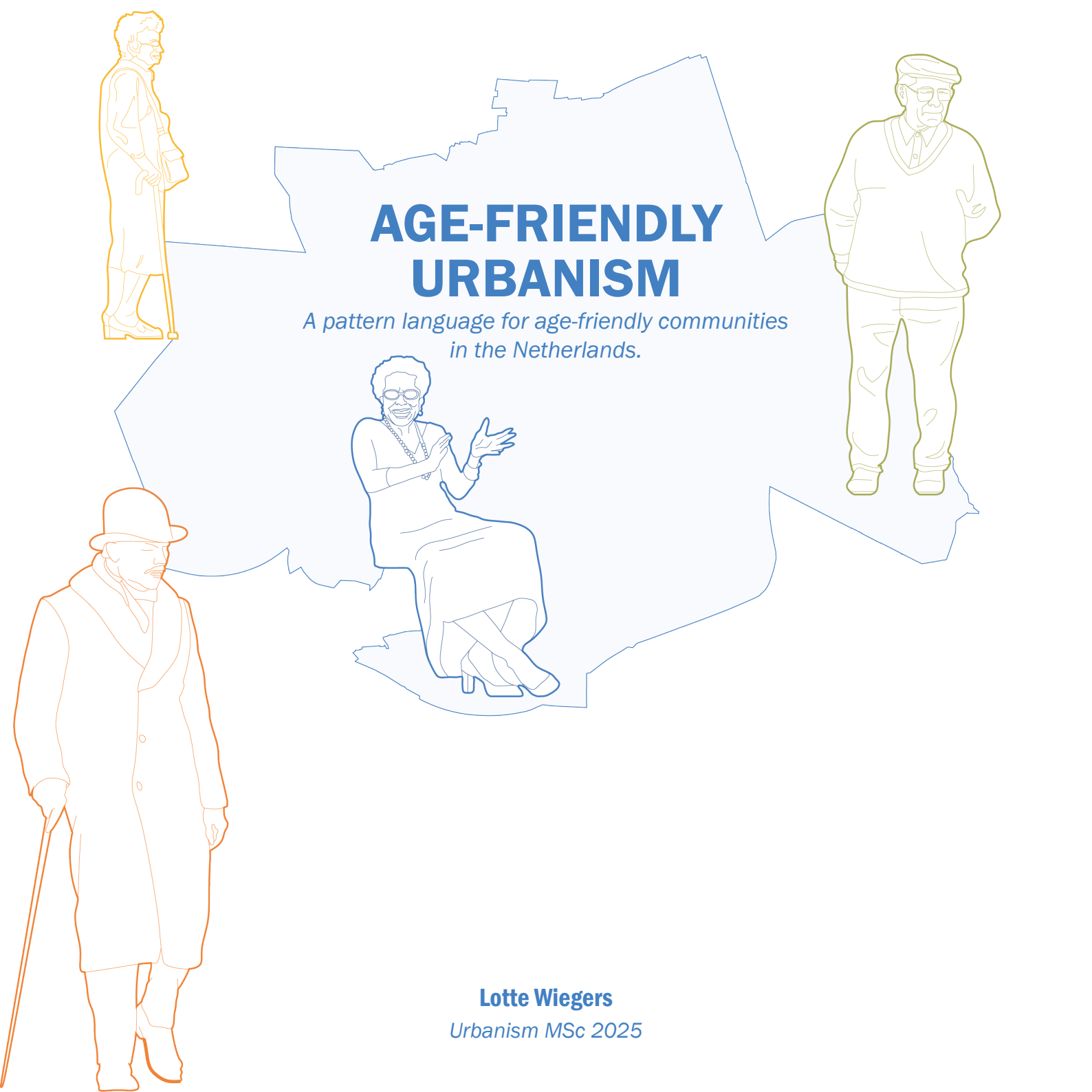




AGE-FRIENDLY URBANISM

*A pattern language for age-friendly communities
in the Netherlands.*

Lotte Wiegers

Urbanism MSc 2025

Colophon

Age-friendly urbansim

A pattern language for age-friendly communities in the Netherlands.

Master thesis - P5 report
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Above all, I am so thankful for the constant love and support of my parents and brother. Thank you for always supporting me, no matter what.

Active and healthy ageing

An individual’s opportunity to continue to participate in a community beyond employment or physical activity and maintain their functional ability as they age.

Age-friendly city framework

A framework developed by the World Health Organization (WHO) that promotes the modification of urban structures and services to enhance the quality of life for older adults.

Age-friendly community (AFC)

A community that presents a supportive environment for active and healthy ageing, where people can age in place and maintain a high quality of life.

Age in place

An older person’s ability to remain in their home or community as they age.

Health

A state of being able to maintain one’s lifestyle and functional ability over their life-course, even with the presence of disease or frailty.

Older person/elderly

A person who is at the age 65 or older.

Physical environment

All physical characteristics of a place that make an individual’s surroundings, such as roads, buildings, and parks.

Quality of life

The relationship between how an individual views their internal and external state.

Social environment

All intangible characteristics of a place that make an individual’s social life.

This thesis examines the role of the built environment to facilitate ageing populations in the support of the quality of life for elderly. Older people, aged 65 and over, are becoming the majority of cities’ populations, yet are still to get acknowledged by urban planners. Resulting in elderly to experience negative impacts on their abilities to maintain their daily activities. As ageing is only going to increase, a shift towards age-friendly communities is needed to support all ages, but elderly in particular, in their later stages of life. Therefore, this study explores how cities can support elderly in active and healthy ageing, while also exploring how age-friendliness can initiate a re-housing chain, starting with older residents. Central to this research is the research question: “How could age-friendly spatial planning and strategy in Dutch cities support

active and healthy ageing for elderly and contribute to a more balanced housing market?” The pattern language has been used to demonstrate what the important domains of age-friendliness are. Through scenario’s and a vision in the case study location, two neighbourhoods in Apeldoorn, the results are presented. Key findings show how this methodology creates opportunities for active and healthy ageing for elderly, as well as how a quantitative and qualitative senior housing supply is an intermediate goal for the housing market. These results conclude that age-friendly spatial planning enhances the quality of life and can be transferable for other cities to face the societal change.

Keywords: Age-friendly community, elderly, housing market, active and healthy ageing, physical environment, social environment, quality of life.

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01

Introduction

This chapter introduces you to personal motivation behind the graduation project. Focusing on the current problems and challenges society is facing regarding the housing market and the elder population. The aim of this project will be defined and introduced.



1.1 Personal motivation

As a student in Urbanism, I am deeply interested in researching societal challenges within urban environments. My decision to pursue this master was driven by a fascination with how urban environments shape our daily lives and influence interactions, both active and passive, among various groups of people. However, cities today face numerous social challenges, such as social exclusion and inequality. I am particularly motivated to address these challenges by creating accessible, liveable, and inclusive environments that cater to all individuals, regardless of their background or social status. This motivation has led me to dedicate my graduation project to one specific demographic: the elderly, and the challenges they face in urban settings.

My interest in the housing market stems from a personal connection to the current struggles. As I approach the stage of considering my own living arrangements, I have directly encountered the limited supply of affordable housing and the burden of high rental prices. Both ageing populations and housing crises are global issues, but through my graduation thesis, I can contribute to promoting social equity and addressing housing challenges in the Dutch context.

1.2 Problem statement

In the past years, populations have been ageing massively. This is not different for the Netherlands, where the population is set to reach 25,1% of people aged 65 and over in 2040 (CBS, 2022). The change in demographics has led to different spatial needs, which requires adaptation in the built environment, especially in cities as the world continues to urbanize (Salmistu & Kotval, 2023).

Because of this trend, there has been literature and research on the topics of ‘active ageing’ and ‘age-friendly cities’. However, the majority of this literature has been published in the domains of social and health sciences and has yet to find its way to urban journals (Salmistu & Kotval, 2023). Additionally, other cities, like Hong Kong or Toyama, have actively designed and planned for their ageing population (Roberts, 2021). But the Netherlands has yet to make this step as only few studies have assessed Dutch cities on their features facilitating for older individuals’ quality of life (Van Hoof et al., 2021). Besides, Dutch policy makers have yet to acknowledge the demographic shift and what desires in spatial changes this causes.

The lack in knowledge has negatively impacted the quality of life for

elderly in Dutch cities. Studies have shown that the experience of loneliness and social isolation among elderly is partly related to the physical characteristics of the living environment (Kemperman et al., 2019). Additionally, Demirkan (2007) reports elderly are more successful in carrying out daily activities when the relationship with their surrounding community is of better quality, indicating they can maintain their independence. Thus, these studies suggest the urban environment plays a central role in the quality of life and well-being of older residents, and disregard of its importance could negatively affect an older individual’s social inclusion.

Aside from the influence of public spaces on elderly, it also extends to individual homes. Wang & Durst (2022) discussed how decreasing incomes and health conditions are arising challenges as people retire around the age of 65. Naturally, with these new challenges elderly have certain needs in and around their home, like access to healthcare facilities or adaptable homes when disabilities appear (Smets A. J. H., 2011). These needs and changes in later life influence older adults to look for a dwelling that is more suitable for maintaining their freedom. However,

the Dutch housing market supply is currently not offering enough dwellings that suit their needs, creating bottlenecks for younger generations in an already imbalanced housing market (Boelhouwer & van der Heijden, 2022).

A possible cause of these problems is the lack of age-friendly communities which understand the needs of elderly, so they can grow old while actively taking part in the community and a good quality of life is supported by the structures and services of such a community. Furthermore, the limited availability of senior housing also affects the independence older individuals have as they age. Addressing the gap of spatial implications and tools for designers, policymakers, urban planners, and residents on how to get elderly to thrive in the urban environment is a critical step to make. Therefore, acknowledging the impact of urban environments, and housing in particular, on the lives of older adults could positively impact the quality of life of elderly in cities.

1.3 Project aim

This graduation project explores the nexus between the elderly, quality of life, the urban environment, and the stagnating housing market. The aim is to develop a strategy for an age-friendly community in a Dutch city, acknowledging all urban environment features, such as housing needs and desires of elderly, and recognizing the heterogeneity of the older population. This way, a case study area in the Netherlands will be holistically redesigned supporting older individuals, ensuring a high quality of life.

The desired outcome of this graduation project is an urban design and spatial strategy addressing age-friendliness based on a transferable pattern language. The pattern language will be assessed in a case study area in the Netherlands, where age-friendly implications are designed.

The aim has led to the following research question:

“How could age-friendly spatial planning and strategy in Dutch cities support active and healthy ageing for elderly and contribute to a more balanced housing market?”

02

Theory

This chapter explores the demographic shift of a rapidly greying population and what struggles older individuals are facing. Age-friendly cities and senior living frameworks are explored to understand how they work and what effects they have. This chapter provides the theoretical framework as a foundation for this project.



2.1 An ageing population

The Netherlands experiences a significant demographic shift, characterized by a vastly ageing population. As of early 2024, the number of elderly individuals aged 65 and older has increased to 3,677,288, accounting for 20.5 percent of the total population (CBS, n.d.-a). Projections by Centraal Bureau voor de Statistiek (2022) indicate that by 2040 the elderly population in the Netherlands will rise to 4.8 million individuals, representing over a quarter of the national demographic, a substantial majority.

Figure 2 illustrates the shift in the percentage of elderly populations across municipalities from 2007 to 2024. In 2007, the majority of municipalities reported elderly populations between 12 percent and 17 percent, with only a small number exceeding 20 percent. However, by 2024, this distribution significantly changed. The majority of municipalities now exhibit elderly populations ranging from 17 to 27 percent, with some municipalities surpassing this percentage and elderly constitute the majority of the local population. Conversely, municipalities with a share of elderly below 12% have become a minority. Geographically, there is a notable

variation in the distribution of elderly populations. Municipalities in the northern, eastern, and southern regions show higher percentages of elderly inhabitants, with many reporting shares of 22 to 27 percent or more. In contrast, the central and western regions continue to have lower percentages of elderly. These regions with municipalities like Amsterdam, Rotterdam, The Hague and Utrecht are part of the Randstad area and remain more attractive to younger generations, which likely contributes to the lower share of elderly in this area.

In the context of this ageing population, it is crucial to not only consider the relative percentages but also the absolute numbers when analysing the distribution of older adults across the country.

For instance, Noord-Beveland, a municipality located in the southern part of the Netherlands in the province of Zeeland, exhibits one of the highest percentages of elderly in the country, at 30.4 percent (CBS, n.d.-b). However, this percentage translates to a relatively small number, with a mere 2,382 inhabitants over the age of 65. In contrast, Utrecht, a larger city in the middle the Netherlands, has a significantly lower share of elderly (10.7%) but a much larger absolute population, totalling 41,166 older inhabitants (CBS, n.d.-b). These examples emphasize the importance of considering both the amount and share of older adults, as well as the size and density of municipalities, when examining demographic trends.

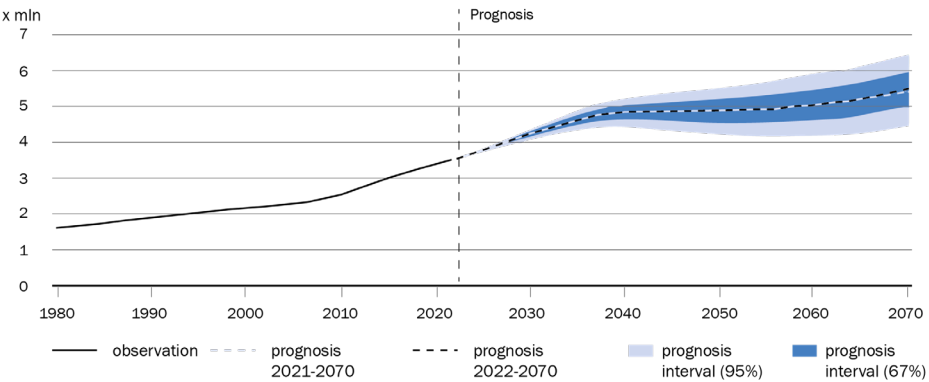


Figure 1. Population on January 1st, aged 65 and older. (CBS, 2022)

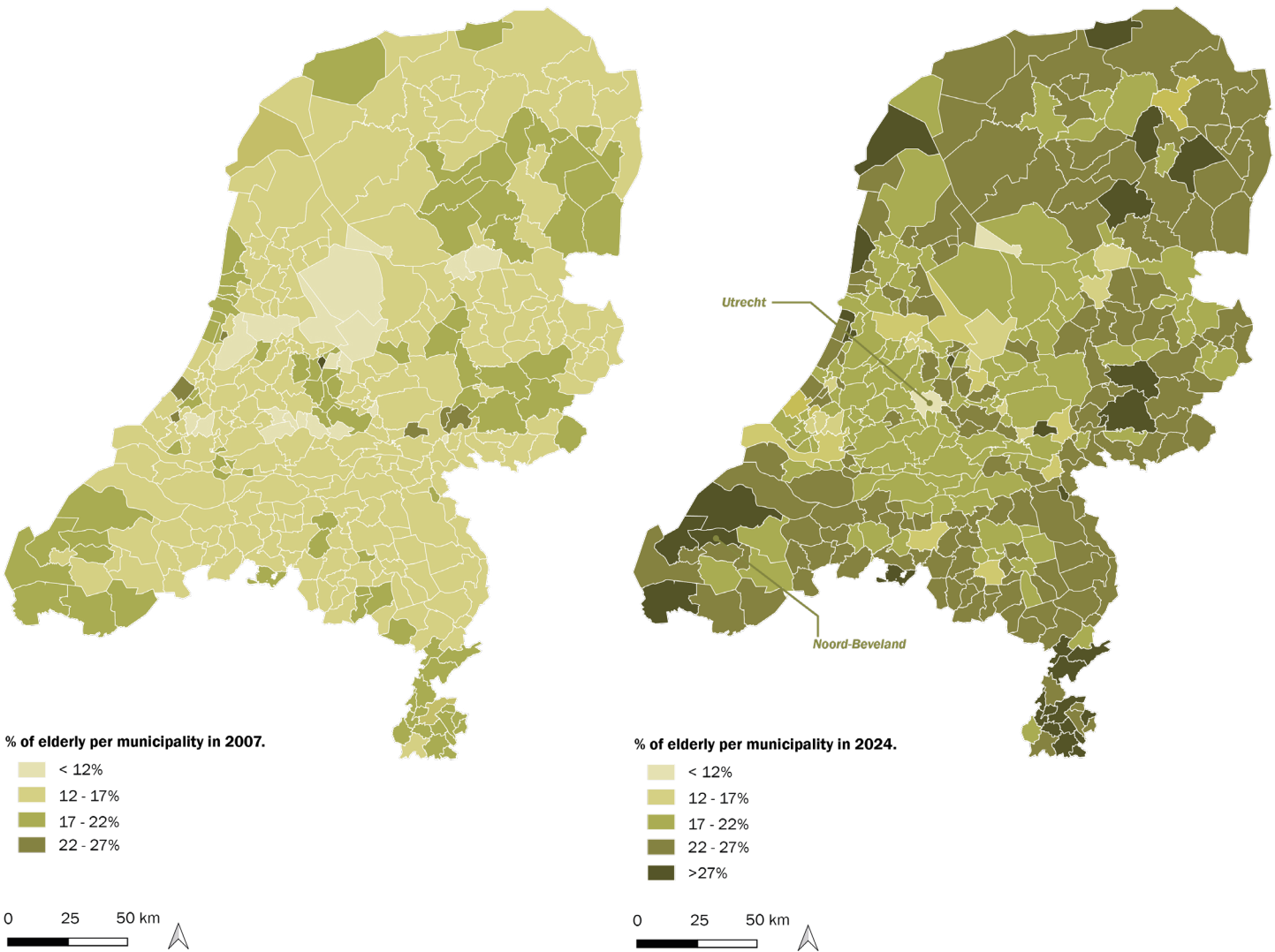


Figure 2. Percentage of elderly per municipality in 2007 (left) and 2024 (right). (based on: Smets, 2012)

Biological ageing

Ageing is an inevitable process affecting everybody. The development of human life changes in physical, mental, and social conditions over time (Salmistu & Kotval, 2023). These changes involve both gains and losses, and it is the decline of abilities in later life that is often associated with ageing (Grey et al., 2023). Biologically, individuals around the age of 60 are likely to start experiencing changes in physical, cognitive, and psychological functioning. This marks the departure of stability in early and middle adulthood, with the first signs of disability emerging, such as a loss of hearing, vision, and mobility (Demirkan, 2007). In addition to physical changes, older people also face social and economic transitions. Social transitions can include the loss of close friends or spouses, while economic shifts occur as individuals reach the retirement age, which currently is the age of 67 (Rijksoverheid, 2019), and move from active employment to a pension-based income. Like marriage or children this is, drastic while inevitable, a big ‘life event’ in someone’s life. For older people, reaching this ‘life event’ and stage of decline can contribute

to experiencing challenges (Renes & Jókövi, 2008). One significant challenge that older adults may face due to the physical, social, and economic changes is loneliness and social exclusion, which can have profound effects on their well being (Salmistu & Kotval, 2023). In 2022, nearly half of the individuals aged 65 to 74 reported feeling lonely, and this frequency increases with age (Volksgezondheid en Zorg, 2024). Given this, it is crucial to focus on this older demographic struggling with challenges to mitigate the potential negative effects on their quality of life in later years.

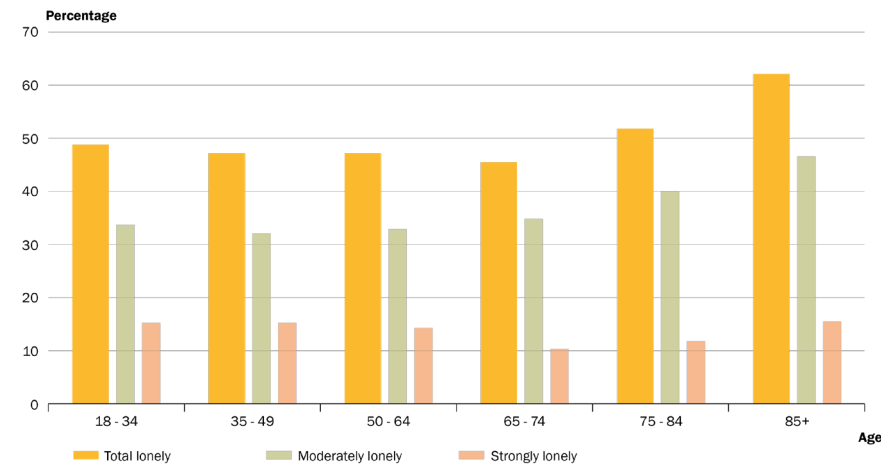


Figure 3. Loneliness to age (based on: Volksgezondheid en Zorg, 2024)

Heterogeneity

In the previous section the biological process of ageing suggests a homogeneous experience of different stages of life. However, it is important to recognise that older adults are, like younger generations, not homogeneous (Salmistu & Kotval, 2023). Not all individuals experience a physical, cognitive, or psychological decline of functioning as they enter the stage of older age. While biological ageing may be associated with a decline in certain functions, this process is not universally experienced (Green, 2013). As illustrated in figure 4, this stage of life represents a phase at which the range of functional capacity diverges. Consequently, the line may intersect with the disability threshold, but this does not apply uniformly to all older individuals.

The experience of ageing is highly context-dependent, varying greatly across different social, cultural, political, and economic environments (Salmistu & Kotval, 2023). For instance, the lifestyle and living arrangements of older individuals in Asian countries often differ from those in Western European countries, reflecting the cultural and political differences. Key variables that shape these environments include

culture and lifestyle, infrastructure, policy and regulation, and economic prosperity (ARUP, 2019).

These diverse factors highlight the complexity of ageing and emphasize the even greater complexity of the context-dependency, demonstrating there can never be a single, global solution when addressing the needs of the elderly population in any context.

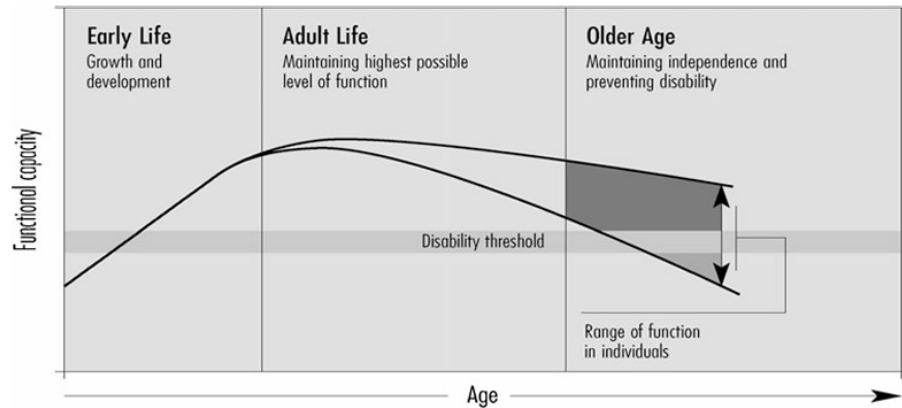


Figure 4. Life-course approach (Green, 2013)

2.2 The Dutch Housing Market

This section introduces the issues in the Dutch housing market, explaining how demographic changes impact the preferences of the housing supply. Then solutions are explored in relocating elderly to start a rehousing chain.

The Netherlands is currently facing a significant housing crisis, characterized by a range of interconnected issues (Boelhouwer & Van Der Heijden, 2022). Among these, the housing shortage is a key concern, alongside the lack of accessible senior housing options. The latter has been intensified by the rapid increase in the elderly population, because as the population is ageing this continues to drive up the demand for senior housing in the Netherlands (Smets, 2012).

A demographic change is a major driver in the dynamics of the housing market. As mentioned, individuals progress through various stages of life and will encounter big ‘life events’ such as marriage, divorce, or the birth of children (Renes & Jókövi, 2008). These events trigger changes in the desires for housing and lifestyle, often accompanied by seeking a bigger home. Nevertheless, older adults seeking smaller homes,

as they reach the retirement age and their household size decreases, happens less frequently compared to younger generations (Renes & Jókövi, 2008). This is partly due to a mismatch between available housing options and the changing needs of seniors, creating a quantitative and qualitative problem for the older generation and hindering the flow in the housing market (Boelhouwer & Van Der Heijden, 2022).

This flow, or in Dutch ‘*doorstroming*’, refers to the movement of households from one dwelling to another, thereby freeing up housing for others. An efficient flow is not seen as a solution, but as an intermediate goal to a well-functioning housing market (Renes & Jókövi, 2008). Nonetheless, improving the flow by moving individuals at the end of the chain, opens up options for younger generations and is a step towards fixing the complex challenges faced by multiple demographic groups.



Figure 5. Rehousing chain (own image)

As mentioned, building housing, specifically for seniors, can start a flow in the housing market. A senior household moving to a new residence often triggers a long re-housing chain, which can help lessen the shortage of single-family homes for both starters and low-income groups. This strategy allows for more efficient use of the existing housing stock and the creation of opportunities for younger generations to enter the housing market (Smets, 2012). Although the idea of older adults moving to smaller homes could potentially ease the flow of the housing market in the Netherlands, there are numerous reasons why this approach is not effective.

The first reason is the current role of the government in the functioning of the housing market. The Dutch government's focus is on enabling older adults to remain in their homes for as long as possible, rather than pushing them to institutional care or nursing homes (Forsyth et al., 2019). The government has increasingly adopted a facilitating role, aiming for extramural living (Boelhouwer & Van Der Heijden, 2022). This approach supports ageing in place, which is the second reason, by providing the necessary policies and services that allow elderly to live independently for

as long as possible. Ageing in place is the desire to stay in the current home as older adults grow older (Forsyth et al., 2019). Place can be understood as a milieu including human activity from people and the physical environment and program (Grey et al., 2023). With this definition, ageing in place can be identified as older individuals maintaining their independence in not only their own home, but also the extended environment outside of the dwelling. Even as physical or health limitations arise, many seniors are less inclined to leave familiar surroundings, especially when these surroundings are integrated with a social network and daily services that make living at home possible (Forsyth et al., 2019). For many, downsizing to smaller homes is not seen as a solution, but rather a reduction in their independence and freedom. Additionally, older individuals are often reluctant to move if it means losing proximity to their social network like family and friends (Smets, 2012). Lastly, the housing market is influenced by policies that increase the stagnation. The Dutch housing market is currently plagued by a mismatch between supply and demand, with the government's spatial planning policies contributing

to an inelastic housing supply (Boelhouwer & Hoekstra, 2009). A low supply elasticity means the value of the existing housing stock determines the value of new houses. A rising demand in housing leads to increasing prices and growing shortages, whereas it would lead to a push in the supply in elastic markets. Inelastic markets are often found in countries with strict spatial planning policies (Boelhouwer & Hoekstra, 2009). Part of this strictness can be explained by the nations' cluster policy, necessary because of the limited amount of land (Smets, 2012). This policy focuses on housing development to take place in urban areas, densifying the existing area rather than giving land to developing rural areas. As Boelhouwer & Hoekstra (2009) acknowledge the value of a spatial planning policy and cluster policy in a country like the Netherlands, they affirm that the organisation of the policies adds to the mismatch in the housing market.

In conclusion, while moving to smaller homes may seem like a potential solution to ease housing market pressure, it overlooks issues within the housing market and the Dutch government's role and policy emphasis on ageing in place. As long as government policies support

older adults living at home and the housing market remains constrained by policies, the idea of downsizing will not effectively address the housing flow challenges. This emphasizes the crucial importance of addressing the needs of the elderly and anticipating both the current and future challenges in the housing market.

2.3 Senior living concepts

There have been initiatives aimed at improving the quality of life for seniors, particularly in the context of housing, health, and social integration. These initiatives are driven by the recognition that elderly individuals require specific attention in urban planning and community development. Senior living initiatives can take various forms, ranging from shared living housing communities to an age-restricted city design. This section explores a variety of initiatives focused on senior living, classified into several categories. Each initiative will be examined in terms of its objective, living typologies, and the impact on the health of senior citizens. By understanding these initiatives, they become more clear on how they contribute to fostering environments that support ageing populations.



Figure 6. World map of senior living examples. (own image)

The Sun City, USA

The Sun City, Arizona, is an example of an age-restricted community the size of a town. This planned community specifically designed for older adults was developed in 1960 by Del E. Web. The community caters to adults aged 55 and older, and restricts children aged under nineteen from a permanent residence (Trolander, 2011).

The town-sized community consists mostly of single-family homes, with amenities such as a swimming pool, recreational centres, and golf-courses. The developers vision for including these amenities was to create a new way of retiring by providing active living.

The remote location of Sun City in the Arizona desert presents both positives and negatives. On one hand, the low land prices were a significant advantage during the development. However, creating a senior-only city in this location isolates older adults from other generations (Trolander, 2011). In Sun City, residents collectively agreed on the restriction of under-aged citizens from taking permanent residence, only allowing short visits. While, for most residents this was the appeal, it also results in a homogeneous and non-diverse community.

All homes are freestanding single-family houses, and were relatively affordable in that period of development. While in the United States land scarcity is no problem, the spatial requirements of such a city in other countries, such as the Netherlands, would conflict with spatial planning and clustering policies, since land is limited (Smets, 2012).

Despite these weaknesses, the amenities provided by the developer promote active ageing, even in later years of life.

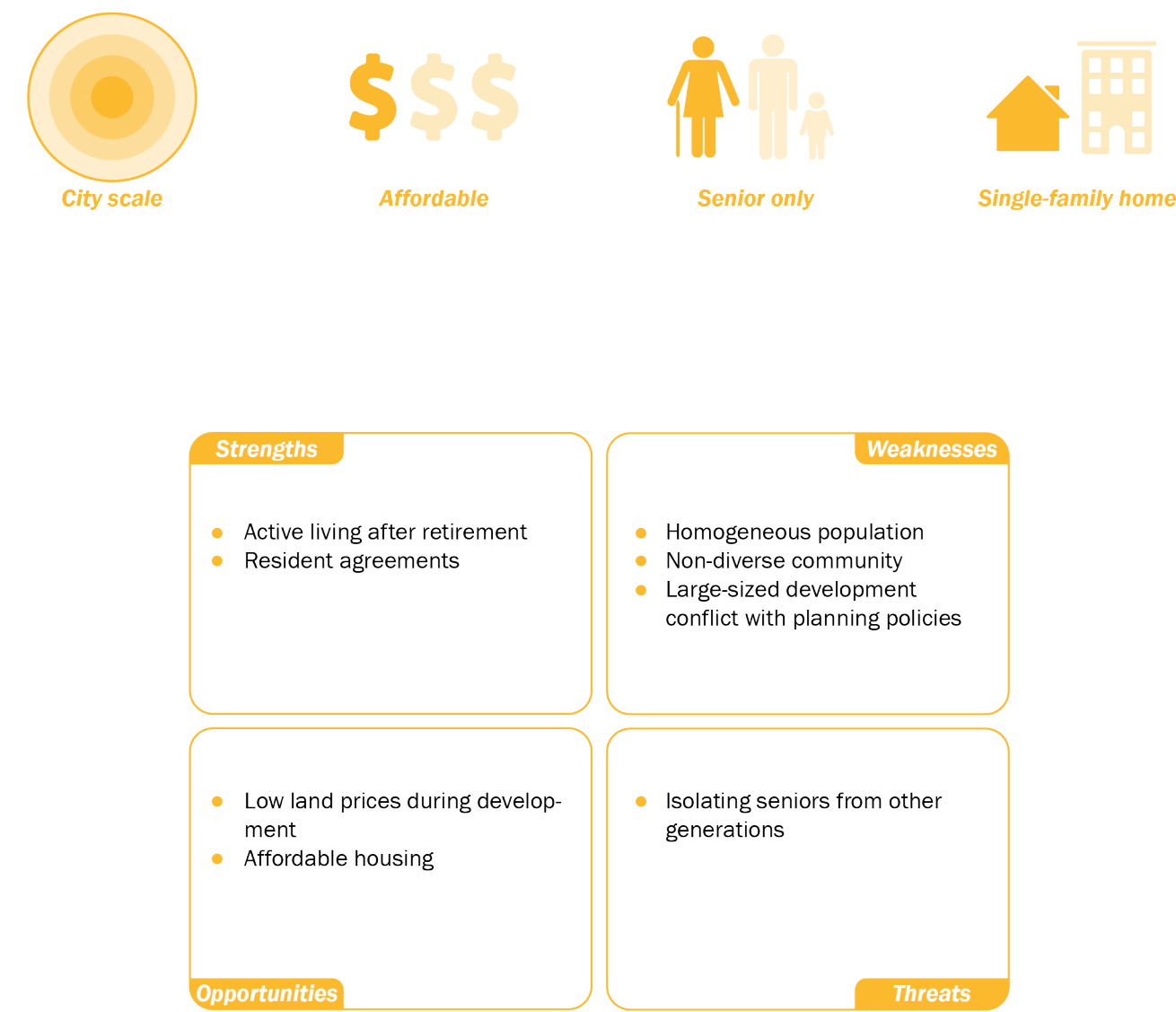


Figure 7. SWOT-analysis Sun City (own image)

Knarrenhof, The Netherlands

A ‘knarrenhof’ is a housing concept designed specifically for older adults, focusing on a social support system between the residents. A knar meaning an old person and hof translating to courtyard in English, this concept consists of several houses arranged around a communal courtyard (Nijkamp & Bosker, 2020). The first Knarrenhof, called Aahof, was established in 2018 in Zwolle, the Netherlands.

One defining strength of the Knarrenhof concept lies in its emphasis on social support, as all residents of a Knarrenhof commit to mutual support, thereby enhancing social connectivity within the community (Nijkamp & Bosker, 2020). By leveraging the social networks of its resident, independent living for as long as possible is promoted, aligning with Dutch governmental policies favouring extramuralization and ageing in place, while minimizing older individuals to rely on professional care.

A knarrenhof aims to accommodate diverse groups by offering a mix of owner-occupied and rental housing, ensuring accessibility for both affluent and less affluent seniors. However, one notable weakness

is the high cost of land in the most suitable locations for developing a Knarrenhof (Nijkamp & Bosker, 2020). The middle of a city is the most suitable location, due to its proximity to amenities, facilities, and public transport. Nevertheless, the appeal of the location does obstruct the possibility to mix both cheap and expensive housing with the high land prices.

Another weakness is the involvement of municipal departments during the process. As the Knarrenhof is initiated by a foundation, representatives have struggled to navigate the contacts with the municipality (Nijkamp & Bosker, 2020). This can result in a long development timeline if a new Knarrenhof is realized. Although, this obstacle could be avoided

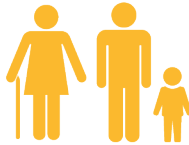
in municipalities that prioritize innovative senior living concepts like a Knarrenhof.



Block



Mixed income



Mixed residents



Single-family home

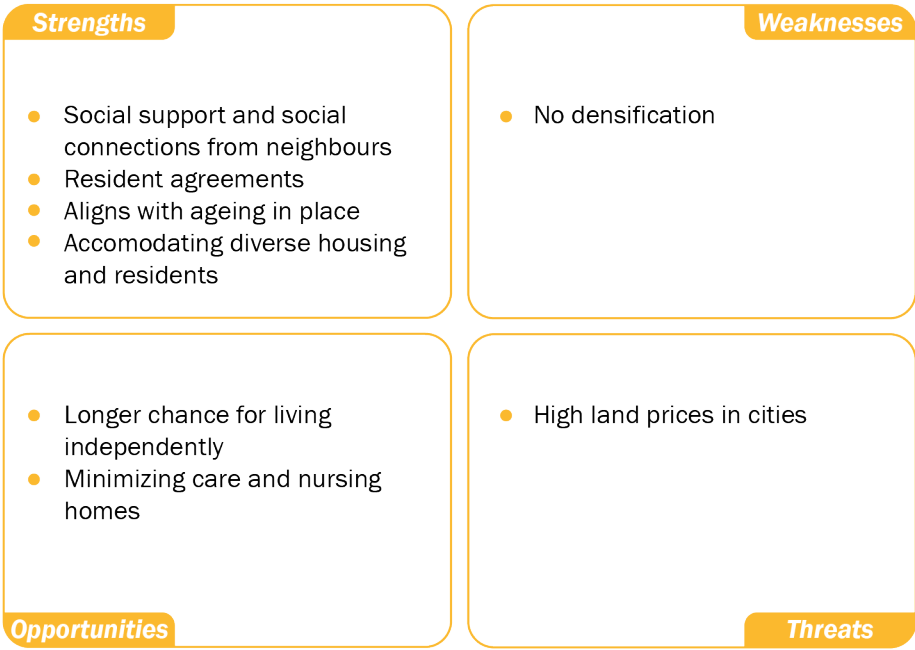


Figure 8. SWOT-analysis Knarrenhof (own image)

Duo-living, The Netherlands

Duo-wonen is a housing concept designed to enable the sharing of certain facilities within a dwelling while maintain residents' independence. In response to changing populations and societal needs, this model aligns with the dual demands for individualization and collectivization (Drieënhuizen, 1998).

