Design of communal housing spaces to stimulate social interaction and promote social cohesion among (older) tenants

EINDHOVEN UNIVERSITY OF TECHNOLOGY

Stan Ackermans Institute

SMART BUILDINGS & CITIES

DESIGN OF COMMUNAL HOUSING SPACES TO STIMULATE SOCIAL INTERACTION AND PROMOTE SOCIAL COHESION AMONG (OLDER) TENANTS

By

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A thesis submitted in partial fulfillment of the requirements for the degree of Professional Doctorate of Engineering

The design described in this thesis has been carried out in accordance with the TU/e Code of Scientific Conduct

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TABLE OF CONENT:

SUMMARY:

The rapid aging and consequent societal changes nowadays have led to the introduction of a new governmental policy for stimulating older people to age in their own homes. Therefore, an appropriate living environment has become an important element of older people's everyday life. Such an environment should be "empathic" and supportive not only physically, but also socially, and corresponding to their specific needs (Mohammadi, 2017).

Older adults, encouraged to age at home face growing social challenges, such as loneliness. Because of the physical and/or cognitive limitations, associated with older age, seniors are at particular risk by not being able to establish sufficient contacts and qualitative social interaction with others. Loneliness can be an acute problem, which negatively affects both older people's wellbeing and society. Experiencing social loneliness or isolation among seniors can negatively impact their health (Courtin & Knapp, 2017). Further, many studies find evidence for the link between the social wellbeing of seniors (including social isolation and loneliness) and the utilization levels and cost of health care facilities (Ellaway et al., 1999), (Gerst-Emerson & Jayawardhana, 2015)) (Molloy et al., 2010), (Newall et al., 2015). The socio-demographic changes described above require searching for innovative, socially supportive housing solutions for seniors to age in place.

The need to answer the social challenges of their customers and propose empathic and supportive living environment, has resulted in a two-years PDEng project, conducted in collaboration between the Technical University Eindhoven and Housing Association Woonzorg Nederland.

It is assumed, that communal housing because of its strong social component, can stimulate social interaction between residents and promote social cohesion as result (Fromm, 2000), (Williams, 2005). From this point of view, community living may contribute to the socially comfortable ageing in place of seniors (Labit, 2015).

Although co-housing is seen by many as a good solution for seniors, there is still systematized knowledge missing on how these should be designed, to promote its hypothetic positive effects on seniors' social wellbeing and health. Therefore, the main research question of this study states: *How communal housing spaces can be designed to attract residents, stimulate social interaction among them and promote social cohesion in result?*

In the current project the research question is answered in three phases: exploration, translation, and process (design). These research phases are determined according to the conceptual framework developed by M. Mohammadi and are based on the empathic design theories (Mohammadi, 2017). In each phase, the needs of the users and relevant stakeholders are central. During these phases, several related studies are conducted. Finally, the research findings are applied in a real Living Lab case from the existing housing stock of WoonZorg Nederland. The evaluation of the proposed concept model by residents and involved stakeholders will take place outside this project. Because of the COVID-19 restrictions and the time limitations of the current study, this could not be conducted as originally planned.

In **Phase one – EXPLORING the (im-) possibilities**, problem related topics are studied through a quick scan literature study and an overview of the best contemporary project examples in the field.

Prior this, a literature study within the paired PhD project on the major social and spatial factors influencing the levels of social interaction among residents in co-housing environments has been conducted.

The best practice overview in this phase explores how and to what extent the major spatial factors identified in literature as being critical to achieve high levels of social interaction between the residents are adopted in practice. Totally twenty-two national and international contemporary project examples have been selected for this study under strict criteria. The analyzed data also included project examples, proposed by master students. Further, a set of variables – based on the major contributing spatial factors has been picked to further explore and analyze per case in both multicriteria tables and graphic schemes. These variables relate both to the spatial characteristics of the project concept, the general layout, the building, and the shared outdoor and indoor communal spaces within the selected cases. In result of the case analysis, different spatial relations, and design patterns, regarding social interaction and private-shared relationships have been recognized.

In the second phase – TRANSLATION - the findings from the explorative phase and the results from the best practice analysis are translated into concept design principles and architectural approaches to promote higher levels of social interaction and connectedness among the residents in (co-living) residential developments. These principles are based on the major (socio-) spatial factors influencing social interaction from literature. Further, the described architectural approaches are inspired by practice and correspond with the design patterns identified within the best practices overview analysis. The principles are discussed both on a layout, building and communal space (indoor and outdoor) level.

In the third phase – PROCESS - the research findings, selected design principles and spatial patterns recognized from the previous phases of the project are further explored and experimentally applied to a Living lab case from the existing housing stock of WoonZorg Nedreland. The selected case is the communal space of Nieuw Bleyenburg - a senior (55+) building complex in Utrecht. According to previous research, the example characterizes with very low scores of resident's participation, utilization, and involvement both in (communal) spaces, initiatives, and activities.

The Living lab study includes different steps, where various quantitative, qualitative, and participatory research methods are applied.

- The established **concept model** draws the basis framework of the living lab study and indicates which socio-spatial factors influence the levels of social interaction within the project case.

- **The observations** on place aim to map the current situation.

This is conducted upon preliminary executed observation list, where the major socio-spatial factors influencing social interaction from the concept model and the related spatial elements are included. Further, the observation indicates if, how and to what extend these elements are present in the current characteristics of the studied case. To gain a complete, complex picture of the current situation, along with the communal space, both the general layout, shared garden, and the building complex are observed.

The identified in result of the observation missing or not sufficiently represented elements are further studied in the next living lab steps.

- **The focus interviews** aimed to further elaborate on the socio-spatial problems identified during the observations on place.

During the interviews was gained information about the main opinions, views, and preferences of the responder(s) regarding the current utilization and spatial characteristics of the studied case. Further, the possible implementation of related spatial and technological elements to enhance its utilization and spatial interaction have been discussed.

Because of the COVID-19 restrictions, the (senior) residents from the building were not directly involved in this stage. The building manager as an objective observer, familiar with the current social and spatial problems of the complex and the views of inhabitants was interviewed instead.

- **Main points of interest**

In the next step the data gained by the observations on place and interview is combined and analyzed to identify the major **main points of interest** to further explore in the next (design) phases of the living lab study.

- The **interactive co-design session** aimed to collectively brainstorm on answering major socio-spatial and utilization question(s) within the studied communal space.

Again, because of the COVID-19 restriction, this was conducted online and instead of residents, colleagues, and experts in the field from the TU/e and HAN have been involved. The session consisted of three interactive workshops, followed by group discussions. The input of the workshops was very diverse and included both individual and group work. During the workshop sessions were discussed possible design approaches and generated ideas on three questions on how to enhance the utilization of the space and social interaction among residents. They are based on the major points of interest and the previously identified socio-spatial problems. More specifically, these relate first to the improvement of the sphere with focus on domesticity and personalization, secondly to the spatial organization of the space with regard to the private-shared opportunities and current segregation problems among different users, and third – to the possible implementation of facilities, activities or technologies to attract / involve residents. The results from the session demonstrated an integrated approach to the studied questions and related problematics in its complexity.

Concept design: In this last step of the Living lab study, the findings from the previous stages are applied to the design of a concept model.

The concept design aligns with the major theoretical findings of the PDEng study and considers the selected in the concept model socio-spatial factors for stimulating social interaction. The proposed concept embodies the outcomes from the previous living lab steps and targets the identified major socio-spatial and utilization problems and points of interest. It incorporates the most important socio-spatial approaches and ideas discussed during the co-creation session. Finally, the main viewpoints, preferences and needs, shared by responder(s) during the interview are considered. The proposed concept respects the special needs of the main users of that space, their possible mobility and/or mental limitations, and the preconditions for access and safety. Further, several scenarios related to the topics sphere, organization of the space, activities, facilities, and possibilities for implementing technology are elaborated more in detail in the proposed concept design.

CONTRIBUTION:

The conducted PDEng study has resulted in several end products: This thesis, the best practice overview, the description of the main design principles and spatial approaches to promote social interaction among tenants from (co-living) housing environments, and finally the proposed concept design model, which experimentally applies the research findings of this report to an existing study case from the housing stock of Woonzorg Nederland. The three products show a vision for the design of (co-) living environments to stimulate social interaction, promote social cohesion and potentially positively contribute to the social wellbeing and the social challenges of older people to age in place.

The thesis contains an extensive report of all the steps that have been taken in this design project. These steps are structured under the empathic design framework (Mohammadi, 2017) and according to the empathic theories. In each step, different studies are conducted, and the special needs of users and the relevant stakeholders are considered.

The best practice overview study provides useful knowledge on the architectural approaches, applied in contemporary co-living project examples to stimulate higher levels of social interaction and connectedness among their inhabitants. As a result of this study concept design patterns and spatial relations for enhancing social interaction have been recognized.

Based on the knowledge gained during the best practice overview and analysis, a set of practical design principles and spatial approaches have been systematized and described. These apply on both general layouts, building, and shared space (outdoor and indoor) scale. The described architectural approaches can be incorporated in future housing (re-) developments of Woonzorg Nederland to possibly enhance social wellbeing of their (senior) customers. Further, these principles can be potentially of great value for architectural professionals and interested parties or researchers as an outgoing knowledge base for future studies. The variety of the selected cases, both in scale and target group also shows, that the lessons learned can be incorporated into the design of various typologies of future residential developments oriented to inclusive and social communities.

The proposed concept design successfully incorporates theoretical and research findings related to social interaction, which in the next stages can be additionally evaluated and tested. Further, the Living lab design study proposed an interactive design approach, which considers the needs of the main users and includes among others, participatory research methods.

Finally, the research findings and practical spatial approaches proposed in this PDEng project can be used as an outgoing base for future research and further explored.

CHAPTER ONE:

INTRODUCTION

1. CHAPTER 1: INTRODUCTION

1.1. THE AGEING SOCIETY:

Ageing has become an important societal issue nowadays. Since 1970, the number of people aged 65 years and more in The Nederland has steadily increased. Data shows that only in 2017 more than 40% of the total number of residents were over 50 years old.1 According to the demographic forecast, the number of older people will increase progressively in the nearby future, and in 2040 one out of four people in the Netherlands will be 65 or older (see fig. 1).

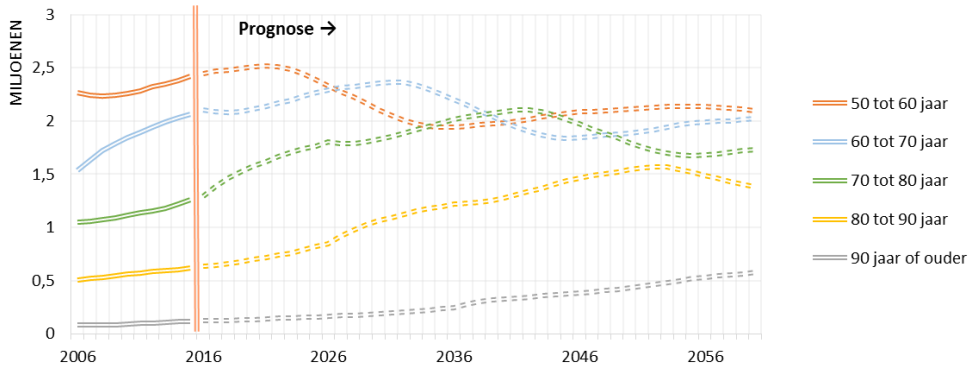


Figure 1: Forecast of the population in the Netherlands until 2060 by age. (source: Ouderenmonitor 2018, CBS, 2017)

The fast-growing number of older inhabitants as a percentage of the total population causes not only significant societal changes, but also increases the pressure on the pension and health care systems. Therefore, significant changes in the Dutch health and care system took place since 2015. The most important consequence of the new government policy has been the substitution of intramural care by extramural care (Mohammadi et al., 2019). This change aims to stimulate the longer independent and active living of seniors preferably in their own housing environment. An appropriate living environment has become an important element of older people's everyday life. According to Mohammadi (Mohammadi, 2017) , such a living environment should be supportive and "empathic". Within the "empathic living" concept, not only the physical-spatial qualities of the environment, but also social factors and the specific needs of the inhabitants are considered.

Housing corporations become recently also aware of the socio-demographic changes. Because of the growing number of older tenants, they began to experiment with new living forms and possibilities, which have the potential to support them not only physically, but the social component plays a role (Witter, 2018).

[1] 1RIGO Research en Advies, Ouderenmonitor 2018, CBS 2017

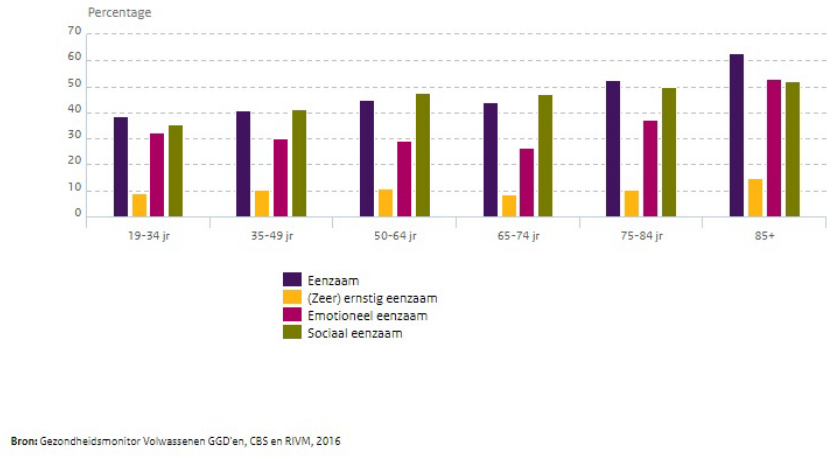
The need to answer the social challenges of their customers and propose empathic and supportive living environment, has resulted in a two-years PDEng project, conducted in collaboration between Technical University Eindhoven and Housing Association Woonzorg Nederland.

Woonzorg Nederland (WZNL) is the biggest housing corporation for seniors in The Netherlands, specialized in offering affordable homes for older people. The well-being of the residents is of major importance for Woonzorg Nederland. WZNL aims to provide suitable housing where elderly can live independently and comfortably, also when (health)care is needed. Therefore, the housing corporation is focused on creating appropriate living environments for the residents, with attention to their specific needs.

1.2. PROBLEM FIELD

1.2.1. Loneliness

Older adults, encouraged to age at home face growing social challenges, such as loneliness Loneliness is experienced by all age groups, but it is a particularly acute problem for older people. According to the statistics, more than half of the 65-plussers in the Netherlands, report that they feel (to a different extent) social or emotionally lonely (Fig. 2) With the age, the experience of loneliness among elderly tend to increase and after 75 years their number rises significantly (see fig. 2).



Bron: Gezondheidsmonitor Volwassenen GGD'en, CBS en RIVM, 2016

Figure 2: Loneliness among Dutch population *(sources: CBS, RIVM, GGD, 2016)*

Because of the physical and/or cognitive limitations, associated with older age, seniors are at particular risk by not being able to establish sufficient contacts and qualitative social interaction with others. In result, they often get socially isolated.

Another factor, that makes seniors vulnerable to social loneliness is lower socio-economic status. The lower socioeconomic status is often related to the physical and/or mental inabilities of seniors (Van Klaveren et al., 2018). This double vulnerability – both physical/mental and socio-economic, may lead

to even higher possibility of experiencing diverse social problems, such as loneliness and social exclusion.

Loneliness can be an acute problem, which negatively affects both older people's wellbeing and society. Experiencing social loneliness or isolation among seniors can negatively impact their health (Courtin & Knapp, 2017). Various studies have linked social isolation and loneliness to the higher risk of developing diverse physical or mental complains, e.g., high blood pressure, heart disease, weakened immune system, depression, Alzheimer disease, and even premature mortality (Courtin & Knapp, 2017), (Cacioppo & Cacioppo, 2014), (Holt-Lunstad et al., 2010), (Holt-Lunstad et al., 2015) . Consequently, the pressure on the health care system can increase. Many studies find evidence for the link between social wellbeing of seniors (including social isolation and loneliness) and the use or cost of health care facilities (Ellaway et al., 1999), (Gerst-Emerson & Jayawardhana, 2015)) (Molloy et al., 2010), (Newall et al., 2015).

From the problematics described above, can be concluded, that the possibilities for social interaction nearby home and the social cohesion among residents are very important for the everyday life of older people who are more dependent on their own living neighborhood to maintain social contacts with others (Thomese, 1998). Thus, the socio-demographic changes described above require searching for innovative housing solutions for seniors, who face the growing social challenges to age in place.

1.2.2. Communal housing

It is assumed, that communal housing because of its strong social component, can stimulate social interaction between residents and promote social cohesion as result (Fromm, 2000a), (Williams, 2005a). From this point of view, community living may contribute to the socially comfortable ageing in place of seniors (Labit, 2015). Different international studies, using both qualitative and quantitative methodologies to measure, have shown that most of the seniors are healthy and satisfied with their living conditions in a co-housing environment (Labit, 2015). Communal housing is described as especially beneficial for older women – often widowed or divorced. Most of them perceive the mutual assistance, support and economic benefits of communal housing as a way for better and secure ageing (Labit, 2009), (Vermeersch 2011).

Communal housing has number of potential social benefits and seen by many as a good solution for seniors: The enhanced interpersonal communication and participation might reduce the risk of social loneliness. Also, regular social interaction can promote connectedness and place attachment among tenants. Further, informal relationships between (older) tenants can occur, which might consequently lead to more informal help among them (Vermeij, 2006). As a result of the increased interaction and connectedness, the early detection of diverse possible (social, economic, cognitive, or health) problems by co-residents is also enabled. This early problem signalization and informal social support are very important for the well-being of older people (Cramm et al., 2013). Some complications of older tenants are not always immediately visible to the (informal) care institutions.

It seems, that communal housing as an innovative housing solution for seniors, not only help comfortable aging in place but is it can be beneficial from an economic point of view – both for residents and the society. (Halfbar 2008). One could expect that the various positive effects on seniors

social wellbeing and health can hypothetically reduce the need for informal care in future (Vermeij, 2006). Based on the studies and assumptions mentioned above, could be concluded, that living in communal housing is a suitable solution for the social challenges of (vulnerable) older people to comfortable age in place. However, there is still systematized knowledge missing on how these should be designed, to stimulate social interaction and cohesion and enable its potential benefits on seniors.

The built environment cannot directly empower social interaction between people, but it can stimulate certain people's behaviors and patterns to facilitate it (Gehl, n.d.). Namely, a suitable spatial context can give people the opportunities to come easily to each other and thus encourage residents to interact regularly. Typically, within communal housing residents can use different common utilities and share living areas. By sharing these spaces, people have more and various (spontaneous) opportunities for regular contacts among each other. Consequently, this social interaction on a regular basis can strengthen the interconnectedness and lead to stronger (informal) relationships, help and support between (older) people with social cohesion as a result (Berger-Schmitt, 2002).

1.3. PROJECT OBJECTIVES:

Although co-housing is seen by many as a good solution for seniors, there is still systematized knowledge missing on how these should be designed, to promote its hypothetic positive effects on seniors' social wellbeing and health.

The current project explores the spatial and practical aspects for the design of communal housing spaces to promote social cohesion among the (older) tenants and increase their social wellbeing in result. It aims at studying the implementation of architectural approaches, design principles and spatial interventions to stimulate the social interaction and connectedness among the residents.

1.4. RESEARCH QUESTION

Consequently, the main research question of this project states: *How can communal housing spaces can be designed to attract residents, stimulate the social interaction among them and promote social cohesion in result?*

1.5. METHODOLOGY:

1.5.1. Empathic design process

The research question of the project will be answered in four phases: exploration, translation, process, and validation. These research phases are determined according to the conceptual framework developed by M. Mohammadi and are based on the empathic design theories (Mohammadi, 2017). In each phase, the needs of the relevant stakeholders are central and they take an active role into the design process. (fig. 4)

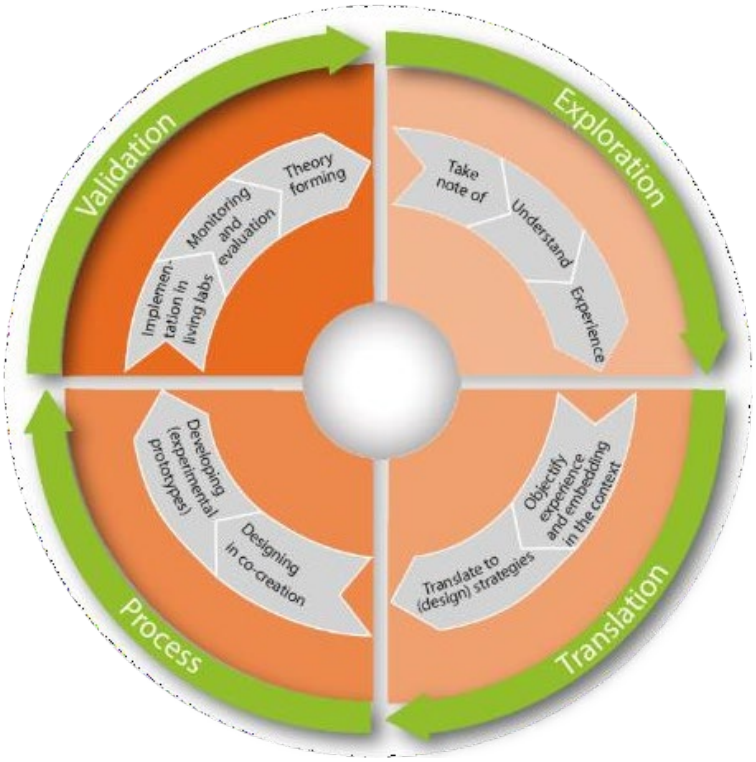


Figure 3: Four research phases in the empathic design process. Source: M. Mohammadi, 2017

1.5.2. Project approach

The project is structured according to the holistic design framework described earlier in this section and covers the four main phases:

- **Exploration:** studying the (im-) possibilities
- **Translation: translation the knowledge into preconditions for design, concept guidelines and strategies**
- **Process / design:** embedding the theoretical findings and design strategies into to a Living lab case and developing design concept
- **Validation:** exploratory evaluation of the proposed concept model

On a bigger scale the project is associated with the "Ageing in place" concept (Pani-Harreman et al., 2020), which promotes a sense of place attachment, identity, security, and familiarity (Wiles et al.,

2009). Further, it is related to studies on how to improve the quality of life and well-being of older people through an empathic design approach (Mohammadi, 2017). In addition, the PDEng project is paired to a related PhD research on communal living, performed simultaneously at the TU/e. While the PhD research focuses on the theoretical aspects of the problem, the current PDEng project studies the ways of practical implementation of these findings into the context of WZNL.

During these phases, several related studies are conducted. The final goal of this project is to design an experimental model (mockup) of innovative communal space(s), a "Living Lab" where the research findings can be realized, evaluated and tested.

This project focuses on the group of seniors and those with lower socio-economic status. It will be executed in the context of social-rent communal housing of Woonzorg Nederland. Potentially, the research findings could be applicable to other housing of WZNL as well.

Detailed information about the design approach and a general scheme of the project phases are presented in the following paragraphs.

1. Exploration:

In **Phase one – Exploring** the (im-) possibilities, the state of art and problem related topics are studied. Further, an extended best-practice overview and analysis focused the contemporary practical design approaches to enhance social interaction among residents are conducted.

2. Translation:

In **phase two – Translation** – the findings from the explorative phase are translated into concept guidelines and practical architectural approaches for the spatial design of communal housing and space(s) to promote higher levels of utilization and social interaction among their residents.

3. Process and Design:

In the **third phase – Process-** the theoretical findings from the previous phases are embedding into the spatial context of WZNL, through creating Living lab concept model.

4. Validation:

The exploratory evaluation of the living lab concept model will be conducted outside the scope of the current study.

PART ONE:

EXPLORING

CHAPTER TWO:

BEST PRACTICES OVERVIEW

"Architecture can't force people to connect; it can only plan the crossing points, remove barriers, and make the meeting places useful and attractive."

Denise Scott Brown

In **PHASE ONE – EXPLORING THE (IM-) POSSIBILITIES**, the state of art and problem related topics are studied. Further, an extended best-practice overview and analysis focused the contemporary practical design approaches to enhance social interaction among residents are conducted.

2. CHAPTER 2: BEST PROJECT PRACTICES OVERVIEW

2.1. INTRODUCTION

2.1.1. Goals of the study

The best practices overview aims at recognizing and investigating the current trends in architecture for the stimulating of social interaction and promoting social cohesion among people. The main goal of this study is to give better insight into the application of contemporary spatial approaches to enhance social interaction. It explores how and to what extend the design approaches used in the project examples adopt the major architectural and urban design principles identified in the literature as being crucial to achieve high levels of social interaction between residents.

2.1.2. Methodology:

The main research methods used in the best practices overview are case study research, drawing analysis and comparative analysis. Case studies research can be applied as a method for many purposes – for example, for inspiration, for drawing comparisons, for determining similarities or to investigate the effects of an intervention (Martin & Harington, 2012). By the detailed drawings analysis of buildings with the similar function, it is possible to detect spatial relations and design patterns (Jong & van der Voordt, 2002).

2.1.3. Value and practical implications:

The information gained from the best practices overview will be used in the next project stages. For example, to study the architectural guidelines and strategies for the promoting of higher levels of social interaction and connectedness among residents. Different aspects of the best practice overview will serve as an inspiration for future (concept) designs, such as the concept design of a Living lab. Diverse spatial approaches can be applied in future into the project context of Woonzorg Nederland.

Further, architects and other professionals may use the information gained within the current best practice overview for different purposes: for example, as a quick guideline for the practical application of the described spatial approaches, as an inspiration for design or as a base for a further qualitative and quantitative research on the design patterns for creating livable spaces which enable greater social interaction among people.

2.2. SELECTION OF CASES:

2.2.1. Data Gathering:

An extended desk research has been conducted to select the project examples which were involved into the study. Both international and local cases have been considered. Only information publicized in trusted professional architectural media sources has been used to conduct the current study.

Because of the huge amount of available information, the selection of samples consisted of several stages. After refining the inclusion criteria and a detailed review of the available information, twenty -two project examples have been selected.

The study of the case samples is based on the data provided by the authors.

2.2.2. Selection criteria:

A list of strict inclusion criteria has been applied to determine the set of project examples.

These criteria are:

- Contemporary projects realized in the last 20 years.
- Location: Preference to projects from countries with a close to The Netherlands cultural and environmental context (for example, Western Europe, UK, Canada, US).
- Scale of the development: limited to a single building or a building complex. No urban scale developments are considered.
- Type of the development: Residential or mixed-use. No public buildings are considered.
- The project samples must provide innovative solutions and their design promote extensive possibilities for social interaction among residents.
- The selected project are preferably winners or nominated at prestigious architectural competitions in the related domain.
- Reasonable number of cases
- The selection aims to provide a larger variety of project examples regarding the concept, scale, type of development, target groups, etc.

2.2.3. Final selection of cases:

The study has resulted in 22 cases that satisfy the described above criteria (see appendix for more information per case). Cases with numbers 11 to 22 have been proposed by three master students from the graduation studio “Smart healthy environment” (2021), TU/e.

