is a more differentiated planning policy, where social relations and practical advantages are evaluated from function to function, and separation is only accepted when the disadvantages of assembling clearly outweigh the advantages (Gehl, 2011). Kumakoshi et al. (2021) show how different scholars have studied how mixing different types of activities, known as mixed land use, can boost city life in many ways, including getting more people to use public transport, improving public health, and stimulating economic growth. These findings highlight the importance of promoting a mix of activities (Kumakoshi et al., 2021). On a large scale, an integration-oriented urban plan makes a consistent effort to mix all functions that do not oppose or interfere with one another. Instead of zoning by function, it describes growth directions or areas for future expansion, specifying growth segments rather than specific functions. This approach fosters diverse and vibrant

communities where people from different backgrounds can interact and stimulate each other (Gehl, 2011).

2.2.3 Traffic

*Design city space so it is inviting and safe for pedestrian and bicycling traffic
(Gehl, 2010, p. 151).*

The perception of public spaces is influenced by our movement and surrounding environment, while the speed at which we travel through these spaces greatly influences our sensory experience. Human senses are optimized to process stimuli while moving at approximately 5 km/h, equivalent to walking speed. Architectural designs tailored to this pace offer a harmonious combination of wide views, such as distant landmarks like town hall towers, and close interactions with ground-level architectural features. In contrast, an infrastructure design accommodating 60 km/h vehicle traffic requires large spaces and noticeable signs to ensure that passengers can perceive details at this high speed. This contrast between pedestrian-friendly environments and vehicle-centric infrastructure creates tension within the urban landscape. Pedestrians are often forced to navigate environments optimized for faster traffic. Additionally, architectural innovations tend to prioritize the ability of roads to be used by vehicles, even in traditionally pedestrian-oriented environments (Gehl et al., 2006)

The quality of a city improves when more individuals are encouraged to walk and cycle. Sustainability within a city is reinforced when a significant portion of its transportation system prioritizes environmentally friendly modes such as walking, cycling, and public transport. This concept, known as ‘green mobility’, offers economic and environmental benefits by reducing resource consumption, emissions, and noise levels (Gehl, 2010). The urgency of decreasing the dominance of vehicles in city centres has been intensified by the climate emergency (Musselwhite, 2022). Motor vehicles contribute to environmental health risks through emissions of pollutants and noise pollution (Nijland & van Wee, 2006).

Moreover, public transportation systems become more attractive when users can safely and comfortably walk or bike to and from various forms of public transportation, such as buses and trains (Gehl, 2010). In his book ‘Life Between Building’ (2011), Gehl points out that planners need to consider subjective perceptions of risk and uncertainty, rather than relying solely on statistical risks, which play a crucial role in shaping outcomes. This highlights the importance of paying close attention to both specific aspects of traffic safety and the public’s perception of safety (Gehl, 2011).

Promoting walking and cycling as essential parts of daily life is important to promote a healthy urban environment. The inactive lifestyle promoted by reliance on automobiles for transportation is contributing to a rapidly increasing number of public health issues. Encouraging walking and cycling as integrated elements of daily life should be an essential aspect of health policies, according to Gehl (2010). In the Netherlands, cycling is common, although to a lesser extent than 50 years ago. This decrease is mainly due to the emergence of automobiles (Nijland & van Wee, 2006).

Cycling offers health benefits (Nijland & van Wee, 2006). By 2023, obesity affected 16 percent of adults aged 20 and over. This is an increase compared to the 1980s when only 5 percent of this age group were obese (CBS, 2024).

Additionally, Southworth (2005) highlights the increasing importance of walking for various reasons. Pedestrian transportation not only reduces congestion and has minimal environmental impact, but also holds social and recreational value. Research indicates that walking contributes to both mental and physical health. Therefore, the quality of pedestrian infrastructure plays an important role in encouraging people to choose walking over driving (Southworth, 2005).

2.2.4 Open up

Open up the edges between the city and buildings so that life inside buildings and outside in city spaces can work together (Gehl, 2010, p. 151).

Public open spaces are important due to the diverse benefits and opportunities they provide (Mumcu & Yilmaz, 2016). Connectivity should be established between the urban landscape and buildings, fostering a symbiotic relationship between the inhabitants indoors and the community outdoors. Urban and residential public spaces can either be welcoming and easily accessible, encouraging individuals and activities to transition from private to communal settings, Gehl calls these place soft edges. Conversely, places can be designed in a way that presents physical and psychological barriers to engagement (Gehl, 2011). Gehl discusses Jacobs, who studied the relationship between the level of activity and the sense of safety experienced on a street. When a street is crowded and there is activity, there is a greater sense of collective protection (Gehl, 2011). Jacobs argues that public safety in cities, especially on sidewalks, does not depend primarily on police presence, but on a complex network of voluntary surveillance and community standards. This dynamic is most evident on busy streets, where pedestrians, street-level vendors, and residents actively monitor the street, contributing to reduced street crime. It is important that residents have a view of the street and that buildings face the street directly (Wendt, 2009). Different people utilize the streets at different times, contributing to the collective surveillance, and encouraging people within buildings to observe the sidewalks. Facilities such as shops, bars, cafes, and restaurants are important for attracting people during nighttime hours. The mix of workplaces and residences ensures the constant presence of individuals, contributing to street safety (Wendt, 2009).

Interactions among individuals within and between buildings are generally considered more crucial and significant than the physical spaces and structures themselves. Even the simplest forms of interaction, such as seeing, hearing, or being in proximity to others, appear to be more fulfilling and more in demand than many other attractions available in public areas of cities and residential neighbourhoods (Gehl, 2011). Jacobs believes these interactions, though seemingly inconsequential individually, collectively foster a sense of public identity, mutual respect, and trust, and serve as a resource during personal or neighbourhood emergencies. The vibrant street life, spontaneous meetings in establishments, and the general tendency to stroll on the sidewalk were disregarded by traditional planners. Impersonal streets create a sense of anonymity,

leading to a lack of accountability for street-related incidents, as seen in many public housing projects where residents isolate themselves due to a lack of vibrant public life. While sidewalk encounters may seem insignificant at first glance, Jacobs considers them vital for fostering a thriving urban community (Wendt, 2009). Regular encounters with neighbours and colleagues during daily routines present valuable opportunities to form and nurture connections casually and effortlessly. Spontaneous social gatherings can naturally unfold, allowing relationships to flourish organically, contrasting with the formality of scheduled meetings or phone calls. Frequent face-to-face interactions make it easier to sustain connections (Gehl, 2011). Researchers argue that connections with individuals, environments, and events play a role in fostering a sense of familiarity and attachment to society (Mumcu & Yilmaz, 2016)

Gehl emphasizes the importance of designing residences in harmony with outdoor areas, facilitating a gradual transition from private to public spaces. In typical suburban housing, Gehl highlights the uncertainty in defining individual dwellings and residential areas. Physical barriers between homes and outdoor spaces discourage their use, particularly evident in high-rise buildings where reliance on elevators or stairs diminishes public interaction. To address this, Gehl advocates for creating inviting semi-private spaces, exemplified by the front yards. These buffer zones offer opportunities for gardening, leisurely observation, and neighbourly engagement, striking a balance between privacy and sociability. Living on a bustling street often limits activities to the back of homes, hindering connections with outdoor spaces. Gehl stresses the importance of street-facing windows and doors, along with well-designed infrastructure like sidewalks and benches, to encourage residents to engage with their surroundings (Musselwhite, 2018).

2.2.5 Invite

Work to strengthen the invitations to invite longer stays in city space because a few people spending much time in a place provide the same sense of lively space as many people spending only a short time. (Gehl, 2010, p. 151).

Out of all these principles, encouraging people to spend more time outside stands out as the simplest and most impactful (Gehl, 2010). Interaction with other people is vital for urban life to thrive, as noted by Gehl. He emphasizes the importance of creating spaces where people can engage in relaxed and informal interactions. This can occur in different ways; strolling along a main street or taking a moment to sit on a public bench. As mentioned before, to create and encourage interactions, places to sit in the public space, such as benches are important and should be facilitated in the street. However, Gehl suggests that simply providing seating is not enough. To attract people, interesting surroundings to capture attention and encourage them to stay should be provided as well (Musselwhite, 2022).

Public spaces serve as arenas where we interact with our outdoor environment and engage with the space around us. The spatial organization of urban environments shapes the pattern of social activities, influenced by our needs, culture, emotions, and experiences (Shinbira et al., 2021). In line with Gehl's (2010) insight that a few people spending much time in a place can provide the same sense of liveliness as many people spending only a short time, urban design should

prioritize creating environments that invite longer stays. In urban design, the notion of place is primarily defined by the physical environment's interplay with social processes, attributes, and activities (Shinbira et al., 2021). The spaces between buildings provide a chance to interact with others in a casual and low-pressure manner. One might enjoy strolls, take a detour along a bustling street while heading home, or stop at a welcoming bench near a front entrance to briefly engage with people. Daily errands, like shopping, can also be done, even if it might be more convenient to do them once a week (Gehl, 2011). If spaces are designed to invite walking, standing, sitting, seeing, hearing, and talking, they possess an important quality that not only facilitates these activities but also provides a solid foundation for a wide range of other endeavours, such as play, sports, and community activities. This is partly because many qualities essential for these activities are shared, and because larger, more complex community events can organically arise from the multitude of small daily activities. Essentially, significant events emerge from the accumulation of numerous minor ones (Gehl, 2011).

Gehl (2011) categorizes three types of activity patterns—necessary activities, optional activities, and resultant activities—which indicate the quality of public spaces. Necessary activities include obligatory tasks like attending school or work and doing errands. These activities typically constitute everyday tasks and leisure pursuits. Most activities involving walking also fall within this category. Since these activities are necessary, their occurrence is minimally affected by the physical environment. They persist year-round, under almost all conditions, and are largely unaffected by external surroundings (Gehl, 2011). Optional activities—those pursued based on preference and feasibility of time and place—are a separate consideration. Examples of such activities are taking a stroll, simply enjoying the moment, or lounging outside. These activities occur only when external conditions are favourable, with weather and location supportive of them. This correlation is notably significant in urban planning, as many outdoor recreational activities fall within this category and are heavily reliant on favourable external conditions (Gehl, 2011). Social activities encompass all interactions that rely on the presence of others in public areas. These include children playing, exchanging greetings and conversations, participating in communal activities, and the most common social activity—passive engagement, which involves simply observing and hearing others. These activities occur in various settings, such as private outdoor areas, gardens, balconies, public buildings, and workplaces. However, in this context, the focus is primarily on activities in publicly accessible spaces. Termed "resultant" activities, they emerge from shared spaces and encounters, benefiting from improved conditions in public areas. This implies that social activities indirectly benefit when necessary and optional activities are provided with improved conditions in public spaces (Gehl, 2011). In Figure 6, Gehl suggests that the frequency of optional activities increases in well-designed environments, while strictly necessary activities dominate in poorly designed ones. Good public spaces inspire various social activities and strengthen the bond between people and their surroundings (Shinbira et al., 2021). Table 1

shows an overview of the different activities. In environments with poor quality, only necessary activities typically occur. On the contrary, in high-quality environments, necessary activities happen with similar frequency, though often taking longer due to improved physical conditions. Furthermore, a diverse range of optional activities is encouraged as the environment invites individuals to pause, relax, engage in recreation, and more. In poorly designed streets and city spaces, minimal activity is observed. In well-designed environments, a wide range of human activities flourishes. A common characteristic to all optional, recreational, and social activities is their reliance on favourable external conditions for movement and stopping, where the environment maximizes advantages and minimizes disadvantages—physically, psychologically, and socially (Gehl, 2011). In conclusion, to encourage people to prolong their activities, it is essential to ensure a high-quality physical environment according to Gehl (2011).







	Quality of the physical environment	
	Poor	Good
Necessary activities		
Optional activities		
Social activities		

Figure 6 The influence of the physical environment on different types of activities (Gehl, 2011).

Activity Type	Definition	Examples	Occurrence	Participant Autonomy	Dependency physical environment
<i>Necessary Activities</i>	Obligatory tasks such as attending school or work, shopping, and completing errands	School/work attendance, shopping, errands	Year-round, under almost all conditions	Little to no choice in engagement	Minimally affected by the quality of physical environment
<i>Optional Activities</i>	Pursued based on preference and feasibility of time and place	Taking a stroll, enjoying the moment, lounging in the sun	Occur only when external conditions are favourable	Dependent on supportive weather and location	Influenced by the quality of the physical environment
Social Activities	Interactions relying on the presence of others in public areas	Children playing, exchanging greetings and conversations	Occur in various settings	Primarily focused on publicly accessible spaces	Stem from shared spaces and encounters

Table 1 The different types of activities (Gehl, 2010)

3. Methodology

The selection of the research strategy and data collection techniques was based on the research question and objectives. The aim of the research is to investigate how Jan Gehl's urban design principles can be applied in practice to enhance the quality of life in Dutch post-war neighbourhoods. The methodology aligns with the research objective of understanding the practical implementation of Gehl's principles and their potential impact on residents' well-being.

3.1 Research Strategy

Surveys and interviews were used to gather insights and opinions within the case study of Vinkhuizen, a post-war neighbourhood in Groningen. Surveys collected quantitative data on residents' experiences and perceptions, providing a comprehensive understanding of their current quality of life and perspectives on the urban environment. This data helped identify general patterns and trends, revealing common issues and opportunities within Vinkhuizen. Understanding these patterns has been essential for effectively applying Gehl's principles in the neighbourhood.

In addition to surveys, semi-structured interviews were conducted with experts Jan Gehl and Theo Adema, planner of the municipality of Groningen. The interviews provided qualitative depth and context. These interviews examined how Gehl's principles could be adapted to Vinkhuizen's specific context. The insights gained from these experts contributed to a more contextual understanding of the neighbourhood's dynamics and potential improvements.

To visualize how a concrete neighbourhood design, informed by Jan Gehl's principles, could be envisioned and developed for Dutch post-war neighbourhood, a street in Vinkhuizen was designed. This design serves as a practical application of the principles, demonstrating their potential impact on enhancing the liveability.

The chosen methodology provided a robust framework for investigating the application of Jan Gehl's urban design principles in Dutch post-war neighbourhoods. By combining community experiences and expert perspectives, the research captured a holistic understanding of how Gehl's principles could improve neighbourhood liveability.

Focusing on Vinkhuizen has allowed for an in-depth exploration of the specific characteristics of the post-war neighbourhoods. This focus has ensured that the analysis is not only detailed but also applicable, offering recommendations that could be applied to the specific needs and challenges of similar post-war neighbourhoods.

The Urban Planning Process

The research strategy aligned with the Urban Planning Process, as discussed in the article by Marasinghe et al. (2023). The framework of the Urban Planning Process involves a continuous cycle of engagement, objective establishment, issue identification, plan-making, and evaluation. The methodology included the stages of the Urban Planning Process cycle:

- **Engaging with the public and stakeholders:** Surveys and interviews were used to engage with the residents of Vinkhuizen and relevant stakeholders, including an expert from the municipality. This approach captured different opinions and experiences, ensuring that the research reflected the needs and desires of the participants.
- **Establishing objectives:** Insights from the surveys helped to establish clear objectives for improving the neighbourhood based on Gehl's principles. Understanding how residents viewed their neighbourhood made it possible to identify goals for improving Vinkhuizen's liveability.
- **Identifying, and proactively addressing issues:** The combination of survey data and interview insights was used to analyse recurring themes and patterns in Vinkhuizen. This analysis identified issues and opportunities regarding the urban space. To proactively address these issues, the research applied Gehl's principles, focusing on enhancing urban spaces. Specifically, the research not only identified problems but also proposed practical solutions by redesigning a street in the neighbourhood based on Gehl's principles, directly addressing the identified issues.
- **Formulating plans, and continuously evaluating and updating those plans:** The insights gained from interviews with experts have contributed to formulating plans tailored to Vinkhuizen's context. These plans incorporated feedback from both residents and experts, ensuring that the plans were relevant and effective. The research process involved continuous evaluation and adaptation of these plans to ensure that they remained responsive to the needs of the neighbourhood over time. Therefore, after the design was completed, an evaluation took place with Mr. Adema, the municipal expert, to discuss the plans.

The stages are divided and implemented over several steps. Figure 7 illustrates the different steps in the Urban Planning Process with its purposes and the relationship between these stages and steps (Marasinghe et al., 2023).

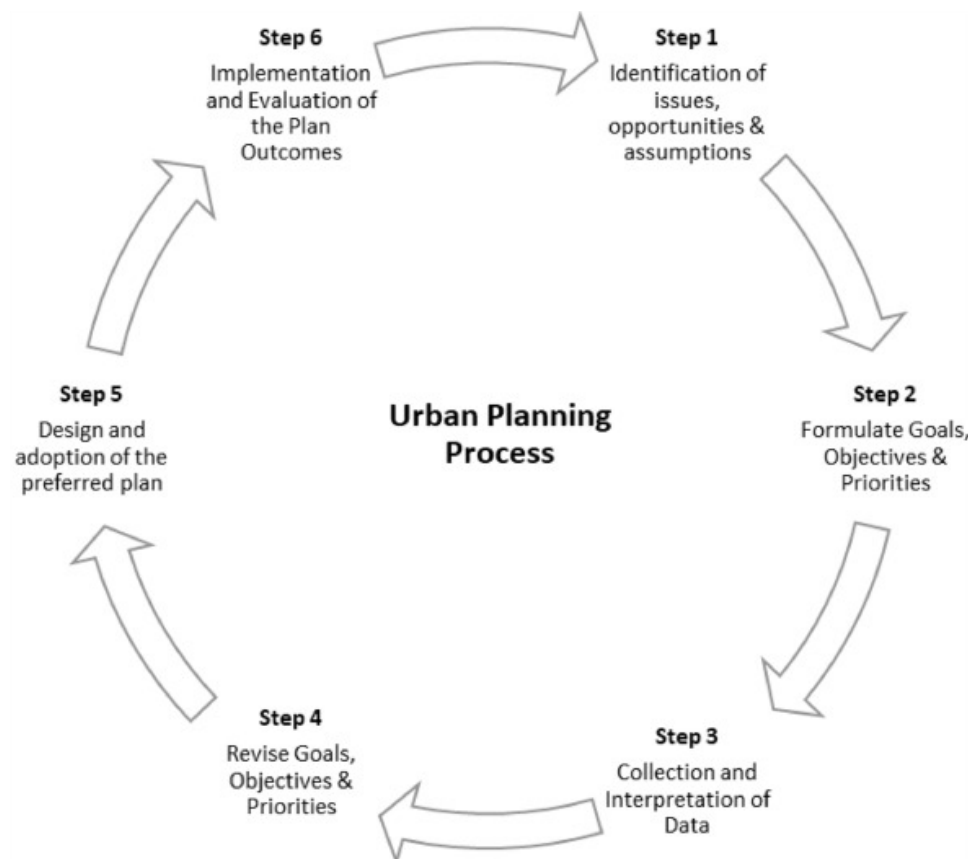


Figure 7 Urban Planning Process (Marasinghe et al.,2023)

The fifth aspect is public participation, an essential part of inclusive decision-making across all the stages. Public contribution has informed the understanding of the opportunities, issues, and potential directions of the case study (Steiner and Butler, 2012). According to Marasinghe et al. (2023), involving citizens in decision-making processes ensures that their voices are heard, leading to urban plans that better reflect their needs and preferences.

