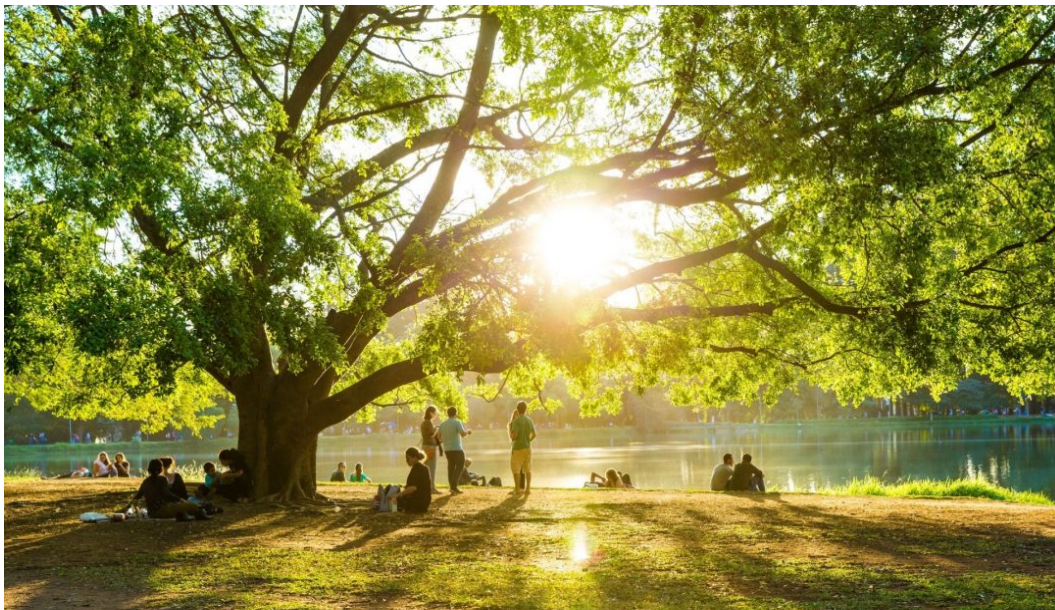# Designing Healthy Urban Spaces: A Case Study of Vinkhuizen Neighborhood

Author: Era Kasami

Supervisor: Terry van Dijk, PhD

Second Reader: Özlemnur Ataol, PhD

July 5, 2024

Summary

This research aims to explore the relationship between urban design, green spaces and well-being in urban environments. The study employs a research-by-design approach, utilizing multiple sketches and designs to determine the best solutions for the neighborhood. The aim is to provide design solutions that incorporate greenery to improve residents' well-being. Qualitative methods, including stakeholder interviews and resident questionnaires, provide insights into the current state of green areas in the target neighborhood.

Neighborhoods lacking access to green and recreational spaces often face challenges such as decreased social cohesion and reduced well-being among residents. Key elements to enhance physical and mental health include the integration of the 3-30-300 rule, which allows for every home to have access to and sights of greenery, and the creation of functional and linear green spaces. These spaces promote inclusive recreational areas that enhance climate resilience and quality of life. Additionally, compact design elements are incorporated to reduce the need for long commutes and encourage walking and biking, thus promoting physical activity.

These findings align with existing literature that emphasizes the importance of green urban planning policies. Such policies should prioritize the integration of green spaces to create healthier and more sustainable cities. Based on the findings, two sample designs are provided to improve urban green spaces, offering curative environments for those with health issues and promoting preventive health measures.

Keywords: Social cohesion, Community engagement, Green spaces, Biodiversity, Healthy Environments, Well-being

Contents

6 Conclusion   **39**

1 Introduction

1.1 The Grand Entrance

As cities continue to expand and populations grow, the need for thoughtfully designed urban environments becomes important. According to Stefano et al. (2018), the design of urban spaces significantly impacts public health, influencing both preventive measures for healthy individuals and curative environments for those with existing health issues. These spaces must accommodate the diverse health needs of residents by promoting physical activity, mental well-being, and social interaction. Central to achieving these goals is the integration of green spaces, which have been shown to significantly enhance human well-being beyond their environmental benefits (Wolf et al., 2020; Gascon et al., 2015).

This research aims to explore how specific design elements can foster mobility, physical activity, relaxation, and social interactions in the context of redesigning a post-war neighborhood. Haaland (2015) underscores the importance of design principles in creating environments that promote residents' well-being.

A key concept in this research is livability, which encompasses several factors contributing to a community's overall quality of life (Kashef, 2016). Walkability, accessibility, and inclusivity are essential components of this concept. Vos (2023) defines walkability as the ease and safety with which residents can navigate their surroundings, promoting physical health, social connections, and access to amenities. These spaces can be designed as public areas that encourage walking, resting, and enjoyment of surroundings. Key design elements enhancing walkability include well-maintained sidewalks, safe crosswalks, street furniture, attractive greenery, and a well-connected network of streets and pathways (Southworth, 2005; Gehl, 2011).

Similarly, accessible spaces ensure that all individuals can easily access essential shops and services and fully integrate into community life (Moreno, 2021). It is essential to ensure accessibility for all users in terms of proximity, visibility, and usability. Enhancing accessibility involves implementing universal design principles such as ramps, tactile paving, ensuring proximity to services, and designing inclusive playgrounds and recreational areas (Litman, 2019; Prellwitz Skär, 2007).

Public spaces should also prioritize inclusivity by catering to residents' needs and enhancing community engagement with features like seating, shading, and playgrounds that attract

residents to use these areas and foster social interaction (Mouratidis and Yiannakou, 2021).

Integrating these design strategies emphasizes compact designs, with key elements including mixed-use green and recreational spaces within proximity to reduce long travel needs and promote walking and biking (Mouratidis and Yiannakou, 2021).

Another significant concept is the sense of belonging, a human need to be accepted in a community to maintain secure and meaningful relationships (Reyes, 2023). Crucial elements to strengthen this sense of belonging include balancing interests and accommodating diverse functions, activities, and preferences. People-centered streets, designed for both movement and relaxation, as proposed by Sheikh and van Ameij (2022), complement diverse green spaces, ranging from urban parks to therapeutic gardens—each offering unique benefits to meet community preferences.

Furthermore, safety is another important consideration in designing and integrating green areas. Proper lighting and services enhance the overall safety of green spaces, making them more inviting (Stefano et al., 2018).

