Vitally Densifying Neighbourhoods

A research-by-design led plan for the creation of dense and green neighbourhoods

Figure 0: Densification and vital green space design of Vinkhuizen by Artificial Intelligence (Source: Dall E)

Bachelor Project
Bachelor of Science
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Abstract

Urban densification presents a dual challenge: increasing housing capacity while preserving and enhancing green spaces vital for youth well-being. This study explores a design-led approach to redeveloping Vinkhuizen-Noord, a post-war neighbourhood in Groningen. Employing the Research-by-Design methodology, the study integrates theoretical insights, stakeholder engagement, and a case study to create a comprehensive redevelopment plan. Key design principles focus on multifunctionality, community involvement, sustainability, and young age group inclusivity. Literature, interviews, and observations inform these principles, demonstrating how green spaces can be integrated into dense urban environments. The principles are tested in a design for Vinkhuizen-Noord, which proposes a 20% increase in housing units while enhancing green infrastructure and social cohesion. Features include a green-blue network connecting parks, promoting eco-friendly mobility, and managing stormwater. The redevelopment aims to create vibrant, liveable spaces supporting young residents' physical, social, and psychological well-being. The findings highlight the necessity of integrated planning, addressing densification and green space preservation. Critical design principles such as multifunctionality, holistic infrastructure planning, and community involvement emerged as crucial for enhancing cohesion. These principles are universally applicable, offering valuable insights for urban planners globally. The study concludes that urban densification can coexist with green space enhancement, contributing to sustainable urban development. Future research should explore the long-term impacts on community well-being and sustainability, leveraging innovative planning technologies. This research underscores that thoughtful design, aligned with the needs of young residents, can foster social cohesion and environmental sustainability in urban redevelopment projects.

Keywords: Research by Design, Densification, Urban Green Space.

Contents

Introduction

1.1 Background

Cities are faced with an increased demand for housing supply, although they have limited space to offer, densification might prove to be a useful approach (Erlwein et al., 2023). However, increasing the housing supply comes hand in hand with the task of maintaining and preserving urban green spaces (Erlwein, S. and Pauleit, S., 2021). In the Netherlands, there is a significant need for more housing, especially for young residents who are facing considerable challenges in finding affordable housing due to the limited availability of rental and purchase properties (Speech from the Throne, 2022). This demographic, vital for the economy and community development, is disproportionally affected by the housing affordability crisis, which could partly be solved by densification (Horne, Nelson, & Dorignon, 2024).

The pressure on urban green spaces intensifies, as those areas are increasingly seen as residual spaces. Balikci, Giezen, and Arundel (2021) have studied urban development with urban green space and concluded that, rather than integral components of the urban fabric. The European Environment Agency (2022) highlights, "The health benefits of urban green space are well recognised for children, whose physical and mental development is enhanced by living, playing, and engaging in these spaces."

Young public space users have distinct needs that urban green spaces can uniquely fulfil, supporting their physical, social and psychological well-being. Public spaces offer young people vital opportunities for recreation, social interaction and connection with nature, essential for healthy development and well-being. Gearin and Kahle (2023) state that adults prioritise recreational activities such as exercising in parks, while teenagers seek green spaces for socialising with their peers and relaxing on the grass. This highlights the importance of designing a versatile urban green space that caters to the diverse needs of youth. Additionally, Douglas, Lennon and Scott (2017) argue that urban green spaces should be planned and managed to provide inclusive opportunities that respond to the life-course needs of residents, including young people. The particular spaces not only promote physical health through encouraging active lifestyles, but also support mental health, by offering settings for unwinding in nature and escape from the urban environment. Providing young people with a healthy place to live is paramount for sustainable urban development, as Haaland and Bosch (2015) concluded in their research on urban green space effects.

In conclusion, when urban densification continues unchecked, the built environment is out of balance. According to Kraemer (2023), who studied urban heat island effects, densification should also correspond to the development of healthy open spaces, such as urban green spaces. Therefore, creating a housing supply forms a dual challenge alongside preserving and improving urban green areas (Na, 2023).

This research aims to achieve a balance between the two. The plan employs a Research-by-Design methodology to redevelop a case area, focusing on increasing housing capacity by 20% while enhancing green spaces through stakeholder engagement and theoretical insights to improve the well-being of young residents and promote sustainable urban development.

1.2 Societal and Academic Relevance

Researching housing shortages, especially in existing neighbourhoods has a significant societal value, addressing urgent affordable housing needs in tandem with growing populations and youthful demographics. It highlights the challenges faced by vulnerable groups such as new market entrants, youth, elderly and (international) students, which emphasises the need for equitable housing conditions.

This research provides insights into the effectiveness of urban densification, bridging theoretical models with real-world impact. It offers practical design guidelines for young residents, contributing to sustainable land use and urban growth, and informs broader urban planning practices.

1.3 The Big How

Given the context of the current housing market, the population growth, competing uses of space, climate change, and energy transition (Speech from the Throne, 2022), in combination with the innovative policies of local governments (Zachte Atlas, 2023), an integral research question concerning the development of housing and the realisation of sustainable green space leads to the following research question:

"How can the densification of an existing neighbourhood expand housing capacity, whilst also enhancing the quality and availability of public spaces for young generations?"

This main research question can be answered by the following sub-questions:

1. **What are specific design needs and desires for young people in public spaces?**
2. **How can involving stakeholders and experts create guidelines for densification alongside vital developing green spaces?**
3. **What would densification and vital green space look like?**

Theoretical framework

This study researches urban densification within neighbourhoods alongside enhancing public space quality, particularly for the younger generation. The study draws upon a base of existing academic work. This collection of theories forms the emphasise step that identifies the literature that specifically aims to bridge the gap between expanding housing capacity and improving green public spaces, while keeping the stakeholders' needs at the forefront. The collection offers an understanding of what is missing in the literature and what needs to be researched still.

2.1 Theories and Concepts

2.1.1 Integrating Green Spaces for Sustainable Urban Densification

Urban densification often raises concerns about the quality of life in densely populated areas. This chapter examines theories and empirical studies that highlight the importance of integrating green spaces in urban densification processes to sustain the well-being of city residents, particularly the young adult demographic.

Integrating green spaces within urban densification processes is essential for sustaining the well-being of city residents. Employing an integrated approach to sustainable urban development demonstrates that urban green spaces are crucial for maintaining environmental quality and liveability. Whitten (2022) gathered empirical evidence from over fifty studies indicate that while densification can enhance housing supply and urban efficiency, it must be balanced with adequate green space provision to support residents' health and well-being. Green infrastructure, including vegetated walls, green roofs, and street trees, can enhance opportunities for biodiversity, shading, cooling, and quiet reflection, even if these features do not dramatically increase the quantity of green space. Such elements can improve access to green spaces in areas where adding new sizeable parks is unrealistic without removing buildings, aligning with the need for densification policies. Planners should continue to pursue larger parks wherever possible, but also incorporate small-scale green interventions to alleviate the pressure on conventional parks and enhance the overall urban green experience (Whitten, 2022).

Urban densification projects reduce the quality of life if green spaces are removed. Kabisch and Haase (2014) and Kabisch and van den Bosch (2017) conducted ecological surveys and participatory workshops to examine the effects of green space removal on urban residents. Their findings reveal that the loss of greenery and open spaces diminishes recreational opportunities and negatively impacts residents' urban experience, underscoring the importance of preserving and enhancing green spaces in densification projects (Kabisch and Haase, 2014; Kabisch and van den Bosch, 2017).

Integrating eye-level greenery can cushion the negative effects of higher urban density on life satisfaction. Maas et al. (2006) conducted a systematic review examining the relationship between urban density, green spaces, and health outcomes. They found that thoughtful incorporation of green spaces within high-density areas is necessary to promote better health and well-being, highlighting the importance of urban planners prioritising green space integration (Maas et al., 2006).

Equitable access to green spaces is crucial for ensuring all socioeconomic groups benefit equally. Sun, et al. (2022) conducted a systematic mapping of access inequity research through correspondence analysis, revealing critical trends, knowledge gaps, and clusters based on a sample of 49 empirical studies screened from 563 selected papers. Their study highlights significant imbalances in green space access, particularly in large cities with populations over 1,000,000, especially in low- and middle-income countries (LMICs). The findings suggest that high socioeconomic status (high-SES) groups, such as the young, rich, or employed, often have better access to urban green spaces (UGS) compared to low-SES groups. Furthermore, analyses on mitigating interventions are sparse, with distinct differences in local mitigating strategies between high-income countries (HICs) and LMICs. Addressing these imbalances is essential to

achieve environmental justice and benefit all residents equally, emphasising the need for policies that prioritize equitable distribution of green spaces (Sun et al., 2022).

Urban densification, which sacrifices green spaces, negatively impacts residents' experience. Arnberger (2012) conducted a survey-based study on the redeveloped Wienerberger area, illustrating that the lack of greenery and open spaces significantly detracts from residents' satisfaction. The absence of green spaces was found to adversely affect residents' overall urban experience, highlighting the necessity of integrating green spaces in densification plans (Arnberger, 2012).

Incorporating adequate room for green spaces within urban densification processes is critical for enhancing the quality of life and ensuring sustainable urban development. The findings from various studies collectively highlight that while densification can offer numerous benefits, it must be balanced with adequate green space provision to support the well-being of all residents.

2.1.2 Enhancing Urban Density with Green Spaces for Youth Well-Being

Urban densification and the maintenance of green urban areas can be seen as a paradox. Innovative urban planning could reconcile these objectives by incorporating green roofs, pocket parks and green corridors into high-density housing developments. Balikci, Giezen, and Arundel (2021) addressed this paradox through spatial analysis and modelling, additionally, they showcased examples of cities that have successfully integrated green spaces within dense urban fabrics.

Urban densification can coexist with the enhancement of green spaces, all the while focusing on the needs of young residents. By synthesising findings from successful green urban densification cases, urban resilience theories, and the public space needs of young people, this study contributes novel insights into sustainable urban planning strategies. The goal is to inform spatial planners and policymakers, illustrating how densification efforts can align with the creation of liveable dense cities that prioritise green spaces, social well-being, and youth engagement (Marucci, 2024).

2.1.3 Innovative Urban Planning: Integrating Green Spaces in High-Density Areas

Green spaces can serve community needs and ecological functions, thus improving the well-being of residents. Haaland and Bosch (2015) have explored urban green spaces' contribution to urban resilience. These areas play a pivotal role in supporting biodiversity, reducing the urban heat island effects, and improving residents' mental health. Through a combination of ecological surveys and participatory workshops, they highlighted how green spaces can be designed to serve both environmental and community functions.

Engagement in green spaces fosters a deeper connection with nature and promotes sustainable behaviours from a young age amongst green space users. Wolsink (2016) studied the interactions that youth had within urban green settings and interviewed educational professionals. The study concluded that urban green space is essential for the environmental education of the younger demographic.

2.1.4 Promoting Physical Activity Among Youth Through Accessible Green Spaces

Proximity and accessibility of green spaces significantly enhance the frequency and likelihood of physical activity among youth. Wolch et al. (2011), found that green spaces located near residential areas promote more frequent use, encouraging regular exercise. They assessed various green spaces' accessibility and their impact on children's physical activity levels, discovering a strong correlation between the proximity of these areas and increased physical activity.

The availability of playgrounds and sports equipment in green spaces encourages a variety of physical activities among youth. Studies indicate that the presence of such facilities not only attracts children, but also promotes diverse forms of exercise, from structured sports to free play. Veiltch et al. (2006), examined several urban parks and noted higher activity levels in areas equipped with playgrounds and sports facilities, supporting the role of these amenities in fostering physical fitness.

Biodiversity and proper maintenance of green spaces significantly impact their attractiveness and usability for physical activities. Diverse plant life and clean, well-maintained environments create engaging and stimulating settings that draw children and encourage prolonged physical activity. Hartig et al. (2014), reached this conclusion through observational studies of various green spaces, where researchers documented usage patterns and environmental conditions.

Perceived safety and the availability of organised community programmes are crucial factors in the usage of green spaces by youth. The presence of security measures and regular community activities were found to boost the attractiveness of these spaces, making parents more likely to allow their children to participate. Holt et al. (2009), surveyed parents and observed participation rates in community-organized events, establishing a clear link between these factors and increased use of green spaces.

In conclusion, the literature underscores the vital role of green spaces in promoting physical activity among youth, emphasising the importance of proximity, accessibility, and the presence of playgrounds and sports equipment. Research indicates that well-maintained, biodiverse environments significantly enhance the appeal and usability of these spaces, encouraging diverse physical activities. Additionally, perceived safety and community programmes are crucial in increasing the utilisation of green spaces.

2.1.5 Designing Inclusive and Equitable Green Spaces for Youth

Genders use green space differently, where young males predominantly engage in sports, while females prefer socialising areas. Schwab and Standler (2004) investigated the preferences of young people in open spaces. This study was conducted through observational research and surveys within diverse urban settings, allowing a comprehensive analysis of behavioural patterns and space usage.