1. **Quayside Village Cohousing**, Vancouver, CA, *The Courtyard group,* 1998
2. **WindSong Cohousing**, Langley, UK, *David Simpson,* 1998
3. **Wohnprojekt Wien**, AT *Einszueins Architektur,* 2013
4. **Kalkbreite**, Zurich, SZ, *Müller Sigrist Architekten,* 2014
5. **Spreefeld**, Berlin, DE, *BAR, Carpaneto & Fatkoehl Architekten,* 2014
6. **New Ground Cohousing (OWCH)**, UK, Pollard *Thomas Edwards,* 2016
7. **Nightingale 1** Brunswick, *AU, Breathe Architecture,* 2017
8. **Marmalade Lane**, Cambridge, UK, *Mole Architects,* 2018
9. **Vrijburcht**, Amsterdam, NL, *CASA Architechten,* 2018
10. **Vindmøllebakken**, Stavanger, NO, *Helen & Hard,* 2019
11. **Vriendenhof**, Olst (2017)
12. **Knarrenhof**, Zwolle (2018)
13. **Het Eikpunt**, Lent (2016)
14. **Krebsestien**, Esbjerg, DK (2017)
15. **Sølund urban nursing home**, Copenhagen, DK (project: 2021, expected: 2023-26)
16. **Zeisterwerf**, Zeist (2019)
17. **Luca II**, Antwerpen, BE (2017)
18. **Het Hallehuis**, Amersfoort (1984)
19. **Vlieland cohousing** (2018)
20. **De hogewyk**, Weesp (2009)
21. **Studentcampus**, Terschelling (2017)
22. **Tietgen Domity**, Copenhagen, DK (2005)

2.3. BEST PRACTICES ANALYSIS:

2.3.1. Approach:

The analysis of the selected project examples explores how major spatial factors, identified in co-housing literature as influencing the levels of social interaction among residents are recognized into the architectural design of the selected cases.

The available information is structured and classified into multicriteria tables. A pattern recognition analysis is conducted to study the spatial outcome of the related factors into the different cases.

Further, a set of graphic schemes, exploring the outcome of major influencing spatial factors into the layout and (ground floor) building plan have been executed per case. By analyzing similarities into the spatial approaches, major design patterns have been distilled. These provide an inspiration and idea of the architectural approaches which can be applied into the future designs.

2.3.2. Description of the studied influencing factors:

The analysis criteria are based on a literature review of the major influencing social and spatial factors for social interaction within co-housing developments. The spatial factors, included in the current study and the ways they may influence the levels of social interaction among people are described below:

- **PROXIMITY:**

Social interaction is enhanced in a community when residents have greater opportunities for contacts. Therefore, both physical and functional proximity of spaces are important factors in terms of encouraging social interaction (Gehl, 2011; Williams, 2005). When people live closer to each other and there are available appropriate spaces, the chances for social interaction are higher (Williams, 2005). Increasing proximity through design enables repeated passive contacts between residents and amplify the occasions in which residents come across each other, enhances spontaneous contacts and interaction. Proximity can be also related to other spatial factors influencing social interaction, like density, clustered configuration, height of buildings, shared pathways, etc.

- **SCALE:**

The scale of a building (number of household units per hectare) is related to the probability of establishing social contacts and the levels of interaction between its residents. If the development is too big, there might be an “institutional” feel. In addition, the bigger number of dwelling units suggests a greater number of inhabitants as well, which results to “anonymity” and lack of closer relationships among residents (Williams, 2005). On the other hand, too small and “intimate” scale developments

will resemble more like a large “family house” and residents may experience a lack of privacy (Durrett & McCamant, 2011). Exact values of the scale factor regarding social interaction are not defined.

- **DENSITY:**

Density and size of the community are critical factors for setting up social contacts between residents (Williams, 2005b), (Baum & Valins, 1977). Density can be related to the proximity of major spaces within the building layout, which greatly influence the intensity and probability of social interactions between residents (Williams, 2005).

Different studies show, that at extremely high densities, residents feel like they lose control over the social environment and tend to withdraw from the community (Williams, 2005; Birchall, 2014). According to Altman (Altman, 1975), there is a critical value of dwelling density that allows proximity but not overcrowding. However, these values are not specified yet.

- **CLUSTERING (BUILDING CONFIGURATION):**

The configuration of a building turns to be of major importance regarding social contacts between its residents. The utilization of communal spaces could be maximized through setting a clustering configuration (Baum & Valins, 1977). Clustering provides shorter distances between the main parts of the building layout (Birchall, 2014). Through the increased proximity, a clustered housing has many social advantages – it supports social interaction, enable spontaneous contacts and the visual observation (Abu-Ghazzeh, 1999). The increased surveillance over the common spaces provides greater social control, which also increase safety.

- **BUILDING HEIGHT / NUMBER OF FLOORS:**

In terms of social interaction, the lower and medium height of the buildings are preferred (Williams, 2005). They have many advantages: For example, residents have good surveillance at the common open spaces. Consequently, they get to know each other better, which strengthens the community (Williams, 2005). Because of the good visibility to the ground level spaces, a greater social control is possible, which from the other hand increases safety.

According to Gehl (Gehl, 2011), buildings with height up to 13,5 m allow various passive and active interaction (like observing, speaking, hearing, and reading face expression) among people within buildings and those on the ground level (fig. 3). The access from private units to the common outdoor spaces is also easier and faster. Within buildings with height up to 31m (ca 8 floors) people can still observe the ground level areas and establish visual contact with people there (Gehl, 2011). Residents in high-rise buildings, for example, may withdraw from the community as the communication between too different levels (e.g. upper floors and lower floors) is difficult.

- **NUMBER OF RESIDENTS / SIZE OF THE COMMUNITY:**

Overall, literature studies state that there are fewer social interactions in large communities. This is mainly because in larger communities, residents do not know well each other, other people's values, attitudes, and norms. Because of this anonymity residents are less inclined to interact socially with each other and rather prefer to communicate with people they know from other social environments (for example on the workplace, at school, in clubs, with own friends, etc.) (Durrett & McCamant, 2011).

When the community is too small, it will resemble more a large family. The residents maintain closer relationships in between, but they might feel overloaded by the intensity of shared responsibilities. Very small communities often suffer from a lack of privacy. (Durrett & McCamant, 2011).

The number of residents can also influence potentially influence the utilization of communal spaces (Baum & Valins, 1977; Coleman, 1990; Fromm, 1991). According to literature, residents are more inclined to use communal spaces shared within smaller groups (Williams, 2005).

There are different opinions about the maximum and optimum number of residents within a community to maintain meaningful social interaction and contacts.

- **PRIVATE UNITS (size, availability of facilities):**

In co-housing literature is suggested that a smaller size of private spaces with limited facilities encourages greater utilization of common spaces and consequently greater social interaction (Fromm, 2000; Williams, 2005).

- **SHARED PATHWAYS:**

Shared pathways to activity sites and major spaces (such as private units, community areas, parking spaces, shared facilities, etc.) enhance the potential for social interaction between residents (Gehl, 1987; Fromm, 1991; McCammant & Durrett, 1994; Abu-Gazzeh, 1999). When using limited number shared routes, residents can easily come upon each other and maintain spontaneous contacts.

- **PARKING OPORTUNITIES:**

The positioning of parking facilities on the periphery of the plot prevents residents from getting straight from their private unit into the car (Williams, 2005). When walking through the area to the parking lot on the periphery residents share common pathways which enables spontaneous contacts between them. Further, such a design configuration creates entirely pedestrian and child safe living zone.

- **POSITIONING OF THE SHARED SPACES (OUTDOOR AND INDOOR)**

Communal spaces (indoor and outdoor) provide excellent opportunities for social interaction (Bouma et al., 2015). They should be centrally positioned within the layout (Fromm, 1991; McCammant & Durrett, 1994), easily accessible (Fromm, 1991; McCammant & Durrett, 1994; Abu-Gazzeh, 1999) and visible.

- **SURVEILLANCE / VISIBILITY:**

Opportunities for surveillance within the community greatly influences the levels of social contacts. The ability of residents to see others and observe shared public spaces provides information about others and strengthens the sense of community (Abu-Gazzeh, 1999), (Williams, 2005).

- **PLACES TO SIT**

Places to sit are important elements of the outdoor spaces to enhance social contacts among residents. The integration of various sitting opportunities within the (urban) design is critical to promote social interaction – both through passive observation and spontaneous contacts (Gehl, 2011).

- **SEMI-PUBLIC (BUFFER ZONES)**

Semi-private space or buffer zones (like gardens, verandas, front yards, patios, porches, balconies) are very important spatial elements in terms of social interaction. They provide a gentle transition between public and private space (Abu-Ghazzeh, 1999) and may also act as an excellent interactional space (Williams,2005), (Gehl, 2011).

2.3.3. Variables

Within the multicriteria table and graphics the following variables based on the described above spatial factors influencing social interaction are studied for each case (see appendix):

- **Multicriteria table:**
  - Project location
  - Layout configuration
  - Community composition
  - Scale

- Area and density
- Dwelling type
- Building configuration
- Building height
- Access method
- Availability, and types of semi-public (buffer zones)
- Private dwellings: types, size, main facilities available
- Indoor and outdoor shared spaces: types, positioning
- Outdoor shared space: types, positioning
- Routing from private dwellings to parking space

- **Graphic schemes:**

  - Layout configuration
  - Building configuration / clustering
  - Access and main routing within the layout
  - Parking facilities (positioning)
  - Positioning of the major indoor and outdoor shared spaces
  - Semi-public (buffer) zones
  - Visibility and surveillance to shared outdoor spaces
  - Private-shared spatial relationships on a layout and ground floor (building) level (schemes layout and ground floor plans)
  - Shared pathways to the main layout and building elements and parking

2.3.4. Multicriteria table:

(See appendix)

2.3.5. Results of the multicriteria table analysis

(see appendix):

2.3.6. Graphic analysis:

Within the description of cases, a set of concept graphic schemes have been executed to study their design regarding the spatial application of major factors influencing social interaction. More specifically the following characteristics have been explored: shared pathways, parking opportunities, (main) access (to the plot, buildings and main facilities), visibility (to the main shared outdoor spaces), positioning and accessibility of outdoor shared spaces, availability and types of buffer (semi-public) zones and positioning (proximity) of the common and private areas. Further, set of schemes of the

building ground floor, in section and of the routing to the main indoor and outdoor common spaces have been executed to study the balance and relationships between private and shared spaces. The schemes, drawings and related information per case can be found in the appendix.

2.3.7. Conclusions:

2.3.7.1. Conclusions per variable - multicriteria table:

Different common spatial patterns for the transition of the major influencing factors have been recognized within the design of the selected cases.

- **LOCATION:**

Most of the listed cases are located in residential (suburban) or dense urban environments. The location context of a project can be related to the outcome of other variables, such as scale, density, dwelling types, height, etc. (see below).

- **NUMBER OF DWELLING UNITS / SCALE:**

By studying number of practical project examples of classic co-housing developments from the 80's and 90's, Durett & McCamant (Durrett & McCamant, 2011) have proposed three different scale sizes by their social and physical characteristics: small scale co-housing developments (S), medium (M) and large (L). The classification of the residential developments within the current analysis is generally based on the values, proposed by McCamant& Durrett. However, the contemporary project examples within the current selection show bigger variety of values, therefore the three more groups are included (see section 4.1.).

The analysis of the cases shows that regarding number of dwelling units per hectare, the samples in the current selection are mostly middle sized with 20-25 household units, large scale (ca 40 units) or their number is in the range of 50 till 100 dwelling units. Middle-sized developments are described by Durrett as optimum in size (Durrett & McCamant, 2011). They are small enough to encourage closer relationships between residents, yet they provide enough diversity of shared facilities, privacy, and freedom of personal.

The outcome values in the current selection of cases are very dependent on the choice of a project sample, the types of dwelling units within the development, and its location context. The greater variety of communal living forms nowadays should be also considered, because other socio-spatial factors may also play a role.

The exact values of the scale factor regarding social interaction are not defined in the literature. The current study, because of its limited character cannot contribute to determining the range of these values, therefore it still needs to be investigated what the desired scale could be.

However, the current study shows some interesting results. For example, within larger scale developments the dwellings are often divided into smaller groups (building blocks or clusters), which in most cases consists of 20 to 35 units. Clustering commonly appears to larger-scale developments with more than 45 dwelling units and over 100 residents. Within the current study, more than 100 dwelling units are identified in extra-large developments, focusing on special target groups (such as students) and utility purposes (for example, nursing houses).

Interestingly, larger-scale project examples also don't show to be necessary also highly dense – seven cases (such as Woonproject Wien, Spreefeld, Vrijburcht, Krebstein, Knarrenhof) have a density of approximately 80 dw/ha (an average value for the current selection of cases) and less. The two student housing cases are again exception from this rule.

Further, several common features have been recognized within the samples, identified as larger-scale projects (45+ units): They are located mostly in an urban context, provide a bigger variety of common spaces and extended choice of facilities – aimed both for the community or open to the public.

Such developments often offer "mixed-use" activities and functions (such as commercial, retail) on the ground level, open to the public. In this way the projects can better integrate (physically and functionally) into the city and provide added value to the neighborhood.

Looking at the community composition, larger-scale developments allow a greater diversity of residents, regarding age, background, and family types. Consequently, they provide a bigger variety and multiples choices of dwelling units, corresponding to the different needs (when multigenerational) of their residents – families with or without children, singles, seniors, couples.

Projects like Kalkbreide, Woonproject Wien and Spreefeld are nice case examples of larger scale developments, combining these features in their designs. Within this study we cannot determine to what extend the described common features of the larger scale developments are related and increase the levels of social interaction among their residents.

- **DENSITY:**

The analysis of the project examples shows an average density of ca 80 dw/ha.

The overview of the current selection of cases shows, that high density values are not necessarily related to a higher number of floors or larger scale of the development. For example, one of the densest developments (Quayside Village, Vancouver) is middle rise (four floors) and has only 19 household units, which shows that dense developments don't need to be overwhelming in scale or tall. Despite its higher density, there is an elegant design.

Further, density values can be referred to the location of the case and its target group – not surprisingly, denser developments are located in an urban context. Regarding target group, senior co-housing developments from the current selection of cases have lower to medium density. The two student housing project examples are here an exception, showing both very high-density values and greater number of dwelling units.

The optimal density values are not identified yet. Further study is needed to estimate the optimal density within the different urban contexts and co-living typologies to promote social interaction among the residents.

- **BUILDING FOOTPRINT AND LAYOUT CONFIGURATIONS:**

Within the current selection of cases there can be distinguished the following types of developments: compact building blocks, complexes of enclosed buildings, detached buildings and attached buildings. Regarding layout, the selected cases can be classified in several major types of configurations: compact building blocks, maximally enclosed developments, open building blocks, detached clustered buildings, clustered buildings with directionally enclosed space, clustered with asymmetric implied space and parallel attached, with directional implied space (row housing) (see 4.1. and appendix).

The majority of project samples have a compact building configuration. Within the current selection of cases there can be distinguished mostly compact mono and maximally enclosed building blocks. Within the multi-structure developments, clustered detached building configurations are most common. The multi-structure developments have clustered layout configuration, with different levels of space enclosure. They are situated around a centralized outdoor shared space (shared greenery, common yard, or pedestrian street).

The compact building configuration is related to proximity, which is an important spatial factor, influencing social interaction. The compact building form ensures also good accessibility, surveillance, and visibility to the shared (outdoor) spaces.

- **HEIGHT / NUMBER OF FLOORS:**

Most of the buildings within the current project selection are low rise (up to 3 floors) or middle rise (3-5 floors). There are few developments with 5+ floors and lift. They are maximum 7 floors high.

As described above, in terms of social interaction, the lower height of the buildings (up to 3 floors or 12m) has many advantages.

Further, several common features related to social interaction appear to higher rise buildings within the current project selection: First, they have a compact, mono-block configuration and provide multiple choices of outdoor common spaces. In addition to the ground level these projects provide community spaces on the upper levels as well, such as elevated decks, community terraces, or rooftop

gardens. These extra shared outdoor areas enlarge the potential for social interaction, especially for residents living on upper floors. The greater people's flow circulation between the building levels towards the shared spaces through shared routes increases the opportunities for spontaneous social contacts between residents.

In the cases, where the ground floor areas have multiple functions and are open to public, the uplifted shared spaces are reserved for the community.

- **NUMBER RESIDENTS / SIZE OF THE COMMUNITY:**

In most of the cases the number of residents vary between 50 and 100. Because for most of the cases there is no available information about the exact number of residents, very limited estimation can be done about this variable.

Usually in project developments with more than 100 inhabitants, the residents are divided into smaller groups (for example, Kalkbreide, Zurich or De Hogewyk, Weesp). Clustering in smaller groups is a way to increase social interactions within larger communities, especially when there is a greater diversity regarding age, family forms or cultural background. As mentioned above, clustering influence positively the levels of common space utilization (Williams, 2005). However, clustering into smaller or target groups also seems to be able to create divisions within the whole community. It is supposed, that for the mutual involvement of different groups should be relied on the integrating effect of the facilities and activities (indoor and outdoor) planned for the whole project.

Based on observations on various co-housing project examples of the 80's, Durett (Durrett & McCamant, 2011) proposes communities with up to 50 adults to sustain connectedness among residents. However, nowadays a great diversity of co-living forms emerges, therefore further research is needed to determine the optimum number of residents ranges within the various communal living types. Future studies can contribute and explore more in detail the optimum number of residents (regarding social interaction) in co-housing developments targeting, for example, older people, homogeneous closed communities, or multigenerational, less inclusive ones.

- **LIFESTYLE / COMMUNITY COMPOSITION:**

The selection of cases aims to provide greater variety of cases not only regarding the types of community living and spatial characteristics, but also the community composition.

Most of the projects host residents of various age, background, and diverse family forms – singles, couples, single parents, families with or without kids. Some projects offer in their program dwellings aimed specially for vulnerable members of the society - handicap youth, people with lower incomes or refugees. In literature is suggested that the greater diversity of generations, mixture of backgrounds and family forms contributes to the potential attractiveness of interaction (Williams, 2005).

Within the current set of cases, those hosting a greater variety of residents usually provide an increased diversity of facilities and spaces (both private and shared) available to residents within the community compared to developments targeting for example only older people (e.g., Woonproject Wien, Kalkbreite).

However, in case of bigger diversity common attitude to the basic values and principles of the community is an important requirement (Williams, 2005). Because of lack of information, the real levels of social interaction, connectedness, and cohesion between residents within these projects' samples cannot be stated. Therefore, the positive effect of the greater residents' diversity within the project samples can be only hypothesized.

- **DWELLING TYPE:**

Within the current selection of cases three types of developments, regarding their dwelling types are generally distinguished: ground bounded, apartments and mixed. Most common are apartment co-housing developments.

The kind of dwellings within a (co-housing) development – ground bounded, apartment or mixed, is related to other project variables as well, such as height, scale, type, and location context.

- **PRIVATE UNITS: Dwelling types and sizes:**

Within the current selection of cases most common are apartment co-housing developments. Apartment units from its side can vary in very broad ranges from 28 m2 for a basic, non-equipped unit or studio to 290 m2 for multi-family flats.

Most projects provide various basic facilities within their private units, such as private bathroom, living and cooking space (depending on the case - kitchenette or fully equipped kitchen), despite the availability of a cluster community space with (professionally equipped) kitchen. The last two project cases aimed for students are the only exception of that rule.

- **PRIVATE UNITS – Access:**

Regarding access to the private dwellings, those with direct access are recognized in fewer cases. These dwellings are usually lower height and ground bounded. The communal areas in this case are situated in apart building. Further, the private dwellings with direct access are related to the outdoor shared (green) space through buffer zones – front yards, veranda's, balconies, or patios. Thus, there is graduation of the spaces from private to shared. Three of four cases with direct entry access are senior co-housing developments, aimed for vital and independent residents.

- **SEMI-PUBLIC/ BUFFER ZONES:**

Within the current selection of cases 17 of 22 projects include different forms of semi-public (buffer) spaces in their designs. Exceptions of that rule are developments with special concept design requirements (such as Windsong Cohousing), student co-housing, and specialized live-and-care complexes for seniors (De hogewyk, Weesp).

From architecture point of view the semi-public spaces available in the overviewed cases can be classified in two types: elements, belonging to the building – such as (front) gardens, yards, patios, and semi-public elements which are part of the building construction – for example verandas, porches, balconies. Currently it is not possible to assume whether there is difference between the two groups in terms of opportunities for social interaction.

When the type or design of a project does not allow to include semi-private elements such as front yards, veranda's, or porches in their designs, there are specious balconies overlooking the common outdoor areas. These can work as a buffer zone as well.

- **INDOOR SHARED SPACES:**

In a socio-spatial aspect, the available indoor shared spaces can be divided in three groups: shared spaces and facilities on a group/cluster level, shared spaces aimed for the community on a project level and shared paces open to public / neighborhood.

Depending on the configuration and type of the development the shared indoor spaces could be situated in apart building or within the building complex itself. Their type and positioning are described per case. All project examples include meting shared spaces into their designs. The major indoor shared spaces are centrally positioned in plan and visible, also on the façade. They are usually situated next to the main entrances (halls) and in close proximity to the main vertical connection building elements, like stairs and lifts.

The main communal spaces within higher rise or bigger scale urban developments are typically situated on the ground floor level within or between the buildings. Often, the project designs provide shared spaces and facilities on the ground level open to public as well.

Communal spaces in an apart building appear within the layouts of lower-rise developments and partially within middle rise complexes, additionally to the ground floor in-built common areas.

- **OUTDOOR SHARED SPACES:**

The following types of shared outdoor spaces have been identified within the current selection of samples: Common green, common yard or pedestrian street on the ground level and elevated decks, common terrace, rooftop on uplifted levels. Further, in some of the cases there is a combination of both on ground and uplifted level elements. Typically, middle, or higher rise and bigger scale

developments include more than one shared outdoor spaces into their designs. In case that the ground level shared spaces are used both from the residents and the neighborhood, the uplifted ones (such as roof gardens and terraces) are aimed for the community only.

2.3.7.2. Conclusions per variable – graphic analysis:

Within the best practices overview, a set of concept graphic schemes have been executed to study the spatial application of the major factors influencing social interaction within the project samples design (see appendix). More specifically the following variables have been explored: shared pathways, parking opportunities, main access, visibility, positioning and accessibility of the outdoor shared spaces, availability, and types of buffer (semi-public) zones, positioning of the common areas in plan and their relationship to private areas.

The graphic analysis of the layout and floor plan gives insight into the practical application of major influencing factors (such as proximity, visibility, shared routes, etc.) into the project design. The executed concept schemes generally follow a similar pattern. However, because of the different amount of available (visual) information, they may vary per case.

- **PARKING OPPORTUNITIES:**

The parking areas within all project samples are limited in their capacity and are located on the periphery of the plots (see appendix) or underground. Two project examples have no parking space included into their design. Instead of car use there are promoted other mobility alternatives, such as carpooling, car share, extended use of public transport and bike share. Consequently, all plots are car free and child safe. According to literature, within entirely pedestrian living zones with parking facilities situated on the periphery of the plot are enabled spontaneous social contacts between residents. Such layout configurations prevent residents from walking directly from their private units into the car (Williams, 2005).

- **SHARED PATHWAYS AND ROUTING:**

The configuration of the major pathways within the layout is studied per case. Overall, there is limited number of pathways, and they provide direct connection to the major elements of the layout.

The relation between communal and private is clearly expressed in the layout: the parking is situated at the border of the plot and shared pathways lead through the common green/outdoor space and along the communal building to the private dwelling (see “routing private to parking” schemes).

Concept schemes, studying the routing from private space to shared areas or the parking lot are executed per case. Depending on the case and the layout configuration, the route from the parking to

private units is never direct, but leading through the shared green/open space, semipublic zones (if applicable) and/or common space(s). This principle is applied to all cases, despite the parking location (outdoor or underground). There is a graduation of the spaces from private to shared areas both in layout and plan.

- **POSITIONING of communal areas (in plan and layout):**

The plan analysis shows that the common outdoor and main indoor spaces are centrally positioned within the design of the studied case examples, easily accessible and in a reasonable distance to private dwellings. Generally good visibility and surveillance opportunities to the common spaces are provided (see also below).

- **PROXIMITY**

Proximity is expressed into the design of the selected cases mainly through their compact building design and enclosed layout configuration (see above).

The main communal spaces are centrally positioned into the layout and building plan, in a reasonable distance from the private dwellings in order to be easily accessible from all the residents. By this reason the majority of the observed cases are lower height with up to 3 floors. In case of higher rise buildings, additional shared spaces, such as roof gardens, common terraces and elevated decks are spread out through the floors.

- **VISIBILITY AND SURVEILLANCE:**

Good visibility and surveillance of the common (outdoor) areas are important aspects of the co-housing design in terms of social interaction and safety. Good visible common spaces allow residents to observe the community life in the shared spaces and take part in the activities. Further, the ability of residents to see others provides information about them, which increases the possibilities for spontaneous social contact and strengthens the sense of community (Abu-Gazzeh, 1999), (Williams, 2005).

The good visibility is enabled within the design of the cases firstly by clustered layout configurations and secondly by the extensive implementation of elements into the building design like large windows, specious terraces, and elevated decks, overlooking to the common outdoor space. Further, all projects provide a direct and multiple access on a ground level to the outdoor shared spaces. They are positioned centrally in the layout, in a way that they can be easily observed from the private dwellings.

- **OUTDOOR ELEMENTS**

Within most of the cases there are many places to sit available in the green and outdoor areas**.** Sitting opportunities are important elements of the layout and building design for stimulating spontaneous social interaction among the residents.

2.3.7.3. Overall conclusions:

Generally, it can be concluded, that the design approaches used in the selected project samples adopt most of the architectural and urban design principles identified in the literature as being crucial for achieving higher levels of social interaction among residents.

Regarding private and common areas within the project designs and their relationship in terms of social interaction, the following spatial patterns can be recognized:

The main communal areas are visible and clearly recognizable within the project layout and the façade design. Depending on the case example, communal areas can be located in a separate building or as a part of the building complex.

Shared spaces as part of the building are common for the design of medium to higher, compact building complexes. They are situated mainly on the ground floor level, typically near the main entrance/hall, and in close proximity to main vertical connection elements (such as stairs and lifts). The main common areas are easily recognizable on the façade. In case that the ground-level shared spaces are open to public and used both by the residents and the neighborhood, the uplifted shared spaces are aimed at the community only. As mentioned above, the bigger scale developments within urban areas include a greater variety of shared spaces into their designs.

Communal spaces located in apart buildings are common in the design of lower (1-3 floors) or medium (up to 4 floors) height building complexes with ground bounded or mixed types of dwellings.

The graduation of the spaces from private to public is visible both in the layout and the ground level plan schemes. Further, elements in the design, such as front yards, verandas, patios, or spacious balconies, are available of in all, but four (special design and target group) cases. They act as buffer zones and provide a gentle transition between private to public space (Abu-Ghazzeh, 1999) and may also act as an excellent interactional space (Williams,2005), (Gehl, 2011).

Finally, it can be concluded, that overall, the major influencing factors for social interaction in relation to private-shared areas are translated into the design of the studied case examples as shown in literature.

However, the analysis of the private units within the current selection of cases showed some interesting results. Within the design of the project examples have been determined increased variety of private units regarding size and typologies. Besides, private units in all project cases, except student housing or those for temporary rental use (Kalkbreite), are equipped with cooking facilities despite the

availability of a common cooking or dining space. Depending on the case and type of units, these facilities are varying from full equipped private kitchens to basic kitchenettes.

In co-housing literature is suggested, that a design with smaller size private units and limited facilities encourages the greater utilization of common spaces and consequently greater social interaction (Fromm, 2000; Williams, 2005). The results can be explained by the greater variety of communal living forms that emerge nowadays, which consequently influences their design.