1.2   Research problem

This research aims to explore the relationship between urban design, green spaces and human well-being in urban environments. As many urban populated areas suffer from a shortage of accessible green spaces, this limits the opportunities for outdoor recreational activities and social engagement (Sheikh and van Ameij, 2022). According to Taylor and Hochuli (2017), access to green spaces correlates with reduced stress levels, lower symptoms of depression and anxiety, and improved mental health. Furthermore, greenery in urban settings encourages physical activities like walking, jogging, and cycling, essential for maintaining physical health (Lee Maheswaran, 2011). In order to investigate these effects further and provide potential design solutions, the main question will be as follows: **"How can urban spaces be designed to promote preventive health measures for healthy individuals and offer curative environments for those with health issues?"**

This question acknowledges the importance of urban design and its potential impacts on residents. It addresses the strategies and interventions that can be implemented to improve residents' overall well-being ranging from preventative to curative solutions through green space designs. Additionally, it acknowledges the significance of designing inclusive urban spaces which according to Sheikh (2022) encourage recreational activities and facilitate access

to nature, promoting community engagement and health.

To delve deeper into this research, the secondary questions will be as follows:

- **How can spaces be re-designed to co-create green inclusive spaces that are inviting for all members of a community?**

- **How can the integration of green spaces in the urban environment lead to lifestyle changes for the residents?**

- **What specific design elements contribute to the promotion of physical activity in urban spaces, and how do they impact residents' health outcomes?**

The structure of the paper is as follows: Section 2 is literature review which aims to set the foundation behind the topic of the central research question. Section 3 presents the data collection process. Section 4 is results and section 5 goes into details about the sketching process and the sample designs. Lastly, section 6 concludes.

2   Building Bridges between theories

To address the research questions, this study analyzes different design principles and theories to understand the relationship between urban environments and residents' well-being. This review highlights the key aspects of urban design that contribute to mental and physical health, livability, and overall community well-being.

2.1   Mental Health Benefits

Urban green spaces significantly improve mental health by reducing anxiety, depression, and fatigue (Kondo et al., 2018). Exposure to green environments can lower negative emotions and restore mental capacities, improving mood and cognitive functions. Short periods spent in nature, such as a 10-minute walk in a park, significantly enhance mood and reduce stress levels (Kondo et al., 2018). This connection with nature can reduce stress hormones like cortisol, fostering a sense of calmness and relaxation (Yeager, Smith and Bhatnagar, 2019). Furthermore, social cohesion, enhanced by natural features and open spaces, is crucial for mental health as strong social connections are linked to lower rates of depression and anxiety (Yeager, Smith and Bhatnagar, 2019).

Some crucial design elements that enhance these mental health benefits include ensuring

inclusive public spaces that consider the needs of all residents. This involves engaging with the community from the start, incorporating essential features such as seating, shading and playground, that attract users, and foster social interaction (Manzini, 2015). In addition, public spaces should also be adaptable to accommodate a variety of functions and activities. Temporary solutions can be implemented to test new designs and experiences, allowing feedback from local communities (Manzini, 2015). As stated by Yilmaz and Mumcu (2016), interacting with the elements of the natural world through sight, touch, and smell can help people clear their minds, recharge, and experience a sense of peace and calmness.

Another crucial element is the resilience of the neighborhood. Public spaces should be designed with potential hazards in mind, aiming to lessen their impact and assist communities in managing when those events occur. Local risk assessments are crucial for tailoring solutions to protect vulnerable populations and spaces (C40 Cities Climate Leadership Group, 2024). This can help reduce hazards and reduce stress for residents; knowing that public spaces are designed to withstand extreme weather and other hazards can reduce stress and anxiety among residents, contributing to overall mental well-being (Manzini, 2015).

2.1.1 Physical Health Benefits

Physical health involves the body's condition and the ability to perform daily activities without limitations. Accessibility to green spaces increases outdoor activity and improves physical health (Song et al.,2017). Proximity to parks can increase physical activity, and areas with more tree cover are associated with higher rates of recreational walking and active transportation. Walking in green environments lowers heart rates and positively affects the cardiovascular system (Song et al., 2017). To strengthen these benefits a rule of thumb of 3-30-300 can be integrated, where 3 visible trees are from each home, 30% tree cover, and 300 meters distance from a park (Nieuwenhuijsen et al., 2022).

In addition to promoting physical activity, green spaces contribute to improved air quality, reducing respiratory problems and enhancing overall health. They moderate urban heat island effects, creating cooler microclimates that make outdoor exercise more comfortable and reduce heat-related illnesses (De Vries et al., 2003). The sensory experiences of nature, such as sights, sounds, and smells, enhance physical well-being by reducing muscle tension and promoting relaxation (De Vries et al., 2003). Encouraging the use of active transportation modes by designing public spaces, particularly streets, to provide safe areas for pedestrians and cyclists while discouraging car use. This can stimulate residents to use sustainable and

healthy modes of transport such as walking and biking (De Vries et al., 2003).

2.2 Examples of Successful Urban Design Projects

'Clever Cities' Project in Malmö

The 'Clever Cities' project in Malmö exemplifies how green spaces directly enhance residents' well-being by integrating communal areas that foster social interactions and community engagement (Ben Ma et al., 2019). Stakeholders work with local residents to design plans for nature-based solutions in Lindängen (Clever Cities, 2021). This collaboration cultivates a sense of ownership and promotes the use of the revitalized urban spaces. The communal green areas are designed to encourage healthy outdoor activities, enable communities to grow their own food, and strengthen social cohesion. To further increase the biodiversity and attractiveness of the area, residents suggested a 'fun green area' with edible plants (European Environment Agency, 2022).

These community gardens offer spaces for biodiversity, social interaction, and physical activity featuring amenities like a garden café (EEA, 2022). Activities include planting, tending plants, beekeeping, and processing harvested vegetables. A collaborative effort among local citizens, businesses, and stakeholders led to the creation of these spaces (Clever Cities, 2022).

The Tuinstraten pilot project

In Antwerp, the Tuinstraten pilot project demonstrates how integrating green spaces in densely populated areas enhances quality of life and climate adaptation (European Environment Agency, 2022). The focus is on areas with limited green space access and vulnerable populations, such as the elderly, children, and social housing residents (EEA, 2022).

The project has designed eight garden streets across different districts of Antwerp, featuring wall gardens, vegetable gardens, trees, planted areas, and lawns. They are designed in partnership with residents, these streets meet the community's needs and ensure accessibility for the elderly (EEA, 2022). Residents are involved in planting and maintaining the gardens which provides opportunities for residents to meet and socialize with local residents (EEA, 2022).

The garden streets reduce heat stress and improve drainage during heavy rain by replacing sealed areas with soil and vegetation. These neighborhoods have become more attractive,

quieter, and offer more space for social interactions and outdoor activities, benefiting elderly residents in particular. Residents also increase their health benefits by growing and harvesting their own organic edible herbs and vegetables (EEA, 2022).

Sankt Kjelds Plads & Brygercargen

In Copenhagen, the Sankt Kjelds Plads & Brygercargen project showcases the integration of extensive green and recreational spaces to mitigate noise and air pollution while promoting biodiversity and community well-being (SLA, 2024). According to Russo (2018), green spaces function as urban lungs, cleansing our air by absorbing pollutants and producing oxygen, an essential element for life. This project shows that when designing the neighborhood to be as climate resilient as possible, green and recreational spaces will be integrated seamlessly (SLA, 2024).