The urban planning process is interconnected and complex. Table 2 shows the researcher's Urban Planning Process and the research methods used within each step.

Step	<i>Purpose</i>	<u>Method for research</u>
Step 1	<i>Identification of issues, opportunities, and assumptions</i>	<ul style="list-style-type: none"> - Literature review on Jan Gehl's design principles - Analyse of neighbourhood statistics from Basismonitor Groningen (n.d.) - Observation and site visits Vinkhuizen
Step 2	<i>Formulate goals, objectives, and priorities</i>	<ul style="list-style-type: none"> - Integrate insights from the literature review and statistical data analysis (Basismonitor Groningen, n.d.) to formulate goals and objectives - Conduct surveys among residents for public participation and to gather input and priorities from residents Vinkhuizen - Hold interview with a municipal expert to align goals with municipality objectives for Vinkhuizen - Hold interview with Jan Gehl to discuss the potential of the neighbourhood
Step 3	<i>Collection and interpretation of data</i>	<ul style="list-style-type: none"> - Process survey data and interviews to extract results - Analyse surveys from residents Vinkhuizen - Analyse interview with municipal expert for expert insights and context - Analyse interview with Jan Gehl for expert insights and context
Step 4	<i>Revise goals, objectives, and priorities</i>	<ul style="list-style-type: none"> - Use the analysis of the survey results and interviews to refine goals and objectives - Align goals with community needs and municipal objectives and priorities
Step 5	<i>Design and adaption of the preferred plan</i>	<ul style="list-style-type: none"> - Utilize Jan Gehl's design principles in the neighbourhood design - Incorporate survey feedback and expert input into the design process
Step 6	<i>Implementation and evaluation of the plan outcomes</i>	<ul style="list-style-type: none"> - Implement the design plan - Evaluate outcomes with municipal expert - Reflect and discuss the outcomes of the plan

Table 2 Urban Planning Process (Marasinghe et al., 2023) applied to research

Surveys among residents

Surveys are commonly used to gather valuable information from stakeholders in the planning process (Steiner and Butler, 2012). The data collected from these surveys has been analysed to identify trends and issues in the neighbourhood, informing the research objectives and design proposal. The surveys facilitated direct engagement with residents of Vinkhuizen and provided essential insights into their experiences and preferences regarding urban design and quality of life. By incorporating community input, this approach aimed to implement the experiences and aspirations of the residents in the design proposal.

The survey started with four demographic questions about age, gender, and education level, to assess the representativeness of the sample. Residents also provided the first four digits of their zip code to confirm their residency in Vinkhuizen. Following these questions, participants responded to ten statements related to Gehl's design principles, which were discussed in Chapter 2 aiming to increase liveability.

Participants rated their level of agreement or disagreement with each statement, providing direct feedback on how these principles resonate with their experiences. The statements covered various aspects of Gehl's design principles, such as pedestrian-friendly environments and vibrant public spaces. Table 3 shows the correlation between each statement and the principles, providing a structured approach to analysing the responses. After analysing the results of the surveys, the findings were used to align Gehl's principles with participant input.

Surveys were distributed among residents of Vinkhuizen using a combination of online and offline methods to maximize accessibility and participation. For the online version, Google Forms was used. The survey aimed to collect quantitative data on residents' satisfaction with various aspects of their neighbourhood's urban design and quality of life. The survey can be found in Appendix 3.

Various methods were used to collect survey data, aiming for validity, transparency, and representativeness. Firstly, the researcher's network was asked to cooperate with the research. Social media platforms, particularly Facebook and WhatsApp, were used to distribute surveys and ask people to participate. Additionally, a flyer with a QR was designed for residents to scan. Furthermore, people from the organization 'Vinkhuizen Groningen' were contacted. They were willing to help and posted an announcement of the survey on the website of the Vinkhuizen neighbourhood, inviting residents to participate. The announcement is included in Appendix 6. The survey results, along with insights from expert interviews, have guided the development of practical plans addressing the specific needs and challenges identified.

Principle	Related survey question
<i>Carefully locate the city's functions to ensure shorter distances between them and a critical mass of people and events (Gehl, 2010).</i>	<p>1. "There are plenty of easily accessible parks and green spaces in Vinkhuizen that are well-maintained, where people can relax and have fun."</p> <p>5. "In Vinkhuizen, there are enough different types of shops, services, and activities, such as restaurants, hairdressers, gyms, supermarkets, stores, and meeting places that are easily accessible."</p> <p>6. "In our neighbourhood, there are various types of functions, such as houses, public facilities, shopping areas, workplaces, and schools, evenly distributed throughout the whole area. As a result, the different services and shops are not concentrated in just certain places but spread throughout the neighbourhood."</p>
<i>Integrate various functions in cities to ensure versatility, wealth of experience, social sustainability, and a feeling of security in individual city districts (Gehl, 2010).</i>	<p>3. "I feel safe walking through the streets and other public spaces of Vinkhuizen both during the day and at night."</p> <p>5. "In Vinkhuizen, there are enough different types of shops, services, and activities, such as restaurants, hairdressers, gyms, supermarkets, stores, and meeting places that are easily accessible."</p> <p>6. "In our neighbourhood, there are various types of functions, such as houses, public facilities, shopping areas, workplaces, and schools, evenly distributed throughout the whole area. As a result, the different services and shops are not concentrated in just certain places but spread throughout the neighbourhood."</p>
<i>Design city space so it is inviting and safe for pedestrian and bicycling traffic (Gehl, 2010).</i>	<p>2. "The neighbourhood and infrastructure invite cycling and/or walking, as it is safe and comfortable to cycle/walk. I leave the car at home since everything is easily reachable by foot or bike."</p>
<i>Open up the edges between the city and buildings so that life inside buildings and outside in city spaces can work together (Gehl, 2010).</i>	<p>3. "I feel safe walking through the streets and other public spaces of Vinkhuizen both during the day and at night."</p> <p>7. "In Vinkhuizen, buildings and houses are designed in a way that there is strong interaction between the activities inside and life on the street. This means that from the buildings, there is good visibility of what happens outside. This applies not only to homes but also to restaurants, bars, and shops in the area."</p> <p>10. "Vinkhuizen is a dynamic urban neighbourhood."</p>
<i>Work to strengthen the invitations to invite longer stays in city space because a few people spending much time in a place provide the same sense of lively space as many people spending only a short time. (Gehl, 2010).</i>	<p>1. "There are plenty of easily accessible parks and green spaces in Vinkhuizen that are well-maintained, where people can relax and have fun."</p> <p>3. "I feel safe walking through the streets and other public spaces of Vinkhuizen both during the day and at night."</p> <p>4. "I find Vinkhuizen to be visually appealing. The surroundings and buildings look nice, and the area is well-designed."</p> <p>8. "The public spaces in Vinkhuizen encourage spending more time outdoors and are suitable for various types of outdoor activities like sports, picnicking, and playing. This contributes to a lively neighbourhood."</p> <p>9. "I mainly go out for necessary activities such as going to school or work, shopping, and running errands. Other social activities, like meeting up with friends, often take place inside the house or in another neighbourhood."</p> <p>10. "Vinkhuizen is a dynamic urban neighbourhood."</p>

Table 3 Principles of Gehl and the related survey questions

Expert interviews

Before conducting the interview, preparatory steps were undertaken, including a comprehensive literature review and gathering statistical data from Basismonitor Groningen (n.d.) related to Vinkhuizen and Gehl's principles. This preparatory work provided essential context and background information that helped validate the insights gained from the interviews.

A special highlight of this research was the opportunity to interview Professor Jan Gehl himself. The goal of the interview was to discuss Gehl's principles and their potential application in post-war neighbourhoods. Professor Gehl gave insights into Vinkhuizen, sharing his perspectives on the layout of the neighbourhood and the streets. To enhance Mr. Gehl's understanding of the neighbourhood, images of two streets in Vinkhuizen were shown, enabling him to directly comment on specific locations. These images are shown in Figure 8. Additionally, maps in Figures 11 and 14 were presented to provide more context on the greenery in the neighbourhood, and infrastructure network. During the interview, the strengths and challenges of the neighbourhood's design were discussed. Professor Gehl provided advice regarding potential design changes for Vinkhuizen. Further details about these suggestions are covered in Chapter 5.

Another semi-structured interview was conducted with Theo Adema, the current urban planner of Vinkhuizen working for the municipality of Groningen. The goal of this interview was to gain insights into the specific case of Vinkhuizen. In the interview various topics were discussed, including the applicability of Gehl's principles in Vinkhuizen. Additionally, potential barriers and opportunities for implementation, along with other challenges faced in the neighbourhood, were examined.

The interview transcripts are analysed using thematic analysis to identify recurring themes, patterns, and insights relevant to the research objectives. The data gathered from both Gehl and Adema's perspectives on the implications of applying Gehl's principles in Vinkhuizen informed the development of practical neighbourhood design.



Figure 8 Streets Vinkhuizen shown to Mr. Gehl

Neighbourhood Design

The design that has been created integrates the principles of Gehl with the specific characteristics and challenges of Vinkhuizen. This design reflects a practical application of findings from the literature, expert interviews, and surveys, following the Urban Planning Process framework (Marasinghe et al., 2023). This process has begun with engaging with residents and stakeholders through surveys and interviews to capture diverse perspectives (Engagement stage). Insights gathered helped establish clear objectives for improving the neighbourhood (Objective Establishment stage). Analyses of this data revealed key issues and opportunities, such as improving interactions between street life and buildings, which have been addressed through design solutions (Issue Identification and Proactive Addressing stage). Formulated plans have been evaluated and adapted based on expert feedback and residents' input to ensure they are responsive and effective (Formulating and Evaluating Plans stage). The purpose of this design is to visualize how Gehl's principles could be implemented to enhance the neighbourhood's quality. By analysing neighbourhood characteristics and design interventions, the research has sought to identify strategies to effectively translate Gehl's principles into objectives to enhance the residents' quality of life. The street design was developed using Archicad and Adobe Photoshop.

Ethical considerations

Participants were informed about the research's purpose and the researcher's role in collecting data for both interviews and surveys. Before beginning the survey and the interview, participants were informed that they had the option to stop their participation at any point. Once surveys were submitted, participants were unable to withdraw. They were informed that their participation was voluntary and provided with information about the study's objectives and expectations. It was emphasized to participants that their responses would remain anonymous. The collected data would be treated with care and stored on the researcher's laptop, accessible only with a password. Participants were reassured that their information could not be linked back to individuals. To ensure the protection of participants' privacy, only essential survey questions were included to minimize the collection of personal data. Questions regarding demographics (such as gender and age) and the four digits of the ZIP code were included solely for checking sample representativeness and geographic distribution. Participants were informed of the necessity of this information and its relevance to the research. Participants were assured that collected data would be exclusively used for this research, and not shared with third parties. Data has been exclusively utilized for this master thesis and will be destroyed after grading. For the interviews, the researcher asked for permission to record, and the participant filled in a consent form. The transcribed interview and the recording were stored on the same laptop as the surveys. The recordings and transcriptions will be deleted when the research is finished.

3.2 Data Analysis Scheme

Surveys

Using a quantitative research method, primary data was collected. The variables are qualitative as they can be sorted into categories and are characterized by their placement within these categories. The data is ordinal because it can be ranked in a specific order, but calculating a meaningful average is not possible. The response options ('completely agree', 'agree', 'disagree', 'completely disagree') have a clear order, allowing the researcher to analyse these ordered categories. However, the exact difference between the different categories cannot be measured. While it is possible to determine a midpoint (median), it is important to note that calculating a mean (average) would not be appropriate for this type of data (Burt, et al., 2009).

To test the representativeness of the sample from Vinkhuizen, demographic data from CBS (Statistics Netherlands) for the year 2023 has been used to perform a Single Sample Chi-square. The dataset includes information on gender and age distribution within Vinkhuizen. The analysis aimed to compare these demographic characteristics between the sample and the broader population to verify if the sample reflects the demographics of Vinkhuizen as reported by CBS (n.d.). To be able to use the data from CBS, the sample data was categorized in the same manner as the CBS data. Appendix 4 includes the detailed calculation for the Single Sample Chi-square test.

Expert Interview

During qualitative research, primary data has been collected through interviews with Jan Gehl and Theo Adema. The insights gathered from these interviews provide detailed information regarding Vinkhuizen, allowing for a nuanced understanding of its liveability, as well as the challenges and opportunities it presents. The responses from the experts are descriptive, capturing their perspectives, experiences, and opinions.

Software program 'Descript' was used to describe the interviews. A content analysis approach was used to systematically examine the data and identify patterns and themes. To further analyse the interviews, the transcript has been put in Word and, valuable insights were highlighted.

4. The case of Vinkhuizen

This case study has applied Gehl's principles to Vinkhuizen, a post-war neighbourhood on the outskirts of Groningen. Vinkhuizen has been the focus for exploring how the Urban Planning Process framework, outlined in Chapter 3, aligns with the specific challenges and opportunities of post-war neighbourhoods. Each stage of this framework has been implemented, to address Vinkhuizen's unique context. This chapter examines the demographic composition of Vinkhuizen using statistics from Basismonitor Groningen (n.d.) and explores the urban planning within the area. This chapter aims to understand Vinkhuizen's demographic and urban planning context, providing a foundation for identifying key issues, opportunities, and assumptions to enhance the liveability of post-war neighbourhoods using Gehl's principles.

Vinkhuizen was chosen for this study due to its current challenges and the municipality's efforts to improve its liveability standards. Compared to other neighbourhoods in Groningen, Vinkhuizen falls below average in various aspects of liveability (Gemeente Groningen, n.d.). The municipality aims to enhance the neighbourhood's quality of life by focusing on factors such as aesthetics, green spaces, accessibility, and safety (Gemeente Groningen, 2024). These efforts align well with Gehl's efforts of creating more human-centric environments.

Vinkhuizen presents opportunities for urban transformation and revitalization. Among all the post-war neighbourhoods in Groningen, Vinkhuizen is the most rational in its design (Staat in Groningen, n.d.). Despite its initial conception as a modern and spacious residential area, Vinkhuizen, like many post-war neighbourhoods, faces challenges related to urban liveability (Blom, 2012). The rational design of Vinkhuizen has provided a clear framework to test the effectiveness of Gehl's urban design principles in addressing urban issues in post-war neighbourhoods.

The neighbourhood was developed during a period of significant growth in the construction economy, leading to rapid and quantity-focused construction. Consequently, the original structures lack architectural diversity and have an overall quantity-driven approach (Staat in Groningen, n.d.). Integrating Gehl's principles could contribute to the evolution of the neighbourhood into a more vibrant and liveable community. Implementing Gehl's principles in Vinkhuizen has served as a practical case study and demonstration of the effectiveness of these principles in a specific urban context.

By examining the application of Gehl's design principles within the unique context of Vinkhuizen, this study aims to discover strategies for revitalizing and enhancing the neighbourhood's urban planning while promoting social connectivity and well-being.

4.1 Neighbourhood composition of Vinkhuizen

Vinkhuizen is a residential neighbourhood on the northwest side of Groningen (Figure 9). It is located next to a railway line and ring road, making it relatively isolated from the city centre. Built at the end of the 1960s, Vinkhuizen attracted many families from Groningen's older neighbourhoods due to its spacious, modern, and affordable rental homes. Most houses were constructed by housing associations and are still managed by them. In the centre of Vinkhuizen, there are educational and elderly care facilities, along with a shopping centre and community center (Basismonitor Groningen, n.d.).

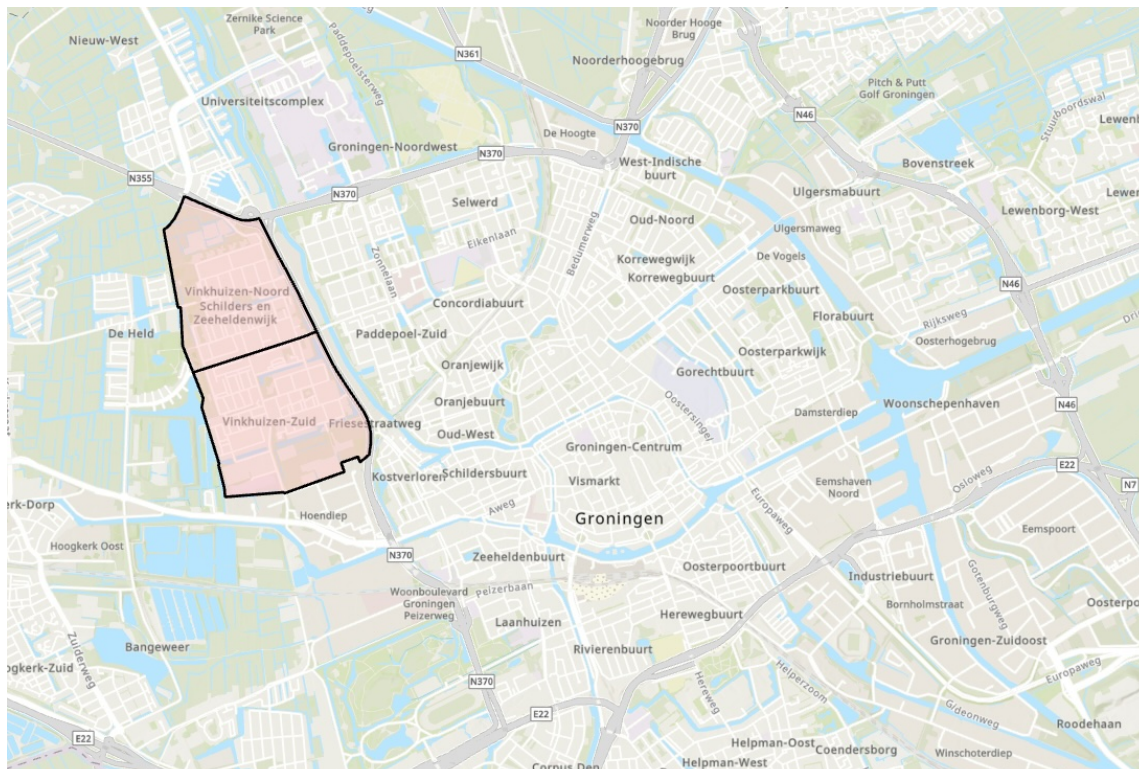


Figure 9 Map of Groningen, Vinkhuizen marked in red (made by author)

In the early 2000s, Vinkhuizen underwent physical renewal. Many of the cheaper rental properties were replaced with homes for purchase, and numerous amenities were renovated. By 2022, almost 10,800 people live in Vinkhuizen, spread across more than 5,100 residences (Basismonitor Groningen, n.d.).