The dwelling units within the samples are often personalized: to a different extend and depending on the project, the future residents had choices regarding the design of their private space. Further design characteristics of the overall concept and common spaces are in most of the cases discussed with residents during the design process through co-creation sessions.

Thus, the proposed contemporary designs to big extend consider the specific user needs and the overall comfort of the private and shared spaces.

Depending on the community composition and target group, some differences within the spatial patterns described above have been recognized.

For example, multigenerational co-housing developments are characterized by a greater variety of communal spaces and facilities. Typically, they have also extended variety of private dwelling unit types in their designs, which is related to their greater diversity of residents in terms of socio-demographic characteristics and needs. Kalkbreite is a nice example of multigenerational co-living development, where units aimed for temporary rental use, singles, families, youth, people with lower incomes or special needs are available into the design. The shared spaces provide variety of spaces for the group, for the community, cooking and dinner, leisure time, open to the neighborhood, retail, etc.

The senior co-living case samples in the current selection include both projects aimed for vital, independent seniors and older people with health complaints or (special) needs (nursing homes). Therefore, their designs are very diverse. However, the design of the studied senior co-living project examples adopts most of the principles, spatial approaches, and elements, described above in this study and in literature.

Comparing to multigenerational project examples, the co-living developments aimed for vital seniors are overall lower height, lower to medium density, direct accessible, and more closed. Bigger scale co-living or live-and care senior complexes usually provide greater varieties of spaces and facilities on the ground floor level or in the communal house. In some cases, these are also (partially) open to public.

There are only two samples aimed at students involved in the current selection of cases. Therefore, no estimations can be made. However, the spatial outcome of many variables (such as scale, density, buffer zones, private unit facilities, etc.) within these projects differ from those, identified in the rest of the cases. In future studies, co-living developments aimed at youth and students can be studied as apart group.

Finally, it can be concluded, that the design approaches used in the current project examples adopt most of the architectural and urban design principles identified in the literature as being crucial to achieve high levels of social interaction among residents. The project samples included into the current selection vary in scale, typology, target group and program. They range from traditional co-housing developments to new contemporary forms of collectives and contemporary residential types with

social, sustainability, or affordability focus. Thus, the lessons learned from this best project overview can be a base for inspiration and incorporated into the design of various future residential developments oriented to inclusive and social communities.

However, the analysis was based on limited information which covers design and spatial characteristics but does not show the actual utilization of these spaces. Because it was not possible to apply qualitative research methods like interviews or observation on place, it was also not possible to determine the real values of social interaction and connectedness among residents. Consequently, the applied design approaches cannot be ranked in terms of their impact on social interaction.

This analysis has mapped the applied design principles and concepts into best practices. There is no judgment made.

There cannot be underestimated the complexity of inter-relationships between all social, personal, and design variables. The results and conclusions within the current study are not statements and they can only be used as an example or an outgoing base, raising questions for future research.

PART TWO:

TRANSLATION

CHAPTER THREE:

CONCEPT DESIGN PRINCIPLES & ARCHITECTURAL APPROACHES

In phase two – **Translation** – the findings from the explorative phase are translated into concept guidelines and practical architectural approaches for the spatial design of communal housing and space(s) to promote higher levels of utilization and social interaction among their residents.

3. CHAPTER 3: CONCEPT DESIGN PRINCIPLES AND ARCHITECTURAL APPROACHES TO STIMULATE SOCIAL INTERACTION AMONG RESIDENTS WITHIN THE CO-HOUSING DEVELOPMENTS

3.1. INTRODUCTION

The current chapter aims to describe major principles and contemporary architectural approaches for the design of communal housing developments to stimulate social interaction and promote spontaneous contacts among their residents. These principles are based on the discussed earlier in this document major spatial factors influencing social interaction from literature. Further, the described architectural approaches correspond with the design patterns identified within the best practices overview analysis conducted in the previous chapter.

Because of its broader scale and complexity, the described principles cover the discussed topic partially and only to a certain extent. However, this document provides the necessary practical basis knowledge on how to potentially stimulate through architectural design the levels of social interaction and connectedness among the residents of (co-) housing developments.

The described below design strategies and approaches are discussed on two scale levels: (general) layout and building. Additionally, within these scales are studied the major principles for the design of indoor and outdoor shared community spaces to promote higher levels of social interaction and spontaneous contacts among the residents of (co-) housing developments.

3.2. LAYOUT

3.2.1. General layout design:

Based on the previously determined spatial factors, influencing the levels of social interaction among residents and the best practices overview analysis from the previous chapter, the following major principles, and architectural approaches for the design of a general layout can be described:

- **Limited number of (shared) pathways to the major layout elements**

Influencing Factors: shared routes

Shared pathways to major spaces, activity sites and private units enhance the potential for social interaction between residents (Gehl, n.d.), (Fromm, 2000b), (Abu-Ghazzeh, 1999), (Kathryn & Charles, 2011). When using limited number shared routes, residents can easily come upon each other and maintain spontaneous contacts.

- **Parking facilities at the plot border**

Influencing Factors: shared routes

Aligned with the principle of designing limited shared routes described above, the positioning of the parking facilities on the periphery of the plot is a widespread architectural approach to enhance the opportunities for spontaneous social interaction among the residents.

According to Williams (Williams, 2005a), this prevents residents from getting straight from their private dwelling into the car. When walking from the parking lot on the periphery through the area to their homes, residents share common pathways with others which enables the opportunities for spontaneous contacts between them. Ideally, the routing to the parking lot goes through the shared outdoor space (in case of on-plot parking facilities) or through the major indoor communal spaces (in case of in-building parking facilities). Further, a layout configuration with parking facilities at the border of the plot creates an entirely pedestrian and child-safe living zone within its boundaries. According to (Gehl, n.d.) the lower pedestrian speed, compared to bike or car ways of transportation, enhances the possibilities for observation, spontaneous contacts, and social interaction on the way.

- **Clustered, compact building layout configuration:**

Influencing Factors: clustering, proximity, visibility, access

A compact, clustered building configuration within the layout is related to the factor proximity, which is an important spatial factor for encouraging social interaction (Williams, 2005a). When people live closer to each other and there are available appropriate spaces, the chances for social interaction are higher (Williams, 2005a). Increasing proximity through design enables repeated passive contacts between residents and amplify the occasions in which residents come across each other, thus it enhances spontaneous contacts and interaction. When living closer, people can observe, and know

their neighbors better. Further, thanks to the clustered, centralized building layout design, the accessibility, and surveillance towards shared communal spaces are better.

Within the best practice overview have been identified several types clustered building configurations (Fig. 2) with different levels of enclosure. Fig. 3 shows a project example (Central Wonen Delft), where the principle of clustering is applied into the layout design.

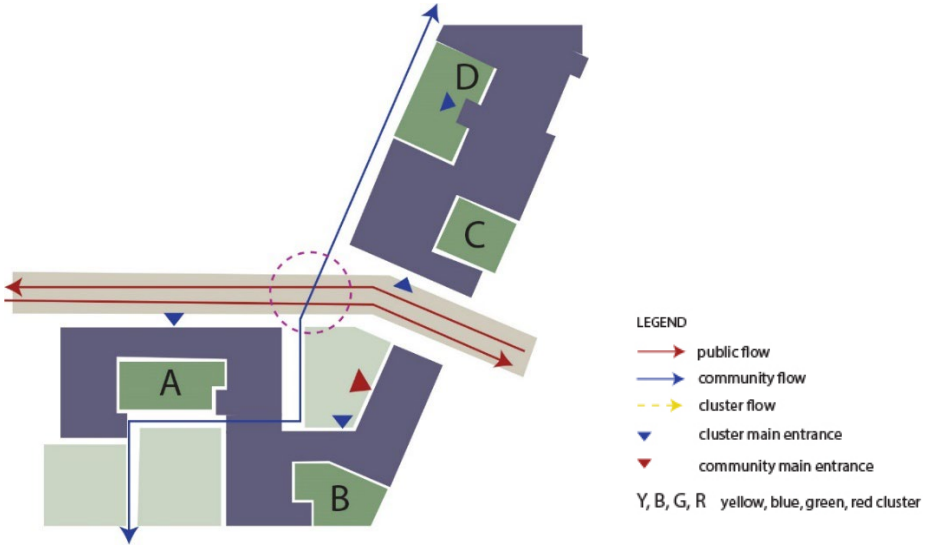


Figure 4: Layout scheme Central Wonen Delft. Example of clustered buildings blocks in the layout. Adapted from (Krabbendam, 2020).

- **Orientation of the buildings to one another through the front**

Influencing Factors: visibility, proximity

Related to the previously discussed design principle of clustered building arrangements, to enhance the passive and stimulate active interaction among residents within the co-housing development, the dwellings must be also oriented to each other through their front and entrance (Abu-Ghazzeh, 1999).

Further, to enable visibility and passive interaction, the housing blocks should be situated on not too big distance from each other. According to Gehl (Gehl, n.d.) people can read other's face expression and emotions on a distance till 22-25m. On distances from 25 till 70 m is still possible to recognize a person but is practically not possible to maintain meaningful contacts with others. Although there are no specific values in literature about the optimal distance between houses in terms of social interaction, based on the relationships described by Gehl it can be suggested, that a distance up to 20-25m is reasonable.

- **Graduation and transition of the spaces from private to public. Semi-public / Buffer zones**

Influencing Factors: hierarchy of spaces, private-shared opportunities

On-ground elements of the layout design, such as front yards, verandas, patios, or porches provide a gentle transition from private to public (Abu-Ghazzeh, 1999). A person in his front garden, for example, has a choice whether, to what extend and in which way to interact with others or take part in the shared activities. Besides, semi-public zones may also act as an excellent interactional space (Williams, 2005a), (Gehl, n.d.).

When the building layout does not allow including semi-private elements into the design such as front gardens or yards, the balconies overlooking the common outdoor areas can work as a buffer zone as well.

3.2.2. Outdoor shared space

In terms of social interaction, the shared by the community outdoor spaces are important elements of the general layout design. Shared gardens, courtyards or pedestrian streets are examples of such communal spaces within the general layout. In the case of compact, one-standing building configurations, such a role may play elements like rooftops and roof gardens, shared platforms, or terraces (see 3.3. Building).

To create a qualitative shared outdoor space, which promotes social interaction and spontaneous contacts among its users, the following major design principles based on literature and the best practice overview analysis can be described:

- **Centralized position of the shared space outdoor space.**

Influencing Factors: proximity, accessibility, visibility

As discussed above, a common approach in the co-housing layout design is arranging the dwellings around the central shared space. The central positioning of the shared spaces (both in the layout and building plan) is a major principle to enhance social interaction among and their utilization by the community (Fromm, 2000b), (Kathryn & Charles, 2011).

When positioned centrally within the layout design, the shared outdoor space is equally and easily accessible by the residents. Good accessibility to the shared space from its side is also an important factor that contributes to social interaction (Fromm, 2000b), (Abu-Ghazzeh, 1999), (Kathryn & Charles, 2011). Further, a central positioning of the outdoor space within the general layout enhances the visibility from the private units to that space (Abu-Ghazzeh, 1999), (Williams, 2005a).

- **Compact size of the outdoor shared space**

Influencing Factors: proximity, visibility, surveillance

When good visibility and surveillance opportunities to the shared outdoor space are provided in the design, this can enhance both passive and active social interaction among the residents. To ensure such good visibility, the outdoor share space should be compact and not too big (Abu-Ghazzeh, 1999). According to Gehl (Gehl, n.d.) we can see a person on a distance lower than 100m. From 50-70m it is possible to recognize a person and details such as the color of the hair, body language, etc. From 20-25m one can view the facial expression or emotions of others. Gehl states, that in a distance from 100 to 25m it is not possible to maintain meaningful social contacts with others. Therefore, it can be concluded, that an outdoor space should not exceed 50-70m from one point to other to recognize other residents and depending on the case, the maximum distance could be lowered to 25m or shorter (<10m) to maintain social contacts on different levels and intensity.

- **Places to sit. Various opportunities regarding private-shared choices:**

Influencing Factors: visibility and surveillance, private-shared choices, places to sit

Places to sit are important elements of the outdoor spaces to enhance social contacts among residents. The integration of various sitting opportunities within the layout design (in common outdoor spaces, along main pathways or along the building façade) is critical to promote social interaction – both through passive observation and spontaneous contacts (Gehl, n.d.).

Ideally, the available sitting places in the layout design/outdoor space should provide various opportunities regarding private-shared choices: for example, benches or smaller sitting groups for closer interaction, places for rest and passive observation, places for community activities, such as (group of) bigger tables with benches, barbeque corners, etc.

- **Gathering nodes along the pathways**

Influencing Factors: shared pathways, activities and facilities, visibility

Practical examples show that gathering nodes along the walkway, created by various elements of the exterior, such as barbeque spot, picnic table, children's playground/sandbox, (group of) benches, sitting group and similar are important features that support socializing and collaborative activities.

According to Durrett (Kathryn & Charles, 2011), such nodes are typically associated with five to nine houses and optimally residents could see at least one gathering node from their place without leaving the house.

- **Good quality of the outdoor shared space: sphere and safety**

Influencing Factors: accessibility, sphere, quality, safety, activities, and facilities

Ensuring good quality of the outdoor shared space could greatly contribute to its utilization and thus enhance the possibilities for spontaneous contacts and interaction among residents. There are numerous aspects, which contribute to the quality of outdoor space. Next to the already discussed above routing nodes, sitting and activity opportunities, also sphere, good maintenance and safety features are of major importance.

Feeling safe and secure encourages social interaction (Chan & Lee, 2008), (Dempsey et al., 2011). Overall, under safety in shared outdoors space is meant, that there is, for example, no risk for accidental falls, the space is good walkable and accessible, there is enough lighting is available and there are no (big) obstacles, preventing the good visibility and surveillance by the residents to the outdoor space.

Under good sphere, we understand here mainly good aesthetics (including colors, materials, etc.) and maintenance of the shared outdoor space. Further, to encourage its utilization by the inhabitants, the outdoor space should provide enough facilities and opportunities for various activities. Such elements can be barbeque corners, children's play nooks, variety in the outdoor furniture, etc.

To summarize, Fig. 3, 5 and 5 represent a nice project example from the best practices (Marmalade Lane, Cambridge, UK), where are applied all the design approaches for stimulating social interaction within the layout discussed above: clustered building configurations, orientation of main entrances to each other, graduation and hierarchy of the spaces prom private to shared and buffer zones, parking facilities situated on the borders of the plot, variety of shared outdoor community spaces, situated centrally within the plot (pedestrian street and common green area), many places to sit and interact, shared pathways to the major layout elements - parking, outdoor communal space, communal house.

In the appendix can be found more project examples, visual material and schemes.

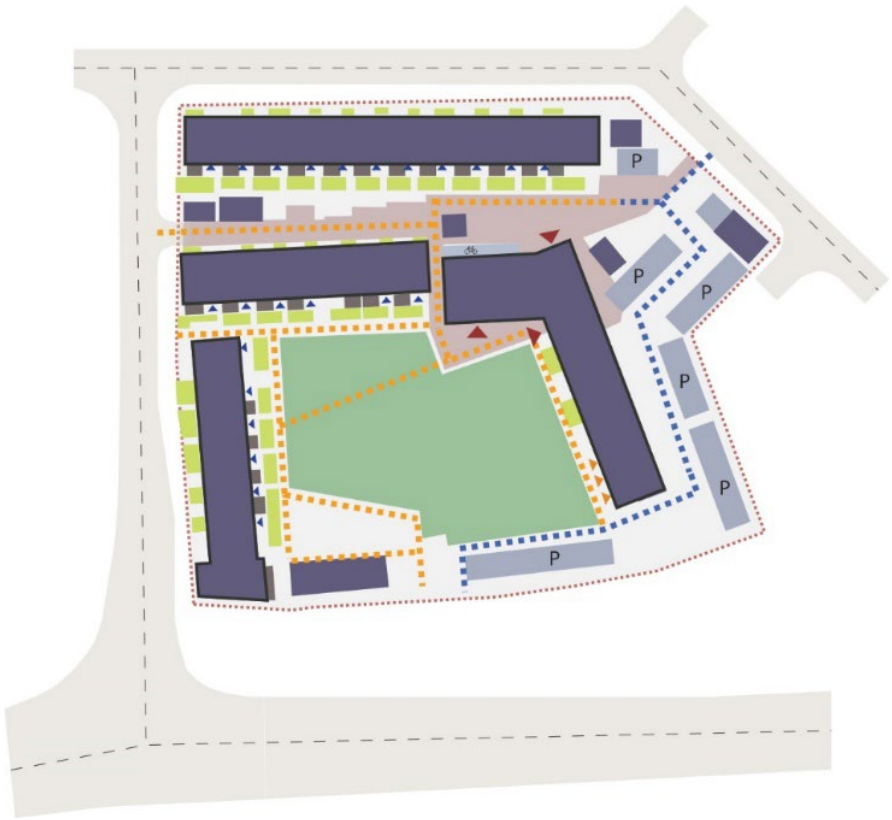


Figure 5: Example of layout scheme, adopting the described design principles. Marmalade Lane, Cambridge, UK.

Figure 6: Impression Marmalade Lane, Cambridge, UK: pedestrian street and front yards, photo: D. Butler, (source: http://www.archdaily.com).

Figure 7: Impression Marmalade Lane, Cambridge, UK: places to sit, photo: D. Butler, (source: http://www.archdaily.com).

3.3. BUILDING:

3.3.1. Building complex

- **Scale: Medium scale developments preferably. Clustering in larger scale developments.**

Influencing Factors: scale, number of residents, size of community

The scale of a building (number of household units per hectare) is related to the probability of establishing social contacts and the levels of interaction between its residents. If the development is too big, there might be an "institutional" feel. In addition, the bigger number of dwelling units suggests a greater number of inhabitants as well, which results in "anonymity" and a lack of closer relationships among residents (Williams, 2005). On the other hand, too small and "intimate" scale developments will resemble more like a large "family house" and residents may experience a lack of privacy (Durrett & McCamant, 2011).

As discussed in the previous chapter, the optimum building scale and community size values regarding social interaction are not defined yet. Based on observations of existing projects and practical experience, some authors suggest possible optimum values. For example, Durret & Mc Camant proposed that the community should not exceed 50 adult residents and ideally ranges between 20 and 50 adults or 15 to 34 households (Kathryn & Charles, 2011). However, these numbers are based on studies of projects from the '80s and '90s. Nowadays a greater diversity of communal living forms emerged, targeting different goals and residential groups. The big variety of dwelling unit types, different users, location and functional contexts, and other contributing factors should also be considered. Therefore, it is doubtful how much the values proposed by Durrett & McCamant are relevant today. The understanding of "medium scale" differs also per country and location context.

Because of the complexity of the problem, more research and further, in-depth study is needed to propose possible optimum ranges of building and community scales.

However, a common strategy to reduce negative effects of larger-scale developments, discussed both in the literature and applied in practice is clustering. This design approach is described in the next paragraph.

- **Clustering in larger scale developments**

Influencing Factors: scale, clustering, size of community

Clusters can stimulate social interaction and inclusiveness within the community (Williams, 2005a). Clustering is a common design approach applied in larger-scale developments to spatially and functionally divided them into smaller parts and thus avoid the described above possible negative effects of larger scale on the social interaction. According to the results of the best practice overview, the principle of clustering applies to larger-scale building complexes with more than 45-50 household units and 100 (adult) residents.

These numbers are supported by literature as well. According to some authors, co-housing developments with more than 50 household units (>100 residents) can be recognized in scale as “small neighborhoods”, thus they have different characteristics regarding social interaction than a building with fewer residents/dwelling units (Krabbendam, n.d.). Further, according to the Dunbar number hypothesis (cite), there exists a cognitive limit (150 people) on the ability of a person to maintain contacts and relationships. The same limit applies on human groups: Up to this number individuals are able to meet their own requirements and coordinate their behavior with other individuals in the group (West et al., 2020), (Dunbar, 1993).

Clustering as architectural approach can reduce the negative effects of larger scale on humans regarding social interaction. However, in this case appears the challenge how - spatially and functionally, to provide through the design smooth transition and connectedness on different scales among the different levels (for example, to connect different groups or clusters with each other and to the community on a project level). Practical project examples (see also chapter best practice overview and the appendix) show that implementing “bounding” spaces and facilities on various scales within the design is a way to solve this problem. The role of “connectors” can play intersectional communal spaces such as shared gardens, children’s playgrounds, community house, open activities on the ground floor (such as community cafes, restaurants, cultural and entertainment activities, workshops, etc.), community spaces and facilities spread out through the building and on the rooftop, etc.

- **Higher density**

  Influencing Factors: density, proximity

Co-housing developments typically have a more compact design and therefore, overall higher density than conventional housing.

Density is a critical factor for setting up social contacts between residents (Williams, 2005a), (Baum & Valins, 1977). Density can be related to the greater proximity of major spaces within the building layout, which therefore influence the intensity and probability of spontaneous social interactions between residents (Williams, 2005a). Besides the greater probability of residents spontaneously meeting and interact, a higher density makes cohousing more affordable, more profitable, and more sustainable. There is less infrastructure spread all over a compact design, saves energy, and overall reduces the built area and overall carbon footprint.

Different studies show, that at extremely high densities, residents feel like they lose control over the social environment and tend to withdraw from the community (Williams, 2005a), (Birchall & Young, 2014). According to Altman (Altman, 1975), there is a critical value of dwelling density that allows proximity but not overcrowding. Similar to the previously described factor scale, because of the complexity of the problem, there are set no optimal values of density yet. Density values are greatly dependent on other factors as well, such as for example project location (urban or rural), the social characteristics of the target group (intergenerational, students', or focused on older people), the type of development, etc. Thus, it can be concluded, that more research is needed to determine the optimum ranges of density values within cohousing developments.

However, the results of the best practices analysis show, that within (European) urban and suburban environments most project examples show density around 80 dw/per ha. This value can be considered as a starting point for future designs or discussions.

- **Building height: low to medium height preferable**

  Influencing Factors: height, proximity, surveillance

Results from the best practice analysis show, that most of the project examples are low rise, on- ground developments (up to 2-3 floors) or medium heigh (up to 4-5 floors, no lift).

In terms of social interaction, the lower and medium heights of the buildings are preferred (Williams, 2005a). They have many advantages: For example, residents have good surveillance at the common open spaces. Consequently, they get to know each other better, which strengthens the community.

Lower height building developments have also other advantages to the community. For example, studies show, that residents living in lower-height developments are more likely to help and assist each other (Nadler et al., 1982). This can be explained by the fact, that higher-rise buildings have greater number of inhabitants, which (as discussed above in paragraph "scale") is related to greater anonymity and lack of closer relationships among residents (Williams, 2005a). Next, the lower the building is, the

easier and faster inhabitants access the ground floor shared community spaces and activities from private dwellings. Further, because of the good visibility to the ground level and (shared) outdoor spaces, greater social and safety control is possible within lower buildings.

The higher the residents live above the ground, the weaker their perception of the ground environment tends to be (Gehl & Svarre, 2013b). According to Gehl, based on the physiological scope of a person's field of vision, people are able to interact passively (view, observe) and actively (hear, speak) with others up to 13,5 m. Thus, anyone living above the fifth floor cannot be involved with ground activities (Gehl, n.d.). Within buildings with a height up to 31m (ca 8 floors) people are still able to observe the ground level areas and establish visual contact with people there.

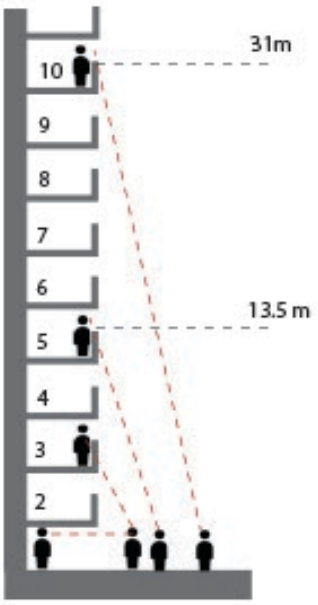


Figure 8: Height of the building. Based on Gehl (Gehl, n.d.)

- **Stairs instead of lifts**

Related to the height characteristics of a building discussed above, the use of stairs instead of lifts can increase the levels of familiarity and frequency of (spontaneous) contacts among residents. Stairs as vertical transportation elements within buildings provide extended opportunities for inhabitants to meet and spontaneously interact. When residents use a staircase as the main transportation method, they share common routes with others on the way to their floor and private dwelling. Thus, on the way, home residents may share a moment to take a break and engage in casual interactions with any neighbors they meet (Chan & Lee, 2008). In addition, when passing through the levels, residents gain a sense of familiarity with each floor they go through.

Building developments with more than five floors typically have elevators. The higher speed and the shorter average time spent in an elevator reduce the opportunities for residents to meet and interact with neighbors (Chan & Lee, 2008).The rapid operational speed of elevators allows people to spend less time with others while moving from the ground level to their living floor compared to residents in low- and middle-rise buildings who use stairs as a main vertical transportation element. In addition, the use of elevators prevents inhabitants from making shared routes with others: Lifts stop on each separate floor, thus residents living in a building with a lift instead of stairs are usually familiar only with the floor they live in.

From the paragraphs above we can conclude, that when possible, designing lower to medium height buildings up to 4-5 floors with stairs instead of lifts can greatly contribute to the frequency of (spontaneous) contacts among inhabitants and increase the levels of social interaction in result.

- **Design approaches to increase social interaction among residents in higher buildings: spaces aimed for the community spread out through the building height.**

Influencing Factors: height, proximity, surveillance

As discussed above, residents in higher buildings may withdraw from the community as the communication between too different levels (e.g., upper floors and lower floors) is difficult Because of the greater anonymity in result, the interaction among inhabitants is limited (Williams, 2005a). Practically, residents can live in close proximity for years while effectively remaining strangers (Bochner et al., 2010).

Practical project examples and some literature studies propose design alternatives to promote social interaction within higher developments. According to Xinyi He (He, n.d.), a key issue in promoting interaction within modern high-rise residential developments is providing corresponding spaces for communication. The best practices overview identifies different approaches for enhancing social interaction among residents within higher housing developments. These include various building elements in the design such as shared community elevated decks, terraces, platforms, rooftop shared gardens and spaces (see chapter 2: Best practice overview).

- **Ensuring good visibility and surveillance opportunities within the building design**

Influencing Factors: visibility, surveillance

The importance of visibility and surveillance regarding social interaction has been broadly discussed within the literature and the previous chapters of the current document.

Next to height, clustering, and centrality, good visibility and surveillance towards the shared spaces and major layout elements can be enabled by the extensive implementation of elements into the building design such as large windows, spacious terraces, and elevated decks, overlooking the common

outdoor space. The availability of these elements into the building design can promote various ranges of social (passive or active) interaction opportunities (fig. 9).

Figure 9: Example of an open façade design with good surveillance opportunities. Nightingale 1, BREATHE Architects, photo: P. Clarke, (source: https://www.archdaily.com)

(Gehl & Svarre, 2013a) has identified a range of interactions, ranking from low-intensity to high-intensity interactions (see fig. 10). Low-intensity (passive) forms of interaction include observation, seeing, and hearing other people. They are considered prerequisites for higher-intensity and more familiar contacts. According to Gehl (Gehl & Svarre, 2013a), by increasing the opportunities for low-intensity interactions (seeing and hearing) through design, there are higher opportunities for establishing closer contacts and relationships among people. Consequently, by promoting visibility through design elements like windows, terraces, etc., we both allow low intensity (passive) forms of interaction (observation and surveillance) and promote opportunities for involvement in the common activities and higher intensity social contacts among residents.