In turn, this can help enhance biodiversity, and reduce noise and air pollution, as well as the urban heat island effect. To achieve this a network of green rainwater beds was integrated and two-thirds of the area's asphalt was turned into a green space (SLA, 2024). Additionally, 586 new trees were planted, integrating a new type of nature that is functional, sustainable, and aesthetic (SLA, 2024). The idea behind this project is to 'design places for life - All life.' (SLA, 2024).

These examples illustrate how green space interventions, whether small or large, including physical changes and social activities, can significantly improve health outcomes. They increase social and cultural exchanges which contribute significantly to the well-being of residents and the sustainability of places (Yilmaz and Mumcu, 2016). Benefits are categorized as mental and physical health benefits economic benefits, social benefits and environmental benefits (Yilmaz and Mumcu, 2016).

2.3 Curative Environments: Enhancing Well-being Through Urban Design

In recent years, urban design has increasingly emphasized creating environments that enhance well-being and integration of the more vulnerable population as well. Studies by Michel and Evans (2023) highlight the multifaceted benefits of such environments. An important factor that contributes to the well-being of these residents is the integration of comfortable places to rest and socialize which helps people living with dementia stay connected to their

community (Michel and Evans 2023).

Moreover, individuals affected with Alzheimer's often spend a considerable amount at home, as it is more challenging for them to integrate into the community, especially when the environment does not allow it according to Michel and Evans (2023). Therefore, neighborhoods with comfortable, accessible and distinctive features play an important role in supporting the well-being of residents with Alzheimer's and fostering their integration according to (Michel and Evans, 2023).

Integrated urban planning that considers the needs of individuals with health issues benefits not them but also enhances the overall livability of the community (Michel and Evans, 2023). By designing inclusive and accessible environments, cities can ensure that their residents remain active, engaged, and connected to their communities (Michel and Evans, 2023).

Inclusive and accessible design elements not only benefit residents' mental and physical health but also enhance community livability and connectivity (Michel and Evans, 2023). Yilmaz and Mumcu (2016) emphasize that inclusive recreational green spaces are designed not only for visual and recreational comfort but also to facilitate social interactions and community engagement. These spaces often include shaded areas with seating and multifunctional green fields, fostering a sense of belonging and positive community relationships (Yilmaz and Mumcu, 2016).

Integrating ramps, tactile paving, and other accessibility features enhances mobility for individuals with disabilities, promoting outdoor activity and social interaction (Yilmaz and Mumcu, 2016).

Beyond their recreational use, functional green spaces play a crucial role in urban environments by serving multiple essential purposes. These spaces serve various essential functions, including community gardening; and provide space for residents to grow their fruits, vegetables, and flowers which offers successful ways to build residents' social connections and sense of inclusion (Bitušíková, 2016). Other primary functions include rain gardens, designed to absorb and filter rainwater, reducing runoff and improving water quality; street trees, which provide shade, reduce heat islands, and improve air quality (Anderson et al., 2023); and green buffers, strips of vegetation that separate different land uses, such as residential areas from industrial zones, to reduce noise and air pollution and provide aesthetic benefits (Yilmaz and Mumcu, 2016). These elements contribute not only to making the neighborhood climate-resilient but also enhance the quality of life (Yilmaz and Mumcu, 2016).

Furthemore, linear green spaces, characterized by their connectivity and accessibility, play a crucial role in urban landscapes, ensuring they are connected to surrounding neighborhoods and accessible to all residents (Bertram, 2015). These features include designing pathways, trails and pedestrian bridges that encourage walking, jogging and cycling and increase proximity to green spaces (Bertram, 2015). While many of these spaces are deliberately designed for recreation and conservation purposes, some are intended to serve both functions simultaneously. Urban green areas, despite their diverse types, serve common purposes such as providing physical comfort through shade and clean air, as well as opportunities for informal and formal social interactions among different social groups and traditions (Yilmaz and Mumcu, 2016).

2.4 Conceptual model

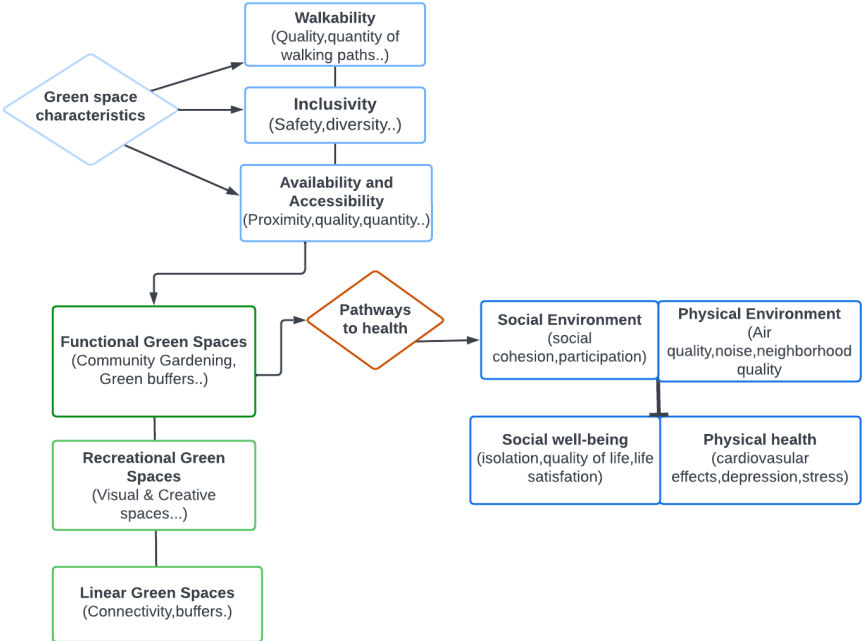Figure 1: Conceptual Model

Figure 1 shows a conceptual model based on the theoretical framework. This will be used to guide the research. It begins with green space characteristics (walkability, inclusivity and availability & accessibility). These characteristics are further strengthened by the following design elements: multifunctional green spaces, recreational green spaces, and linear green

spaces. Each of these elements contributes unique benefits necessary for the redesign of our target neighborhood. The integration of these elements can lead to lifestyle changes which can benefit the social and physical environment by enhancing social cohesion, participation, and overall quality of life. Additionally, the improved physical environment can help reduce health issues such as depression, stress, and cardiovascular problems by promoting better air quality, encouraging active mobility, and elevating the overall quality of the neighborhood. Together, these elements characterize a livable and healthy neighborhood where residents can thrive in harmony with their surroundings and each other. The thoughtful design and integration of green spaces are pivotal in achieving this harmony, as they directly influence the neighborhood's social fabric and residents' quality of life.