The concept requires at least two private rooms, which can function as solely a bedrooms or combined bed/ living room. Shared rooms, such as the kitchen, bathroom, and balcony, are ideally accessible through common areas, allowing residents to establish their own agreements regarding the use of these rooms (Drieënhuizen, 1998).

Another strength is this form of living offering both safety and support for older residents, while preserving independence and privacy. This aligns with the Dutch government reducing reliance on healthcare and promoting ageing in place.

However, a weakness is the feasibility of implementing this housing model in certain contexts. For example, the renovation of older buildings may impose structural constraints that make this type of shared floorplan impractical (Drieënhuizen, 1998).



Figure 9. SWOT-analysis Duo-wonen (own image)

Lifetime neighbourhoods, UK

Lifetime neighbourhoods is a UK framework which emphasizes on creating communities that support older residents in their quality of life, where independence and a strong connection to the neighbourhood is prioritized. The framework consist of a six main components: supporting residents to develop lifetime neighbourhoods, access, services and amenities, built and natural environments, social networks/well-being, and housing. Overarching these components is the principle of resident empowerment (Bevan & Kroucher, 2011).

This framework has limited capacity for systematic assessment. The components provided to achieve a lifetime neighbourhood are non-prescriptive, remaining as broad goals, which can make transferability and implementation in other areas challenging. Neighbourhood planning under this framework often emphasizes resident engagement over service provision or physical design of the neighbourhood. While this focus on engagement can be a strength, it also poses a risk if engagement efforts fail to yield meaningful outcomes (Bevan & Kroucher, 2011).

The foundation of the framework

lies in resident empowerment, prioritizing both formal and informal relationships, participation, and inclusion, thereby strengthening the social environment like set in WHO’s Age-Friendly City framework and operating through a bottom-up governance approach (Buffel et al., 2012). Other frameworks like this exist, such as the Manchester Valuing Older People framework in the United Kingdom, the AdvantAge framework in the United States of America, Healthy Ageing framework in Canada, and the Positive Ageing framework in New Zealand (Salmistu & Kotval, 2023).



Figure 10. SWOT-analysis Lifetime neighbourhood (own image)

NORCs, USA
A Naturally Occurring Retirement Community (NORC) refers to a community that was not initially designed for older adults but has naturally evolved to house a significant proportion of senior residents, due to migration patterns. In the 1980's this concept was introduced as a model to ageing in place with supporting collaborative care for older adults (E et al., 2022).

A NORC includes both supportive services as well as safety and close proximity to age peers. The concentration of older individuals within a close area enables effective delivery of services and promotes both formal and informal cooperation (E et al., 2022). However, the concept has some weaknesses. While the general definition of a NORC is widely accepted, details such as what constitutes a significant proportion of senior residents or the minimum age for being considered an older adult remain inconsistent across various studies. Additionally, as the term suggests, NORCs evolve naturally over time, making it uncertain how long this process takes or at what point a community can be considered a NORC, posing challenges for planning support structures (E et al.,



Figure 11. SWOT-analysis NORCs (own image)

Humanitas Housing, The Netherlands

The model created by Humanitas Housing in the Netherlands focuses on housing where care services can be increased as residents' needs evolve. In general, this model consists of apartment buildings with 100 to 250 units and includes shared amenities and services open to both the residents and the public (Forsyth et al., 2019).

The Humanitas Housing model integrates amenities and services for residents and the public, enabling independent living while fostering connections to the broader community. Although all units are designed with accessible for older adults in mind, and thus creating a bit of segregation, the inclusion of public amenities, like a restaurant, help maintain a connection to other generations (Forsyth et al., 2019). Residents can age in place seamlessly, as care services can be accommodated to meet the changing needs without having to relocate. Another strength is compensating the nursing staff and volunteers involved in the model for their contribution. The provided healthcare facilities in the apartment building, including a general practitioner, psychologist, personal or nursing care, dietician and other, are located on the

ground floor as part of the street-level environment, extending to the community (Forsyth et al., 2019).

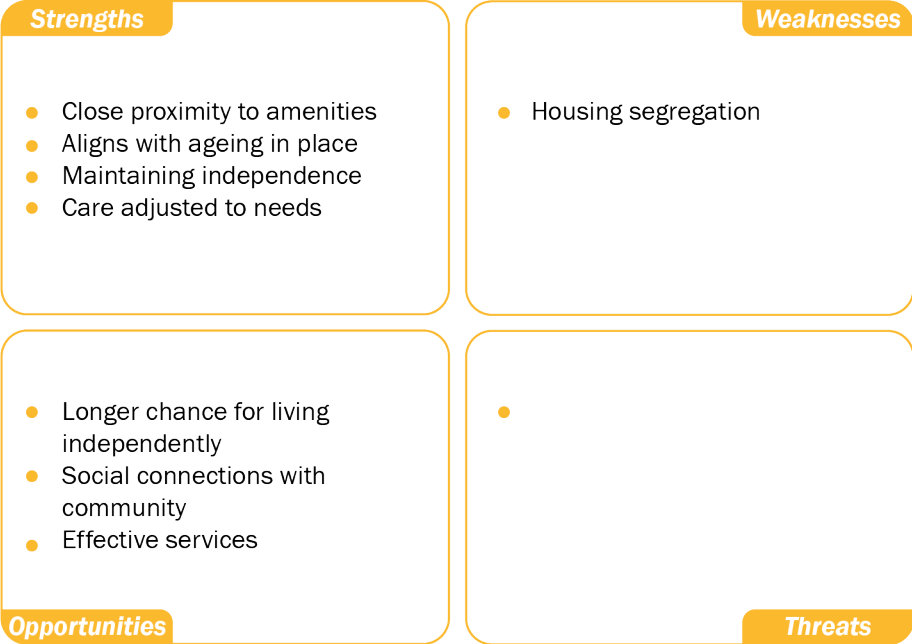


Figure 12. SWOT-analysis Humanitas Housing (own image)

2.4 Age-Friendly City concept

Ageing in cities

The growth in both the size and share of the elderly population has a profound impact on social systems, with the effects being most acutely felt in urban areas (Wang & Durst, 2023). For the reason that cities are often home to a great amount of older inhabitants, yet urban environments are not designed with this demographic in mind, but prioritize the younger, working-age generation (ARUP, 2019).

This discrepancy between the population and the environment is what affects the quality of life for older individuals. Since one of the key factors contributing to the well being of older individuals is their home and direct surroundings, as these have been identified as fundamental factors for fostering a positive quality of life (Demirkan, 2007).

Several countries have already made noteworthy advances in addressing the needs of elderly in cities by developing and implementing solutions aimed at enhancing their quality of life.

One example of a city addressing the challenges of an ageing population is Toyama, Japan. In 2007, the city faced a demographic crisis, when it became one of the world's fastest ageing society. Toyama

encountered a range of challenges, such as environmental, societal, and economic issues. In response, Toyama's leaders decided to take a pro-active approach in solving these issues. As a result, the city has created a safe, healthy, and comfortable environment with socio-economic benefits that support elderly in healthy ageing. These results have laid the foundation for plans to make Toyama a climate-resilient city (Roberts, 2021)

In contrast, the Netherlands has made limited progress in making advances toward developing for elderly. Van Hoof et al (2019) did a study assessing how certain city features of The Hague and Zoetermeer were either facilitating or impeding older individuals in their daily lives. Aside from smaller scale initiatives set up by communities themselves (explained in chapter 2.3), this study is one of few evaluating the demographic trend in regards to the urban environment. And thus, the overarching issue is the limited knowledge in the Netherlands, which hinders the development and implementation of strong urban structures and senior housing which respond to the needs of an ageing population.

Age-friendly city framework

The demographic shift toward an ageing population has become a significant driver for international organisations in seeking solutions to ensure the inclusion and well being of older residents (Khoddam et al., 2020). This growing interest developed in the World Health Organization (WHO) launching "Global Age-Friendly City: A guide" in 2007, aimed at promoting active ageing and engaging cities in the needs of elderly (WHO, 2007).

The Age-Friendly City framework sets forth a set of guidelines designed to help cities evaluate their age-friendliness. In the guide an age-friendly city (AFC) is defined by the WHO (2007) as a city enhancing the quality of life of ageing people through adjusting its structures and services, so the city is accessible to and inclusive of all elderly, as they maintain healthy, active and secure.

The primary goal of the WHO was to assist cities in becoming more age-friendly by providing an universal framework. The guide is set as a tool for individuals or groups to self-assess the age-friendliness of their city and to track the progress made over time. Importantly, the checklist included in the guide is not a

technical guideline or specific design implications. Instead, the features in the checklist serve as criteria to help with the evaluation (WHO, 2007).

A total of 33 cities contributed to the development of the guide, representing a diverse range of geographical contexts and city sizes. In all participating cities, older people were the primary source of information, ensuring a bottom-up participatory approach (WHO, 2007). Additionally, cities included focus groups with service providers from different sectors to complement the advantages and barriers of ageing in urban environments described by the older participants.

Domains

The focus groups were asked to express their opinion on the city's age-friendliness according to eight topics. The eight central domains identified by the WHO are outdoor spaces and buildings, transportation, housing, social participation, respect and social inclusion, civic participation, communication and information, and community support and health services. These domains represent key areas that shape the overall experience of age-friendliness within urban environments, as can be seen in figure 13 (WHO, 2007).

Outdoor spaces and buildings.

The first domain focuses on the outside environment and public buildings, of which the impact on older adult's independence, quality of life and ability to age in place is significant. The focus groups mentioned the overall design of outside spaces as well as public buildings to influence the accessibility and safety. An age-friendly city considers features in the design, such as the type of pavement or adding ramps and elevators to buildings, that support the mobility for elderly.

Transportation.

Similarly, transportation, which encompasses not only the availability and affordability of public transport, but also its safety and frequency, is closely tied to supporting active ageing. In this domain older adults discussed every aspect of infrastructure, services, and equipment. For instance, accessible platforms in stations allow older adults to use public transport where drivers are courteous and priority seating is available.

Housing.
The housing domain is related to safety and well-being of older individuals. Safe, affordable, and adaptable housing that accommodates changing physical needs, allows for the possibility of modifications, and is in close proximity to services supports independence. Furthermore, an age-friendly city has a diverse range of housing options connected to the community.

Social participation.
Engagement in social, cultural, and leisure activities is integral to the health and wellbeing of older adults. Opportunities for participation help maintain social connections, foster intergenerational interactions, and combat isolation. Accessibility and affordability of these activities are crucial to ensuring inclusivity and community integration.

Respect and social inclusion.
Older people often experience mixed attitudes toward them, ranging from respect and inclusion to neglect and ageism (WHO, 2007). These conflicting experiences are influenced by societal norms, generational gaps, and a lack of understanding of ageing. Addressing these issues involves promoting respect and

fostering inclusive communities that value older individuals' contributions.
Civic participation.
Older adults continue to contribute to their communities, whether through voluntary or paid work. Age-friendly cities support these contributions by offering flexible employment options and encouraging political participation. Valuing the roles of older individuals in community life is essential for maintaining older individuals' sense of purpose.

Communication and information.
Access to timely, relevant information is essential for active ageing and for older adults to stay informed about events, services, and opportunities. Ensuring widespread, accessible, and well-designed communication channels helps older adults stay connected and informed.

Community support and health services.
Accessible and affordable health and social services are fundamental to supporting the health and independence of older adults. As costs for health care are increasing, basic support for health and income and the cost of care are highly desired. Focus group participants also emphasized the importance of

high-quality care that is tailored to their needs, including home care and residential facilities for those unable to live independently.

The eight domains explored in the Age-Friendly City framework are deeply interconnected, with each area influencing and shaping the others in various ways. Housing is directly related to the need for community support and health services. The affordability and accessibility of housing with high-quality health care available influences an individual's ability to live independently, particularly as the reliance on healthcare tends to increase with age. Respect and social inclusion are closely linked to the accessibility of outdoor spaces and buildings, as well as the variety of opportunities for older adults to engage in social and civic participation. Social participation itself fosters social inclusion as well as enhancing access to information. When older individuals are actively engaged in community activities, they are more likely to be informed about available services and events. Additionally, civic and social participation also depend on the accessibility of outdoor spaces and public buildings. When these spaces are designed

with age-friendly features they encourage participation. Lastly, transportation and communication and information connect to all domains. Good transportation systems ensure that older adults can reach social and civic opportunities, while information allows them to stay informed about these opportunities.

Together, these eight domains outline the complexity that shapes the experience of ageing in cities. An age-friendly city must prioritize these aspects to enhance the quality of life for older adults in the city. Although the WHO's framework primarily addresses the elderly, it is important to note that age-friendly cities are inclusive of all ages, benefitting not only older individuals but people of all ages. As Buffel et al. (2012) argue the name calls to 'friendly for all ages', and not just 'elder-friendly'. Because age-friendly cities serve people at every stage of life, since ageing is an inevitable, lifelong process (Khoddam et al., 2020). Therefore, the ability to age within an inclusive, supportive environment should not be considered a privilege, but a fundamental requirement for ensuring quality of life.

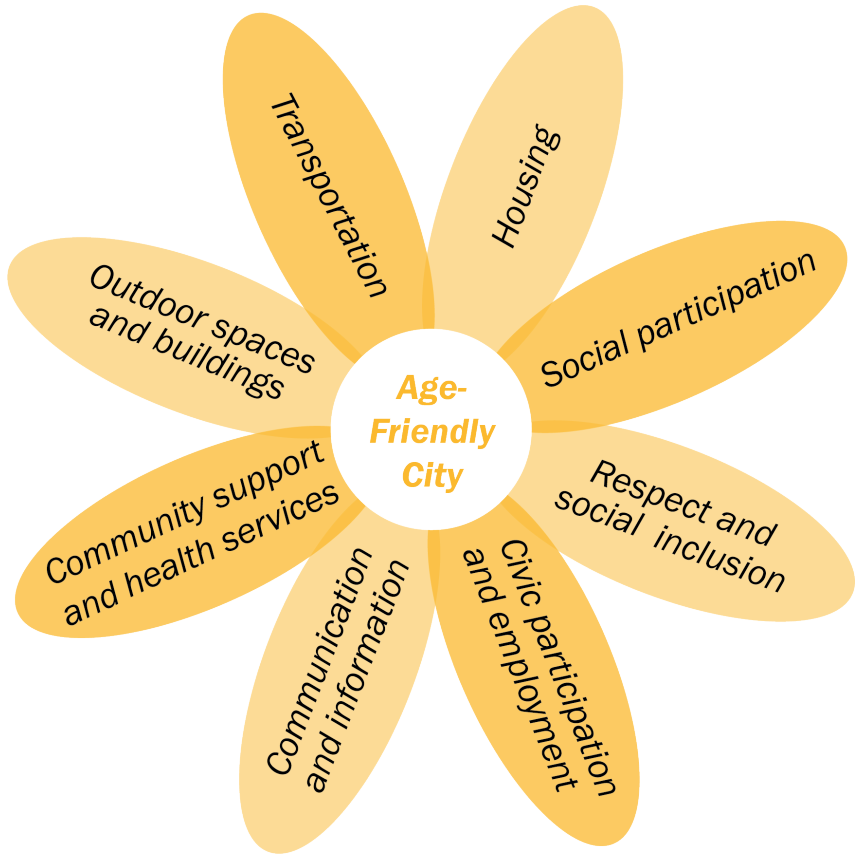


Figure 13. Age-friendly city topic areas. (WHO, 2007)

2.5 Synthesis

Chapters 2.1 to 2.4 have explored several key topics, including the general concept of ageing, the shifting demographics within the Netherlands, challenges in the housing market, and age-friendly initiatives responding to ageing populations. This section synthesizes the insights gained, positioning the project for subsequent steps and its implementation within the case study location.

The Age-Friendly City framework outlined by the World Health Organization (WHO) provides a comprehensive overview how cities can understand age-friendliness and enhance the quality of life for elderly populations. However, to make the framework more practical and better aligned with the context-dependency of ageing, such as the housing market challenges in the Netherlands, this graduation thesis will position itself by slightly adjusting the framework. Firstly, by shifting the focus from entire cities to age-friendly communities. Salmistu and Kotval (2023) described an age-friendly community as “a place that provides a supportive environment that enables people to grow old with their families in neighbourhoods and actively take part in the community life” (p.2). This

community-level definition allows for interventions that are more responsive to the local needs of older residents, making the smaller scale not only more sustainable but also more responsive to specific needs of elderly.

Moreover, in this smaller scale framework, some domains need to be adjusted. Transportation, as the WHO defines it, primarily emphasizes on the accessibility and usability features of public transportation vehicles. However, broadening this domain to mobility allows for a more inclusive interpretation that encompasses walking, biking and the car. This title better reflects the heterogeneity of older adults and their mobility possibilities.

Secondly, the housing domain plays a particular role in this thesis, which explores the nexus between elderly, quality of life, the urban environment, and the stagnating housing market. In previous sections the housing market and the struggles regarding elderly were already discussed. Therefore, housing in age-friendly communities does not promote relocation as a must for quality of life, but rather to facilitate and encourage more suitable options and services, so that a destabilising move is avoided.

Furthermore, these eight domains can be categorized into three clusters. Outdoor spaces and public buildings, mobility, and housing are all tangible elements in defining the physical structures of a community, thus forming the physical environment cluster. The second cluster, the social environment, reflects the social dynamics of a community, including the domains of social participation, social inclusion, and civic participation. Lastly, the final two domains, communication and information and health services, can be grouped into the municipal services as these domains are focused on coordinated systems (Salmistu & Kotval, 2023). As this project encompasses the field of urbanism, all three environments are essential. The physical environment is directly shaped through design, while the social environment reflects the outcomes of this design, fostering the sense of community. Municipal services, while facilitated by the design of the physical environment, are primarily social outputs.

Several challenges faced by elderly were discussed in the preceding sections of this chapter. To summarize, retirement can be seen as one of the big life events in one’s life, often characterized by a stage of decreased functional ability as crossing the disability threshold is a higher possibility. Additionally, the limited availability of public space and appropriate housing options that support the needs and lifestyles of older adults results in both quantitative and qualitative problems for elderly in the public and private spaces. These challenges are potential factors contributing to the increased percentage of elderly experiencing loneliness, affecting the quality of life for older people in later life.

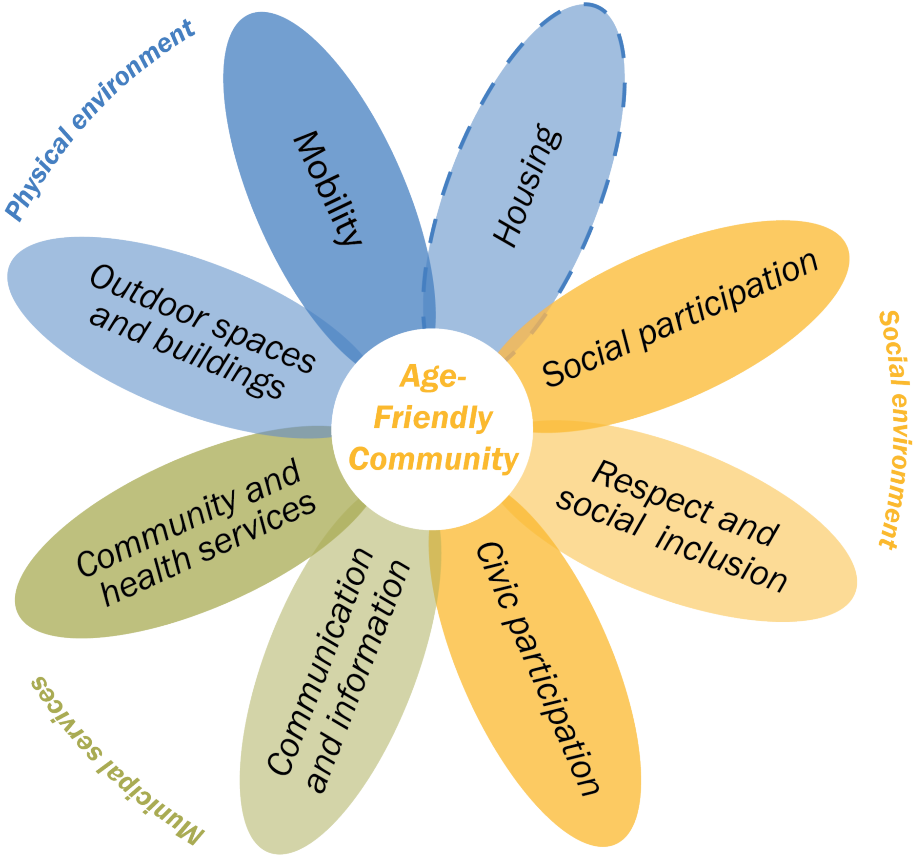


Figure 14. Age-friendly city clusters and domains (adapted from: WHO, 2007)

Quality of life, as defined by health studies, refers to the relationship between an individual's internal and external state (Cai et al., 2021). The internal state covers how an individual feels about themselves, while the external state extends to the relationships with others. Other studies identify four measures to summarize quality of life (Post, 2014). The first two measures are the physical health and mental health, capturing the presence or absence of diseases or levels of loneliness. Social health is the third measure, comprising the amount and quality of social contacts and interactions. Where the former two embody the internal state of an (older) individual, the latter represents the external state. The last measure, functional health, includes both the internal and external state. Functional health is about the physical activity such as mobility, and the social functioning, like carrying out daily activities and having social interactions (Post, 2014).

Building on this definition, a connection can be made to the Age-friendly framework of the WHO to examine how the built environment influences quality of life. In its framework on age-friendly city, the WHO references the term

active ageing multiple times. This term is particularly important to age-friendliness, as the WHO (2007) defines three key components of quality of life: health, security and maintaining an active lifestyle. Active ageing within an age-friendly city emphasizes that older individuals should have the opportunity to continue to participate in social, cultural, economic, and civic activities. It extends beyond employment or physical activity to encompass broader societal engagement (Buffel et al., 2012). Active ageing can be considered a key outcome of providing age-friendly communities, as it promotes social inclusion in the neighbourhood and allows for independence and a sense of safety. However, the term active and healthy ageing also entails another crucial component: health. In this context, health is not the absence of disease, but rather about individual's ability to maintain their lifestyle and functional ability over their life-course, even as they age (Salmistu & Kotval, 2023). Thus, promoting active and healthy ageing among elderly in age-friendly communities serves as an approach to enhance the quality of life for elderly.

This thesis focuses on the redesign of Dutch cities with age-friendly features. One city has been selected as a case study to assess the theoretical research and spatial implications for age-friendly communities. The findings from this study can serve as an example for other Dutch cities, allowing for an exploration of transferability. Apeldoorn has been chosen as the case study location. Since larger cities in de Randstad face other challenges, a site outside of this region was chosen. Apeldoorn, a big city in the Province of Gelderland, has a relatively high older population, approximately 21%, resulting in a dense and ageing demographic (AlleCijfers, 2016). Therefore, of the 15 biggest cities in the Netherlands, Apeldoorn has both a high percentage as a high absolute number, of which the importance was shown in section 2.1. To achieve the project's objectives, a case study area in Apeldoorn will be selected for the development of an age-friendly community.

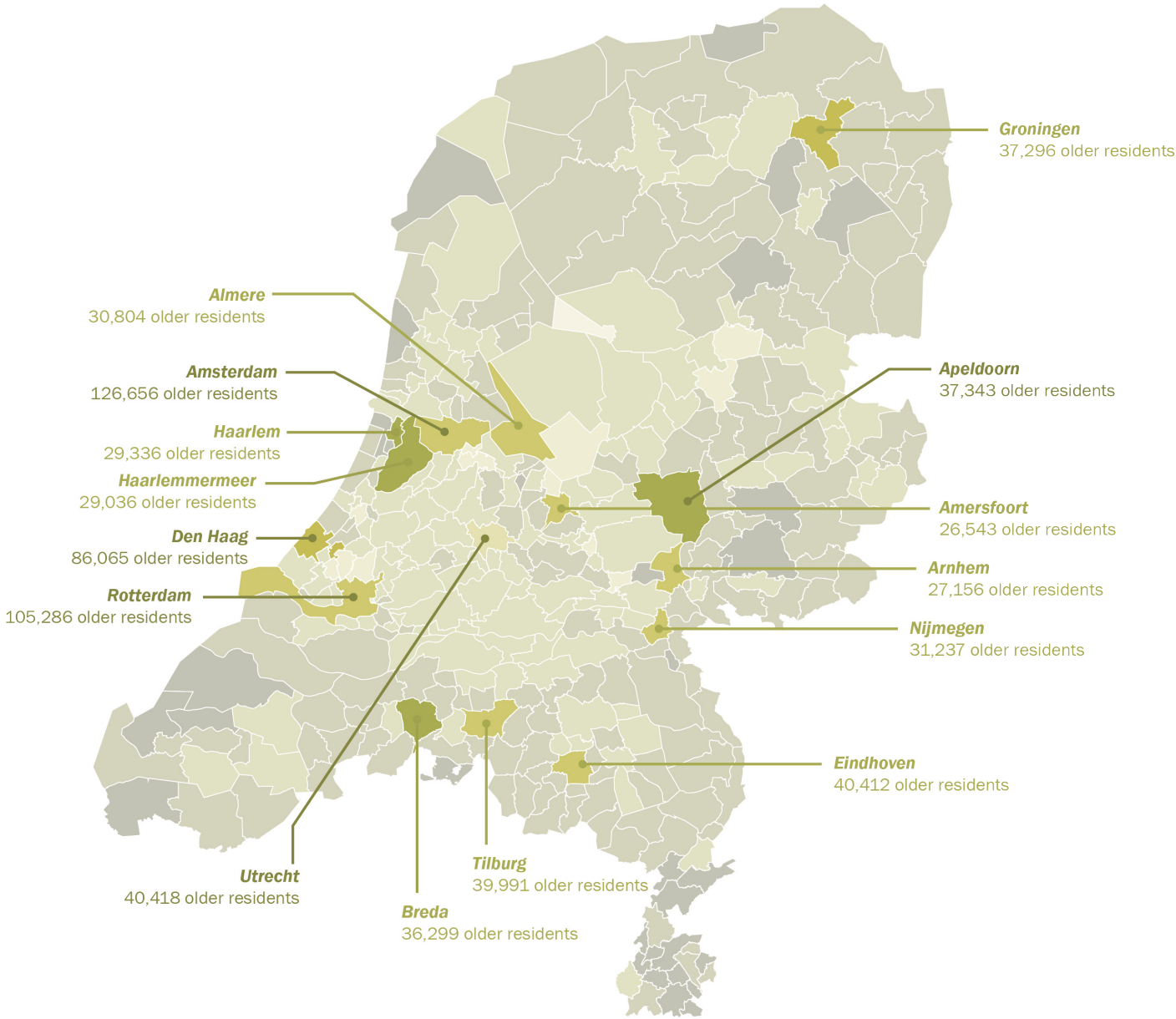


Figure 15. Biggest Dutch cities and their elderly demographic. (own image. adapted from: Smets, 2012)

03

Methodology

This chapter will introduce the main research question and sub-questions, explain the conceptual framework, and set out the methods used throughout the project.



3.1 Research questions

As previously mentioned in the introductory chapter, the main research question of this thesis is:

“How can age-friendly spatial planning and strategy in Dutch cities support active and healthy ageing for elderly and contribute to a more balanced housing market?”

To answer the main question, this research is structured around three key phases: 1) analysis, 2) identification, and 3) implementation. Each of these phases corresponds to specific sub-questions, breaking down the central issue into manageable components. These phases address the current barriers to achieving an age-friendly community, identify the practical implications of age-friendliness, and explore how these implications can be implemented and transferred to other cities.

Phase I Analysis

In this phase, an extensive analysis of the case study location is conducted to understand the current challenges and opportunities related to age-friendliness. The aim of this section of the analysis is to determine the neighbourhoods that will be the focus area for implementing the AFC. Subsequently, the structures at both city and neighbourhood scales are mapped, analysing each category and domain of the framework as discussed in the synthesis in chapter 2.4.

The physical environment is assessed through its three domains (outdoor spaces and public buildings, mobility, and housing), framing the spatial structures of both city and neighbourhoods. The social environment is analysed through the initiatives and locations offering social and civic participation and promote respect. Finally, the healthcare opportunities and policy documents are examined to understand the services and communication structures. By identifying these key structures and their challenges and opportunities for an age-friendly community, this phase defines the task and basis for the following phases.

Phase II Identification

The second phase focuses on identifying possibilities for creating an age-friendly community. A pattern language is developed based on theory about AFCs and the analysis of the case study location. This phase investigates how urban environments can support active and healthy ageing and reduce the imbalance of the housing market. The pattern language explores how spatial designs and social structures can contribute to age-friendliness.

Phase III Implementation

Finally, the phase of implementation tests the finished set of patterns by applying them in a scenario-based design for two neighbourhoods in Apeldoorn. This phase explains the strategy needed to apply the design to the neighbourhood and the aim is to illustrate how these patterns can be transferable to work together to foster an age-friendly environment.

Through chapters 4 to 6, the sub-questions are explored and answered. The main research question is answered in the conclusion and the discussion limitations to the project are argued.

Main research question:

“How can age-friendly spatial planning and strategy in Dutch cities support active and healthy ageing for elderly and contribute to a more balanced housing market?”

Subquestions:

- 1 *“How do the current physical, social, and municipal factors influence age-friendliness and the quality of life for elderly residents in Apeldoorn?”*
- 2 *“What are spatial and systemic patterns of age-friendliness related to urban planning and design?”*
- 3 *“What would the age-friendly community pattern language look like in Apeldoorn?”*
- 4 *“How can the pattern language and framework be transferable for other cities?”*

Figure 16. Research questions. (own image)

3.2 Conceptual framework

The conceptual framework (figure 17) illustrates how the eight domains work together to create an age-friendly community. The figure shows how the individual domains are grouped into three categories, and how these categories collectively define a community that supports active and healthy ageing for elderly and contributes to a more balanced housing market. In section 2.5, each category and its associated domains were discussed individually. This section will focus on how these categories and domains interact to form a cohesive whole, and how they influence the objectives of this thesis.

As depicted in the figure, each domain contributes, independently yet equally, to the central aim of an age-friendly community. The equal size of each slice signifies the equal importance of all domains; the absence of any one domain would result in an incomplete approach to achieving an AFC.

The enclosing layer groups the domains into three interrelated categories: the physical environment, the social environment, and municipal services. These categories collectively define the community context. Because the physical

environment encompasses all tangible characteristics that serve as a foundational setting enabling social and service-related functions. For instance, public buildings host the space for daily activities and medical workers to practice their healthcare service, thereby supporting both the social environment and community services. Additionally, the social environment refers to the intangible characteristics of a community and is closely linked with the community services. For example, participation and inclusion in the social life of a community requires accessible and communicated opportunities.

Together, these categories holistically create an environment that enables and encourages active and healthy ageing. As the physical environment promotes accessible mobility, diverse opportunities for participation in social and civic settings, and suitable housing where individuals can age. Additionally, this contributes to the flows in the housing market by enabling older adults to move out of unsuitable homes and choose a supportive dwelling. Furthermore, the social environment reduces loneliness and isolation, while the community services offer support as the care needs of

individuals change over time. In this way, the framework demonstrates how a collaborative and integrated approach between all eight domains is essential for creating age-friendly communities.

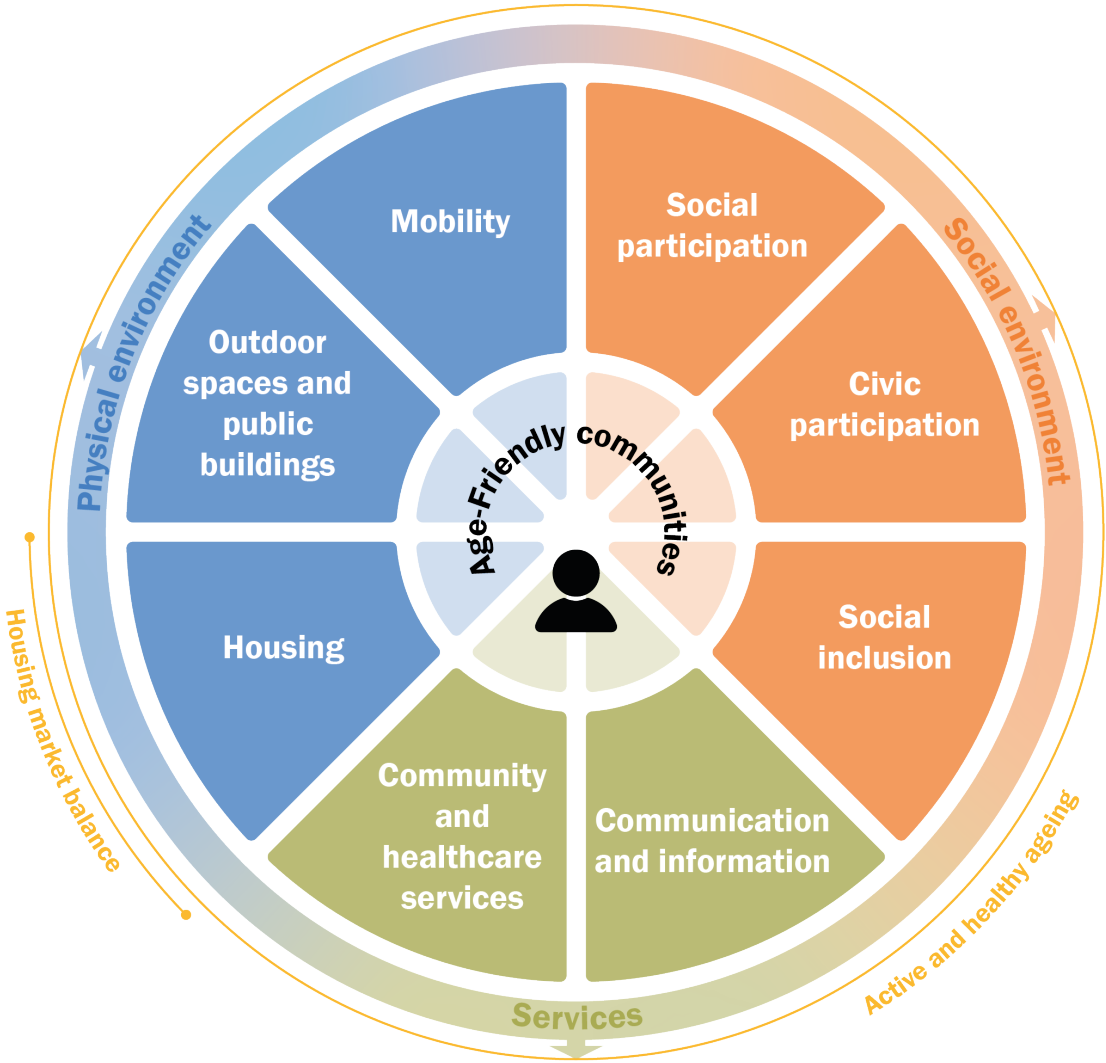


Figure 17. Conceptual framework. (own image. inspired by: WHO, 2008)

3.3 Methodological framework

The process of this thesis is conceptualised in the methodological framework, showing the use of different methods throughout the process to gather information and explore options. In Figure 18, the sub-questions are aligned with the methodological approaches that help provide the answers. Subsequently, each sub-question has a specific aim and desired outcome, which contributes to answering the overarching research question. The selected set of methods employed per sub-question also assist in the execution of the desired outcomes.

	Sub question	Aim	Method	Outcome
Analysis	How do the current physical, social, and municipal factors influence age-friendliness and the quality of life for elderly residents in Apeldoorn?	Map out the structures of the city and neighbourhoods and understand the current challenges and opportunities for age-friendliness.	Literature research Fieldwork Spatial analysis Critical policy analysis	Chosen case study neighbourhoods, systemic site analysis, policy framework, task definition.
Identification	What are spatial and systemic patterns of age-friendliness related to urban planning and design?	Create a set of patterns for an age-friendly community in Apeldoorn.	A pattern language Literature research Fieldwork Interviews Critical policy analysis Spatial analysis	A pattern language
Implementation	What would the age-friendly community pattern language look like in Apeldoorn?	Examine how spatial structures and social connections affect and contribute to age-friendliness and create scenarios.	A pattern language Design	Age-friendly community scenarios, Personas, Senior housing typologies
	How can the pattern language and framework be transferable for other cities?	Showcase how a pattern language can be transferred to a spatial design and strategy and explain the transferability.	A pattern language Design and spatial design strategy	Neighbourhood design Spatial design strategy

Figure 18. Methodological approach. (own image)

Research methods

This section provides an overview of the different methods that will be used throughout the project, explaining each method with a brief description on its approach, the specific sub question(s) it addresses, and the desired outcome of the method for the project. The methods are interrelated, which is briefly mentioned in the end of this section and displayed in figure 19.