Figure 10: Range of social interaction according to Gehl (Gehl & Svarre, 2013a)

- **Ground floor design**

Influencing Factors: positioning, proximity, visibility, hierarchy of spaces, relation to public

The ground floor design is critical for enhancing the social interaction among residents within the (co-housing) building complex and enabling its physical and functional relations with the surrounding neighborhood (public) areas. Different factors, such as positioning and proximity of spaces, visibility, and availability of private – community choices contribute to the design of the ground level in terms of social interaction.

Project examples from the best practices overview show, that within mid- or higher height buildings, on the ground floor are located major community and often open to public spaces: for example, common rooms, flexible spaces for workshops and activities, cafés, restaurants, or rental spaces. Further, to attract people from outside and thus enhance social interaction opportunities, the façade on the ground level should have recognizable, interactive, and "open" design, ensuring good connection and visibility inside-outside. Further, it should have "soft" edges and preferably vertical than horizontal elements. Ideally, the border edges of the building should provide opportunities for sitting or standing (Gehl, n.d.).

The following design approaches can be described within the ground level plan to stimulate (spontaneous) social contacts and interaction among residents. They are related to the factors proximity, positioning and visibility, described above: First, the main entrance, entrance hall, and vertical transportation elements be visible and recognizable, ideally centrally positioned. The communal spaces are positioned close to these major building elements and be visible from the main entrance and main hall to "welcome" and attract residents to pass by on their way home. Within the design of the ground, the floor plan should provide variety, hierarchy, and transition of the spaces regarding public-community-shared relationships.

In the section best practice overview from the appendix cand be found ground floor schemes of the project examples, which illustrate the discussed above design approaches.

3.4. SHARED SPACES:

3.4.1. Outdoor communal spaces as part of the building

Communal spaces (indoor and outdoor) provide excellent opportunities for social interaction (Bouma et al., 2015). The next paragraph describes major principles and architectural approaches for the design of communal spaces within the building.

In the case of compact, one-standing building configurations, the role of an outdoor community space may play elements such as rooftops and roof gardens, shared platforms, or terraces. Within the best

practices analysis have been identified different types of in-built open community spaces. They can be applied to the building design both separately and in combinations (see chapter xx and appendix).

Especially when the ground floor is more open to public, the rooftop spaces or platforms are reserved for the community only. Rooftop gardens and (green) platforms are nice contemporary approaches to incorporate outdoor communal spaces into the design, when there are no or limited possibilities into the layout. Rooftops can be places for the residents to meet and interact, as they usually provide various facilities and activity opportunities.

Fig. 11 and 12 illustrate nice examples of utilization of the rooftop spaces to combine different facilities, activities and social opportunities for the community. In the appendix can be seen more related to the topic rooftop design schemes and project examples.

Figure 11: Rooftop of the Commons (BREATHE Architects). Photo by Andrew Wuttke (source: https://www.archdaily.com).

Figure 12: Rooftop Nightingale I, BREATHE Architects (https://www.breathe.com.au/project/nightingale-1)

3.4.2. Indoor communal spaces

- **Communal spaces positioned centrally and close to main entrances / vertical transportation elements.**

Influencing Factors: positioning, proximity

Similar to the discussed in part 4.1.2. approaches for the design of outdoor shared spaces in the layout, to enhance their utilization by the residents the indoor community space has to be centrally positioned in the plan, easily accessible, and visible (Fromm, 2000a), (Kathryn & Charles, 2011). Further, the community spaces are usually situated next to the main entrances (halls) and in close proximity to the main vertical connection building elements, like stairs and lifts to stimulate spontaneous use by the residents (Fromm, 2000a), (Kathryn & Charles, 2011), (Williams, 2005a). To attract people from outside, the communal space should be recognizable both in plan and on the building façade (Lee & Rodiek, 2013). Depending on the project type and building configuration, the shared indoor spaces could be situated in apart buildings or within the building complex itself. In the case of the apart communal house, the building should be respectively easily accessible, centrally positioned on equal distance from the private dwellings, visible and recognizable in the layout.

Figure 13: Vindmøllebakken project: The communal space is centrally positioned, next to the main entrance, good visible on the façade and indoor. Photo: S. Ellingsen, (source: https://www.archdaily.com).

- **Direct access from the indoor communal space to the outdoor shared space**

Influencing Factors: positioning, access, buffer zone

As seen within the best practices overview and the project layout graphics analyses, the indoor communal space is usually physically related and has direct access to the outdoor shared space. Ideally, there can be also a buffer space (such as communal terrace) between the indoor and outdoor communal space to promote a better transition of the spaces inside-outside.

- **Graduation of spaces regarding privacy within the communal space.**

Influencing Factors: hierarchy of spaces, private-shared- public choice opportunities

As described above, to enhance the utilization of shared space and consequently stimulate communication and interaction among its users, there should be provided enough choices within that space to residents regarding their privacy. Within the design, this means that there should be available various options for sitting, observation, and interaction – such as sitting places for passive observation, for private/close relationship communication, for interactions within a group, and different activities. Further, to sustain flexibility within the space depending on the current needs and situation, the tables and chairs are preferably easily movable (Lee & Rodiek, 2013).

- **Domesticity and sphere within the communal space.**

Influencing Factors: domesticity, place attachment, comfort, safety

The sphere and domesticity features are related to the place attachment and can stimulate the utilization of the communal space by residents and enhance the probability of social contacts. Different factors can contribute to the welcoming and “home-like” sphere of the communal space. The major ones are described below:

  - **Type of Furniture**

Domesticity in the interior can be achieved in many ways: for example, by arranging the furniture in an informal way. The choice of furniture (type, variety, style, materials, colors, etc.) in the interior of the space is also important for achieving a nice sphere and domestic look: it should be varied in type and “not formal” looking (Lee & Rodiek, 2013) , (Quick et al., 2015), (Weenig & Staats, 2010). Different smaller elements of the interior, such as curtains, carpets, the decoration can contribute to the “home-like” perception of a space as well.

- **Sphere: Good quality and maintenance of the space**

Influencing Factors: quality, comfort, place attachment

The good quality and maintenance of the space contribute to domesticity and place attachment. Consequently, people are more likely to utilize and interact within a space, which is of good quality, nice looking, clean, and comfortable (Williams, 2005a).

- **Personalization and identity of the space**

Involving personalization elements into the space can contribute to increase the place attachment among its users (Zavotka & Teaford, 1997). Specific elements of the interior can enhance the individuality of a space and play the role of a "conversation starter", thus enhance spontaneous social contacts among people. According to the cited above study, typical personalization elements of private dwellings such as pictures and memory artifacts, can be adapted and applied as personalization elements to the community spaces as well.

- **Safety**

Feeling safe and secure can be seen as essential features for encouraging social interaction (Chan & Lee, 2008), (Dempsey et al., 2011). Within indoor communal spaces under safety, we understand mostly good walkability and lack of risk for accidental falls. The last is especially important for designing communal spaces in housing developments targeting older people.

- **Variety of facilities and activities**

The variety of facilities and choices for (spontaneous) activities within a communal space positively contribute to its utilization. Related to the principle of hierarchy of spaces, there should be provided different functional and activity choices and opportunities within the communal space regarding private - shared relationships.

According to Hall, social interaction among inhabitants can appear on different levels, from passive to close familiar (Hall, 1973). Therefore, within the space should be provided opportunities for different types of activities and levels of social interaction: for example, passive observation-only, close contacts among friends and family, smaller or bigger group activities, etc. In socio-spatial aspect, the activities can be organized on different scales – activities aimed for the group/cluster only, for the (project) community or open to the public (Krabbendam, n.d.).

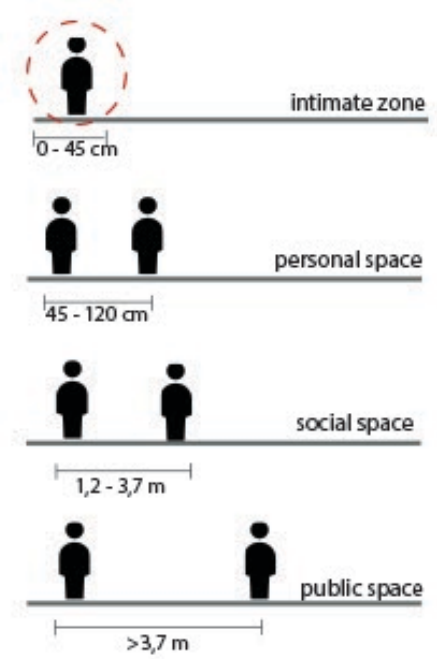


Figure 14: Social distances, scheme upon Gehl, (Gehl, n.d.). Interpersonal distances defined by Edward T. Hall. Source: Edward T. Hall. "The Hidden Dimension"

- **Spatial and functional flexibility within the space**

In design aspect, providing opportunities for flexibility in the utilization and organization of a space can provide bigger variety of activities and spontaneous contacts among its users. In practice flexibility can be applied into the design of communal spaces by providing flexible wall systems, introducing movable room dividers or replaceable furniture in the interior.

3.5. TRENDS:

Many of the contemporary project examples described in the best practice overview from the previous chapter include different sustainability features within their design.

- **Sustainability features and technologies within co-housing developments**

In line with the recent sustainability goals to reduce global CO2 footprint, the parking facilities in many contemporary co-housing and residential projects are limited or even missing. Instead, other opportunities, such as car sharing, bike sharing, or public transport or are proposed.

Further, different green technologies for generating electricity and heat, systems for reusing gray water and waste and others are applied to the design of contemporary co-housing projects. The presence of modern sustainability features within the cohousing design not only contributes to reducing the overall CO2 footprint and the affordability of the development. They have many benefits to the residents regarding social interaction, as sharing common sustainability goals strengthens the community. Further the project becomes a positive example to the neighborhood area and thus strengthens the relations and inclusiveness within the neighborhood.

- **New types of communal housing**

Nowadays various types of co-housing emerge. Consequently, the co-living communities tend to be more diverse and inclusive, combining people of different ages, civic and social statuses, cultural backgrounds, physical and mental states, etc. As a result, major co-housing spatial design principles for enhancing social interaction have been experimentally applied to different contexts, such as in nursery homes, live-and-care complexes, or residential developments targeting older people.

The greater variety in co-housing types and residents' composition from its side results in a greater variety of private dwelling units in contemporary co-housing developments compared to project examples from the 80s or 90s. As elaborated within the best practice overview, the diversity of private dwellings in co-housing developments is seen both regarding their size and facilities.

3.6. DISCIUSSION:

Because of the broader scale and complexity of discussed topics, the described design principles, and architectural approaches to enhance social interaction within co-housing developments can cover them only partially and to a certain extent. Some principles are described only generally, and more systematic research and extended studies are needed to propose optimal values or specific approaches.

However, this document provides the necessary practical basis and knowledge on how to potentially stimulate through architectural design the levels of social interaction and connectedness among the residents of (co-) housing developments. Additionally, most of the discussed design approaches / and strategies to enhance social interaction among inhabitants can be applied not only to co-living, but also in various residential, live and care or public building contexts. Consequently, many of the described principles can be referred to residential project developments targeting various groups, such as older people, refugees or multigenerational. Architects and (senior) housing or live-and care corporations are already experimenting in this field. Thus, the design principles systematized in this chapter can be potentially of great value for future designs, aiming to enhance the social interaction and connectedness among their (future) residents and users.

PART THREE:

PROCESS & DESIGN

CHAPTER FOUR:

LIVING LAB

4. CHAPTER 4: LIVING LAB

4.1. INTRODUCTION:

4.1.1. Description and goals of the Living Lab study:

In the **third phase – Process-** theoretical findings and outcomes - selected design principles and spatial patterns recognized from the previous phases are further explored and experimentally applied to a Living lab case from the existing housing stock of WoonZorg Nedreland, where they are further explored.

The selected Living lab case is **the communal space** of Nieuw Bleyenburg - a senior (55+) building complex in Utrecht. According to previous research, the building complex characterizes with very low scores of resident's participation and involvement both regarding (communal) spaces, initiatives, and activities. This makes the Nieuw Bleyenburg a suitable from research and interesting from design perspective case for the current PDEng study.

The Living lab design process includes different steps, where various quantitative, qualitative, and participatory research methods are applied. The final goal of this study is to propose a concept design, where the theoretical findings and practical design approaches from the previous chapters are applied.

The **Living Lab design process** in the current study consists of the following main steps:

- Establishing a concept model
- Observations
- Focused interview(s)
- Determining points of interest
- Co-design session
- Design of a concept model and scenarios.

The described steps follow the general research approach applied to the PDEng project (fig. 15).

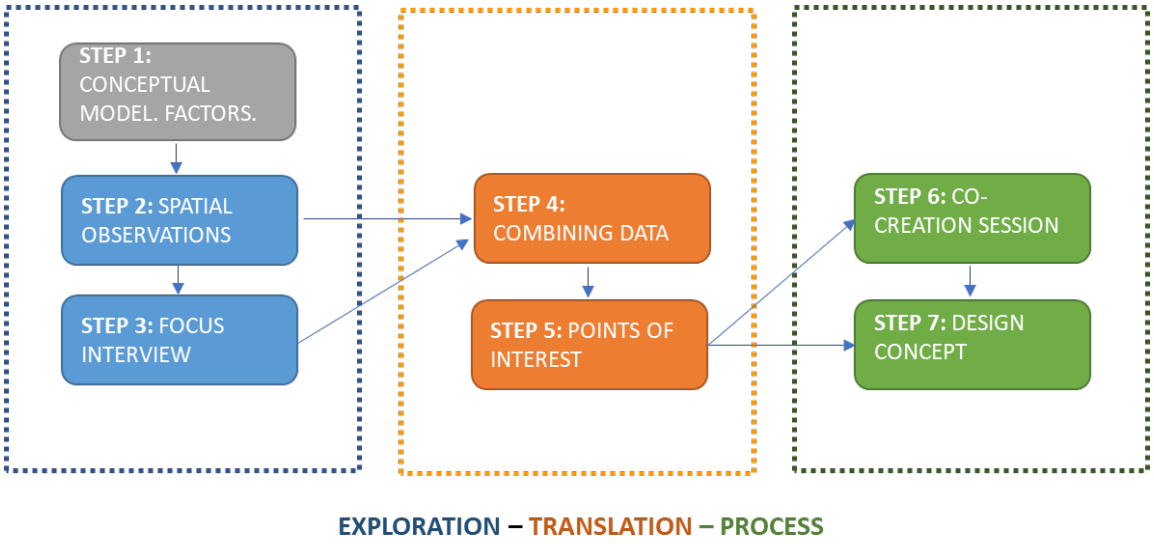


Figure 15: Living lab roadmap

4.2. CONCEPT MODEL:

The concept model draws the basis framework of the living lab study and indicates which of the previously described in this document socio-spatial factors influence the levels of social interaction within the project case.

Because of the identified very low scores of resident's participation and involvement regarding (communal) spaces, initiatives, and activities, the focus of the current study is on how through architectural design and spatial interventions to enhance the utilization of the communal space and the possibilities for social interaction among the residents.

In her publication, Williams (Williams, 2005a) emphasizes the importance of different factors, which can influence the levels of social interaction among the residents of co-housing developments. She developed a framework in which the potential for social interaction among residents is interrelated to both personal characteristics of residents, (in)formal social factors and spatial factors, where these influence each other.

In her article Williams (Williams, 2005a) emphasizes the importance of different personal, social, and spatial factors for stimulating social interaction between residents in communal living environments. She developed a framework in which the potential for social interaction among residents is interrelated to both personal characteristics of residents, (in)formal social factors and spatial factors, where these influence each other.

The personal factors are related to the social behavior of the resident. The informal social factors relate to the mutual relationships within the resident group, and the opportunities residents have for mutual interaction. The formal social factors reflect the social organization within the form of housing and organized activities. The spatial factors proposed by Williams in her framework relate to the spatial

design of the building complex, including aspects regarding the relationship between private and communal spaces, and the quality and functionality of the common spaces.

As indicated before, because of its limited scope and time duration, the current PDEng project focuses mainly on the spatial influencing factors. Yet some selected (in-)formal social factors, related to the utilization of the communal space, such as a social sphere, organizational aspects related to activities, and informal groups are considered in the concept living lab model.

There is empirical evidence about the effect of design on the use of social spaces, reported by Howell (1976).

Within their article about the design of shared social spaces in assisted living residences for older adults, Zavotka and Teaford (Zavotka & Teaford, 1997) propose a model, where they relate place attachment (the connection people experience with specific spaces of the built environment (Jennings & Bamkole, 2019) to the utilization of the (social) space and socialization. Further, in their study, in the term personal attachment they include different processes, related to the spatial characteristics of the (common) space and among others to privacy, personalization, and continuity with the past through furniture and colors.

Based on the theoretical findings described above, as well the scope and goals of the current study, the following Living Lab concept model is proposed (fig. 16) :

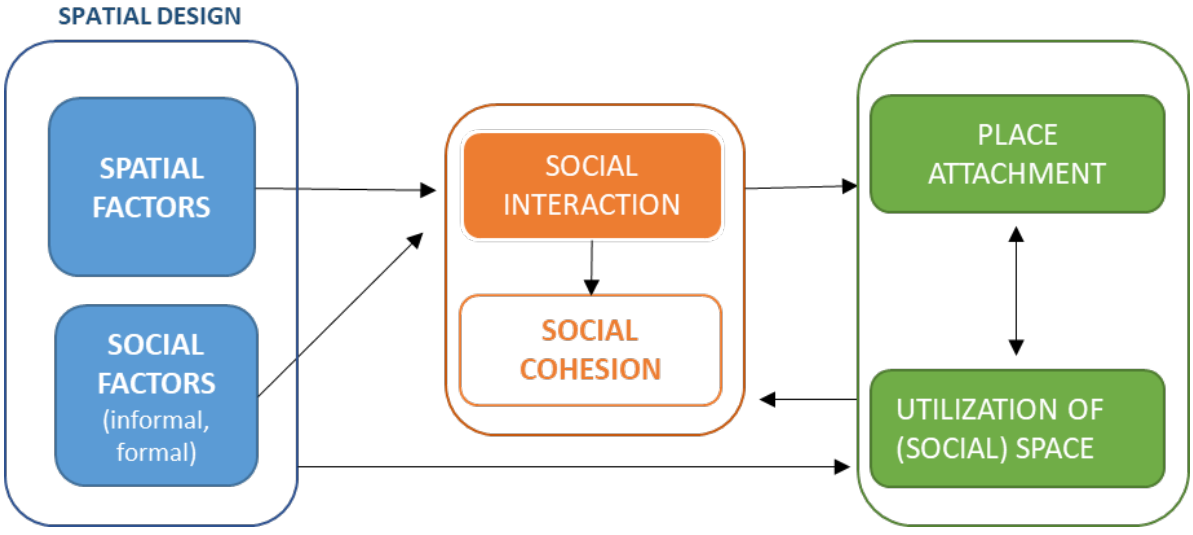


Figure 16: Scheme concept model Living lab. Upon (Williams, 2005a), (Zavotka & Teaford, 1997).

Within this concept model, the following major (socio-) spatial factors influencing the levels of social interaction are proposed to further explore in the current study:

- Access
- Positioning
- Shared pathways and main routing
- Proximity
- Visibility and surveillance opportunities
- Organization and hierarchy of the space.
- Availability of choices regarding private-shared opportunities.
- Domesticity, sphere, and comfort
- Places to sit
- Facilities and activities
- Availability of technologies related to social interaction and utilization of the space

The living lab case – the communal space of Nieuw Bleyenburg cannot be studied outside the context of the whole project. Therefore, to have better understanding of the current situation, the implication of the following (socio-) spatial factors influencing social interaction in the layout (including shared garden) and the building complex are studied as well:

- **Layout and shared community garden:**
    - positioning
    - access
    - shared pathways
    - places to sit
    - quality of the outdoor space (maintenance and safety)
    - activities and facilities

- **Building complex:**

    - building configuration
    - scale
    - surveillance opportunities to the outdoor and indoor communal spaces
    - access to the main building parts
    - semi-public (buffer) zones. Related social factors on a building complex level

Next to the spatial factors, selected social factors influencing the levels of social interaction among the residents are considered as well:

- **Social factors:**

    - number of residents
    - social sphere
    - informal groups and residents' organizations
    - common activities – organization and access

4.3. OBSERVATION ON PLACE

4.3.1. Goals of the observation study:

The observations on place aim to gather spatial information about the project case and to map the current situation. The observation is conducted upon preliminary executed observation list (see appendix), where the major influencing factors from the concept model (fig. 17) and the related spatial elements of the space are included. The observations lists (see appendix) are inspired and based on the work of the colleagues from HAN (Bernell Herder, Kim Hamers) for a similar project.

	SPATIAL INFLUENCING FACTORS:
LAYOUT	Shared paths
	Parking opportunities
	Outdoor shared space:
	Positioning
	Access / openness
	Maintenance, safety
	Places to sit
BUILDING	Building configuration
	Scale
	Access
	Surveillance opportunities
	Buffer zones
COMMON SPACE	Positioning
	Proximity
	Access
	Visibility / surveillance
	Organization of spaces (private-shared)
	Flexibility (spatial, functional)
	Facilities, activities (incl. promotion)
	(social) technology
	Places to sit
	Domesticity, sphere
	Comfort (light, climate, acoustic, furniture, greenery)
	Maintenance

	SOCIAL INFLUENCING FACTORS:
BUIDLING	Number residents and composition
	Community composition
	Informal groups & organizations
SPACE	Social sphere
	Activities
	Organization
	Access to residents and users

Figure 17: Observed socio-spatial influencing factors from the concept model

The observations on place aim to indicate how and to what extend the spatial elements related the (selected) socio-spatial factors influencing social interaction from the conceptual model are present in the current characteristics of the studied case.

The observation study consists of two parts – preliminary observation, where along with the communal space also the building complex and the adjacent indoor/outdoor communal spaces are considered and detailed observation, which focuses on the communal space only.

The results of the observations are described in the paragraphs below.

4.3.2. Basic project case information:

Before the observations take place, a quick desk study is conducted to gain basic information about the project.

The Nieuw Bleyenburg complex is designed by Mecanoo Architects. The building is easily accessible by public transport and located in an urban area, close to different amenities and neighborhood facilities in a distance from 200 to ca 500m, such as GP and health center, public transport stop, supermarket, pharmacy, physiotherapist, dentist. On the ground floor of the complex are located several offices for public services, café, and a restaurant.

Nieuw Bleyenburg is a large-scale development, aimed for seniors (55+). The complex consists of three parts. The middle part has three separate entrances and is privately owned. The two side parts are rental. The complex consists of totally 161 apartments, of which 96 are rental and 65 privately owned. The communal space of the complex, on which the current Living lab study is focused, is located in one of the rental parts (see fig. 18). It is directly accessible from the garden side and from the restaurant but is located far from the main building entrances. The communal space is accessible indoors by the residents through the bicycle storage spaces. The location of the communal space into the plan makes the communal space difficult to visit spontaneously and without a purpose.

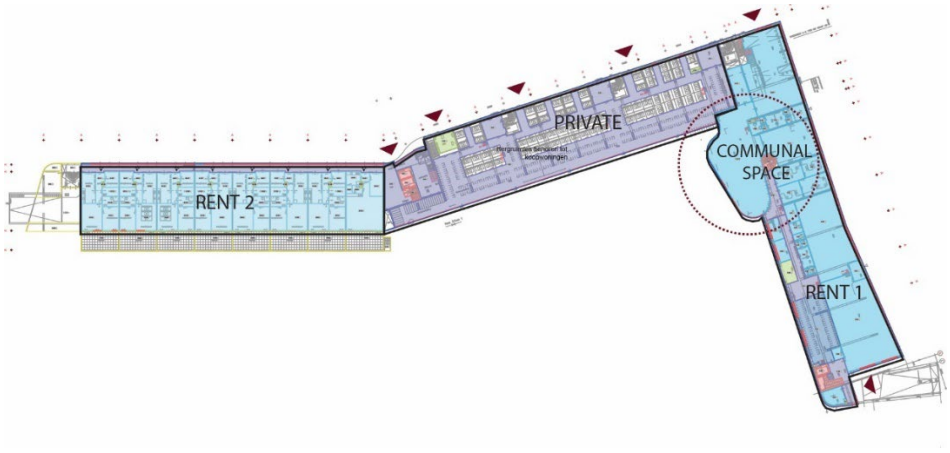


Figure 18: Scheme existing situation – main building parts. Scheme upon the original plan (Mecanoo Architects).

4.3.3. Observation results:

The preliminary observation aimed to gain complex view and general idea about the project case. Therefore, the observation was broader scale and included both the surrounding area, layout, the shared community garden, the building complex and the communal space.

The observation of the layout included the available parking opportunities and the shared garden.

According to Williams (Williams, 2005a) the route from parking place to the private dwelling is important in terms of social interaction. When situated at the edge of the plot for example, this creates

shared routes and prevents residents from walking from the car straight to their homes. Similarly, when the parking situated in a building, but the route to private dwellings goes through common spaces, this enhances the chances for spontaneous social interaction on the way.

In this case, the observation on place showed, that the parking for the residents is situated underground within the building, accessing directly (via lifts and stairs) the private units. Therefore, inhabitants of the building complex do not share common routes with others. The storage space for bikes provides more opportunities for spontaneous contacts, however, these storage spaces are planned apart for every building part, therefore residents from different groups cannot mix with each other.

The observation results showed that the design of the **shared garden** adopts most of the concept principles regarding social interaction: It is spacious, centrally positioned, and visible from most of the private units. Further the green area is very good maintained, with interactive design, shared paths in a curved form. There are many places to sit, grouped in various configurations regarding private-shared choices. The shared garden is directly accessible from the communal space. There are several entrances on the ground level from the building parts as well. The shared garden is closed on all sides and thus not accessible to public.

Gardening is very popular activity among the residents of the building complex - there is a gardening club of residents and volunteers.

Not surprisingly, the shared green space is actively used by the residents from the complex and a favourite place to meet and interact. Fig. 19 represents impressions of the community garden.

Figure 19: View to the shared garden

The observation of the building complex showed mixed results regarding the availability of major spatial elements influencing social interaction levels.

First, the three **building** parts – the two rental and one privately owned, have several apart main entrances, which are far from each other. These separate the different groups of residents. Further, the two rental building parts are not equal in terms of design quality: one of them has smaller units and no windows or balconies overlooking the communal space. The existing balconies are “decorative” and accessible only from the common corridor. The windows of the private dwellings are facing the

neighborhood and main streets. On contrary, the other rental and the privately owned parts characterize with large windows on the façade and spacious balconies, overlooking the spacious shared green area. They have private terraces on the ground level which can act as buffer zones.

According to the observations of the building manager of the complex, the favorite places for residents to meet and interact are the mailboxes by the entrances (fig. 20). The place where residents (from the different groups) really mix is the shared garden.

Figure 20: Impressions: Rental building part with no balconies, but public facilities on the ground level; building parts with balconies overlooking the shared garden; entrance space by the mailboxes with a bench to sit.

In summary, the main entrances far from each other, no shared pathways, and differences in spatial quality regarding social interaction are potential reasons for the limited communication among the target groups of residents from the three building parts.