Vinkhuizen has a diverse demographic profile, including a high proportion of elderly individuals, single persons over 65, non-Western backgrounds, single-parent households, and children of divorced parents. The neighbourhood also reflects significant ethnic diversity.

The neighbourhood has a relatively large number of individuals with low levels of education and households with low incomes. As a result, the socioeconomic status of the neighbourhood residents is lower compared to the municipal average (ibid.).

Currently, the Municipality of Groningen plans neighbourhood renewal in Vinkhuizen. The Municipality's website outlines plans not only to enhance housing but also to address broader aspects of neighbourhood improvement, including promoting sustainable and healthy living, creating green spaces, and fostering positive environments for children (Municipality of

Groningen, n.d.). Basismonitor Groningen (n.d.) created ‘Kompas van Groningen,’ which presents statistics on various aspects of different neighbourhoods within the municipality. Statistics show that Vinkhuizen underperforms on several themes compared to the municipal average. The quality of life is below average; the quality of the social environment is around the average, but on the bottom (ibid.). Below, several statistics regarding different aspects of the neighbourhood are discussed.

4.1.1 Public space

According to Basismonitor Groningen (n.d.), Vinkhuizen shows below-average satisfaction compared to the municipality in terms of public spaces. The neighbourhood performs the least well regarding degradation and climate. A high number of residents are dissatisfied with water drainage and the availability of spots to cool down during hot weather. Maintenance of sidewalks, roads, green spaces, and street furniture is also rated negatively. The presence of playgrounds receives the most positive rating. The inhabitants are more neutral regarding the neighbourhood design. However, concerning the presence of street furniture, residents are more dissatisfied than the average (Basismonitor Groningen, n.d.). Overall, Vinkhuizen residents are less satisfied with multiple physical living space aspects compared to the municipality's average, as detailed in the table:

Category	Concerns
<i>Climate</i>	Dissatisfaction with climate adaptation
	Water drainage
	Availability of cooling spots within the neighbourhood
<i>Neighbourhood Decline and Vandalism</i>	Vandalism as a common occurrence
	Presence of dog poop
	Trash on the street
<i>Maintenance</i>	Sidewalks
	Bike lanes
	Roads
	Street furniture and playgrounds
	Greenery
	Cleanliness
<i>Neighbourhood Design</i>	Presence of greenery
	Presence of street furniture
	Availability of sport, game, and movement facilities
	Presence of playgrounds

Table 4 Concerns regarding public space (Basismonitor Groningen, n.d.)

4.1.2 Quality social living space

Vinkhuizen performs below the municipality's average regarding neighbourhood social interaction. There is a significantly low score for the interaction between students and other residents, as well as social cohesion according to the residents. Few residents experience their neighbourhood as pleasant, feel attached to it, or have a sense of community. The number of residents who feel at home in Vinkhuizen is significantly lower than in the rest of the municipality, despite the relatively large number of long-term residents. Additionally, fewer

residents show civic engagement and have little trust in municipal governance (Basismonitor Groningen, n.d.).

Regarding social activity and engagement in the neighbourhood, Vinkhuizen performs poor in the following aspects:

Category	Concerns
<i>Actively engaged</i>	Trust in the municipality and the way it performs.
	Neighbours who watch over each other when absent
	Residents feeling responsible for neighbourhood liveability
	Active residents in their neighbourhood in the past year
<i>Interaction, acceptance, integration</i>	Residents who felt discriminated in their neighbourhood
	Residents who believe ethnic groups in this neighbourhood get along well
	Residents who believe youths and seniors in this neighbourhood get along well
	Residents who believe students and others in this neighbourhood get along well
<i>Social interaction</i>	Residents who find that neighbours interact pleasantly with each other
	The rating that residents give for the pleasantness of the neighbourhood to live in
	Residents who are attached to their residential neighbourhood
	Residents who believe that neighbours somewhat know each other
	Residents who feel at home with their neighbours
	Residents who say they live in a friendly neighbourhood with a strong sense of community

Table 5 Concerns regarding social living space (Basismonitor Groningen, n.d.)

4.1.3 Quality of housing

Regarding residential satisfaction, Vinkhuizen performs close to the municipal average. Residents are less satisfied with the atmosphere of their homes and express a higher-than-average desire to move. The layout and size of the houses score slightly above average. Residents also frequently express dissatisfaction with the maintenance of the homes in the neighbourhood. There are many homes with valid energy labels due to the numerous new construction homes built in Vinkhuizen since the early 2000s (Basismonitor Groningen, n.d.).

4.1.4 Quality of life

As previously mentioned, the quality of life in Vinkhuizen is below the average of the municipality. This includes the aspects upbringing, health, financial situation, and participation. In terms of upbringing, Vinkhuizen scores below the municipal average. A significant proportion of children face an elevated risk of falling behind in school. Furthermore, a greater number of adolescents pursue secondary education at the 'VMBO' level, and a relatively high number of young adults lack a secondary education diploma, see Table 6 (Basismonitor Groningen, n.d.).

Category	Concerns
<i>Growing up - Education</i>	High percentage of secondary school students (VO) in pre-vocational education (VMBO) and practical education
	Percentage of primary school students at an increased risk of falling behind in their studies
	Percentage of young adults aged 18 to 27 without a basic qualification

Table 6 Concerns regarding quality of life (Basismonitor Groningen, n.d.)

Regarding health, Vinkhuizen performs below the municipal average. A significant number of people with have physical limitations that affect their functioning and personal resilience. Many residents rate their quality of life, health, and happiness low. There are relatively few residents who believe that their quality of life will remain the same or improve in the next two years. Many residents rely on assistance, and they perceive their personal strength, resilience, and control as weaker. This is evident from the number of residents who report having little control over their lives. In terms of lifestyle, the population of Vinkhuizen scores slightly below the municipal average. While excessive alcohol consumption is relatively low, a high number of residents do not exercise enough and struggle with overweight (ibid.) *Appendix 1 includes a table with the health aspects where the neighbourhood is underperforming.*

Financially, Vinkhuizen residents face challenges, performing significantly below the municipal average. Specifically, regarding employment, it is noticeable that Vinkhuizen falls below average in all aspects. There are relatively many unemployed individuals, and the percentage of employed residents is low. Additionally, the neighbourhood scores below average in terms of poverty. Despite the presence of many residents with minimum incomes, the number of people struggling financially in Vinkhuizen is around the municipal average. Moreover, the number of people expecting an improvement in their household income in the next two years is around the municipal average. Table 7 includes an overview of the concerns (ibid).

Category	Concerns
<i>Financial Situation</i>	Registered job seekers at the Employee Insurance Agency (UWV) in the population aged 15 to 26 years.
	Registered job seekers at the Employee Insurance Agency (UWV) in the population aged 15 to 64 years.
	Employed individuals in the population aged 15 to 75 years.
	Residents expecting their household income situation to improve over the next two years.
	Residents struggling to make ends meet.
	Households with less than €4500 in savings.
	Residents (aged 15 to 64) receiving welfare benefits.
	Percentage of households with minimum income.

Table 7 Concerns regarding quality of life (Basismonitor Groningen, n.d.)

In terms of participation, Vinkhuizen performs below the municipal average, particularly in the socio-cultural activities. Residents engage less in sports and attend relatively few events or museums. However, compared to the municipal average, a larger number of people in Vinkhuizen attend religious gatherings: approximately a quarter of the residents occasionally visit a church, mosque, or other religious assembly. Concerning the social network, Vinkhuizen

scores slightly below average, especially in terms of the quality of social contacts. Many residents say they do not know enough people to engage in meaningful conversations or seek help or advice. Additionally, residents are less satisfied with their participation in the city's society. Table 8 shows the different concerns.

Category	Concerns
<i>Participation - Network</i>	Residents who have contact with friends, or close acquaintances once a week or more.
	Residents who have contact with their neighbours, or other residents of the municipality once a week or more.
	Residents who feel they have sufficient contact with others.
	Residents who feel there are enough people they can talk to.
	Residents who say they know enough people to ask for help or advice.
	Residents who sometimes or often feel lonely.
	Average rating given by adult residents for their level of participation in society in the municipality.
<i>Participation</i>	Residents who exercise once a week or more.
	Residents who are members of a sports club or gym.
	Residents who engage in creative hobbies, such as making music, acting, dancing, or painting, once a month or more.
	Residents who occasionally or frequently attend film or theatre performances, events, concerts, or museums.
	Residents who visit a café, restaurant, or nightclub once a month or more often.
	Residents who occasionally attend an activity at a community centre, library, or cultural centre.

Table 8 Concerns regarding quality of life (Basismonitor Groningen, n.d.)

4.2 Urban planning of Vinkhuizen

Vinkhuizen was designed by urban planner Henk Eysbroek, who worked for Urban Development and Housing in the municipality of Groningen (Kunstpunt, n.d.). The development of Vinkhuizen began during a time when urban planning decisions were made with limited room for discussion or experimentation. Housing associations and municipal authorities followed a standardized approach, prioritizing efficiency, and production. This approach was further strengthened by the urgent need to address post-war housing shortages (Jansen, 1999).

Quantity was more important than quality. This can be seen through the limited diversity in architecture. Details and the 'beautification' of houses were not considered important. This is also visible in the pictures of houses in Vinkhuizen below (Figure 10).

Despite the emphasis on rapid and standardized construction, significant attention was given to the living environment. This resulted in Vinkhuizen being an open and green neighbourhood (Kunstpunt, n.d.). Figure 11 shows a map with the greenery spread across Vinkhuizen. This map shows how the planners, following a standardized approach, purposefully integrated extensive green spaces into the neighbourhood's urban planning. Figure 12 shows a greenspace in Vinkhuizen.



Figure 10 Single-family houses in Vinkhuizen (made by author)



Figure 11 Map of green spaces, Vinkhuizen (made by author)



Figure 12 Greenspace in Vinkhuizen (made by author)

In 1960, a structural plan was formulated for Groningen, outlining the construction of a city intended to accommodate 265,000 inhabitants by 1980. This initiated a period of intensive building activity. In just four years (1967-1971), approximately 4,500 residences were built in Vinkhuizen. This construction phase marked an era of extreme standardization and rationalization in Groningen's building practices (Jansen, 1999). In Groningen, the Vinkhuizen neighbourhood is the most rationally designed and constructed of all post-war neighbourhoods. It was rapidly built when the construction economy was at its peak (Kunstpunt, n.d.).

Post-war Groningen faced numerous challenges, including a damaged city centre, acute housing shortages, unemployment, and poverty. The city aimed to restore public life, enhance living environments, and improve overall living conditions through structural plans. These plans aimed to provide suitable housing for every citizen of the city, with a particular emphasis on factors such as light and space tailored to family compositions (Jansen, 1999).



Figure 13 Demolished houses, Groningen (Battlefield Tours, n.d.).

Influence of the Garden City

Post-war neighbourhoods were influenced by the Garden City. In Groningen, the neighbourhoods Selwerd, Paddepoel, and Vinkhuizen, adopted elements of the Garden City concept. The Garden City aimed to transform existing cities into a network of decentralized garden cities. Each city would accommodate 30,000 people, with additional residents in surrounding agricultural areas. The concept emphasized collective land ownership and cooperative development to ensure communal benefits (Ward, 2005).

While Vinkhuizen followed this concept, it adopted a nuanced approach, envisioning itself as a 'garden neighbourhood with an urban aspect. This implied a mix of greenery, spatial planning, and connectivity with the urban fabric (Jansen, 1999).

This idea influenced the number of houses considered appropriate for the area, to preserve sufficient greenery, light, and space in the neighbourhood, while staying within the available budget. However, Jansen (1999) critiques this approach, describing it as follows: *'The once idealistic and philosophical ideas of the Garden City Movement have been reduced to an ordinary allotment strategy in the Northern city districts; an extreme erosion of ideas.'* (Jansen, 1999, p. 11).

According to the author, Vinkhuizen lacks an urban character, even in the area surrounding the neighbourhood's centre. Furthermore, the neighbourhood does not have a green environment as intended by the Garden City Movement. Other planners and designers came to the same conclusion: the nuanced approach that was taken had a bad outcome. Therefore, Vinkhuizen

marks a turning point in the manner of building post-war neighbourhoods in Groningen (Jansen, 1999).

Car

The neighbourhood's design was influenced by a sociographic report that outlined principles for the expansion plan, specifically addressing the accommodation of passenger cars. The report assumed each household would own at least one car, which called for adjustments in the planning process to accommodate this requirement (Jansen, 1999). The traffic structure of the neighbourhood is hierarchical. It consists of six elements: main roads, neighbourhood collector streets, district collector streets, neighbourhood streets, residential streets, and footpaths. The main roads serve a connecting role that extends beyond the neighbourhood but also have a structuring function by dividing the neighbourhood into four sections.

Figure 14 shows a map with the bike and car infrastructure. Planners in Vinkhuizen allocated significant space for roads in response to the era's increasing car ownership. This is visible on the map; the car has a considerable amount of space. The map shows a notable overlap between car and bike infrastructure, highlighting the coexistence of these modes of transportation within the neighbourhood's infrastructure network.



Figure 14 Bike and car infrastructure, Vinkhuizen (made by author)

Monotone

The systematic repetition of specific design elements can create an engaging interplay of rhythm and volume. However, depending on the skill and creativity of the designers, it could also result in monotony. The designers needed to infuse the often-uniform housing design with an engaging and more than merely functional appearance (Jansen, 1999).

The concept of repeated design elements, or 'stamps', combined with varied elements such as green spaces, paving, street furniture, and play facilities, aimed to give the neighbourhood a unique character. However, by the 1960s, designers in Groningen recognized that this approach did not guarantee to produce engaging results. In Vinkhuizen, despite the desire not to apply a strong mixture of housing types, a significant variation in typologies is found. The core of the neighbourhood is surrounded by two high-rise buildings, which emphasize the urban structure and the vertical potential. They have an orientational function, marking the neighbourhood's centre. Around this core, four neighbourhoods are grouped, each consisting of approximately 1000 to 1200 homes. Each neighbourhood is built with repeatable design elements and urban features, incorporating different housing types (Jansen, 1999).

Characteristics of Vinkhuizen include a community centre at its core consisting mainly of high-rise buildings, the construction in strips, and repeating layout patterns (Kunstpunt, n.d.). Only a few places in Vinkhuizen have a cohesive physical living environment. Jansen (1999) describes how the neighbourhood is a puzzle without a coherent image.

Figure 15 provides a map of Vinkhuizen's architectural layout and residential typologies. The map illustrates the systematic construction in strips and repeating layout patterns. It shows the presence of high-rise buildings, strategically positioned at the neighbourhood's core and periphery, serving both an urban structuring and orientational function. Most housing consists of single-family homes that are distributed over the entire neighbourhood. A third type of housing is mid-rise buildings. Figure 16 shows these three types of houses.

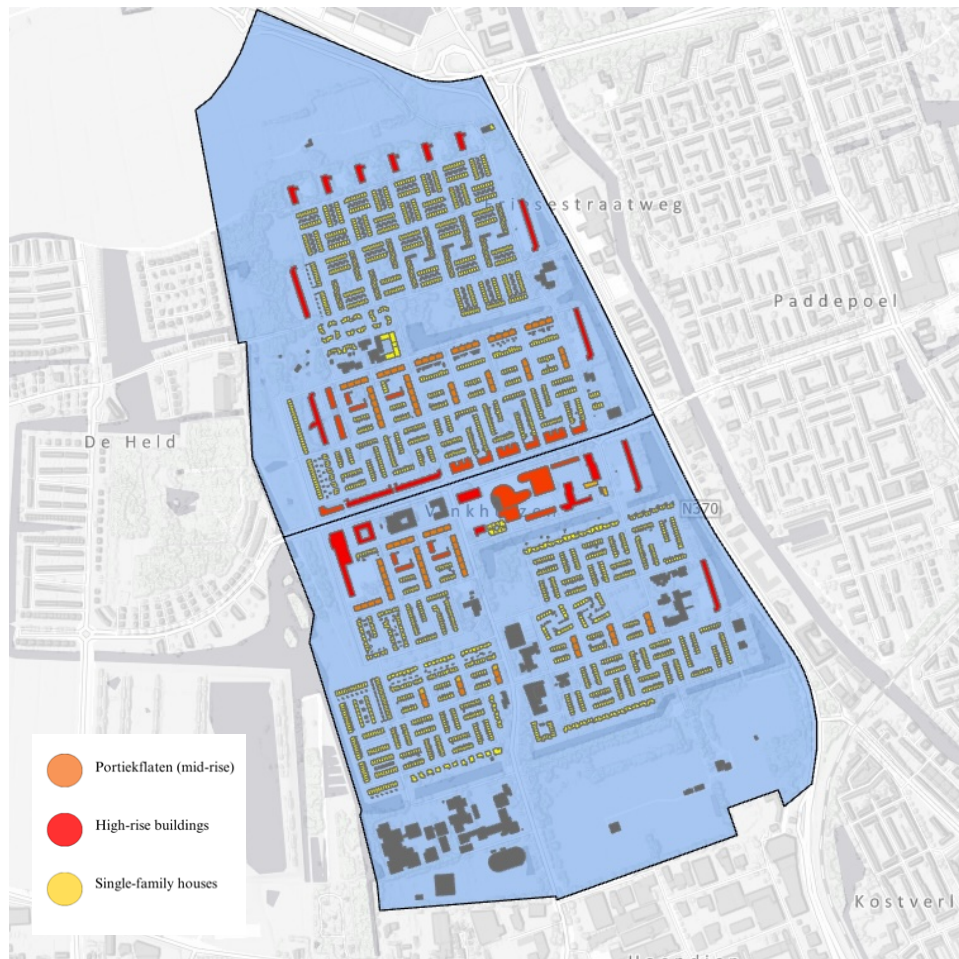


Figure 15 The different type of buildings, defined by the amount of 'living functions' (made by author)



Figure 16 Different types of buildings. From left to right: Single-Family houses, portiekflats (mid-rise), High-rise building (made by author)

Figure 17 illustrates the functional zoning in Vinkhuizen, showing the separation of different functions. The core of the neighbourhood features grocery stores and retail stores (Figure 18). Surrounding this central hub, various communal spaces, workplaces, and educational institutions are located. In the southwest of Vinkhuizen, there's another concentration of educational facilities.

Furthermore, the map shows the isolation of the residential areas, spatially segregated from other activities. In the centre of the neighbourhood, there is some overlap in functions; for instance, some buildings combine retail stores and housing. This spatial organization reflects the functionalist urban planning strategy that was used in post-war neighbourhoods, aiming for efficiency and facilitating ease of access to essential services and amenities for residents.