Literature research

The literature research serves as the foundation for the theoretical framework of the project. It explores current trends, concepts and scholarly perspectives related to ageing, urban environments, and the housing market. This method helps refine the problem statement and provides a comprehensive understanding of existing knowledge on these three topics. Additionally, the literature research plays a pivotal role in developing the theoretical background for the pattern language, ensuring that the design interventions proposed later in the project are grounded in theory.

Outcome: the desired outcome of using this method is to broaden and refine the scope of the topic, while providing a solid theoretical

backbone for other methods, particularly the pattern language.

Critical policy analysis

The purpose of a critical policy analysis in urban planning is to understand and evaluate the decisions made by policymakers regarding urban planning and particularly the housing market. By analysing municipal and provincial policies, this method provides valuable insights into how these policies impact elderly.

Outcome: The desired outcome of this method is a deeper understanding of policy documents, creating a critical perspective on what topics the municipality and province view as important in relation to the older residents.

Spatial analysis and mapping

Spatial analysis is a crucial tool in urban planning and design, as it provides insights into the physical, social and functional characteristics of the study location. By creating detailed maps, this method allows for the visualization of existing spatial features, including demographic information, land use and infrastructure. The spatial analysis will form the basis for the final design.

Outcome: The outcome of this method is a set of maps showing the physical, social and functional characteristics of the case study location, Apeldoorn, which will serve as the basis for the design and strategy proposed later in the project.

Fieldwork

Doing fieldwork offers a real feel of the area, allowing for experiencing invisible characteristics of the community and its dynamics. While spatial maps and data provide useful information, fieldwork adds a human perspective by uncovering aspects like social interactions and informal spaces. Additionally, fieldwork is necessary to obtain interviews with local residents and elderly.

Outcome: The desired outcome of fieldwork is an on-the-ground perspective of the study location, complementing the findings from the maps of the spatial analysis, and taking interviews with locals.

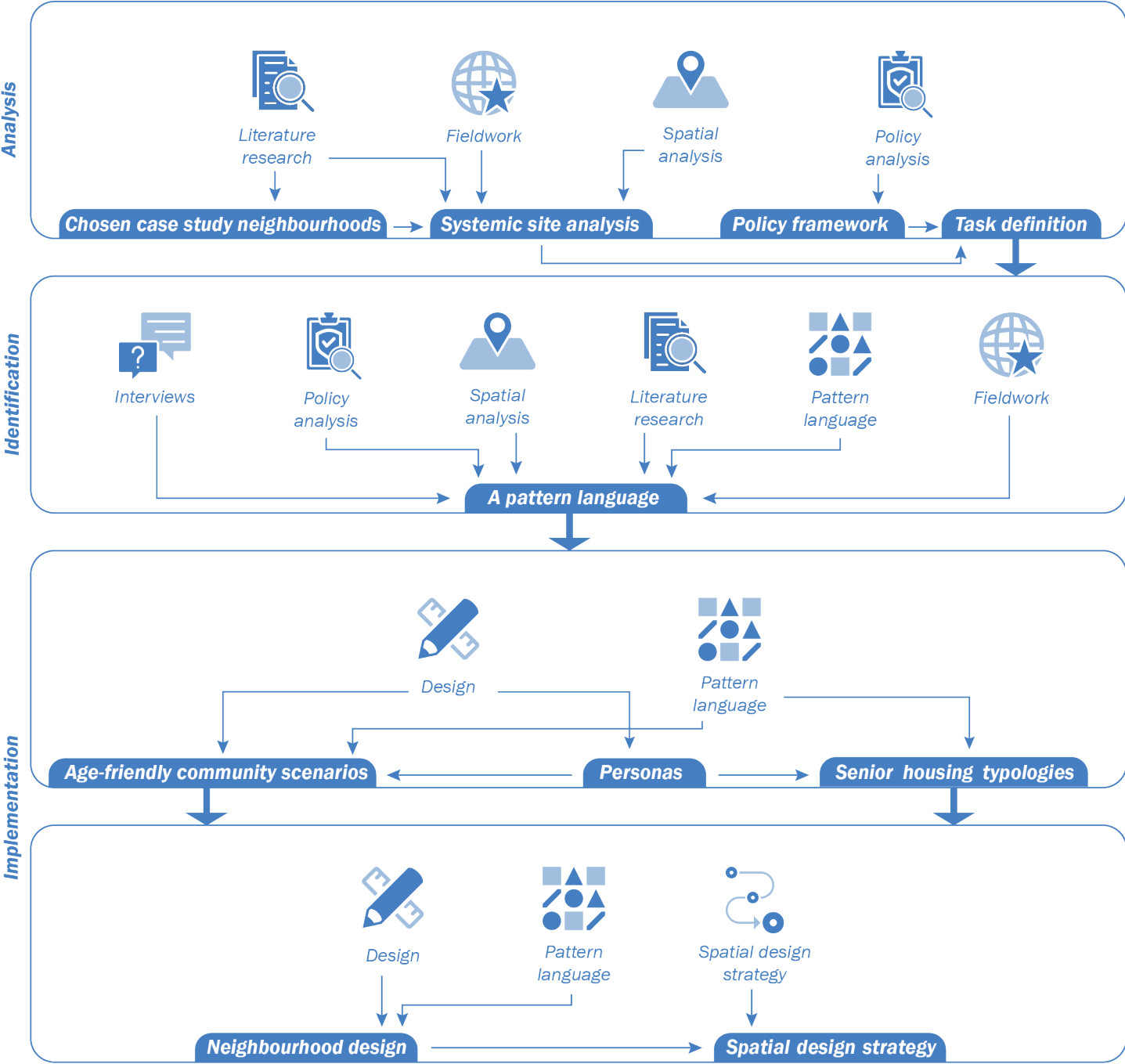


Figure 19. Methodological framework. (own image)

Interviews

Interviews with elderly residents are a key method for gathering insights directly from the target demographic. This approach provides a platform for elderly to voice their experiences, concerns, and suggestions, in order to identify gaps or opportunities in the project. The interviews also serve to confirm or test the findings from the analysis.

Outcome: the desired outcome of taking interviews is to collect qualitative data that adds to the analysis, provides new insights from informal conversations, and talk to the target audience.

A pattern language

The pattern language is composed of a set of interconnected patterns, each addressing a specific issue and offering a solution derived from theory gathered in the literature research. By using this method a structure to the design process is provided, giving urban planners and designers a chance to create functional and sustainable designs based on a theoretical framework.

Outcome: The desired outcome of the pattern language method is a set of patterns, connected in a pattern field, which will guide the design

process in creating an age-friendly community.

Scenario building

Scenario building can be used as a tool to explore different age-friendly approaches. Setting out parameters based on outcomes from the literature research and spatial analysis, this approach operates as a method to apply the pattern language into a site-specific location.

Outcome: The desired outcome of scenario building are alternative scenarios, with the implementation of the developed patterns from the pattern language.

Design and spatial design strategy

Based on the pattern language, a spatial design will be created for the case study location. Visual representations of the design will showcase how the patterns can be implemented in practice, creating an age-friendly community for active and healthy ageing.

Outcome: The desired outcome of this method is a spatial design that illustrates the implementation of the pattern language, offering a tangible solution to the challenges identified in the previous phases of the project.

Interrelation between the methods.

These methods, and their use in this project, all link to each other. Each of them providing a piece to the puzzle. Literature research is the foundation for the theory in this project, offering a theoretical background to the patterns from the pattern language. While the critical policy analysis give insight into the governance and social constructs of the study location, the spatial analysis provide a clear understanding of the physical and functional characteristics of the area. Both documenting valuable information regarding the city and neighbourhoods chosen for this project. Fieldwork and interviews further confirm and challenge these findings by observing the location from a human perspective and talking to the target group. Besides the literature research, these four methods add new patterns to the set when new insights emerge, tying everything together in the pattern language. Together with scenario building, this provides a structured approach to the design process in creating an age-friendly community in Apeldoorn.

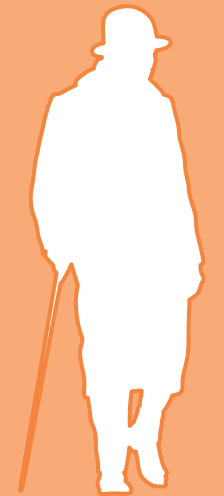
3.4 Scope of the project

It is valuable for all planners and designers in the architectural field to look at the ageing society. Because studies found that both housing and neighbourhood environments have an impact on the quality of life of the elderly (Demirkan, 2007). Therefore, the extend of this graduation project covers various scales of the built environment, including housing typologies facilitating for the diverse housing needs of older residents, a neighbourhood-scale design of what an age-friendly community in Apeldoorn would look like, and a city-scale analysis relating the case study to the rest of the city-wide structures. However, since this graduation is within a studio in the urbanism masters, the implications of the private spaces will focus more on broader household typologies and impact to the physical and social environments. Rather than more architectural floorplans and designs, which fall outside of the scope of this project.

04

Socio-spatial analysis

This chapter analyses the social and spatial structures of the case study location, Apeldoorn. Exploring how the physical environment currently scores in the domains of age-friendly communities.



4.1 Apeldoorn

This section provides an analysis of the case study location for this project. As discussed in section 2.5, this thesis focuses on Apeldoorn a case study because of its geographical location in the east to municipalities with high rates of elderly, the number of inhabitants of the city, and demographic statistics.

Apeldoorn is a municipality located in the province of Gelderland. With its main city being the homonymous Apeldoorn. The municipality counts 168,591 inhabitants (Apeldoorn in Cijfers, n.d.), of which most live in the city. The municipality sizes to 34.115 hectare, even though the city only accounts for 5.878 hectares (AlleCijfers.nl, 2016). Showing how dense the city is, in relation to the other towns. With the size it is equivalent to Nijmegen, a city a little more to the south, yet a little less dense. As shown in figure 20, the remaining hectares of the municipalities are mostly to the west of the city, which is predominantly the national park de Veluwe. In further sections of this report, ‘Apeldoorn’ will refer to the city, whereas ‘the municipality of Apeldoorn’ will indicate the municipality.

The rest of this chapter will firstly focus on the variables to choose the specific case study area, those being the demographic and liveability. Second, the area will be analysed over the three clusters of age friendly communities and its domains; the physical environment, social environment, and services. Furthermore, the policies of the municipality and the province will be discussed. In the last section of this chapter, the data gained about the case study area will be concluded in answering the first sub-question and set out the task for the implementation and strategy.

Location



Municipality



City

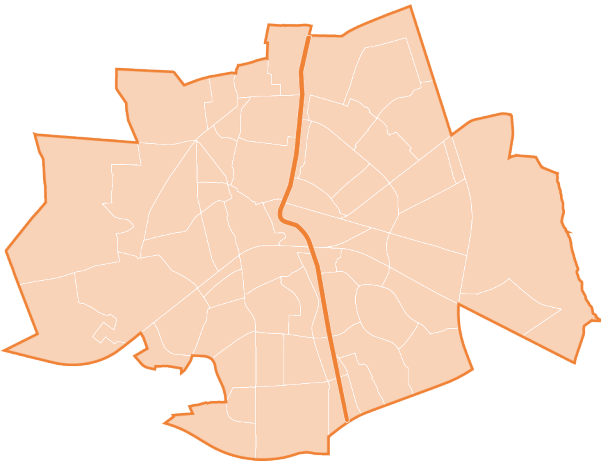


Figure 20. Apeldoorn. (own image)

Demographic

The city of Apeldoorn counts a total of 30,445 inhabitants aged 65 and over. This equates to an older demographic of 21,4% of the total population (142,110) in Apeldoorn, making it an older populated demographic (AlleCijfers, 2016). Figure 21 shows the division of older inhabitants throughout the neighbourhoods. Neighbourhood Orden (dark orange) has the most elderly, counting 1,338 older individuals in total. Furthermore, the neighbourhoods to

the north of the city centre usually have 500 to 1,000 elderly or more. The neighbourhoods on the outer edges of the city show lower numbers of older individuals, due to a higher amount of green structure in those areas and lower population numbers living in those neighbourhoods.

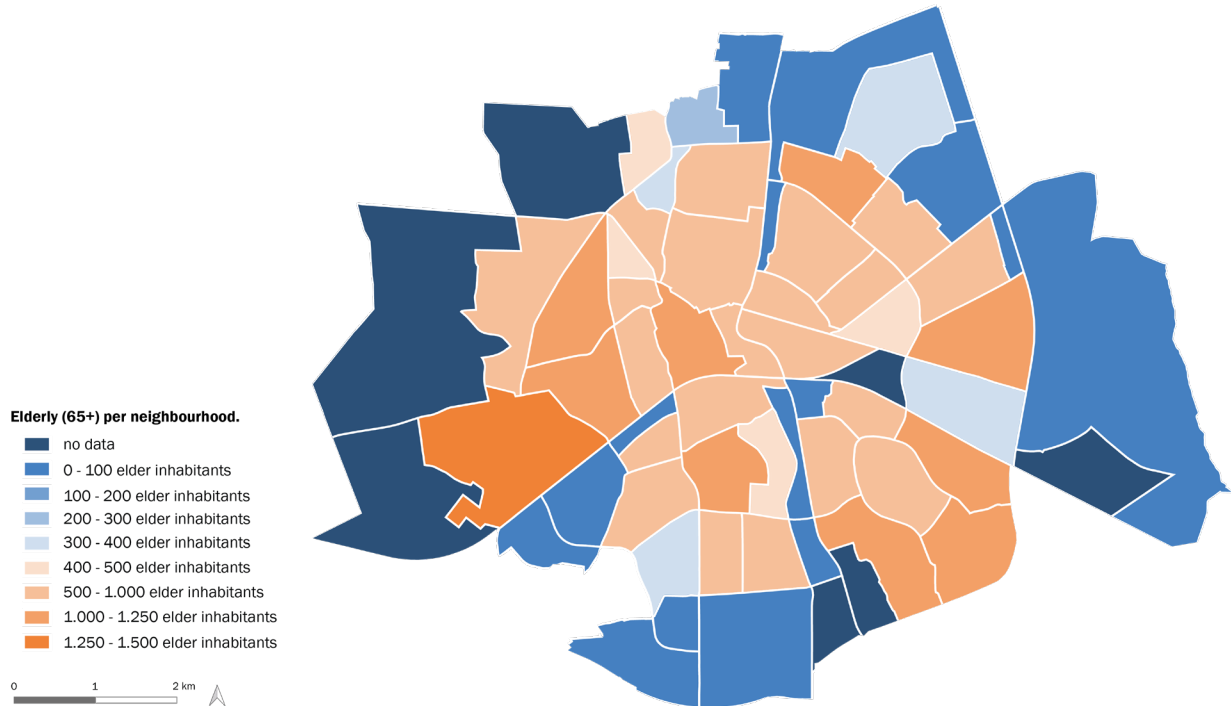


Figure 21. Amount of elderly per Neighbourhood. (CBS, 2022)

Liveability

As the physical and social environment play a pivotal role in the process to an age-friendly community, understanding the liveability of each neighbourhood is an important step in gaining knowledge on the city's overall score. Additionally, it is a step in deciding which neighbourhood has the biggest gap to achieve age-friendliness. The *Ministerie van Binnenlandse Zaken en Koningsrelaties* did a research about the liveability for each neighbourhood throughout

the Netherlands (Leefbaarometer, n.d.). Each neighbourhood is scored on the current situation and on the developments on 5 aspect: the housing supply, physical environment, facilities, social cohesion, and nuisance and unsafety. The score given to each neighbourhood as seen in figure 22 is the total deviation compared to the rest of the country. As can be seen below, the neighbourhoods in the west of the city score very good on average. The top right and bottom right however

score less good, even though these neighbourhoods still score more than sufficient (lightest green), which is the national average. One neighbourhood in particular scores negative. This is Sprenkelaar (yellow), where only the physical environment has a slightly positive score on average.

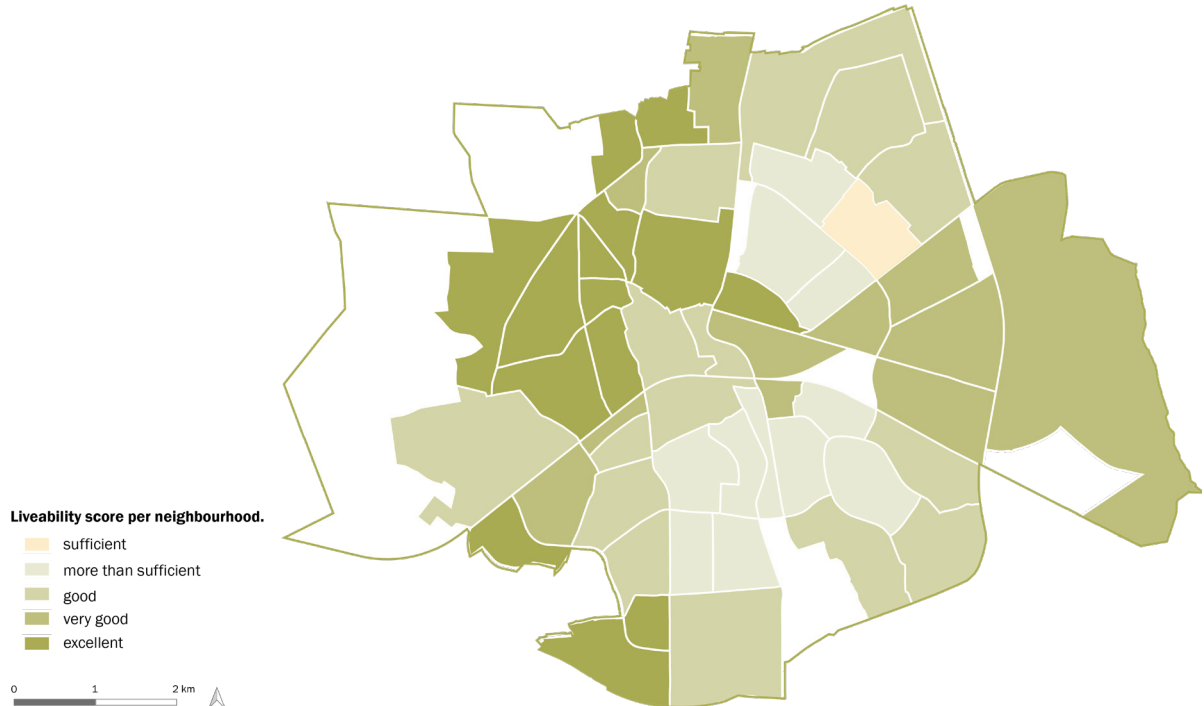


Figure 22. Liveability per Neighbourhood. (Leefbaarometer, n.d.)

4.2 Case study area

Case study neighbourhood

In choosing the designated area as case study for designing an age-friendly community two factors were important. The first were the demographic statistics, a neighbourhood should have a noteworthy share of older inhabitants, but this also has to translate to a significant amount. The second deciding factor was the current situation of the physical and social environment. As discussed in chapter 2.4, an age-friendly community includes eight domains categorized into three clusters, the physical environment, the social environment, and municipal services. Some domains - such as housing, outdoor spaces and public buildings, mobility, social inclusion, and social participation - are also factors deciding the liveability per neighbourhood as mentioned on the previous page.

Therefore, the demographic and the liveability of the neighbourhoods in Apeldoorn influenced the decision for the case study area. Two neighbourhoods in Apeldoorn score relatively low on the liveability results, yet are home to many older residents: Anklaar and Sprenkelaar.

Sprenkelaar is a neighbourhood located in the north-east with

almost four thousand inhabitants, of which 17% is aged 65 or over. This neighbourhood scored the least in the liveability research, in the bottom frame of figure 23 is set out how the five factors sum up to the total deviation. Three neighbourhoods surrounding Sprenkelaar also score average in the liveability research, therefore, another neighbourhood was chosen to frame the case study area of this particular community. Anklaar is the neighbourhood next to Sprenkelaar and provides similar, yet different, findings. The surface is a little smaller, even though there are 600 more people taking residence there, 23% being elderly. The liveability score is somewhat better with fewer negative scores. Anklaar differs from Sprenkelaar as it facilitates more amenities, which will be discussed on page 70.

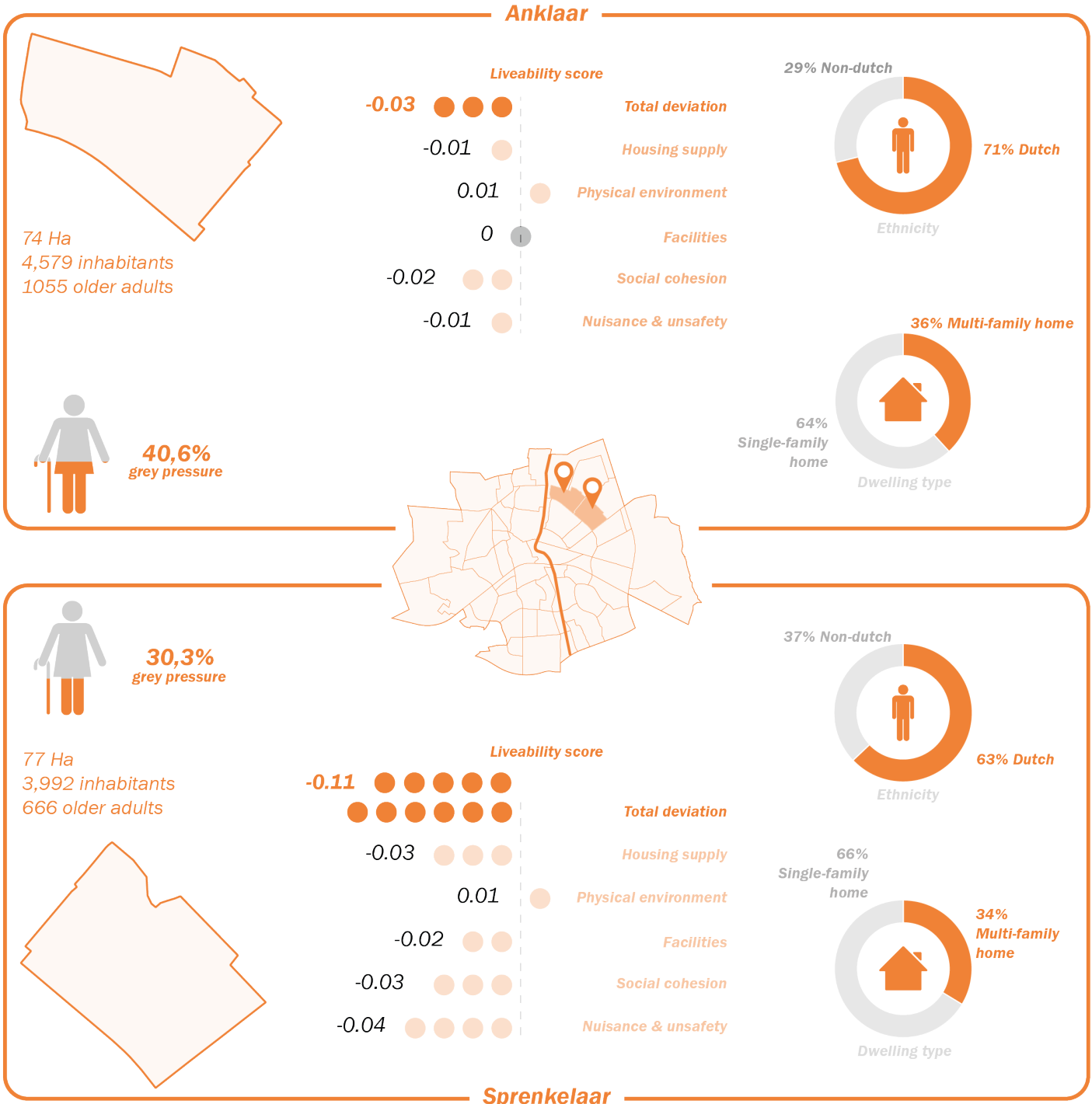


Figure 23. Social analysis of Anklaar and Sprenkelaar. (own image) (sources: Apeldoorn in Cijfers, n.d. & Leefbaarometer, n.d.)

4.3 Physical environment

This section of the chapter focuses on the three domains of the physical environment in the age-friendly framework: Outdoor spaces and public buildings, Housing and Mobility. Where on both city scale and the two neighbourhoods each domain will be analysed in order to understand the dynamics on both scales and understand how this led to the liveability score.

Green-Blue structure

Apeldoorn is geographically positioned within a highly green context, bordered by the National park ‘De Veluwe’ to the west and agricultural lands to the east, situating the city next to the biggest national nature reserve. Within the urban boundaries, the greenery disperges into the city through parks and forests while a canal divides the city into eastern and western sections, adding a blue element to the urban landscape.

Notably, two large parks are located on either side of the case study area. Although these parks and the local green and blue structure in the two neighbourhoods consist mainly of monofunctional spaces: stretches of grass, rows of trees, ponds of water, and occasionally a bench. While these elements contribute to

the visual green characteristic of the area, they often lack functional use and do not always meet the 3-30-300 rule. Especially regarding the 300 meter proximity to high-quality green space (Browning et al., 2024). Since high-quality green space for this situation is defined as larger areas of green space that provide both shade and water features. Lacking in this situation is the quality of the green spaces for functional use.

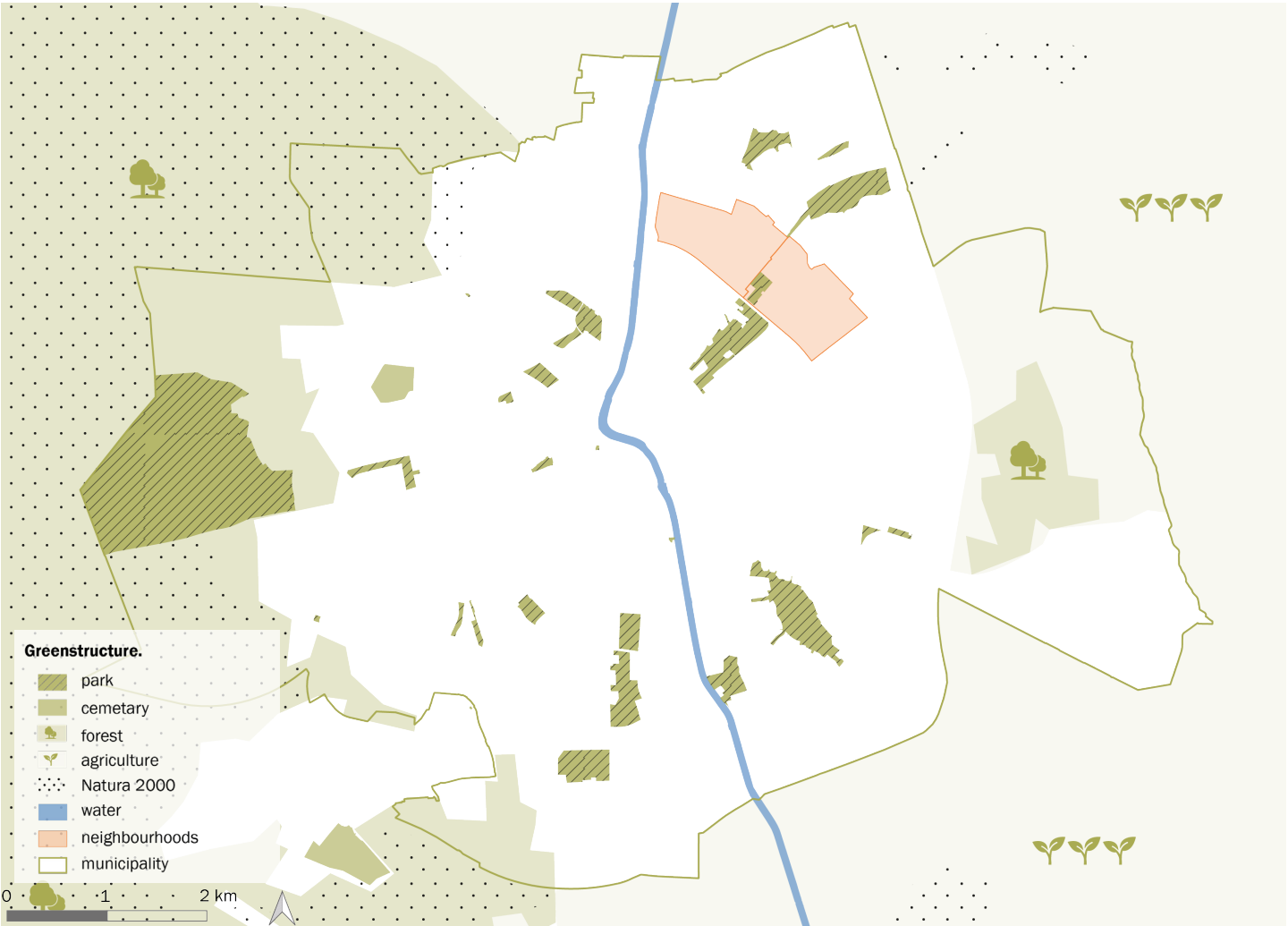


Figure 24. Green-Blue structure. (QGIS)

Notably, two large parks are located on either side of the case study area. Although these parks and the local green and blue structure in the two neighbourhoods consist mainly of monofunctional spaces: stretches of grass, rows of trees, ponds of water, and occasionally a bench. While these elements contribute to the visual green characteristic of the area, they often lack functional use and do not always meet the 3-30-300 rule. Especially regarding the 300 meter proximity to high-quality green space (Browning et al., 2024). Since high-quality green space for this situation is defined as larger areas of green space that provide both shade and water features. Lacking in this situation is the quality of the green spaces for functional use.

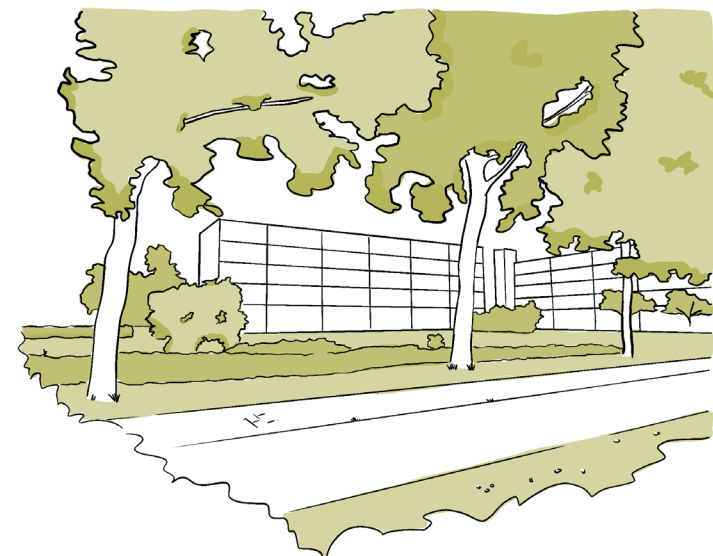


Figure 25. Unused green space opportunity. (own image)



Figure 26. Green space without function. (own image)

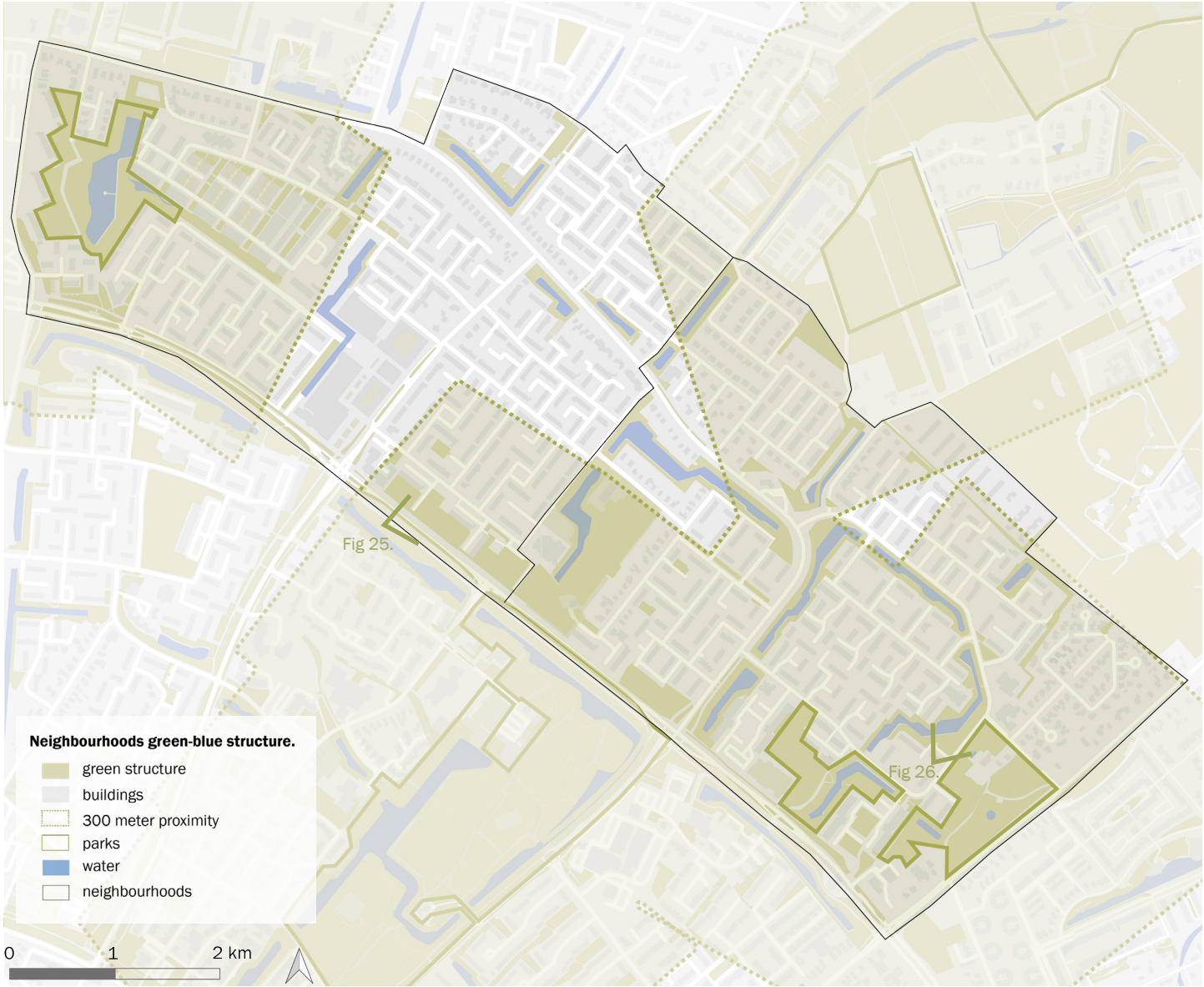


Figure 27. Green-blue structure neighbourhoods. (QGIS)

Amenities

Within and around Anklaar and Sprenkelaar, a range of amenities are present. Anklaar in particular, hosts a large shopping area that serves as a central hub, offering supermarkets, cafés, and shops of all kinds. This concentration of essential amenities provides residents with access to daily needs, supporting independence for older adults as daily activities are within proximity. However, the concentrated characteristic means some residents are rather distant from the amenities.

Additionally, some amenities are noticeably absent from these neighbourhoods, in particular entertainment and cultural activities. Facilities such as (movie) theatres, museums, or cultural centres are lacking, which limits the diversity of leisure and social opportunities available to residents. These types of amenities are critical not only for recreational purposes but also for fostering intergenerational interaction and reducing social isolation among older adults.