The communal space is situated on the garden side of the building but is internally accessible by residents. However, the space is located far from the main building entrances, lifts, and staircases. The observation on place confirmed, that the access indoors is complicated, and it is not possible to internally visit the communal space spontaneously except through the restaurant. Further, the communal space and the belonging terrace are used both by the residents, clients from the restaurant and seniors with light dementia complaints from the King Arthur daycare group. The access of the different visitors is regulated within the opening hours. On Wednesday's afternoon are organized activities for people from outside the complex. Residents from the building complex have no restrictions to visit and use the communal space at any time. However, during the two observation no residents came to the space. According to the building manager, the common utilization of the space by several groups results in potential social conflicts between the different users, complaints and withdraw of the residents from the complex.

During the two spatial observations of the communal space have been identified several missing or not sufficiently represented elements, related to the major influencing factors for social interaction from the observation list (see appendix).

Despite the human scale and very good natural light within the space, the sphere is overall more functional, than domestic. There are no identity elements or conversation starters available as well. Further, there is mismatch in style, materials, and colors of the main interior elements and furniture.

The space is clean and good maintained, but the quality of most interior elements is not sufficient: the floor is outdated, the furniture has user traces and surface damages.

The available furniture and sitting opportunities are limited in type: there are three big tables for group activities, a bookshelf, and a small coffee table in the corner. The tables and the chairs along them are aligned in a row, not in groups. These is no lounge area or other opportunity aimed for smaller groups. Thus, except the only small coffee table, there are limited opportunities regarding privacy within the space. A group of coffee tables is positioned outside on the terrace, but these are reserved mainly for the customers of the restaurant.

The communal space is good visible on the façade and there are large windows, providing very good view to the shared garden. However, because of the existing partition wall dividing the space, the surveillance indoor is limited. The replaceable room divider provides some flexibility within the space, but the rest of the furniture is heavy and difficult to replace.

The coffee machine is available only for the King Arthur group. Therefore, the opportunities for spontaneous visit and activities by residents are limited.

There are two billiard tables. Residents organize other common activities by themselves because there is no organizational committee. There are no technology opportunities for information or interaction available within the space, except a flat screen on the wall, which was not working.

Fig. 21 represents a scheme and mood board of the existing situation:

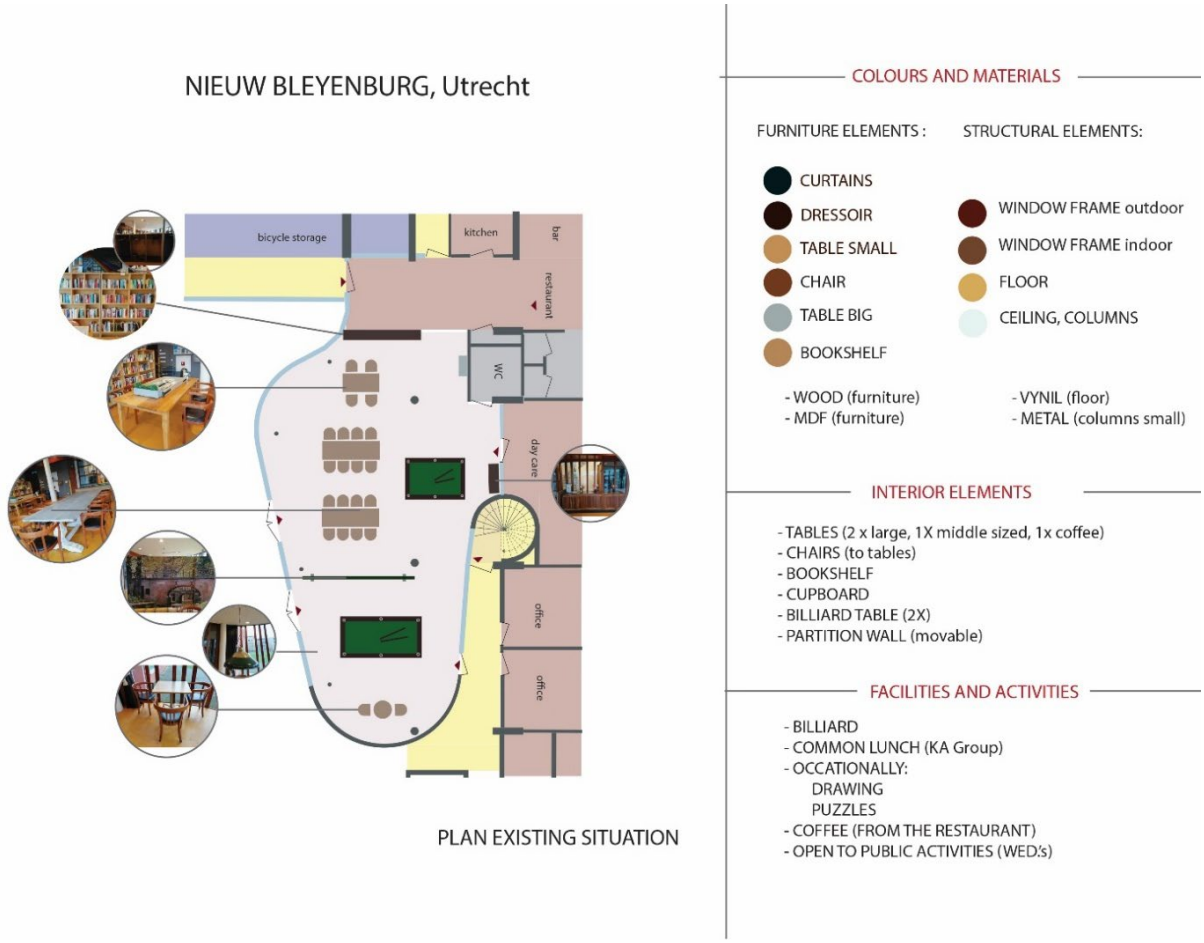


Figure 21: Mood board of current situation and existing elements

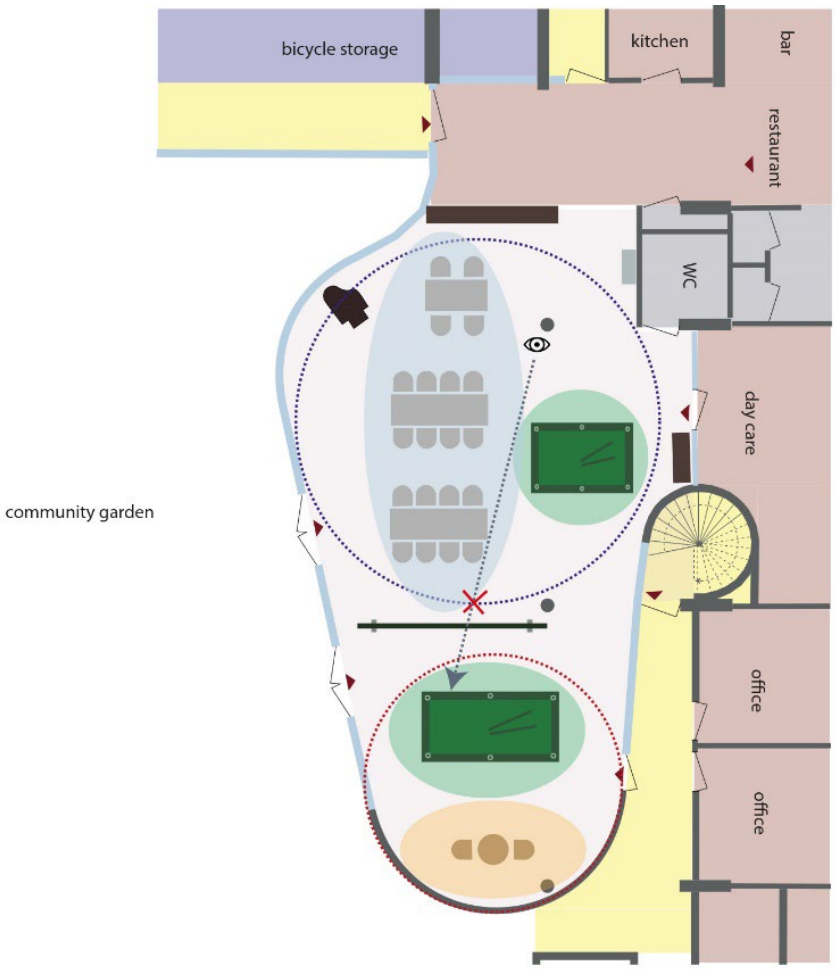


Figure 22: Scheme existing situation: current zones

Figure 23: Collages current situation

4.3.4. Discussion:

Based on the results from the observations, it can be concluded, that overall, the design characteristics of the building complex and the outdoor shared garden align with the major factors for enhancing social interaction and the related spatial elements from the observation list.

Within the building complex the spatial outcome of some influencing factors, such as visibility and buffer zones are insufficient in one of the rental parts. Further, the residents from the three building parts do not share common routes in the layout and the building from the main entrances and parking to their private dwellings. The communal meeting space is located far from the main entrances as well. Therefore, a future design concept must focus on promoting the communal space and make it more "visible" to the residents.

The shared garden is actively used. This nice green space currently adopts most of the spatial principles for enhancing social interaction within the design and not surprisingly it is favorite places for residents to meet. According to the building manager, another place for residents to meet and interact are the mailboxes at the entrance halls. A future design concept would benefit of strengthening the functional relation between the shared garden and the communal space.

The spatial observations of the communal space showed that some basic elements related to the factors influencing social interaction from the concept model are currently missing or not sufficiently. Therefore, in the next steps for designing Living lab concept the researchers must focus on:

- **Proximity:** to promote and the make communal space more "visible" and "closer" to the residents.

- **Organization and hierarchy of the space:** to provide more choices and opportunities within the space regarding private-shared relationships. This can be possible by implementing bigger variety of furniture and sitting types and groups, by functional and/or spatial zoning of the space.

- **Domesticity, sphere:** In the next steps of the living lab design process more attention must be given to improve the sphere within the space to make it more welcoming and domestic. Possibly match styles and colors of the main interior elements, involve elements for personalization and identity of the space (conversation starters), providing more sitting opportunities.

- **Facilities and activities**: More facilities (such as coffee corner, for example) and opportunities for spontaneous activities within the space must be considered.

- **Technologies:** there is potential to implement technologies for information and promoting the communal space to the residents both in the building (entrance halls) and the meeting room.

- The communal space needs to become **more "visible" and "popular"** among residents.

4.4. INTERVIEW AND INFORMAL TALKS:

As a next step focus interviews with the building manager of Nieuw Bleyenburg and spontaneous, informal talks with the accompanying staff of the KA daycare group (two persons) have been conducted. Because of the current COVID-19 limitations residents were not directly involved in the interviews as originally planned.

4.4.1. Goal of the interview:

The main purpose of the interview with the building manager as an objective observer, most familiar with the current social and spatial problems of the complex, is to gain impression of the current situation and further, in-detail elaborate on the identified within the previous step major socio-spatial problems. Further, together with the results of the observations on place, the data gained during the focus interviews help to identify the main points of interest for the developing of a future concept design. During the interview and the informal talks has been collected information about the views, opinions of the respondents about the current use and characteristics of the space, and preferences about the spatial elements to possibly implement in the concept design to enhance levels of social interaction and utilization.

4.4.2. Description of the results:

- **Current space utilization:**

According to the building manager (Bewonersconsulent) of Nieuw Bleyenburg, the communal space is used every day, both by the residents from the complex, seniors from the King Arthur group (a daycare group for people with mild dementia complaints), and by the customers from the restaurant. The seniors from the King Arthur group have their apart room, but actively use both spaces for activities like drinking coffee (the group has own machine), billiard, and common lunch. The terrace is visited mainly by the customers of the restaurant, but residents from the building complex can sit there for free.

According to the building manager of the complex, the communal space is generally not very popular and little (unregularly) used by the residents from the complex. In her opinion, the residents do not feel welcome when the space is (actively) used by the others.

In her opinion, possible reason for the low popularity and utilization of the space is, that generally there are few opportunities for spontaneous or organized activities. As mentioned above, no coffee corner is available. There is a small group of residents, who come to the communal space mainly for

activities, such as painting, table tennis or billiard for example. However, there is no activity committee to organize them, and residents must arrange events by themselves. Mostly in the summer, residents may come along spontaneously for a cup of coffee to the terrace of the restaurant. Probably they come because the shared garden is actively used during this time of the year. According to the building manager, the lack of facilities and activities is the main reason for the low utilization of the space by the residents. As she says: “If they (residents) have a purpose to come, will come!”.

- **Social problems and (potential) conflicts:**

During the preliminary observation on place, the building manager has mentioned, that one of the reasons for the lower utilization of the communal space by the residents could be the shared use of the space. Therefore, this topic was elaborated once again during the interview. According to the responder, some residents feel uncomfortable and not welcome in the communal space when it is used by the seniors from the King Arthur group or by the customers from the restaurant. It seems that residents find it difficult to confront with the visitors of that group (King Arthur), who occupy and use the space very actively, although they have an apart room as well.

The accompanying staff of the KA daycare group confirmed that there are potential conflicts between the residents and the KA group. In their words residents often complain about the group and it is not easy to solve the problem.

Therefore, the management of the complex has introduced opening hours for the visitors of the KA group (every working day from 9 a.m. t/m 17 p.m.) and customers of the restaurant. Once per week – on Wednesday afternoon – the communal space is open to visitors from the neighborhood (Buurtkamer group). The rest of the time, the space can be used free by the residents. There are no time or access restrictions for them.

- **Zoning and space organization:**

Despite the tension between the residents and seniors from the KA group, the building manager does not find it necessary to separate physically the space for the different groups. Functional zoning could be an option. In her words it is good for residents to use the restaurant services.

From the other hand, respondents from the KA group would like to keep the existing partition wall and separate their customers from the other visitors when needed. In their words, this works very well, because it is flexible and can be removed when needed. They are open for cooperation with the others (residents) to solve the existing segregation problems. They would like to control who comes to the room. They find it fine to have different (functional) zones within the space.

- **Current and possible future spatial aspects of the space- visions, opinions, and preferences:**

During the interview, different opinions, and preferences regarding the current spatial characteristics of the space and the possible spatial and elements interventions in terms of stimulating its utilization and promoting the social interaction among residents/users have been discussed.

According to the building manager of the complex, the sphere in the communal space is currently not nice, the space is not cozy, not welcoming, and not hospitable. The existing tables are too big for that scale; the floor is outdated, not nice and made from bad artificial material (vinyl). The observation on place confirmed these statements.

On the question what possible design and spatial interventions can be implemented in the space to attract residents, the responder said, that on first place more facilities (like a coffee machine for example) and possibilities for (unplanned) activities (such as puzzles, games, etc.) could greatly contribute to the spontaneous utilization of the communal space by the residents and their involvement in the community. Further, she proposed placing a lounge area or a nice sitting place (such as bank or similar). In her words, to attract residents to the communal space more homelike feeling and a nicer sphere are needed, more activities, and facilities. Natural materials, like wood, nice colors and new paint on the walls can make the space nicer. There might be some paintings or decoration on the walls as well. More greenery is also a good option.

The communal space is situated relatively far from the main entrances. Thus, a visitor from the complex should have a purpose to come along. This could be improved by providing more information and broader advertising of the activities, using info boards (digital ones are also an option) or signs (at the entrances for example).

For the responders from the KA group, it is important to keep the big tables, because seniors from the group often have their lunch there. They would like to keep also the billiard table and the existing partition wall. Further, for them it is important that a future design to considers the fact that the space will be used by seniors with dementia complaints. Therefore, the space must be easily accessible with a rollator, easy walkable, safe (to prevent accidental falls) and easily maintained.

4.4.3. Discussion interviews:

Because of the COVID-19 limitations, residents were not involved in the interview. Although the building manager of the complex is familiar with the current socio-spatial problems and the main wishes of the inhabitants, the data gathered in result of the interview is limited and this may influence the results.

Overall, the outcome of the interview aligns with the problems already identified during the observations on place. To big extent the visions and preferences of the responders about possible future spatial interventions correspond with the conclusions of the previous part.

Further, the interview with the building managers and the spontaneous, informal talks with representatives from the King Arthur group confirmed the mentioned before (social) problems regarding the common utilization of the space and the segregation among its users. Therefore, in the future steps the study must focus on topics like promoting the communal space, attracting residents and the opportunities to solve the social problems among its users. The two groups of responders shared different opinions regarding the possible dividing of the space. The organization of the space with focus on the provided private-shared opportunities and the social (utilization) problems among the different user groups are interesting topics to explore in the next stages and the concept design.

Improving the sphere, with focus on domesticity and personalization of the space is needed.

Adding more facilities and opportunities for spontaneous activities in the space is according to the building manager critical for its utilization and popularization among residents of the complex.

4.5. POINTS OF INTEREST:

In the next step the data gained by the observations, interview and informal talks is combined and analyzed to identify the main points of interest to further explore in the concept design. Based on the outcome of the previous Living lab steps, the following **points of interest** are identified:

- Space organization (physical and functional) and providing more choices related to the private-shared utilization relationships within the space.
- Social problems among different users regarding the utilization of the space.
- Sphere – focus on domesticity and personalization of the space, quality and aesthetics of the main interior elements and furniture.
- Providing variety of furniture and sitting opportunities
- Providing more facilities and opportunities for spontaneous activities
- Studying the opportunities for implementing technology to attract and involve residents, information, and promotion.

Further**, the main preconditions for the future design** have been determined:

- The main construction elements cannot be changed.
- The space will be used by older adults with possible light dementia and/or mobility. problems, therefore it must be easily walkable, accessible, easily maintaining, and safe to use.

4.6. CO-DESIGN SESSION

In the next step, an interactive co-design session with colleagues and experts in the field from the TU/er and HAN has been conducted to further elaborate on the major identified points of interest and collectively brainstorm on which possible approach strategies and potential solutions can be applied to solve major socio-spatial problems of the studied space.

4.6.1. Goals of the co-design session:

The co-design session aimed to brainstorm on answering major socio-spatial-related questions within the studied communal space. During the session were discussed possible design approaches and generated ideas on how to solve previously identified major socio-spatial problems regarding the space utilization and stimulating of social interaction among different users.

The explored topics are aligned with the major theoretical socio-spatial factors for stimulating social interaction, presented in the previous chapters, and included in the Living lab concept model. Besides, the topics explored within the co-design session are based on the main points of interest, identified on the base of the observations and focused interview in the previous Living lab design stages.

4.6.2. Study questions:

The Nieuw Bleyenburg building complex has been proposed as a study case for this project because of the previously identified low levels of resident's involvement and participation, both in a social and spatial aspect. The results of the interview and observations on place conducted within the current study generally align with these statements. Further, several major socio-spatial problems and missing elements regarding social interaction have been identified within the communal space of Nieuw Bleyenburg building complex.

Consequently, the general question to explore during the co-creation session is: How could we attract residents to the communal space and enhance the social interaction among residents/different users?

The topic is too broad to cover all the (socio-) spatial aspects and to be studied within one session. Therefore, the focus was on several major topics, related to the identified points of interest, such as sphere, organization of the space and activities/facilities.

Hence, the conducted co-design session consisted of three parts, aiming to brainstorm on the following related to the major points of interest questions:

1. How could we improve the sphere within the space?
2. How could we organize the space to enhance social interaction among residents and other users of the space?
3. What else could we do to attract and involve residents to the space? (Focus on facilities, activities, and related interventions).

Within the studied topics (see above) the participants considered also the potential social conflicts and segregation problems among the different users of the space.

4.6.3. Description of the co-design session:

Originally it was planned to conduct the co-design session in live with both end-users (residents from the building complex) and employers from the WZN. However, due to the COVID restrictions, the session was conducted fully online. Further, in place of residents for the co-design session were invited to participate colleagues – researchers from HAN and the TU/e who are not directly involved in the project, but are experts in the field of social design, sociology, and social interaction.

The inclusion of not directly involved people in the process allowed the researcher to gain valuable "fresh-eye" views and independent expert opinions. There were present totally seven participants of different academic and professional backgrounds, both with and without design experience. All participants have been beforehand in detail informed about the project case, the major identified socio-spatial problems, and points of interest. Further, the main preferences of the different users – residents and seniors from the King Arthur group and the main preconditions for a future design have been described.

The co-creation workshop was conducted via Teams, using the Miro platform for the brainstorming and ideation parts. There were considered the possible limitations of the online environment to the creative process. Therefore, multiple choices have been provided to the participants: every attendee was free to choose and use the visualization tools (text, drawing, or combinations) that he/she finds most comfortable and best suited to express the participant's visions. Next, for every session part on the Miro platform were provided schemes, plans, and photo collages of the existing situation, empty plans of the communal space, and additional basic elements (furniture icons and related) for ideation. There were totally three session parts, which consisted of individual input (session one and three) and teamwork (session two), followed by group discussions.

4.6.4. Results of the co-design session:

During the three workshops, the participants boosted their imagination and creativity to generate ideas and shared their view and opinions in the follow up group discussions. They were enthusiastic and engaged in the sessions and the discussions, which also showed their interest in the studied problems.

The next paragraphs describe the results of the three co-design session parts.

A. **CO-DESIGN SESSION PART ONE:** HOW COULD WE IMPROVE THE SPHERE WITHIN THE SPACE?

The first session aimed to explore the spatial approaches to improve the sphere within the communal space. In this part, as possible contributing factors to study were proposed domesticity, personalization of the space, and increasing the overall users' utilization comfort.

During the session participants were asked to individually brainstorm on the problem and map their opinions and ideas on the provided space and empty plans on the Miro platform. Because of the provided multiple choices to attendees for work on the Miro platform, the input was very diverse: the end results consisted both of text notes, comments, concept schemes, and reference pictures to illustrate the main idea of the participant (See appendix). The main ideas and views on the problem have been further elaborated during the follow-up group discussion.

RESULTS PART ONE:

Generally, the obtained results can be summarized in several main groups, which refer to the following major topics: Zoning, facilities and activities, greenery, interior sphere elements (such as light and colors), furniture elements, technological implementations.

- **Greenery**

Greenery is the most preferred element to contribute to the sphere within the space. Different forms of greenery and green interventions have been proposed by all the participants. They related green interventions to different functions and applications: according to some, the application of greenery within the communal space strengthens the visual and functional connection with the communal garden. Further, taking common care of the plants could create activities, which was seen by many as a way to connect and increase the social interaction among different users and thus also contribute to reducing current utilization conflicts among them. Particularly some participants proposed to design an indoor (winter) garden within the communal space. In their opinion, people can take care of and grow different plants. Some self-grown vegetables can even be used by the restaurant. Next, it was mentioned, that greenery and plants ca be used as functional elements to create different zones and “borders” within the space.

- **Zoning**

Zoning of the space is the second most proposed by participants approach to create inviting, home-like sphere. According to them currently the space “feels big and empty”. Participants proposed that

the differentiation of different zones should be recognizable in the design and clear to people, however with this is meant no “hard” separation, but more gentle and friendly way to create various areas where (a group of) people can withdraw. Further, this should provide opportunities for interaction between users, but also create different privacy opportunities and possibilities for using (parts of) the space by different group.

Various design approaches have been proposed by attendees to spatially and functional zone the space and thus improve the sphere of the communal room: For example, by creating groups of various furniture types (for example, different sizes and types of tables, sitting and lounge areas, etc.). Further, zones can be expressed by changes in floor materials, colors, or levels, by varieties in lighting or ceiling height. Next, the space can be zoned by using plants and greenery. Another way to organize the space proposed by participants is by using movable, open partial dividers, such as open shelves with plants and books. Thus, according to responders, one can not only physically separate the space when needed but also “attract” residents and provide additional activities. Further, the open shelves still provide surveillance opportunities to the whole indoor space.

- **Entrance area:**

According to participants, the main entrances to the space are currently not clear and well defined. Therefore, a lobby or bigger entrance area can be also created.

- **Technology**

Technology has been proposed by some participants as a possibility to create better sphere within the studied space. According to them, different technological interventions, such as digital welcome boards, digital devices for (common) activities, interactive walls to change the mood / sphere during different parts of the day or guiding lights to create routes and zones can be applied. Further, information boards can be implemented on different places within the building complex to promote the communal space and inform residents about upcoming activities and events.

- **Sphere elements: Lighting, colors, materials.**

Lighting, colors, and materials have been seen by many as important interior elements, which can greatly contribute to improving the sphere within the communal space. For example, interactive and warm lighting can improve the atmosphere within the space. Participants proposed that light can change over the day to create different sphere and mood opportunities. Further special lighting can be applied to highlight important zones within the space.

Participants proposed to be implemented predominantly warm colors and natural materials within a future design. Furniture should be, according to them, matching more in style, materials, and colour.

To increase the “home-like” feeling in the space, one participant suggested using pillows and similar small elements, associated with domesticity.

- **Facilities and activities:**

To improve the sphere within the communal space, all participants suggested to be implemented additional facilities and proposed different activity opportunities. According to many, adding commonly used facilities will give a purpose for residents to visit the communal space. The most suggested facility to place is a coffee corner, open 24/7 to residents.

Participants proposed to add common activities and related elements to the space, which can join all different users (residents, clients, and seniors from the King Arthur group (under supervision)). These can be for example, indoor gardening and plant care. Further, standard activity possibilities such as reading, and workshop areas have been also mentioned. One of the participants suggested to use technology (e.g., tablets with learning games) to connect users and enhance the social interaction among them.

DISCUSSION PART ONE:

Generally, it can be concluded, that this was a very productive session. Because of the provided multiple choices for work on the Miro platform, the participants’ input was very diverse: the results consisted of both short texts, comments, concept schemes, and reference pictures to illustrate the main idea of the participant.

There are several key elements proposed by participant for improving the sphere of the studied communal space:

Greenery in different forms and functions has been the most discussed element within the first session part. Participants highlighted the importance of strengthening the connection between the indoor space and the communal garden. Further, greenery was associated with various applications, such as to create zones and physically divide the space, to stimulate activities and thus create opportunities to involve all users and to potentially solve current social problems and strengthen the community.

According to literature, elements such as lighting, materials, colors can contribute to achieving a welcoming sphere of space. Participants elaborated on these and proposed to implement more natural materials, warm colors, and different lighting options. Besides, lighting was associated by participants also with creating zones, navigation (guiding lights) and related technologies (interactive lights/walls).

To improve the sphere within the communal space, participants saw potential in the implementation of technologies to attract, inform, and engage the residents in activities.

It was interesting to see, that attendees didn’t focus only on applying sphere elements, but proposed broader interventions such as zoning and adding different activities and facilities. In a way, they

referred to the topics of the following two sessions. The results of the first co-design session part demonstrated an integrated approach to the problem in its complexity.

B. CO-DESIGN SESSION PART TWO: HOW COULD WE ORGANIZE THE SPACE TO ENHANCE SOCIAL INTERACTION AMONG RESIDENTS

The second part of the co-design session aimed to study how the communal space can be spatially and functionally organized to better attract residents, enhance social interaction, and reduce the potential utilization conflicts among different users of the space.

During the workshop participants worked in teams. There were formed totally three groups of 2-3 people with different backgrounds, who were asked to discuss and visualize their ideas on the provided empty plans on Miro.

RESULTS SESSION PART TWO:

In general, the results of the second session part (see appendix) can be referred to several major topics, namely:

- **Zoning:**

During the workshop session, participants brainstormed together on how to zone and organize spatially and functionally space.

In their concept sketches, two of three teams clearly defined the entrance zones. As mentioned in the discussion of the previous part, according to participants these must be more visible and bigger.

Overall, the following functional zones have been proposed: zones for group and creative/hobby activities, where the bigger tables can take place, zones for sport and gaming - mostly centrally positioned, a zone for closer interaction with smaller tables and rest/observation lounge area. Further, coffee and drink zones have been proposed. According to one of the teams, the coffee corner can be multifunctional and combined in a block with planting and act as a room divider.