The design and accessibility of urban spaces significantly influence the social behaviours and interactions of young people. They explored the dynamics of young people's interactions with urban public spaces. Pyyry and Tani (2016) undertook qualitative research that employed

ethnographic methods, including participant observation and interviews, to understand the spatial arrangements that facilitate informal social activities among youths.

The inequity of green space provisions negatively impacts the well-being and social opportunities of youths in less affluent areas. Edwards (2015) provided a critical review of public space provisions for young people in the UK, comparing these with international standards. This analysis was based on a combination of policy reviews and case studies, highlighting the disparities in green space quality across different socio-economic regions.

Age-appropriate design modifications are essential to meet the diverse needs and enhance the safety and usability of these spaces for different age groups. Standler (2014), asserted the specific needs of various age groups in open spaces, utilising design analysis and user feedback to recommend suitable modifications in playground and sports area designs.

2.1.6 Designing Age-Appropriate Green Spaces for Youth Development

In order to create a physical environment that does not rely on one sole urban green space, the needs of different age categories have been divided in sections and linked to their needs. This could assist in designing urban green spaces that cater to the respective needs of different youth groups.

Ages 0-5: Green spaces for children aged 0-5 should be safe and specifically designed to enhance sensory and motor development (Wang et al., 2013). Wang et al. (2013) explored how outdoor play spaces' design influences learning and development, concluding that such environments should include soft ground surfaces, low-height structures, and interactive elements like sand and water that are safe and accessible for young children.

Ages 5-10: For children aged 5-10, playgrounds should incorporate a variety of equipment that supports physical development and social interaction (Jansson and Persson, 2010). Jansson and Persson's research into playground design highlights the importance of including climbing structures, swings, and slides, along with natural landscapes that encourage imaginative play and interaction among children in this age group.

Ages 10-15: Urban green spaces need to cater to the independence and physical activity preferences of children aged 10-15 (Gill, 2014). Gills's empirical review study on outdoor environments for learning discusses the necessity of features like skate parks, basketball courts, and spaces for socialising that respect the growing autonomy and physical capabilities of pre-teens and early teenagers.

Ages 15-20: Green spaces designed for teenagers aged 15-20 should provide flexible facilities that accommodate both active recreation and being in green surroundings (Chawla, 2015). Chawla's work on the benefits of nature contact for children emphasises that urban green areas should include multi-use game areas, quiet zones for social interaction, and safe, well-lit areas that are accessible during evening hours, supporting inclusivity and extending usability.

2.1.7 Literature Summary

Urban green spaces are essential for maintaining environmental quality and liveability, especially in dense urban areas (Whitten, 2022). Their removal undermines recreational opportunities and well-being (Kabisch and Haase, 2014; Arnberger, 2012). Integrating green spaces within urban densification processes is crucial to sustaining residents' well-being, particularly for young adults

(Maas et al., 2006; Whitten, 2022). Equitable access to these spaces is vital for all socioeconomic groups (Sun et al., 2022).

Innovative urban planning can reconcile densification with green space enhancement by incorporating green roofs, pocket parks, and corridors within high-density housing (Balikci, Giezen, and Arundel, 2021). This creates liveable cities prioritising green spaces, social well-being, and youth engagement (Marucci, 2024). Green infrastructure, such as vegetated walls, green roofs, and street trees, can enhance biodiversity, shading, cooling, and reflection opportunities, even without increasing green space quantity (Whitten, 2022).

Urban green spaces enhance resilience, biodiversity, and mental health (Haaland and Bosch, 2015) and foster sustainable behaviours among youth (Wolsink, 2016). Proximity to green spaces enhances physical activity among youth (Wolch et al., 2011). Playgrounds and sports equipment promote diverse physical activities (Veitch et al., 2006). Biodiversity and proper maintenance increase attractiveness and usability for activities (Hartig et al., 2014). Perceived safety and organized community programmes boost green space usage (Holt et al., 2009).

Gender influences green space use, with males engaging in sports and females in social activities (Schwab and Standler, 2004). Design and accessibility influence social behaviours of young people (Pyyry and Tani, 2016). Inequity in green space provision impacts youths' well-being and opportunities (Edwards, 2015). Age-appropriate design modifications are essential for different age groups' safety and usability (Standler, 2014).

Designing green spaces for various age groups is crucial for youth development. For ages 0-5, spaces should enhance sensory and motor skills (Wang et al., 2013). For ages 5-10, playgrounds should support physical and social interaction (Jansson and Persson, 2010). For ages 10-15, spaces should cater to independence and physical activity (Gill, 2014). For ages 15-20, spaces should provide flexible facilities for recreation and social interaction (Chawla, 2015).

2.3 Conceptual model

Urban densification requires strategies for increasing housing capacity within existing neighbourhoods, considering the constraints and opportunities presented by the built environment of the existing neighbourhood. Green Public spaces in Figure 1 reflect the importance of maintaining and improving accessible and healthy green spaces for the community, focusing on the needs of the younger residents. Key stakeholder engagement ensures the translation of community needs into data for design refinement (informed design). Their input helps in creating a support base for a concrete urban design. Additionally, the stress caused by densification on cohesive public spaces for youth will become apparent. The observational analysis and background study provide the design process a benchmark for an integrated densification design. At the end of the design process, the design will aim to come to a concrete consensus between places for living and places for being, leading to a vitally densified neighbourhood.

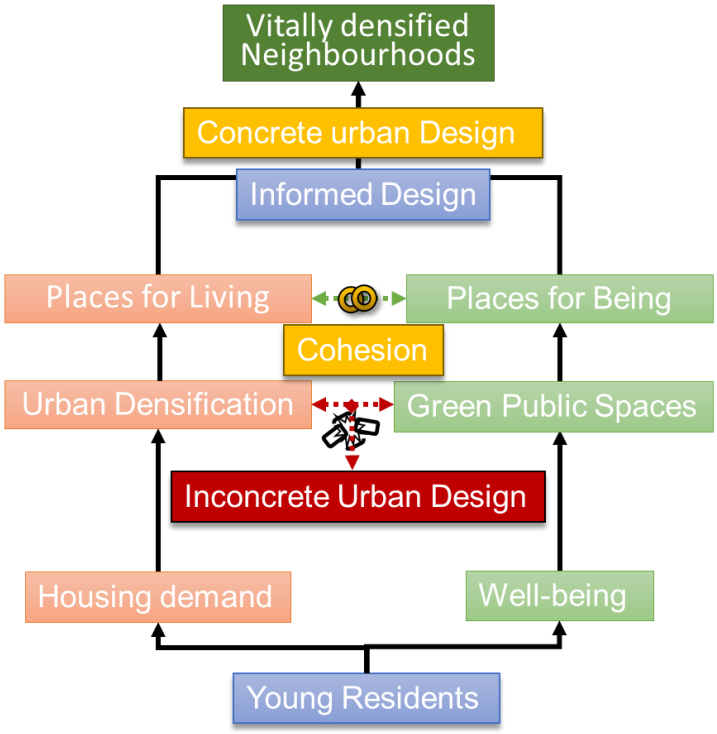


Figure 1: conceptual model describing the relationship between societal/market context and the design building blocks that lead to the design.

Methodology

3.1 Research-by-Design

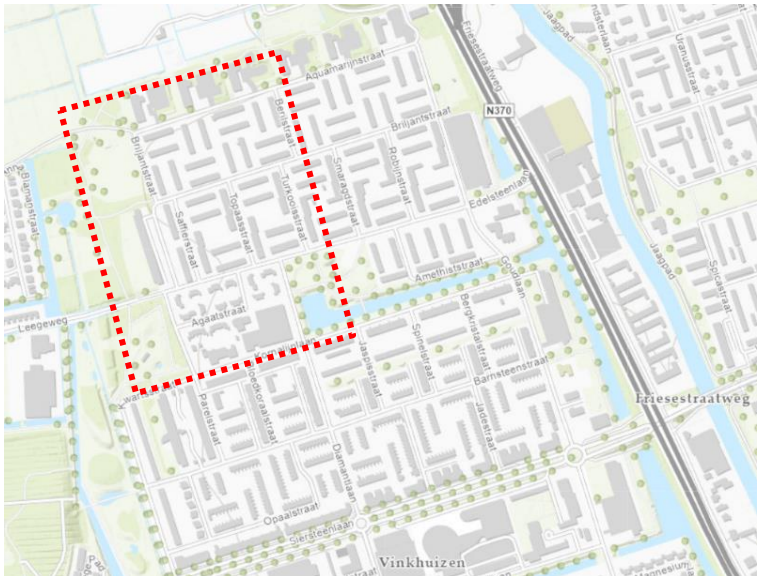
Addressing urban densification while integrating green spaces necessitates innovative approaches, with Research-by-Design standing out as a key method. This approach diverges significantly from traditional data collection methods. It is inherently dynamic, iterative, and integrative, merging theoretical frameworks with practical design applications. Unlike classical descriptive methods that rely heavily on pre-existing data and linear analysis, Research by Design is a creative process where proposals evolve in response to direct feedback from stakeholders, observational insights and iterative testing (De Jong and van der Voordt, 2002).

For the research question, ***"How can the densification of an existing neighbourhood expand housing capacity, whilst also enhancing the quality and availability of public spaces for young generations?"*****,** research-by-Design is particularly suitable for creating

context-specific solutions: By engaging directly with the neighbourhood and its residents, the designs can be tailored to meet local needs, ensuring practicality and applicability. This method also incorporates diverse perspectives: Through stakeholder involvement, insights into the preferences and needs of the young demographic can be gained, which might be overlooked in traditional methodologies. This method enables continuous improvement of design principles, ensuring they address both housing capacity and the quality of public spaces effectively (Guzmán et al., 2017).

3.2 Case Selection: Vinkhuizen Noord, Groningen NL

It is essential to discuss how the case neighbourhood is selected for testing the design method. The author's network of experts is located in Groningen, and these experts are focused on the redevelopment of Vinkhuizen. Additionally, the author lives near the case study area and knows several residents who can easily participate in formulating design principles.



Map 1. Location of Vinkhuizen Noord and the 500 by 500 metre research area (Source: Gemeente

A case study in Vinkhuizen-Noord is particularly relevant because the city of Groningen is planning to renovate the neighbourhood and increase densification in its existing areas (Gemeente Groningen, 2023). The current layout of Vinkhuizen-Noord, as shown in Map 1, includes Urban Green Spaces and potential areas for densification. This aligns with current urban challenges and the potential for transformative impact through design, as described in Chapter 2 (Zachte Atlas, 2023).

According to the municipality of Groningen (2021) and TopDutch (2022), the area faces ongoing housing shortages intensified by demographic pressures, as well as potential for green space integration (Zachte Atlas, 2023). These factors present a compelling case for this research.

The combination of these considerations makes Vinkhuizen-Noord in Groningen an ideal location for exploring sustainable densification, aiming to increase housing supply and enhance green spaces for young residents.

3.3 Data Collection

The first research sub-question has yielded the needs of young residents and the imbalances between the densification and enhancement the public spaces, the second and third sub-questions require a detailed plan to answer them. They require a multi-faceted data collection

instrument, that structures the research process. The design cycle in Chapter 3.3.4 visualises the chronological research steps structuring the output, ultimately leading to design principles. The process is subdivided in research steps: the empathise phase, ideate phase, converge phase and the evaluation phase (see 3.3.4).

3.3.1 Plan de Campagne

Primary data will be collected through a spatial analysis of Vinkhuizen-Noord, in-person interviews to formulate design principles and an integrated design exploration. Stakeholder interviews will help understand public green space usage and theoretical design principles. Spatial analysis and site visits will provide insights into the physical layout and conditions of the case area, uncovering desires and combination chances. The research-by-design process will illustrate the possibilities of balancing densification with green space enhancement for the young community. Visualisation tools such as Adobe Illustrator and Google SketchUp will be used to visualise these designs.

Supporting primary data, a systematic review of existing literature on urban densification and green space will be conducted. This review will help establish design principles and stakeholder needs, providing a broader context for the research. Additionally, demographic data and local government policies will offer deeper insights into the community profile and neighbourhood developments, further tailoring the design process.

These steps ultimately result in design principles.

3.3.3 Data Collection Planning

The researcher will collect data over three months, starting in March 2024. Participants will include experts from Vinkhuizen-Noord, urban planning professionals, and residents from Vinkhuizen-Noord and the city of Groningen. Data will be collected in person (for semi-structured interviews, for input and observations). Responses will be stored securely in digital cloud services provided by Groningen University or a private archive, ensuring privacy and data integrity.