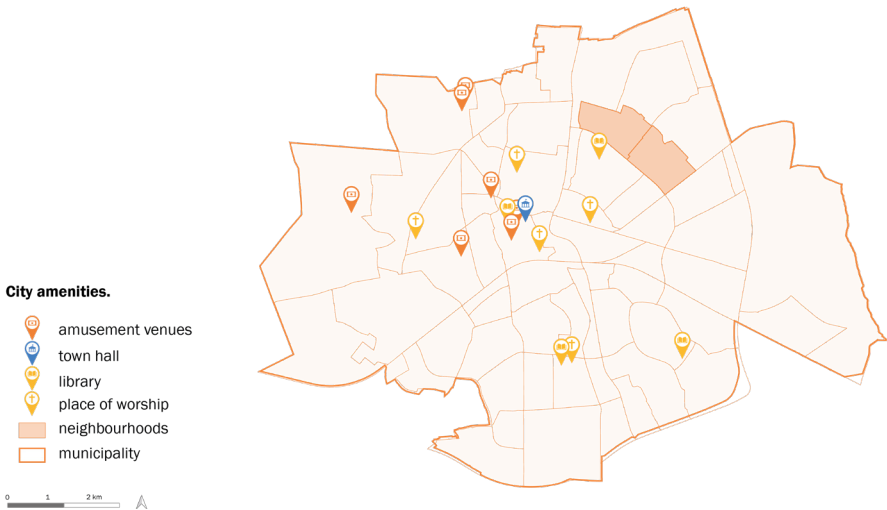


Figure 28. Amenities in Apeldoorn. (QGIS)

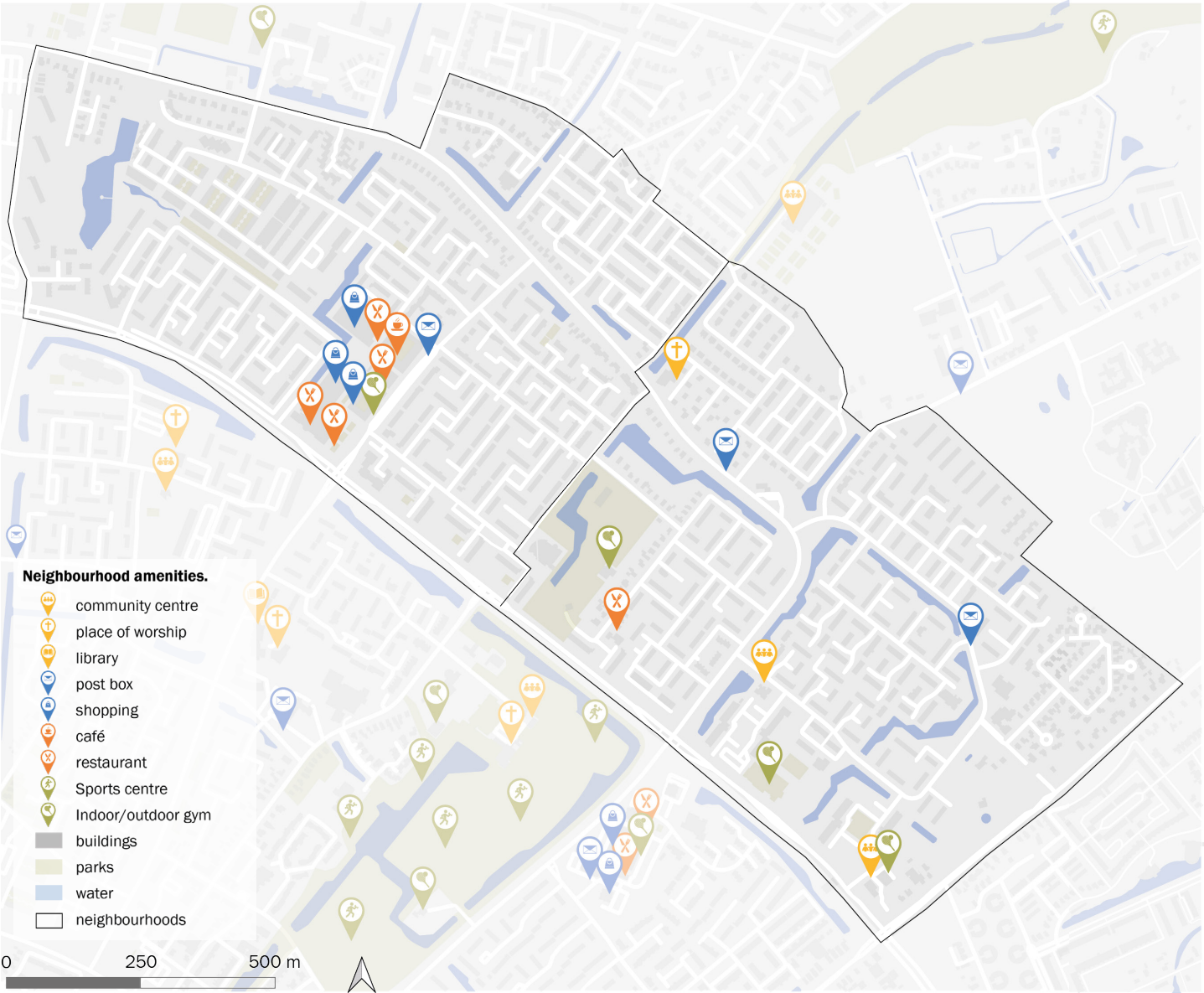


Figure 29. Amenities in and around the neighbourhoods (QGIS)

Housing

In Apeldoorn, senior housing is available in various forms, including independent living and assisted living, where the level of care provided varies depending on individual needs. Within both neighbourhoods there are two assisted living examples dedicated to seniors who can no longer live independently and require assistance. Koningin Wilhelmina is a facility catering individuals with dementia or those needing somatic care, providing housing for 76 residents (Koningin Wilhelmina - Atlant, n.d.) Additionally, the Socrateshuis offers care for 22 residents with dementia (Dagelijks leven, 2025). Together, these two senior housing locations provide 98 dwellings for older adults dependent on assisted living with dementia care.

Giving that eight per cent of adults older than 65 is expected to develop dementia (Feiten en Cijfers Over Dementie - Alzheimer Nederland, n.d.), the 98 dwellings are not sufficient enough for the 1,700 older adults living in Anklaar and Sprenkelaar. Even less sufficient are the independent living options for the elderly seeking senior housing without in need of care, as these neighbourhoods do not provide

senior housing with independent living options.

Both Anklaar and Sprenkelaar are post-war neighbourhoods, with the majority of residential dwellings constructed between 1967 and 1969. This gives the neighbourhoods a predominantly residential character, marked by single-family homes that share a similar design, apart from minor variations. After 2020, some renovations were carried out on houses and the shopping centre, though most dwellings have retained their original appearance.

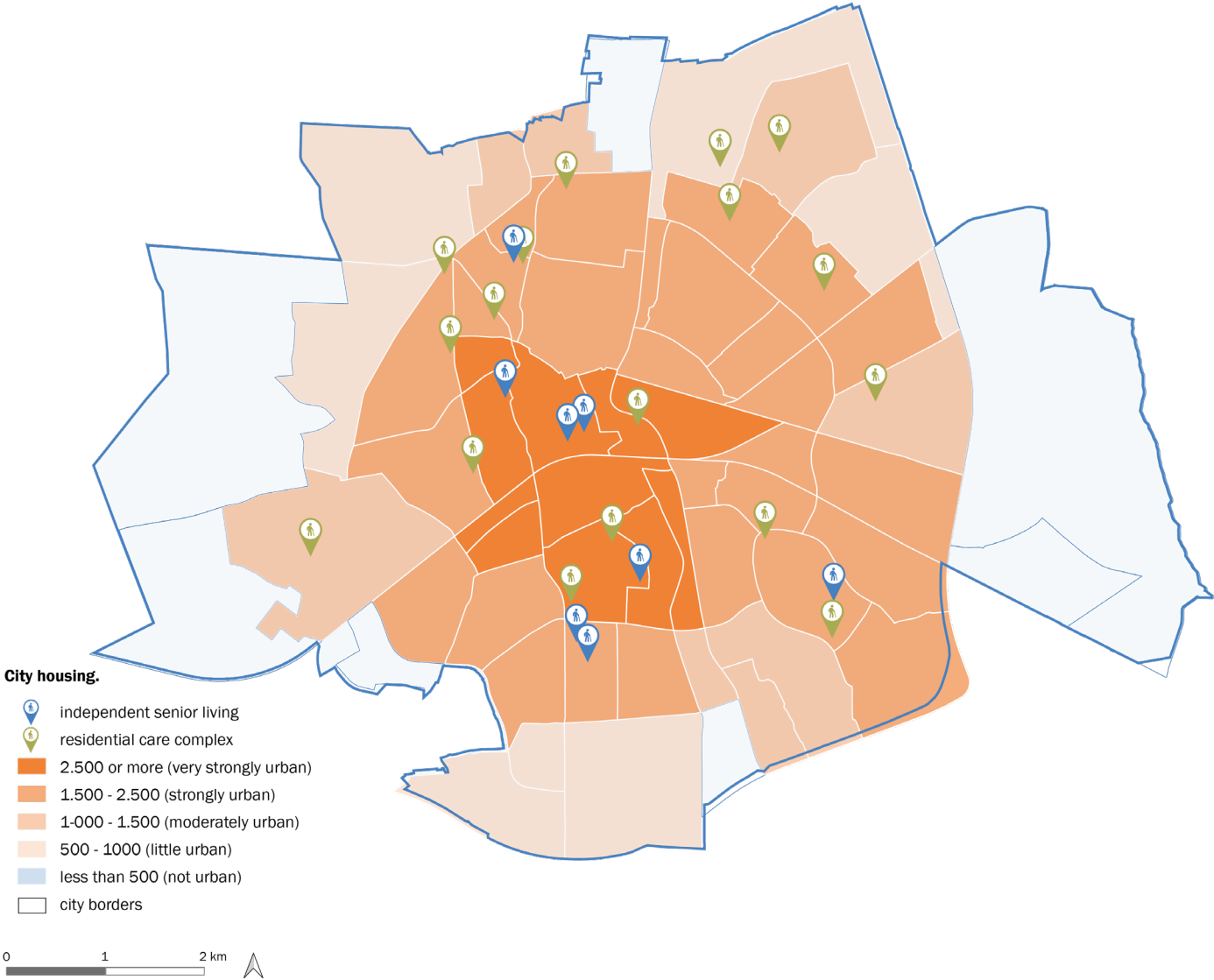


Figure 30. Senior housing in Apeldoorn. (Zorgwoningen in de gemeente Apeldoorn, 2020)

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Figure 31. Main typology housing in Sprenkelaar. (own image)

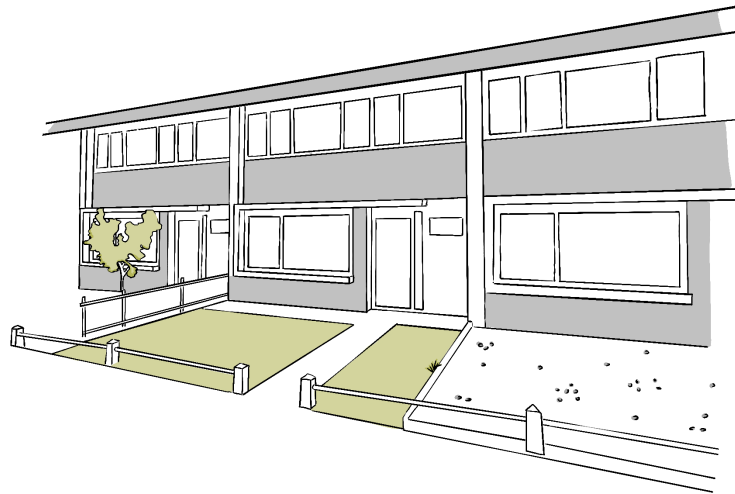


Figure 32. Main typology housing in Anklaar. (own image)



Figure 33. Neighbourhood construction years. (QGIS)

Infrastructure

The figure below illustrates the main infrastructure of Apeldoorn. To the east and south, two major highways, the A1 and A50, provide regional vehicle connectivity. A railway line runs directly through the city, linking Apeldoorn to other cities such as Amersfoort and Enschede, with the central train station located in the heart of the city.



Figure 34. Infrastructure Apeldoorn. (QGIS)

Zooming in on Anklaar and Sprenkelaar, the public transport routes and stops are illustrated. Each stop is mapped with a 400 meter radius, representing a comfortable walking distance for most individuals and what would take older pedestrians under 10 minutes (Wilmot & Purcell, 2022). From these stops to either the city centre or train station typically takes around 10 to 15 minutes. Anklaar is operated by three bus lines connected to the centre, while Sprenkelaar is connected by one. However, both neighbourhoods contain areas where residents live beyond the 400 meter reach of a public transport stop, potentially limiting accessibility for those less mobile.

The neighbourhoods are highly accessible by car, and biking and walking is also facilitated. Nevertheless, the infrastructure prioritizes car use, sometimes to the disadvantage of pedestrians or cyclists. For example, pedestrian crossings are not always conveniently located, and although some areas feature dedicated bike lanes, many streets require cyclists to share the road with vehicles. Sidewalks are present throughout the neighbourhoods but are occasionally cluttered or partially blocked by

parked cars, reducing their usability especially for older individuals with mobility difficulties.



Figure 35. Car-oriented road in Anklaar. (own image)



Figure 36. Road in Sprenkelaar. (own image)

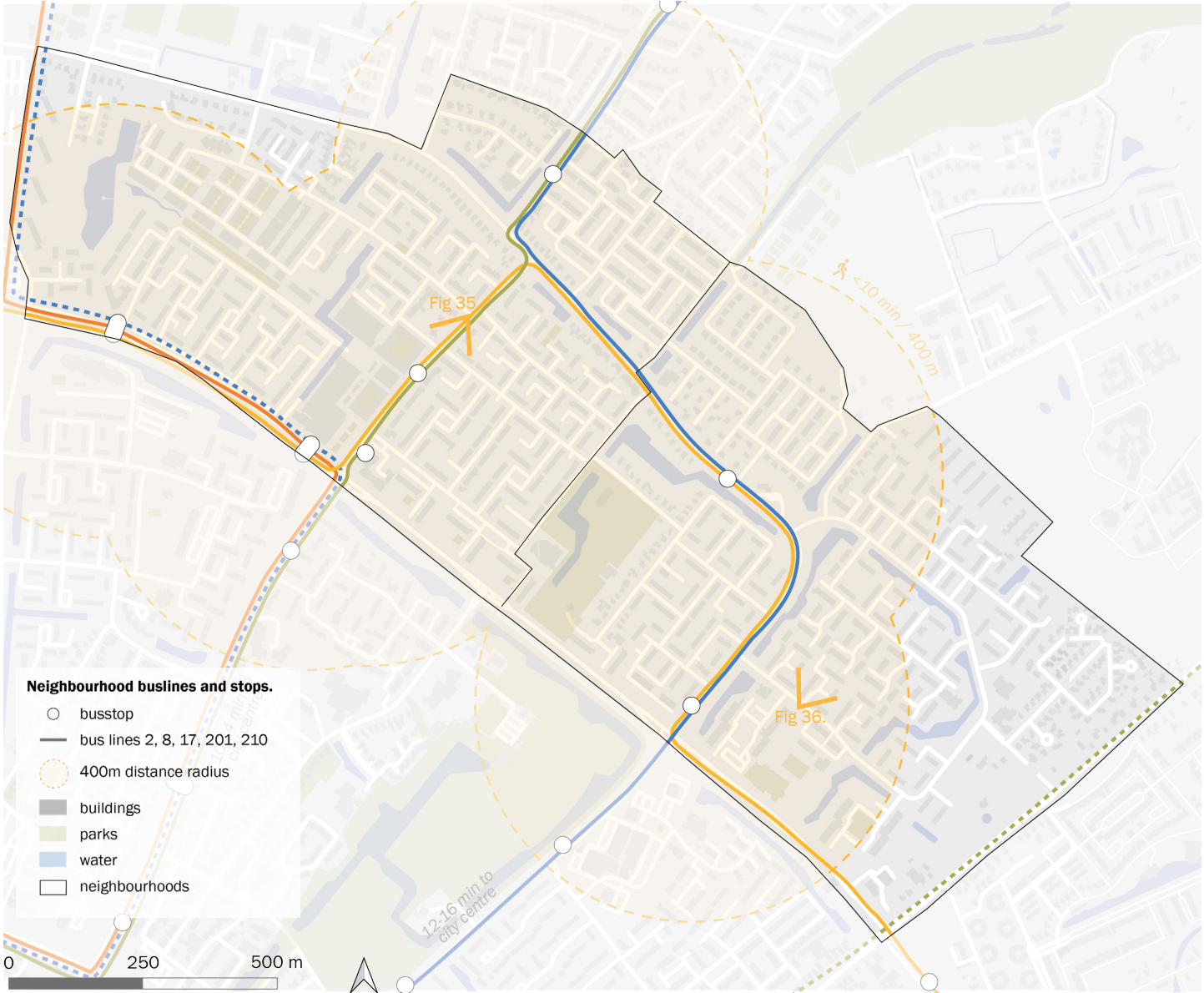


Figure 37. Neighbourhood buslines and stops. (QGIS)

4.4 Social environment

This section of the chapter focuses on the three domains of the social environment in the age-friendly framework: social participation, civic participation, and respect and social inclusion.

In Apeldoorn, several initiatives promote social participation, civic participation, and social inclusion, contributing to the social connections and reducing loneliness for older adults. Across the city, there are multiple venues where people, and specifically older people, can gather and engage socially. These meeting places are listed on a website, with many located within senior living locations. This initiative

not only encourages interaction among residents but also creates opportunities for the broader community to connect with those living in assisted living, fostering social connectedness even for individuals who might otherwise be isolated.

At some of these locations, scheduled activities are organized, including games, creative workshops, and other social events, further enhancing opportunities for social participation. Another noteworthy initiative is the ‘Apeldoorn Pakt aan’ platform, which connects individuals through volunteering opportunities. This

platform offers a wide range of activities, from tasks that older people could volunteer for, to services searching for younger volunteers to assist older adults, such as accompanying with grocery shopping or on walks. These initiatives not only strengthen intergenerational relationships but also promote active civic engagement, helping older adults maintain a sense of purpose and belonging within their community.

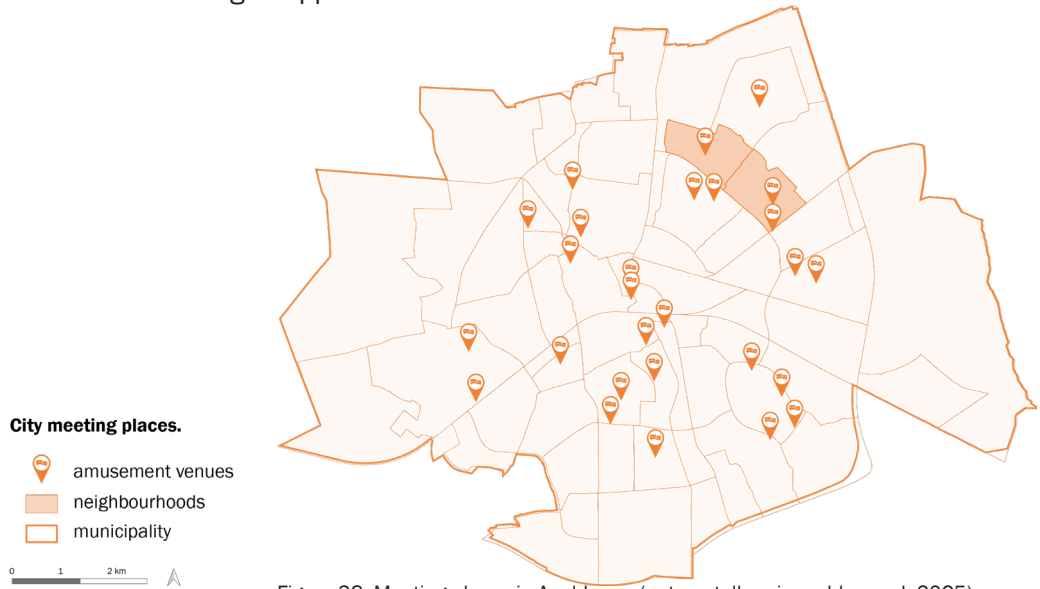


Figure 38. Meeting places in Apeldoorn. (ontmoetelkaarinapeldoorn.nl, 2025)

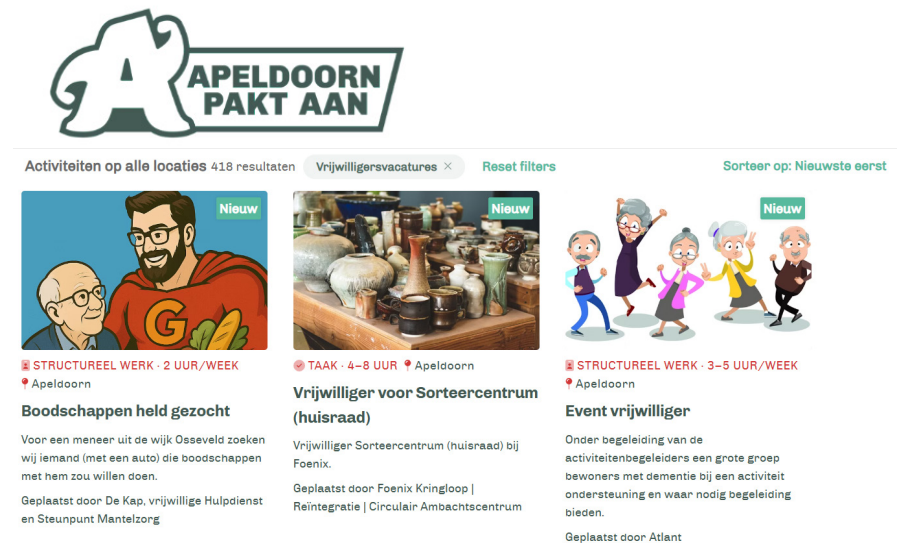


Figure 39. Social platforms. (apeldoornpaktaan.nl, 2025 & ontmoetelkaarinapeldoorn.nl, 2025)

4.5 Services

Healthcare facilities

An important aspect of age-friendly communities is the accessibility and availability of healthcare, as older individuals often require increasing levels of care as health and mobility decline. In the figure below, a heatmap of care facilities is illustrated. Darker red areas indicate clusters where multiple facilities are closely located, most notably surrounding the city centre. Here, two prominent red clusters offer many facilities, such as a general practitioner, pharmacy, dentist, and physiotherapists. Another cluster of facilities is located in Anklaar, providing residents with a variety of healthcare options nearby, thus ensuring that essential services are relatively accessible.

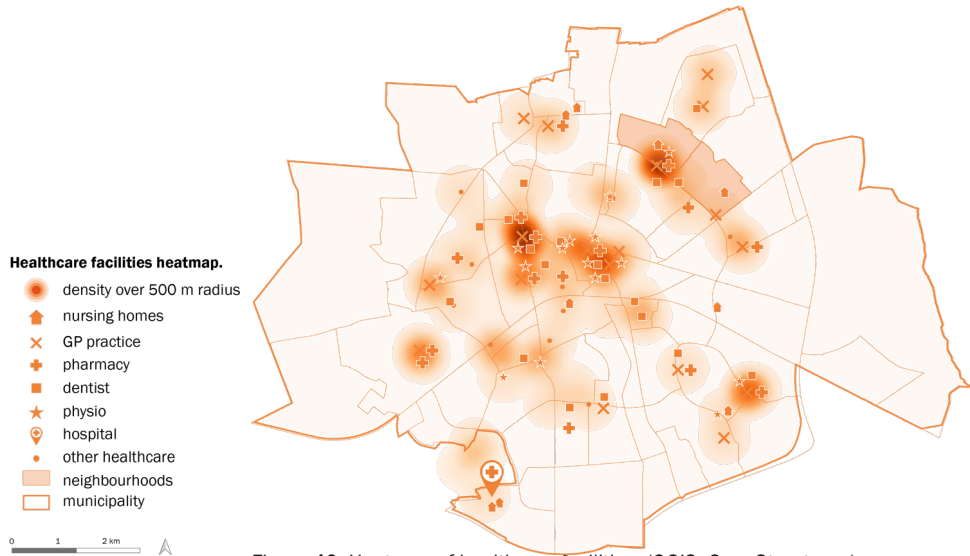


Figure 40. Heatmap of healthcare facilities. (QGIS, OpenStreetmap)

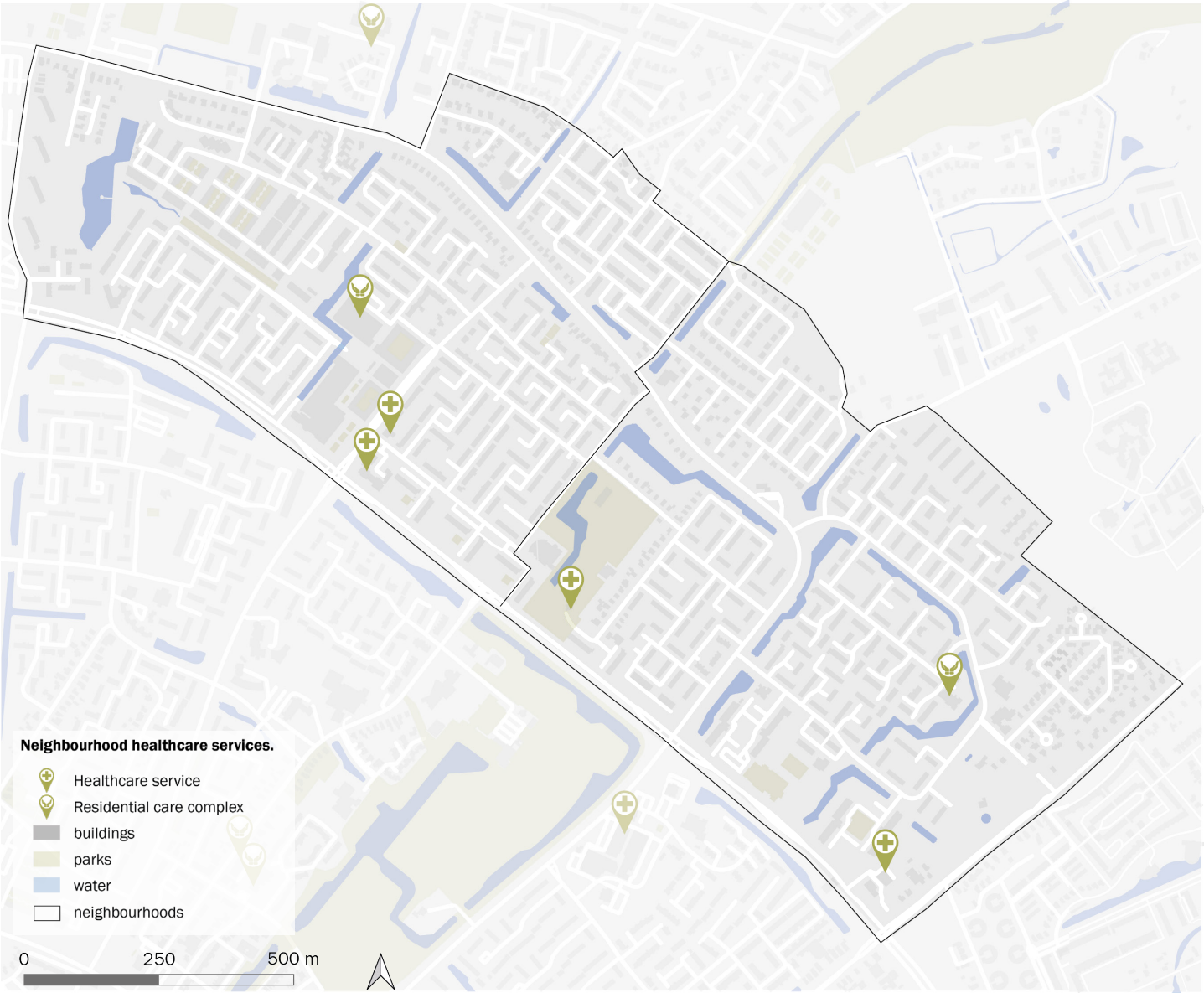


Figure 41. Neighbourhood healthcare services. (QGIS, OpenStreetmap)

4.6 Policy documents

Policy of the province Gelderland

The province of Gelderland outlines a vision of a healthy, safe, clean, and prosperous province, summarized through seven ambitions. One of these ambitions is accessibility: sustainably connected, which strives for flexible, efficient networks that are inclusive for all. With this ambition, the province takes responsibility for ensuring safe and smooth flows of these networks.

In their policy, the province Gelderland explicitly acknowledges the demographic shift and housing preferences, stating:

Woonwensen veranderen door de tijd en met de leeftijd. Mensen worden ouder, wonen steeds langer alleen en zelfstandig, worden steeds meer energiebewust en zijn mobieler dan vroeger, waardoor ze ook meer en makkelijker verhuizen. De dynamiek op de woningmarkt is groot, ook als gevolg van ontwikkelingen in de Randstad. (Provincie Gelderland, 2021, p. 47)

This highlights the province’s awareness of societal changes, particularly in relation to housing. Gelderland aims to align the housing supply with the diversity of desires and lifestyles among residents.

Furthermore, the province recognises the increasing independence and mobility of the older population, as well as their changing housing needs. In their vision, the western part of Apeldoorn is identified as most impacted by the housing market dynamics, particularly as a result of the expansion and pressure from the Randstad (Provincie Gelderland, 2021).

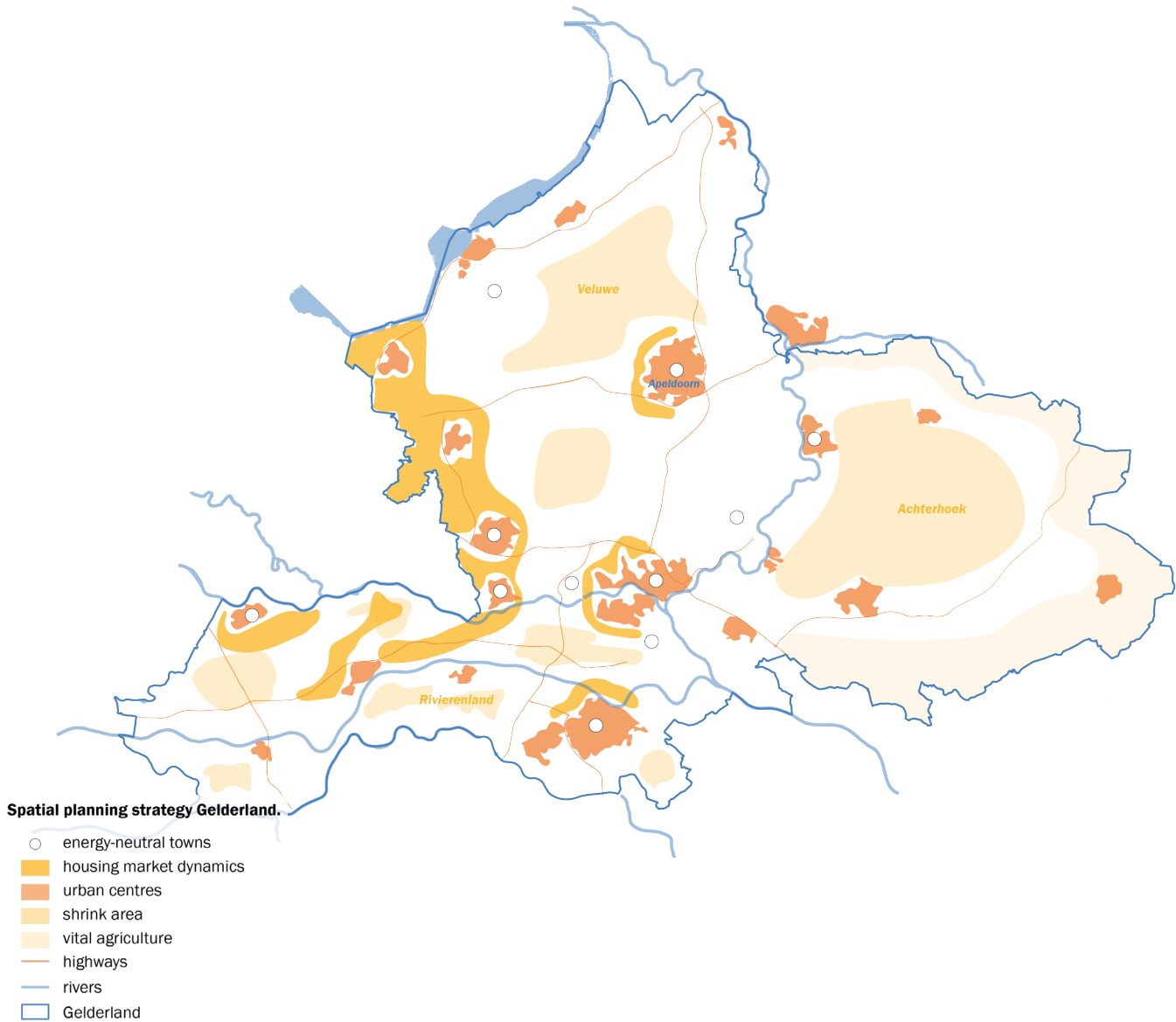


Figure 42. Policy document Gelderland (own image, based on: Provincie Gelderland, 2021)

Policy of the municipality

The municipality of Apeldoorn strongly identifies itself as a ‘family city’ in its policy document, an identity that they strive to strengthen even more. Almost disregarding the demographic change that is occurring.

The municipality emphasizes creating a relocation chain within the housing market by building for different life stages and price ranges, including both rental and owner-occupied housing with an extra portion allocated to the social housing sector (Joon, 2022). Despite this, the municipality plans to only focus on the development of affordable and assisted housing in surrounding towns rather than within the city itself. Neglecting the opportunity to provide suitable housing for the majority of the population, who reside in the city. In alignment with this aim, Apeldoorn projects the construction of approximately 12,500 new homes between 2020 and 2039, which will be both urban infill and city expansion (Joon, 2022). The policy identifies six areas where most developments will be realised: Binnenstad, Kanaalzone Centrum, Spoorzone Centrum, Stadsrand Zuid, Stadsrand Noord, and Uddel. The first three cover different areas of the city centre, including the

canal, developing more urban infill projects. Stadsrand Noord and Zuid will focus on city expansion. However, none of these planned development areas intersect with the neighbourhoods chosen for this project, which allows the area to be assessed to age-friendliness without new projects intervening. Moreover, the municipality expresses an intention to renovate the post-war neighbourhoods of the city, and aiming to improve the sustainability. Thus, also diversifying the housing supply of Anklaar en Sprenkelaar, among other neighbourhoods (Joon, 2022).

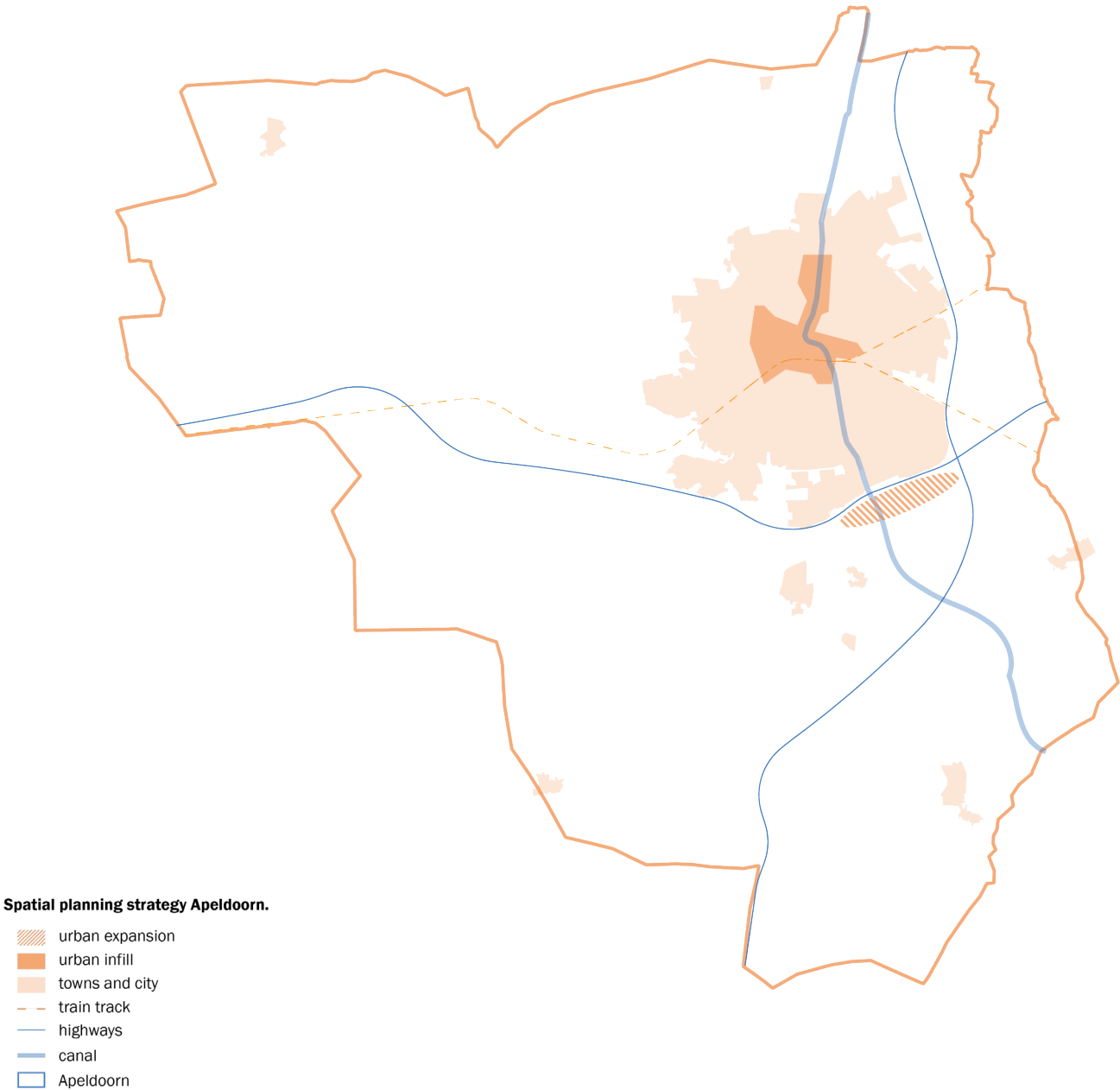


Figure 43. Policy document Apeldoorn. (own image, based on: Joon, 2022)

4.7 Conclusion and task

The analysis of Apeldoorn and both neighbourhoods reveals a multifaceted picture of the current age-friendliness, marked by both strengths and critical gaps across the key domains.