The zones for coffee/drinks and group activities or gaming are positioned centrally within the proposed by the teams' sketches. Others, related to hobbies, creative activities, greenery, reading, closer interaction, or observation are situated more into the corners. One group proposed to arrange a zone for (family) visits.

The teams created the mentioned above zones by using various sizes and types of furniture (such as big or small tables, sofas), by using varieties in lighting, by implementing greenery or by placing movable room dividers. Participants suggested interesting options for room dividers, namely movable open shelves with (combinations of) greenery and books, which can also provide opportunities for additional activities, good visibility, and flexibility to the space.

- **Greenery:**

During the second workshop, the participants once again highlighted in their works the relation of the communal space to the garden. Further, greenery in different forms is present in all three concepts, namely in the form of movable green dividers, indoor greenhouse / green corner or green islands spread out through the space. Greenery was suggested by the teams as a gentle and functional way to organize the space. As further discussed, greenery aims to enhance the relationship to the communal garden, to zone the space physically and functionally and to create common activities.

- **Facilities and activities:**

The proposed activities are related to the created zones, described above. Regarding facilities, a coffee corner is according to participants essential. According to one of the teams, a (technology) device with questions could play the role of a conversation starter.

DISCUSSION SESSION PART TWO:

Like the first session part, participants involved actively and with enthusiasm in the ideation and creation process. The format of working in teams allowed participants to discuss together and look at the problem in its complexity.

Overall, the results of the second session visualize the main ideas, already expressed, and discussed in part one. To summarize, the participants found it important to divide the space into different spatial and functional zones, but in a gentle and flexible way. Regarding current social problems among different users, the concept designs aimed to rather find a way to involve users, than separate them. Yet, different levels and possibilities for privacy (in a group or individual) were also provided. During the discussion part, participants mentioned, that solving organizational problems – such as proposing local resident's committees for activities or organizing major user's flows can contribute to the problem.

Generally, the schemes proposed by the three teams provide graduation of the inner space, both regarding functions and private-community opportunities, which aligns with the literature.

A new approach proposed by participants is the use of greenery to organize the space spatially and functionally. They saw potential in using green for various purposes.

One limitation of this co-design session part has been the time. Compared to in-live sessions, the online activities are in general more intensive for the participants, therefore also more limited in time duration. This reflected on the final result as well. Participants mentioned that they could not succeed to visualize all their ideas on Miro.

C. **CO-DESIGN SESSION PART THREE:** WHAT ELSE COULD WE DO TO ATTRACT AND INVOLVE RESIDENTS TO THE COMMUNAL SPACE?

The third part of the co-creation session consisted of individual brainstorming work on Miro, followed by an interactive group discussion. The aim of this closing activity has been to summarize the outcome of the previous two parts and discuss what else can be done to attract residents to the space. Participants were expected to propose ways to attract residents to the space, for example by adding facilities and activities.

RESULTS PART THREE:

Next to the already discussed facilities and possible activities to meet the needs of the different users (such as a coffee corner, sports, reading, crafts, etc.), the participants elaborated on the possible organizational approaches, which can contribute to the greater utilization and involvement of the residents into the communal space. One of the attendees noted for example, that there are currently too many different types of users of the space. According to him, this makes the space non-personal, and it is hard to achieve a domestic look or feel. Further, it was proposed to set up local committees of residents to be responsible for organizing activities and practical issues.

Once again participants discussed the idea of a broader involvement of greenery in the space, by for example creating an indoor greenhouse or green corner to attract and actively involve residents and different users.

DISCUSSION SESSION PART THREE:

The additional measures to attract and involve residents to the communal space proposed in the last session part to a big extent recap the previously discussed topics. Once again participants elaborated on involving more greenery within the interior of the space.

Interesting for this part is, that next to the proposed possible activities and facilities, participants discussed the organizational issues which according to them should also be considered. It was proposed to set up committees of residents, responsible for organizing events and maintaining other practical issues.

4.6.5. Co-design session – overall conclusions:

Generally, it can be concluded, that despite the limitations of the online environment, this was a very productive session. Participants contributed actively and with enthusiasm to the design process with their views and expert opinions. The brainstorming and ideation work on the Miro platform included both individual contributions, teamwork, and group discussions, which ensured variety in the approaches and contributed to the interactiveness of the co-design session. Because of the provided multiple choices for work on the Miro platform, the input of the participants has been very diverse, which led to various results.

Overall, the proposed during the co-creation session ideas align with literature, the previously set concept ideas of the researcher and the expectations of users, expressed during the informal talks. However, there were proposed some interesting ideas as well. There are several key elements suggested by participants to invite residents to the space and enhance the social interaction among them and different users:

Greenery in different forms and functions has been the most discussed element during all the session parts. Participants proposed to include greenery within the interior design for different purposes – for example, as an element to contribute to the better sphere within the space, for personalization of the space and way to reduce social conflicts among different users and strengthen the community (residents can take care of their (own) plants), to organize the space spatially and functionally, for recreation and improving wellbeing, to stimulate different activities. Participants highlighted also the importance of strengthening the relationship between the indoor space and the communal garden.

Further, participants proposed to use lighting and technologies for various purposes as well: For example, technology can be applied to welcome, inform, connect, or interact with residents. Varieties in lighting can improve the sphere, navigate, or organize the space. The suggested colors and materials are warm and natural.

There were proposed different approaches to arrange the space spatially and functionally. Common features are the Implementing of a bigger variety of furniture, ensuring flexibility and creating soft boundaries among the different zones.

Different facilities and activities have been proposed as well. They are related to the organization of the space. However, adding coffee and drink corners was according to everyone essential. An interesting idea has been the arrangement of an indoor greenhouse or green island within the communal space. Regarding current utilization conflicts among different users, participants highlighted the importance to solve the existing organizational problems and proposed to be set different resident committees. Some proposed to possibly reduce the variety of users.

A valuable aspect regarding the results of the co-design session was that during the different parts participants demonstrated an integrated approach to the questions and studied the problem in its complexity. One barrier to the co-creation session was, that this had to be conducted in an online environment. Along with the technical challenges and interaction or time limitations, the participants were working on a common platform and thus maybe influenced each other in their decisions. Nevertheless, the session was very successful, and all participants truly engaged with the process and the discussed problematics.

4.7. DESIGN CONCEPT

4.7.1. Description of the design concept study:

In this step of the living lab process the results of the co-design session are further developed in design concepts and scenarios. The proposed concept designs are based on the living lab framework described in the beginning of this chapter. The designs described below consider the selected in the concept model socio-spatial factors for stimulating social interaction and align with the major theoretical findings described earlier in this document. Further, the concept incorporates selected design principles and architectural approaches, both described in literature and inspired by practice. The proposed concept design approaches summarize the findings and target the already identified in the previous steps (observation and interview) socio-spatial problems and main points of interest. Moreover, they incorporate the most important socio-spatial approaches and ideas discussed during the co-creation session and consider the main viewpoints, preferences and needs, shared by responders during the interview and informal talks.

The proposed concept and scenarios respect the special needs of the main users of that space – older people with possible mobility and/or mental limitations for access and safety. Therefore, when positioning the different interior elements in the plan enough space for seniors with a rollator to pass by is provided. Further, in the concept designs there are no differences in the floor levels and the proposed materials (wood, laminate) are safe and easily to maintain. Although some interior elements, such as carpets and textile flooring generally contribute to the “home-like” feeling of the space, they are (because of safety and access reasons) avoided.

As mentioned above, the selected living lab case characterizes with very low scores of resident’s participation and involvement both regarding (communal) spaces, initiatives, and activities. The observations on the place and the interviews confirmed this. Further, in the previous Living lab stages, certain social problems – such as segregation among the residents and the different users of the communal space have been identified.

Therefore, the focus of the proposed concept designs is to explore how through architectural approaches and spatial interventions to possibly enhance the utilization of the communal space, stimulate the (spontaneous) social interaction and diminish utilization and social problems among the different users.

The concept model of the Living lab described above clearly shows the interrelation between spatial design, influencing socio-spatial factors, levels of social interaction and place attachments / utilization of the (social) space. In their the study Zavotka and Teaford (Zavotka & Teaford, 1997) describe different processes related to the place attachment and the connection that people experience with specific spaces of the built environment, (Jennings & Bamkole, 2019)). The processes they figure, are related among others to the privacy opportunities and personalization elements within the (shared) pace.

Therefore, within the proposed concept designs the topics of sphere with focus on domesticity and personalization of the space, spatial organization in relation to private-shared and the availability of facilities and activity opportunities are studied. Next to the concept design, these major topics are further explored in several scenarios.

- **Scenario one - sphere:**

This scenario aims to study the design approach opportunities and possible spatial interventions to create a better sphere within the communal space to enhance its utilization by the residents, promote place attachment and stimulate the social interaction among them in result. Based on literature, the findings from the previous chapters of this study and the viewpoints and preferences shared by the responders during the interviews, the main topics explored in the sphere concept scenario are spatial quality of the space (in terms of social interaction), domesticity (home-like feeling) and its possible personalization.

- **Scenario two – organization of the space:**

In this scenario the spatial organization of the common meeting room to enhance the social interaction among the residents is explored more in detail. Within this scenario are considered the private-shared relationships among the users and the related spatial choices and opportunities provided within the space. Further, within the designs are taken in account the possible conflicts and social problems among the different users regarding the utilization of the space. Therefore, within this scenario are also proposed different possibilities to organize and/or divide the space spatially and functionally, with focus on the needs of the different users.

- **Scenario three – facilities and activities:**

This scenario focusses on the possible spatial and design interventions within the space to promote spontaneous activities and therefore attract the residents. Further, different possibilities for the implementing of technologies to promote the communal space to the residents of the building complex and enhance the social interaction among them are explored.

Both the proposed concept design and the three related scenarios focus on the strengthening the functional and visual relation with the outdoor shared garden and the implementation of greenery for different purposes, related to the explored different topics.

4.7.2. General concept:

4.7.2.1. Highlights and main principles of the general concept

As a first step the general design concept is created. The proposed concept is based on the living lab framework described in the beginning of this chapter. Further, it is aligned with the main points of interest identified as result of the conducted on-place observations and focus interviews. Besides, it considers the preferences and needs of the main users. Last, but not least, the proposed design incorporates selected ideas and design approaches, proposed during the co-design session.

The main design principles and spatial approaches, implemented within the general concept are:

- **Strengthening the relation with the communal garden: implementation of greenery within the interior design.**

Within the previous living lab steps and during the co-design session has been broadly discussed the importance of strengthening the relation between the actively used outdoor shared green space and the communal space. As pointed before, a possible approach is implementing greenery into the interior of the communal space for different purposes – aesthetical, to improve sphere, to personalize, organize the space, or to create activities. In this way, greenery plays multiple roles in solving major socio-spatial problems of the studied space.

More in detail these approaches and the possible elements to involve (green walls, vegetation pots, column cladding with green, etc.) are described in the scenarios below.

- **Providing private – shared choices within the space:**

One of the major spatial problems, identified during the observation was the limited variety of furniture and sitting opportunities. Consequently, the provided private-shared choices within the space are also restricted.

Therefore, the proposed basic concept aims to provide bigger variety of types and sizes furniture and sitting opportunities regarding private-shared choices: lounge area, big tables for group activities, smaller ones for private or smaller group interaction, sitting opportunities around the green walls or the columns for observation or spontaneous interaction. These are organized in different size groups and in an informal way. In result various zones regarding private-shared relationships and types of activities are created.

The different possibilities for organizing and zoning the space are further elaborated in the scenario “organization of the space”.

- **Improving sphere with focus on domesticity and personalization:**

To increase the identity of the space and promote place attachment among the residents/users, different personalization elements, such as picture collages and (decoration) elements related to community life are involved into the interior. When placed around the coffee corner, entrances or similar intensively used places, they can work as conversation starters as well.

The design approaches to improve the sphere and promote domesticity within the communal space are described more in detail in scenario “sphere” below.

- **Implementing main facilities and different spatial opportunities for spontaneous and organized activities.**

To attract inhabitants and enhance the (spontaneous) utilization of the space, different facilities are introduced into the concept design. A coffee and drink corner for the residents is the most important one. Further, the variety of furniture and sitting opportunities enable observation, interaction, smaller or bigger group activities. Billiard, chess, interactive touch tables involve users into common activities. Further, opportunities for growing own vegetables, plants or herbs are also provided, to encourage activities and spontaneous interaction among the different groups. More in detail, the possible activities and related elements are described in scenario “activities and facilities”.

- **Technologies to attract residents to the space and stimulate social interaction:**

During the co-design session have been broadly discussed the opportunities to implement technologies for the purposes of this study. Different application of technologies within the space – to inform, welcome or navigate, to attract and interact, or as a conversation starter have been proposed.

More in detail, the possible applications of technologies to attract residents to the space and enhance the social interaction among the different users are described in the thematic scenarios below.

Fig. 24 represents the general concept and plan of the communal space.

GENERAL CONCEPT PLAN:

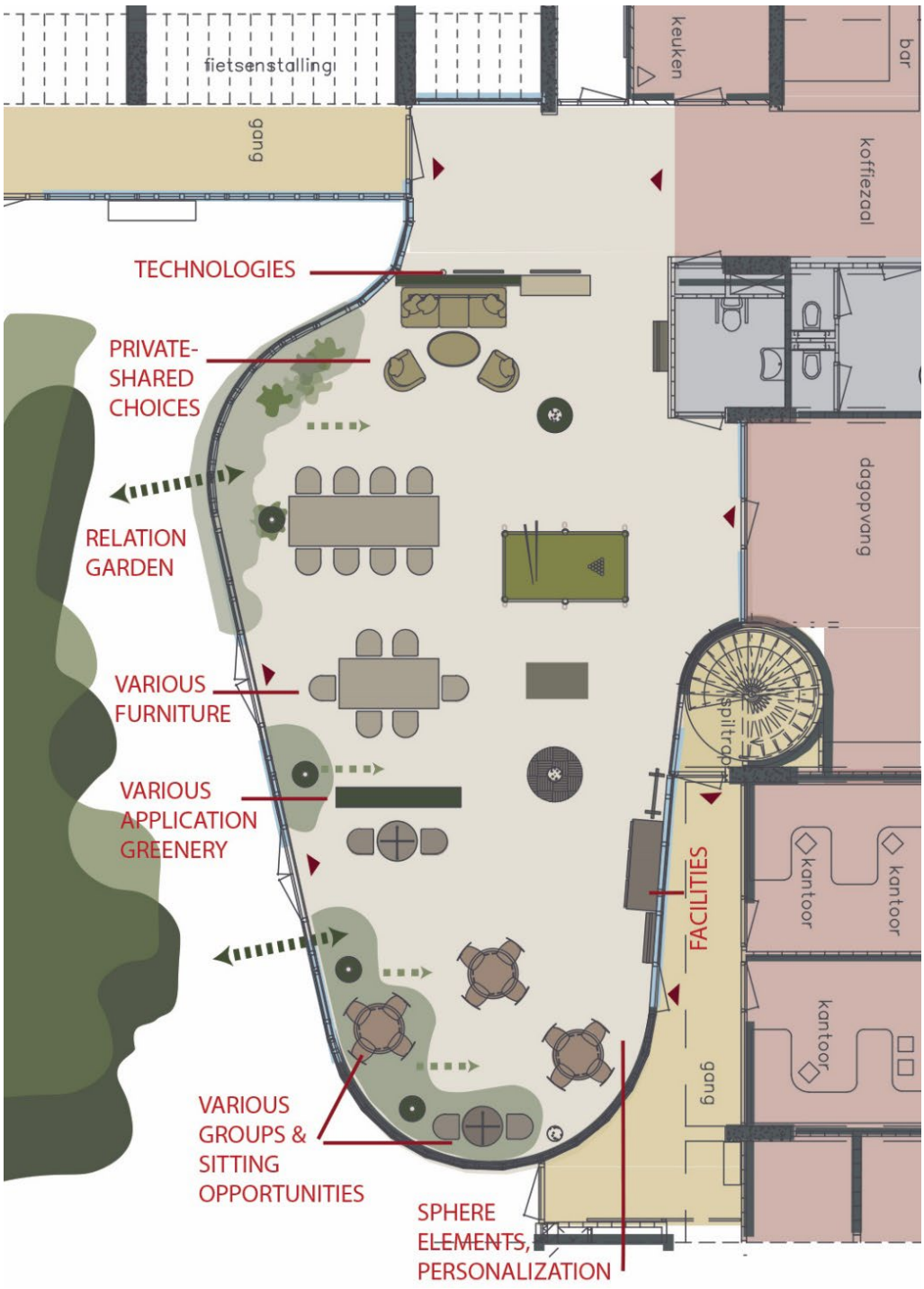


Figure 24: General concept plan

4.7.3. Scenario one - sphere:

This scenario aims to study the design approach opportunities and possible spatial interventions to improve the sphere within the communal space to enhance its utilization by the residents, promote place attachment and stimulate the social interaction among them in result. Based on literature, the findings from the previous chapters of this study and the viewpoints and preferences shared by the responders during the interviews, the main topics explored in the sphere concept scenario are spatial quality of the space (in terms of social interaction) and domesticity. Further, the possibilities to implement personalization elements and technologies are studied.

According to literature, domesticity in the interior is among others, related to the choice of furniture (in terms of type, variety, style, materials, colors, etc.) and the way of grouping / arranging. (Campbell, 2015; Weenig & Staats, 2010; Lee & Rodiek, 2013).

Therefore, within the current design are provided variety of furniture types and sitting opportunities – smaller tables for closer conversations, lounge area (sofa) for observation and relax, smaller coffee tables, bigger tables for group activities, optional sitting possibilities around the main column and next to the coffee corner. These are arranged in various groups and in an informal way.

The proposed colors and materials are calm and natural, in the neutral green-brown palette, inspired by nature and associated with the outdoor green space. The choice of the proposed materials is mostly natural, like wood, metal, textile, and leather. The choice of materials aligned with the preferences, shared by the responders during the interviews.

Further, as proposed during the co-design session, special elements such as attractive lighting can increase the identity of the space and highlight some parts of the interior (such as the conversation / coffee area).

Personal elements into the interior can increase the sense of place attachment and “home-like” feeling (Zavotka & Teaford, 1997). According to this study, typical personalization elements from private dwellings such as pictures and memory artifacts, can be adapted and applied to the community spaces as well. Such elements especially placed around frequently used facilities may also play the role of a “conversation starter”, thus enhance spontaneous social contacts among the resident’s involvement of personalization elements within the space.

Therefore, different personalization and decoration elements, such as for example, photo frames with community pictures, decoration elements, paintings (made, for example, during drawing activities) or other similar objects can be arranged around the coffee corner, lounge area and main entrances. In this way they can also play the role of a conversation starters as well.

Greenery is main element of the proposed scenario. Different implementations of greenery into the space are possible - to improve the sphere, but also personalize it, organize, and create activities. Different approaches to include greenery within the space are, for example, arranging greenery around the windows to strengthen the relation with the garden, including elements like plant pots, green boxes for growing own plans and herbs, decoration / cladding with greenery main structural elements like columns, possibly combined with sitting opportunities as well. Further, green partition walls with integrated other functions – bookshelves and sitting opportunities are nice possibilities to organize the

space in an interactive and attractive way. Examples on how to possibly implement greenery within the space to improve the sphere in terms of social interaction are shown on the mood board.

Finally, various opportunities for implementing technology into the space to inform, welcome and entertain are proposed within the sphere scenario as well. To welcome residents to the space can be placed informational and welcome boards by the entrances. Interactive touch screen tables, suitable also for seniors with dementia symptoms, can create multiple activities.

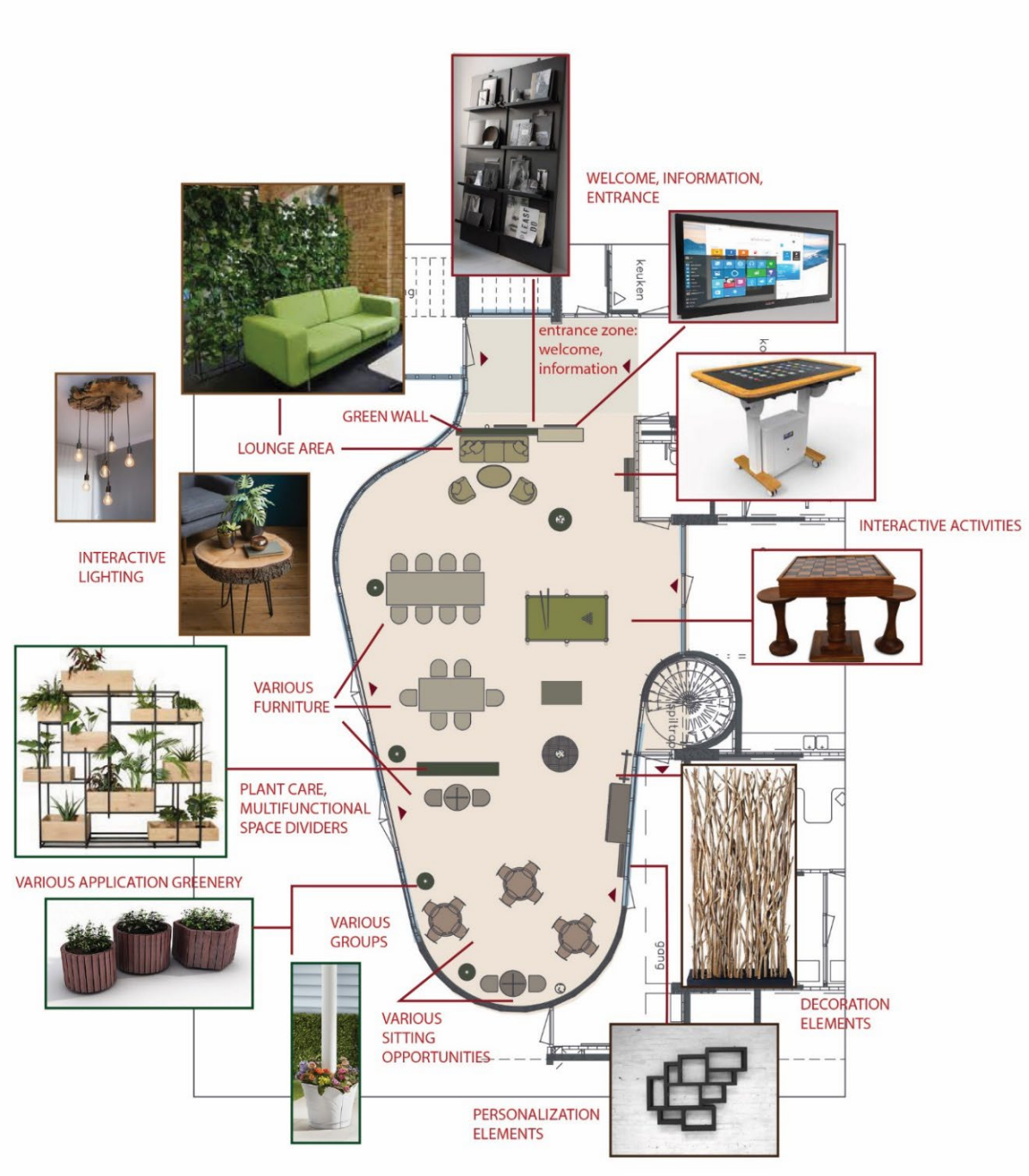


Figure 25: Mood board sphere

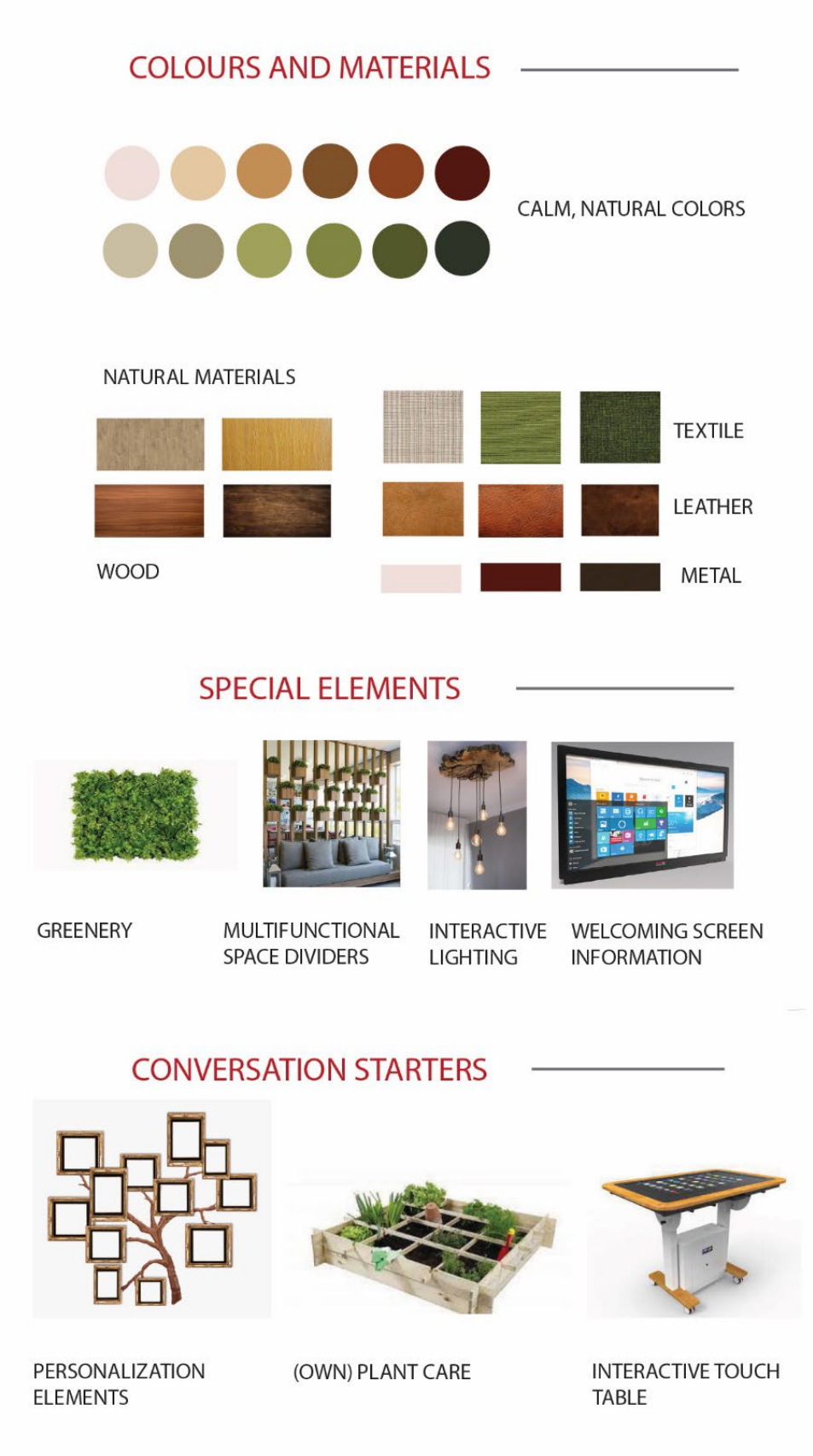


Figure 26: Concept sphere: Elements

4.7.4. Scenario two - organization of the space:

In this scenario the spatial organization of the common room to enhance the social interaction among the residents and possibly reduce the utilization conflicts and/or segregation among the different users is explored. Within this scenario are considered the private-shared relationships within the space. Further, on this base several different possibilities to spatially and/or functionally organize the space with regard to the social problems among the different users are proposed.