3.3.4 Design Cycle

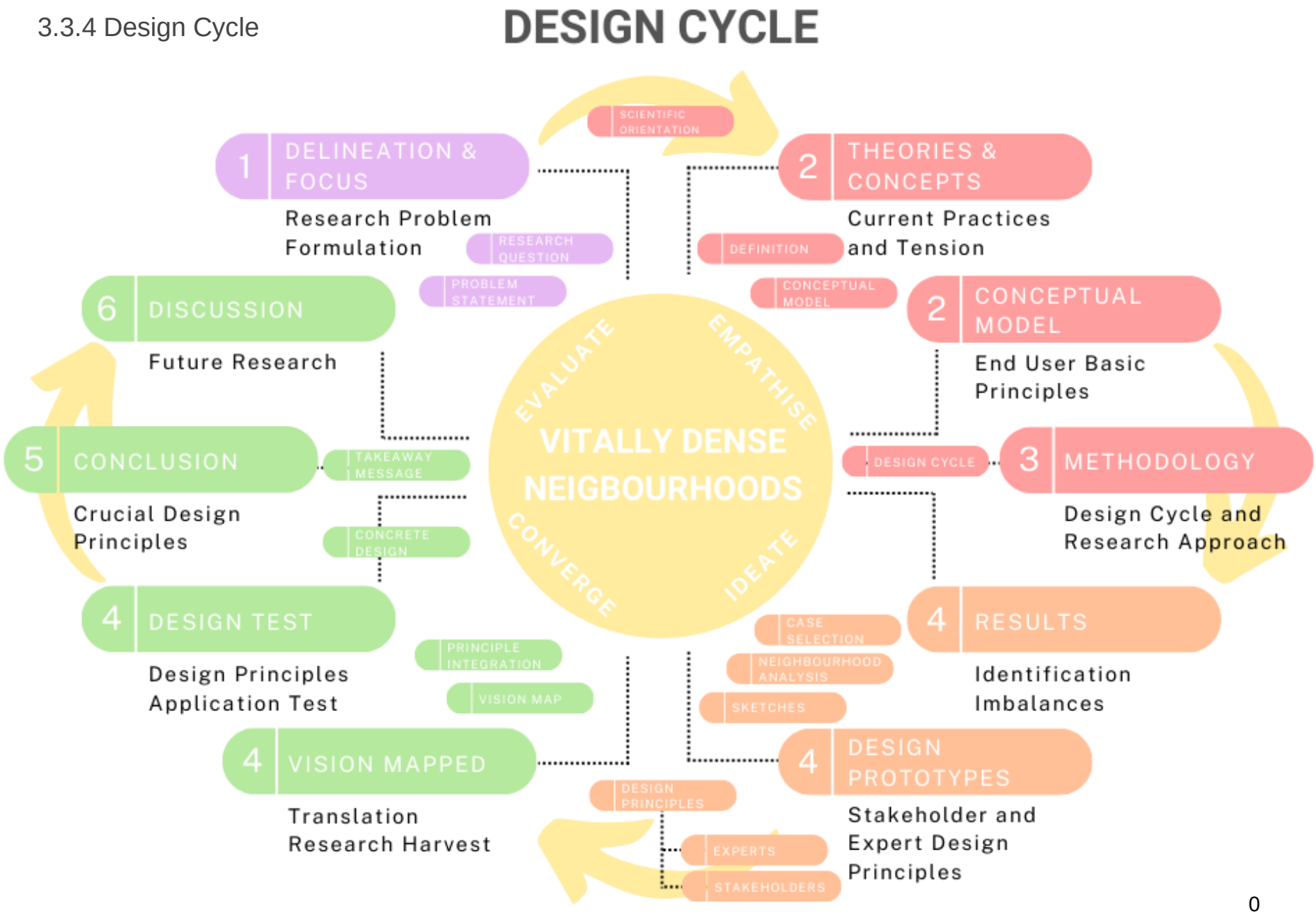


Figure 2: Design Cycle describing the relationship between research steps and the final product.

3.3.5 Data Analysis Plan

Observational data will undergo systematic analysis to highlight the current use and state of green spaces, aiding in understanding how urban densification impacts young residents' access to and quality of public spaces. Sketches translate the future design guidelines into design concepts (ideate phase).

Converging these sketches to a design test forms the base for evaluating the principles with residents and neighbourhood experts, which will be central to establishing crucial design guidelines that answer the research question. This ensures they meet the diverse needs and preferences of the young community.

3.4 Data Processing and Design Synthesis

A mixed-method approach, integrating a multitude of data, underpins the design synthesis process. This approach validates theoretical frameworks and translates the community and expert feedback into concrete design proposals. By treating the designs as data, this research transcends traditional interview-based and statistical methodologies, instead offering a design that tests integrating the principles and visualising their possible effects. This method offers a structured framework for addressing urban densification in neighbourhoods and creating urban green space that provides space to increase the well-being of the young demographic. The design will be inspired by the Faculty of Spatial Sciences of Groningen University's (2017) credo: “Making Places Better Together.” This ultimately results in tried and tested design principles that marry places for living with places for being.

3.5 Ethical Considerations

Informed verbal consent and transparency to write down respondents’ interpretations and views on the conceptual designs are stressed before the residents are asked for their input (KNAW et al., 2018). Ensuring confidentiality and anonymity of respondents’ input, obtaining informed consent, and addressing any potential psychological discomfort from discussing urban living conditions will be taken into consideration. Concerning secure data management, acquired insights and transcripts are stored in multiple locations, on the cloud and laptop. The researcher is aware that a respondent can change their mind and back out of the process, their input will still be used in the design, but to a lesser and strictly anonymous extent.

Results

4.1 The Written Story

This chapter builds upon the previous literature from the empathise phase by further describing the desires of stakeholders and policy documents. The documents describe housing, green and play themes found by the Municipality of Groningen. Understanding the current situation of the case study area plays a critical role on the road to formulating design principles that embody the latent developmental needs of children and adolescents across different ages.

4.1.1 The “Soft Atlas”

The municipality of Groningen has identified challenges related to urban green spaces and housing densification within the context of Vinkhuizen, which they have outlined in the "Zachte Atlas Vinkhuizen" (2023). Firstly, the emphasis on augmenting the greenness and cooling of the urban environment underscores a pronounced effort to mitigate the issues of excessive urban heat and stonework. There is an ongoing initiative to alleviate waterlogging and enhance green spaces, yet these efforts necessitate a more integrated approach and improved communication among the varied stakeholders.

In terms of housing densification, the neighbourhood contends with predominantly ageing housing stock from the 1960s and early 1970s that requires significant renovations to meet contemporary standards. These updates extend beyond physical refurbishments to include the incorporation of sustainable practices and the potential transition to gas-free living arrangements, facilitated by new heating networks. The complexity of revitalising these living spaces is further complicated by the mixed ownership involving municipal bodies, private landlords, and housing associations, which poses challenges to coordinated action (Zachte Atlas, 2023).

These issues are intertwined with broader socio-economic concerns, characterised by a demographically diverse population with a significant portion residing in social housing and experiencing lower economic conditions, impacting the overall viability and sustainability of urban renewal efforts.

4.1.1 Green Space Plans

Integrating municipal plans increases the validity of the proposed design principles. The stakeholder from Neighbourhood Input 4 (Appendix D.) shared the findings from the recent Urban Forest Master Plan (UFMP) development meeting for the municipality of Groningen. This plan supports the integration of green spaces in the urban densification process. Due to research time constraints, the UFMP findings will not be integrated into the design principles

The UFMP emphasises a holistic approach to urban forestry, where all trees and vegetation are viewed as a unified forest contributing to the municipality's ecological and social well-being (Gemeente Groningen, 2024). This conclusion was reached through discussions highlighting the necessity for strategic planning, community involvement, and the multifunctionality of green spaces. This insight aligns with the research's aim to balance increased

housing capacity with the enhancement of urban green spaces, demonstrating the viability of this research.

4.2 Case Study Analysis

4.2.1 A walk through Vinkhuizen.

Vinkhuizen-Noord is characterised by its abundant green spaces, which include Kornalijnpark, De Oude Held, and Roege Bos. These parks are valuable assets to the community, yet gaps in accessibility and usability for different age groups, particularly teenagers and adolescents, exist. This section analyses the strengths and weaknesses of Vinkhuizen-Noord's green spaces and their integration into the urban fabric, based on the theoretical framework discussed in Chapter 2.

While the Zachte Atlas (2023) reports many playgrounds in Vinkhuizen-Noord, play equipment for older children is lacking. According to Maas et al. (2006), diverse green spaces promote health and well-being. Vinkhuizen-Noord currently falls short for children aged 10-15, who need spaces for independence and physical activity (Gill, 2014). Playgrounds are mainly for younger children, and there are few facilities for teenagers and adolescents, such as skate parks or basketball courts.

Maintaining these public areas can be challenging, including physical upkeep and ensuring social cohesion (Zachte Atlas, 2023). Wolsink (2016) emphasises that engaging green spaces foster sustainable behaviours and environmental education among youth. Enhancing the usability and inclusiveness of these spaces is critical for maintaining attractiveness and quality of life in Vinkhuizen-Noord

The urban fabric of Vinkhuizen-Noord includes mixed housing typologies from the 1970s to the 1990s, with renovations post-2000 in areas like Goudlaan and Diamantlaan, where green corridors have been introduced (Figure 5). These corridors support biodiversity and reduce urban heat island effects (Haaland and Bosch, 2015). However, the distribution of playgrounds within the stamp cores and along Diamantlaan and Edelsteenlaan creates barriers to free movement for young residents.

The children’s petting zoo De Eelderbaan serves as a hub for children aged 0-5, promoting sensory and motor development (Wang et al., 2013). However, playgrounds and football fields for ages 5-10 and 10-15 are scattered, potentially limiting accessibility and social interaction. For teenagers aged 15-20, there is a significant gap in provision, as evidenced by their rare sightings in existing green spaces. These findings align with Chawla's (2015) work on the need for flexible, safe, and well-lit facilities that support both active recreation and social interaction for older youth.

Equitable access to green spaces is crucial for all age groups, as stressed by De Vries, Buijs, and Snep (2020). While Vinkhuizen-Noord has green spaces, there is a need for policies that prioritise equitable distribution and address disparities. Community engagement programs, which Holt et al. (2009) found to increase green space usage, are also essential to enhance social cohesion and inclusiveness.

Vinkhuizen-Noord presents a mixed picture regarding integrating green spaces within its urban densification. Strengths include well-maintained parks and recent green corridor developments, but challenges remain. These include the need for diverse and age-appropriate play equipment, better accessibility for teenagers and adolescents, and equitable green space

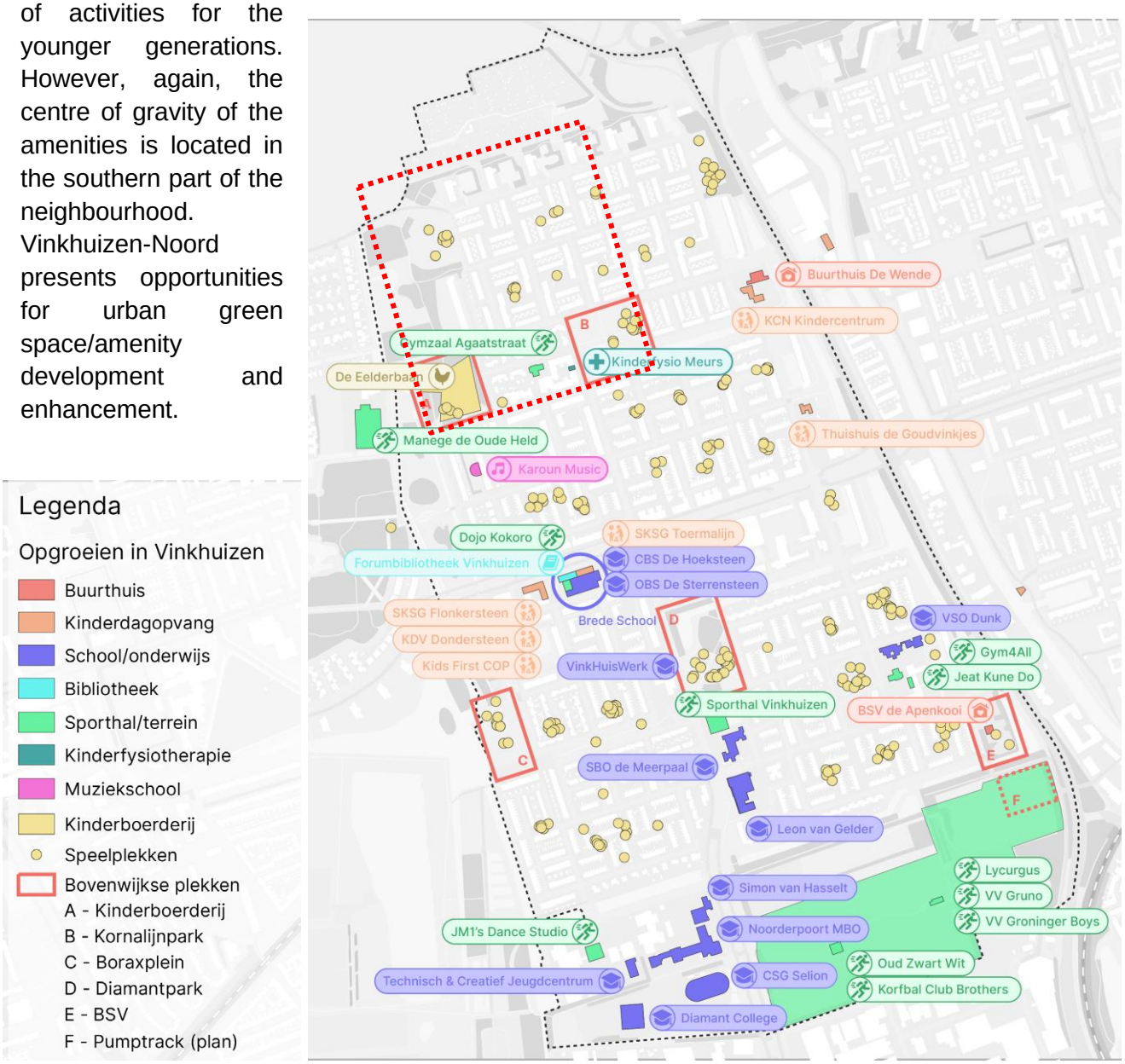
distribution policies. Addressing these gaps is critical to enhancing the overall quality of life and social cohesion in Vinkhuizen-Noord.