On the spatial level, the neighbourhoods benefit from regional connectivity, nearby amenities, and accessible healthcare services, but they fall short in providing multifunctional high-quality green spaces within short walking distance. Local mobility is heavily car-oriented, with the pedestrian and cycling infrastructure limiting safe and independent movement for older people with declined mobility. Senior housing options appear insufficient to the needs of a growing ageing population.

Socially, Apeldoorn demonstrates efforts to foster social inclusion, intergenerational contact, and civic engagement through local initiatives and volunteering networks. However, cultural and recreational activities within the neighbourhoods remain limited.

In conclusion, to answer the first sub-question: ‘How do the current physical, social, and municipal factors influence age-friendliness and the

quality of life for elderly residents in Apeldoorn?’ and define the task, both neighbourhoods have urgencies and opportunities requiring age-friendly implementations. Anklaar and Sprenkelaar could benefit from improving the outdoor spaces to high quality green with diverse functions, as the physical environment in both Anklaar and Sprenkelaar score slightly positive in the liveability research, yet the green-blue structure data showed there was room for improvement, especially taking the health of older residents into account. As studies show that individuals experience a 42% increase in stress levels when living more than one kilometer away from a green space like a park. (United States Department of Agriculture, 2018).

Anklaar has a hub of amenities, where a lot of residents rely on. Sprenkelaar is not provided with many amenities, which shows in the liveability score. So, to provide Sprenkelaar with more amenities could benefit the score as well as the independence of older adults. Even though Anklaar has this hub, and is a really social space with lots of people, the availability of green falls short and opportunity for shaded area. Additionally, there is an opportunity in creating a less car-

oriented infrastructure around the amenity hub, and instead increase the accessibility for pedestrians and cyclists with pedestrian crossings and safe sidewalks. These interventions could benefit older adults in active and healthy ageing and an increased sense of safety (Salmistu & Kotval, 2023).

For housing, the analysis showed a very monofunctional type of housing. Thus, in order to improve the age-friendliness and enable ageing in place with suitable houses, there is another opportunity in line with the municipality’s aim in diversifying the housing supply of post-war neighbourhoods.

As for the social environment and municipal services, Apeldoorn seems to already have multiple platforms where connections are made through for example meeting places. The healthcare is relatively good, but with minimal interventions could support older residents even more. The social environment could however improve more, as the before mentioned physical limitations also contribute to the social participation.

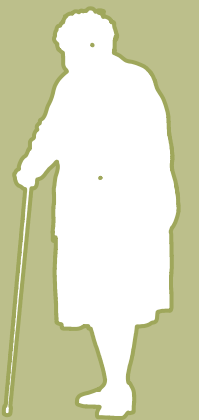


Figure 44. Analysis conclusion. (own image)

05

A pattern language

This chapter presents the development and application of the pattern language, including an introduction to the patterns and the connection between them.



5.1 A pattern language

As introduced in chapter 3, developing a pattern language is one of the main methodologies used throughout this research. In this chapter, the concept of a pattern language, originally introduced by Christopher Alexander in 1977, is applied to the context of age-friendliness, with the aim of identifying spatial and systemic patterns that contribute to age-friendly communities.

In a pattern language, each individual pattern identifies a problem and offers a corresponding solution. This method of Christopher Alexander helps to deconstruct the complex and dynamic process of planning and design into smaller, individual interventions (Rooij & van Dorst, 2020). Additionally, each pattern is linked to other patterns through either supportive or conflicting relations. By doing so, the total collection of individual patterns and relations is understood as a comprehensive whole again, thereby forming a language (Alexander, 1977). This structured approach addresses the complexity of the design process and applying patterns can be done more systematically and theory-based, rather than through isolated design implications (Salingaros, 2000). Because the method allows for the translation of scientific

knowledge from literature researches into planning and design principles (Rooij & van Dorst, 2020). This is particularly valuable when designing age-friendly communities, which requires the integration of various factors, such as population size and diversity, city density, and other contextual elements (Buffel et al., 2012). Thus, applying a pattern language to the case study location helps to simplify and operationalise the interventions to these complexities by breaking them into smaller spatial and systemic interventions.

Sections 5.2 and 5.3 explain the structure of an individual pattern and the key components, while section 5.4 presents and discusses the interrelations between patterns in the pattern field. The full set of patterns can be found in the accompanying Age-friendly Urbanism Pattern Book.

The age-friendly urbanism pattern language is based on theory drawn from multiple scientific disciplines, including gerontology, social sciences, health sciences, and architectural and urban studies. Since this thesis aims to explore the nexus between ageing and the built environment, the integration of insights from these diverse fields

forms the theoretical foundation for developing a pattern set that reflects the potential of age-friendliness in urban planning. The analysis of age-friendly communities resulted in four different categories that structure the 44 possible patterns, translating social and health-related knowledge into the built environment.

The primary function of this pattern set is as a design tool. The set offers spatial and systemic interventions that can be applied to the context of the case study location, thus creating age-friendly communities. Additionally, the pattern language serves as a learning tool for understanding the context of the city. Providing a theoretical foundation for urban planners and designers to identify both the existing and missing components of age-friendliness in the current urban context, particularly in the earlier phases of a project. Given that the patterns bridge multiple disciplinary sciences, the method also functions as a communication tool. Concepts such as active and healthy ageing or independence can be difficult to visualize. By representing these concepts through tangible design interventions, the pattern set facilitates communication between planners, policy makers, and the general public.

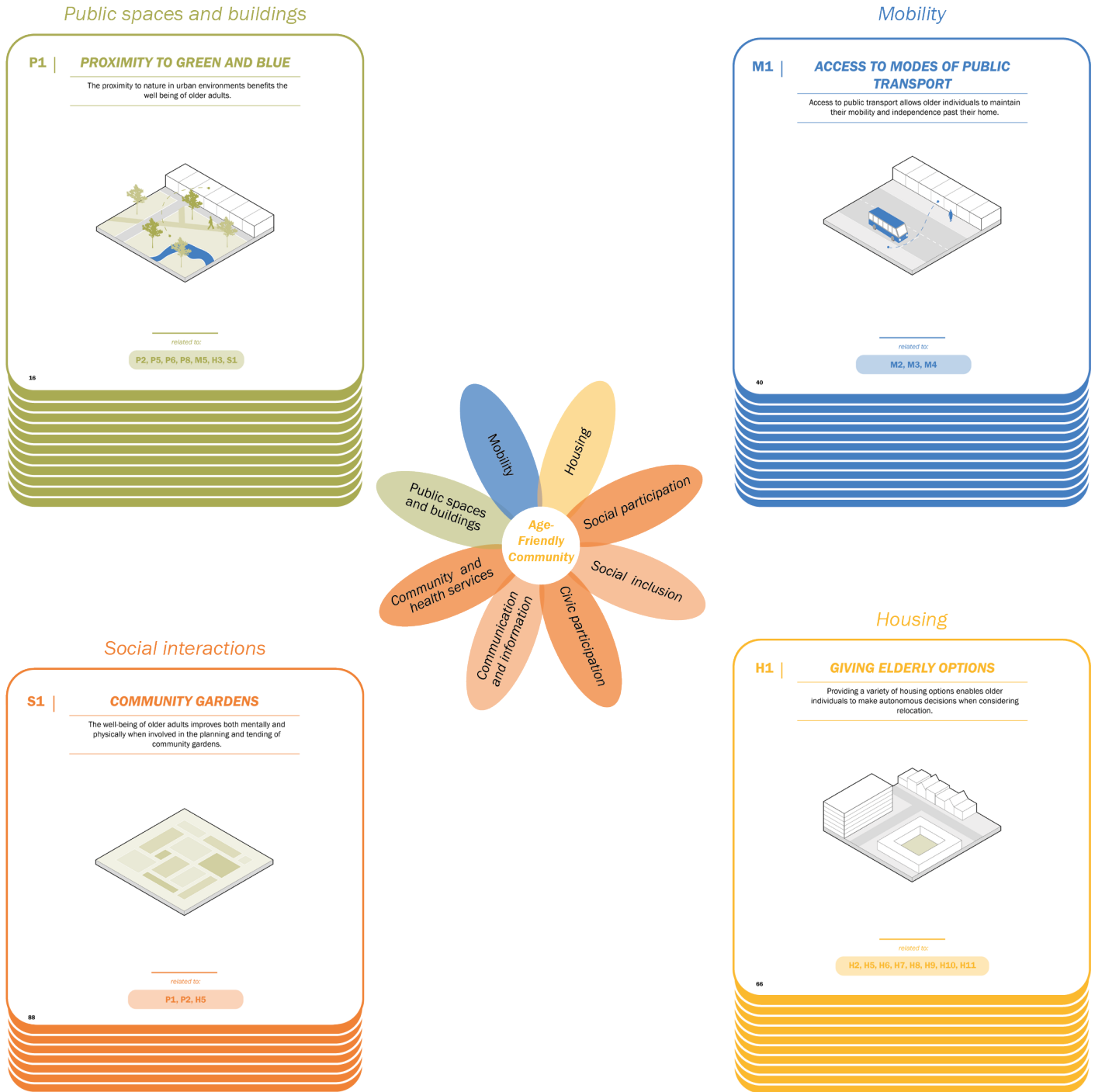


Figure 45. Pattern set. (own image)

5.2 The patterns

The patterns available in the Pattern Book are a collection of mostly spatial implications in order to create an age-friendly community. The patterns are categorized in four categories, based on the domains of the age-friendly community framework. Since the use of a pattern language mostly consists of spatial implications, the three domains of the physical environment each have their own set of patterns providing solutions. The last category encompasses all domains of the social environment and municipal services. The patterns are categorized in this way because the physical environment has a significant influence on the other two clusters, facilitating opportunities for interactions and services. Thus, the pattern set is grouped into four categories, the public spaces and buildings, mobility, housing, and social interactions. The colour of the pattern indicates which category they are part of (figure 45).

In figure 46 the structure of a pattern is shown through one example. A pattern consists of a number, title, and diagram to introduce the concept. Additionally, the hypothesis shortly states what the pattern entails in relation to how the implication contributes to the quality of life for older individuals. Beneath

the diagram, the numbers of other patterns relating to this implication in either the same or another category are shown. On the right side of each pattern a theoretical background supports the hypothesis with literature and the practical implication exhibits what the pattern would look like when applied. Lastly, the scale of the implication is identified and whether the pattern is elder specific or contributes to the larger community.

5.3 Pattern example

Number	Title	Hypothesis	Theoretical background	Practical implication
M5	INFRASTRUCTURE FOR WALKING AND BIKING	A good infrastructure supporting active mobility for walking and cycling allows elderly to stay active and independent.	theoretical background Older adults often rely more on walking and public transportation as their main mode of transport. Active mobility, supported by appropriate infrastructure, is essential for maintaining independence and promoting health (Salmistu & Kotval, 2023). In contrast, the lack of supporting infrastructure, such as unsafe sidewalks with obstacles and crossings with high car speeds, can limit older adults' ability to stay active and in turn accelerate the decline in mobility.	practical implication Infrastructure that supports active mobility and walkability for older adults includes accessible walkways and bicycle paths, clear street zoning that designates specific areas for different modes of transport, and reduced car speeds in areas where pedestrians and cyclists have priority. Additionally, features that enhance visibility, safety, and encourage are essential in creating walkable and cycleable infrastructures that foster active mobility and independence.
related to:			Scale: object building block street neighbourhood city	Age-friendly to: elderly specific children all ages individuals with declined mobility
M2, M6, M7, M8, M9, M11, M12, M13, M14, P1, P4, P9, P10, S5				
Related patterns		Diagram	Pattern scale	Applies for what demographic

Figure 46. Pattern example. (own image)

5.4 Pattern field

The patterns developed in this thesis are interconnected, and these relations are visualised in the pattern field (figure 47). This diagram illustrates the connections between patterns and in doing so is valuable because the connective structure of a set, shown in a pattern field, validates the pattern language to be comprehensive (Salingaros, 2000).

The pattern field is structured along two axes, one representing the four categories of the patterns and the other indicating the scale of intervention, ranging from individual objects to the city scale. This way, not only the connections between the patterns in the same category are identified, but also which patterns connect to patterns in different categories.

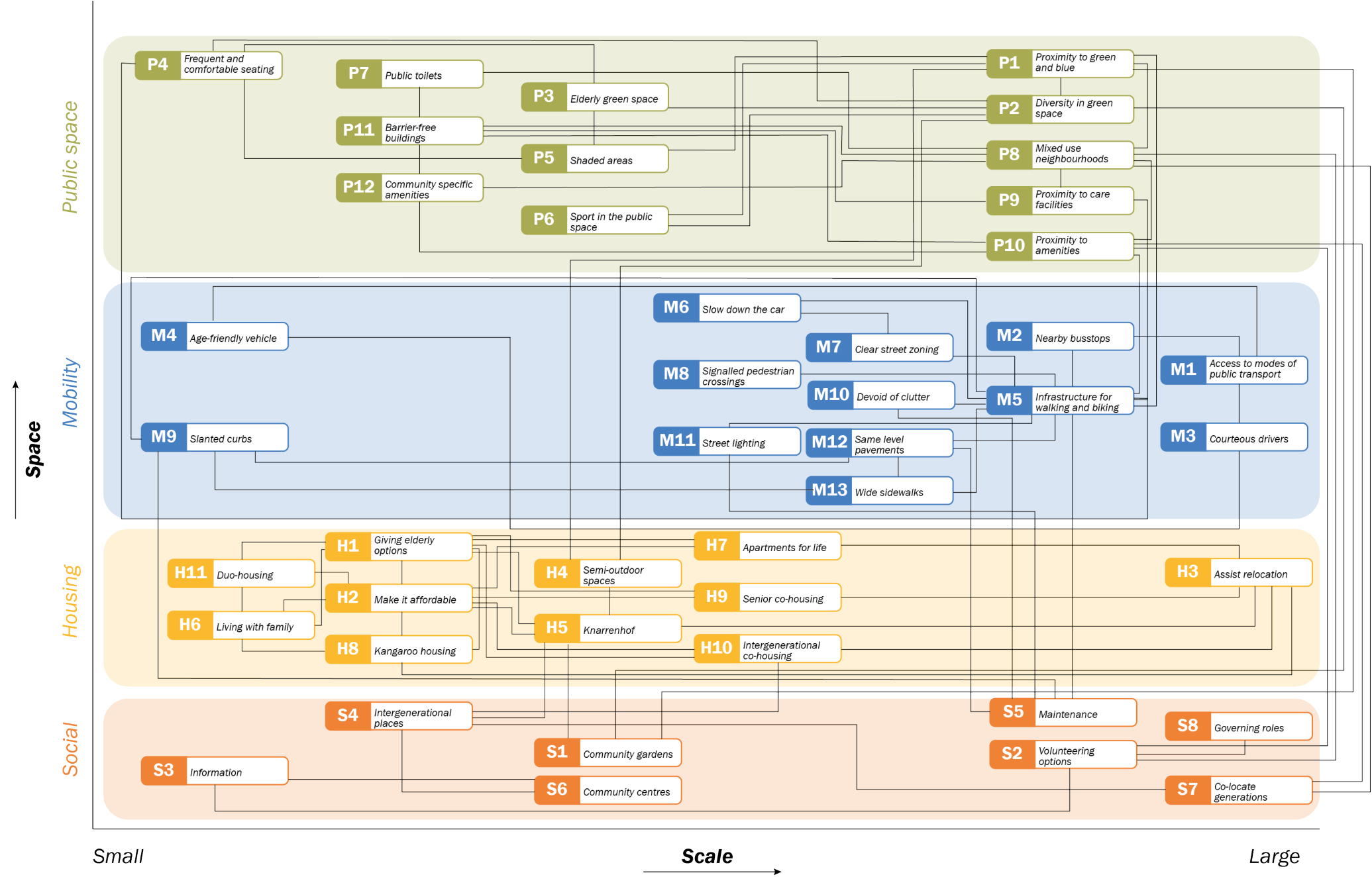


Figure 47. Pattern field. (own image)

Based on this pattern field multiple observations can be done. Firstly, the pattern field helps to identify key patterns with a high number of connections, suggesting a significant role in achieving age-friendliness. Patterns such as *M5 Infrastructure for walking and biking* and *P8 Mixed-use neighbourhoods* emerge as crucial interventions, as they are supported by, and contribute to patterns across the domains of mobility, public space and social interactions. These key patterns illustrate how smaller-scale interventions can support larger strategies. For example, smaller-scale patterns like, adding *seating*, ensuring *wide sidewalks* with *same-level pavement*, and *installing street lighting* can collectively support a larger infrastructure where walking and cycling is encouraged, rather than car-oriented streets.

A notable structural insight is the relative isolation of the patterns in the housing category. Unlike the other categories, housing patterns are predominantly connected to one another, with fewer relations to other categories. This distinction can be explained by the fact that the housing patterns focus predominantly on the private space of an individual, while the other categories engage more

with the public space and community interactions. Therefore, it is more common for patterns related to social interaction to be supported by a public space and buildings pattern. For example, how the availability and accessibility of amenities can offer volunteering work and promote community engagement. Nonetheless, this underlines the significance of the housing category, since age-friendly communities and ageing in place both emphasize quality of life, which extends over both private and public spaces. Therefore, incorporating housing typologies that support older adults in their private home, regardless of the form, is an essential component of age-friendly communities.

While many patterns are complementary, the field also reveals some possible tensions between patterns. Certain interventions may limit the ability to implement other patterns. These conflicts show the real-world complexity of urban planning and the context-dependency for implementing the pattern language. One example of a potential conflict is between patterns promoting housing typologies with single-family homes, such as *H5 Knarrenhof*, *H6 living with family*, *H8 kangaroo housing*, and *H11*

duo-housing against proximity and density based patterns, like P1 and P10 focusing on *Proximity to green and blue* and *Proximity to amenities*, which are more commonly realised in higher-density, mixed-use neighbourhoods. While single-family typologies might offer privacy, they require more land to achieve mixed neighbourhoods, multi-family typologies however create opportunities for effectively integrating housing, healthcare, retail, and green spaces within short walking distances. This proximity is especially important for older adults, as it reduces mobility barriers and supports independence.

5.5 Chapter conclusion

The sub-question leading this chapter was: *What are spatial and systemic patterns of age-friendliness related to urban planning and design?*

This chapter explored the pattern language methodology, resulting in the development of an Age-friendly urbanism pattern set. Originally introduced by Christopher Alexander, the pattern language approach allows for the dissect the complex and diverse variables of an age-friendly community into individual patterns that each address a specific problem and propose a solution. Grounded in the theoretical research of the age-friendly community framework and the interrelation between the domains (see chapter 2), a comprehensive pattern set established.

The age-friendly pattern set addresses urban planning with patterns, covering all eight domains of an age-friendly community, thereby ensuring a holistic approach. The patterns are grouped into four categories: Public spaces and buildings, Mobility, Housing, and Social interactions. The first three categories reflect the three domains of the physical environment, representing spatial dimensions of urban planning. While the final category captures the remaining

five domains, which primarily focus on services and social constructs, thereby addressing the systemic dimensions of age-friendliness.

Furthermore, the pattern field illustrates the connective structure of the patterns, making visible the relationships between individual patterns. This not only highlights how smaller interventions support larger key patterns, but also underpins the importance of the housing category as it extends the quality of life to the private space of an older individual. Key patterns, such as *Infrastructure for walking and biking* and *Mixed-use neighbourhoods*, emerge as central patterns with a high number of connections across categories. These patterns demonstrate how improvements in the built environment can create benefits for active and healthy ageing and social inclusion.

However, the pattern field also revealed the possibility of tensions between certain patterns. For example, low-density housing typologies, like a *Knarrenhof* may conflict with patterns that require proximity and density, such as *Proximity to green and blue* or *Proximity to amenities*. These conflicts highlight the context-

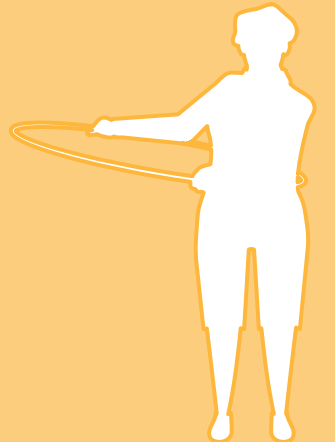
dependent nature of urban planning and the need to be critical of priorities when applying patterns in practice.

In conclusion, the 44 patterns illustrated and described in the Age-friendly urbanism pattern book cover both spatial and systemic patterns that can be utilized in age-friendly urban planning and design. By addressing multiple domains and scales, and by recognizing both connections and tensions within the developed set, the pattern language offers a flexible yet structured approach to supporting active and healthy ageing and housing typologies for qualitative and quantitative supply in the housing market.

06

Implementation

This chapter presents the implementation of the developed pattern language into the case study location. This is primarily done through focus scenarios, which establish the vision of the location together with the task definition. Additionally, the pattern interventions are shown in the implementation and strategy.



The previous chapters have established the foundational context of this thesis. Chapter 4 analysed the strengths and limitations of the case study area regarding age-friendliness, concluding with a task definition. Chapter 5 discussed the pattern language method and presented the developed pattern set (see pattern book). Building on this groundwork, this chapter shows the implementation in the case study area, answering both sub-question three and four. To answer the third sub-question: ‘What would the age-friendly community pattern language look like in Apeldoorn?’ this chapter examines what age-friendliness looks like in Apeldoorn and how it is realised over time. Structured around four focus scenarios: active ageing, healthy ageing, independence, and social inclusion, these values represent the overarching goals of the age-friendly community framework and support ageing in place. Each scenario implements patterns, using personas of older adults living in or around the case study area to illustrate their needs and the patterns’ practical impact. Furthermore, this chapter presents the location-specific design for Apeldoorn, outlining senior housing typologies suited for the case study

location. It further explains how these housing typologies can contribute to a better balance in the Dutch housing market. Finally, this information will form the basis for the strategy as well as the transferability of an age-friendly community, detailed in the last part of the chapter. The sub-question answered in the final part is as follows: ‘How can the pattern language and framework be transferable to other cities?’.



AGE
69 years

HOUSE
A seniorcomplex apartment

HOUSEHOLD
With her husband

NEIGHBOURHOOD
Near the city centre

Anneke

DAILY ACITIVITY
Anneke has a busy daily lifestyle, where she does volunteering work and sports and two times a week visits her mother, who resides in a care facility in Anklaar. Most of these activities she does by either bike or public transport, only with impractical destinations over 7 kilometres she uses the car.

RELOCATION
11 years ago she and her husband, who is a few years older, made the decision to move to their current residence because of his age. therefore, they now live in an apartment in a seniorcomplex. And moving would only be considered as health starts to decline.

SOCIAL CONNECTIONS
Many, including neighbours, friends and Truus, her mother.



AGE
Maria: 66 years
Jan: 70 years

HOUSE
owner-occupied detached house

HOUSEHOLD
Together

NEIGHBOURHOOD
Sprenkelaar

Jan & Maria

DAILY ACITIVITY
Together they volunteer two times a week in the city center and Maria goes swimming every thursday at the pool in Sprenkelaar. Aside from the pool and the shopping mall in Anklaar, there are no other amenities and activities in the neighbourhood, meaning they have to go more to the center. Luckily they are still very mobile so they can do this by bike.

RELOCATION
In their current home Jan and Maria raised their children. Now, as empty nesters, they are considering moving. But as they have bought this house many decades age, all current options are more expensive than staying.

SOCIAL CONNECTIONS
They often visit their children and grandchildren, who live in neighbouring cities and towns. Otherwise they have build a good relationship with neighbours and close living friends.



AGE
66 years

HOUSE
A rental terraced house

HOUSEHOLD
Alone

NEIGHBOURHOOD
Anklaar

Paul

DAILY ACITIVITY
Paul does spent time outdoors, like bridging or the local bingo afternoon. With a declined mobility cycling is not an option and both activities are outside the neighbourhood, so he takes the car.

RELOCATION
His spouse passed away a few years ago, leaving Paul alone in the house where they have lived all these years and created many memories. Now he lives alone with a lot of space and rooms he barely sees. Yet, Paul would not want to move.

SOCIAL CONNECTIONS
His children and their spouses help him when needed, and 2 siblings are also still visiting often.



AGE
Sandra: 61 years
Dirk: 55 years

HOUSE
A rental terraced house

HOUSEHOLD
Together

TOWN
Teuge

Sandra & Dirk

DAILY ACITIVITY
Both are still working, which takes up most of their day. But Dirk enjoys puzzling outside of work, and Sandra enjoys cycling.

RELOCATION
As their youngest kid has now left the house, Sandra and Drik are left with a big house where they have been living for 28 years and raised all three kids. They are considering relocation to a city as retiring comes closer, but it appears to be a tough process as there are currently no available and affordable options.

SOCIAL CONNECTIONS
Their kids still visit on occasion and both have friends they meet up with at least once a month.

Figure 48. Personas. (own image)

6.1 Scenarios

The adventure hub

Focused on active ageing, the adventure hub envisions Anklaar and Sprenkelaar as a hub where active ageing replaces retirement with continued exploration and engagement. Rather than promoting a passive retirement, this scenario creates a dynamic hub enabling older adults to sustain an active lifestyle. As discussed in chapter 2, active ageing refers to an individuals’ opportunity to continue to participate in a community to enhance the quality of life (Buffel et al., 2012). Extending beyond employment or physical exercise, active ageing also includes social, cultural, and civic activities. A key outcome for age-friendly communities as it simultaneously promotes social inclusion and independence.

For Jan (70) and Maria (66), two elderly residents living in Sprenkelaar, the Adventure Hub aligns with their lifestyle. Due to the current limited availability of amenities in the neighbourhood, they rely on their car and bike to get to amenities. While still in good mobility, an *Infrastructure for walking and biking*, alongside *Clear street zoning*, would make moving to and from the neighbourhoods easier. These two patterns allow elderly to stay mobile as older adults

often rely less on the car and more on walking and biking as mode of transportation. Clear zones for each mode and priority for pedestrians and cyclists therefore encourage the physical activity of older adults. In addition, a *Mixed-use neighbourhood* with close proximity to public buildings and green spaces would provide Jan and Maria with easier access to amenities they value. Mixed use neighbourhoods are often vibrant places with a smaller radius to preferred amenities and green spaces. That proximity is a crucial factor in the accessibility of these places as it allows individuals easier access, enabling older adults to remain active consumers and users. Moreover, Jan and Maria enjoy doing volunteering work to fill their weeks. Offering *Volunteering opportunities* or shared *Community gardens* in the Adventure Hub allows Jan and Maria to stay active. Because these activities can offer both mental and physical activity opportunities, allowing for both active ageing socially and through civic participation.

In conclusion, the Adventure Hub promotes active ageing not only through physical activity, such as fitness provided by sports in the public space, or walking and cycling

through the infrastructure for walking and biking pattern. But it also fosters active engagement through providing volunteering work or social activities, and amenities in proximity to stay active consumers.

The Adventure Hub

Active ageing for replacing retirement with exploration

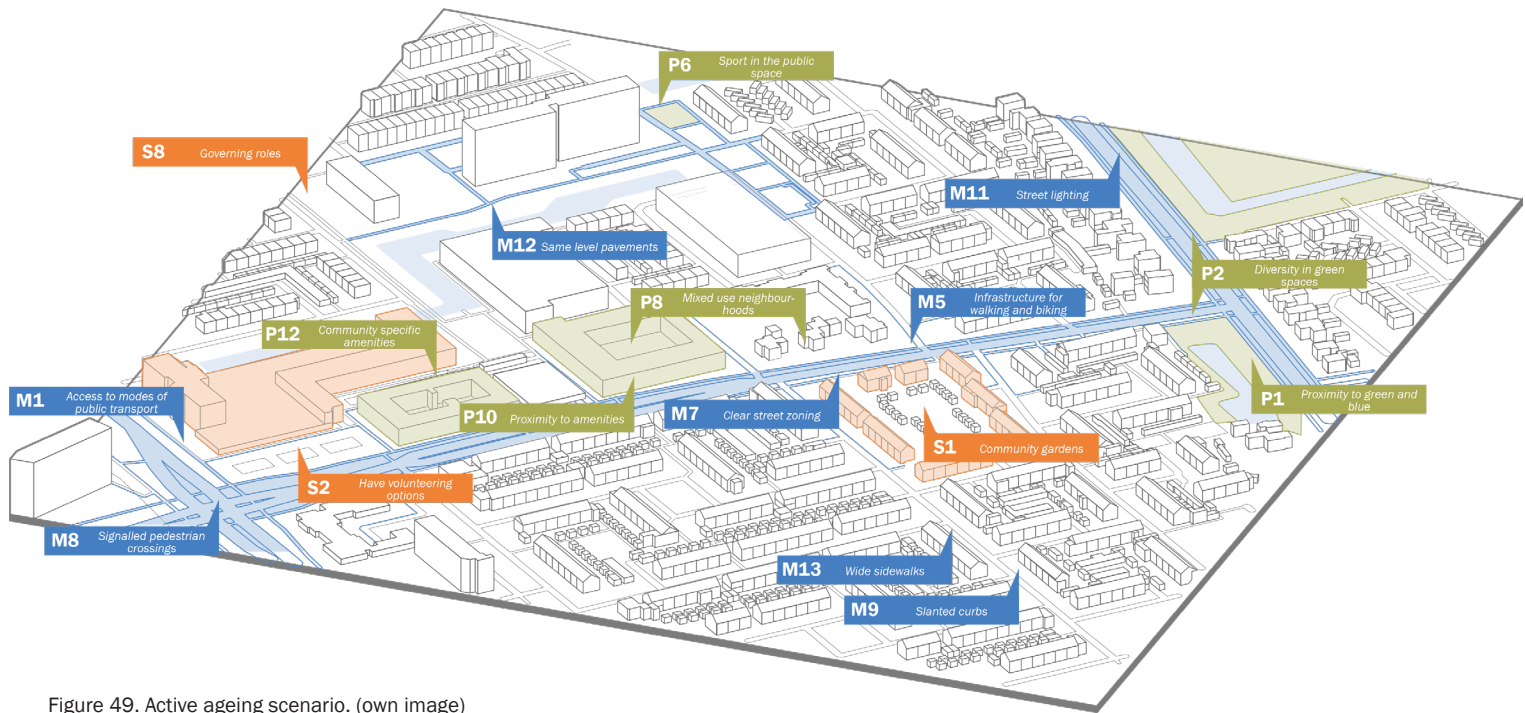


Figure 49. Active ageing scenario. (own image)



AGE
Maria: 66 years
Jan: 70 years
HOUSE
owner-occupied detached house
HOUSEHOLD
Together

Jan & Maria

NEIGHBOURHOOD
Sprenkelaar

DAILY ACTIVITY

Together they volunteer two times a week in the city center and Maria goes swimming every thursday at the pool in Sprenkelaar. Aside from the pool and the shopping mall in Anklaar, there are no other amenities and activities in the neighbourhood, meaning they have to go more to the center. Luckily they are still very mobile so they can do this by bike.

RELOCATION

In their current home Jan and Maria raised their children. Now, as empty nesters, they are considering moving. But as they have bought this house many decades age, all current options are more expensive than staying.

SOCIAL CONNECTIONS

They often visit their children and grandchildren, who live in neighbouring cities and towns. Otherwise they have build a good relationship with neighbours and close living friends.

The wellness Neighbourhoods

The Wellness Neighbourhoods scenario is focused on healthy ageing, where the built environment supports well-being and preventive healthcare. This includes promoting walking and biking, high-quality green spaces, and health services in close proximity. As previously mentioned, healthy ageing and health do not mean the absence of disease, rather it focuses on an individuals' ability to maintain their functional ability and lifestyle. Another key outcome for age-friendly communities as it also seeks to improve the quality of life of individuals by decreasing social isolation and loneliness.

Anneke (69) lives close to the centre in the neighbourhood De Parken, yet the Wellness Neighbourhoods would still support her and her mother. Her mother lives in Koningin Wilhelmina, the assisted living facility for people with dementia, and Anneke regularly visits her. *Clear street zoning* with *wide and smooth sidewalks* and *frequent benches* would allow them to go on walks when Anneke visits. Since cognitive impairments increases the risk of falling, these implications are especially important for Anneke's mother (Salmistu & Kotval, 2023). Outdoor hazards even

increase the fear alone, thus clear street zoning, with smooth, even, and clear sidewalks decreases the fear and allows Anneke to enjoy the time with her mother. Another feature contributing to mental and physical well-being, by being in nature, is frequent seating. Frequent seating takes away the challenge to walk long distances without rest, and creates opportunities for Anneke and her mother to enjoy nature and each other's presence. Additionally, housing typologies where care is provided nearby enhances Anneke's mother's ability for healthy ageing and ageing in place, contributing to her quality of life.

In conclusion, the Wellness Neighbourhoods foster healthy ageing for individuals' mental and physical well-being. Mental health is improved by the presence of quality green spaces, as this improves the physical health with decreasing chances for mobility issues. Aside from a good walking and biking infrastructure maintaining the mobility of older adults, implications like community gardens also contribute to social inclusion.

The Wellness Neighbourhoods
Healthy ageing for longevity

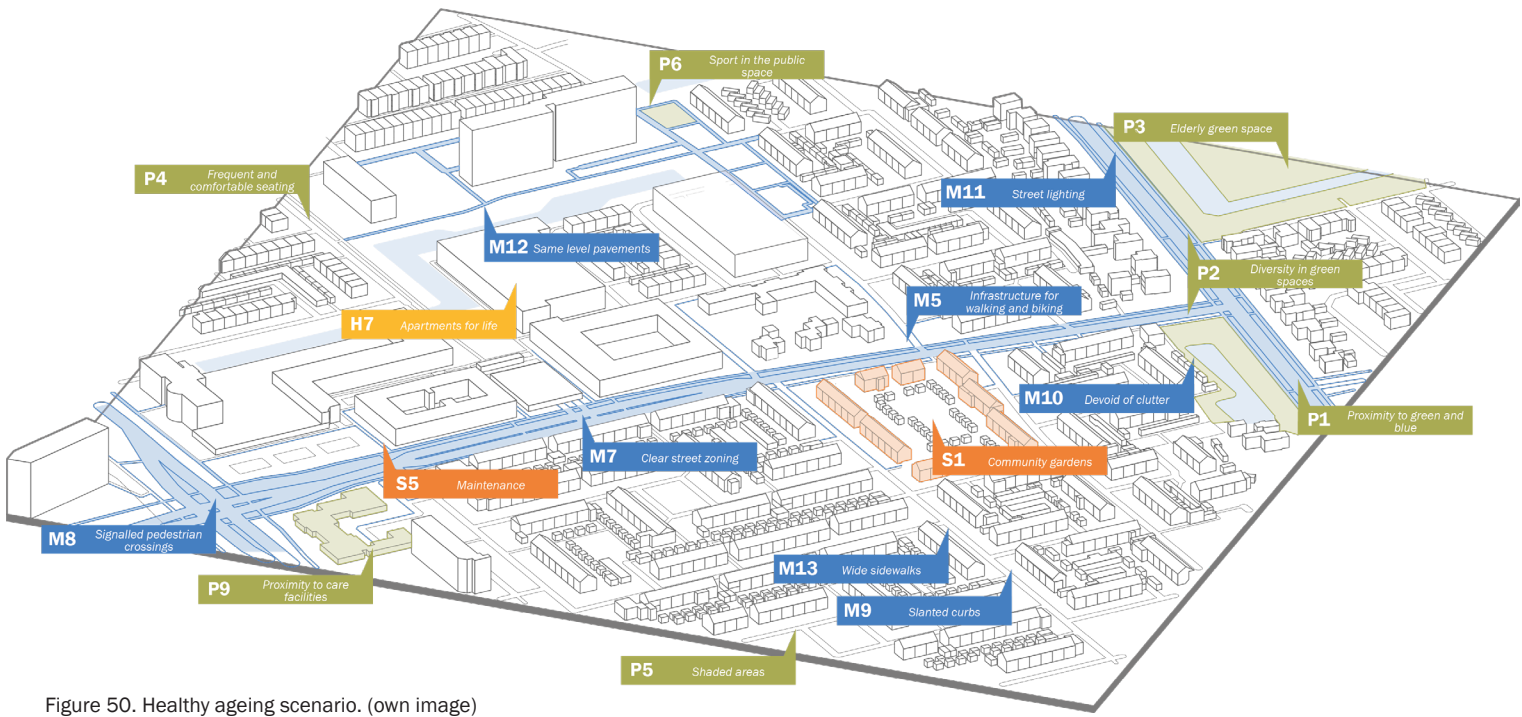


Figure 50. Healthy ageing scenario. (own image)



AGE
69 years

HOUSE
A seniorcomplex apartment

HOUSEHOLD
With her husband

NEIGHBOURHOOD
Near the city centre

Anneke

DAILY ACITIVITY
Anneke has a busy daily lifestyle, where she does volunteering work and sports and two times a week visits her mother, who resides in a care facility in Anklaar. Most of these activities she does by either bike or public transport, only with impractical destinations over 7 kilometres she uses the car.