3   Research by Design

The study employs a research-by-design approach, utilizing multiple sketches and designs to determine the best solutions for the neighborhood. The aim is to provide design solutions that incorporate greenery to improve residents' well-being. The research consists of a literature review and a case study, with primary data collected through interviews and surveys. The case study approach was chosen for this research focusing on Vinkhuizen. Case studies are particularly suitable for in-depth analysis of a specific phenomenon within real-life settings. They enable researchers to gather detailed information from multiple sources which provides a comprehensive understanding of the topic.

Research by Design (RbD) promotes community engagement and participatory design processes, ensuring that solutions are co-created with residents and reflect their needs and preferences (Reimann, P. (2011). Research by design can help in creating age-friendly environments through inclusive design practices. Research by design allows for a nuanced exploration of these complexities, facilitating tailored solutions that respect the area's historical fabric while addressing modern needs.

The Research by Design (RbD) is particularly suitable for this research question because it allows for the development of context-specific solutions. It enables design thinking with research which allows for an exploration of design solutions to best re-design a neighborhood while taking into consideration the residents' well-being. This approach allows for an understanding of how concrete designs of green spaces influence their effectiveness in promoting social cohesion and overall well-being(Reimann, P. (2011)). Moreover, the nature of the RbD

approach allows for continuous refinement of green space designs based on real-time feedback and it closely examines the specific context of Vinkhuizen, ensuring that the findings are tailored to the local environment.

RbD emphasizes an iterative process of designing, testing, and refining solutions. This approach allows the researcher to continuously improve the design of green spaces based on feedback and empirical data collected during the study. It ensures that the final design is well-informed and optimized to enhance residents' well-being.

Throughout this process, prototypes of green space designs were developed based on initial research and workshop outcomes. These prototypes were presented to the community for feedback, allowing for iterative refinement and improvement of the designs. Used the feedback from prototypes to evaluate the effectiveness of the designs in meeting the community's needs. This evaluation informed further refinements, ensuring that the final designs were both beneficial for residents' well-being. Documented the entire RbD process, including sketches, feedback sessions, and final rendering designs which will be presented below.

To visually represent the methodology used in this research, a flow chart (figure 2) is provided below. This flow chart illustrates the sequential steps undertaken from data gathering through qualitative methods and the Research by Design approach, to the integration of primary and secondary data sources. Moreover, the sketching process below will provide a clear understanding of how these ideas unfolded and the final designs were developed which incorporate crucial design elements.
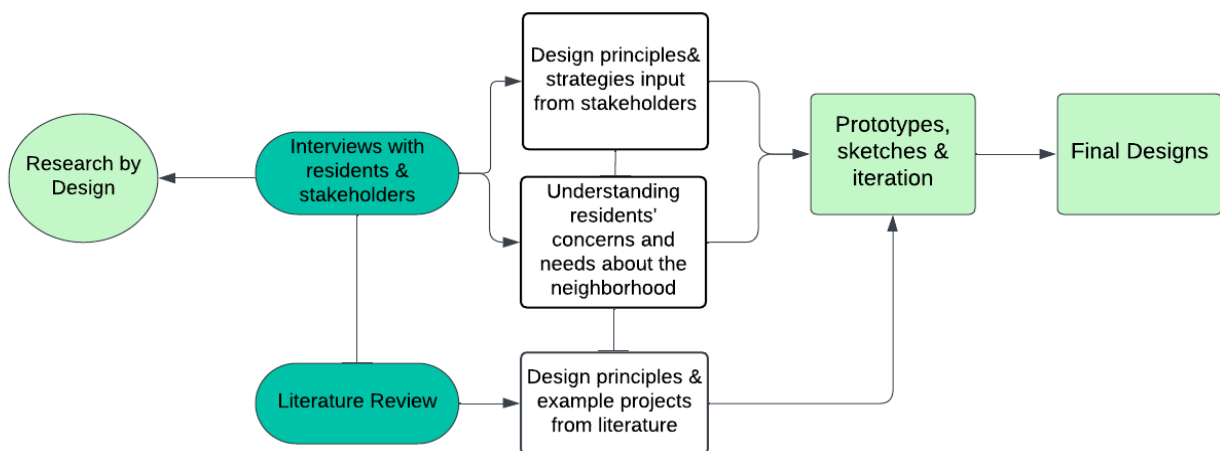

Figure 2: Research by Design

3.1 Case Study

Figure 3: Target area in Vinkhuizen, Groningen (source: by author)

The area the researcher is going to explore is the Diamantlaan neighborhood in Vinkhuizen (Figure 3). Diamantlaan in Vinkhuizen is chosen for this research due to its distinct post-war urban design, characterized by detached buildings, a lack of green spaces and extensive streets, which create accessibility and usability challenges for green spaces primarily located behind apartments. Green spaces behind buildings lack visibility and safety, making them prone to misuse and illegal activities. These secluded areas can become hot spots for crime, and without adequate visibility, they reduce the overall safety of the neighborhood. Another concern is that these green spaces are subject to noise pollution from nearby roads and parking lots. This neighborhood faces traffic congestion and fast-moving cars due to wide lanes, which adds to the challenges to the area (Bogar and Beyer, 2015).

Furthermore, Diamantlaan has a significant elderly population, which raises concerns about their safety on the streets and overall well-being (Dam et al., 2021). Increased traffic and unsafe green spaces make it challenging to feel a strong sense of belonging within the community and decrease access to recreational areas. Additionally, the neighborhood's low-income status and lower educational levels highlight green equity issues. Addressing these issues is crucial to fostering a safer and more inclusive community in Diamantlaan.

3.2   Firsthand insights

For the primary data collection, interviews were held in the neighborhood of Vinkhuizen, and additionally, a survey was distributed via social media and personal contacts. The targeted respondents were aged 21-50 years, including both genders, students, and working individuals. These interviews and surveys aimed to gather residents' perceptions of green spaces, their frequency of use, overall well-being, and satisfaction with the neighborhood environment. Residents, being intimately familiar with their neighborhood's dynamics, provided valuable insights into its layout, amenities, and challenges. Questions were asked to gather data on their perceptions of green spaces, frequency of use, well-being, and overall satisfaction with the neighborhood environment. This allowed us to capture the diversity of perspectives and identify patterns and preferences in the community's use of green spaces. Questions about specific health issues related to insufficient greenery helped understand community concerns and areas needing interventions. Moreover, asking for design considerations and improvement suggestions developed the design process by implementing how can urban spaces best support individuals with health issues. This information was taken into consideration when developing the designs as well as a resident-centered approach was implemented.

The preferences and opinions of residents regarding the design of urban spaces, such as parks, walking paths, or community gardens, are crucial for creating livable and accessible environments. Interviews helped identify preferences for outdoor activities, recreational facilities, and green spaces. Therefore, taking into consideration all these features can lead to maximizing the usage of these open green spaces and promoting the residents' overall health.