Figure 3,4,5. Urban Green Space impression: Playground, Kornalijnpark and recent redevelopment in Vinkhuizen-Noord (Source: Own Photo's 2024)

4.2.2 Amenities

Map 2 places the earlier observed lack of play programme into perspective. The northern part of Vinkhuizen has fewer amenities than the centre and south. Vinkhuizen has over **1,500 children under 14 years**, making up about **14% of the population**. Assuming that about one-third lives in the northern part, there are about 500 children that have limited play possibilities in contrast to their central and southern neighbours. Thus, enhancing the urban green spaces in Vinkhuizen-Noord is necessary to provide equal play opportunities.

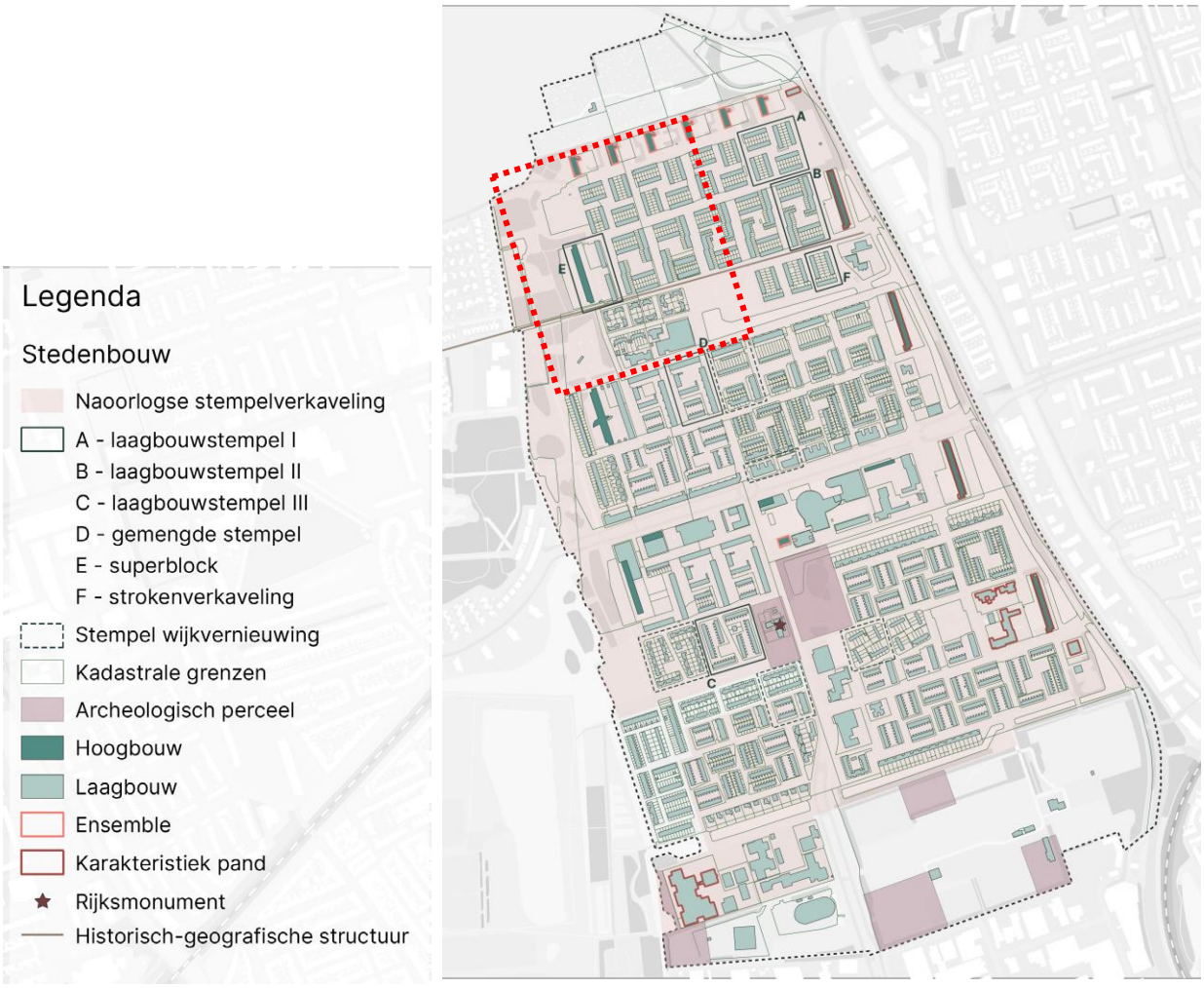
The activity map (Map 2) shows that Vinkhuizen-Noord has several playgrounds (speelplekken), a petting zoo (kinderboerderij), two parks, outdoor sporting facilities, children's amenities, and a sports hall (Zachte Atlas, 2023). The neighbourhood hosts a diverse selection of activities for the younger generations. However, again, the centre of gravity of the amenities is located in the southern part of the neighbourhood. Vinkhuizen-Noord presents opportunities for urban green space/amenity development and enhancement.



Map 2. Activity Map (Source: Gemeente Groningen)

4.2.3 Housing Stock

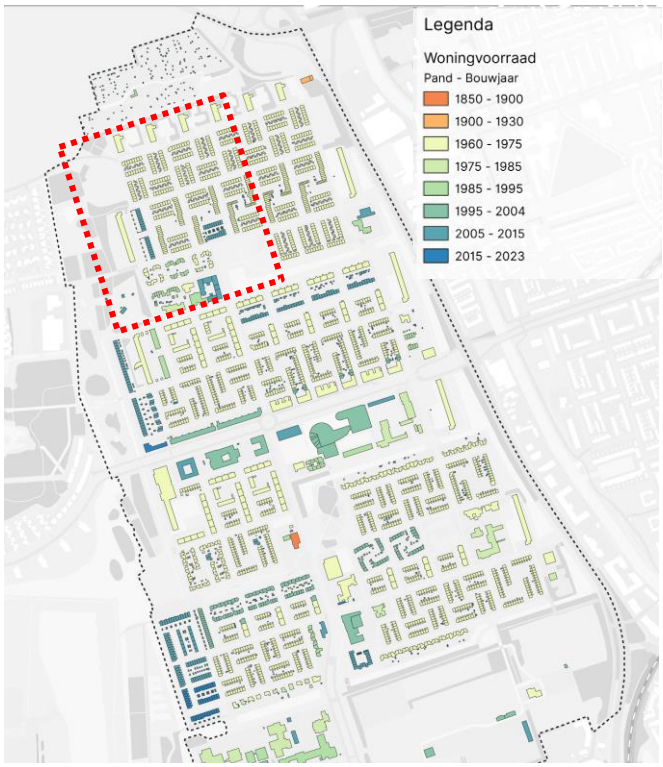
When applying design principles, it is important to understand the current housing typology. Respecting the orientation and height differences increases the validity of any future densification efforts. Vinkhuizen-Noord is a typical **post-war expansion neighbourhood** (Zachte Atlas, 2023). The fabric consists of a repeated low stamp structure as seen in map 3, indicated by the letter A. The housing stock from the 1960s is best characterised by the six apartment buildings on Aquamarijnstraat in Vinkhuizen-Noord and the Diamantflat in the centre, serving as a focal point for the central shopping area. The elongated flats on Goudlaan are also key landmarks. The neighbourhood's layout features four distinct variations of a stamp structure, combined with superblocks and strip parcelling.



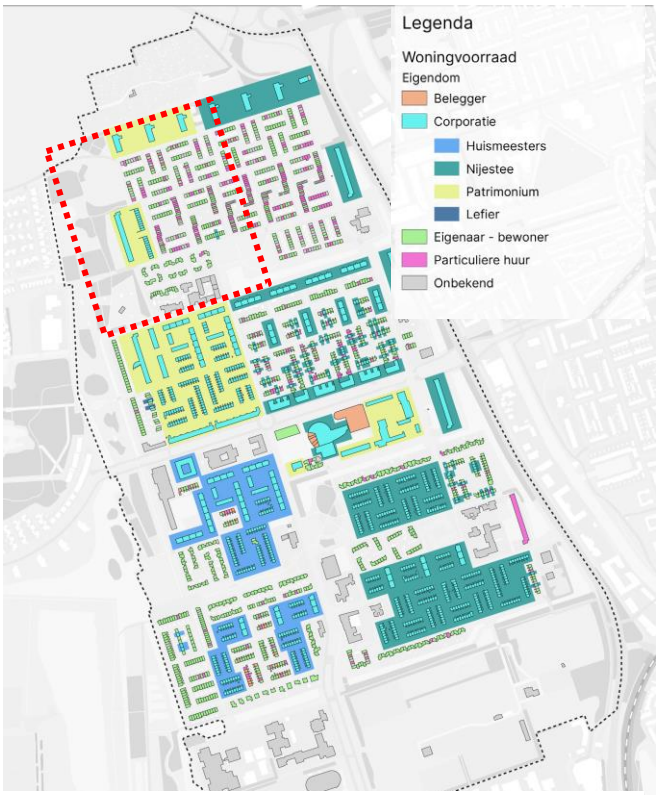
Map 3. Building typology (Source: Gemeente Groningen)

4.2.4 Housing Ownership and Origin

Knowing what property belongs to who and what the property age is, is critical in exploring the possibility of replacing housing with new developments. The housing in the case area mostly consists of privately owned terraced houses and rental apartments owned by Patrimonium (map 5). Previous urban renewal efforts have increased housing density and improved pedestrian mobility as a response to the area's original design emphasis on cars, reflected in the main infrastructure axes (Zachte Atlas, 2023). Previous densification has been built on prime locations, so new locations should be explored. In conclusion, it proves to be difficult to demolish housing in the case study area, without needing to buy out the owners of the single-family homes. Therefore, new developments should be built on currently open areas.



Map 4. Building year of the buildings (Source: Gemeente Groningen)



Map 5. Ownership (Source: Gemeente Groningen)

4.2.4 Combining Chances

Map 6. Chances (Source: Gemeente Groningen)

Building on the neighbourhood analysis and potentials from the Zachte Atlas (2023), integrative design principles addressing climate adaptation, social cohesion, and play across the entire neighbourhood are essential due to limited urban space. The neighbourhood currently lacks an overarching design that incorporates green space with densification, leading to potential blind spots and misalignment between spatial projects and social challenges like urban space quality. This highlights the need for designs that integrate social solutions with spatial developments (Zachte Atlas, 2023).

Sustainability initiatives aimed at improving the affordability and condition of housing in Vinkhuizen-Noord present a valuable opportunity for social interventions (Zachte Atlas, 2023; Interview 1). Enhancing Kornalijnpark and the neighbourhood infrastructure to increase connectivity with the city is essential (Interview 2). Developing a robust green and blue network can foster a healthier, interconnected community, and addressing mobility and traffic safety concerns through physical changes can improve residents' quality of life (Neighbourhood input 3). The design of Vinkhuizen-Noord should focus on maintaining and enhancing existing playgrounds and green structures while increasing housing stock and public spaces to meet future demands (Interview 2).

4.3 Expert and stakeholder input

Design principles form the foundation of the designs in Chapter 4, they have been distilled from talks with two experts from the municipality of Groningen, two neighbourhood inhabitants, a neighbourhood organisation member, two 20+-year-old inhabitants of Groningen and stakeholders. The principles help form the vision that is the base form where the design takes shape and translates the needs of the community into a tangible story. Chapter 4.4 discusses the principles formulated from these talks.

4.3.1 Design Principles for Enhancing Public Spaces and Cohesion in Neighbourhoods

Key stakeholders emphasise the necessity of integrating multiple opportunities for combined spatial improvement. Addressing a single issue in isolation rarely achieves meaningful outcomes; instead, social cohesion emerges from deliberate social initiatives and spatial pathways. Consequently, increasing density should not only accommodate but also promote the development of amenities and augment green spaces within the neighbourhood (Neighbourhood input 3).

Crucial physical design elements include modifications to infrastructure that reduce the speed of motorised vehicles, an enhanced green-blue network that amplifies the neighbourhood's cooling effect, and pathways designed to encourage young residents to engage in physical activities and connect with local amenities (Interview 2). Establishing stronger connections between Reitdiep, De Held, and the broader Groningen urban area is essential, as many residents of Reitdiep and De Held rely on the dental, medical, and other facilities in Vinkhuizen, thereby straining the capacity of these amenities (Interview 2). The design should focus on integrating all aspects in creating an integral design, especially since it is cost-effective to do all spatial improvements simultaneously (Interview 2).