RELOCATION
11 years ago she and her husband, who is a few years older, made the decision to move to their current residence because of his age. therefore, they now live in an apartment in a seniorcomplex. And moving would only be considered as health starts to decline.

SOCIAL CONNECTIONS
Many, including neighbours, friends and Truus, her mother.

Autonomous living

This focus scenario explores independence among older adults for safety and well-being. A model where ageing in place is supported as sufficient amounts of senior housing is available and the public space is designed with an infrastructure facilitating movement for older adults. As previously mentioned, independence is an important value for elderly. This was stated by participating elderly in the age-friendly city framework by the WHO, and it is also visible in the ageing in place trend where independent living is highly valued. Independence therefore is an essential focus for age-friendly communities as it factors in a good quality of life.

Autonomous living would allow Sandra (61) and Dirk (55) to look to their retirement with prospect. As they are thinking of moving to a different house where they can age in their retirement years, having various affordable opportunities in Anklaar and Sprenkelaar could convince them to move to Anklaar. Various options of elderly housing accommodates the different needs of elderly, thus having a higher chance for Sandra and Dirk to have a dwelling that supports their lifestyle

and needs. Relocation becomes even more appealing when supported by services that reduce possible barriers. Moving coaches or financial incentives ease the transition and help ensure the process does not feel destabilising. Equally important for Sandra and Dirk is staying informed about their neighbourhood and local activities. When *Information* is available and shared over various platforms, online, printed, or at key locations, it increases the accessibility. Staying up to date with local news, events, or *volunteering opportunities* enables older adults and Sandra and Dirk to feel connected and included in their community.

In conclusion, Autonomous Ageing envisions neighbourhoods supporting older adults' independence, fostering each lifestyle and need. Providing for both active lifestyles and quieter ones, with supporting infrastructure, proximity to various public spaces, and information on things like activities, housing, or helping platforms. Meaning also Sandra and Dirk can be more confident the urban environment will facilitate in maintaining independent lifestyles, while staying both physically and socially active and healthy as they desire.

Autonomous living
Independence for safety and well-being

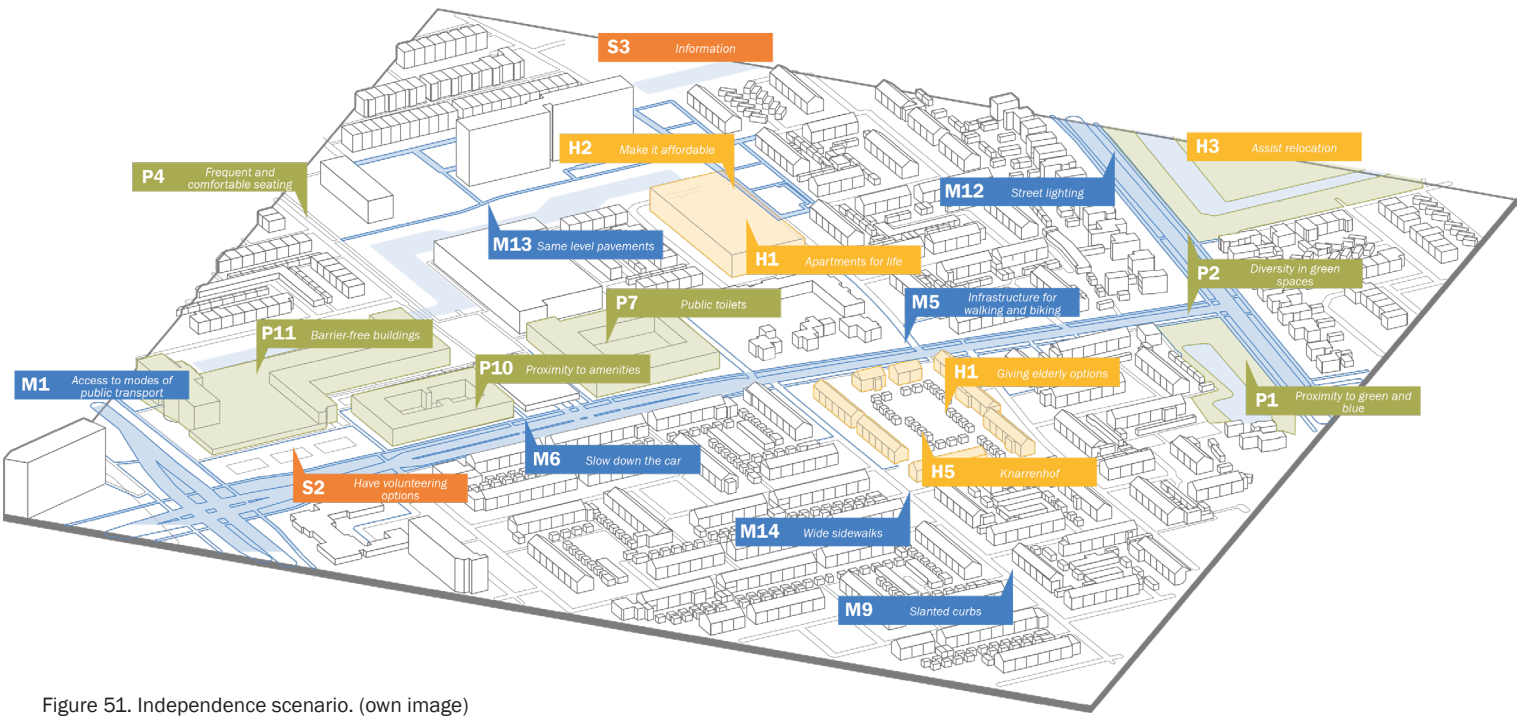


Figure 51. Independence scenario. (own image)



AGE
Sandra: 61 years
Dirk: 55 years
HOUSE
A rental terraced house

HOUSEHOLD
Together

TOWN
Teuge

Sandra & Dirk

DAILY ACTIVITY
Both are still working, which takes up most of their day. But Dirk enjoys puzzling outside of work, and Sandra enjoys cycling.

RELOCATION
As their youngest kid has now left the house, Sandra and Dirk are left with a big house where they have been living for 28 years and raised all three kids. They are considering relocation to a city as retiring comes closer, but it appears to be a tough process as there are currently no available and affordable options.

SOCIAL CONNECTIONS
Their kids still visit on occasion and both have friends they meet up with at least once a month.

The Intergenerational Neighbourhoods

Focused on decreasing loneliness and isolation, the intergenerational neighbourhoods is centred around social engagement, where seniors are not passive residents but contribute to the community and engage with other generations.

The Intergenerational neighbourhoods would help Paul (66) stay a part of the community. Still living in the rental terraced house where he and his spouse raised their children, the elderly *housing options* provided in the Intergenerational neighbourhoods could offer Paul with more social connections without having to move. Renovating his block to a *Knarrenhof* would give him both a better connection to his neighbours, while staying in the same house. Furthermore, providing the neighbourhoods with public spaces and places where different generations can come together supports Paul in a more active and healthy lifestyle.

In conclusion, the Intergenerational Neighbourhoods envisions an environment where older adults remain engaged in the community. Providing for both active lifestyles and quieter ones, various types of

social interactions are promoted, either in public spaces or more private setting integrated in housing typologies. By co-locating older adults, with amenities where younger generations are active, subtle social interactions are stimulated. Therefore, even for Paul social interactions and connections are possible for his lifestyle, improving his quality of life and well-being.

The Intergenerational Neighbourhoods
Social engagement for ending elder isolation



AGE
66 years

HOUSE
A rental terraced house

HOUSEHOLD
Alone

NEIGHBOURHOOD
Anklaar

Paul

DAILY ACITIVITY
Paul does spent time outdoors, like bridging or the local bingo afternoon. With a declined mobility cycling is not an option and both activities are outside the neighbourhood, so he takes the car.

RELOCATION
His spouse passed away a few years ago, leaving Paul alone in the house where they have lived all these years and created many memories. Now he lives alone with a lot of space and rooms he barely sees. Yet, Paul would not want to move.

SOCIAL CONNECTIONS
His children and their spouses help him when needed, and 2 siblings are also still visiting often.

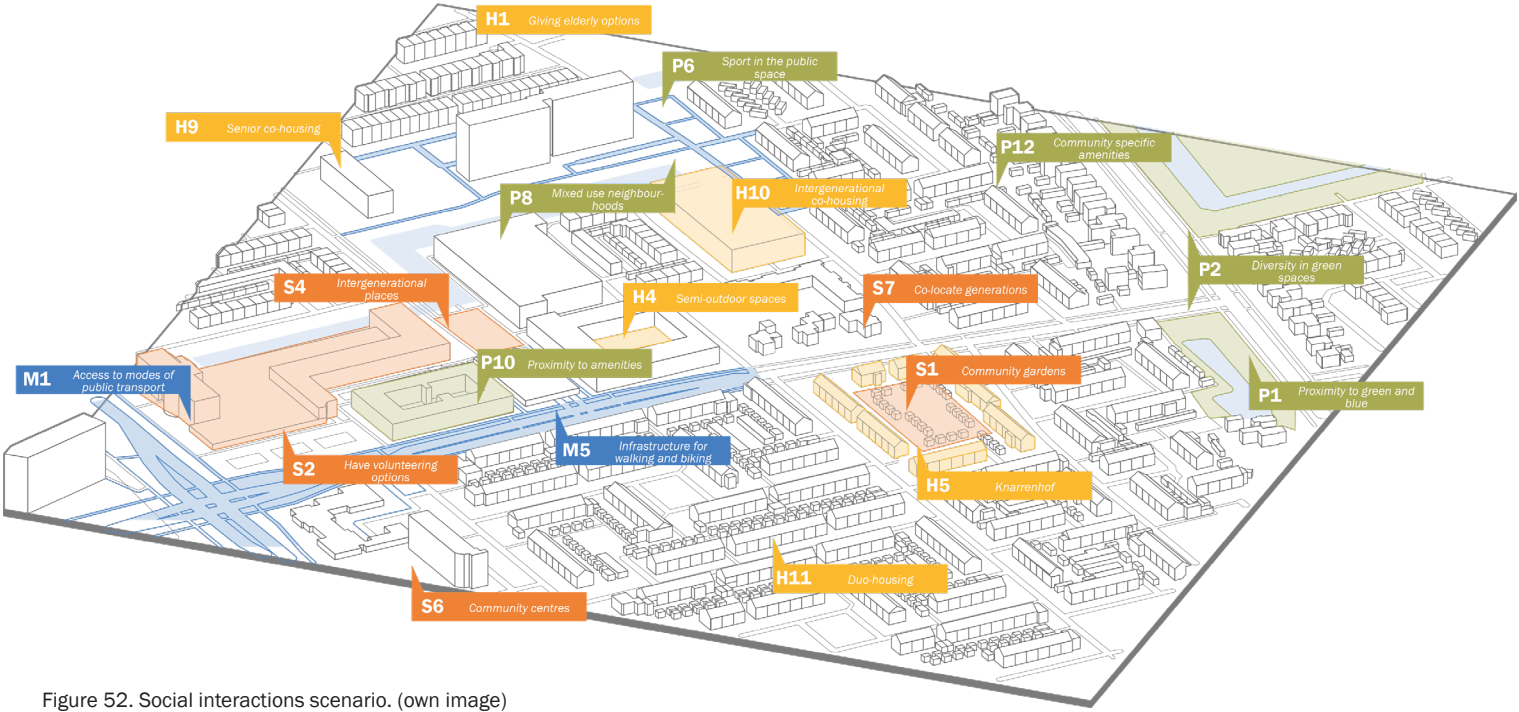


Figure 52. Social interactions scenario. (own image)

6.2 Vision

The four scenarios presented in chapter 6.1 focused on active ageing, healthy ageing, independence, and the social environment. These approaches were selected because they represent key outcomes and values in age-friendly communities and ageing in place. To transform the case study area into a fully age-friendly community, one that supports active and healthy ageing, fosters independence, and offers a supportive social environment, it is essential to integrate elements from all four focus scenarios.

Relating the four scenarios reveal several recurring patterns. For example, the pattern *Infrastructure for walking and biking* appeared in all four scenarios, highlighting how mobility options beyond the car can significantly enhance active mobility among older adults, thereby improving their overall health. Moreover, such infrastructure promotes independence by enabling older adults who rely on walking and biking to sustain their daily activities outside of the house, which in turn increases opportunities for social interaction. Furthermore, several patterns from the public spaces and buildings category, including *‘mixed use neighbourhood’*, *‘diversity in green*

spaces’, *‘proximity to amenities’*, and *‘proximity to green and blue’*, consistently emerged. This highlights that for older adults, it is not only the presence of outdoor spaces and public buildings that matters, but also their proximity and diversity, as these factors cater to a wide range of needs uses for older adults.

Figure 53 illustrates the vision for the neighbourhoods shaped by the most recurring patterns, identified across the four focus scenarios, and the task definition set in chapter 4.7, where the chances and urgencies were determined. It maps both existing and proposed amenities, ensuring that residents of both neighbourhoods fall within proximity of amenities. It also identifies suitable locations for senior housing typologies, highlights streets where improvements to walking and biking infrastructure are suggested, and points out existing green spaces that could be enhanced with new functions to increase the diversity and functionality. By 2040, the interventions proposed for Anklaar and Sprenkelaar will significantly impact the quality of life of older residents across multiple aspects.

Firstly, the designated locations for

senior housing typologies, as can be seen in the figure, will ensure that 25% of the housing supply in these neighbourhoods is senior-friendly, a major increase from just 2.3% in 2025. Divided over four different typologies, this allows the elderly residents to choose from a variety of suitable housing options that support different lifestyles and care needs. These typologies include solutions that enable ageing in place, such as Knarrenhof models, or Kangaroo housing where relocation to familiar settings is supported. But also rehousing options in apartment models that accommodate residents through their retirement, such as Apartments for life and Co-housing. The implementation of these apartment typologies requires a modest densification. Three building blocks north or the shopping centre in Anklaar would modify from single-family to multi-family dwellings, increasing overall density by approximately 10%. Meanwhile, the four apartment buildings in the southern part of Sprenkelaar are suitable for senior housing without requiring demolition, renovating apartments to ensure adaptability for elderly care needs. Therefore, a qualitative and quantitative supply of senior housing is facilitated in Anklaar and Sprenkelaar



Figure 53. Neighbourhood vision. (own image)

without drastic spatial interventions. Additionally, realising new senior housing doubles the re-housing chain compared to building standard housing, creating further flow in the local housing market (Renes, n.d.).

Moreover, the development of mixed-use neighbourhoods and the addition of a second amenity hub will improve accessibility and allow older adults to maintain daily routines independently. Because this new hub doubles the number of residents living within 400 meters of amenities. Through the strategic placement of senior housing near these hubs, the proportion of older adults within walkable distance to essential services increases substantially. Thus, making it easier for older people to do their activities independently.

Enhancing and expanding the green structure of the neighbourhoods also brings considerable environmental and health benefits. Increasing tree coverage and green spaces around the amenity in Anklaar introduces shaded areas in this high-movement zone. Shared gardens and courtyards within residential blocks further help to cool down dwellings, reducing heat-related risks and promoting both physical and mental wellbeing, according to ARUP (2019), outdoor

greenery can prevent heat-related casualties and reduce the number of falls among older adults by 30%.

A well-integrated mobility network that supports walking, biking and public transport plays a critical role in active and healthy ageing. Improved infrastructure can reduce the risk of developing mobility difficulties up to three times, while also decreasing the rate of mobility decline (ARUP, 2019). Furthermore, proximity to healthcare facilities or the availability of accessible transport for longer distances increases the likelihood of older adults attending medical care by 2.3 times (Mattson et al., 2010). Multiple interventions, such as community centres, volunteering options, governing roles, and intergenerational places, also stimulate social participation and inclusion. These promote interactions both among peers and across generations, directly addressing high levels of loneliness discussed in earlier sections (see figure 3). Since older adults experiencing loneliness are twice as likely to develop dementia, reducing social isolation not only improves well-being but also has broader implications for reducing the pressure on healthcare services.

Beyond their local impact, the implementation of these patterns is likely to influence dynamics between the case study location and other neighbourhoods in Apeldoorn. As illustrated in figure 54, improved senior housing options and enhanced physical environment structures may attract new residents to these neighbourhoods. Transformations to infrastructure and the accessibility of public transport will enable older adults to move more easily between neighbourhoods, broadening their social networks and daily activity spaces. This increased connectivity will also facilitate greater exchange between neighbourhoods, as people visit for leisure, social engagement, or community activities, while residents themselves can more readily access opportunities elsewhere.

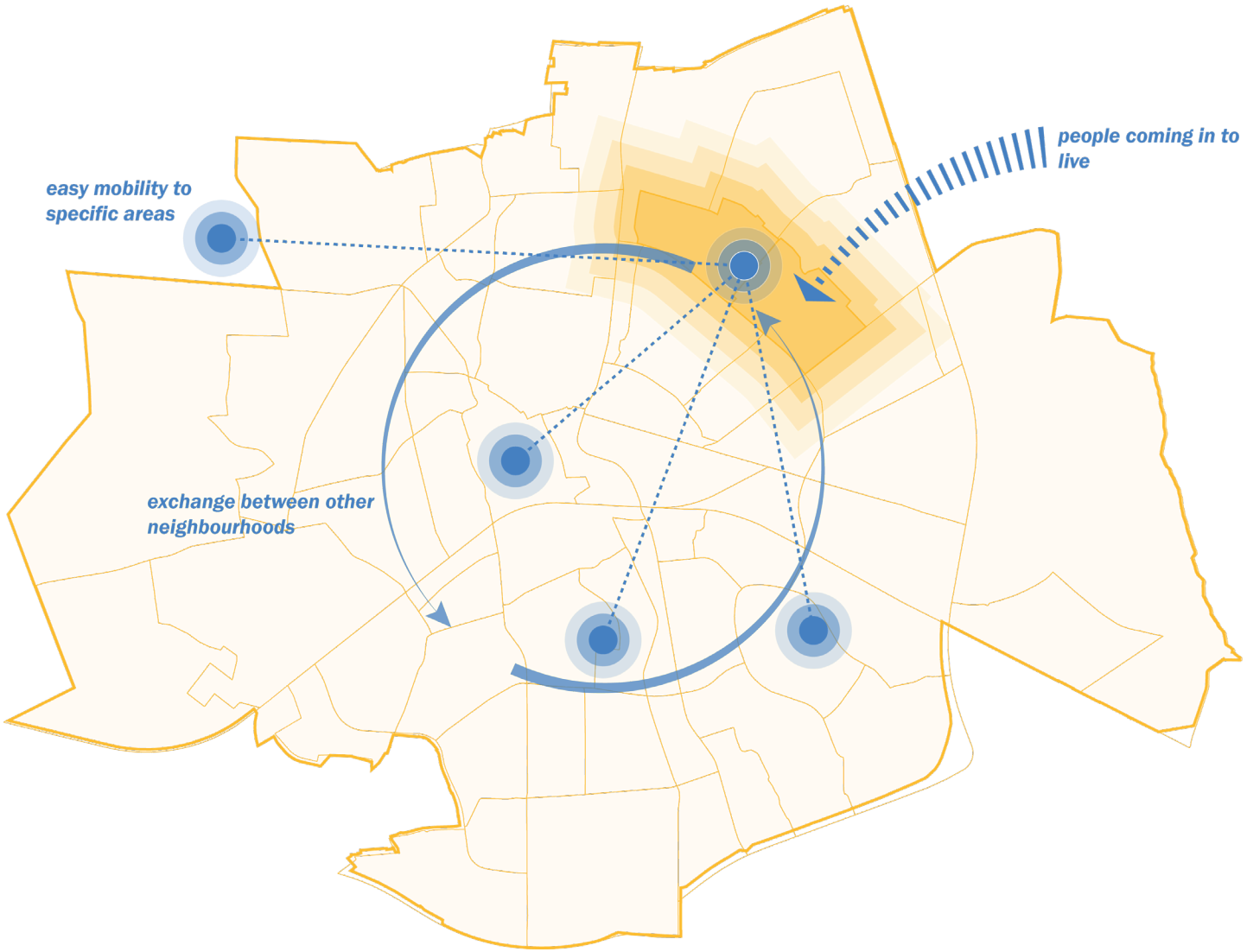


Figure 54. City vision. (own image)

6.3 Implementation

In this section, the spatial implications from the developed pattern set are incorporated into the case study location. This illustrates how the pattern language can be applied in Anklaar and Sprenkelaar to achieve age-friendliness. Based on the task definition, scenarios, and vision, three representative spots depict the collaboration between the patterns to support active and healthy ageing and enhance the quality of life for older individuals.

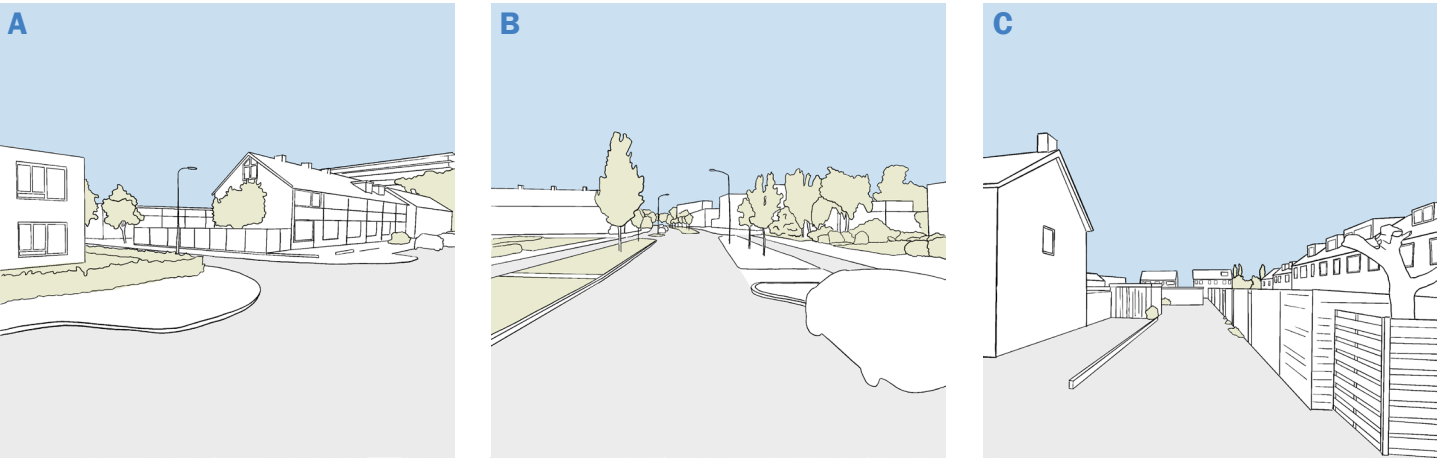


Figure 55. Current neighbourhood location situations. (own image)

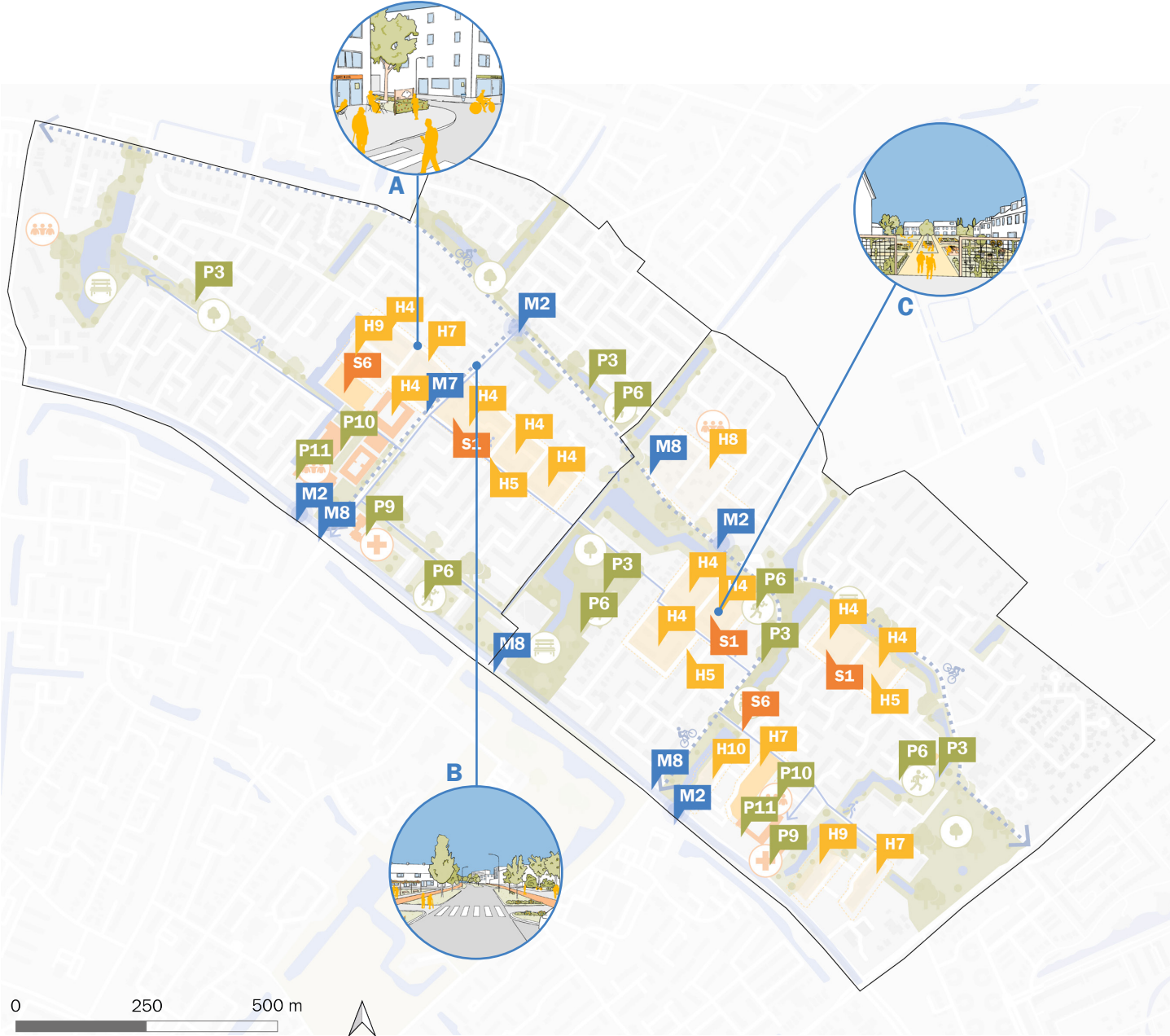
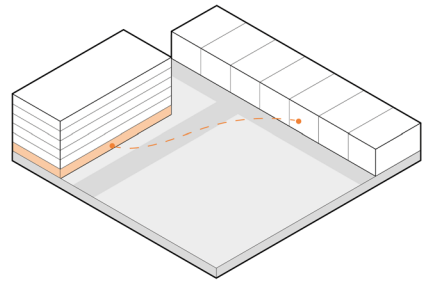


Figure 56. Neighbourhood implementation locations. (own image)

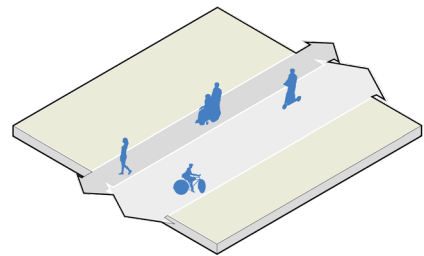
The lively, vibrant character of this spot exemplifies how multiple spatial and systemic patterns can be implemented in a compact place. It demonstrates how several small-scale implementations collectively contribute to the broader concept of age-friendliness. For example, the pattern *proximity to amenities* serves as a place-making pattern that ensures amenities are close at hand. However, this can be strengthened when paired with *barrier-free buildings*, a pattern ensuring accessible entry for older adults to the realised amenities. Similarly, *infrastructure for walking and biking* functions as a primary mobility pattern, which is supported by detailed patterns, such as *slanted curbs*, *wide sidewalks*, *same level pavement*, and *street lighting*. These smaller design implications significantly impact the ability of an older adult to age actively and healthily by promoting independent and safe walking or biking through the neighbourhood.

Furthermore, two possible housing typologies complementing the vibrant mixed-use character are *apartments for life* and *senior co-housing*. These multi-family housing typologies allow for ground floor public amenities and offer close proximity with housing

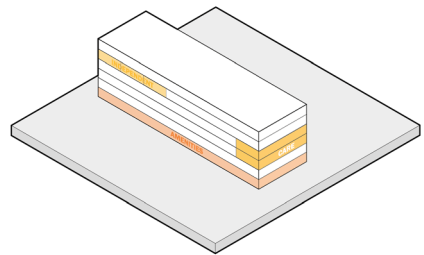
above. Providing various housing options centred around elderly housing, one emphasizes individual housing and the other a collaborative approach, but both encouraging ageing in place. Lastly, the presence of amenities enables opportunities for event and activities. Thus, a good distribution of information over various channels is essential. Either online websites for those digitally active, physical boards for those wandering around, or printed in key locations like care practices, libraries, or community centres for more targeted spreading.



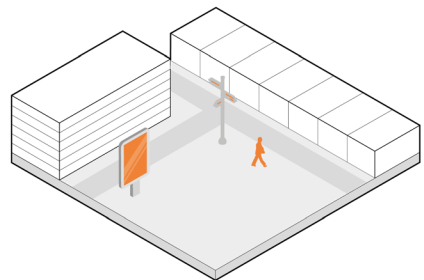
P10 Proximity to amenities



M5 Infrastructure for walking and biking



H7 Apartments for life



S3 Information

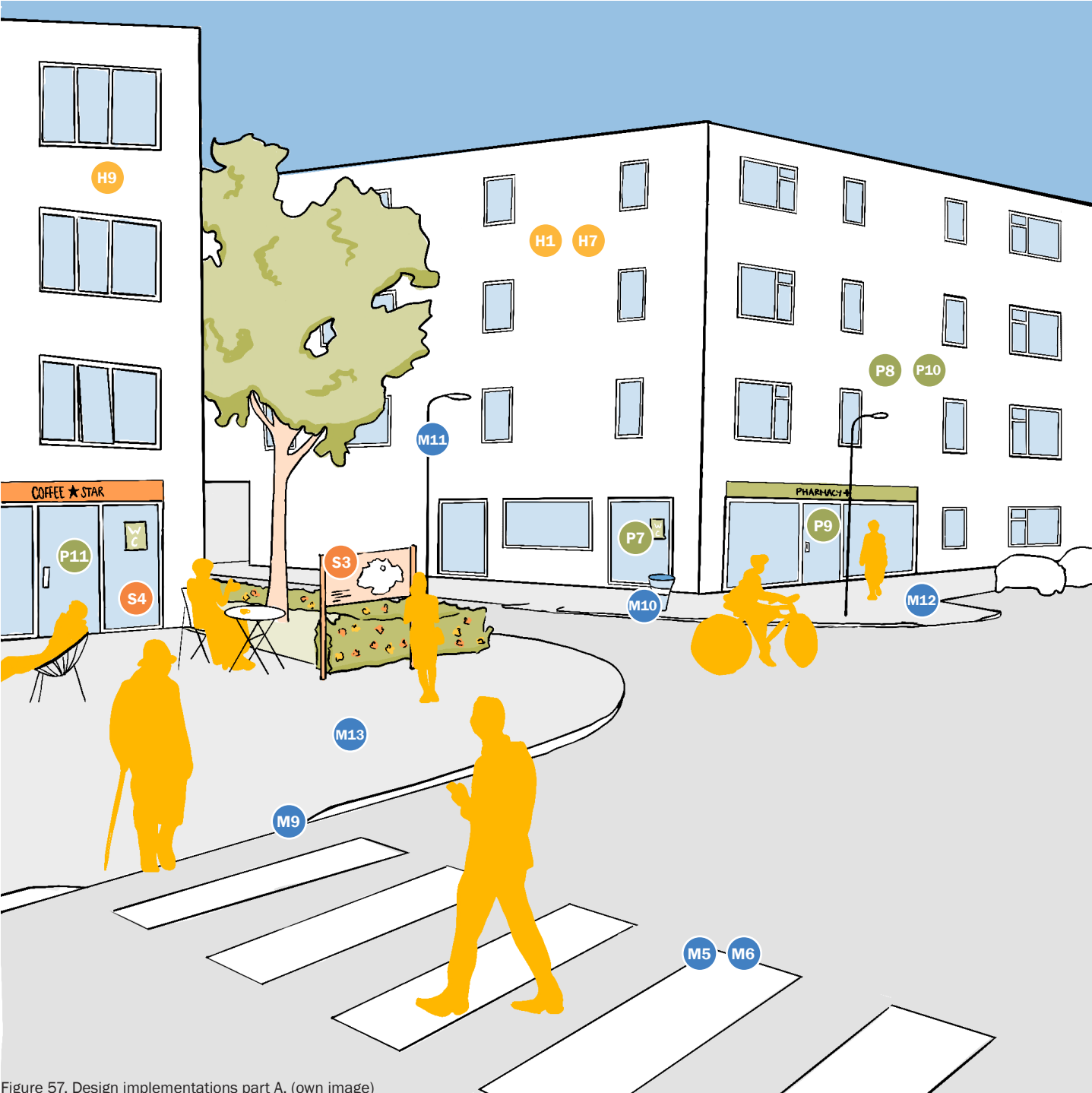
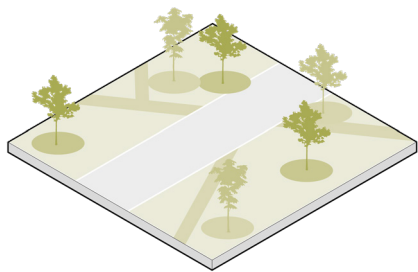


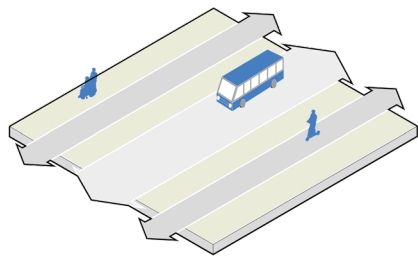
Figure 57. Design implementations part A. (own image)

Mobility and infrastructure is a key facilitator for an individual's ability in active and healthy ageing and carrying out daily tasks independently. Streets currently oriented toward car use can be gradually adapted into pedestrian and biking infrastructure through the implementation of patterns that prioritize safety and comfort. Facilitating for those dependent on walking or biking, without diminishing the car use for those with limited mobility. *Clear street zoning* actively enforces separate zones so each mode of transport can safely traverse, while crosswalks and give-way road markings help slow down cars. Additionally, strategically placed outdoor sport stations along pedestrian sidewalks, subtly promote easy access exercise, encouraging physical activity.

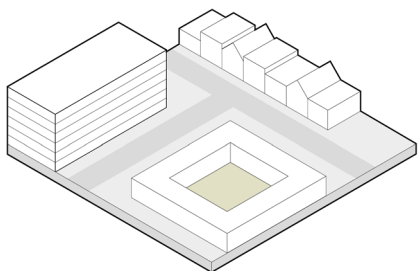
In addition, the maintenance of common roads and sidewalks is an important pattern in remaining accessibility and usability. For example, seasonal interventions like the municipality arranging the removal of fallen leaves from sidewalks, is a small but significant action to ensure safe mobility for older adults.