Figure 17 Functions in Vinkhuizen (made by author)



Figure 18 Centre of Vinkhuizen with the function groceries/stores (made by author)

5. Findings

This chapter presents the findings from the study on applying Jan Gehl's urban design principles to the Vinkhuizen neighbourhood in Groningen. The methodology combined surveys and interviews to gather both quantitative and qualitative insights, structured around the Urban Planning Process framework described by Marasinghe et al. (2023). This chapter follows the stages of engagement, objective establishment, issue identification, and planning and evaluation, providing a comprehensive analysis of how Gehl's principles can enhance neighbourhood liveability.

5.1 Engagement

The first section focuses on the engagement phase of the research. Surveys and interviews were used to collect data from Vinkhuizen residents and relevant stakeholders. Surveys were utilized to collect quantitative data on residents' experiences and perceptions of their neighbourhood, while interviews provided qualitative insights from urban design expert Jan Gehl and municipal planner Theo Adema. Together, these methods captured a wide spectrum of opinions and experiences, crucial for understanding the community's needs and supporting public participation in the Urban Planning Process.

5.1.1 Survey

All 66 surveys collected from residents of Vinkhuizen were deemed valid and included in this study. The data on gender and age were used to assess sample representativeness. A Chi-square test showed that the sample was representative regarding gender. However, the sample was not representative regarding age. This is a limitation since the findings may not apply to the entire neighbourhood population. Furthermore, by a repetition of the study, the results might be different. The insights of the sample are used, and one should keep in mind that they pertain only to the sample and should not be used to draw broad conclusions that apply to the entire population.

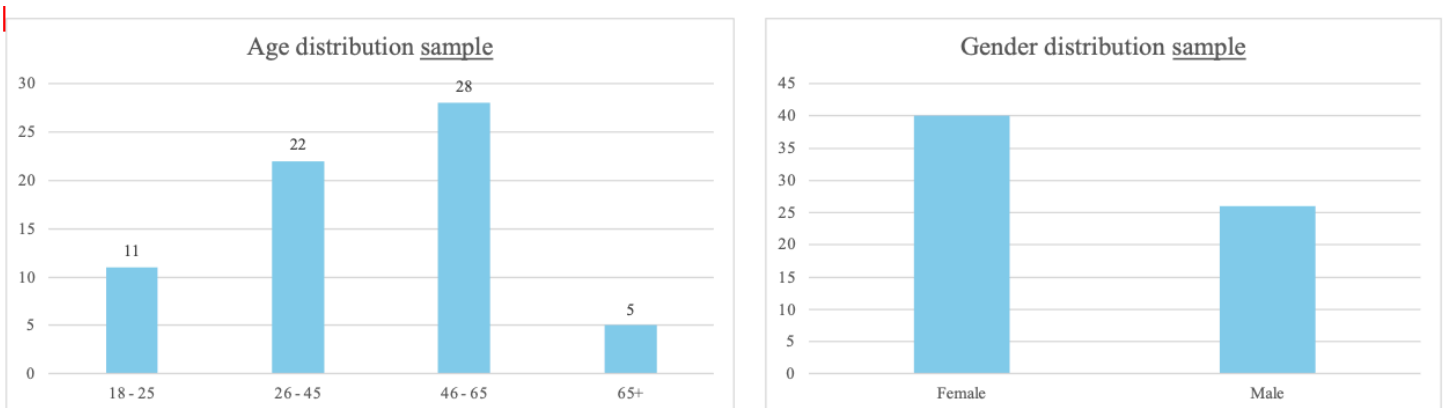


Figure 19 Bar charts with age distribution (left) and gender distribution (right) within the sample

Figure 19 shows graphs with the distribution of age groups within the sample and the gender distribution. Although the data on gender and age provides valuable insights, it's important to consider that other factors such as income, and geographic distribution within the neighbourhood can also influence the sample's representativeness. While efforts were made to include a variety of people in the sample, it is important to be careful when interpreting the results. Non-participation of specific groups could potentially impact the findings. Detailed calculations for the Chi-square test are included in Appendix 4. Table 9 shows the survey results.

Survey question	% of participants
1. <i>"There are plenty of easily accessible parks and green spaces in Vinkhuizen that are well-maintained, where people can relax and have fun."</i>	%
Strongly agree	13.6%
Agree	68.2%
Disagree	16.7%
Strongly disagree	1.5%
2. <i>"The neighbourhood and infrastructure invite cycling and/or walking, as it is safe and comfortable to cycle/walk. I leave the car at home since everything is easily reachable by foot or bike."</i>	%
Strongly agree	15.2%
Agree	53%
Disagree	28.8%
Strongly disagree	3.0%
3. <i>"I feel safe walking through the streets and other public spaces of Vinkhuizen both during the day and at night."</i>	%
Strongly agree	4.5%
Agree	51.5%
Disagree	39.4%
Strongly disagree	4.5%
4. <i>"I find Vinkhuizen to be visually appealing. The surroundings and buildings look nice, and the area is well-designed."</i>	%
Strongly agree	0%
Agree	22.7%
Disagree	72.7%
Strongly disagree	4.5%
5. <i>"In Vinkhuizen, there are enough different types of shops, services, and activities, such as restaurants, hairdressers, gyms, supermarkets, stores, and meeting places that are easily accessible."</i>	%
Strongly agree	19.7%
Agree	56.1%
Disagree	21.2%
Strongly disagree	3.0%

6. <i>"In our neighbourhood, there are various types of functions, such as houses, public facilities, shopping areas, workplaces, and schools, evenly distributed throughout the whole area. As a result, the different services and shops are not concentrated in just certain places but spread throughout the neighbourhood."</i>	%
Strongly agree	1.5%
Agree	50%
Disagree	42.4%
Strongly disagree	6.1%
7. <i>"In Vinkhuizen, buildings and houses are designed in a way that there is strong interaction between the activities inside and life on the street. This means that from the buildings, there is good visibility of what happens outside. This applies not only to homes but also to restaurants, bars, and shops in the area."</i>	%
Strongly agree	0%
Agree	47%
Disagree	50%
Strongly disagree	3.0%
8. <i>"The public spaces in Vinkhuizen encourage spending more time outdoors and are suitable for various types of outdoor activities like sports, picnicking, and playing. This contributes to a lively neighbourhood."</i>	%
Strongly agree	4.5%
Agree	45.5%
Disagree	48.5%
Strongly disagree	1.5%
9. <i>"I mainly go out for necessary activities such as going to school or work, shopping, and running errands. Other social activities, like meeting up with friends, often take place inside the house or in another neighbourhood."</i>	%
Strongly agree	15.2%
Agree	60.6%
Disagree	24.2%
Strongly disagree	0%
10. <i>"Vinkhuizen is a dynamic urban neighbourhood."</i>	%
Strongly agree	6.1%
Agree	54.5%
Disagree	36.4%
Strongly disagree	3.0%

Table 9 Survey responses

Table 9 presents a summary of survey responses, illustrating the distribution of opinions across various aspects of neighbourhood liveability. Appendix 5 contains piecharts that visually represent these results.

Analysis of the survey data reveals two distinct patterns. For several statements, responses have varied, indicating a diversity of opinions among participants. This suggests that while certain issues are acknowledged, participants differ in their perceptions of the severity or impact. Conversely, other statements reveal a clear consensus, with a majority either agreeing or disagreeing. This demonstrates widespread agreement among participants regarding these aspects of the neighbourhood.

Accessibility of Parks and Green Spaces

Survey Statement:

"There are plenty of easily accessible parks and green spaces in Vinkhuizen that are well-maintained, where people can relax and have fun."

The survey results indicate that a significant majority of respondents view Vinkhuizen's parks and green spaces positively. Specifically, 13.6% of participants strongly agreed with the statement, and an additional 68.2% agreed, totalling 81.8% who perceived these outdoor areas as accessible and well-maintained.

This positive feedback highlights a notable strength of Vinkhuizen in providing accessible and well-maintained green spaces for relaxation and recreation. However, a minority of respondents expressed dissatisfaction; 16.7% disagreed with the statement, and 1.5% strongly disagreed. This suggests that while most participants are satisfied, about 18.2% believe there is a need for improvement in the accessibility and maintenance of Vinkhuizen's parks and green spaces.

Cycling and Walking Infrastructure

"The neighbourhood and infrastructure invite cycling and/or walking, as it is safe and comfortable to cycle/walk. I leave the car at home since everything is easily reachable by foot or bike."

The survey results reveal varied opinions regarding the infrastructure's suitability for cycling and walking. Specifically, 15.2% of participants strongly agreed with the statement, while 53% agreed, totalling 68.2% who find the infrastructure supportive of walking and cycling. This indicates that a majority of the respondents appreciate the neighbourhood's design and safety features that promote non-motorized transportation. However, a significant minority expressed dissatisfaction: 28.8% disagreed, and 3% strongly disagreed with the statement. This mixed feedback suggests that while many respondents are positive about the current infrastructure supporting cycling and walking, a notable portion are dissatisfied.

Perception of Safety

"I feel safe walking through the streets and other public spaces of Vinkhuizen both during the day and at night."

Regarding feelings of safety in Vinkhuizen, 4.5% of participants strongly agreed with the statement, and 51.5% agreed, making a total of 56% who feel secure in their neighbourhood. This indicates that most respondents generally feel safe. However, 39.4% of participants disagreed with the statement, and 4.5% strongly disagreed, totalling 43.9% who have concerns about their sense of security. This significant portion of respondents indicates a need to address safety-related issues.

Visual Appeal

"I find Vinkhuizen to be visually appealing. The surroundings and buildings look nice, and the area is well-designed."

A majority (77.2%) of participants expressed dissatisfaction with the visual appeal of Vinkhuizen. This highlights an area for potential improvement, suggesting that the aesthetics of Vinkhuizen may be lacking in several aspects according to the findings. Enhancing the design and appearance of surroundings and buildings could increase residents' satisfaction with their environment.

Availability of Shops and Services

"In Vinkhuizen, there are enough different types of shops, services, and activities, such as restaurants, hairdressers, gyms, supermarkets, stores, and meeting places that are easily accessible."

Most respondents (75.8%) agree that Vinkhuizen offers a sufficient variety of shops and services. This positive feedback indicates that the neighbourhood is generally well-equipped to meet the needs of its residents. However, a minority (24.2%) disagree, suggesting that some participants feel improvements are needed in the accessibility or diversity of these facilities.

Distribution of Facilities

"In our neighbourhood, there are various types of functions, such as houses, public facilities, shopping areas, workplaces, and schools, evenly distributed throughout the whole area. As a result, the different services and shops are not concentrated in just certain places but spread throughout the neighbourhood."

Participants are nearly evenly divided on whether facilities in Vinkhuizen are well-distributed. While 51.5% agree that there is a balanced distribution of different services and shops, 48.5% disagree. This split suggests that while some areas of the neighbourhood benefit from an even

distribution of amenities, others may feel underserved, indicating potential areas for improvement in how facilities are allocated throughout Vinkhuizen.

Interaction Between Buildings and Street Life

"In Vinkhuizen, buildings and houses are designed in a way that there is a strong interaction between the activities inside and life on the street. This means that from the buildings, there is good visibility of what happens outside. This applies not only to homes but also to restaurants, bars, and shops in the area."

The responses are divided, with 47% agreeing that there is good interaction between buildings and street life, while 53% disagree. This split indicates that the design of some buildings may not effectively foster a connection with the street, which could impact the dynamic and safety of public spaces. Enhancing transparency and connectivity between buildings and the street could promote a more engaging and secure environment.

Suitability of Public Spaces for Outdoor Activities

"The public spaces in Vinkhuizen encourage spending more time outdoors and are suitable for various types of outdoor activities like sports, picnicking, and playing. This contributes to a lively neighbourhood."

The responses show an even split, indicating differing views among respondents. 50% of them agree that public spaces encourage spending more time outdoors. Nevertheless, the other 50% disagree. This highlights a need for improvement to support outdoor activities and enhance the overall liveliness of the neighbourhood.

Social Activities and Community Interaction

"I mainly go out for necessary activities such as going to school or work, shopping, and running errands. Other social activities, like meeting up with friends, often take place inside the house or in another neighbourhood."

A majority (75.8%) of participants agree that their social activities are limited to necessary activities, with other interactions occurring indoors or in different neighbourhoods. This indicates a potential lack of attractive or accessible public spaces for social gatherings within Vinkhuizen, suggesting a need to develop more engaging community spaces.

Overall Dynamism of the Neighbourhood

"Vinkhuizen is a dynamic urban neighbourhood."

A majority (60.6%) of respondents agree that Vinkhuizen is a dynamic urban neighbourhood, while 39.4% disagree. This suggests that while many participants perceive vibrancy and activity

in the area, there remains a significant portion who feel that the neighbourhood lacks the dynamism.

5.1.2 Interviews

In addition to the quantitative insights gathered through surveys, interviews with experts Theo Adema (municipality of Groningen) and Jan Gehl provided qualitative context and recommendations for applying Jan Gehl's urban design principles in Vinkhuizen. These interviews were conducted to complement the survey data, offering deeper insights into the challenges and opportunities related to the neighbourhood.

Mr. Adema offered insights into past and current approaches to urban development in Vinkhuizen. His commentary provides observations on the evolution of green space initiatives and highlights community concerns regarding public space quality. His insights are valuable for understanding current dynamics and setting realistic objectives. Mr. Adema's perspectives underscore the municipality's commitment to addressing resident needs while navigating practical challenges in urban renewal.

Jan Gehl provided strategic recommendations tailored to enhancing Vinkhuizen's liveability. To give Mr. Gehl an impression of Vinkhuizen, two streets were printed out for him. These streets are shown in Figure 20 and are the Briljantstraat and Opaalstraat. These streets were selected because they reflect urban design challenges and opportunities within the neighbourhood. They feature a mix of uniform residential architecture, including single-family homes and portiekflats, which represent two of the predominant housing types in the area. These streets illustrate the post-war neighbourhood characteristics, characterized by wide roads that prioritize car accessibility, architectural uniformity, and a predominant residential function. Additionally, there is some greenery in the Opaalstraat. Jan Gehl's observations and recommendations on these streets will provide valuable insights into how a new design can increase the liveability of Vinkhuizen. His insights focused on upgrading existing infrastructure, such as parks and green spaces, to meet contemporary standards and promote community engagement.



Figure 20 Briljantstraat and Opaalstraat, Vinkhuizen (Google Maps)

Accessibility of Parks and Green Spaces

Adema and Gehl noted that the current public spaces and parks in Vinkhuizen are not inviting or contemporary. Mr. Adema provided context on past and current approaches to green space development in Vinkhuizen. He explained that initial renewal plans, which included significant demolition, faced resistance from residents. This led to a shift in focus towards improving and adding greenery. He noted that demolition in certain areas was specifically done to add new green structures: *"In various places, especially here, demolition was done mainly to add greenery, as the new green structure is now in place here."* Adema expressed general criticism regarding the quality of public spaces, noting they are often lacking behind other neighbourhoods, such as Haren or Helpman: *"Well, perhaps a general criticism of this type of neighbourhood is that the quality of public space is generally very mediocre."*

Adema emphasized the need for higher-quality public spaces, noting that the community deserves better: *"These neighbourhoods and the people living here deserve a much nicer public space."* However, Adema highlighted a concern from residents about the maintenance of existing green spaces and the feasibility of adding more.

Jan Gehl provided several observations related to the design and enhancement of green spaces in Vinkhuizen. Gehl emphasized the importance of upgrading existing parks to meet contemporary standards, noting: *"It would be a very good idea to upgrade the park to make it really contemporary and not look like the 1950s."* Commenting on the playground at the end of the Briljantstraat (Figure 21). Furthermore, Gehl suggested creating small, well-defined green spaces close to residential areas to enhance accessibility and utility: *"Make sure that there are some defined [green] small parts close to where you live. And not one."* He acknowledged the potential costs associated with creating new green spaces by removing buildings, remarking: *"What is really expensive is to tear down or rebuild or make green pocket parks by removing buildings."*



Figure 21 Playground at the end of Briljantstraat (made by author)

Cycling and Walking Infrastructure

Theo Adema provided insights into the historical and current infrastructure challenges in the neighbourhood. Adema pointed out that the historically car-oriented design results in wide roads and extensive car presence, negatively impacting the environment and feelings of safety among cyclists and pedestrians. He described a cycle where fear of cycling due to traffic leads to increased car usage, worsening the problem, and suggested the need to break this cycle to promote safer cycling and walking: *"People indicate that they prefer to take their children to school by car, especially foreign people because they are afraid to cycle. It feels unsafe with all those cars, so you have a vicious circle that you think, maybe you should break through."* Adema emphasized the necessity for safe walking and cycling routes that connect neighbourhoods and amenities, promoting safer and more comfortable travel by foot or bike. He acknowledged the poor level of traffic safety, reflecting concerns about the overall safety for pedestrians and cyclists: *"No, but the safety, the traffic safety is poor. Okay. It is just bad."*

Gehl observed the excessive width of the street and the presence of many unused parking spaces. He suggested that these unused parking spaces should be removed, indicating a potential for reallocating space for other uses. Gehl emphasized the need for better street design, incorporating trees and sidewalk configuration, to create a safer environment that discourages speeding and enhances the comfort of cycling and walking: *"I don't think you'll need in a street like this one, bicycle lanes, because this invites also to speed up. But with trees and figuration of the sidewalk, it will be a completely different street."* To illustrate how the street could be more pedestrian and cycle-friendly, he made a sketch showing how the width of the street should be narrowed at both ends (Figure 22). This would force people to slow down. Furthermore, he pointed out that there should be a crossover that is slightly elevated.

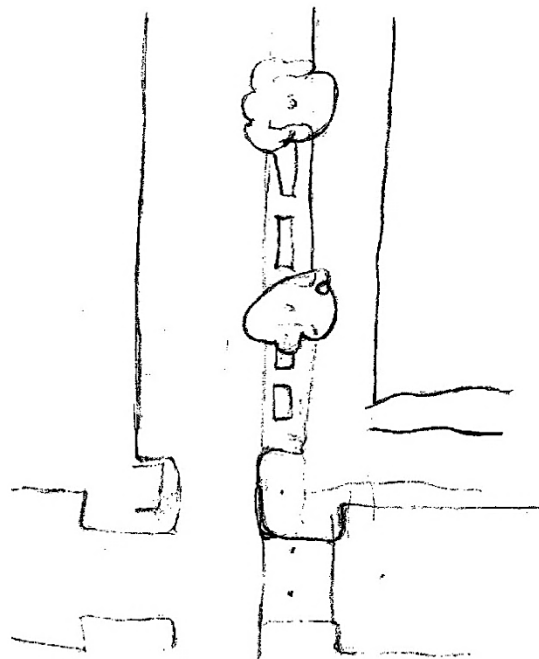


Figure 22 Sketch by Gehl (2024) on how to change the street

Perception of Safety

Adema highlighted a significant rise in nighttime drug dealing and harassment, particularly targeting women. This increase in criminal activity and perceived harassment has contributed to a declining sense of safety in Vinkhuizen.

"It often involves dealing drugs in various places at night, you know. But also, women are being harassed at night. That has really increased extremely... What was it again? Something like fivefold. The number of people who are harassed on the street, I think. Who at least feel like they are being harassed on the street. That has really increased a lot. So, safety is also declining."