The following main design principles, spatial approaches and elements are implemented within this scenario:

- **Creating various zones / private shared choices and opportunities**

First, to functionally organize the space, different zones are created:

- Entrance zone, where technology can be implemented to inform and welcome the residents
- Lounge area with library
- Activity zone (with different activity opportunities: billiard, chess table, interactive tough table, etc.)
- Group (activity) zone
- Greenery plant and care zone(s) (different possibilities, described below)
- Coffee and drinks zone (with additionally included decoration and personalization elements)
- Zone for smaller groups and private conversations

The different zones are formed by introducing various groups of sitting opportunities, furniture, and facilities in the concept plan.

- **Routing through the main zones**

The furniture and interior elements within the proposed concept are organized in a way, that the main routes through the space and from the shared garden pass through the described above main zones. Further, to create a safe and easily accessible space for the target users, the (furniture) elements in the proposed concept plan are situated in a way, that the space and main routes are suitable for seniors with mobility limitations and rollators.

- **Options for dividing / organization of the space**

The social and utilization problems among the different uses and particularly between the residents and seniors from the King Arthur day-care group have been broadly discussed both during the interview and the informal talks and the co-design session.

Based on these, several versions on how to possibly divide the space for the different groups, yet not segregate them are proposed (fig. 27).

In the first version, the space is functionally organized through different size and type sitting groups. For example, while seniors from the day care use the big, common activity tables, residents and other visitors can find privacy in the lounge area or the zone with smaller tables.

In the second version the space is physically separated by multifunctional space dividers to provide greater privacy. These structures must be not solid, but to provide good surveillance opportunities through the space. The space dividers can combine different functions and activity opportunities – for example, plant care, bookshelves, sitting. Thereby, the space divider also provides opportunities for spontaneous activities and interaction and bring together the different groups of users.

In the third version, a similar principle is applied. Instead of (multifunctional) room dividers, in this version different greenery – green walls, green (free standing) pots, plant baskets and similar, is implemented.

In the fourth version, the space is visually divided by providing differences in the floor colors and materials, or by introducing special (lighting) interior elements.

On fig. 28 are presented examples of possible elements to involve in the different versions.

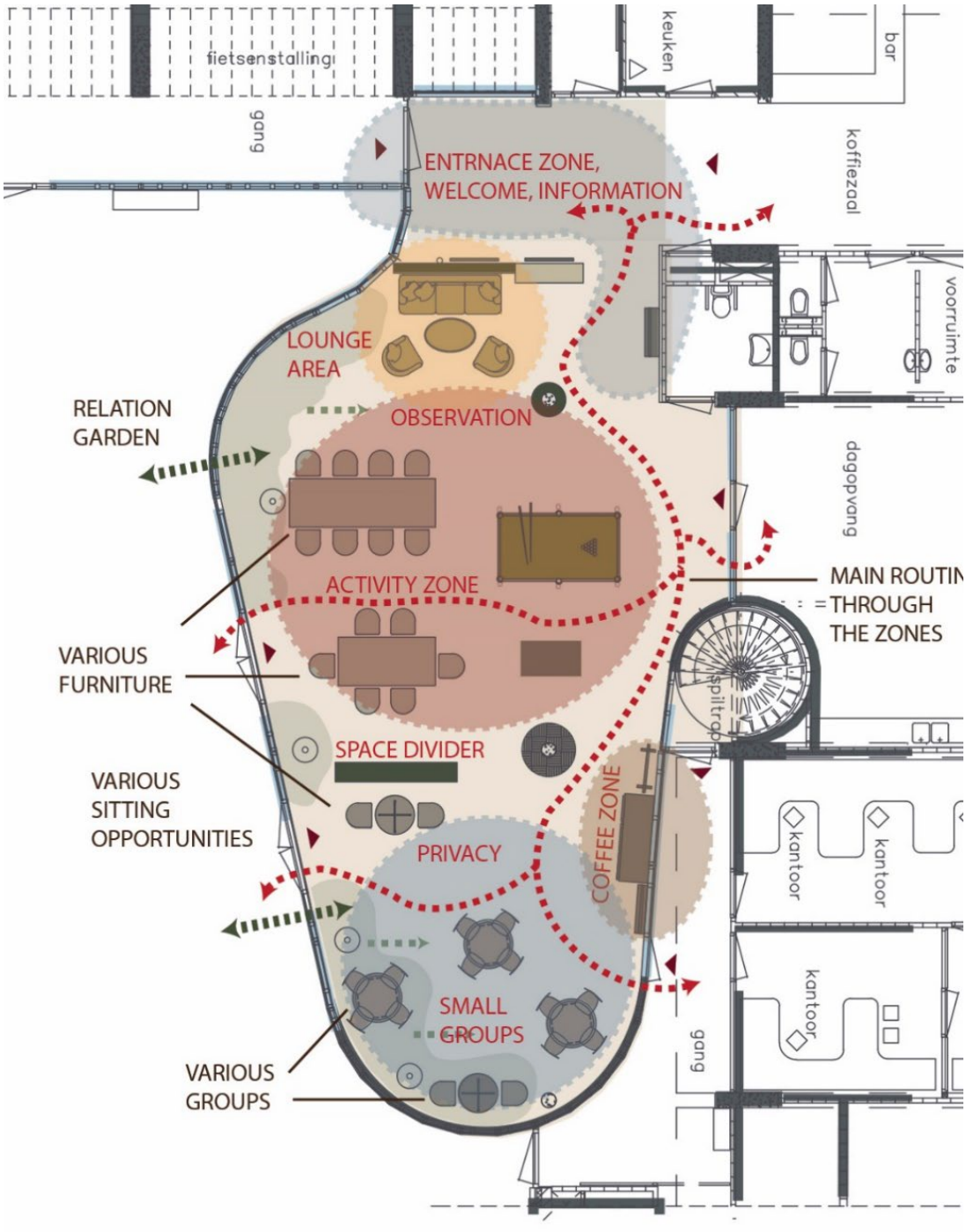


Figure 27: Organization of the space: concept zones and routing

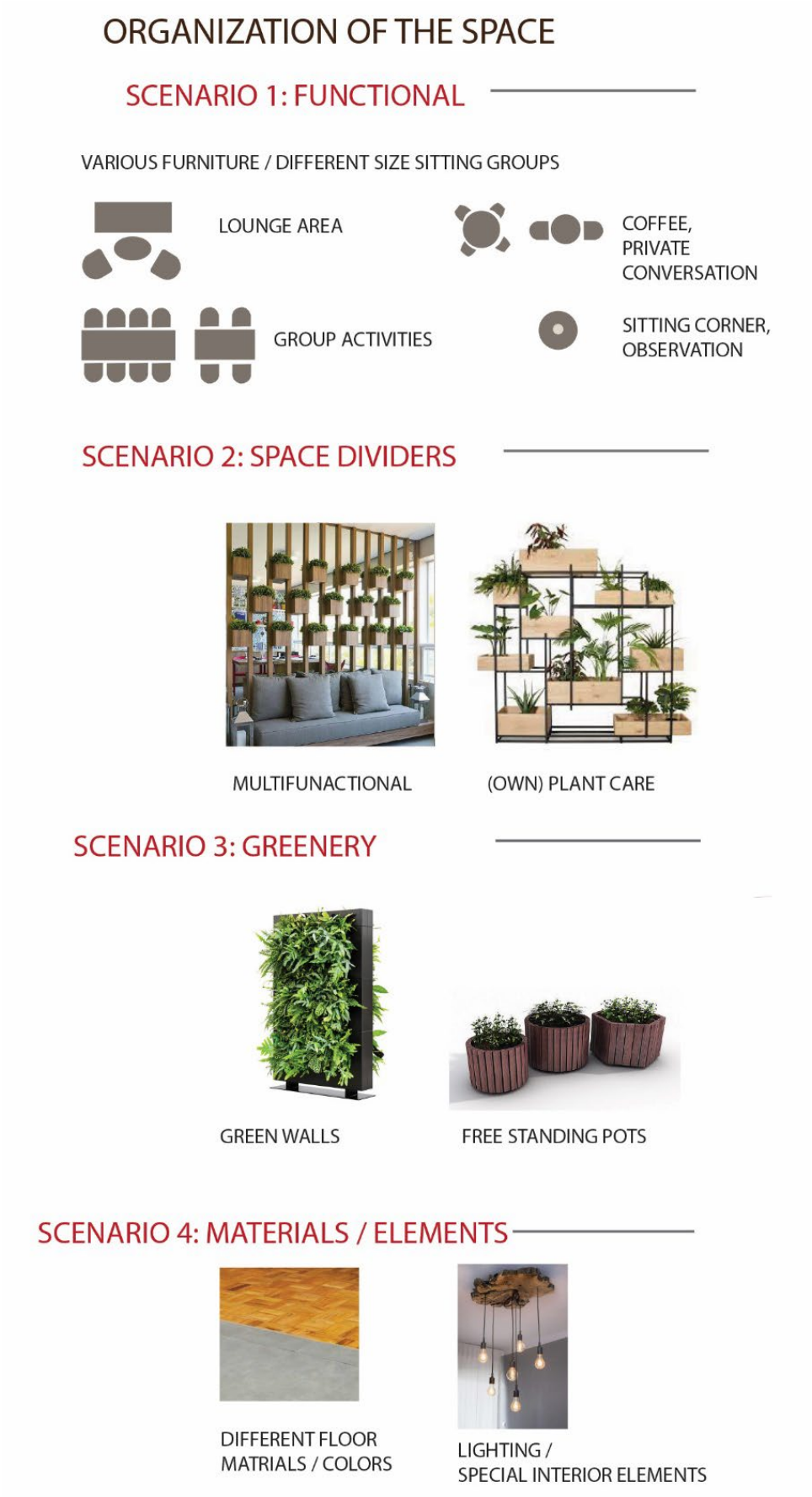


Figure 28: Possible approaches to organize the space

4.7.5. Scenario three - activities and facilities:

This scenario focusses on the possible spatial and design interventions within the space to promote spontaneous activities and therefore attract the residents. Further, different possibilities for the implementing of technologies to promote the communal space to the residents of the building complex and enhance the social interaction among them are explored.

- **Facilities and activities:**

The proposed concept provides basic facilities (such as coffee and drink corner), but also multiple opportunities for unplanned activities and spontaneous contacts. To strengthen the relation with the outdoor space, for example, there are possibilities to grow own plats and herbs indoors. This could not only have aesthetical function, but also act as potential room divider, and create activities. Providing elements into the concept design to grow own plants can act as a conversation starter, thus create spontaneous interaction opportunities. Further, growing own plants can contribute to the personalization of the communal space and stimulating the place attachment (Zavotka & Teaford, 1997).

Other elements, which can act as conversation starters can be a library, standing walls for hanging pictures and brochures around the coffee corner, small sitting places around the column nearby the coffee corner, interactive chess table, interactive touch screen table, etc.

The big size tables provide opportunities for different group activities. Different options for observation, (private) communication or rest are present in the design.

Further, in the “activity zone” a billiard table is available. Additionally, a chess or digital interactive table can be placed.

- **Technologies:**

To promote the communal space among residents and partially compensate the fact, that this is situated far from the main building entrances of the building and not spontaneously accessible, different opportunities provided by technology are implemented into the design. Through touch screens, positioned at the main entrances and in the entrance area of the communal space can welcome and inform the residents about upcoming events, interact, change the sphere.

Further, nearby the entrance and in the “activity” zone, can be placed interactive touch tablet tables, which are replaceable and specially designed for seniors.

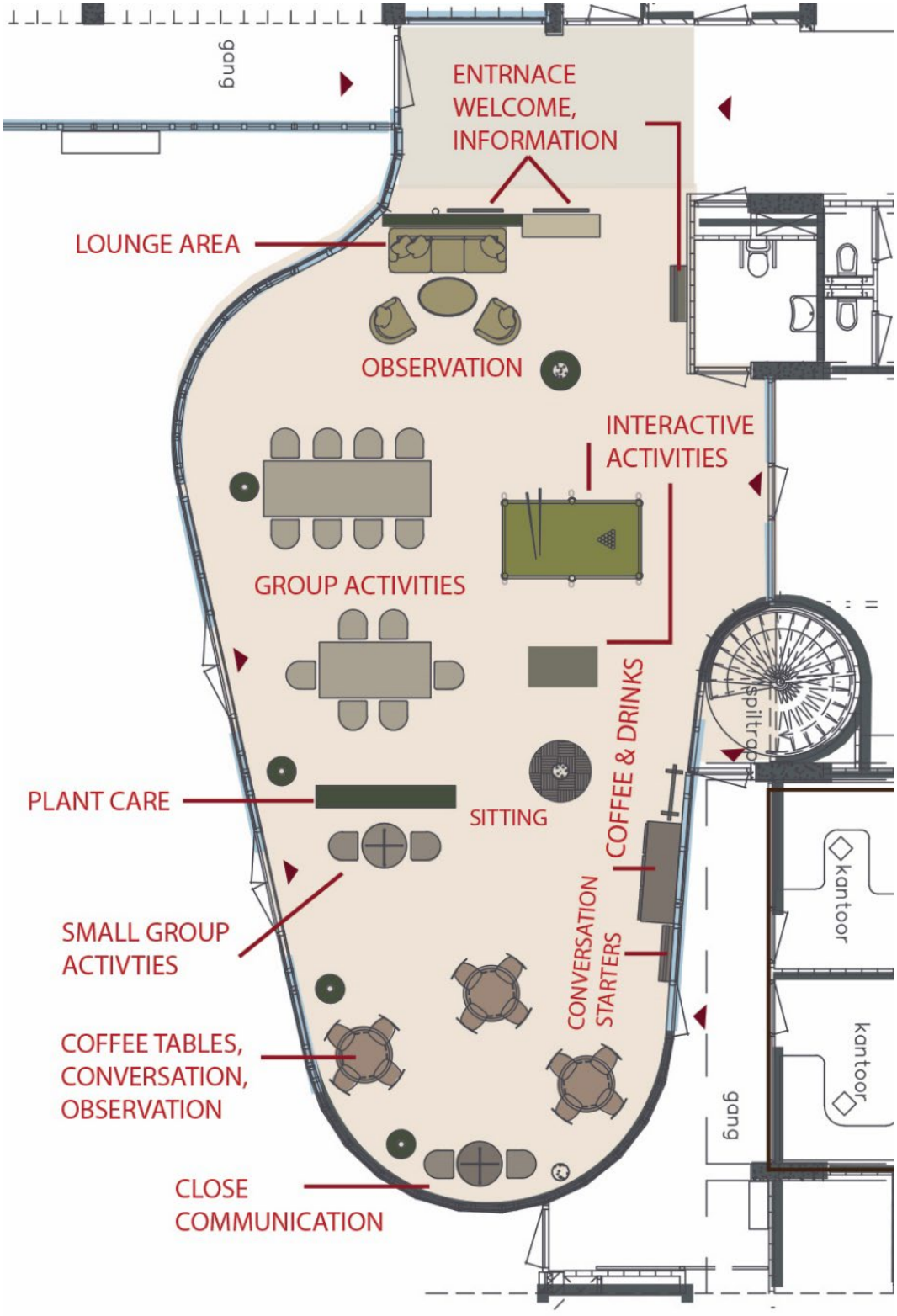


Figure 29: Activities and facilities within the space

FACILITIES / ACTIVITIES

(OWN) PLANT CARE

COFFEE & DRINKS CORNER

SITTING OPPORTUNITIES

LOUNGE AREA

GROUP ACTIVITIES

COFFEE, CONVERSATION OBSERVATION

INFORMATION & TECHNOLOGY

INFORMATION BOARD

INTERACTIVE TOUCH TABLE

CONVERSATION STARTERS

PERSONALIZATION ELEMENTS

SPECIAL ACTIVITIES

Figure 30: Facilities and activities: design approaches and elements

4.7.6. Discussion living lab study:

The theoretical findings and design approaches, discussed within the previous chapters of this PDEng project, and suitable for the selected case, have been successfully applied within the Living lab study. Unfortunately, the evaluation of the proposed concept and scenarios by the residents could not take place within the time scope of the project.

The COVID-19 restrictions affected and limited the Living lab study, especially in the steps, where participatory methods are applied. Although alternative ways have been found to conduct the interview and co-design sessions, the residents have not been involved, which potentially can influence some outcomes.

Despite the difficulties and restrictions, the living lab study has covered all the steps and finally a design concept and several related scenarios have been proposed. Again, because of the COVID-19 and time limitations, the evaluation of these scenarios by residents and stakeholders could not take place within the PDEng project. The validation of the design concept will be conducted on a later stage, outside the scope of this study.

DISCUSSION

5. GENERAL DISCUSSION:

The main goal of this project was to explore the spatial aspects for the design of communal housing spaces to promote social cohesion among the (older) tenants and increase their social wellbeing in result. It aims at studying the implementation of architectural approaches, design principles and spatial interventions to stimulate the social interaction and connectedness among the (older) residents to support them age in place.

The research question was answered in several phases, according to the conceptual framework developed by M. Mohammadi (Mohammadi, 2017) and based on the empathic design theories. This framework includes four phases: exploration, translation, process, and validation, in which the needs of the relevant stakeholders are central, and they take an active role into the design process.

Despite the challenges and limitations due to the COVID-19 restrictions, the project has covered all these steps, except the validation one and finally a design concept was proposed.

The COVID-19 restrictions have with no doubt influenced the process, especially in the process and design phase and particularly the Living Lab study, where among others, participatory research methods are applied. Most probably, these limitations have (partially) influenced some of the results.

The final step - validation of the design concept by residents and involved stakeholders was also affected by the pandemic restrictions. Because of the time limitations of this project, it could not take place and will be conducted on a later stage, outside the scope of this study.

Further, because of the broader scale and complexity of the topic, the described design patterns, and principles to stimulate social interaction with (co-) housing can cover the discussed question only to a certain extent. Moreover, for some of the basic influencing spatial factors there are currently no values defined in literature and therefore, more research is needed.

However, this report provides an outgoing knowledge base for future research and design work. The described design patterns, principles, and spatial approaches to enhance levels of social interaction among (older) tenants can be potentially of great value to the company, architectural professionals, and other interested parties.

ACKNOWLEDGEMENT:

In the spring of 2020, with great enthusiasm I started my PDEng training as part of the Smart Building and Cities program. Unfortunately, the first COVID-19 lockdown was announced only few days later.

In the next two years there were a lot of challenges, but this was also a period of big professional and personal self-grow and learning. Now, while writing the final pages of my thesis, I would like to thank all those amazing people who I met during this journey and who supported and helped me get there.

First and foremost, I would like to express my deepest gratitude to my supervisors. I am grateful to prof.dr.ir. Masi Mohammadi and ir. Anne van Grinsven for their outstanding professionalism, valuable feedback and for their support along this journey.

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Moreover, I would like to thank all the committee members - dr. Irene Curulli, dr. Olivia Guerra-Santin, and dr. Shore Shahnoori for their time and consideration to evaluate my PDEng final thesis.

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Time is too short to mention all the wonderful people and amazing professionals I met. The only thing I am sorry is, that because of the COVID-19 restrictions I could not spend more time in live together.

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6. REFERENCES:

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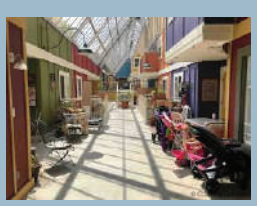
LIST OF IMAGES:

APPENDIX

APPENDIX

BEST PRACTICES OVERVIEW





MULTI-CRITERIA TABLE LEGEND:

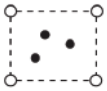
LOCATION CONTEXT:

rural area

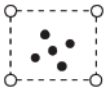
suburban area

urban area

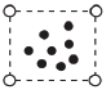
DENSITY:



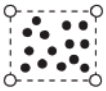
< 50 dw/ha



50 - 100 dw/ha



101 - 150 dw/ha



> 150 dw/ha

SCALE/ NUMBER DWELLING UNITS:

M = 16 - 25 dw units

L = 26 - 35 dw units

XL = 36 - 49 dw units

XXL = 50 - 100 dw units

XXXL > 100 dw units

HEIGHT BUILDING:

1-2 floors | 3-4 floors | 5+ floors

low | medium | high

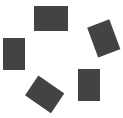
RESIDENTS / TARGET GROUP:

multigenerational

seniors

students

BUILDING CONFIGURATION:



clustered detached

open building block,

clustered, directional enclosed

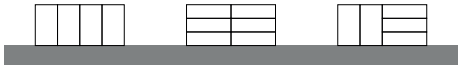
closed building block maximally enclosed

clustered, asymetric implied

compact mono-block

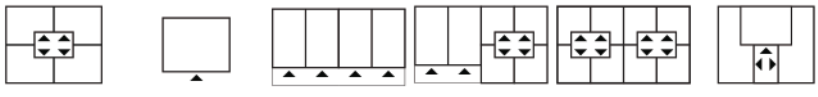
paralell, directional implied

DWELLING TYPE:



ground bound | apartment | mixed

ACCESS:



core | direct access | gallery | mixed | multiple cores | portiek

MULTI-CRITERIA TABLE LEGEND:

TYPES BUFFER ZONES:


front garden


patio


veranda


balcony

ROUTING:


visibility towards shared space (windows)

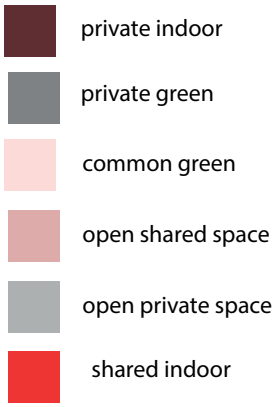

entrance

route to parking

route to shared space

vertical transportation

parking



TYPES AND POSITIONING OUTDOOR SHARED SPACE

TYPES OUTDOOR SPACES:


community garden


(green) rooftop


community courtyard


pedestrian street

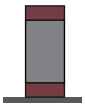

elevated deck

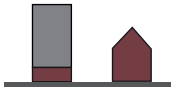

communal terrace

POSITIONING INDOOR SHARED SPACE

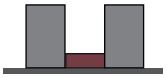

communal house


ground floor

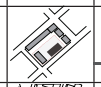

ground floor, rooftop


ground floor and communal house

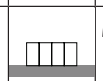
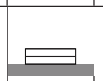
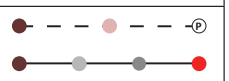
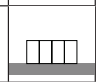
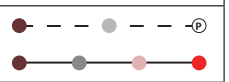
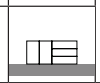
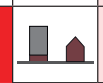
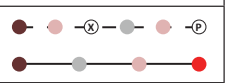
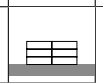
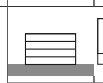
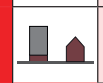
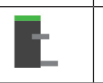
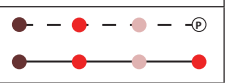

ground floor, dispersed


ground floor, connection

MULTI-CRITERIA TABLE part 1

No.	PROJECT	LAYOUT	LOCATION	LIVING TYPOLOGY	RESIDENTS Compositon	NUMBER RESIDENTS	NUMBER UNITS / SCALE	AREA DENSITY	DWELLING TYPE	BUILDING FOOTPRINT	HEIGHT	ACCESS	BUFFER ZONES				PPRIVATE SPACE						SHARED SPACE									Routing private to parking
																		Indoor					Indoor					Outdoor				
													Front yard	Patio	Veranda	Balcony	Dwelling types and sizes	Bedroom	Bathroom	Living room	Kitchen	Backyard	Functional	Household	Meeting	Open public	Position-ing indoor shared space	Green	Functional	Meeting	Open public	Type outdoor space	
1.	**Quayside Village Cohousing** Vancouver, CA, 1998			cohousing, residential		n/a	M, **19 units**	**D=190 dw/ha** A=0,1000ha			 M (4)						**42-93 m2** townhouses, studios, app's															
2.	**WindSong Cohousing** Langley, UK, 1998			CPC		**N=100**	L, **34 units**	A=2,5 ha **D= 13,6 dw/ ha**			 L (2-3)						**63- 150 m2** three types houses															
3.	**Wohnprojekt Wien** AT, 2013			CPC		**N=100**	XL, **40 units**	A=0,4783 ha **D=83,62 dw/ ha**			 H (7)						**36- 150 m2** standart apartments															
4.	**Kalkbreite** Zurich, SZ, 2014			residential and multi-functional complex		**N=250** dividde in 3 groups	XXL, **97 units** divided in groups	A=0,6 ha **D=161, 66 dw/ha**			 H (7)						**28-212 m2** diverse, studios, apartments															
5.	**Spreefeld** Berlin, DE, 2014			CPC, afford-able residen-tial		N= n/a	XXL **65 units,** dividded in 3 buildings	A=0,7414 ha **D=87, 67 dw/ ha**			H (7)						**54-290 m2** variety studios, clusters & flats															
6.	**New Ground Cohous-ing (OWCH)** UK, 2016			cohousing		**N=25**	M, **25 units**	A=0,3 ha **D=83,33 dw/ ha**			L (2-3)						**54-103 m2** standart apartments															
7.	**Nightingale 1** Brunswick, AU, 2017			residential		**N=75**	M, **20 units**				M (5)						2-3 bedroom standart apartments															
8.	**Marmalade Lane** Cambridge, UK, 2018			residential		N= n/a	XL, **42 units**	A=0,43 ha **D=97,67dw/ ha**			L (2-3)						houses 100-123 m2,50-75 m2 apart-ments															
9.	**Vrijburcht** Amsterdam, NL 2018			CPC, resi-dential and business		**N=150**	XXL, **52 units**	A=0,654 ha **D=80,51 dw/ ha**			M (4)						apartments, studios, mai-sonettes															
10.	**Vindmøllebakken** Stavanger, NO, 2019			CPC		N= n/a	XL, **40 units**	A=0,4950 ha **D=80,80 dw/ ha**			M (4)						40 co-liv-ing units,4 houses, 8 apartments,															

MULTI-CRITERIA TABLE part 2

No.	PROJECT	LAYOUT	LIVING TYPOLOGY	RESIDENTS	LOCATION	NUMBER RESIDENTS	NUMBER UNITS / SCALE	AREA DENSITY	DWELLING TYPE	BUILDING FOOTPRINT	HEIGHT	ACCESS	BUFFER ZONES			SHARED SPACE											Routing private to parking
																Indoor				Outdoor		Indoor					Outdoor					
													Front yard	Patio	Veranda	Bedroom	Bathroom	Living room	Kitchen	Backyard	Terrace	Functional	Household	Meeting	Open public	Positioning indoor shared space	Green	Functional	Meeting	Open public	_Type outdoor space	
11	Vriendenhof, Olst (2017)		CPC				M, 12 4 clusters x 3 dw	A=0,56 ha D=21,4 dw/ha																							
12	Knarrenhof, Zwolle (2018)		CPC				XL, 48 8 blocks x 6 units	A=1,221 ha D=39,31 dw/ha																							
13	Het Eikpunt, Lent (2016)		CPC/ spiritual				XL, 49 ?	A=0,453 ha D=108,17 dw/ha																							
14	Krebsestien, Esbjerg , DK(2017)		Nursing homes				XXL, 100 ?	A=1,2 ha D=83,33 dw/ha																							
15	Sølund urban nursing home, Copenhagen, DK		Nursing homes, apartments				XXXL,530 4 blocks	A=5 ha D=106 dw/ha																							
16	Zeisterwerf, Zeist		Cohousing				M, 22 2 clusters	A=0,4 ha D=55 dw/ha																							
17	Luca II, Antwerpen, BE		Apartments with open communal space				XXXL, 118 7 building units	A=1,96 ha D=60,02 dw/ha																							
18	Het Hallehuis, Amersfoort		WG			45	L, 33 6 groups/ clusters																								
19	Vlieland cohousing (2018 project only)		CPC				XXL, 60																								
20	De hogewyk, Weesp		CPC			140	XXL, 80 23 groups	A=0,94 ha																							
21	Studentcampus, Terschelling (2017)		rooms with shared facilities				208 4 buildings x 52 units	A=1 ha D=208																							
22	Tietgen Domity, Copenhagen, DK		Studenthousing with shared kitchen				300 clusters																								