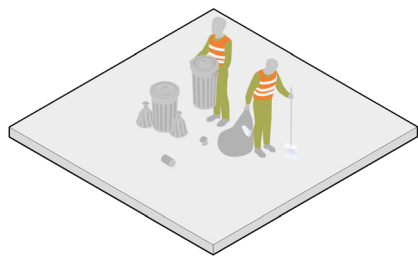
P6 Sport in the public space



M7 Clear street zoning



H1 Giving elderly options



S5 Maintenance

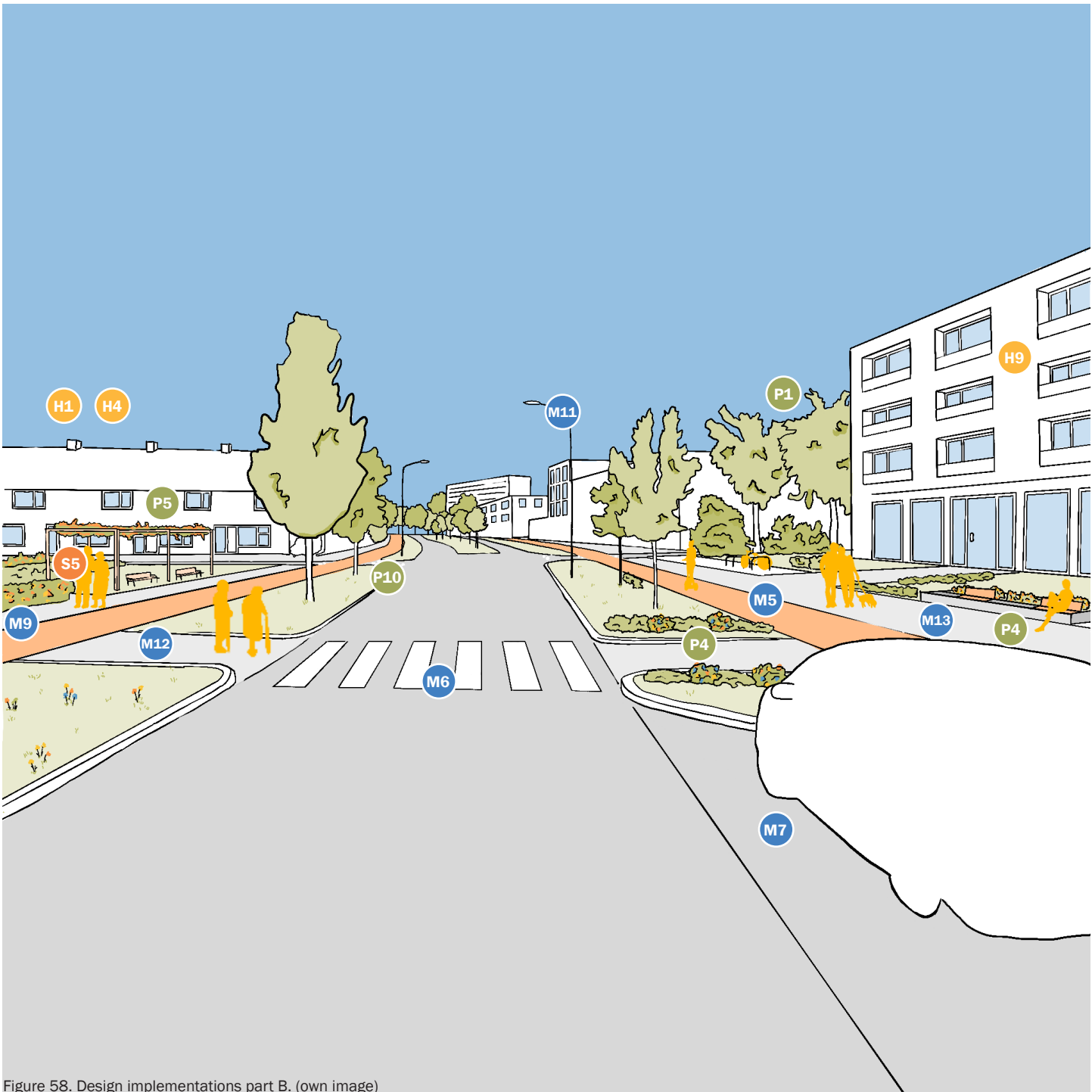
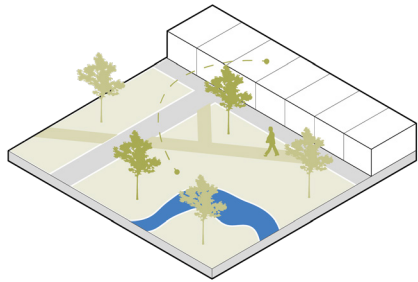


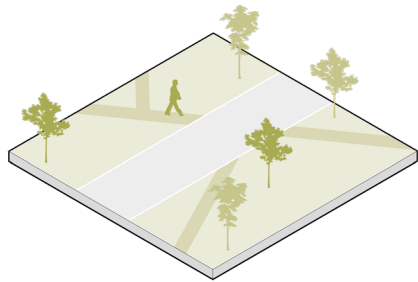
Figure 58. Design implementations part B. (own image)

Social inclusion and participation, although essential for age-friendliness, may not always involve partaking in volunteering work or governing roles. Therefore, fostering casual social inclusions close to home and with neighbours is essential, reducing loneliness and isolation. A housing typology supporting this, is the *Knarrenhof*, where neighbours agree to support each other socially and a shared courtyard encourages interaction. With this typology, green and blue are in close proximity to the home because of the courtyard where residents themselves can garden, encouraging healthy ageing simultaneously. Producing a *community garden* in the courtyard can further enhance this as well as active ageing and intergenerational interactions. Requiring light physical activity, but collaborative participation where residents of all ages can come together.

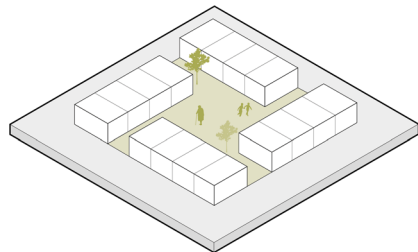
Moreover, *same level pavement* or well-designed paths in these semi-public outdoor spaces ensure that individuals with declined mobility are not excluded from participating. Through this typology, an age-friendly community is embedded not just in large-scale infrastructure but in the daily, lived experiences of older residents.



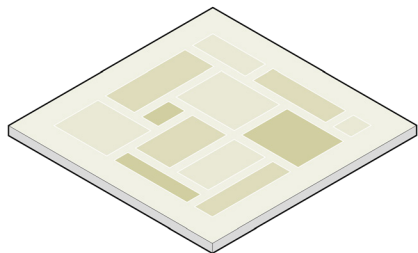
P1 Proximity to green and blue



M12 Same level pavements



H5 Knarrenhof



S1 Community gardens

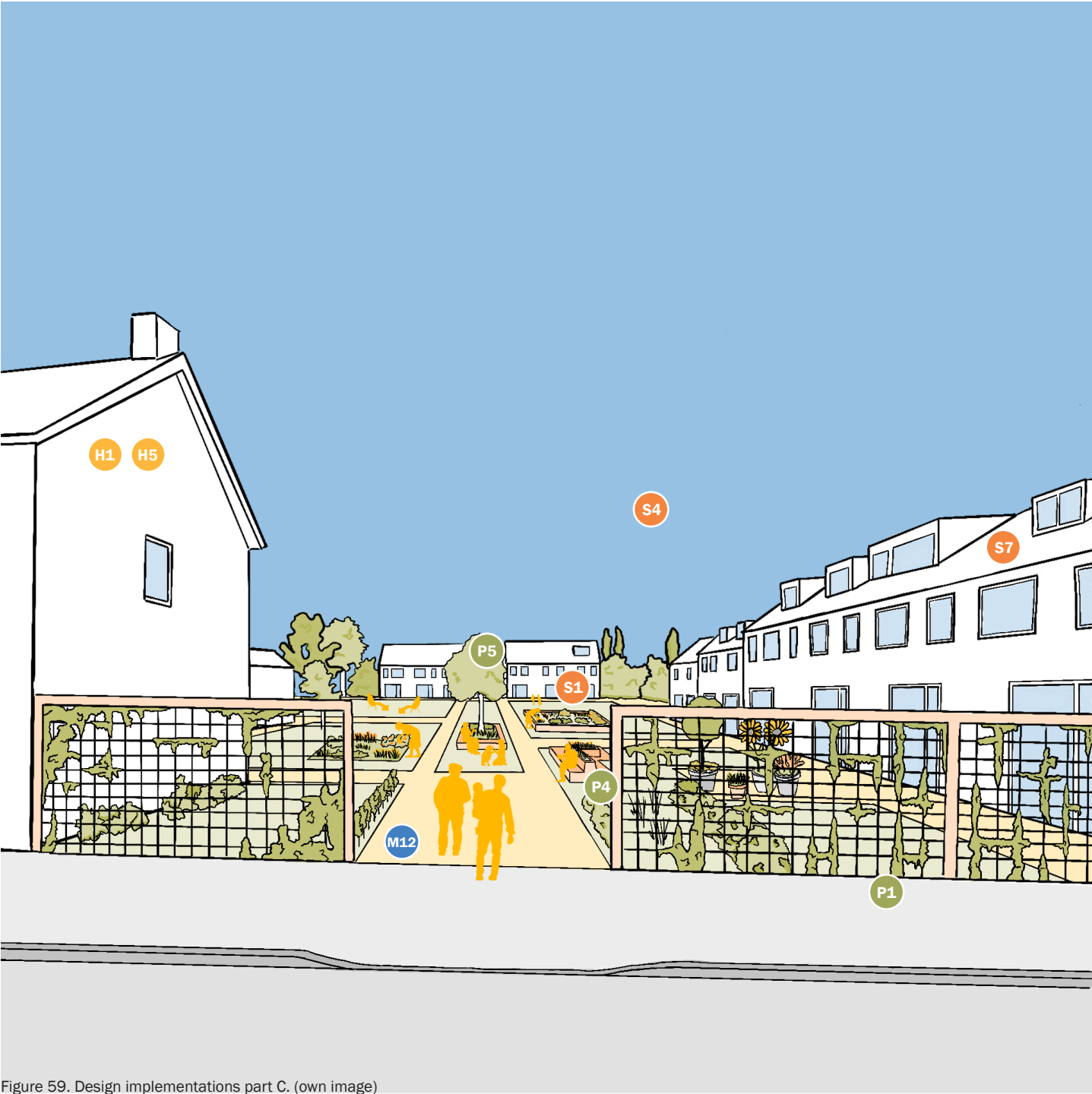


Figure 59. Design implementations part C. (own image)

In figures 60 and 61, two sections further illustrate how the patterns are implemented, focusing on infrastructure and the green-blue structure.

Section 1 shows a frequently used road adjacent to the shopping centre in Anklaar, a road that already exhibited several age-friendly features. Patterns such as *clear street zoning, wide sidewalks, same level pavement, and street lighting* were already implemented, possibly due to the renovations of the shopping centre in 2020. This creates a relatively accessible and safe infrastructure for older adults.

However, some key patterns were still missing. The section with the integrated patterns depicts an improved infrastructure for active and healthy ageing. Previously, the area lacked sufficient pedestrian crossings, making access by foot or bicycle less convenient compared to car travel. By implemented *infrastructure for walking and biking*, more crossings and continuous pedestrian and cycling routes are introduced. The revised design supports a wider range of mobility options for older adults, improving access to this key amenity and contributing to their independence

and active and healthy ageing.

The second section illustrates a green space in Sprenkelaar, which was previously shown in figure 26. In its current state, the location lacked clear functionality and usability, particularly for older adults. However, the close proximity to surrounding homes and the trees creating shaded areas revealed several opportunities for improvement, in particular regarding access to green and blue spaces.

Despite the advantages, the area lacked essential features, such as seating and a paved sidewalk, limiting the use and accessibility. To improve this, several patterns were integrated into the area. A wide, same level, paved sidewalk on the left side of the road allows

for comfortable and safe pedestrian movement through the green space. Additionally, strategically placing seating next to the sidewalk invites people to sit and embrace nature, while also offering a place to rest for elderly.

Together, these modest yet meaningful interventions transform the space into a more inviting environment, supporting both active and healthy ageing by making green spaces not only accessible but also inviting and functional for older adults.

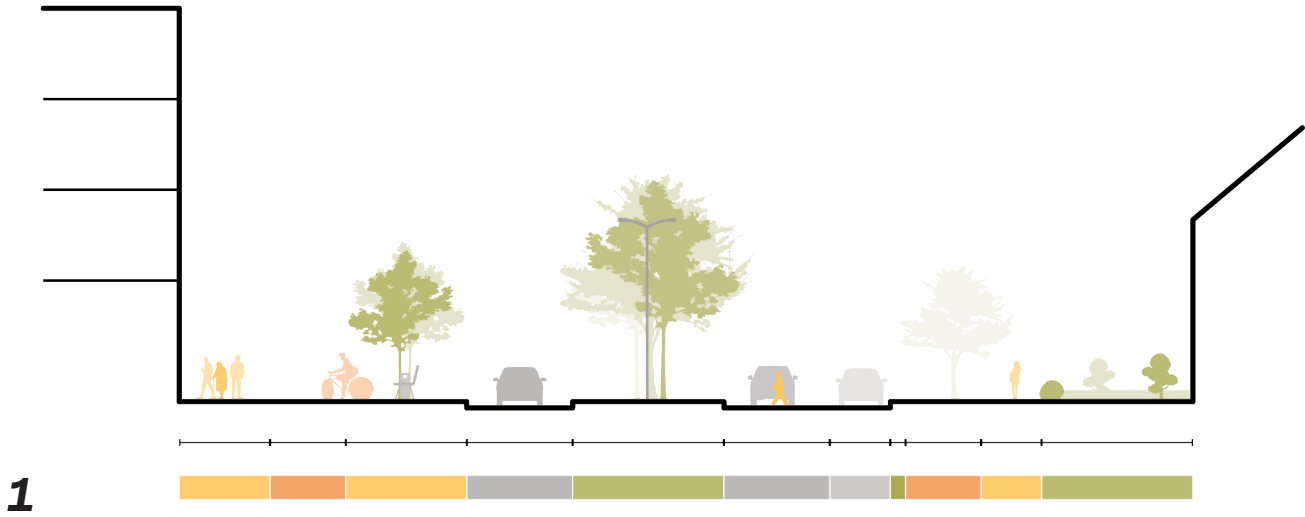
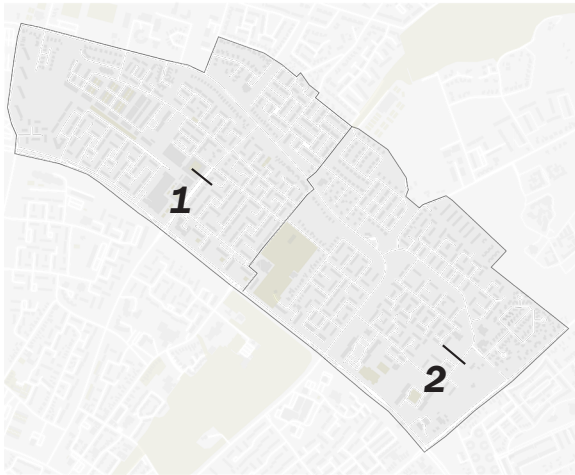


Figure 60. Neighbourhood section Anklaar. (own image)

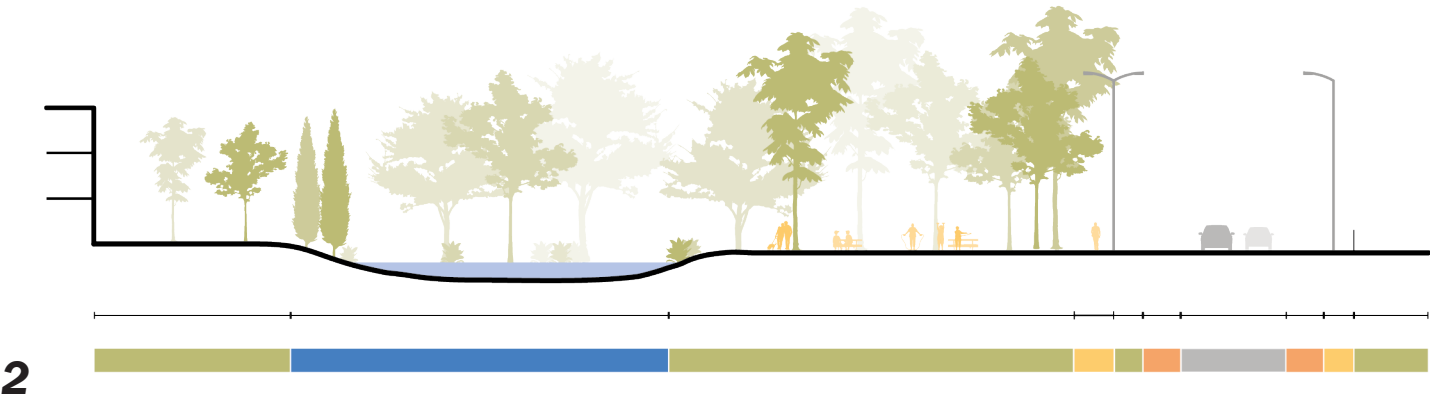


Figure 61. Neighbourhood section Sprenkelaar. (own image)

6.4 Housing

In chapter 2.3 housing initiatives on senior housing were explored. Setting these initiatives against the age-friendly community framework revealed some were more fitting for age-friendliness than others. Resulting in seven housing patterns explaining senior housing typologies. After the socio-spatial analysis and task definition in chapter 4 and the developed pattern set in chapter 5 conclude four of these typologies to be valuable options in Anklaar and Sprenkelaar. These senior housing typologies and how they contribute to Apeldoorn becoming age-friendly are discussed in this section.

The first typology is the Knarrenhof, a typology not exclusively for elderly, but it functions as a small, close-knit community. Where single-family homes are enclosing a collective courtyard, replacing private backyards with a larger semi-private courtyard. While residents give up some individual outdoor space, they gain access to a supportive social network of neighbours. Those who choose to live in a Knarrenhof commit to mutual support, fostering social interaction. This living arrangement also facilitates informal care, such as helping with groceries or gardening with them.

As Anklaar and Sprenkelaar are two post-war neighbourhoods with similar housing, a Knarrenhof is a small-scale change. The single-family houses currently framing the neighbourhoods only require the outdoor space to change, without adjusting the dwellings. In return, a larger semi-private courtyard is gained and a social support network can be fostered.

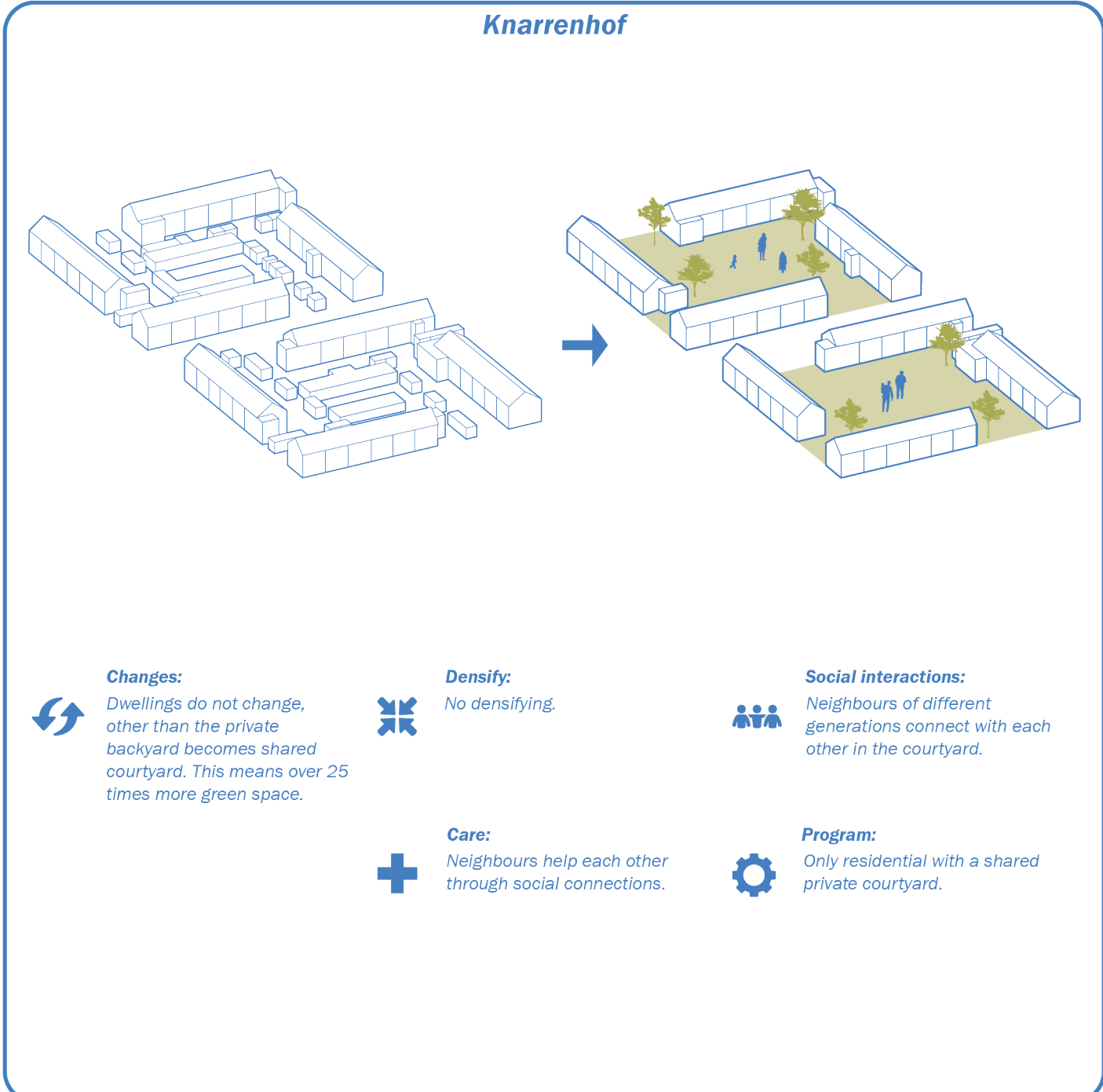


Figure 62. Knarrenhof typology. (own image)

The second and third typology relies on multi-family homes, possible through either apartments for life or co-housing. Co-housing could focus on senior only, but can also foster intergenerational connections with intergenerational co-housing.

Apartments for life is a typology where elderly can live, regardless of the need for care. These apartment buildings are exclusively for seniors, but with public amenities on the ground floor that are open to outside community. The apartments vary in size, just like the assisting services. Older residents could live in apartments for life completely independent, with the occasional need for a general practitioner based at the ground floor. But as people age, increasing levels of care can be provided by professional caregivers, adjusted to their needs.

In Apeldoorn, this typology has a slightly different approach than the assisted housing in Koningin Wilhelmina or Het Socrateshuis, where only older adults in need of care live. In apartments for life, this care is adjusted to the needs of the residents. Therefore, active and independent older adults are able to take residency, with the prospect that when needed in later life care

is available. This guarantee fosters independence and ageing in place.

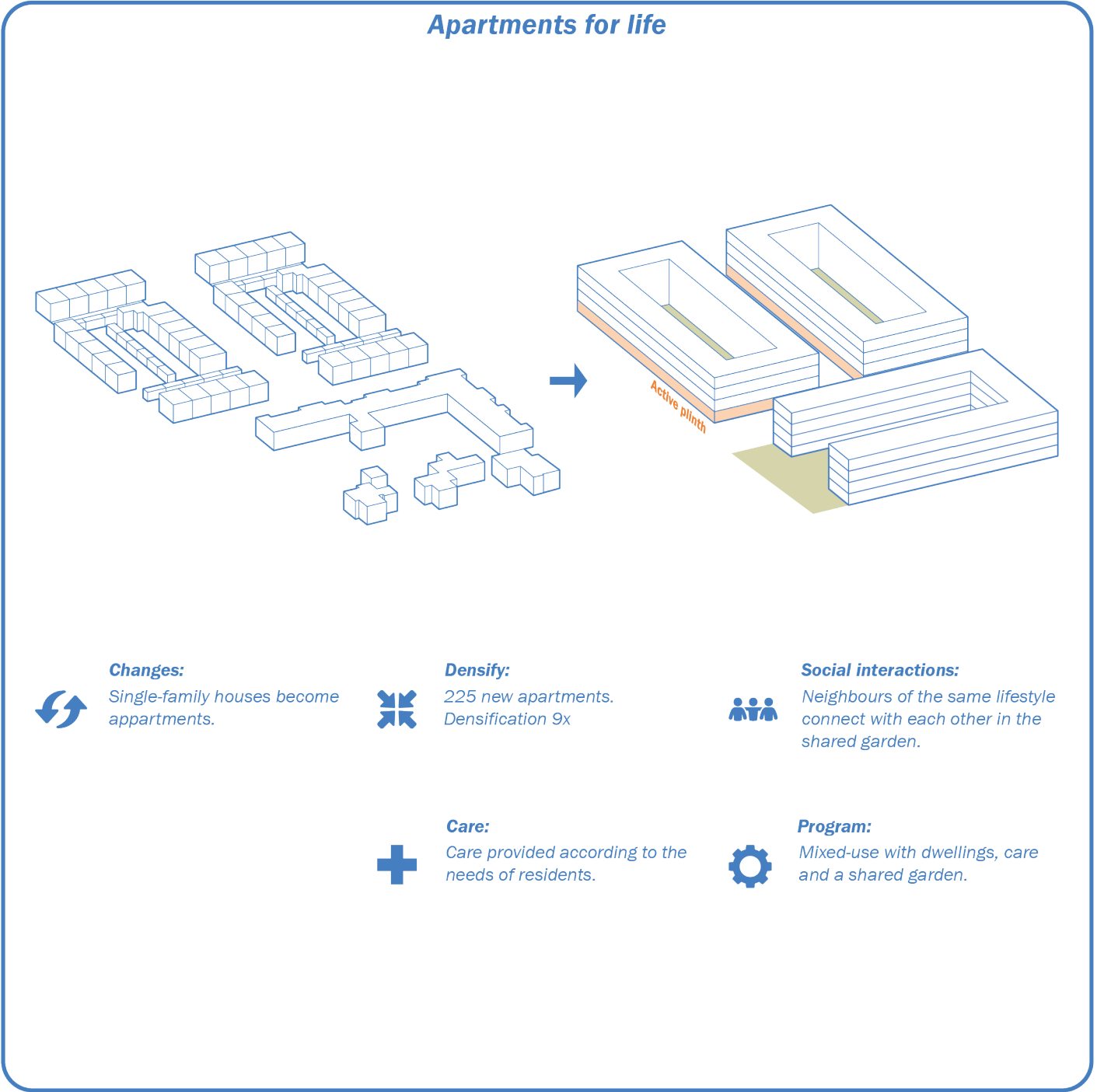


Figure 63. Apartments for life typology. (own image)

Intergenerational and senior co-housing is a typology encouraging a collective living model that promotes self-help, social support and interaction. Where senior co-housing is exclusively for older adults, intergenerational co-housing focuses on social interactions among different generations. For both, this means a smaller-scale apartment building, where some space is traded for common shared space. The typology strives for a living environment where residents help each other through informal care and social interactions.

For Anklaar and Sprenkelaar, the implementation of this housing typology would require renovations to existing housing, because the current supply does not provide this typology. However, implementing co-housing also benefits the neighbourhoods. Since, this slight densification would help with the municipality’s policy for urban infill. Additionally, social inclusion is supported and a more vibrant, mixed use neighbourhood could be achieved, fostering active and healthy ageing.

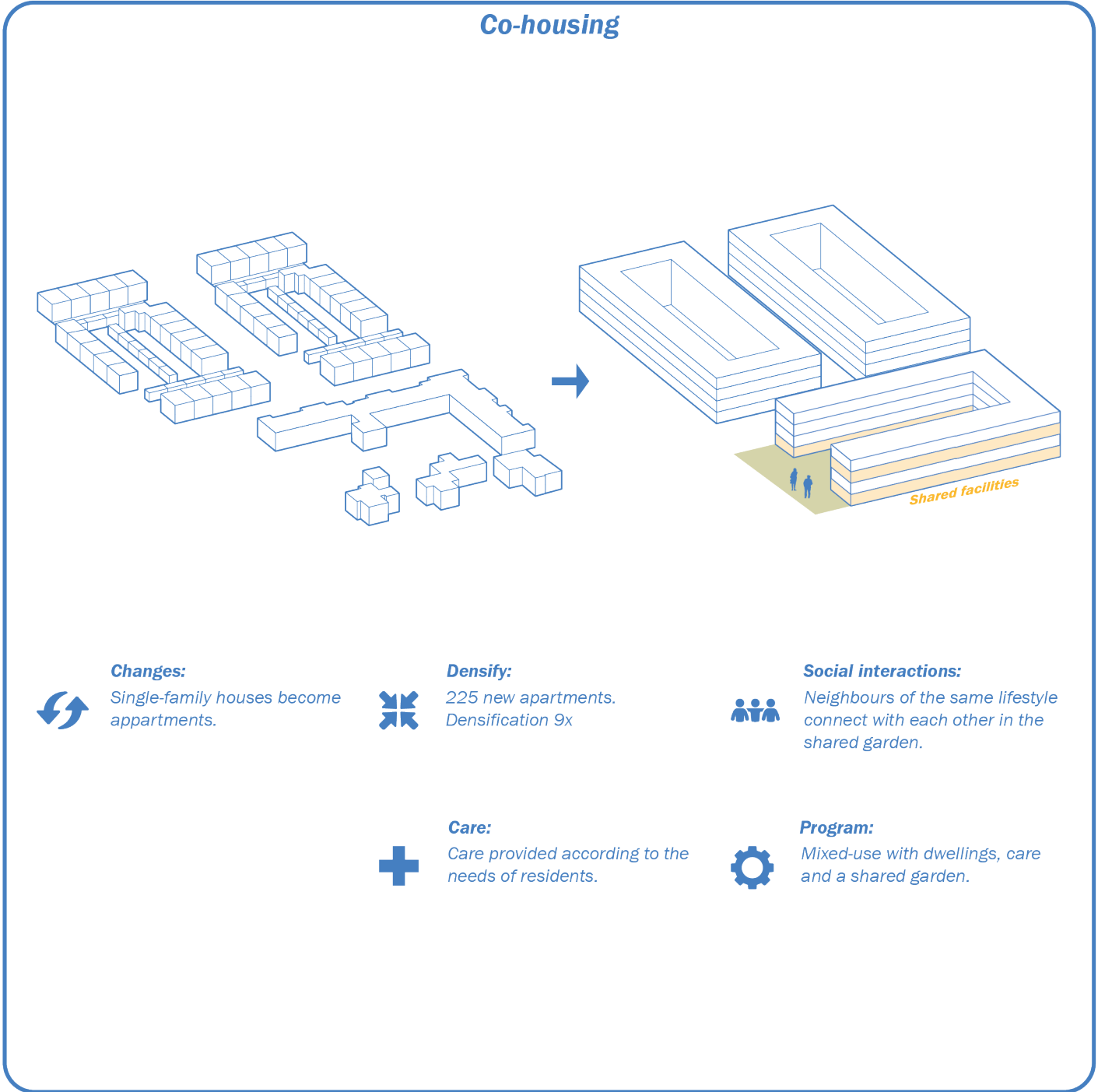


Figure 64. Co-housing typology. (own image)

The last typology contributing to age-friendliness in Apeldoorn is a kangaroo dwelling. Kangaroo housing is an additional unit attached to or situated in the yard of a single-family home. This typology is based on an older person living in the unit while a caregiver, family member, or tenant occupies in the main house. Or vice versa, with the older adult living in the home, while the caregiver lives in the unit. This enables informal care and fosters daily social interactions, where the older person could be helped with things like cooking and eating together or more care related services, depending on what the older adult needs.

Just like the Knarrenhof typology, kangaroo housing is a small-scale change. Since Anklaar and Sprenkelaar are two post-war neighbourhoods with mostly single-family houses. Those single-family houses only require an additional unit in the backyard, without adjusting the dwelling. In return, this typology allows older adults to live in a safe environment with a familiar tenant. A tenant who can provide necessary help and social interactions.

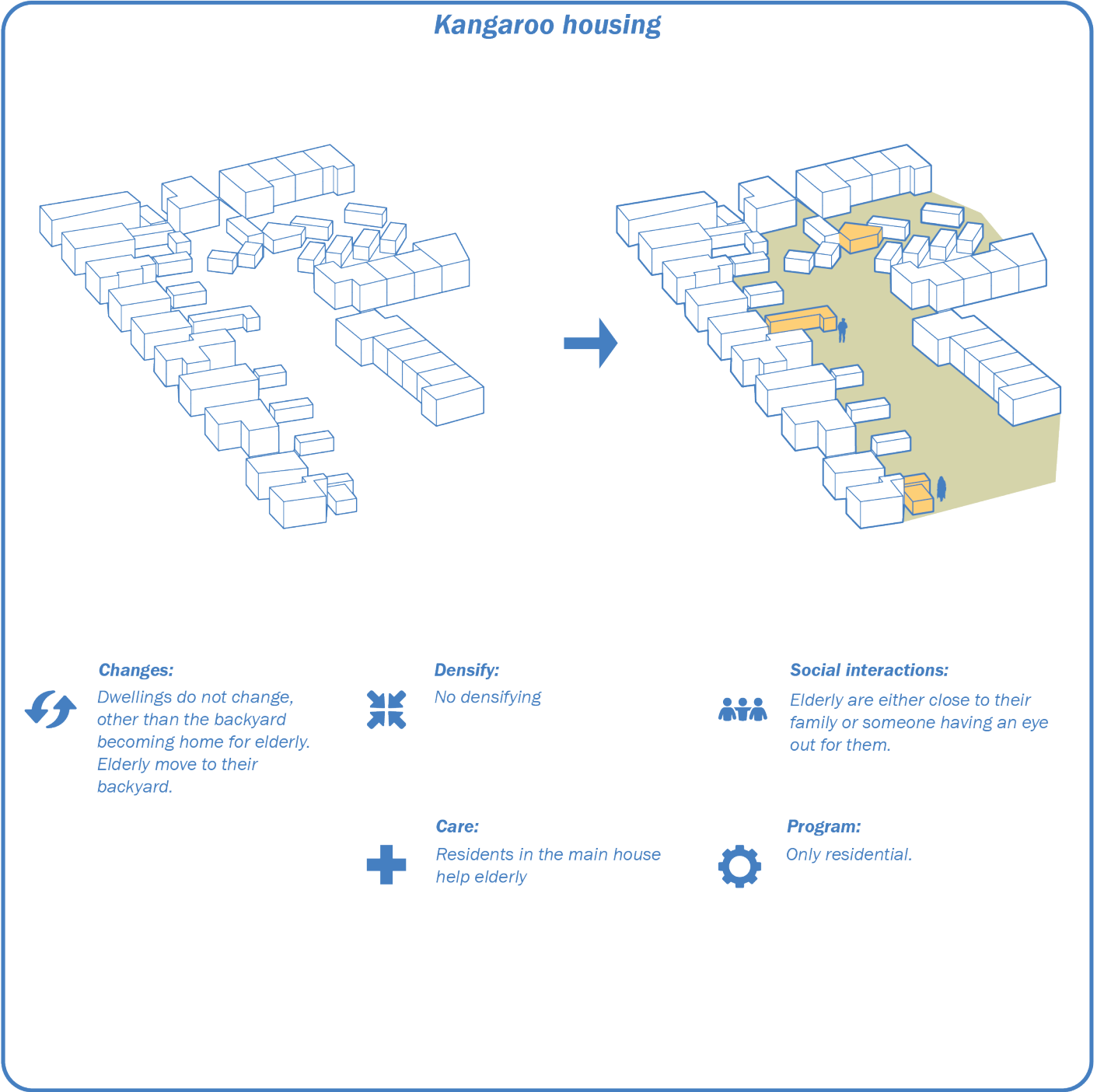


Figure 65. Kangaroo housing. (own image)

6.5 Strategy

The strategy revolves around the outdoor spaces and public buildings, mobility, housing, and social interaction as key categories. While each category can positively influence the case study area independently, their interconnectedness strengthens the impact for achieving an age-friendly community. By combining these pattern categories, a holistic strategy for an urban environment with supportive structures can be established.

The strategy consists of four phases, the first phase being the premise of this thesis, where the location is assessed and urgencies and opportunities are found for achieving an age-friendly community. In this phase all the context-dependent features should be assessed, like how was done in chapter 4, defining the demographic, their needs, urgencies and opportunities of the existing built environment. In practice, sharing information with residents, the municipality and other stakeholders would also take place in this phase.