Adema described concerns from long-term residents about new neighbours, particularly those who may need social support but do not receive this assistance. This has led to unease and a perceived sense of risk, as residents feel uncertain about the intentions and behaviour of some residents. Adema sees this as one of the biggest problems in Vinkhuizen.

Visual Appeal

Adema described the original construction approach in Vinkhuizen as highly utilitarian, prioritizing efficiency and cost over aesthetics and design quality. He noted that the repetitive and outdated design of the housing makes the neighbourhood less attractive, especially to those who can afford to live elsewhere: *'These are not the best neighbourhoods. The housing is also not very good. It is a lot of the same. Everyone has the same floor plan. So, people who are a bit better off choose less often to live in these kinds of neighbourhoods.'*

Adema also pointed out that investing in the houses is about upgrading their appearance and the gardens: *"When it comes to investments in the home? What the homes look like, including the gardens, in the immediate living environment."*

Gehl acknowledged the challenges posed by the existing architectural materials and design, particularly the extensive use of concrete, which may contribute to the unappealing appearance. He suggested that improving the visual appeal of parking areas and street edges could already enhance the overall aesthetics of Vinkhuizen. A more attractive living environment would likely increase residents' pride and satisfaction with their neighbourhood. Gehl proposed affordable aesthetic improvements, such as adding greenery and wooden elements, which could significantly enhance the appearance. He highlighted the positive impact that adding trees could have on the streetscape, enhancing both beauty and liveability:

"I think that if you do things like I mentioned, with greenery and little wooden partitions and things like that, that could be done very cheaply, and have a fantastic effect".

The interview made it clear that, while Vinkhuizen has its challenges, it is not the worst Gehl has encountered, implying significant potential for improvement. Gehl advocated for upgrading existing structures rather than demolishing them, emphasizing sustainable and cost-effective improvements to enhance the neighbourhood's aesthetics: *"I've seen much worse, I can tell you." "And to me, this is very easy to upgrade. And you can be done with not many expenses also."*

Availability of Shops and Services

Mr. Adema provided additional insights into the nature and community response to local services. He acknowledged that while residents appreciate the presence of services, there is criticism regarding the monofunctionality of the shopping centre, suggesting a need for more multifunctional, engaging spaces: *"That [the shopping centre] is really very much appreciated. But it is now also often said that it is again a very monofunctional shopping centre. You know? It is really just designed for shopping and leaving, residents also indicate this. Couldn't we design it in a much more fun way, so that we can also sit for a while, have a drink, a terrace, meet, that kind of thing. So, this also really applies here, of course, to give it more recreational functions."*

Adema highlighted the importance of creating spaces that serve multiple functions and are designed for social interaction, indicating that the success of such amenities depends on community engagement.

Jan Gehl provided critical observations about the state and functionality of services and facilities in the area. During the interview, he described the layout as: *"It looks like a maze, like a labyrinth."* The layout of the facilities might be confusing or difficult to navigate, which could impact accessibility despite the availability of services.

Gehl noted that many shops in neighbourhoods from this time appear inactive or underutilized nowadays, indicating that while services are present, their attractiveness is lacking: *"And the shops are dead. Yeah. All shops are dead."* Gehl proposed transforming underutilized shopping areas into spaces for community activities, suggesting alternative uses that could better serve the neighbourhood's needs.

Distribution of Facilities

Adema notes the current monofunctional nature of the shopping centre, which is mainly designed for quick shopping trips. He proposes increasing the experiential value, making it a more attractive and engaging place for residents to spend time. This includes adding recreational amenities such as seating areas, cafes, and meeting spots to create more engaging and multifunctional centres.

"I would really like it if, for example, you say that the heart of the neighbourhood, the shopping centre, we give that much more experiential value."

The need for sufficient population density and a mix of amenities to support a diverse range of functions throughout the neighbourhood is highlighted. Adema acknowledges that some residents prefer a quieter environment, highlighting the need for a balanced approach to accommodate different preferences. He recognizes that enhancing local amenities and functions could encourage residents to spend more time within their neighbourhood, promoting a greater sense of community and local engagement.

Interaction Between Buildings and Street Life

Gehl and Adema's observations point to specific design and functional challenges, such as underutilized spaces, lack of clarity between public and private areas, and missed opportunities for integrating indoor and outdoor spaces.

In the interview, Adema pointed out that the unclear distinctions between public and private spaces have resulted in unattractive and dysfunctional areas, such as neglected back sides. Efforts have been made to clarify the ownership and boundaries to improve these spaces. He highlighted that increased traffic and reduced local engagement have contributed to a decreased sense of community among residents. The importance of integrating indoor public buildings like schools and libraries with outdoor spaces should be emphasized to promote interaction and connectivity. Adema suggested that creating a seamless connection between indoor and outdoor activities, especially around communal areas like shopping centres, would greatly benefit the community.

Jan Gehl provided several observations related to promoting interaction between indoor and outdoor spaces. He emphasized the importance of developing “soft edges” at the ground floor level, to connect indoor spaces with the outdoor environment. Gehl suggested that these edges should be designed to encourage private yet accessible outdoor activities, such as enjoying coffee or sitting outside. He noted that although there is physical space available for fostering interaction between indoor and outdoor activities, it is not effectively utilized:

"I really think that the first thing to do is to make sure that the edges are developed. Most, 50 percent of everything going on in the neighbourhood is soft edges. Generated by the ground floor. So, make sure that the ground floor can get out easily. And make sure that these spaces are conceived as private. As something you can occupy and sit here and have coffee. And whatever."

In the Opaalstraat, he commented that the presence of garages/storage (Figure...), contributes to a lack of activity at the street level. This diminishes the street's vibrancy and potentially increases its perceived danger. He contrasted this with the other side of the street where there is more street-level activity, which he suggests is safer and more vibrant. Gehl proposed strategies to increase activity and interaction at the street level:

"I think that I will try to maybe turn all the garages into one-room flats or maybe for some small shops or some, we call them start-ups where you can start a little something, but if there were windows here, it would be completely different. There was some activity. This [pointed at garages/storage] is really what we will never do today."

Suitability of Public Spaces for Outdoor Activities

Adema highlighted the disparity between Vinkhuizen and, in his opinion, more aesthetically appealing areas like Groningen-Zuid, emphasizing the lack of high-quality green spaces and attractive public areas in Vinkhuizen. Furthermore, Adema noted that Vinkhuizen's car-oriented design contributes to its uninviting atmosphere. The presence of large roads and parked cars negatively affect the pedestrian experience and reduces the neighbourhood's appeal for outdoor activities. Adema advocated developing safe walking and cycling networks within Vinkhuizen to connect different areas and amenities.

Gehl criticized the state of public spaces in Vinkhuizen as uninviting, implying that their design and amenities fail to attract or retain residents for outdoor activities:

"It's not very inviting at all as it is."

Social Activities and Community Interaction

Adema suggested that improving central areas like the shopping centre to enhance their experiential value could make them more appealing for residents to spend more time here. Transforming these functional spaces into places not only for shopping but also for relaxation and socializing, could encourage greater use and foster a stronger sense of community within Vinkhuizen.

Gehl emphasized that effective use of 'soft edges,' or the transitional spaces at the ground floor level, is crucial for fostering outdoor activities and social interactions. He suggested designing these areas to encourage residents to spend more time outside, engaging in casual activities such as having coffee or reading a newspaper. This would make outdoor spaces more appealing and functional for daily use. Gehl proposed enhancing outdoor areas to make them more inviting for residents to linger and engage in casual activities. By improving these spaces to support everyday social behaviours, neighbourhoods can become more vibrant and livelier, encouraging people to use the public spaces more frequently:

"I would elaborate these areas so that they were much more inviting for people to take the coffee out or take the newspaper out or the smoking, whatever. And then people would walk past."

Overall Dynamism of the Neighbourhood

Adema noted a significant decline in the neighbourhood's appeal and character over the past decade. Residents who initially moved to Vinkhuizen for its vibrant energy now feel disconnected as the area has deteriorated:

"People moved here because there were investments in the neighbourhood; We moved here because it's a nice, mixed neighbourhood, you know. But they now say, over the last ten years, it has been declining. It's really a negative trend. People in these kinds of neighbourhoods often say... that they no longer recognize their neighbourhood."

Adema pointed out the increased turnover of residents and reduced community engagement due to housing policies that prioritize allocation to those in need. This change has contributed to a

feeling of instability and reduced neighbourhood cohesion. Adema stressed the critical need to maintain quality living conditions, which are increasingly challenged by the current dynamics in Vinkhuizen:

"It is very important to live comfortably somewhere. And that is under serious pressure."

Jan Gehl provided insights into how urban design could address these dynamics and challenges. He emphasized how the presence of garages and similar inactive structures at street level creates uninviting, lifeless areas: *"Is that garages? Oh, my dear. That means that is completely closed? But that means that there is actually no activity on the street level. While here there is activity on the street level. That makes it much more dangerous to walk here than here."*

These spaces fail to promote social interaction or street safety, in contrast to more active street-level areas that encourage engagement and feel safer for pedestrians.

Gehl suggested converting underutilized spaces, such as empty shops, into community-oriented facilities like youth clubs or neighbourhood centres. This transformation could revitalize the neighbourhood core, creating hubs of activity and engagement.

5.2 Objective Establishment and Issue Identification

Survey data and interview insights were separately analysed to identify recurring themes and patterns. These findings inform the Objective Establishment stage, where specific, actionable objectives are developed to enhance Vinkhuizen's urban environment based on Jan Gehl's principles. This stage starts by identifying key issues and opportunities, such as the limited interaction between street life and indoor activities, and dissatisfaction with the neighbourhood's design and architecture. Proactively addressing these issues ensures alignment with Gehl's principles for vibrant urban spaces. By applying Gehl's principles, the proposed neighbourhood design aims to effectively resolve these issues, fostering enhanced social interaction and architectural satisfaction.

Gehl's principle:

Carefully locate the city's functions to ensure shorter distances between them and a critical mass of people and events (Gehl, 2010)

Based on the insights from the surveys and interviews, the objective that aligns with the principle would be:

- 1. Carefully locate community services and amenities to enhance accessibility and encourage frequent use by residents, ensuring that essential facilities are within convenient reach to promote social interaction and community vitality.*

This is supported by the following findings:

While 81.8% of participants agreed that Vinkhuizen has accessible and well-maintained parks and green spaces, 18.2% indicated areas that could be enhanced. Adema and Gehl emphasized the necessity for higher-quality public spaces as well. Adema stressed residents deserved better, while Gehl suggested upgrading parks to contemporary standards and creating small, defined green spaces closer to residents.

Additionally, 75.8% of participants are satisfied with the variety of shops and services, 24.2% expressed dissatisfaction. Adema proposed adding recreational functions to the shopping centre to address criticisms about its monofunctional nature. Furthermore, while 51.5% believed facilities are well-distributed, 48.5% felt certain areas were underserved. Thus, it is important to strive for a more even distribution of public facilities, shopping areas, and services to ensure equitable access for all residents across Vinkhuizen.

Gehl's principle:

Integrate various functions in cities to ensure versatility, wealth of experience, social sustainability, and a feeling of security in individual city districts (Gehl, 2010).

Objective established on findings:

2. Foster a mixed-use urban environment that combines residential, commercial, recreational, and cultural functions to promote diversity, social sustainability, and a sense of security within the neighbourhood.

This is supported by the following findings:

75.8% of participants found existing services and facilities accessible, indicating a strong foundation. However, 24.2% disagreed. Additionally, 51.5% felt there was a balanced distribution of services and shops, while 48.5% did not. Adema noted the monofunctionality of the shopping centre and suggested more multifunctional, engaging spaces. He believed that enhancing local amenities throughout Vinkhuizen could encourage residents to spend more time outside, fostering community and local engagement. Gehl noted the potential of repurposing underutilized spaces to enhance local amenities. He specifically mentioned the garages on Opaalstraat, which detracted from the street's vibrancy and potentially increased its perceived danger. Converting these into small shops or community spaces was seen as a way to increase local activity density, provide residents with convenient access to services, and promote a vibrant, mixed-use environment, leading to more sense of safety (Gehl, 2010).

Gehl's principle:

Design city space so it is inviting and safe for pedestrian and bicycling traffic (Gehl, 2010)

Objective established on findings:

3. Create pedestrian-friendly and bike-safe environments through well-designed streets, green corridors, and dedicated pathways that prioritize safety, comfort, and accessibility for all users.

This is supported by the following findings:

While 68.2% of the participants agreed that the infrastructure invites cycling and walking, 31.8% disagreed. In the interview with Adema, he pointed out the need to break the cycle of car dependency due to safety concerns. Safe and attractive walking and cycling routes are necessary to address residents' concerns about car dependency and promote active transportation.

Gehl suggested narrowing streets and reconfiguring sidewalks to discourage speeding. This could enhance the comfort of cycling and walking. Adding trees and with the figuration of the sidewalk, the street would be completely different. Gehl also noted that the streets are wide, so there is no need to implement separate bike lanes. He suggested that the unused parking spaces

should be removed, indicating a potential for reallocating space for other uses that could enhance pedestrian and cyclist safety.

Gehl's principle:

Open up the edges between the city and buildings so that life inside buildings and outside in city spaces can work together (Gehl, 2010)

Objective established on findings:

4. Enhance connectivity between indoor and outdoor spaces through thoughtful design interventions such as public plazas, green transitions, and mixed-use developments that promote interaction and integration between building interiors and urban streetscapes.

This is supported by the following findings:

47% of the participants thought there is a strong interaction between indoor and outdoor spaces; 53% disagreed. Adema suggested that creating a better connection between indoor and outdoor activities would benefit the community.

Gehl emphasised the need to develop 'soft edges' on the ground floor to better connect indoor and outdoor activities. Noting that the current available space should be used more effectively to connect indoor and outdoor activities.

The survey also revealed that 43.9% of participants expressed concerns about safety in public spaces. Adema emphasized increasing safety issues attributed to increased nighttime drug dealing and harassment. Gehl highlighted that vibrant street-level areas enhance safety compared to inactive spaces. Creating soft edges fosters this dynamic street environment. He specifically pointed out the closed garages on Opaalstraat, which he argued create an unsafe environment and hinder indoor-outdoor connectivity.

Gehl's principle:

Work to strengthen the invitations to invite longer stays in city space because a few people spending much time in a place provide the same sense of lively space as many people spending only a short time. (Gehl, 2010)

Objective established on findings:

5. Create inviting and inclusive public spaces that encourage prolonged use and social interaction through amenities, seating areas, and recreational opportunities that cater to diverse resident needs and preferences.

This is supported by the following findings:

In the survey, 50% believe public spaces support outdoor activities, while the other 50% of the respondents disagree. Adema and Gehl highlight the need for inviting functional public spaces. Adema advocated for developing safe walking and cycling networks within Vinkhuizen to connect Vinkhuizen to surrounding neighbourhoods and amenities. Gehl criticized the current state of public spaces in Vinkhuizen, calling it uninviting.

75.8% of participants indicated that they mainly leave their homes for essential activities and prefer other neighbourhoods for social activities. To address this, Adema suggested enhancing central areas, such as the shopping centre, by increasing their experiential value to encourage socializing and community engagement. Gehl proposed making outdoor areas, including gardens and street spaces, more inviting by incorporating private, well-defined spaces where residents can comfortably enjoy activities like having coffee or reading. He noted that the current openness of these gardens makes them less appealing.

60.6% of the respondents view their neighbourhood as dynamic, yet 39.4% felt it lacks vibrancy. Adema notes a decline in neighbourhood appeal. Gehl proposed increasing street-level activity by repurposing garages into flats, shops, or startups, and adding windows to improve interaction between indoor and outdoor environments. This conversion will not only introduce more activity but also enhance the visibility and accessibility of these areas, encouraging a lively and interconnected community.

Furthermore, 77.2% of the participants were dissatisfied with Vinkhuizen's visual appeal. Adema criticized the repetitive and outdated design. Gehl recommended incorporating greenery and wooden elements, improving parking areas, and enhancing street edges to boost attractiveness, visual charm, and liveability.

5.4 Planning and Evaluation

5.4.1 Design and adaptation for the Opaalstraat

Based on the establishment objectives, a new design was created for the Opaalstraat (Figure 23). By incorporating feedback from residents and experts, the planning process ensures that proposed strategies address current challenges effectively. The design is illustrated in Figure 24, with key design principles highlighted in the figure and discussed below. Appendix 7 includes a larger format of the image of the design.



Figure 23 Current situation of the Opaalstraat, Vinkhuizen

Extending this design to the entire neighbourhood was not feasible due to time constraints. Opaalstraat was chosen as the focus area because it represents two typical housing types found in the region: portiekflats and single-family houses. Some objectives, like integrating various amenities in Vinkhuizen, are intended for implementation on a larger scale, beyond the street level. While these broader objectives will be acknowledged, they will not be further detailed in the discussion of this specific street design.

The new street design, shown in Figures 24 and 25 aligns with Jan Gehl's principles for creating human-scale urban environments and includes several key changes.

Architectural Enhancements

The architectural enhancements aim to improve aesthetic appeal, foster community interaction, and better integrate residential areas with different activities. Key improvements include:

1. Façade Updates

The red and blue accents on the portiekflats have been replaced with a consistent, unified colour scheme, providing a more harmonious appearance. Wooden elements have been introduced to the building façades, as recommended by Mr. Gehl. Additionally, the closed garages are replaced by a façade of glass, to improve the interaction between life inside and outside. These updates not only enhance the aesthetic quality of the flats but also contribute to a more welcoming environment for residents and visitors.

2. Front Yards

To balance privacy with social interaction, single-family homes in the street now feature hedges in their front yards. These hedges serve as natural buffers, defining the boundary between private and public spaces. This arrangement facilitates social interaction by allowing residents to engage with neighbours and passersby from the comfort of their yards while maintaining a sense of privacy. The introduction of these green buffers has improved the overall streetscape, making it more inviting and increasing social interaction.

3. Conversion of Ground Floors

As recommended by Mr. Gehl, ground floors of the portiekflats have been converted to accommodate a mix of residential units and small shops or start-ups. This transformation aims to revitalize street life by integrating different types of activities and functions into residential areas. Large windows have replaced garage doors, enhancing the visual connection between indoor activities and the street. This design strategy not only makes the ground floors more accessible and engaging but also contributes to a vibrant streetscape where daily life and commercial activity blend.

Public Space Improvements

The adjustments to public spaces in Vinkhuizen aim to enhance the area's aesthetic appeal and foster community interaction. These improvements focus on creating a more welcoming and functional environment for residents and visitors alike. Key changes include:

4. Green Spaces

To improve the aesthetic quality of the neighbourhood, new green spots and trees have been strategically placed along the streets. These green areas break up the urban landscape with natural elements, offering visual relief and contributing to a more pleasant and engaging environment. The introduction of green spots is part of a broader effort to integrate more nature into the streets, trying to make them more attractive and inviting.