Drawing from expert interviews and resident feedback, several design principles emerge as crucial. Creating multi-functional green spaces that serve various community needs is vital for enhancing cohesion. According to the interviews, green infrastructure not only improves aesthetic appeal but also reduces maintenance costs and supports ecological sustainability (Interview 1). The idea of informal play areas that are visually appealing even when not in use ensures that these spaces remain attractive and functional throughout different seasons and weather conditions (Interview 1).

A holistic approach to infrastructure planning that combines necessary upgrades, such as water management and heating networks, with public space enhancements is essential. Integrating various utilities during street renovations can save costs and minimise disruption. This approach ensures that public spaces are not only green but also resilient and functional, capable of managing environmental challenges like heavy rainfall, which is crucial for the sustainability of the area (Interview 2).

Engaging the community in the design process fosters a sense of ownership and ensures that the public spaces meet the residents' needs. A bottom-up design approach, where stakeholders' desires are prioritised before finalising the designs, helps create spaces more likely

to be used and appreciated by the community. This participatory process builds trust and ensures the designs are practical and welcomed by the residents (Interview 1).

Improving accessibility and connectivity within the neighbourhood is crucial for encouraging active transportation and reducing car dependency. Integrating green routes with existing amenities and ensuring safe pedestrian and bicycle pathways can significantly enhance the quality of life. Blocking off certain roads to prioritise green and active transportation routes can transform the neighbourhood into a more cohesive and liveable space (Neighbourhood input 3).

Designing public spaces that promote social interaction among different age groups can strengthen community bonds. The use of multi-functional areas that cater to various activities, such as play areas, sports facilities, and social gathering spots, can help in achieving this goal. Incorporating elements that attract both young people and adults, like playgrounds, sports facilities, and kiosks, creates vibrant community hubs (Interview 2).

Adopting sustainable and maintenance-friendly solutions ensures the longevity and usability of green spaces. Feedback from residents indicates a preference for robust and easily maintainable green areas over elaborate but difficult-to-maintain designs. Incorporating durable materials and low-maintenance plants can help in creating spaces that remain attractive and functional over time (Neighbourhood input 3).

Achieving the right balance between increasing housing density and maintaining green spaces is critical. Dense housing should be complemented with sufficient green spaces to maintain the quality of life. Integrating green spaces within high-density areas ensures that residents have access to nature and recreational areas (Interview 2).

4.4 Prototype Harvest

The sketches chapter presents the initial design concepts aimed at balancing urban densification and green space enhancement in Vinkhuizen-Noord. This finalises the ideate phase of the design process, this step involves generating a vast array of potential designs as seen in the following figures. The sketches, consider variables such as enclosure, openness, and orientation relative to cardinal directions (Edelsteenlaan and Kornalijnlaan) and prevailing westerly winds. This iterative process results in refined concepts, focussing on adjusting parameters to enhance the design principles' effectiveness. These concepts can then be tested in the exploratory design of Chapter 4.6 and 4.7.

4.4.1 Sketches

Figure 6 explores the bottlenecks on the movement of residents through the neighbourhood, caused by cars. The stamp structure consists of squares surrounded by housing, which can form safe play islands within the neighbourhood infrastructure. Safe play spaces cater to the needs of the youngest age categories of 0 to 10 years. However, connecting these islands would entice the age categories of 10 to 20 years to move throughout the neighbourhood. Connecting the play programme likely improves social interaction.

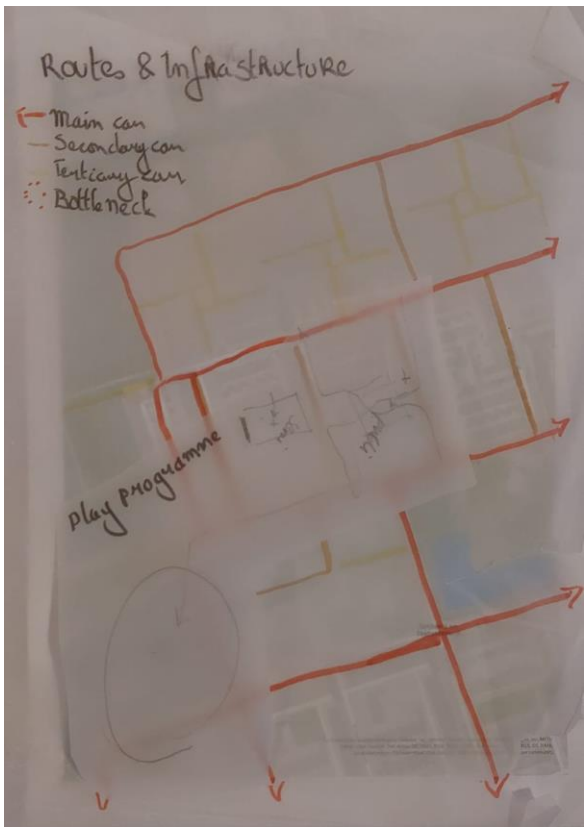


Figure 6. **Routes and Infrastructure** *Sketch for Vinkhuizen-Noord (Source: Original Creation 2024)*

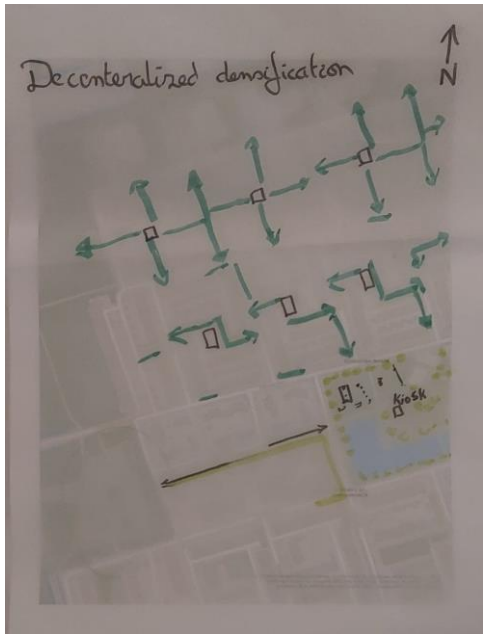


Figure 7. **Decentralised Densification**
Utilising the stamp squares forms a chance as well as a challenge. Amenities and dense housing could be systemised. However, the green spaces would be pushed to the fringes of the neighbourhood, since central public space is then diminished. Additionally, it would form a heat island.
Sketch for Vinkhuizen-Noord (Source: Original Creation 2024)

Figure 8. **Play Spaces and Density**
When thinking from a child's perspective, squares and connecting streets such as the Agaatstraat form important places and routes where play programmes could be most effectively placed. A younger child would prefer the petting zoo, whilst an adolescent would prefer the fringes, far removed from parental scrutiny.
Sketch for Vinkhuizen-Noord (Source: Original Creation 2024)

Figure 9. **Centre Stage**
This sketch exploration includes the proposal constructing a high-rise structure while partially demolishing outdated buildings to make way for a new park, thereby addressing densification and maintaining the same amount of open space. Its impact on the surrounding urban fabric is costly.
Sketch for Vinkhuizen-Noord (Source: Original Creation 2024)

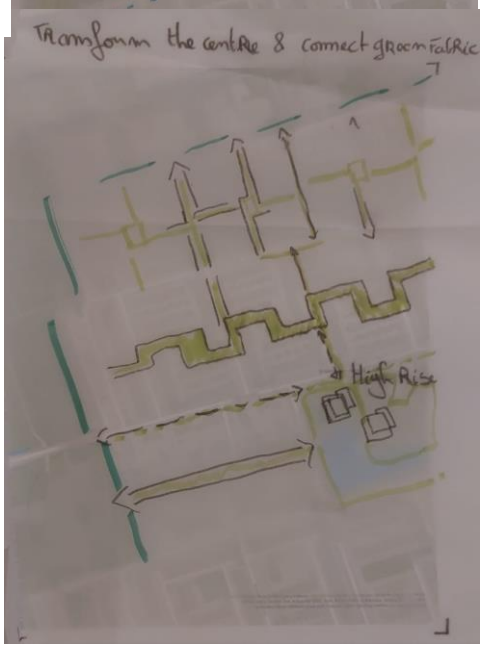


Figure 10. **Transform the Centre and Connect Green Fabric**
Creating attractive park structures might entice physical exercise among young residents. Al though completely cutting parts of the neighbourhood off might meet resistance among residents.

Sketch for Vinkhuizen-Noord (Source: Original Creation 2024)

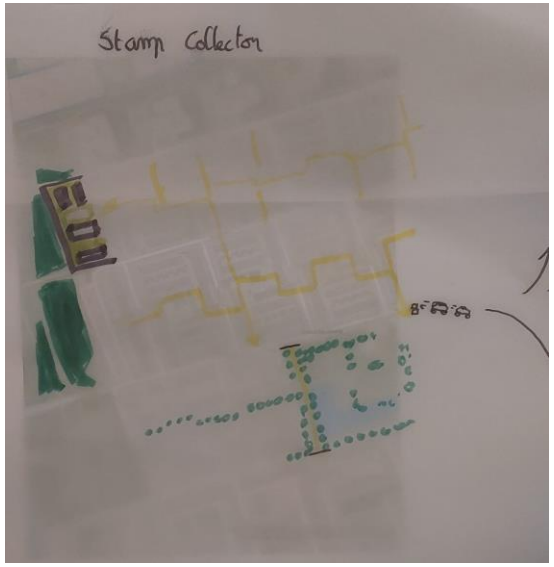


Figure 11. **Stamp Collector**
This concept proposes creating a new stamp next to the Briljantstraat, emulating the existing structure. Additionally, cutting some roads off might offer room for car free bicycle roads.

Sketch for Vinkhuizen-Noord (Source: Original Creation 2024)

Figure 12. **Green Blue Network**
This concept explores the green blue connections that could be enhanced so that a dominant park structure could be realised. The parks would then be tailored to different age brackets, thus creating a specific meeting ground for children.

Sketch for Vinkhuizen-Noord (Source: Original Creation 2024)

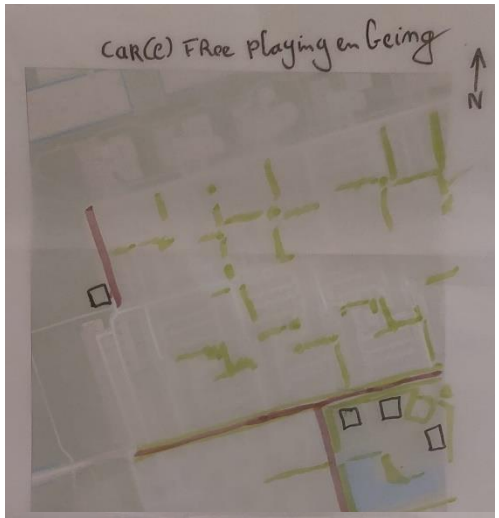


Figure 13. **Car(e) Free Playing and Being**
This concept explores creating dead-end streets in and around stamps, so that the young street users can play safely.

Sketch for Vinkhuizen-Noord (Source: Original Creation 2024)

Figure 14. **Connecting the Dots**
Connecting the Kornalijnpark with the Oude Held Park and Roege Bos could create a vibrant park structure that has opportunities for climate resilient play features such as water and communal garden objects.

Sketch for Vinkhuizen-Noord (Source: Original Creation 2024)

4.4.2 Conclusion

The most promising aspects of the sketches are further developed and analysed to conclude how they meet the research objectives. Following ideation, the prototype stage (converge phase) results in design principles translated to concepts that are green and blue networks and densification at the fringes. The outcome of this phase will be a robust test design that integrates community needs with environmental and spatial considerations in Chapter 4.7. This test shows the effectiveness of the design principles.

4.5 Vision Mapped

The design principles derived from input from, literature, experts and stakeholders (Appendix D.) result in this vision map for Vinkhuizen-Noord. The vision integrates green spaces, play areas, seating, wadis and flowerbeds, catering to various activities and age groups. Direct routes promote mobility through pedestrian and cycling paths within attractive green-blue networks.

The housing programme combines residential, commercial, and recreational uses, fostering a sense of cohesion, without sacrificing quality urban spaces. The densification is planned at a strategic place that attracts residents to use the green structure through pathways and a coherent design, ensuring the physical exercise of young residents. The Kornalijnpark promotes social cohesion and identity. Integrated infrastructure leads to amenities at the densification, minimising disruption, and maximising efficiency. Encouraging active transport and employing a diverse green design further support a place for being and socialising.