These various sources of information—primary data from interviews and surveys, secondary data from literature, and insights from the Soft Atlas—complement each other. The interviews and surveys provide firsthand experiences, while secondary data offers context and theoretical insights. The qualitative data collected provides rich insights into residents' per-

ceptions, behaviors, and needs related to green spaces. Research by Design (RbD) integrates these qualitative insights directly into the design process, ensuring that the resulting green spaces are responsive to the community's preferences and concerns.

Regarding ethical considerations, all respondents were provided with clear information about the purpose of the research before participating. Informed consent was obtained from each participant to ensure their voluntary participation and the confidentiality of their responses. Participants were also informed that they could withdraw from the interview at any time without any consequences.

3.3   Digging deeper

In addition to primary data, secondary data was collected through literature review. One significant source utilized is the "Zachte Atlas" (Soft Atlas) for Vinkhuizen, published by the municipality of Groningen. This resource offers insights into the neighborhood's development and renewal efforts. It consists of various analyses, including livability surveys and spatial studies, to provide a detailed overview of Vinkhuizen's development. Moreover, the Soft Atlas integrates both quantitative data, such as facts and figures, and qualitative insights, including the perspectives and experiences of residents and users of the neighborhood.

The literature review also offered insights from previous studies and reports related to urban planning, green space development, and social cohesion enabling the formulation of expectations and hypotheses.

3.4   Secondary data analysis

3.4.1   Health and Well-Being

To further develop our understanding of the current green urban situation of Vinkhuizen neighborhood, specifically Diamantlaan and the well-being status of Vinkhuizen Zuid is crucial for our research on designing urban spaces that promote preventive health and offer curative environments. By analyzing the existing conditions, the researcher can identify the gaps and challenges that need to be addressed to enhance the quality of life for all residents. According to the National Institute for Public Health and the Environment (2020), Vinkhuizen Zuid has 56.16 percent greenery and perceived health is indicated to be good for 69 percent of the population. This is still a low percentage compared to other neighborhoods. About 44,9 percent of residents comply with exercise guidelines of 150 minutes per week and

37,7 percent have long-term illnesses or other health conditions. Moreover, 15,5 percent experienced severe loneliness and 21,3 percent experienced high stress in the past 4 weeks. 7,5 percent answered yes to high risk of anxiety and depression (National Institute for Public Health and the Environment, 2020).

Addressing these physical and mental health issues requires a multifaceted approach in urban design that goes beyond mere provision of green spaces. The Neighborhood Compass data from Gemeente Groningen (2023) further illustrates the health challenges in Vinkhuizen. The neighborhood has a relatively high number of individuals with visual, auditory, and especially mobility impairments. Vinkhuizen also scores below average in terms of psychosocial health. Residents themselves also report lower perceived health compared to residents of other neighborhoods. They expect more often than average that the quality of their life will not improve and score below average on experienced happiness. Residents of Vinkhuizen less frequently engage in excessive drinking and score slightly worse on smoking. In terms of personal strength, resilience, and control among residents, Vinkhuizen also clearly scores below the municipal average. There are relatively many residents with limitations in activities of daily living or who receive informal care or assistance. Residents also indicate that they perceive their own strength, resilience, and control as less effective. This is evident in the number of residents reporting a low sense of control over their lives (Gemeente Groningen, 2023).

These insights highlight the importance of designing urban environments that empower residents and enhance their sense of control and resilience. Moreover, in Vinkhuizen, a relatively large proportion of residents use social support services: 12% compared to the Groningen average of 6%. The largest part of this group uses aids (wheelchairs, home adaptations, and (collective) transportation), followed by domestic help. The largest group of social support service users is above 65 years old. In Vinkhuizen, 42% of those aged 65 and above use a social support service, compared to the Groningen average of 24% (Gemeente Groningen, 2023) . Particularly, domestic help and aids are more commonly used in Vinkhuizen.

By understanding these underlying issues, our research aims to propose urban design solutions that enhance accessibility, and overall well-being. These findings are directly relevant to our research question as they emphasize the need for urban designs that incorporate elements that support preventive health measures for healthy individuals and create curative environments for those with existing health issues.

4 What I Found

As part of the Research by Design approach in Vinkhuizen-Zuid neighborhood, surveys and interviews were conducted to gather quantitative data that complements the qualitative insights gained through participatory design and community engagement. The decision to incorporate surveys and interviews adds value by:

- Identifying community priorities

- Understanding behavior and preferences

- Informing design decisions

4.1 Survey Findings of Diamantlaan

The researcher surveyed 46 respondents in Vinkhuizen-Zuid neighborhood. It is noted that most of the respondents have lived in the neighborhood for about one year and more than half reported going outside in the neighborhood once a week, which can indicate that they are not satisfied with their surroundings.

The researcher asked respondents to indicate which improvements they would like to see in their neighborhood, what factors influence their visits to the neighborhood, how urban design can support people with health issues, and what health issues arise from insufficient greenery. Respondents could choose multiple options from a provided list. The main factors that encouraged residents to spend time outside were proximity to home and the availability of greenery.

The high frequency of responses for greenery suggests that a significant majority of respondents prioritize the addition of green spaces in their neighborhoods. Sports facilities and walking trails are also highly favored, indicating a community interest in recreational and physical activity spaces. Moreover, respondents believed that adding green areas contributes to enhanced mental well-being, community engagement, improved air quality and physical health benefits.

4.1.1 Interviews with residents

In order to gain deeper insights into the current state and perceived shortcomings of green spaces in Vinkhuizen, interviews were conducted with residents.

Interviews revealed that the residents perceive the current state of green spaces as inadequate in design, which affects their satisfaction and health. They emphasized that the health benefits of green spaces would be improved mental and physical health, air quality and community engagement. These are key aspects that contribute to overall well-being. Challenges that were encountered by citizens were poor maintenance, limited facilities and accessibility and availability issues. As stated in the interview from a concerned resident of Vinkhuizen 'we need to want walking around the neighborhood'. Strategies to encourage inclusivity and livability of the neighborhood were discussed; such as the implementation of recreational facilities, cafes and therapeutic landscapes.

The possible designs that can help improve the current state of Vinkhuizen neighborhood were part of the discussions. It was emphasized that there is a need for houses to have communal spaces and include greenery and recreational spaces in between houses, this way, residents can have a greater sense of belongingness and interact with one another. This, in turn, will have significant benefits to the residents' mental health by preventing loneliness and encouraging them to spend time outside more often, which can strengthen the social cohesion of the neighborhood which is considerably low compared to other neighborhoods.

Furthermore, in most responses it was cited that densification has slightly led to a reduction in green spaces in Vinkhuizen, as the neighborhood is built to accommodate as much as possible and greenery, inclusivity and livability elements were not taken quite into consideration.