5. Seating Areas

Various seating options, including benches, tables, and communal seating areas, have been installed to make public spaces more inviting. These additions provide residents with places to

rest, gather, and interact socially. A communal table has been installed, which complements new seating areas, which aligns with Objective 5. As part of the redesign, certain parking spaces were removed to accommodate these seating areas. Trash cans have been added to maintain cleanliness.

Traffic Calming Measures and Street Safety

Enhancements to Vinkhuizen's streets aim to create safer and more accessible environments for pedestrians and cyclists. These measures prioritize non-motorized users, aligning with safety and accessibility goals. Key improvements include:

6. Sidewalk Expansion and Parking Reduction

To create a more pedestrian-friendly environment, sidewalks have been expanded. This enhances pedestrian accessibility and comfort, providing more space for walking and other activities. The parking spaces on the left side of the streets have been removed. In the design, several parking spots are replaced by trees. This redesign not only creates a greener streetscape but also reduces the dominance of motorized vehicles in the street, promoting a more pleasant environment for biking and walking.

7. Traffic Safety Measures

Raised crosswalks and curb extensions have been implemented to improve traffic safety for non-motorized users, as recommended by Mr. Gehl. These features slow down traffic, making the streets safer for pedestrians and cyclists. Raised crosswalks enhance visibility and accessibility for pedestrians, while curb extensions shorten crossing distances and slow vehicle speeds. These measures align with Objective 3, enhancing the safety, comfort, and accessibility of the streets.

8. Street Safety Measures

In response to safety concerns in Vinkhuizen identified in the survey and emphasized by Mr. Adema in the interview, the design incorporates additional street lighting and enhances the interaction between indoor and outdoor spaces. This interaction contributes to a sense of safety, as discussed by Gehl (2010).

Visual and Functional Quality

Enhancements to the visual and functional quality of Vinkhuizen aim to create a more aesthetically pleasing and cohesive urban environment. Key updates include:

9. Material and Colour Changes

As mentioned in point 1, to enhance the neighbourhood's appearance and improve its visual appeal, materials used in the streetscape have been updated and colours have been standardized. This cohesive approach to materials and colours creates a more harmonious look, enhancing the overall aesthetic quality. Additionally, the increased presence of trees and green spaces along streets and gardens forms attractive green corridors. These green elements not only improve the visual landscape but also create a more pleasant and inviting environment.



Figure 24 Design Opaalstraat with numbers pointing out the implemented changes (made by author)



Figure 25 Opaalstraat before and after implementing established objectives (made by author)

Broader Recommendations

Some objectives, such as integrating various amenities, receive less emphasis in the design of Opaalstraat and are intended for implementation on a larger scale.

Modernization of Parks

At the neighbourhood level, modernizing parks with features like new seating areas, improved lighting, and play equipment is recommended. This can enhance engagement and multifunctionality, aligning with Objectives 1 and 5. These improvements aim to improve accessibility, promote social interaction, and create inviting, interactive public spaces that meet community needs.

Integration of various amenities

Integrating various amenities on a neighbourhood level is important for fostering vibrant communities. This includes providing convenient essential services, promoting social interaction, and enhancing overall liveability and quality of life, aligning with Objective 2.

5.4.2 Alignment with Objectives

Objectives were established during the urban planning process based on the collected data. The new design principles have been developed in alignment with these objectives:

Objective 1: Enhance Aesthetic Appeal and Functionality

The neighbourhood aims to elevate its visual and practical appeal using diverse materials, architectural styles, and green facades. These elements not only beautify the area but also enhance its functionality, creating an attractive and harmonious environment.

Objective 2: Foster a Mixed-Use Urban Environment

In the Opaalstraat, there is a mix of residential, commercial, recreational, and cultural functions. This mix ensures that residents have easy access to essential services and amenities. This approach fosters a dynamic urban environment where different aspects of daily life converge, promoting convenience and community interaction.

Objective 3: Improve Urban Mobility

To prioritize safety and accessibility for pedestrians and cyclists, the design includes expanding sidewalks, reducing parking spaces, and implementing traffic calming measures. These efforts aim to create a more pedestrian-friendly neighbourhood while enhancing overall mobility and safety.

Objective 4: Enhance Indoor-Outdoor Connectivity

To promote a sense of community and security, the design prioritizes integrating indoor activities with street life. This is achieved through the strategic placement of large windows and the creation of semi-private front yards, encouraging interaction and visibility.

Objective 5: Create Inviting Public Spaces

Enhancing the attractiveness and functionality of public spaces is important for fostering social interaction and community cohesion. The installation of benches, tables, and communal seating areas encourages prolonged use and social gatherings, making public spaces inviting hubs of neighbourhood life.

These objectives collectively aim to transform the neighbourhood into a vibrant, inclusive, and liveable community that meets the diverse needs of its residents while promoting sustainable urban development. Implementing these principles in the redesign of Opaalstraat enhances the street's visual and functional quality and fosters a stronger sense of community. The improvements make public spaces more attractive and conducive to social activities, contributing to a vibrant and inclusive urban environment.

5.4.3 Implementation and Evaluation with Theo Adema

The Urban Planning Process for Vinkhuizen involves formulating plans based on research and continuously evaluating and adapting these plans to ensure they meet the evolving needs of the neighbourhood. To complete all stages, an evaluation was conducted on the completed street design, integrating insights from Mr. Adema to refine and discuss proposed interventions, thereby finalizing this round of the continuous Urban Planning Process cycle. Mr. Adema's feedback provided critical insights into the practical aspects and potential improvements of the design.

Positive feedback

Adema expressed overall approval and enthusiasm for the design, noting its focus on enhancing social interactions, which aligns with the municipality's strategic goals for Vinkhuizen. He praised the physical improvements that enhance social aspects and could complement existing municipal social programs. Another improvement that Adema appreciated is how the design facilitates better visual connections and social engagement within the neighbourhood. He highlighted, *'And what's great is the views it offers. For instance, you can see people sitting on a terrace as you walk here. However, if there are cars parked in front, that view is obstructed.'* Adema also raised questions about the current use of garages in the area. He stated, *'I think it's a very bad use of garages. I'm sometimes curious about how it's used, you know? I can imagine that almost nothing happens to it.'* He agreed that repurposing the garages could enhance the streetscape and overall design by making better use of these spaces.

Adema highlighted the potential economic benefits of the design, such as increased rental income and enhanced public spaces. This could contribute to a better living environment and economic viability. He also appreciated the implementations that were made to improve traffic safety for cyclists and pedestrians. He mentioned the value of having ideas realized in an actual visual design.

Challenges

During the evaluation, some challenges arose as well. Adema observed that current front gardens lack the greenery depicted in the design, attributing this to existing conditions that do not favour vegetation. The current situation results in gardens being predominantly paved. He proposed reorganizing these areas into semi-public spaces managed jointly by the municipality and housing cooperatives. He emphasized, *'We ensure that the design looks good in one go. We also take care of it [front yards] in some way, perhaps with support, to maintain it a bit. And then at least we have it neat.'* This collaboration could create an attractive street through sustainable maintenance. Adema said he believes the addition of green gardens will significantly improve the overall appearance of the street.

Regarding the proposed new trees, Adema questioned their necessity, suggesting instead to improve the layout of existing trees, which he deemed more beneficial.

The challenge of dealing with different owners of the buildings was highlighted. Adema pointed out, for instance, that housing cooperatives may have sold off the garages a decade or more ago. This could result in practical difficulties in changing their use, as the garages would need to be repurchased before any transformation can take place. However, he was unsure about the current ownership status of these spaces. He emphasized the importance of understanding these ownership dynamics and cooperative perspectives for effective collaboration. This discussion with the different parties involved shows the complexity and collaborative effort needed to effectively address the challenges in Vinkhuizen.

Opportunities

An opportunity for the new plan could be adding an extra layer of construction to the flats. This was suggested by Adema to increase housing density and create additional space for new residents. He highlighted the potential for densifying the neighbourhood and recommended using lightweight, bio-based materials for feasible construction atop existing flat layers. He suggested that the municipality could reinvest a portion of the increased property value into the development of Vinkhuizen.

Furthermore, he noted that the urban design of the Opaalstraat is very similar to that of Paddenpoel and Selwerd. Therefore, these ideas could also serve as a model for similar neighbourhoods in Groningen.

The design's focus on social cohesion and interaction aligns well with municipal goals for community health and social development. Adema appreciated the connection between physical design and social impact, stating: *'This is actually a physical intervention, that can have a lot of social impact'.*

He stressed the importance of social interaction for overall health. Adema highlighted the municipality's commitment to social development through initiatives like the Department of Social Development (DMO), which invests significantly in promoting health, social interaction, and reducing loneliness, among other social issues. He suggested that physical interventions, like improving the front gardens and making them greener, could have substantial social impacts. He even mentioned that it potentially could offer more tangible benefits compared to large-scale health programs.

He expressed enthusiasm for exploring these ideas further to support broader municipal initiatives.

6. Discussion and Conclusion

This thesis explored the potential of Jan Gehl's urban design principles to enhance the quality of life in Vinkhuizen, a Dutch post-war neighbourhood. These principles served as a framework for analysing the neighbourhood and guiding the design interventions. The study involved surveys of Vinkhuizen residents and interviews with experts, including Jan Gehl and Theo Adema, to explore the practical application of these principles. Key findings highlighted the importance of improving the accessibility of urban functions by more evenly distributing them across the neighbourhood, thereby reducing distances. Other findings are the benefits of mixed-use developments in creating lively environments, the need for safe and well-designed infrastructure for pedestrians and cyclists, and the positive impact of improving the connection between indoor and outdoor spaces. Additionally, inviting public spaces plays a crucial role in fostering community interactions. These insights were applied in the design intervention for Opaalstraat, illustrating how Gehl's principles can effectively enhance urban quality in a specific area.

Applying Gehl's principles to Vinkhuizen revealed several opportunities for enhancement, shaped by direct input from residents and expert insights. Locating essential amenities and services closer to residents could enhance accessibility and foster a stronger sense of community. This approach aligns with Gehl's advocacy for walkable urban environments and is supported by the survey findings, which indicated a preference among residents for more conveniently located functions. Integrating mixed-use developments addresses the issue of single-function areas and promotes a livelier and more flexible environment. Feedback from residents emphasized the need for a greater variety of uses within the neighbourhood, which supports Gehl's principle of functional diversity. Prioritizing infrastructure for pedestrians and cyclists aligns with Gehl's focus on enhancing safety and promoting active transport, addressing safety concerns, and encouraging healthier lifestyles. Improving connections between indoor and outdoor spaces encourages social interactions and community engagement, resonating with Gehl's idea of strengthening the public realm. Finally, developing appealing public spaces with diverse amenities encourages their use and enhances social interactions, aligning with Gehl's philosophy of designing spaces that foster public life.

Through surveys with residents and expert interviews, valuable insights were gathered on practical implementations to meet local needs and improve urban quality. The research followed the Urban Design Process, which includes public engagement, objective setting, issue identification, plan formulation, and continuous evaluation. Resident surveys provided insights into their experiences and opinions on the neighbourhood. These findings were complemented by interviews with Jan Gehl, providing theoretical and practical perspectives on applying his principles, and with Theo Adema, offering municipal insights into local challenges. Drawing from the collected data, recurring challenges and opportunities were identified. Based on this, objectives were established including enhancing aesthetic appeal and functionality, integrating mixed-use functions, improving mobility and indoor-outdoor connectivity, and creating inviting public spaces. Based on this, a design for Opaalstraat was developed. The redesign included various improvements aligned with Gehl's principles. In the design, the objectives are

visible in the improvements of updating building facades, converting ground floors for mixed-use purposes, and enhancing front yard designs. Public space improvements involved creating green spaces, seating areas, and communal zones to encourage social interaction. Traffic safety measures involved expanding sidewalks, removing parking spaces, and implementing traffic calming features such as curb extensions. Diverse materials, colours, and green corridors were employed to enhance the overall appeal of the street.

The proposed design was evaluated with input from Theo Adema. The evaluation highlighted the potential of the design, and opportunities such as increasing housing density by adding additional layers to existing flats and using the design as a model for similar post-war neighbourhoods in Groningen, like Selwerd and Paddenpoel. However, challenges were also identified, illustrating the complexity and collaborative effort needed to effectively address the challenges in Vinkhuizen.

Several limitations were identified during the study. The focus on Opaalstraat limits the application of the findings to the entire neighbourhood or other post-war areas. While the ideas could serve as a model for similar neighbourhoods, additional research is needed. Furthermore, the study recognized but did not thoroughly address practical implementation challenges. Examples are issues pointed out by Adema, regarding property ownership and ongoing maintenance of front gardens, which require coordinated efforts among stakeholders to address these existing conditions. The short timeline of the study restricted the investigation into the long-term impacts of the design interventions. Moreover, while the study included input from residents and municipal experts, it did not comprehensively explore the perspectives of a broader range of stakeholders, such as business owners and housing cooperatives. Additionally, the survey was only representative regarding gender, which limits the broader applicability of its findings. The survey does not represent the entire population of Vinkhuizen.

For future research, conducting surveys with a larger and more diverse sample could improve representativeness across various demographic characteristics such as age and level of education. This study focused solely on one street within a single post-war neighbourhood. Future research could broaden its scope and apply these findings to neighbourhood level, investigating the effectiveness of scaling up the principles. Furthermore, conducting studies to evaluate the long-term effects of design changes on resident satisfaction and social dynamics would provide a deeper understanding of the effectiveness of applying these principles. Implementing Gehl's principles to a broader range of Dutch post-war neighbourhoods could test their adaptability and effectiveness in diverse urban contexts. Another possibility for future research could be to develop strategies to engage diverse stakeholders, including residents, municipal authorities, housing cooperatives, and businesses. Adema pointed out that the collaboration between the different parties is important in making these plans reality. Looking into this can help address implementation barriers and gain community support.

The study's findings show the potential of Gehl's principles for revitalizing Dutch post-war neighbourhoods. By focusing on human-scale design and integrating a mix of functions, improvements can be made to the quality of life in these neighbourhoods. This approach

addresses common challenges such as outdated infrastructure and monotonous urban layouts, offering a framework for urban renewal projects across the Netherlands.

In conclusion, Gehl's principles offer a robust framework for addressing challenges in post-war neighbourhoods, promoting environments adjusted to human needs and interactions. This research showed how these principles can be applied in Vinkhuizen. Future research could build upon these findings to test and develop these principles across diverse contexts and over longer periods. The exploration of Gehl's principles presents opportunities to reimagine more Dutch post-war neighbourhoods.

7. Reflection

Several challenges were faced during this research. The first challenge was aligning the theoretical principles with the reality in Vinkhuizen to be able to adapt these and develop interventions for the design. Furthermore, during the process of collecting and analysing survey data some unforeseen difficulties arose relating to ensuring representativeness among residents in Vinkhuizen. The survey collection stagnated, which resulted in being uncertain about how to proceed with this part of the research.

A valuable contribution to the research was the feedback from the residents and experts. This improved the development of the design for Opaalstraat and showed the importance of adaptability and responsiveness in the Urban Planning Process. Furthermore, despite being difficult, the design's visualization eventually fulfilled the researcher's expectations. It proved that Gehl's theories could be used in a real-world setting.

Even though at one point it was challenging to gather surveys, the researcher is grateful to everyone who wanted to help. Interviewing Jan Gehl and Theo Adema offered valuable insights that greatly contributed to the study. Theo Adema's positive and enthusiastic feedback on the design was particularly motivating.

However, there are opportunities for improvement. In hindsight, spending more time on community consultations and using various methods like focus groups or workshops could have provided deeper insights into the neighbourhood. Ensuring a balanced representation of participants across various age groups and education levels could have made the findings more reliable.

The research findings show interesting results regarding applying Gehl's principles in the context of Vinkhuizen. Nevertheless, further research and long-term evaluation are needed to fully assess their effectiveness. Future research could focus on implementing these principles at the neighbourhood level and evaluate their impact on resident satisfaction and social dynamics over a longer period. Such research would provide a more comprehensive understanding of the applicability and sustainability of Jan Gehl's design approach in post-war neighbourhoods.

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Appendix

Appendix 1 Health Vinkhuizen by Basismonitor

Table with underperforming aspects regarding Health Vinkhuizen by Basismonitor Groningen (n.d.).

Category	Concerns
Health	Adults aged 19 and older with two or more chronic conditions
	Adults aged 19 and older with visual impairments
	Adults aged 19 and older with hearing impairments
	Adults aged 19 and older with mobility impairments
	Adults aged 19 and older with moderate to poor mental health
	Average grade that adult residents give for their health
	Average grade that adult residents give for the quality of their life
	Average grade that adult residents give for how happy they felt in the past two weeks
	Adults who expect that the quality of their life will remain the same or improve in the next two years
	Adults aged 19 and older meeting the Dutch physical activity guidelines
	Adults aged 19 and older who are overweight
	Adults aged 19 and older who are moderately or severely limited in performing activities due to health problems
	Adults who have received assistance from others due to health problems or other limitations in the past 12 months
	Adults who feel restricted by physical and/or mental health issues in their daily activities at home, school, work, or during leisure time
	Adults aged 19 and older who experience moderate to high levels of autonomy in their own lives
	Percentage of residents (18 years and older) who say they can easily bounce back when things have been tough
	Percentage of residents (18 years and older) who say they can organize help for themselves if needed

Appendix 2 Interview Guide

Interview guide for the interview with Theo Adema, Municipality of Groningen.

Introductie:

Dit onderzoek richt zich op hoe naoorlogse wijken kunnen worden verbeterd, aangezien deze vaak worden bekritiseerd vanwege hun te rationele ontwerp. Deze casestudy streeft ernaar om de principes van Gehl toe te passen op de context van Vinkhuizen. Vinkhuizen is gekozen als focus van het onderzoek vanwege de huidige uitdagingen en de inspanningen van de gemeente om de leefbaarheid te verbeteren. In vergelijking met andere wijken in Groningen scoort Vinkhuizen onder het gemiddelde op verschillende aspecten van leefbaarheid (Gemeente Groningen, z.d.). Van alle naoorlogse wijken in Groningen is het het meest rationeel ontworpen. Maar ondanks dat het ooit bedoeld was als moderne en ruime woonwijk, heeft Vinkhuizen, net als veel andere wijken uit die tijd, problemen op het gebied van stedelijke leefbaarheid (Blom, 2012).

- Dit interview heeft als doel inzichten te verzamelen over hoe de ontwerpprincipes van Jan Gehl kunnen worden omgezet in actie in de naoorlogse wijk Vinkhuizen om de levenskwaliteit van de bewoners te verbeteren.
- Gaat u ermee akkoord dat dit interview wordt opgenomen en dat het wordt gebruikt voor een scriptie onderzoek?

Achtergrond:

- Wat is uw achtergrond wat betreft planning en wat is uw rol binnen de gemeente?
- Heeft u ervaring met vergelijkbare wijkvernieuwingsprojecten zoals Vinkhuizen?
- Bent u bekend met de design principes van Jan Gehl?