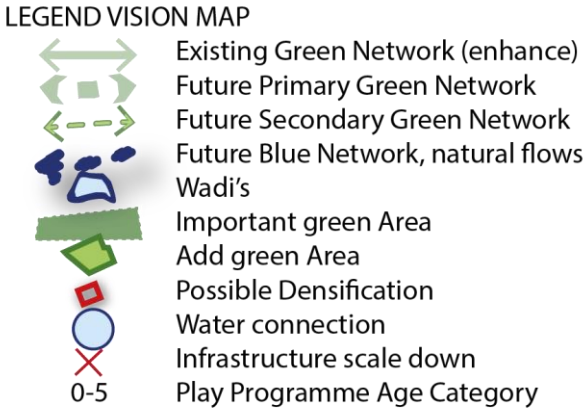


Figure 15. Vision Map Legend (Source: Original Creation 2024)

Map 7. Vision Map (Source: Original Creation 2024)

4.6 Analysing Design Principle Integration

The findings indicate that incorporating the needs of young residents in urban design fosters social cohesion and environmental sustainability. Key principles derived from literature and stakeholder input, such as multifunctionality, community involvement, and sustainability, are essential for creating vibrant, liveable neighbourhoods that support the well-being of young people and the broader community. Multifunctionality is crucial, with green spaces serving diverse community needs and supporting activities ranging from recreational to social and cultural functions. Flexible design elements, like age-appropriate leisure areas and community gardens, ensure these spaces remain relevant and engaging across seasons and age groups, fostering a sense of ownership and frequent use among residents.

Engaging the community in the design process ensures that public spaces meet residents' needs. A bottom-up approach, which prioritises stakeholders' desires, helps create practical and appreciated spaces, building trust and ensuring their usage. Integrating infrastructure upgrades with public space enhancements is also crucial for sustainability and resilience. By combining necessary upgrades, such as water management systems, with green space development, costs can be saved, and disruption minimised, ensuring functionality and resilience of the public spaces.

Improving neighbourhood accessibility and connectivity encourages active transportation and reduces car dependency. Safe pedestrian and bicycle pathways enhance quality of life, fostering a healthier and more cohesive community. Using durable materials and low-maintenance plants ensures the longevity and usability of green spaces, supporting ecological sustainability and reducing long-term maintenance costs. Public spaces should also promote social interaction among different age groups. Multi-functional areas catering to various activities, such as play areas, sports facilities, and social gathering spots, create vibrant community hubs.

4.6.1 Vinkhuizen-Noord Design Test

With the design principles and sketch concepts of densification on the fringes, increased bicycle and pedestrian infrastructure and park structures in mind, the following designs serve as a test, based on a housing stock increase of approximately 20%. The increase provides an extra of 500 to 576 addresses to the 2880 existing ones AlleCijfers (2024). Due to the limited space available, a mixed housing programme consisting of high-rise and terraced housing forms the realistic base of densification in the design.

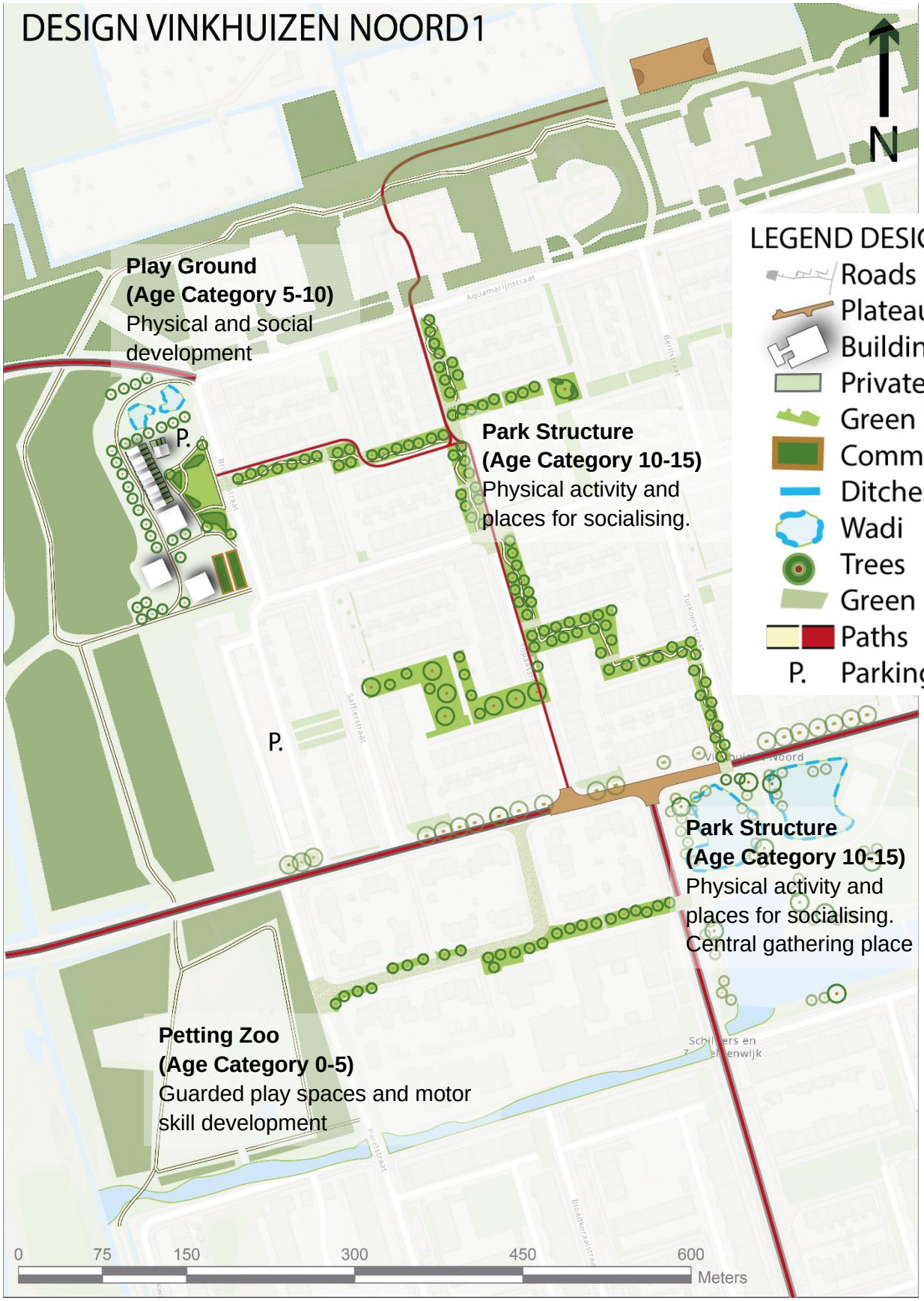
The designs **“Connecting the West with the rest” & “Stamp and repeat”**, together with a general highlighted location and one three-dimensional design showcase how the principles affect the neighbourhood. The proposed green blue network, (Maps 8 and 9) showcases the urban densification and green space enhancement for the north-western part of the neighbourhood.

The neighbourhood overhaul proposes green paths that encourage residents and visitors alike to travel in an environmentally friendly manner. By physically discouraging cars, the speed and presence of traffic is reduced. Integrating bicycle roads, semi-permeable road surfaces, tree boxes and walking paths, creates sustainable and relaxed environments that can encourage physical movement.

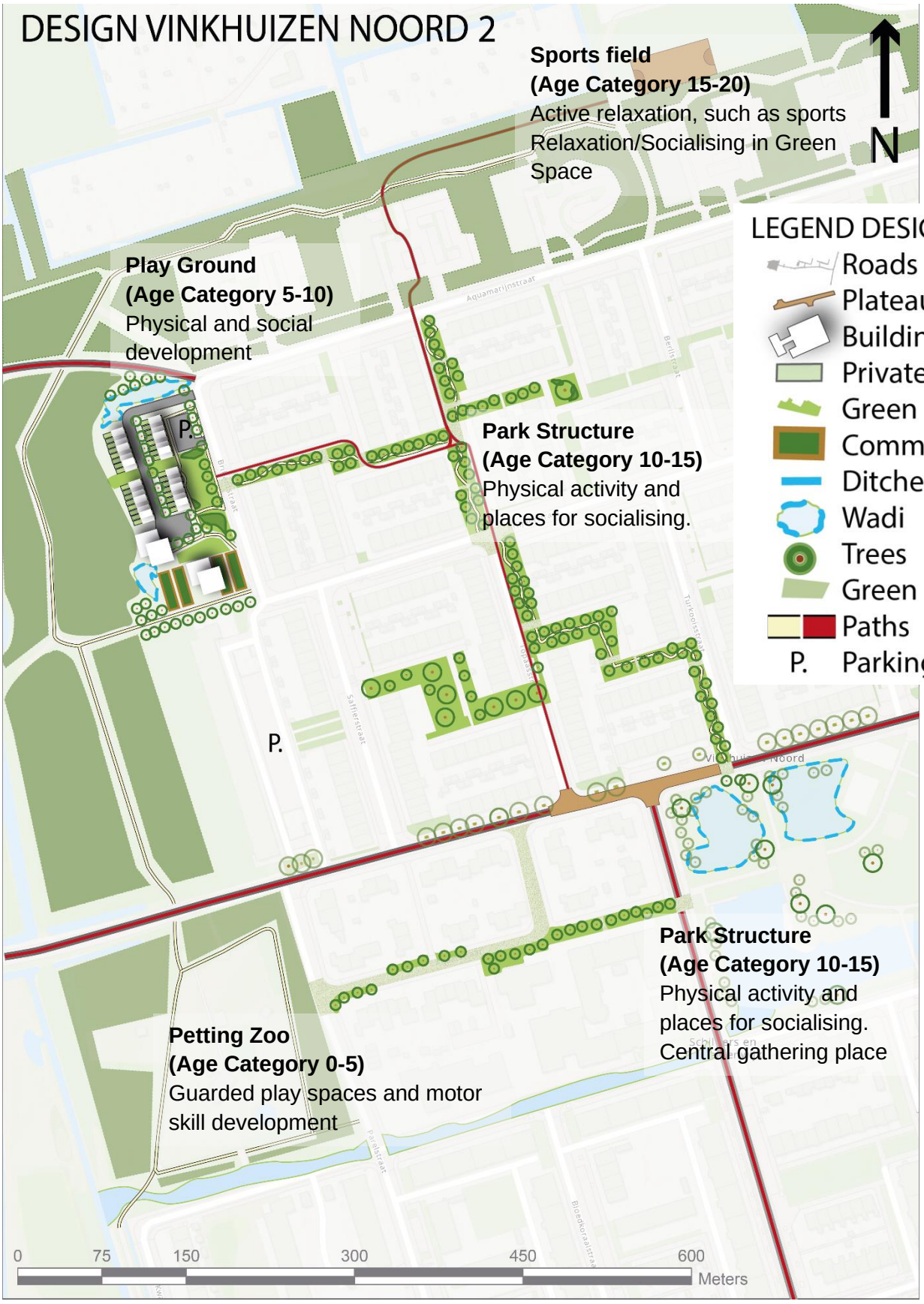
Connecting the water of Kornalijnpark with the Roege Bos and the Oude Held, creates an integrated water structure that can naturally store and discharge stormwater. Additionally, wadi’s

can temporarily store water in neighbourhood parks and cool the surrounding area simultaneously.

The green network connects the central Kornalijnpark with the Eelderbaan, de Oude Held Park, and the gardens to the north. Furthermore, it bridges the gap between De Held, Reitdiep, and Vinkhuizen neighbourhoods (Neighbourhood input 3).. The trees create shade, which cools the neighbourhood and stimulates the resident's well-being.



Map 8. Design Vinkhuizen-Noord 1 (Source: Original Creation 2024)



Map 9. Design Vinkhuizen-Noord 2 (Source: Original Creation 2024)

4.7 Design in Detail “Briljant Design”

The detailed design for Vinkhuizen-Noord, specifically at Aquamarijnstraat and Briljanstraat, reflects key principles such as multifunctionality, community involvement, and sustainability. This section emphasises creating green spaces incorporating environmentally-friendly infrastructure that leads to densification, which forms a centre between multiple neighbourhoods. The design ensures public spaces are inclusive and engaging for all age groups. Simultaneously, the densification plan for "De Oude Held" translates these principles into a three-dimensional design featuring mid-highrise apartment buildings and terraced houses.

4.7.1 Vinkhuizen-Noord: Green space

Zooming into the design, mixed-use activity spaces for sporting and gathering, environmental-friendly infrastructure consisting of walking and cycling paths, and climate adaptive landscaping techniques such as wadis and flower beds become visible. The park leads to the newly added centre, thus encouraging the use of the facilities shown on Map 10. The design incorporates principles of community engagement, inclusivity, and multifunctionality, offering accessible and safe public spaces that encourage social interaction and physical activity among young residents. Those social aspects cover the exercise and socialising needs of the age groups from 10 to 15. Additionally, it incorporates stormwater management systems and diverse plants, trees, herbs, flowers and insect hotels, ensuring ecological resilience.