4.1.2 Interviews with stakeholders

Insightful information was gathered during the interview with landscape architects from Strootman LandschappenArchitecten in the city of Groningen. A method of stacking up houses was suggested so that there is more space for greenery and amenities, rather than designing houses next to each other as there is little space for greenery. The importance of maintaining or even increasing density while integrating greenery was also emphasized. Project examples similar to our case of interest were presented to inspire and help determine design principles, some of which are presented below.

Moreover, the 3-30-300 rule was given as an example during the interview as a guideline to assess if there is enough greenery and trees in the city for a healthy living environment. A healthier environment was defined as having more space for exercise or sports, better air quality for improved physical health, and recreational opportunities or relaxation areas that

benefit mental health. This is rule of thumb consists of:

- **3 rule**: There are at least 3 mature trees close to every home, school or workplace.

- **30 rule**: Every neighborhood has at least 30% tree canopy, providing shade and cooling the area.

- **300 rule**: A park is within 300 meters of every home, school, or workplace, offering recreational and relaxation opportunities.

A notable project that was developed by Strootman Landschapsarchitecten was the Climate Adaptation Design Manifestation to conduct design research for the Selwerd district. The chosen neighborhood was a post-war area. For the Selwerd district, they created three perspectives, each of which gives its own strategy to tackling climate change. The challenge for designing a pleasant and attractive urban climate lies in uniting the 'soft' sides of nature and the 'hard' requirements of the city. This requires thinking about public space differently than has been the case so far, thus designing it differently. The solution to the climate challenge is to create public space that is 'soft' (green): which people can use it and there are trees that can grow healthily and provide shade and coolness, and the soil can handle the summer peak showers. At the same time, this increases biodiversity and improves the overall well-being of the community. Therefore investing in climate adaptation can also have social benefits (Strootman Landschapsarchitecten, 2019).

A post-war reconstruction neighborhood like Selwerd despite appearing green, had fragmented greenery that did not invite use and was poorly connected. In addition, the district has large paved surfaces, cars dominate the streetscape and 'hard' edges close the neighborhood off from its surroundings. The advisory report 'Selwerd, the Green Stamp' showed how such areas could adapt to environmental changes by enhancing green spaces, reducing paved surfaces, and minimizing car dominance. The plan consisted of four instruments for a greener environment:

1. A robust green network

2. Attractive and diverse green areas

3. Healthy living, working, and shopping areas

4. Future-proof and accessible rural areas

General principles, such as each park having its own services and activities and increasing biodiversity in built-up areas, guided these instruments.

The plan emphasized using the power of nature for a healthy living environment. For instance, permeable soils can easily absorb rain peaks, extra trees provide shade, filter air and absorb CO2 emissions. The aim is to create connected, high-quality green spaces and invite people to enjoy the outdoor space, designed from the perspective of slow users like children playing, students cycling and elderly people walking (Strootman Landschapsarchitecten, 2019).

Whatever climate action is chosen, the strategy includes pushing vehicles out of the streets, making the space green, and connecting the neighborhood to its surroundings (Strootman Landschapsarchitecten, 2019).

Figure 4: Re-design of Selwerd Neighborhood

Moreover, an interview with Wijkoverleg Vinkhuizen, a volunteer organization, provided further insights. They focus on themes like climate adaptation, traffic, and greenery. If necessary, they address issues or neighbourhood needs with the municipality and other organizations. A traffic controller emphasized the need for more green spaces where residents can interact, particularly near shopping centers to enhance social cohesion. He noted that

car-free streets could reduce the risk of accidents and minimize car nuisance and pollution, thereby improving residents' sense of safety and overall well-being.

Furthermore, creating spaces where residents can walk their dogs can foster social interactions, strengthening the neighborhood's social cohesion. An important point raised was the need for residents to feel safe, which is a priority for their overall well-being. As one interviewee noted, "People want to have a life inside the neighborhood and not have to drive to the city center." The main cause of safety concerns is the neighborhood's car-dependence, which increases the risk of road accidents. Thus, there is a need for car-free streets to decrease the risk of accidents occurring while also minimizing car nuisance and pollution.

Finally, using these inputs from stakeholders, residents, and literature, the researcher develops sketches to propose the best solutions for the neighborhood, integrating the gathered design elements which will be shown below.

5 Sketching Process

Based on the research findings, a process of conceptualization and ideation was made. During this process, various design ideas were brainstormed and sketched out in multiple iterations, exploring different approaches to integrating green spaces, recreational areas, and community gathering spaces within the neighborhood layout.

The sketching process involved creating multiple sketches (Figures 10 to 17 below) that depicted different design possibilities. The researcher experimented with different configurations of green spaces, recreational facilities, and community amenities, exploring how they could be arranged to promote social interaction, physical activity, and well-being.

Prioritizing the 3-30-300 Rule

Sketches 1 to 8 (Figures 5 to 12) prioritize the 3-30-300 rules in design. The green areas follow the 3-30-300 rules by ensuring that every resident has at least 3 trees visible from their home, 30% tree canopy coverage within the neighborhood, and access to a park within 300 meters of their home. This promotes mental well-being, encourages outdoor activity and enhances the neighborhood's aesthetic appeal. This strategy was discussed with relevant stakeholders as an efficient and easy way to integrate as much greenery as possible while maintaining or increasing urban density.

Reducing Car Usage

Sketches 5, 6 and 7 (Figure 9,10 and 11,12) emphasized discouraging car usage by removing unnecessary roads and replacing them with greenery and people-centered streets. This encourages the utilization of these areas and increase time spent outside, engaging in physical and recreational activities. Insights from an interview with the traffic controller highlighted the importance of minimizing car dependency to enhance neighborhood safety and air quality. This strategy was discussed with residents, as it was mentioned that cars need to get pushed out of the roads and increase active mobility and air quality.

Multi-functional Areas

Sketches 2 to 7 and 8 (Figures 6 to 9, 11 and 12) prioritize multi-functional areas that serve as playgrounds, and relaxation spots. These designs included linear green spaces along walkways that act as green buffers, separating pedestrian paths from busy roads and

providing shaded areas for walking and biking. This strategy increases the neighborhood's resilience to environmental stressors and was refined based on feedback from residents and survey inputs.

All sketches feature elements of inclusivity, walkability and accessibility. The designs emphasize robust green networks of interconnected green spaces, ensuring continuity and easy access throughout the neighborhoods. This network also supports biodiversity.