Vinkhuizen:

- Wat zijn volgens u de grootse problemen en uitdagingen in Vinkhuizen?
- Wat denkt u dat de belangrijkste oorzaken hiervan zijn?
- Denkt u dat het ontwerp van de wijk hier iets mee te maken heeft?
- Kunt u kort vertellen wat de huidige plannen van de gemeente om Vinkhuizen te verbeteren zijn?
- Wat vindt u een belangrijk aspect (bijvoorbeeld: infrastructuur, groenvoorzieningen, voorzieningen, sociale cohesie, etc.) wat verbeterd moet worden in Vinkhuizen wat betreft de planning om de leefbaarheid van de wijk te verbeteren?

Jan Gehl's Principes:

- Bespreek de stedelijke ontwerpprincipes van Jan Gehl en hun relevantie voor Vinkhuizen.
- Welke specifieke principes denk u dat het meest waardevol kunnen zijn om toe te passen in Vinkhuizen, en waarom?
- Zijn er principes die al een belangrijk onderdeel zijn van de plannen?
- Zijn er al concrete voorbeelden waarin Gehl's principes met succes zijn toegepast in andere steden of wijken, en wat daarvan geleerd kan worden voor Vinkhuizen?
- Hoe kunnen deze principes worden aangepast of aangevuld worden om beter aan te sluiten bij de context van Vinkhuizen?

Barrières en kansen:

- Wat kunnen mogelijke barrières voor de implementatie van Gehl's principes in Vinkhuizen zijn? (Bijv. regelgevend, financieel, cultureel).
- Heeft u specifieke voorbeelden van barrières die u in het verleden heeft ervaren bij het implementeren van stedelijke ontwerpprincipes?
- Wat zijn volgens u de mogelijkheden om deze barrières te overwinnen?

Strategie voor implementatie:

- Hoe denkt u dat het mogelijk is om Gehl's principes om te zetten in uitvoerbare plannen voor Vinkhuizen?
- Hoe wordt het succes van wijkvernieuwing gemeten en geëvalueerd?

Betrekking van de inwoners:

- Kunt u het belang van betrokkenheid van de gemeenschap bij stedelijke ontwerpprojecten bespreken en hoe is de burgerparticipatie in Vinkhuizen wat betreft wijkvernieuwing?

Afsluitend:

- Bedankt voor uw tijd en inzichten.
- Heeft u nog andere opmerkingen over het onderzoek?

Principes Gehl:

De functies van de stad moeten zorgvuldig geplaatst worden om kortere afstanden tussen de verschillende functies en mensen te verzekeren (Gehl, 2010).

- Een eerste principe dat wordt besproken in het boek is dat de functies van steden zorgvuldig moeten worden geplaatst om kortere afstanden tussen de verschillende functies en de bewoners en evenementen te garanderen (Gehl, 2010).

Integreer verschillende functies in steden om veelzijdigheid, rijkdom aan ervaring, sociale duurzaamheid en een gevoel van veiligheid in individuele stadsdelen te waarborgen (Gehl, 2010).

- Verschillende functies moeten worden geïntegreerd binnen stedelijke gebieden om aanpasbaarheid, rijkdom aan ervaring, sociale duurzaamheid en een gevoel van veiligheid binnen elk stadsdeel te garanderen (Gehl, 2010).

Ontwerp stadsruimte zodat deze uitnodigend en veilig is voor voetgangers en fietsverkeer (Gehl, 2010).

- Volgens Gehl (2010) zou het stedelijk gebied zo ontworpen moeten zijn dat het veilig en aantrekkelijk is voor voetgangers en fietsers.

Maak de randen tussen de stad en gebouwen open, zodat het leven binnenin gebouwen en buiten in stadsruimtes samen kunnen werken (Gehl, 2010).

- Connectiviteit moet worden gevestigd tussen het stedelijk omgeving en gebouwen, waarbij een wederzijds voordelige relatie wordt bevorderd tussen de bewoners binnen en de gemeenschap buiten (Gehl, 2011).

Maak plekken meer uitnodigend om langere verblijven in stadsruimtes aan te moedigen, omdat enkele mensen die veel tijd op 1 plek doorbrengen dezelfde levendige sfeer kunnen creëren als veel mensen die slechts kortstondig aanwezig zijn (Gehl, 2010).

- In het boek wordt vermeld dat van al deze principes, het aanmoedigen van mensen om meer tijd buiten door te brengen, zich onderscheidt als het eenvoudigste en meest impactvolle principe (Gehl, 2010).

Appendix 3 Survey

Survey that has been handed out to the residents of Vinkhuizen.

Beste buurtbewoner van Vinkhuizen,

Allereest, hartelijk bedankt voor het invullen van deze enquête. Mijn naam is Lena van Bolhuis, master-student aan de Rijksuniversiteit Groningen, faculteit Ruimtelijke Wetenschappen. Als onderdeel van mijn scriptie, doe ik onderzoek naar de verbetering van de leefbaarheid van Vinkhuizen. Het kost ongeveer 10 minuten om de enquête met 14 vragen in te vullen.

Het doel van dit onderzoek is om inzicht te krijgen over hoe de leefbaarheid van Vinkhuizen kan worden verbeterd aan de hand van bepaalde stedenbouwkundige principes.

Als bewoner van de buurt kent u als geen ander de dagelijkse uitdagingen en kansen van de wijk. Uw bijdrage zal een waardevolle aanvulling zijn in het onderzoek naar een leefomgeving die veilig, duurzaam en aangenaam is voor alle bewoners van Vinkhuizen.

Deelname aan het onderzoek is vrijwillig. Als u besluit dat u toch niet wil deelnemen, hoeft u niet uit te leggen waarom. U kunt uw deelname op elk gewenst moment beëindigen door de internetbrowser te sluiten. Wanneer u de enquête heeft ingeleverd op het eind, zullen de door u ingevulde antwoorden mee worden genomen in het onderzoek.

Er wordt gevraagd naar uw leeftijd en postcode (alleen de vier cijfers). Dit wordt gevraagd om er zeker van te zijn dat er enkel volwassenen met het onderzoek mee doen en om te controleren of buurtbewoners uit Vinkhuizen de vragen beantwoorden.

Ik wil u erop wijzen dat er geen foute of goede antwoorden zijn. Het wordt erg op prijs gesteld als u zo eerlijk en spontaan mogelijk wilt antwoorden vanuit uw interpretatie. U kunt de enquête invullen waar en wanneer u dat het beste uitkomt.

Er zal met zorg met de gegevens worden omgegaan en de verkregen informatie wordt vertrouwelijk verwerkt. Alle gegevens zijn anoniem en zullen ook zo worden opgeslagen en verwerkt. De gegevens worden enkel voor dit onderzoek gebruikt en zullen niet met andere partijen worden gedeeld. Na de beoordeling van mijn scriptie worden de verzamelde data vernietigd.

Mocht u nog vragen hebben dan kunt u contact met mij opnemen via mijn e-mailadres:

l.a.j.van.bolhuis@student.rug.nl

Door te beginnen met de enquête, verklaar ik (de deelnemer) dat:

- Ik naar tevredenheid ben geïnformeerd over het onderzoek.
- Ik heb begrepen wat er van mij verwacht wordt.
- Ik de gelegenheid heb gehad om vragen te stellen over het onderzoek.
- Ik weet dat mijn deelname vrijwillig is.

- Ik weet dat mijn deelname op elk moment beëindigt kan worden, zonder dat het nodig is om uit te leggen waarom.
- Ik ga akkoord met de deelname aan dit onderzoek.
- Ik ga ermee akkoord dat mijn ingevulde enquête wordt gebruikt voor een scriptie onderzoek.

De enquête begint met 4 algemene vragen. Daarna komen er 10 stellingen over Vinkhuizen.

1. Wat is uw leeftijd?

- 18 - 25
- 26 - 45
- 46 – 65
- Ouder dan 65 jaar

2. Wat is uw geslacht?

- Man
- Vrouw
- Anders/Zeg ik liever niet

3. Wat is uw hoogst afgeronde onderwijsniveau?

- Basisonderwijs
- VMBO
- HAVO
- VWO/Gymnasium
- Lager beroepsonderwijs (LBO/LTS/LHNO/huishoudschool)
- Middelbaar beroepsonderwijs (MBO)
- Hoger beroepsonderwijs (HBO)
- Universiteit (bachelor/master/doctoraal)
- Anders

4. Wat zijn de vier cijfers van uw huidige postcode? (Dit is om te controleren of deelnemers van de enquête inderdaad uit Vinkhuizen komen).

.....

1. "Er zijn genoeg gemakkelijk bereikbare parken en groene plekken in Vinkhuizen die goed onderhouden zijn, en waar mensen kunnen ontspannen en plezier hebben."
 - Volkomen mee eens
 - Mee eens
 - Oneens
 - Volkomen oneens
2. "De wijk en de infrastructuur nodigt uit om te fietsen en/of te wandelen, het is namelijk veilig en comfortabel om te fietsen/wandelen. De auto laat ik staan, aangezien alles goed te bereiken is te voet of met de fiets."

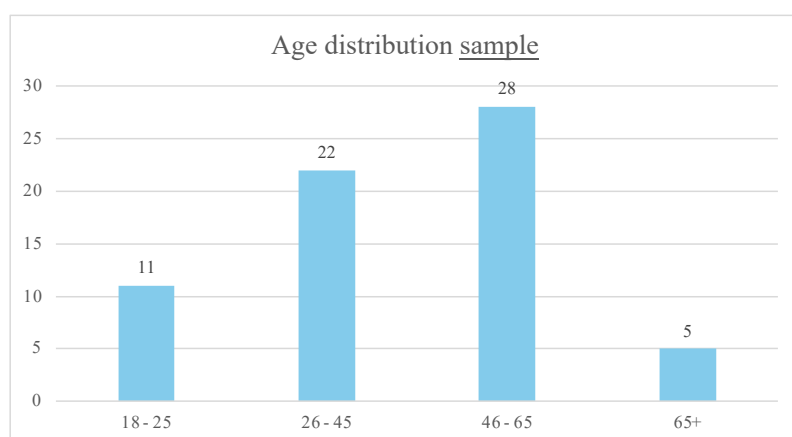
- Volkomen mee eens
 - Mee eens
 - Oneens
 - Volkomen oneens
3. "Ik voel me veilig wanneer ik overdag én 's nachts door de straten en andere openbare ruimtes van Vinkhuizen loop."
- Volkomen mee eens
 - Mee eens
 - Oneens
 - Volkomen oneens
4. "Ik vind dat Vinkhuizen er mooi uit ziet. De omgeving en de gebouwen zien er mooi uit en de omgeving is goed ingericht."
- Volkomen mee eens
 - Mee eens
 - Oneens
 - Volkomen oneens
5. "In Vinkhuizen zijn genoeg verschillende soorten winkels, diensten en activiteiten, zoals horeca, kappers, sportscholen, supermarkten, winkels en ontmoetingsplekken die goed bereikbaar zijn."
- Volkomen mee eens
 - Mee eens
 - Oneens
 - Volkomen oneens
6. "In onze wijk zijn verschillende soorten functies, zoals huizen, openbare voorzieningen, winkelgebieden, werkplekken en scholen, gelijkmatig verdeeld over de hele buurt. Hierdoor zijn de verschillende diensten en winkels niet geconcentreerd op slechts bepaalde plekken, maar door de hele wijk."
- Volkomen mee eens
 - Mee eens
 - Oneens
 - Volkomen oneens
7. "In Vinkhuizen zijn gebouwen en huizen zo ontworpen dat er een sterke interactie is tussen de activiteiten binnen en het leven op straat. Dit betekent dat er vanuit de gebouwen goed zicht is op wat erbuiten gebeurt. Dit geldt niet alleen voor woningen, maar ook voor restaurants, bars en winkels in de buurt."
- Volkomen mee eens
 - Mee eens
 - Oneens
 - Volkomen oneens
8. "De openbare ruimtes in Vinkhuizen moedigen aan om meer tijd buitenshuis door te brengen en zijn geschikt voor verschillende soorten buitenactiviteiten zoals, sporten, picknicken en spelen. Dit draagt bij aan een levendige buurt."
- Volkomen mee eens
 - Mee eens

- Oneens
 - Volkomen oneens
9. "Ik ga vooral de deur uit voor de noodzakelijke activiteiten zoals naar school of werk gaan, winkelen en klusjes afhandelen. Andere sociale activiteiten, zoals het afspreken met vrienden vindt vaak plaats binnen in huis of in een andere buurt."
- Volkomen mee eens
 - Mee eens
 - Oneens
 - Volkomen oneens
10. "Vinkhuizen is een dynamische stadswijk."
- Volkomen mee eens
 - Mee eens
 - Oneens
 - Volkomen oneens

Appendix 4 Chi-square Test Representativity

To determine whether the sample is representative of the population of Vinkhuizen, a chi-square test has been performed. The two variables that were used are age distribution and gender distribution. The chi-square test compares the observed frequencies in the sample with the expected frequencies based on population data from the CBS (n.d.). The significance level was set at $\alpha=0.05$.

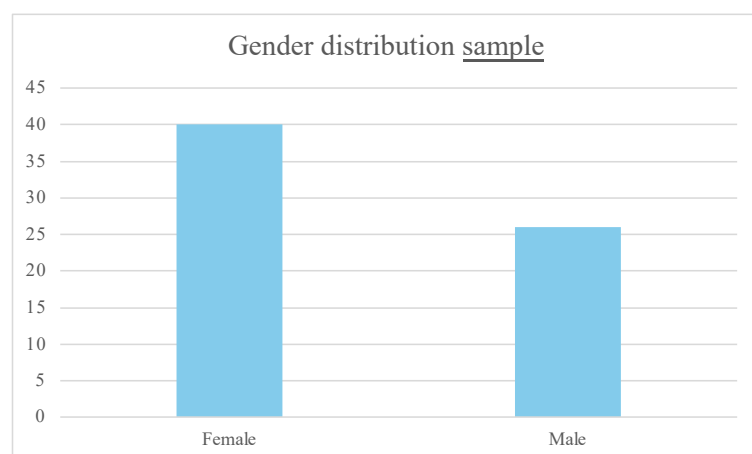
The distribution for age and gender within the sample are shown in Figure 1, 2, and Tables 1, and 2. The distribution for age and gender within the data from CBS are shown in Figure 3, 4, and Tables 3, and 4.



Age	Amount
18 - 25	11
26 - 45	22
46 - 65	28
65+	5
Total	66

Table 1 Amount of participants per age group
SAMPLE

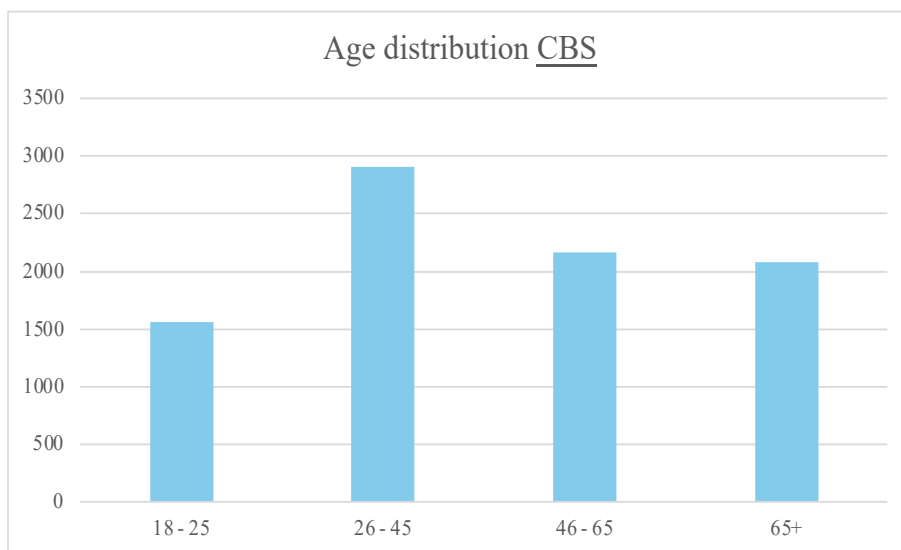
Figure 1 Barchart distribution age groups SAMPLE



Gender	Amount
Female	40
Male	26
Total	66

Table 2 Amount of participants per gender
SAMPLE

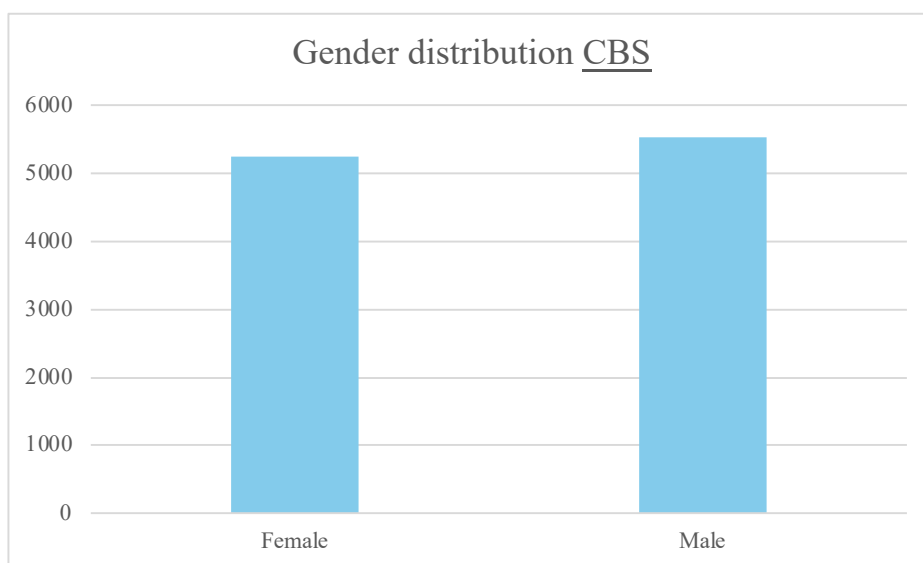
Figure 2 Barchart distribution gender SAMPLE



Age	Amount
18 - 25	1566
26 - 45	2910
46 - 65	2170
65+	2080
Total	8726

Table 3 Number of residents per age group in Vinkhuizen, CBS (n.d.)

Figure 3 Barchart distribution age groups Vinkhuizen, CBS (n.d.)



Gender	Amount
Female	5250
Male	5530
Total	10780

Table 4 Number of residents per gender in Vinkhuizen, CBS (n.d.)

Figure 4 Barchart distribution gender Vinkhuizen, CBS (n.d.)

An adjustment was necessary to be made for the age group 18–25. CBS provided data starting from age 15, but the survey focused on individuals aged 18 and above, excluding children. Because the provided age ranges did not exactly match, the researcher estimated the proportion of the population aged 18–25. To adjust the CBS data for the age group 18–25, given that the data included individuals starting from age 15, the researcher assumed an even distribution of individuals across the ages within the 15–25 range. Although this assumption simplifies the actual distribution, it allows for a reasonable estimate. Here’s the calculation process:

- 15–25 years: This age group spans 11 years in total.
- 18–25 years: This age group spans 8 years.