Map 10. Design Detail Vinkhuizen-Noord (Source: Original Creation 2024)

4.7.2 Vinkhuizen-Noord: densification “De oude Held”

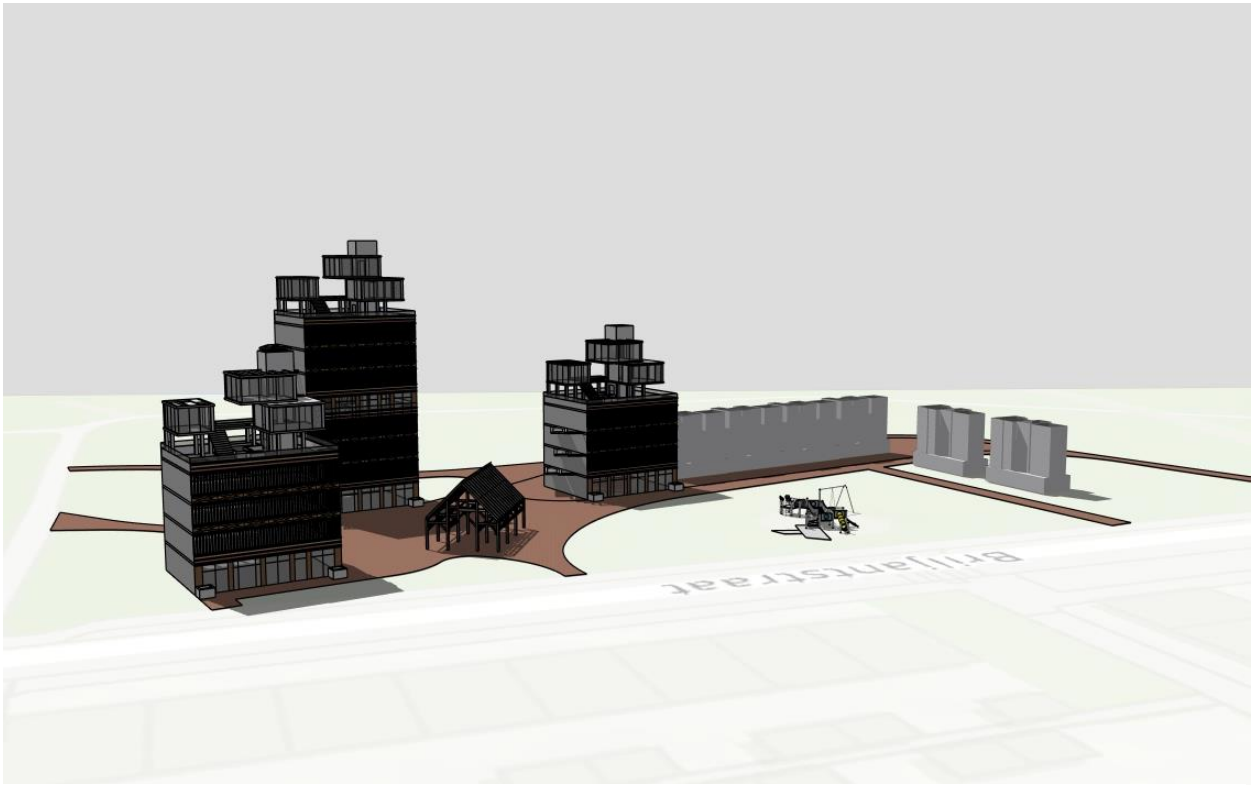


Figure 16. 3D-Design Vinkhuizen-Noord Briljantstraat & Oude Held (Source: Original Creation 2024)

Translating the expert and stakeholder input in conjunction with the gathered design principles, the design process leads to the question, “How can densification be realised in Vinkhuizen-Noord”. The answer to that question is this three-dimensional design of three mid-highrise apartment buildings and two rows of three-level terraced houses. This should increase the housing stock significantly.

The terraced houses can be single or multiple-family houses; the supply can be tailored to the current housing demand. When supplying apartments, it will become possible for older neighbourhood residents to move from a family house to an apartment, which will improve the housing flow of Vinkhuizen-Noord. Additionally, travel time to amenities will be reduced for less mobile people, when they live above the amenities in the three towers. The amenities can fill the gap of amenities in De Held and Reitdiep. Additionally, creating a direct bicycle route to Reitdiep can serve as a connection to the supermarkets at Reitdiephaven, thus exchanging the services between the neighbourhoods.

The green square at the front with the existing playground can be increased in size and connected to the green network leading to the Kornalijnpark. The central playground provides a safe place where children between the ages of 5 to 10 can develop physically and socialise with their parents and peers. In conclusion, this design emphasises social cohesion, connectivity and the green-blue network throughout the neighbourhood.

Discussion

The study's findings suggest that a comprehensive, integrated approach is crucial for successful urban densification. While increasing housing density is necessary to address the growing demand, it should not come at the expense of green spaces, which are vital for young residents' physical and mental health. The case of Vinkhuizen-Noord illustrates that incorporating community feedback and sustainable design principles can lead to a harmonious balance between housing and green spaces. However, the implementation of such projects requires careful coordination among various stakeholders, including local governments, planners, and residents. Future research could focus on longitudinal studies to assess the long-term impact of such redevelopments on community well-being and environmental sustainability. Additionally, exploring technological innovations in urban planning could further enhance the efficiency and effectiveness of integrating green spaces into dense urban fabrics.

Conclusion

This research explored the potential for redeveloping Vinkhuizen-Noord in Groningen to balance increased housing capacity with enhanced urban green spaces. By employing a Research-by-Design approach, the study highlighted the need for integrated planning that addresses both densification and green space preservation. The findings indicate that a thoughtful design that incorporates the needs of young residents can foster social cohesion and environmental sustainability. Key principles such as multifunctionality, community involvement, and sustainability were instrumental in shaping the final design principles. These principles not only increase the housing stock but also improve public spaces, ensuring they are inclusive and engaging for all age groups. The research underscores that urban densification, when aligned with green space enhancement, can create vibrant, liveable neighbourhoods that support the well-being of young people and the broader community.

Several critical design principles emerged as essential for enhancing cohesion through green spaces. These principles, applicable to Vinkhuizen-Noord and globally, include multifunctionality, community involvement, holistic infrastructure planning, accessibility and connectivity, sustainability and maintenance, and design for social interaction. Multifunctionality is key, as green spaces should support diverse activities ranging from recreational to social and cultural functions. Engaging the community in the design process fosters a sense of ownership, creating spaces more likely to be used and appreciated.

Integrating bicycle and pedestrian paths with public space enhancements ensures sustainable movement and resilience. Combining elements such as wadis and blue networks with green space development enhances functionality and environmental management. Improving accessibility and connectivity encourages active transportation and reduces car dependency. Safe pedestrian and bicycle pathways enhance quality of life and community cohesion. Adopting sustainable and maintenance-friendly solutions ensures the longevity and usability of green spaces. Lastly, designing multi-functional green spaces that cater to young residents’ activities, placed along strategic paths towards a neighbourhood centre, creates vibrant community hubs.

Incorporating these design principles can successfully expand housing capacity while enhancing public spaces for younger generations, ensuring new developments are sustainable, functional, and contribute positively to community cohesion. These principles offer a universal strategy for urban planners worldwide.

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Appendix

Appendix A.

Observation Checklist for Vinkhuizen Noord Neighbourhood

Date of Observation: 13-03-2024, 08-04-2024
Time of Observation: one hour each
Weather Conditions: sunny

A. Public Spaces

1. Type and Variety of Public Spaces
   - [X] Parks
   - [X] Playgrounds at multiple locations
   - [X] Sports facilities, two football fields
   - [X] Green corridors/walkways, some small green walkways and one large green blue corridor.
   - [X] Community gardens, located just north of the Neighbourhood.
2. Condition and Maintenance
   - [ ] Well-maintained

- [X] Moderately maintained
- [ ] Poorly maintained
- [X] Signs of vandalism or neglect, football field (eastern side) seating place has signs of graffiti, broken glass and cigarette buds.

3. Accessibility
- [ ] Easily accessible (no barriers)
- [X] Moderately accessible (some barriers), roads form a barrier for smaller children. There are cars present on the Diamantlaan and the Edelsteenlaan.
- [ ] Poorly accessible (many barriers)

4. Amenities Available
- [X] Seating (benches, etc.)
- [X] Lighting
- [X] Trash bins
- [ ] Informational signage
- [ ] Restroom facilities

5. Usage Patterns
- [ ] Mostly empty
- [x] Light usage
- [ ] Moderate usage
- [ ] Heavy usage

6. Activities Observed
- [X] Recreational (playing, jogging, etc.)
- [X] Socializing (groups talking, picnics, etc.)
- [ ] Resting/Relaxing
- [X] Other (leisurely walking)

B. Housing Density

1. Types of Housing
- [X] Single-family homes
- [ ] Multi-family homes/apartments
- [X] High-rise buildings

2. Condition of Buildings
- [ ] Well-maintained
- [X] Moderately maintained, mostly well-maintained with some terraced houses looking poor.
- [ ] Poorly maintained

3. New Construction
- [X] No new construction observed
- [ ] New constructions in progress
- [ ] Recently completed constructions

4. Space Between Buildings
- [X] Spacious
- [ ] Moderate spacing
- [ ] Crowded

C. Interaction of Young People with Spaces

1. Presence of Young People
   - [ ] No young people observed
   - [X] Few young people observed
   - [ ] Many young people observed
2. Activities of Young People
   - [X] Playing
   - [ ] Exercising
   - [ ] Socializing
   - [X] Moving through (transit)
   - [ ] Other (please specify)
3. Areas Frequented
   - [X] Specific areas, children’s petting zoo and playgrounds
   - [ ] Evenly distributed throughout the public spaces
4. Interactions with Environment
   - [X] Interaction with natural elements (plants, water, etc.)
   - [X] Interaction with built elements (play equipment, benches, etc.)
5. Group Dynamics
   - [ ] Alone
   - [X] In small groups (2-4)
   - [ ] In large groups (5+)

Additional Observations and Comments
Most observations were made during school times, therefore the observations might show an underrepresentation of the actual usage of the green spaces.

Appendix B.

Reflection on Proposed Design for a Densified Neighbourhood with Green Urban Spaces (Input Session with Residents)

Introduction to the Design Concept
This section of questions aims to gather detailed feedback from young residents on a specific design proposal for a densified neighbourhood with integrated green urban spaces. Their reflections and suggestions are crucial for refining the design to better meet the community's needs and preferences, ensuring that the redevelopment leads to a vibrant, inclusive, and sustainable urban environment.
Briefly describe the proposed design for the densified neighbourhood, emphasizing the integration of green urban spaces tailored for the youth. Include visuals or descriptions of key features, such as community gardens, sports facilities, green corridors, and social areas.

Understanding Participant's Initial Impressions:

1. What are your first thoughts on the proposed design for the neighbourhood?
2. Are there elements of the design that immediately stand out to you as positive or negative? Please elaborate.

Evaluating Specific Design Features:

3. How do you perceive the balance between the densified residential areas and the green spaces in the design?
4. Can you identify any features in the proposed green spaces that you think would be particularly beneficial for young people? Why?
5. Are there aspects of the green spaces you feel could be improved or are missing? What would you add or change?

Assessing Accessibility and Inclusivity:

6. How accessible do you find the proposed green spaces in terms of location, physical access (e.g., for individuals with disabilities), and safety?
7. Does the design seem to cater to a diverse range of interests and needs among the youth? How could it be made more inclusive?

Reflecting on Community Engagement and Interaction:

8. Do you think the proposed design encourages community engagement and social interaction among residents, especially the youth? Why or why not?
9. Are there specific areas or features within the green spaces that you think will become focal points for community activities? What makes them stand out?

Considering the Impact on Well-being and Lifestyle:

10. How do you think the introduction of these green spaces will affect your personal well-being and lifestyle?
11. In what ways do you see yourself utilizing these green spaces? Are there activities you would be particularly interested in?

Feedback on Sustainability and Environmental Considerations:

12. How do you evaluate the proposed design in terms of sustainability and its impact on the environment?
13. Are there any eco-friendly features or practices you would like to see incorporated into the green spaces?

Closing Thoughts:

14. After discussing the proposed design, how do you feel about the future of the neighbourhood and its ability to meet the needs of young residents?
15. Is there any other feedback or suggestions you would like to offer to further refine the design?

Thank the participant for their feedback and reflections.

Notes Section:

Appendix C.

Semi-Structured Interview Guide for Urban Green Space Experts

This guide is structured to elicit expert insights on the complex interplay between urban densification and the integration of green spaces. The questions aim to uncover both the challenges and opportunities in creating sustainable, liveable urban environments that prioritize both housing needs and the intrinsic value of green spaces for community well-being and ecological health.

Introduction:

- Introduce myself, explaining the purpose and significance of the interview within the context of the research.
- Assure the participant of confidentiality and the anonymous treatment of their input.
- Confirm the participant's consent to proceed with the interview.

Background Information:

1. Can you briefly describe your role and experience in urban planning, particularly in relation to green spaces and housing density?

Challenges and Opportunities:

2. From your perspective, what are the main challenges in integrating housing with green spaces within urban environments?
3. Can you share examples of successful strategies or projects that have managed to balance densification with the development of green urban spaces?
4. What are common misconceptions or overlooked aspects when planning for green spaces in dense urban areas?

Strategic Approaches:

5. How do you approach the design and planning process to ensure that green spaces are effectively integrated into densified neighbourhoods?
6. Are there innovative urban planning solutions or technologies that have facilitated the inclusion of green spaces in high-density areas?