These are designed with future-proofing in mind, including adaptable spaces that can accommodate future community needs and climate changes. These spaces are intended to be flexible, allowing for modifications as the neighborhood evolves and as new environmental challenges arise.
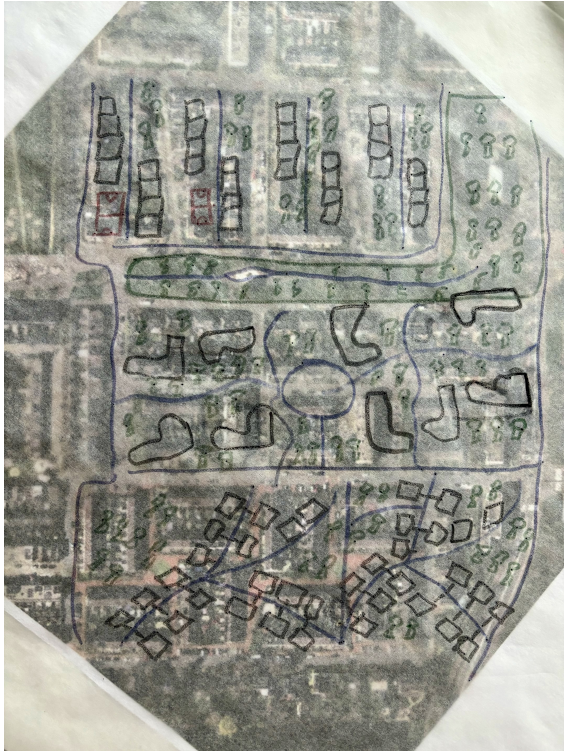
Figure 5: Sketch 1

Figure 6: Sketch 2

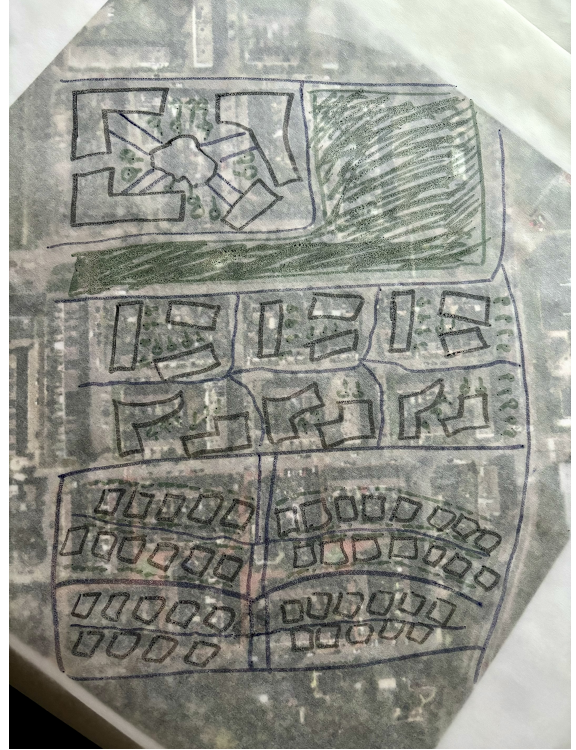Figure 7: Sketch 3

Figure 8: Sketch 4

Figure 9: Sketch 5

Figure 10: Sketch 6

Figure 11: Sketch 7

Figure 12: Sketch 8

27

5.1   First Design Sample

Figure 13: Recreational areas

Figure 14: Bird view

Figure 15: Communal shared area

Figure 16: Open green space

Figure 17

Figure 18

5.2 Second Design Sample

Figure 19: Recreational areas

Figure 20

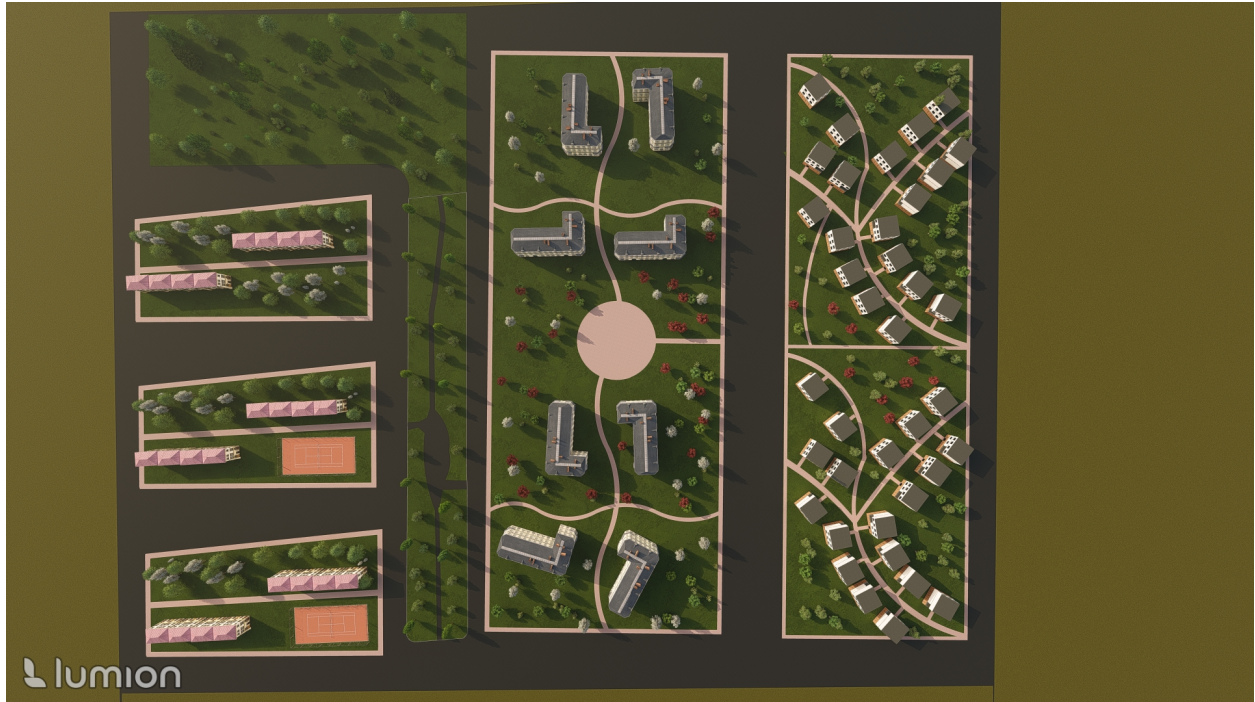Figure 21

Figure 22: Secluded green spaces

Figure 23

Figure 24: Bird view

Figure 25: Walking trails

5.2.1 3-30-300 Rule

In the final designs, the integration of extensive green spaces ensures that all housing areas are within a distance of 300 meters from green areas. The tree canopy coverage of 30% is maximized by lining streets and public spaces with trees, and at least 3 trees visible from every home enhancing the visual connection to nature from residential units (Nieuwenhuijsen et al., 2022). This rule of thumb focuses on the crucial effect of urban nature to our health and overall well-being, as well as climate change adaptation. Integrating this rule has been significantly associated with better mental health, less medication use, and fewer psychologist or psychiatrist visits (Nieuwenhuijsen et al., 2022).

5.2.2 High density housing

A strategy is employed to increase density while also increasing greenery. By stacking housing units, more ground area is left for parks, gardens, and recreational spaces, thus increasing the amount of greenery per capita and enhancing residents' access to nature. This approach ensures that the benefits of urban green spaces are maximized without compromising on housing density (Arnberger ., 2012).