The second phase is where core implementations are done. From the assessment and the focus scenarios the vision illustrated the implementations with several patterns being key implications.

In this phase those key patterns are realised, like improving the infrastructure for walking and biking, and diversifying existing green. These key patterns are also supported by quick wins, such as adding seating and ensuring clear street zoning, which support the key implementations. Additionally, plots can be renovated into a Knarrenhof and incentives for kangaroo housing can be allocated. Informing older adults and soon-to-be older adults in the transformations and their options is also a valuable step in this phase.

Phase III is all about optimizing the key patterns and enhancing the age-friendliness. This means expanding the green structure, so all residents are in proximity to green and blue. With a new amenity hub realised in Sprenkelaar in phase two, other implementations can then optimize this space. By enhancing the public transportation, easy access to the hubs by bus is available. Implementing public toilets and seating increases the accessibility for older adults to carry out their daily activities and participate in social activities, as these implementations decrease the barriers.

The final phase is about setting up for future sustainability. In this phase

it is important to decide what types of maintenance are needed in order to keep the implemented patterns accessible and available in the future. Upkeep on the green structure or removing fallen leaves from sidewalks are examples of municipal services, which help maintain the neighbourhoods in age-friendly condition. Additionally, evaluating the process and outcomes of the previous phases can be valuable for further use of the framework.

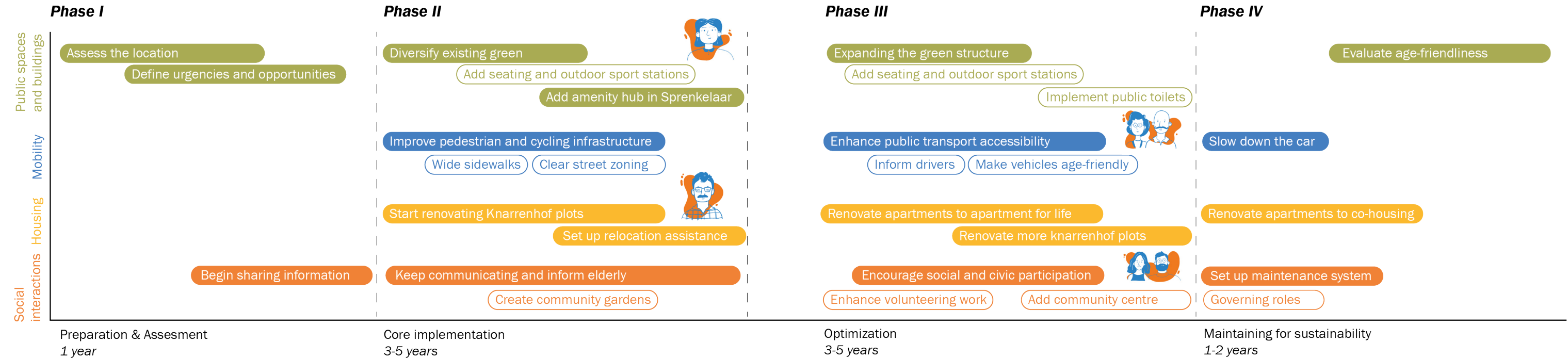
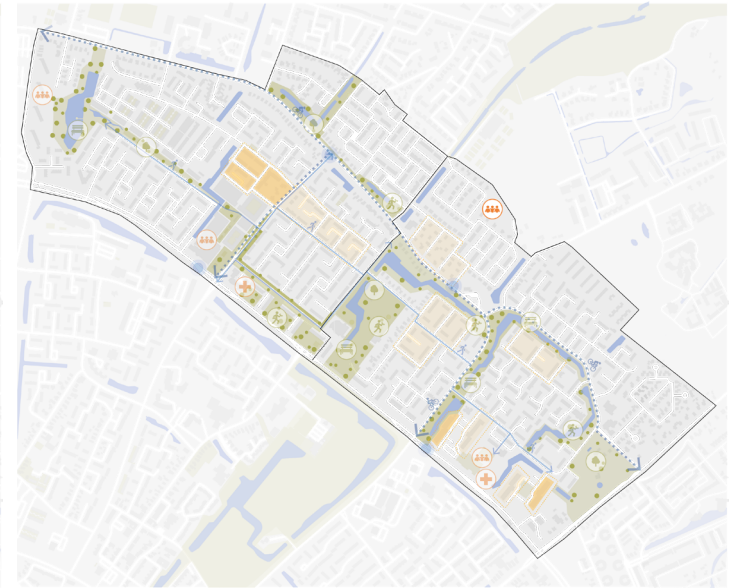
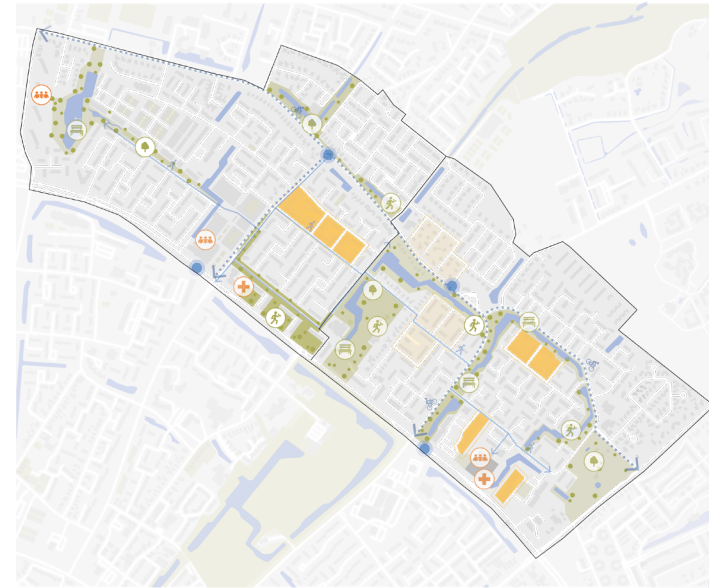
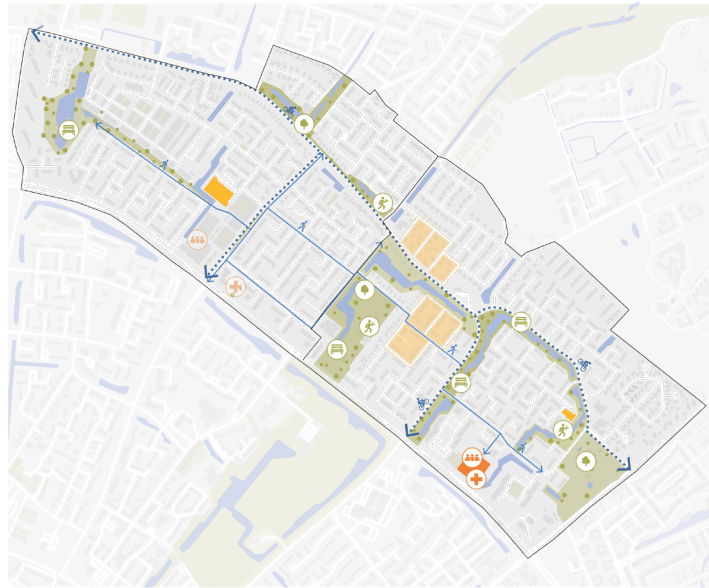
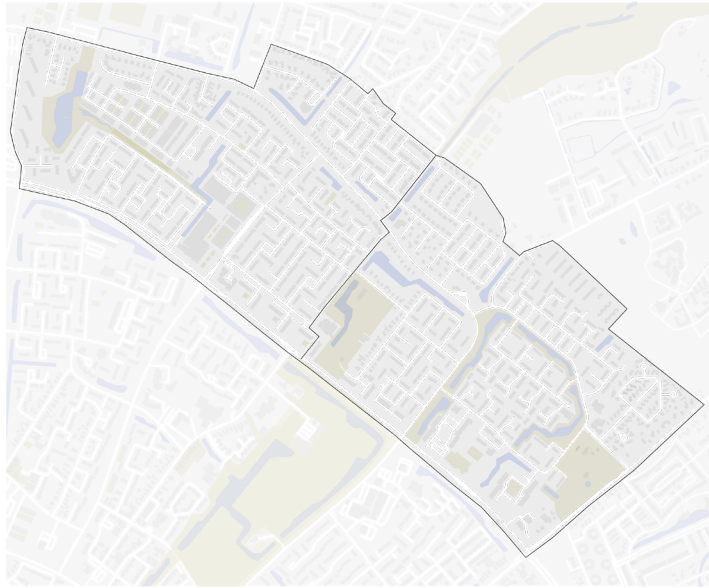


Figure 66. Strategy phasing. (own image)

6.6 Chapter conclusion

The first sub-question leading this chapter was: *‘What would the age-friendly community pattern language look like in Apeldoorn?’*

In this chapter the pattern language was implemented into the case study area, the neighbourhoods Anklaar and Sprenkelaar. The elements deciding the implementation were the assessment in the socio-spatial analysis, concluding in the task definition, and the age-friendly community framework.

This lead to the use of scenarios, focusing on active ageing, healthy ageing, independence and intergenerational connections. Implementing the patterns in each individual scenario resulted in finding key patterns that were valuable in multiple scenarios. However, the integration of all four focusses together would make it more holistic. Thus, the vision showed what Anklaar and Sprenkelaar would look like in 10 – 15 years as an age-friendly community, and the strategy explained when implementations could be best carried out.

Several spots in the neighbourhoods further exemplified what this vision would look like. A community where active ageing is physically possible, because of a supporting infrastructure for all types of

mobility, and active ageing is available through local activities or volunteering work. Where healthy ageing can be achieved through the simple availability of green and blue, mitigating possible climate risks, or can be ensured through the proximity to healthcare services. A community where independence is fostered, because older adults have enough housing options where ageing in place can be reassured. And where social interactions with other generations is stimulated and older adults experiencing loneliness is reduced. All supporting a good quality of life in later years.

The second sub-question *‘How can the pattern language and framework be transferable for other cities?’* can also be answered after this chapter.

As cities around the world experience ageing populations, the relevance of age-friendly communities extends beyond the case study location. Assessing the transferability of the framework and implementation approach used in this thesis is essential for understanding how it can also be applicable in other urban contexts.

First of all, the use of a pattern language allows for context-dependent adaptation. While the patterns provide a theoretical foundation, their implementation requires local contexts. Social, cultural, political, and economic environments shape how and to what extent patterns are adopted. The developed pattern set is widely applicable, but good assessment of the location is necessary, as was done in this thesis. The pattern language’s emphasis on both spatial and systemic dimensions enables cities to respond holistically to the needs of their ageing populations, making it a valuable tool for urban planners across diverse contexts.

Furthermore, the age-friendly community framework applied in Apeldoorn, offers a sort of base for transforming other Dutch post-war neighbourhoods. As the case study location framed a typical post-war neighbourhood, the findings and outcomes can be seen as an example of how to transform post-war neighbourhoods to age-friendly communities.

Moreover, it is important to acknowledge that certain patterns may conflict with the social, cultural, economic, or political context of a location. As stated in section 2.1, ageing is highly context-dependent and these factors significantly influence how the pattern language can be applied in practice. For instance, the cluster policy and spatial planning policy are employed in the Netherlands due to, among other things, land scarcity. Encouraging urban densification rather than outward expansion. In other countries however, differing policies or economic conditions may affect whether and how specific patterns can be adopted or adapted. This highlights the strength of the pattern language methodology. While it provides a theoretical background and evidence-based rationale, it remains flexible and adaptable.

The selection, prioritization, and application of patterns ultimately depend on the decisions of urban planners and designers, who must tailor them to the unique need and constraints of each context.

07

Conclusion and discussion

This chapter discusses the final outcomes and answers the research question. Furthermore, some limitations of the thesis are discussed.



7.1 Conclusion

In chapters 4.7, 5.5, and 6.6 the four sub-questions were answered. This leads to answering the main research question. The research question was: *“How can age-friendly spatial planning and strategy in Dutch cities support active and healthy ageing for elderly and contribute to a more balanced housing market?”*

This thesis explored how age-friendly spatial planning and strategic urban interventions can support active and healthy ageing while also addressing the challenges of a stagnating housing market in Dutch cities. Through the development and application of a pattern language, grounded in the age-friendly community framework, the research identified a set of spatial and systemic patterns that together can enable Dutch cities to become age-friendly.

Main research question:

"How can age-friendly spatial planning and strategy in Dutch cities support active and healthy ageing for elderly and contribute to a more balanced housing market?"

Subquestions:

1 *“How do the current physical, social, and municipal factors influence age-friendliness and the quality of life for elderly residents in Apeldoorn?”*

2 *“What are spatial and systemic patterns of age-friendliness related to urban planning and design?”*

3 *“What would the age-friendly community pattern language look like in Apeldoorn?”*

4 *“How can the pattern language and framework be transferable for other cities?”*

Figure 67. Research questions. (own image)

Demographic projections indicate that population aged 65 and over will continue to grow significantly, reaching 4.8 million individuals by 2040 in the Netherlands. However, planning for older adults is inherently complex due to the heterogeneity of ageing and the context-specific nature of elderly needs. No single solution can address this global societal shift in a universal way. Thus, a transferable approach is needed to address the issue holistically.

In the Dutch context, several factors were found to influence the quality of life for older adults. First, in the ongoing housing market crisis elderly are encouraged to age in place, a goal actively supported by the Dutch government. However, both the qualitative and quantitative supply of appropriate senior housing remains lacking, contributing to a mismatch between housing needs and availability and reinforcing broader housing market stagnation.

Moreover, the needs of older adults in the public realm are often overlooked in urban

planning, despite the fact that the immediate environment plays a critical role in supporting autonomy, mobility, and social participation. A well-designed physical and social environment can significantly improve quality of life by reducing loneliness, promoting social inclusion, and maintaining independence.

The concept of age-friendly communities provides a useful framework to address these challenges. Such communities offer environments that enable individuals to continue participating in social life beyond retirement or physical activity, while maintaining their functional ability as they age. In this context, active and healthy ageing emerges as a powerful strategy for enhancing overall quality of life in later years.

The findings show that planning for ageing populations is not solely about healthcare or specialized housing, but rather about enabling mobility, social connections, and independence to maintain the quality of life of

older adults. This asks for design interventions for the physical environment, social environment, and municipal services in order to fully frame the domains of age-friendly communities.

To address the complexities of urban planning for a context-dependent question, the pattern language methodology offers a structured approach in achieving age-friendliness. The developed age-friendly pattern language is grounded in interdisciplinary theory, merging gerontological research with spatial urban planning and design practice. It enables spatial planning and strategy to be applied in Dutch cities with a holistic, adaptable framework for improving quality of life.

Each pattern in the set targets one or more core values of age-friendliness, including active and healthy ageing, social interaction, and independence. The pattern language also introduces a range of senior housing typologies, directly addressing the gap in both the quality and supply of housing for older adults.

In conclusion, age-friendly spatial planning and strategy in Dutch cities provides a means to enhance quality of life for older adults by supporting active and healthy ageing and enabling suitable housing options for ageing in place. In doing so, it not only improves the well-being of the elderly, but also contributes to unlocking housing for younger generations, offering a pathway toward a more balanced housing market.

7.2 Discussion

In this discussion, some limitations of the project are discussed.

In this thesis, the spatial strategy focused on a time frame of 10-15 years for accomplishing an age-friendly community in Apeldoorn. In this time frame I look at the ‘now elderly’. However, in fifteen years the demographic that is now 50 years old, will then be part of the elderly. And even further into the future, in 40 years, I myself will be part of that demographic. That is a whole different generation embodying the elderly. Certain patterns might need to be adapted to the changed societal trends of the future in order to keep them applicable.

Therefore, there is a certain limitation to this project as needs and lifestyles will possibly change. However, the approach and recognition of the influence of the built environment on an ageing population is valuable. The pattern language can then still be useful as the current situation is also very context-dependent, as will be in the future.

The theoretical framework of this thesis is partly grounded in

gerontological research and social sciences, and this theory was applied to the spatial implications of the built environment. Due to the interdisciplinary nature of the topic certain limitations were present. In section 3.4 the scope of this thesis was discussed, one key limitation lies in the architectural dimension of the housing question. As this is an urbanism thesis, detailed architectural plans and designs for senior housing were intentionally excluded from the scope.

However, these limitations also present an opportunity for further research into the interdisciplinary possibilities of age-friendly communities. It would be valuable to investigate how an interdisciplinary collaboration between urban planners, architects, healthcare professionals, and other relevant disciplines can strengthen the understanding of age-friendliness. Designing supportive environments for older adults requires not only spatial expertise, but insights from social and healthcare professionals can further explore

effective implications. Since, from an urban planning perspective some aspects of age-friendliness are more speculative, like the effects of spatial interventions on an individual’s participation and inclusion. Insights from healthcare and social professionals can contribute to the development of cross-sector implications, thereby improving the relevance, responsiveness, and effectiveness of interventions aimed at supporting older adults.

Finally, an important consideration in this approach is that it does not aim to prescribe or impose specific lifestyles on older adults. Rather, the objective is to create environments that offer greater opportunities for independence, mobility, and inclusion, grounded in the principle of active and healthy ageing. The pattern language and spatial strategy proposed in this thesis are not designed to direct behaviour, but to enable it, by removing barriers and expanding choices. In doing so, the approach recognises the diversity of ageing experiences and allows individuals to engage

with their environment in ways that align with needs and preferences. The intended outcomes, such as active mobility, improved health, and stronger community interactions, are not guaranteed, but are made more likely by environments that support and encourage them.

08

Reflection

This chapter reflects on the process, values and relations of this thesis, together with personal reflections on the project.



What is the relation between your graduation project topic, your studio choice, your master track (A, U, BT, LA, MBE), and your master programme (MSc AUBS)?

The approach of the Metropolitan Ecologies of Place (MEP) studio for a graduation thesis aligned with my own methodological approach and research focus. Therefore, this studio seemed beneficial to guide me in this process. Unlike the Urban Fabrics studio, which emphasizes a more design-driven approach, MEP provides a stronger theoretical foundation that supports research-based design decisions. Or Complex cities, which focuses more on governmental policies and regional areas rather than my chosen topic of a demographic-focused approach in a case study neighbourhood. And Transitional Territories, where broader regions with environmental issues are mostly explored. Given the complexity of populations and the urban system, I found that a research-based methodology was essential for developing solutions into a meaningful and transferable design.

Within the urbanism track, my project relates to the way spatial designs in the built environment can influence

societal changes. The focal point of my graduation thesis is how the built environment can facilitate and support ageing demographics. This aligns with the master track’s position as how urban planners and designers need to address an ageing population as one of those societal changes.

How did your research influence your design/recommendations and how did the design/recommendations influence your research?

A key method for me during this thesis was the use of the pattern language method, which is structured around theoretical backgrounds rather than purely form-based urban interventions. The use of this method had a significant influence on the relation between research and design in my project, because this methodology requires both research and design in a more systematic approach. A pattern language requires an adaptable and attainable set of research-based principles, which then forms the foundation for designing the urban fabric. Unlike a direct site-specific urban design approach, the pattern language method provided a framework guiding me in making decisions for

a neighbourhood design. Hence, the significance of research for developing a set of patterns. Additionally, the set of patterns I developed around an age-friendly community was implemented in the two neighbourhoods in Apeldoorn. During this step, a more design-based approach was necessary since the pattern language only provides the principle outlines and requires a context-dependent design. Therefore, the context of Apeldoorn, and the neighbourhoods Anklaar and Sprenkelaar in particular, influenced how and where the patterns could be implemented best. During this step, I had to use my knowledge and skills as a designer to systematically integrate the research into the design location. This was valuable, because the breakdown of the complex question into smaller, obtainable patterns allows a design to connect more easily to human needs (Salingaros, 2000). With the focus of my thesis being the nexus between the elderly demographic and the built environment this allowed me to design more systematically.

How do you assess the value of your way of working (your approach, your used methods, used methodology)?

Throughout this thesis there was one question in particular in my approach and methodology that I kept wondering about. This was in what way I, as an urban planner and designer, am responsible for the social environment and municipal services. In my synthesis, three clusters were identified encompassing the age-friendly community framework. One of which was the municipal services, focused on healthcare services and information and communication. Salmistu & Kotval (2023) positioned in their research that these services have no direct connections to urban planning, therefore not taking responsibility. However, as positioned during the project I believe all eight domains of the framework are interconnected with each other. The physical environment facilitating locations for services and information being embedded in participation practices. Therefore, there is value in including the municipal services cluster in urban planning.

As a result, I chose to address all eight domains in this thesis, although some were explored more in depth

than other, like the public space and buildings and mobility domains, which are closely tied to spatial design. This process also highlighted how certain domains gain more significance when connected to others. For example, the housing typologies I introduced were shaped by my research and background knowledge from my bachelor’s degree. However, where a collaboration with an architectural expert could have deepened the spatial and technical interpretation of these housing models, now the thesis only provides an general understanding of what typologies are possible. An alternative approach could have involved input from interviews with a social scientist or gerontologist, particularly given that part of the theoretical foundation of this research draws from those disciplines. Both collaborations with architects or professionals in gerontology would have added further depth, but at the start of the project I had to make practical choices about what was feasible within the available time and scope. Ultimately, I determined that conducting an introductory study to bring this societal challenge into the urban planning discourse in the Dutch context was the most meaningful and achievable goal for this thesis.

How do you assess the academic and societal value, scope and implication of your graduation project, including ethical aspects?

The academic and societal relevance of this graduation project is strongly relevant, as it addresses a pressing demographic and urban challenge: the nexus between population ageing, urbanization, and the housing crisis. The project is particularly valuable because it focuses on an often-overlooked demographic, older adults, who despite being a significant and growing portion of society, remain overlooked in urban planning and housing policies (Salmistu & Kotval, 2023). From an academic standpoint, this research adds to the fields of urban planning, architecture, and additionally sociology, particularly within the context of age-friendly communities. Through exploring an interdisciplinary theoretical framework, it engages the design of urban environments with housing and the social environment of elderly. Which is possible through the application of a pattern language methodology to the theory, assessing how smaller implications can impact the bigger scale, both physical and social. Therefore, the theory connects various academic disciplines and

enables the conclusion to address the complexity of urban planning for this demographic. On a societal level, this research is engaging due to its worldwide relevance. Ageing is a shared human experience, everyone will either know elderly, or if not, will become elderly one day (Salmistu & Kotval, 2023). This realization has made the graduation project more human-centred, emphasizing the importance of designing environments that are inclusive, adaptable, and sustainable that support people throughout their lives.

How do you assess the value of the transferability of your project results?

As cities around the world experience ageing populations, the relevance of age-friendly communities extends beyond the case study location. Therefore, assessing the transferability of the framework and implementation approach used in this thesis is an essential step. As design, but also the elderly demographic, is entirely context-dependent, the transferability of the thesis shows whether the methodology will support the framework in other places. The answer to the sub-question regarding the transferability

emphasized how implementing the pattern language alone is not enough. Good assessment of the location is necessary in order to understand the opportunities and urgencies of the area and the population. However, when assessment is properly done, the pattern language is a very valuable tool for urban planners to enable cities to respond holistically.

What (sub)topics do I talk about which could be elaborated further, or because of time and place am not able to do?

The housing market is a crucial aspect of this thesis, yet a detailed understanding of the system extends beyond the scope of the studio and master track that were chosen and falls more within the domain of management in the built environment. Throughout the initial stages of this research, I received feedback cautioning against an unwarranted focus on this topic. Therefore, the implementation of the housing market in this urbanism project is developed out of an urban perspective, as far as my knowledge and expertise could be applied. As a result of feedback, I redirected my approach to ensure that my research remained within my disciplinary scope. Rather than deeply analysing

market dynamics, I focused on how spatial strategies and senior housing typologies can contribute to more inclusive built environment.

Due to time constraints and disciplinary focus, some aspects were not explored in depth, but they remain essential for a comprehensive understanding of age-friendly communities. One of these aspects is the cultural and political differences across the world. For this project, the research area was the Netherlands, but I do acknowledge that this western culture is not a worldwide view and older individuals in other continents or countries desire and need different things. However, I believe that through the pattern language the possible design interventions are adaptable to other cultures.

What are values and challenges of designing from a specific target group?

This project focuses on elderly individuals as the primary target group, a demographic that presents spatial and social needs in the built environment. One of the key values of designing for this group is the awareness of frailty and vulnerability, which tends to increase with age (Grey et al., 2023). Addressing mobility limitations and social isolation in the built environment allows for the creation of spaces that enhance independence, well-being, and participation. However, a significant challenge in designing for a specific demographic is the risk of exclusion or segregation. A potential weakness of this approach is the possibility of reinforcing separation based on ages, where older adults are designed for in isolation. Age-segregated design can then lead to further social fragmentation. To mitigate this, the project has been grounded in a theoretical framework, which emphasizes on age-friendliness that is not exclusively for older adults but instead promotes inclusivity for all generations. Thus, where there are challenges in designing for a specific demographic, I believe the approach I

employed with the utilised framework and methodology is inclusive for all ages to live active and healthy.

Personal reflection.

During my thesis journey, I have not only gained new knowledge and developed skills, but also gained a deeper understanding of my values as both an urban designer and person. I have come to understand and appreciate the different approach taken within the field of architecture. Unlike the problem-focused mindset typical of most scientific research, architectural practice often adopts a more solution-oriented strategy. As noted by Archer et al. (1982), this mindset is something developed throughout architectural education. However, it remains a form of tacit knowledge, which must be externalised through trying and experience. The characteristic ambiguity and iterative nature of the design and research process makes this even more challenging to master. I have learned that I am still finding my way in navigating the loops between analysis, research and revision.

Looking back, this project has not only deepened my understanding of how the built environment influences human lives, but also broadened my perspective on the tools and methods available to respond to these challenges. It has

equipped me to integrate diverse methodologies and the experience of working independently on a year-long research project. This has helped clarify my values as a researcher and urban planner, where fostering impactful societal changes through inclusive and human-centred design, particularly for vulnerable and underrepresented groups, is at the core of my professional ambition. While I have enjoyed the autonomy of this thesis, I have also realised that I perform better in collaborative settings, where open discussions, the exchange of ideas, and shared challenges and goals improve both the process and outcome. This has made me even more excited to step into the professional field and see what it has in store.

Reference list

Alexander, C. (1977). A pattern language.

Apeldoorn in Cijfers—Bevolking—Apeldoorn. (n.d.). Retrieved 11 May 2025, from <https://apeldoorn.incijfers.nl/dashboard/apeldoorn-in-cijfers/bevolking>

Archer, B., Royal College of Art, Cross, A., & Whitehead, A. N. (1982). Designerly Ways of Knowing. *Design Studies*, 221–227.

ARUP. (2019). Cities Alive. Designing for ageing communities [Report]. Arup. <https://foresight.arup.com>

Bevan, M., & Croucher, K. (n.d.). Lifetime Neighbourhoods.

Boelhouwer, P., & Hoekstra, J. (2009). Towards a Better Balance on the Dutch Housing Market? Analysis and Policy Propositions. *European Journal of Housing Policy*, 9(4), 457–475. <https://doi.org/10.1080/14616710903357235>

Boelhouwer, P., & Van Der Heijden, H. (2022). De woningcrisis in Nederland vanuit een bestuurlijk perspectief: Achtergronden en oplossingen. *Bestuurskunde*, 31(1), 19–33. <https://doi.org/10.5553/Bk/092733872022031001002>

Browning, M. H. E. M., Locke, D. H., Konijnendijk, C., Labib, S. M., Rigolon, A., Yeager, R., Bardhan, M., Berland, A., Dadvand, P., Helbich, M., Li, F., Li, H., James, P., Klompmaker, J., Reuben, A., Roman, L. A., Tsai, W.-L., Patwary, M., O’Neil-Dunne, J., Nieuwenhuijsen, M. (2024). Measuring the 3-30-300 rule to help cities meet nature access thresholds. *Science of The Total Environment*, 907, 167739. <https://doi.org/10.1016/j.scitotenv.2023.167739>

Buffel, T., Phillipson, C., & Scharf, T. (2012). Ageing in urban environments: Developing ‘age-friendly’ cities. *Critical Social Policy*, 32(4), 597–617. <https://doi.org/10.1177/0261018311430457>

Cai, T., Verze, P., & Bjerklund Johansen, T. E. (2021). The Quality of Life Definition: Where Are We Going? *Uro*, 1(1), 14–22. <https://doi.org/10.3390/uro1010003>

Demirkan, H. (2007). Housing for the aging population. *European Review of Aging and Physical Activity*, 4(1), 33–38. <https://doi.org/10.1007/s11556-007-0016-z>

E, J., Xia, B., Susilawati, C., Chen, Q., & Wang, X. (2022). An Overview of Naturally Occurring Retirement Communities (NORCs) for Ageing in Place. *Buildings*, 12(5), 519. <https://doi.org/10.3390/buildings12050519>

Eenzaamheid | Leeftijd en geslacht | Volksgezondheid en Zorg. (n.d.). Retrieved 15 January 2025, from <https://www.vzinfo.nl/eenzaamheid/leeftijd-en-geslacht>

Feiten en cijfers over dementie. (n.d.). Alzheimer Nederland. Retrieved 11 May 2025, from <https://www.alzheimer-nederland.nl/dementie/feiten-en-cijfers-over-dementie>

Forsyth, A., Molinsky, J., & Kan, H. Y. (2019). Improving housing and neighborhoods for the vulnerable: Older people, small households, urban design, and planning. *URBAN DESIGN International*, 24(3), 171–186. <https://doi.org/10.1057/s41289-019-00081-x>

Gemeente Apeldoorn in cijfers en grafieken | AlleCijfers.nl. (n.d.). Retrieved 11 May 2025, from <https://allecijfers.nl/gemeente/apeldoorn/>

Green, G. (2013). Age-Friendly Cities of Europe. *Journal of Urban Health*, 90(S1), 116–128. <https://doi.org/10.1007/s11524-012-9765-8>

Grey, T., Xidous, D., O’Neill, D., & Collier, M. (2023). Growing Older Urbanism: Exploring the nexus between ageing, the built environment, and urban ecosystems. *Urban Transformations*, 5(1), 8. <https://doi.org/10.1186/s42854-023-00053-z>

Hernandez, C., & Zubiaur González, M. (2008). Effects of Intergenerational Interaction on Aging. *Educational Gerontology*, 34, 292–305. <https://doi.org/10.1080/03601270701883908>

van Hoof, J., Dikken, J., Buttig, S. C., Kroon, E., & Marston, H. R. (n.d.). Age-friendly cities in the Netherlands: An explorative study of facilitators and hindrances in the built environment and ageism in design. *Indoor and Built Environment*.

Van Hoof, J., Marston, H. R., Kazak, J. K., & Buffel, T. (2021). Ten questions concerning age-friendly cities and communities and the built environment. *Building and Environment*, 199, 107922. <https://doi.org/10.1016/j.buildenv.2021.107922>

Joon, J. (2022). Woest aantrekkelijk Apeldoorn.

Keivani, R. (2009). A review of the main challenges to urban sustainability. *International Journal of Urban Sustainable Development*, 1(1–2), 5–16. <https://doi.org/10.1080/19463131003704213>

Khoddam, H., Dehghan, M., Sohrabi, A., & Modanloo, M. (2020). The age-friendly cities characteristics from the viewpoint of elderly. *Journal of Family Medicine and Primary Care*, 9(11), 5745. https://doi.org/10.4103/jfmpc.jfmpc_1098_20

Koningin Wilhelmina. (n.d.). Atlant. Retrieved 11 May 2025, from <https://www.atlant.nl/zorg-bij-atlant/onze-locaties/koningin-wilhelmina>

Leefbaarometer. (n.d.). Leefbaarometer Kaart. Retrieved 23 January 2025, from <https://www.leefbaarometer.nl/kaart/#kaart>

Mattson, J., Small Urban & Rural Transit Center, & Upper Great Plains Transportation Institute. (2010). Transportation, Distance, and Health Care Utilization for Older Adults in Rural and Small Urban Areas. In Upper Great Plains Transportation Institute. <https://www.ugpti.org/resources/reports/downloads/dp-236.pdf>

OECD. (2003). Ageing, Housing and Urban Development. OECD. <https://doi.org/10.1787/9789264176102-en>

Post, M. (2014). Definitions of Quality of Life: What Has Happened and How to Move On. *Topics in Spinal Cord Injury Rehabilitation*, 20(3), 167–180. <https://doi.org/10.1310/sci2003-167>

Regio Stedendriehoek (n.d.). Regionale woondeal 2022-2030 [Report].

Reference list

Reimagining Age-Friendly Living. (n.d.). BDP. Retrieved 6 May 2025, from <https://bdp-beta-5l6ub8q1y-bdp-ab2794d1.vercel.app/nl/ideas/reimagining-age-friendly-living>

Renes, G. (n.d.). Doorstroming op de woningmarkt.

Rooij, R., & Van Dorst, M. (2020). A Pattern Language Approach to Learning in Planning. *Urban Planning*, 5(1), 58–64. <https://doi.org/10.17645/up.v5i1.2961>

Salingaros, N. A. (2000). The structure of pattern languages. *Architectural Research Quarterly*, 4(2), 149–162. <https://doi.org/10.1017/S1359135500002591>

Salmistu, S., & Kotval, Z. (2023). Spatial interventions and built environment features in developing age-friendly communities from the perspective of urban planning and design. *Cities*, 141, 104417. <https://doi.org/10.1016/j.cities.2023.104417>

Smets, A. J. H. (2012). Housing the elderly: Segregated in senior cities or integrated in urban society? *Journal of Housing and the Built Environment*, 27(2), 225–239. <https://doi.org/10.1007/s10901-011-9252-7>

Het Socrateshuis. (n.d.). Dagelijks leven. Retrieved 11 May 2025, from <https://dagelijks-leven.nl/huizen/apeldoorn-het-socrateshuis/>

Statistiek, C. B. voor de. (n.d.-a). Jongeren en ouderen per gemeente [Webpagina]. Centraal Bureau voor de Statistiek. Retrieved 15 January 2025, from <https://www.cbs.nl/nl-nl/visualisaties/dashboard-bevolking/regionaal/jongeren-en-ouderen>

Statistiek, C. B. voor de. (n.d.-b). Ouderen [Webpagina]. Centraal Bureau voor de Statistiek. Retrieved 15 January 2025, from <https://www.cbs.nl/nl-nl/visualisaties/dashboard-bevolking/leeftijd/ouderen>

Statistiek, C. B. voor de. (2022, December 15). Kernprognose 2022–2070: Door oorlog meer migranten naar Nederland [Webpagina]. Centraal Bureau voor de Statistiek. <https://www.cbs.nl/nl-nl/longread/statistische-trends/2022/kernprognose-2022-2070-door-oorlog-meer-migranten-naar-nederland?onepage=true>
Trolander, J. A. (2011). Age 55 or Better: Active Adult Communities and City Planning. *Journal of Urban History*, 37(6), 952–974. <https://doi.org/10.1177/0096144211418435>

United States Department of Agriculture. (2018). Urban Nature for Human Health and Well-Being.

USDA. (2018). Urban Nature for Human Health and Well-Being.

Wanchai, A., & Phrompayak, D. (2019). Social Participation Types and Benefits on Health Outcomes for Elder People: A Systematic Review. *Ageing International*, 44(3), 223–233. <https://doi.org/10.1007/s12126-018-9338-6>

Wang, W., & Durst, N. J. (2023). Planning for active aging: Exploring housing preferences of elderly populations in the United States. *Journal of Housing and the Built Environment*, 38(2), 795–809. <https://doi.org/10.1007/s10901-022-09962-0>

Wilmut, K., & Purcell, C. (2022). Why Are Older Adults More at Risk as Pedestrians? A Systematic Review. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 64(8), 1269–1291. <https://doi.org/10.1177/0018720821989511>

Woonplaats Apeldoorn in cijfers en grafieken. (2016, July 1). AlleCijfers.nl. <https://allecijfers.nl/woonplaats/apeldoorn/>

World Health Organization. (2007). Global age-friendly cities: A guide. <https://iris.who.int/handle/10665/43755>

Zaken, M. van A. (2019, June 6). AOW-leeftijd 2024-2030—AOW - Rijksoverheid.nl [Onderwerp]. Ministerie van Algemene Zaken. <https://www.rijksoverheid.nl/onderwerpen/algemene-ouderdomswet-aow/aow-leeftijd-2024-2030>

Zorgwoningen in de gemeente Apeldoorn. (2020). In *De Goede Woning*, KleinGeluk, & Woonzorg Nederland, *Zorgwoningen in de Gemeente Apeldoorn* [Brochure]. De Goede Woning. <https://www.degoedewoning.nl>