Therefore, 8 out of the 11 years of the age group falls into the category 18 – 25 range. The estimated individuals aged 18 – 25 can then be calculated by multiplying 8/11 by the total amount of the age group 15 – 25 years. The formula for the estimated individuals aged 18–25:

$$1566 \times 8/11 = 1138$$

So, by assuming an even distribution and calculating the proportions, the researcher estimated that the CBS data indicated approximately **1138** individuals in the age group 18–25, derived from the total population provided for the age range 15–25.

The following formula has been used to calculate the chi-square test (Burt, et.al., 2009):

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

χ^2 = Chi squared

O_i = Observed value

E_i = Expected value

To calculate the degrees of freedom (df), the number of rows – 1 must be calculated.

Regarding age, there are 4 rows. Gender includes 2 rows. Since nobody in the survey selected the answer ‘other/prefer not to say’, this row is not included in the calculation. Filling in these numbers, the formula’s look as following:

$$df_{age} = 4 - 1 = 3$$

$$df_{\text{gender}} = 2 - 1 = 1$$

As mentioned before, the critical chi-square value for alpha is set on 5%. When using the degrees of freedom and the critical chi-square value in the chi-square distribution table, it is shown that the critical chi-square value for age is 7.815. For gender this is 3.841.

The expected frequencies are calculated based on the proportion of each age group in the population. The population data provided the following numbers for each **age group**:

- Expected Frequencies (based on CBS data):
 - o 18-25 years: 11.84
 - o 26-45 years: 22.00
 - o 46-65 years: 16.41
 - o 65+ years: 15.74
 - o Total: 66

Applying the Chi-square formula to the **age** data:

$$\chi^2_{\text{age}} = \frac{(11 - 11.84)^2}{11.84} + \frac{(22 - 22.00)^2}{22.00} + \frac{(28 - 16.41)^2}{16.41} + \frac{(5 - 15.74)^2}{15.74}$$

$$\chi^2_{\text{age}} = \frac{(-0.84)^2}{11.84} + \frac{(0.00)^2}{22.00} + \frac{(11.59)^2}{16.41} + \frac{(-10.74)^2}{15.74}$$

$$\chi^2_{\text{age}} = \frac{0.7056}{11.84} + \frac{0.0000}{22.00} + \frac{134.6081}{16.41} + \frac{115.4276}{15.74}$$

$$\chi^2_{\text{age}} = 0.06 + 0.00 + 8.20 + 7.30 = 15.56$$

So, the Chi-square Statistic: $\chi^2_{\text{age}} = 15.56$

The population data provided the following numbers for the **genders**:

- Expected Frequencies (based on CBS data):
 - o Female: 33.84
 - o Male: 32.16
 - o Total: 66

Applying the Chi-square formula to the **gender** data:

$$\chi^2_{\text{gender}} = \frac{(40 - 33.84)^2}{33.84} + \frac{(26 - 32.16)^2}{32.16}$$

$$\chi^2_{\text{gender}} = \frac{(6.16)^2}{33.84} + \frac{(-6.16)^2}{32.16}$$

$$\chi^2_{\text{gender}} = \frac{37.9856}{33.84} + \frac{37.9856}{32.16}$$

$$\chi^2_{\text{gender}} = 1.12 + 1.18 = 2.29$$

So, the Chi-square Statistic: $\chi^2_{\text{gender}} = 2.29$

The results of the Chi-square calculation are shown in the table below.

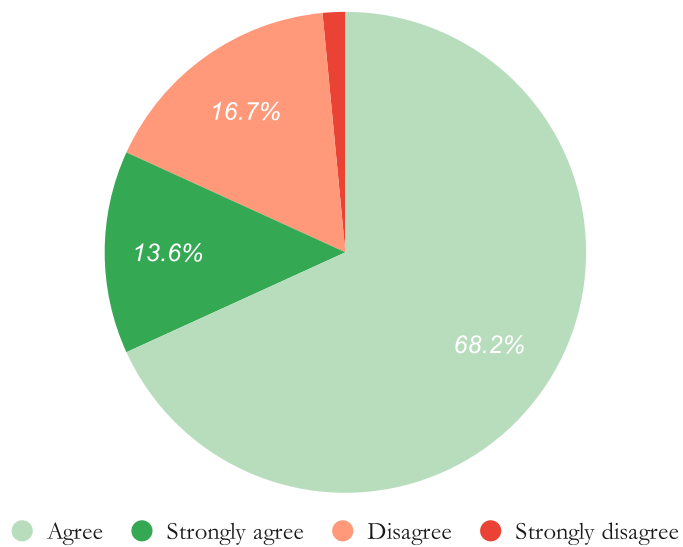
Since the chi-square (15.56) is bigger than the critical value (7.815), the test is significant. Meaning that the sample is not representative for the population.

Since the chi-square (2.29) is smaller than the critical value (3.841), the test is not significant. Meaning that the sample is representative for the population.

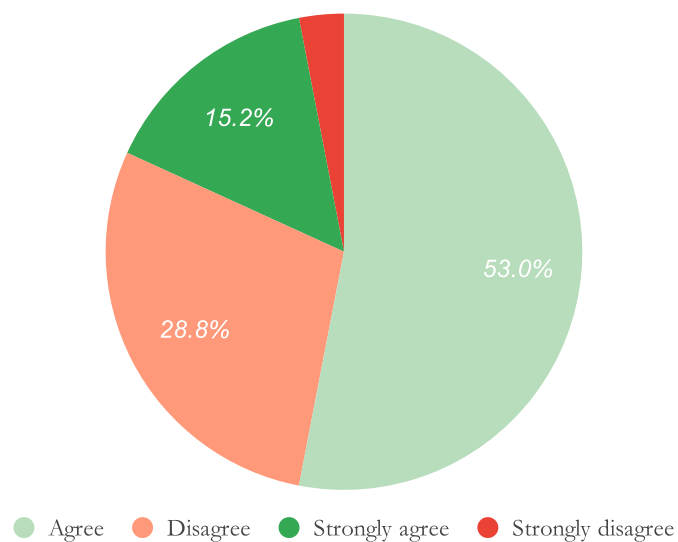
	Chi-Square	Critical value	Significant?	Representative?
Age	15.56	7.815	Significant	Not representative
Gender	2.29	3.841	Not significant	Representative

Appendix 5 Piecharts Outcomes Surveys

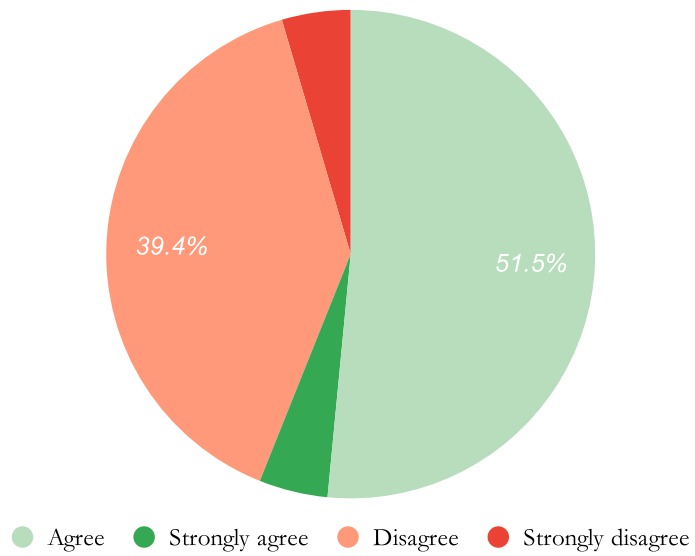
"There are plenty of easily accessible parks and green spaces in Vinkhuizen that are well-maintained, where people can relax and enjoy themselves."



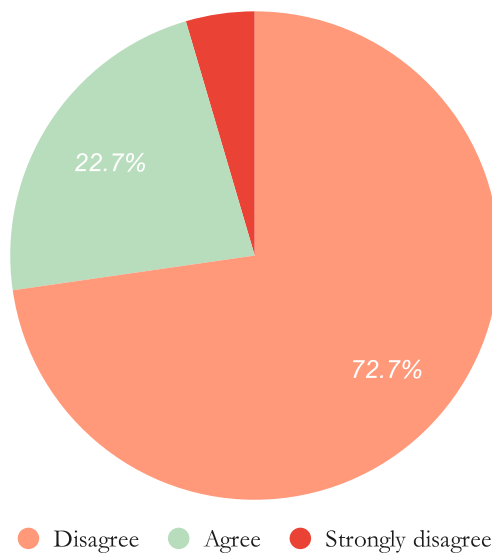
"The neighbourhood and infrastructure encourage cycling and/or walking, as it is safe and comfortable to cycle/walk. I leave the car at home since everything is easily accessible by foot or by bike."



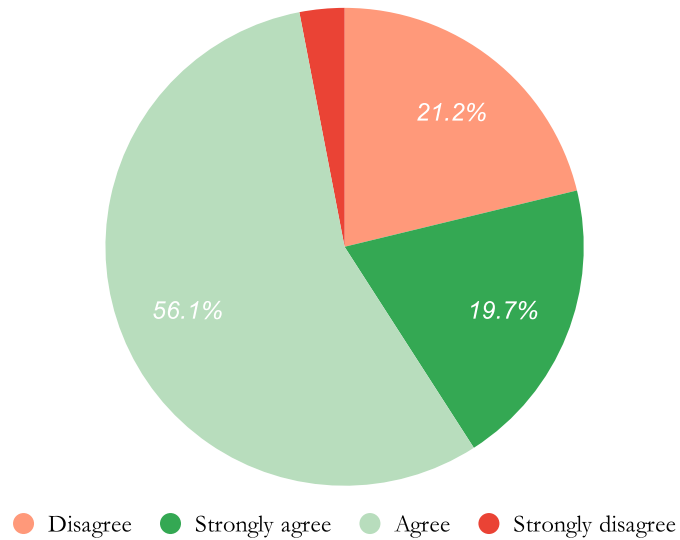
"I feel safe when walking through the streets and other public spaces of Vinkhuizen both during the day and at night."



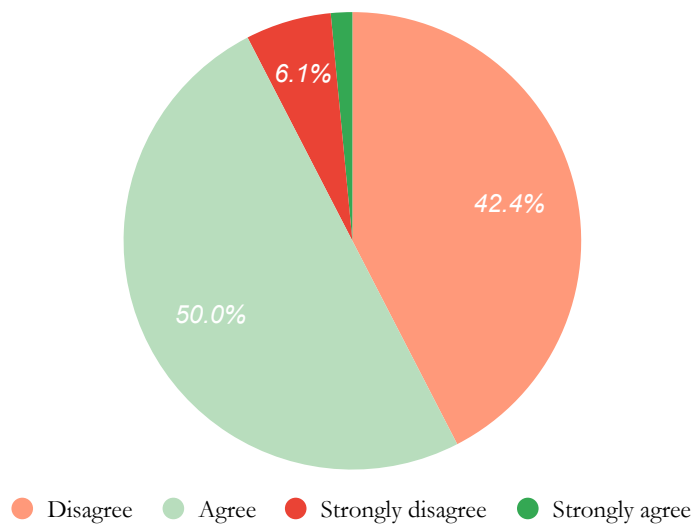
"I think Vinkhuizen looks beautiful. The surroundings and the buildings look nice, and the area is well designed."



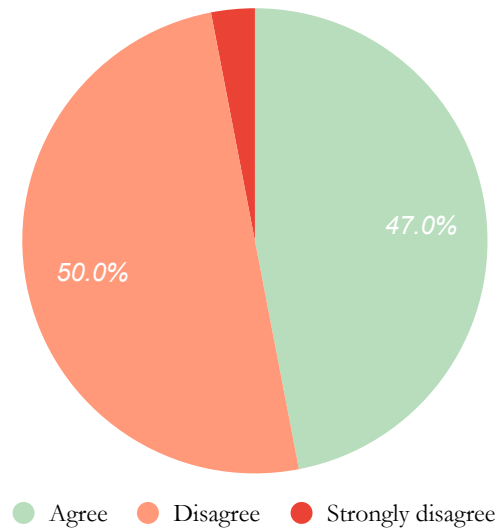
"In Vinkhuizen, there are plenty of different types of shops, services, and activities, such as restaurants, hairdressers, gyms, supermarkets, shops, and meeting places that are easily accessible."



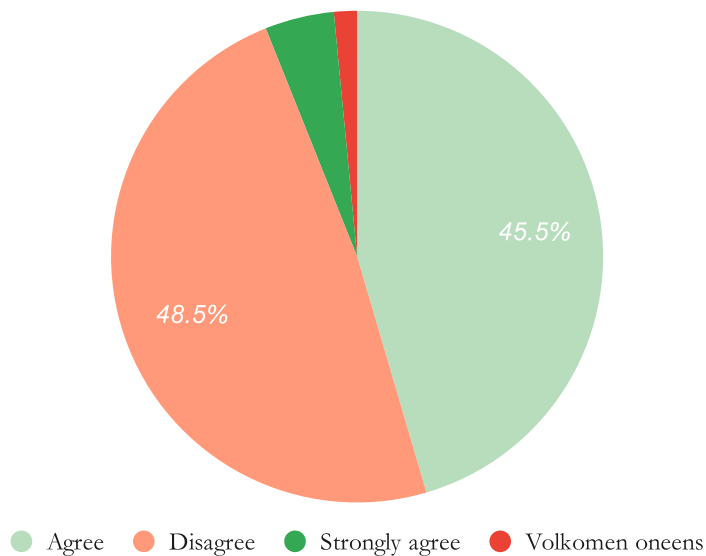
"In our neighbourhood, various types of functions, such as houses, public amenities, shopping areas, workplaces, and schools, are evenly distributed throughout the entire area. This means that the various services and shops are not concentrated in specific areas but spread throughout the neighbourhood."



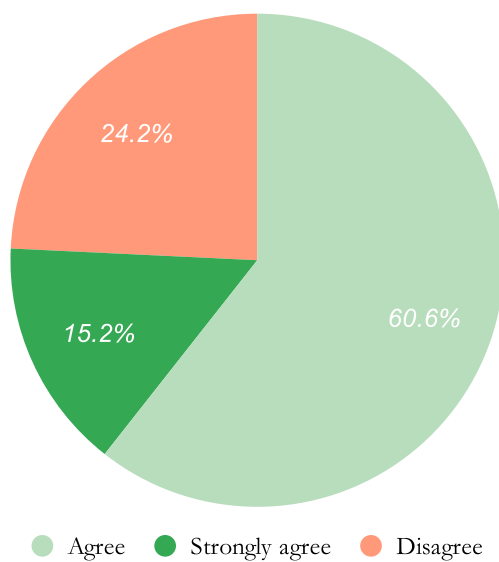
"In Vinkhuizen, buildings and houses are designed in a way that promotes strong interaction between indoor activities and street life. This means there is good visibility from the buildings to what is happening outside. This applies not only to homes but also to restaurants, bars, and shops in the neighbourhood."



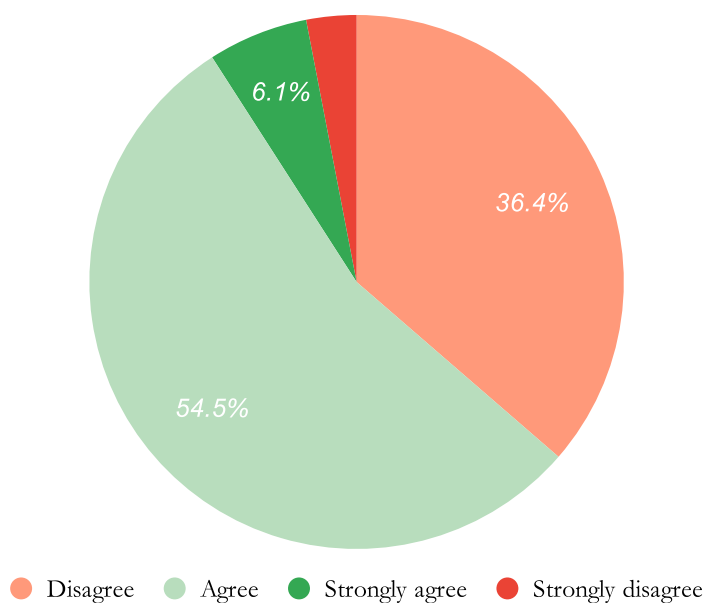
"The public spaces in Vinkhuizen encourage spending more time outdoors and are suitable for various outdoor activities such as sports, picnics, and playing. This contributes to a lively neighbourhood."



"I mainly leave the house for essential activities such as going to school or work, shopping, and running errands. Other social activities, like meeting friends, often take place indoors or in a different neighbourhood."



"Vinkhuizen is a dynamic urban neighbourhood."



Appendix 6 Announcement Posted on the Website of Vinkhuizen Groningen



The screenshot shows the homepage of the Vinkhuizen Groningen website. The header features a navigation menu with links to Home, Nieuws, Activiteiten, Organisaties (with a dropdown arrow), and Contact. A search bar is located on the right side of the header. The main content area has a light blue background and features a large heading: "Oproep: Doe mee aan onderzoek over het verbeteren van de wijk". Below the heading is a decorative wavy line. To the right of the heading is a button that says "Lees tekst voor" followed by a question mark icon. Below the heading, there is a small image of a pond with reeds and a building in the background. To the right of the image, the text reads: "30 mei 2024 | Beheer". The text continues: "Studente Lena Bolhuis van Rijksuniversiteit Groningen doet onderzoek naar manieren waarop naoorlogse wijken kunnen worden verbeterd voor de buurtbewoners. Daarom verzamelt ze momenteel informatie over hoe buurtbewoners van Vinkhuizen over hun wijk denken. Zo ontstaat er een beeld van wat punten van verbetering in de wijk zijn, maar ook welke problemen er spelen." Below this text, it says: "Wil je meedoen? [Klik dan hier](#) en vul de enquête in." The footer is a dark teal bar with three sections: "Partnerorganisaties", "Footermenu", and "Sociale media".

Home Nieuws Activiteiten Organisaties Contact Zoeken ...

Oproep: Doe mee aan onderzoek over het verbeteren van de wijk

Lees tekst voor ?

30 mei 2024 | Beheer

Studente Lena Bolhuis van Rijksuniversiteit Groningen doet onderzoek naar manieren waarop naoorlogse wijken kunnen worden verbeterd voor de buurtbewoners. Daarom verzamelt ze momenteel informatie over hoe buurtbewoners van Vinkhuizen over hun wijk denken. Zo ontstaat er een beeld van wat punten van verbetering in de wijk zijn, maar ook welke problemen er spelen.

Wil je meedoen? [Klik dan hier](#) en vul de enquête in.

Partnerorganisaties Footermenu Sociale media

Appendix 7 New Design for the Opaalstraat