5.2.3 Functional, and Linear Green Spaces

The designs incorporate multifunctional green spaces that serve various purposes such as recreational areas, sports facilities, community gardens, and gathering spots. Linear green spaces, such as green buffers along streets, provide continuous greenery and connect larger parks, ensuring a seamless integration of green areas throughout the urban environment (Kondo et al., 2018). This neighborhood design addresses the lack of recreational areas and greenery typically found in Vinkhuizen neighborhood. Benches are arranged to face each other, promoting inclusivity and engagement within the community. The neighborhood features two recreational areas that cater to both adults and children, including a basketball court, playground, and numerous seating spots. Regular physical activity in these spaces can reduce the risk of chronic diseases (e.g., heart disease, diabetes) and improve the quality of life (Yeager, Smith and Bhatnagar, 2019). These designs focus on both preventing health issues among healthy individuals and providing supportive environments for those already facing health challenges.

5.2.4 Compact Design with a Place for Everyone

The compact design ensures that all amenities and green spaces are within walking distance, making the environment accessible to different age groups. The inclusive design considers the needs of children, adults, and the elderly ensuring that everyone has access to the benefits of urban green spaces. Unlike many areas in Vinkhuizen, which often lack inclusive designs and creative engagement spaces, this layout incorporates areas such as cafes, a tennis court, and a park. To further enhance accessibility, ramps and tactile paving are integrated into the design. Ramps provide easier access for individuals with mobility issues, such as those using wheelchairs or strollers, while tactile paving assists visually impaired individuals in navigating the space safely. These features promote social interaction and enhance overall well-being by fostering community connections (Yilmaz and Mumcu, 2016). The outcome of this design is expected to enhance community health and well-being through increased access to green spaces, improved physical activity opportunities, and supportive environments for relaxation and social interaction. These elements are designed to address specific health concerns identified through community feedback, promoting a healthier and more cohesive neighborhood environment.

5.2.5 Robust Green Network

A robust green network is established by connecting all green spaces, parks, and gardens through a network of green corridors and pathways. This network enhances biodiversity, supports wildlife, and provides residents with uninterrupted access to nature trails and recreational areas (Zhou et al., 2019). The interconnected green spaces ensure continuity and accessibility, fostering a harmonious coexistence between urban life and nature. (Zhou et al., 2019).

5.2.6 Therapeutic Landscapes

These designs showcase features like quiet seating areas under tree canopies that provide spaces for relaxation and recuperation. These areas are especially beneficial for individuals with health issues or those needing a quiet environment for recovery and mental ease. The emphasis on accessible seating areas and therapeutic landscapes in the designs reflects the survey respondents' preferences for improvements to support individuals with health issues. Furthermore, the significant stress, anxiety, and respiratory issues mentioned due to lack of greenery are addressed through the extensive integration of natural elements in each design

layout.

5.2.7 People-Centered Streets- Designing for the Slow User

Streets are redesigned to prioritize pedestrians and cyclists, making them safer and more inviting. The inclusion of wide sidewalks, pedestrian crossings, and dedicated bike lanes promotes active mobility and reduces the dominance of vehicles in urban areas. This strategy is complemented by car-free streets. Vinkhuizen, characterized by its wide lanes for cars, currently makes vehicle use convenient. However, discussions with a traffic controller and residents emphasized the need for car-free streets to improve air quality and reduce noise pollution.

In the designs, excessive roads are removed, and pedestrian and cycling paths are prioritized. The designs feature fewer roadways, with most replaced by green areas, promoting active mobility and reducing vehicle dependency. This approach can increase air quality and decrease noise pollution, which residents and literature have indicated as significant issues affecting community life. Discussions with a traffic controller and residents emphasized the need for car-free streets to improve air quality and reduce noise pollution. By removing excessive roads and prioritizing pedestrian and cycling paths, the designs encourage physical activity and reduce vehicle dependency. This re-design is intended to address respiratory health issues and promote a sense of safety and belonging, allowing for peace of mind when moving about the neighborhood. The focus on designing for the "slow user" – children playing, students cycling, and elderly people walking – further enhances this sense of community and safety.

5.2.8 Garden Streets

Garden streets are lined with trees, shrubs, and flowers, creating aesthetically pleasing and environmentally friendly thoroughfares. These streets enhance the urban landscape and provide residents with beautiful and relaxing environments. This encourages residents to spend more time outdoors, and engage in physical activities. This contributes to healthier lifestyles and a greater sense of well-being (Pffeifer and Cloutier, 2016).

5.2.9 Climate Resilience

Climate resilience is achieved by designing green spaces that can absorb excess rainwater, reduce urban heat island effects, and provide shading (SLA, 2024). These features help

mitigate the impact of extreme weather events and create more comfortable living conditions. In turn, this reduces stress and provides ease to the minds of residents.

6 Conclusion

In this research, our aim was to explore the relationship between urban green spaces and well-being while providing design ideas to promote preventive health measures and healing environments for those dealing with health issues.

By employing a Research by Design methodology, the study demonstrated the importance of thoughtful urban design in fostering healthy urban environments. Key design principles that were emphasized include the 3-30-300 rule ensuring that green spaces are accessible within a short distance for all residents, people-centered streets to encourage active mobility and utilization of green spaces, compact design to ensure that all amenities and green spaces are within walking distance, multi-functional green spaces and community gardens.

Triple win design
The final designs achieve a triple win by focusing on three core objectives:

- Enhance green/natural connectivity

- Promote Active Lifestyles

- Increase compactness & environmental sustainability

They were developed through iterative sketching and feedback integration and feature abundant green spaces, recreational facilities like sports courts and walking paths, and community gathering spaces. These elements promote physical activity, social interaction, and a sense of connection, optimizing health benefits by enhancing both physical and mental well-being. Furthermore, the focus on environmental sustainability ensures that these benefits are achieved in a way that is eco-friendly and sustainable for the long term.

Qualitative methods, such as interviews and surveys, provided valuable insights from Vinkhuizen residents about their experiences and preferences for the improvement of the urban spaces. This feedback guided the development of the final design proposal.

These principles are not only applicable to Vinkhuizen but also to urban planners in cities worldwide. By following these guidelines planners can create green spaces that enhance

social cohesion and improve well-being.

6.1 Policy Implications

Our research highlights the potential for urban green spaces to serve as therapeutic landscapes, offering respite and healing for individuals dealing with health challenges. This underscores the need for policy-makers and urban planners to prioritize health and sustainability in urban design. By implementing these recommendations, cities can create healthier and more livable environments for all residents. Future research should focus on long-term studies to assess the sustained impact of green spaces on well-being. This will help understand the evolving needs of the community and the lasting effects of the implemented design solutions.