Policy and Governance:

7. How do local government policies support or hinder the development of green spaces alongside densification?
8. In your experience, how significant is the role of community engagement and feedback in shaping urban green space projects?

Design and Functionality:

9. What design principles do you believe are most effective for creating green spaces that serve the needs of a diverse urban population?
10. How can urban green spaces be designed to maximise their ecological, social, and health benefits in dense neighbourhoods?

Sustainability and Resilience:

11. What measures can be taken to ensure the sustainability and resilience of urban green spaces in the face of climate change and urbanisation pressures?
12. Can you discuss the role of green infrastructure in mitigating urban environmental issues, such as heat islands and air pollution?

Vision for the Future:

13. Looking forward, what trends or innovations do you see shaping the future integration of housing and green spaces in urban areas?
14. What advice would you give to urban planners and developers looking to create more cohesive and sustainable urban environments?

Final Thoughts:

15. Is there anything else you would like to add that we haven't covered, particularly regarding the challenge of realizing density alongside the development of vital green spaces?

Thank the participant for their time and valuable insights.

Notes Section:

Appendix D.

Interview and Stakeholder Transcripts

Interview 1

Het koppelen van budgetten met werkzaamheden is de belangrijkste les. Doordat er wegdekken zijn welke binnenkort afgeschreven worden hebben wij samen met Warmtestad deze straten aangepakt. Warmtestad breekt de weg open, legt de warmte infrastructuur aan en is ook de eindverantwoordelijke voor het terugbrengen van de weg. Doordat dit proces tijdelijk de straat openbreekt, kunnen we deze werkzaamheden gelijk koppelen aan de herinrichting. Alle partijen worden hierin meegenomen. Vanwege de groene herinrichting, komt er minder grijs terug in de straat. Dit smallere wegprofiel is goedkoper aan te leggen en bespaart tegelijkertijd onderhoudskosten. Warmtestad houdt daarnaast ook meer geld over. Wat normaal vierhonderd ton zou kosten, kost nu honderdvijfenzeventigduizend euro.

Dankzij de leidraad (inspiratiebron), ‘buurtwalks’ (informatiebron participatie), budgetten en werkzaamheden, ontstaat er een integraal ontwerp. De gemeente zet steeds meer in op het bottum-up ontwerpen waarbij eerst de wensen en eisen van de betrokken partijen en stakeholders gevraagd worden en daarna pas een ontwerp gemaakt wordt. De plekken worden geselecteerd op basis van de opeenstapeling van knelpunten en kansen, het is niet een geval van wie het eerst komt, wie het eerst maalt. Op basis van deze selectiecriteria worden de meest prangende zaken aangepakt.

De gemeente is blij met de Leidraad, de ontwerpen dienen als inspiratiebron en niet als eindontwerp. Zo kun je bewoners laten zien wat de kansen zijn. Het stappenplan wordt gebruikt om de meningen, uitdagingen, kansen en belangrijke elementen uit de leidraad te vertalen naar een inzetbaar ontwerp.

De wijkvernieuwing zet het liefst in op informele speelplaatsen “aanleidend spelen” is beter dan leidend spelen. Zo’n inrichting ziet er tevens beter uit wanneer het niet gebruikt wordt dan een formele speelplaats. Een wipwap in de regen ziet er maar zielig uit.

Interview 2

De heer werkt als kwartiermaker in de wijk Vinkhuizen voor de gemeente Groningen. Een paar jaar terug was er nauwelijks budget voor wijkvernieuwing, daarom is destijds het wijkbedrijf in het leven geroepen. Inwoners, beheerders en de gemeente werkten samen aan een wijkplan. Nu

zitten we in Vinkhuizen tegen de wijkvernieuwing aan, het wijk energieplan. Het warmtenet moet aangelegd worden, dat werkt nu goed nu de wegen deels afgeschreven worden. Als er wat moet gebeuren, dan pakken we die kans gelijk.

We hebben een simulatie op de wijk toegepast, een bui die eens per honderd jaar plaatsvindt. Er speelt dus een grote wateropgave in Vinkhuizen; als er 7 centimeter per vierkante meter valt, gaan veel plekken onder water staan. Er zal dus een hemelwaterriolering aangelegd moeten worden. De riolering moet eigenlijk tegelijk met het warmtenet van Warmtestad aangelegd worden. Zo hoeft de straat maar een keer open. Verder moet de stroomcapaciteit ook tien keer zo groot worden in de toekomst en Waterbedrijf Groningen moet ook leidingen aanleggen. Alles moet eigenlijk in één keer gebeuren. Stadsbeheer heeft deze visie op de kaart gezet, kansen zijn inzichtelijk.

Op dit moment spelen er hoofdzakelijk particuliere buurtgerichte projecten, we isoleren de huizen en gaan van energielabel C naar B ter voorbereiding van het warmtenet. Voor woninggerichte projecten is relatief veel budget, maar voor de wijk zelf, de openbare ruimte weinig. Vinkhuizen heeft veel snippergroen en de kwaliteit van de openbare ruimte is laag, een kwaliteitsimpuls is hard nodig. In Haren en het zuiden van de stad zijn de straten rijk aan bomen en staan er huizen met flinke tuinen. Ze hebben veel groene openbare plekken en veel particulier groen, daar zou je dus minder aan kunnen besteden. Gewoon onderhoud. Daarentegen kun je in Vinkhuizen veel meer budget vrijmaken voor een openbare ruimte met cohesie. De buurtvoorzieningen centraal stellen of onderdeel maken van een (openbare) route door de wijk. Zo hebben mensen een wandelroute voorzien van groen en kun je de ruimte ook voor verschillende leeftijden inrichten. Er is bijvoorbeeld een kinderboerderij die misschien niet eens bekend is bij de hele wijk. Combineer een openbare ruimte route met spelen. Maak logische routes met een programma, sport, iets doen een kiosk en publieke voorzieningen. Publieke ruimtes binnen en buiten verbinden. Nu is de auto nog te veel de baas. Mensen met een migratieachtergrond kiezen soms nog om hun kind met de auto naar school te brengen, want de auto heeft nog altijd de hoofdrol in de straat. Wandelen en fietsen moet gestimuleerd worden.

De Dienst Maatschappelijke Ontwikkeling heeft veel aanbod voor de jeugd, maar erg veel moeite om deze doelgroep te bereiken. Er zijn buurtteams actief, energieadviseurs en een wijkanalyse team van onder andere “WIJZ” actief. Zij inventariseren wat ze op straat horen, zo hebben zes studenten in twee dagen tijd honderdvijftig mensen gesproken. Door één op één gesprekken kom je er achter waar bijvoorbeeld bomen geplaatst kunnen worden. Helaas is het vertrouwen soms ver te zoeken, sommige mensen zeggen: “Leg maar tegels aan, jullie onderhouden dat groen toch niet.” Terwijl de gemeente juist zich inzet op beter beheer dan voorheen. Een onderhoudsvriendelijke inrichting is daarom handiger. Nu zijn er veel afgebroken binnenplaatsjes met van die rubberen tegels tegen letsel. Openbare ruimte moet speels en avontuurlijk zijn. Bosjes om hutten te bouwen en bomen om in te klimmen.

De wijk verdichten is een goede kans, we zien dat bijvoorbeeld in Meerstad de behoefte naar voorzieningen toch is gekomen ook al waren deze er origineel niet gepland. Met een woonverdichting kun je dus dichtbij bestaande voorzieningen bouwen. We zien wel dat inwoners van Reitdiep eigenlijk nauwelijks ruimte hebben, zij parkeren dan ook vaak hun auto in Vinkhuizen (tot ergernis van de bewoners). Huisartsen melden ook dat zij overbelast zijn, maar de scholen merken dat de meer welvarende ouders hun kinderen naar scholen buiten de wijk brengen.

“Behoud van areaal." Door verdichting kunnen er ook meer voorzieningen naar de wijk gebracht worden.

Een interessante vraag zou kunnen zijn wat een extra 20.000 inwoners oplevert. Deze mensen betalen belasting wat meer budget voor het beheer van openbare ruimte betekent. Een kwaliteitsimpuls, openbare ruimte koppelen aan bijvoorbeeld het rioleringbudget. Nu is er geld voor isoleren, maar niet voor de openbare ruimte. Een coöperatie zou van twintig naar honderdvijftig woningen kunnen groeien. De grondwaarde is ongeveer 15.000 euro keer 130, dat is een mooi bedrag voor de realisatie. Meer belasting voor de gemeente en in samenwerking met de coöperatie ook meer geld voor de openbare ruimte. De mensen moeten zich tot de openbare ruimte aangetrokken voelen terwijl ze naar buiten kijken. Met deze extra mensen en een kwalitatief hoge openbare ruimte is er ook meer draagvlak voor voorzieningen en projecten. Wenen is een goed voorbeeld met een sociale huursector van 70%, daar wonen agenten, zusters, noem het maar op naast elkaar. Je kunt dan ook veel makkelijker verhuizen. De doorloop is ook beter. Nu blijven er veel ouderen bijvoorbeeld in een doorzonwoning hangen. Een grote sociale huursector is zeer positief.
In de toekomst wordt de westelijke ringweg aangepakt. De wijken Reitdiep, Paddepoel en Vinkhuizen worden beter met elkaar verbonden doordat de ringweg in een tunnel en verdiepte ligging aangelegd gaat worden. Er ontstaat meer ruimte voor groen en ontmoetingsplek zoals in het Sterrebos. Zo’n herrinneringsbalkon is lelijk, maar leuk op de juiste plek. Een beeld van hoe belangrijk de infrastructuur vroeger voor ons geweest is. Maakt niet uit hoe lelijk het was, je moest met je auto naar de Grote Markt kunnen rijden. Bizar, zoals de Leidraad laat zien gaat de mobiliteit weer onderdeel uitmaken van tien dimensies in plaats van één hoofdzaak. Je zou niet eens met je auto de stad in moeten willen.

De wijk moet warm, droog en koel blijven.

Neighbourhood input 1

Ik heb met een medewerkster van de kinderboerderij gesproken. Zij vertelde dat ze geen opmerkingen ontvangen over de wijkinrichting. Ze werken veel samen met mensen die een zorgindicatie hebben. Zowel vrijwilligers met als zonder beperking helpen regelmatig bij het voederen en verzorgen van de dieren. De voornaamste bezoekers zijn kinderen in de leeftijdscategorie van 0 tot 5 jaar, hoewel er soms ook kinderen van 5 tot 10 jaar komen; de gemiddelde leeftijd ligt echter lager. Hoewel de kinderboerderij niet groot is, organiseert men er regelmatig feestjes, wat veel bijdraagt aan de sociale cohesie in de buurt en vooral gebruikt wordt door de jongste leeftijdsgroepen.

Neighbourhood input 2

Ik heb met een medewerkster van buurtcentrum De Wende gesproken. Zij vertelde dat ze zelden negatieve opmerkingen hoort over het groene karakter van de buurt. Ze wees grappend naar de jeu de boulesbaan, die volgens haar juist te groen is! Ze gaf me de contactgegevens van de verantwoordelijke voor de groenportefeuille, een man die ook zelf ontwerpen maakt voor de wijk

en buurt. Hij en de wijkorganisatie zouden een waardevolle ontwerpjury kunnen vormen. Volgens haar staan hij en de rest van de organisatie hier zeker voor open.

Neighbourhood input 3

The infrastructure right now is too much car oriented, blocking of certain roads will not harm the accessibility of the neighbourhood. The planners have already done this in the past by making the ‘Woonerf’, this adds much value to the neighbourhood liveability. The green-blue network in the design brings a nice route to the neighbourhood, but bicycle paths should ideally be part of the same green structure. Try to link the design to the amenities already present in the neighbourhood. The Diamantlaan and the Edelsteenlaan are difficult streets to cross, because of the cars and their speed. Therefore, infrastructure is also an important aspect in the design. Ideally, a Jumbo supermarket in the neighbourhood would make a great addition.

Neighbourhood input 4

Jouw plan ziet er al goed uit, ik ben zeer benieuwd naar de vordering ervan. De wijk heeft op dit moment veel versteende voortuinen, terwijl er veel aanvragen zijn voor de volkstuinen. Wij moeten als volkstuinorganisatie gaan uitbreiden, daarom vernieuwen we nu eerst ons gebouw; begin juni gaat de aannemer van start.

Meer groen toevoegen is een goed idee, dat is in lijn met het bomenplan wat ik je kan toesturen als je daar interesse in hebt. Wij hebben laatst met de wijk en de gemeente het plan doorgenomen. Er moeten flink wat bomen geplant worden. Helaas zaten er meer partijen die tegen het planten van bomen zijn aan de tafel dan de voorstanders. Zulke partijen als Warmtenet en Enexis staan er niet om te springen vanwege de kabels en leidingen die op verschillende plekken liggen.

Neighbourhood input 5

De ontwerpen zien er heel mooi uit, als tip zou ik willen meegeven dat een zijaanzicht of perspectief ontwerp een extra laag beleving toevoegt.