RESULTS multi-criteria table:

LOCATION / CONTEXT:

rural area **N = 4**

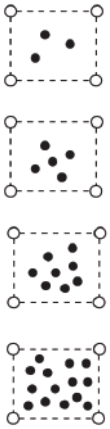
suburban area **N = 10**

urban area **N = 8**

SCALE/ NUMBER DWELLING UNITS:

M = (16 - 25 dw units)	**N = 5**
L = (26 - 35 dw units)	**N = 2**
XL = (36 - 49 dw units)	**N = 5**
XXL = (50 - 100 dw units)	**N = 6**
XXXL (> 100 dw units)	**N = 4**

DENSITY:



< 50 dw/ha **N = 3**

50 - 100 dw/ha **N = 9**

101 - 150 dw/ha **N = 2**

> 150 dw/ha **N = 3**

(Note: 3 cases - no data)

HEIGHT BUILDING:

1-2 floors	3-4 floors	5+ floors
low	medium	high
N = 9	**N = 7**	**N = 6**

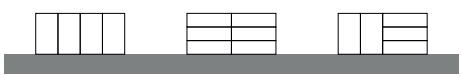
RESIDENTS / TARGET GROUP:

multigenerational **N = 13**

seniors **N = 7**

students **N = 2**

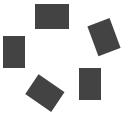
DWELLING TYPE:



ground bound	apartment	mixed
N = 5	**N = 12**	**N = 5**

RESULTS multi-criteria table:

BUILDING CONFIGURATION:



clustered detached

N = 5

clustered, directional enclosed

N = 1 (combination)

clustered, asymetric implied

N = 1

paralell, directional implied

N = 3

open building block,

N = 3

closed building block maximally enclosed

N = 5

compact mono-block

N = 5

TYPES BUFFER ZONES:

front yard

N = 6

patio

N = 4

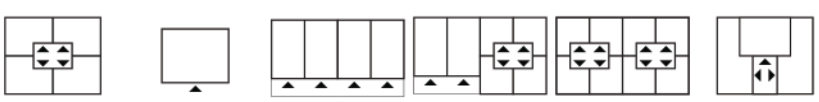
veranda

N = 2

balcony

N = 15

ACCESS:

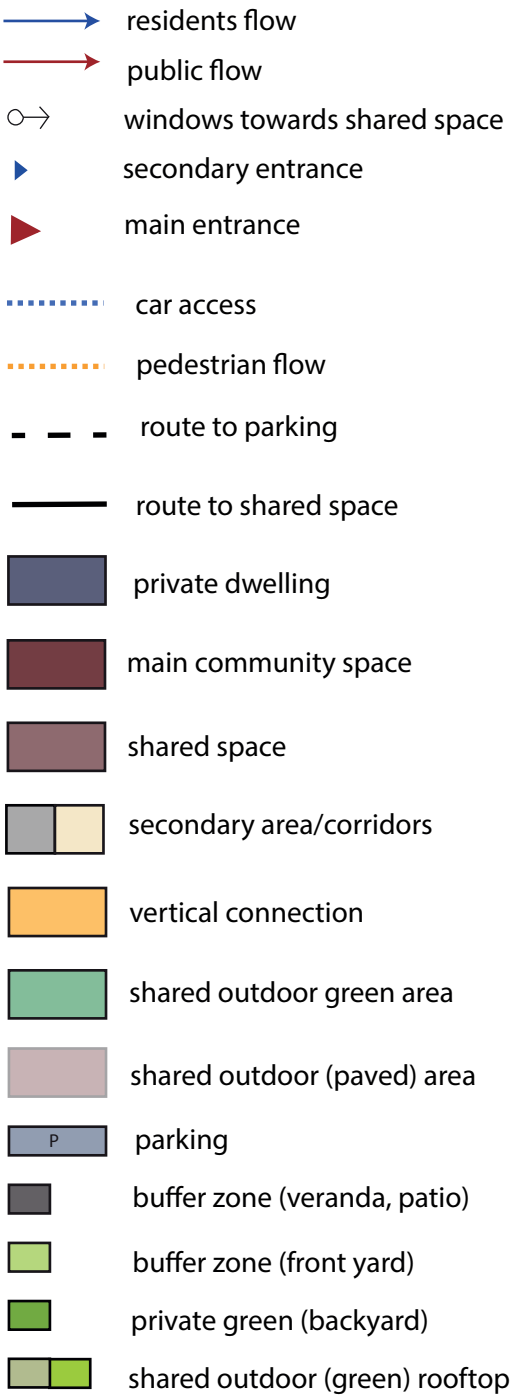


core | direct access | gallery | mixed | multiple cores | portiek

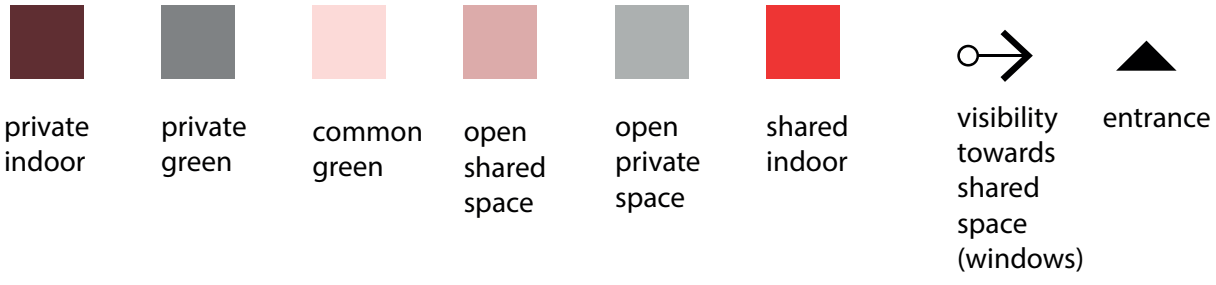
N = 2 | **N = 5** | **N = 3** | **N = 8** | **N = 2** | **N = 2**

LEGEND:

PART 1:

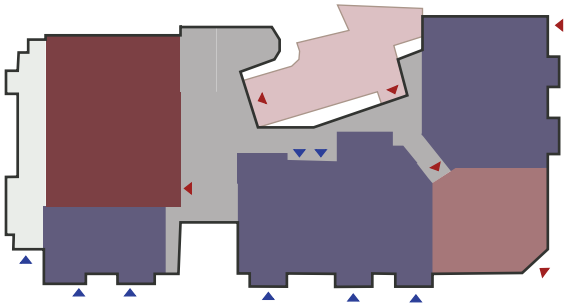


PART 2:

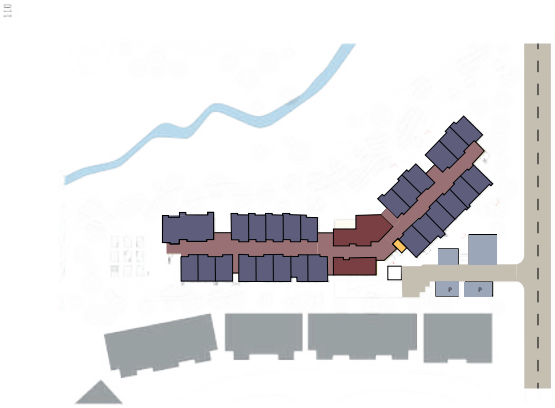


PRIVATE-SHARED OVERVIEW

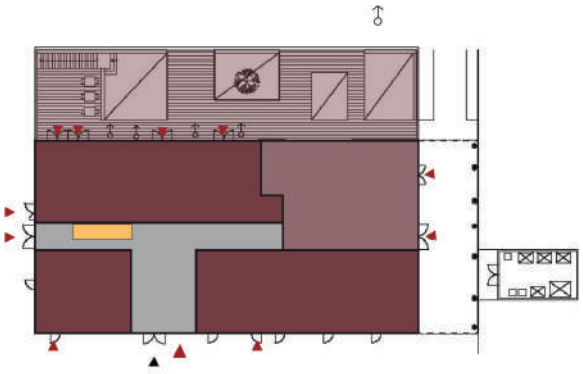
1. Quayside Village Cohousing, CA

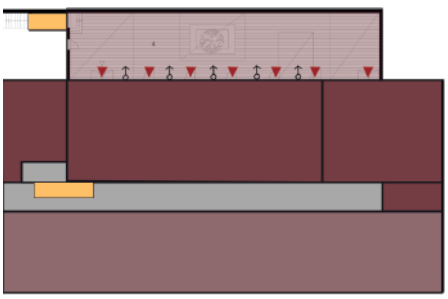


2. WindSong Cohousing, UK

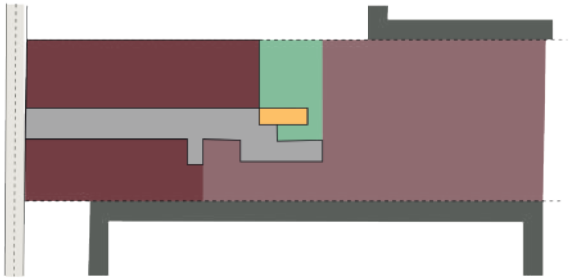


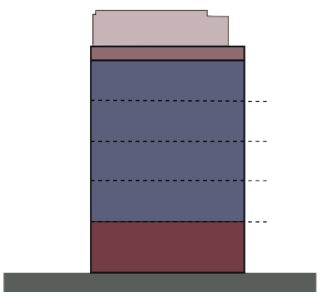
3.Wohnprojekt Wien , AT



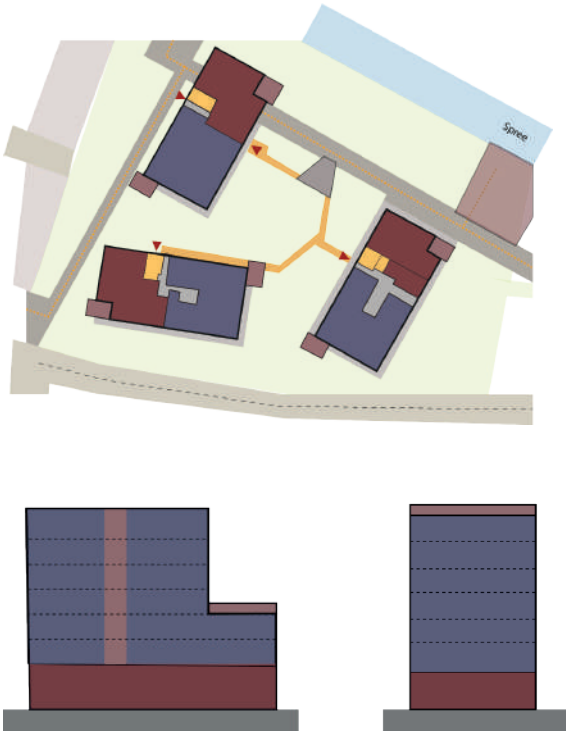


4. Nightingale 1 , AU

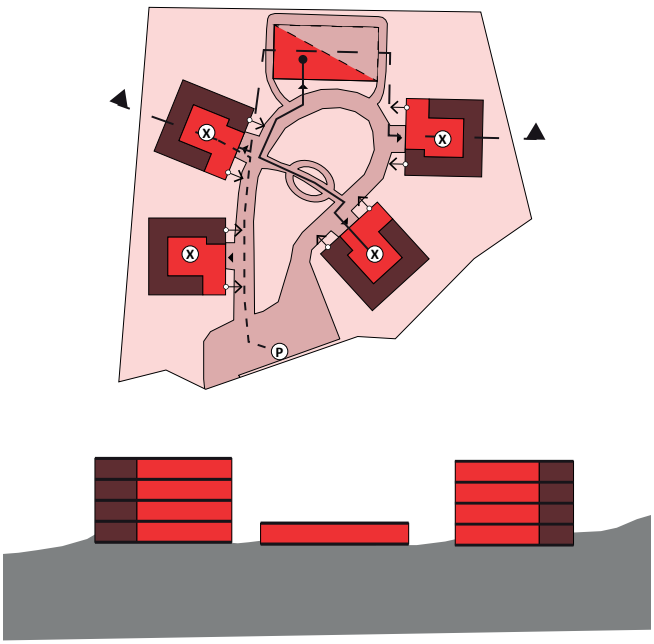




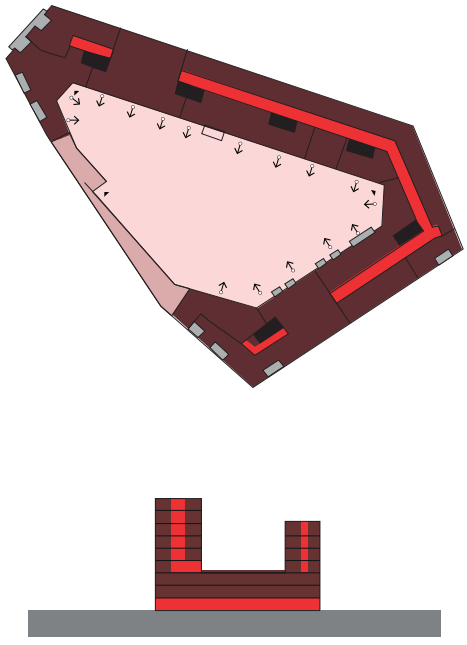
5. Spreefeld, DE



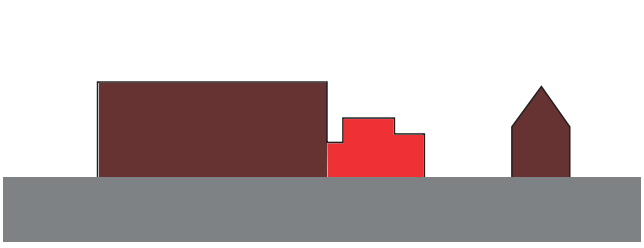
6. New Ground Cohousing, UK



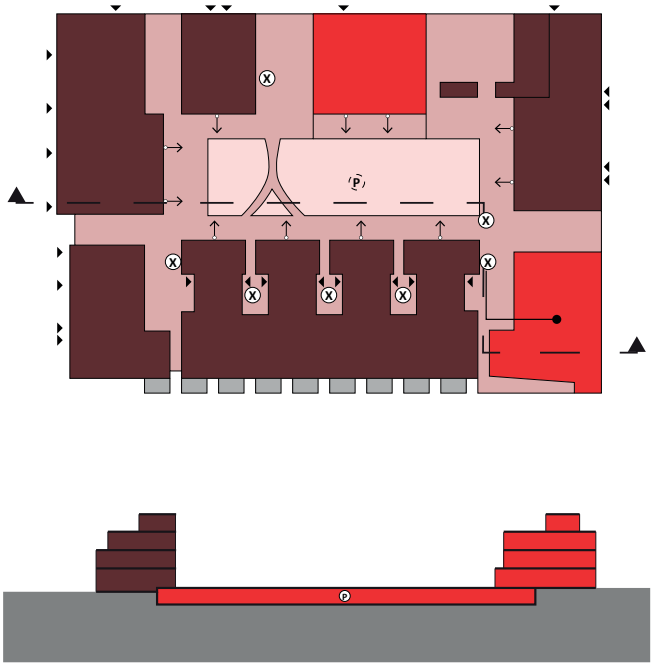
7. Kalkbreite, Zurich, CH



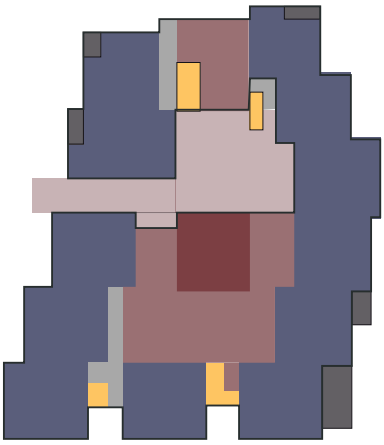
8. Marmalade lane, Cambridge, UK



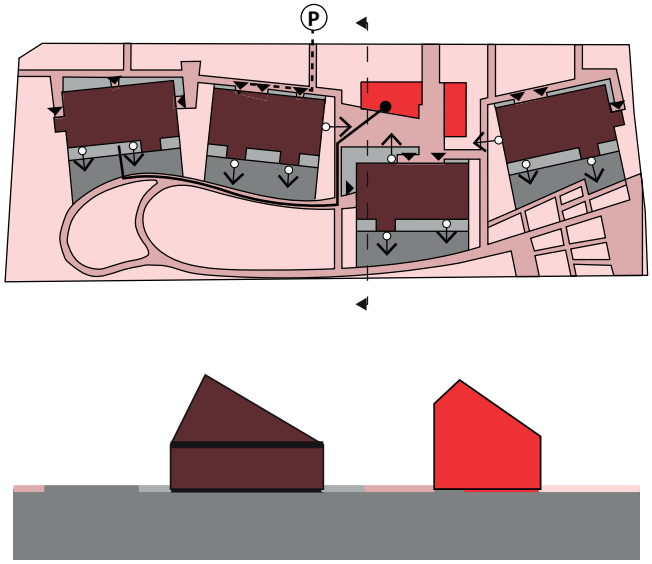
9. Vrijburcht, Amsterdam



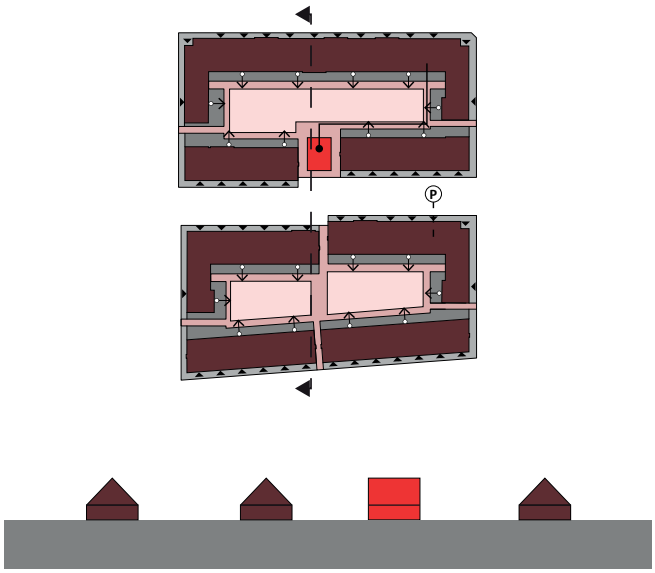
10. Vindmøllebakken, NO



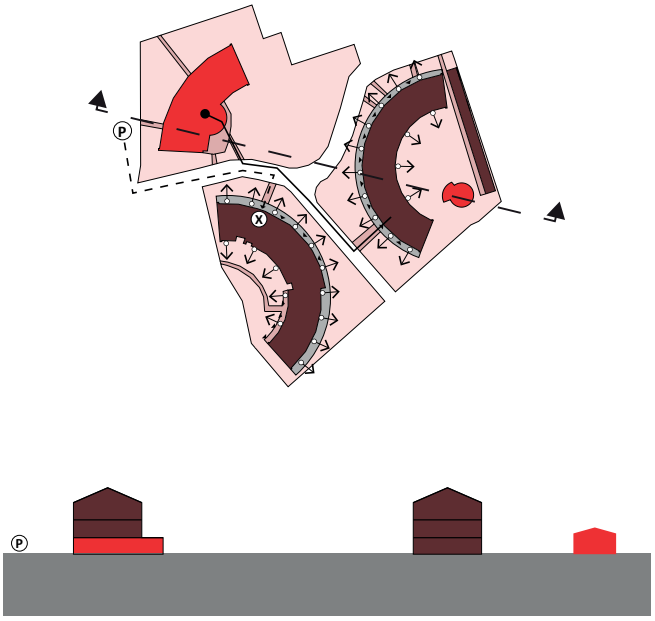
11. Vriendenhof, Olst



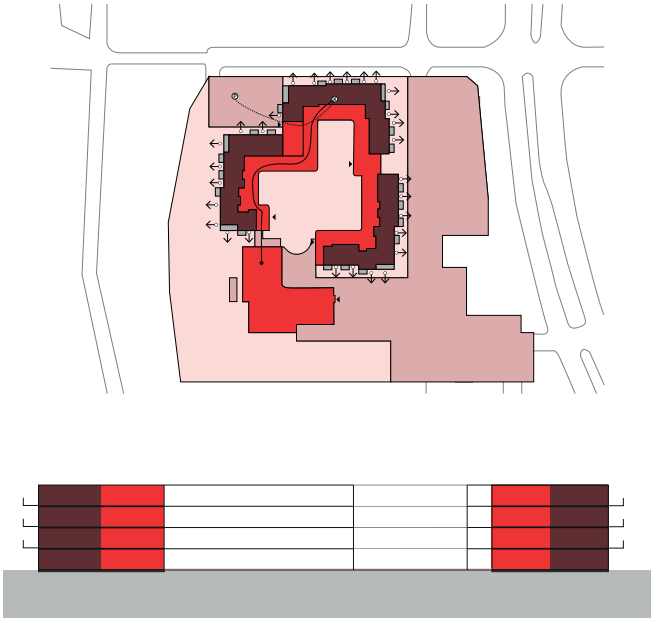
12. Knarrenhof, Zwolle



13. Het Eikpunt, Lent

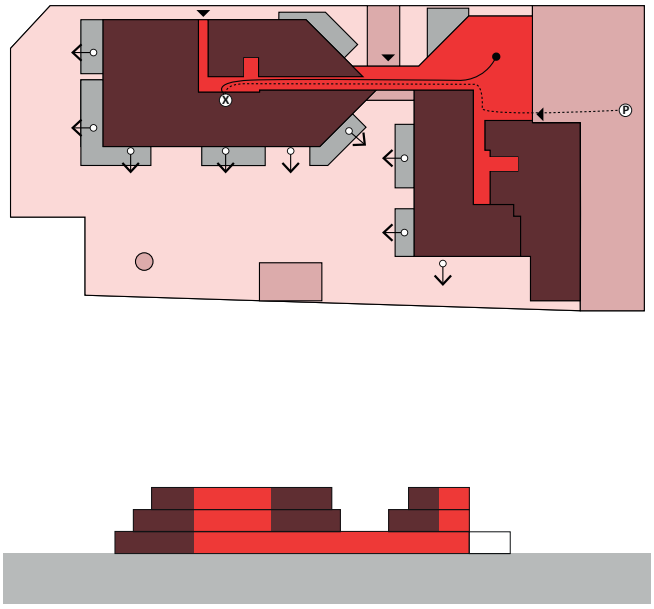


14. Krebsestien, Esbjerk, DK

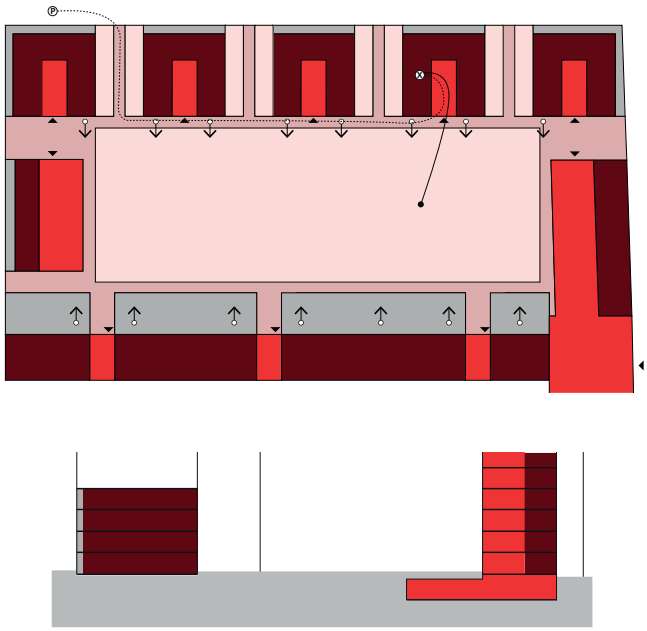


15. Sølund urban nursing home, Copenhagen, DK

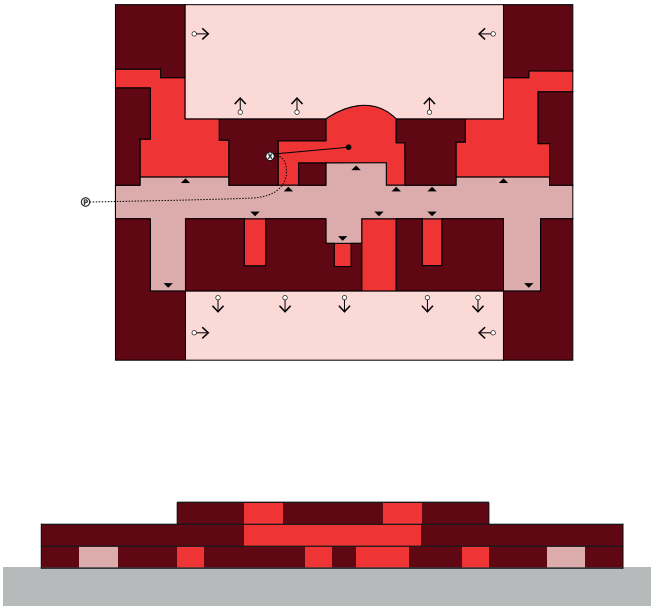
16. Zeisterwerf, Zeist



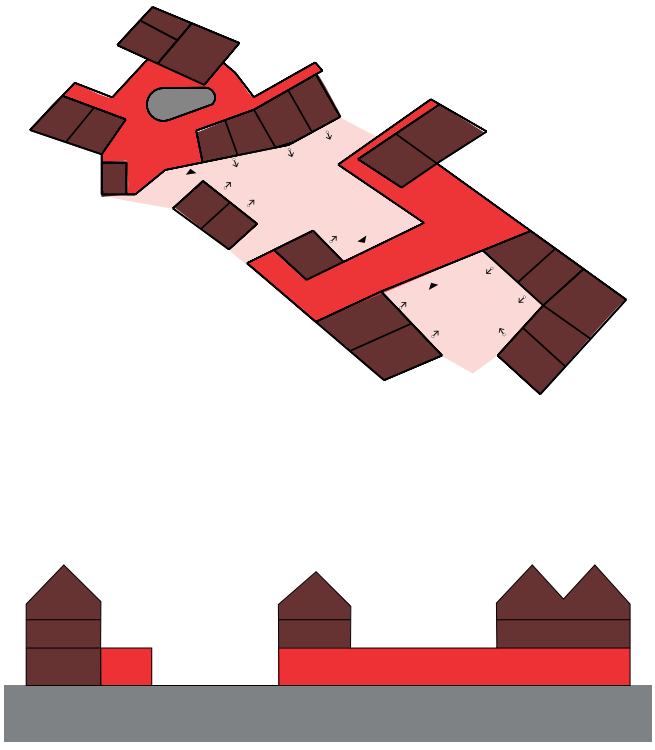
17. Luca CC, Antwerp, BE



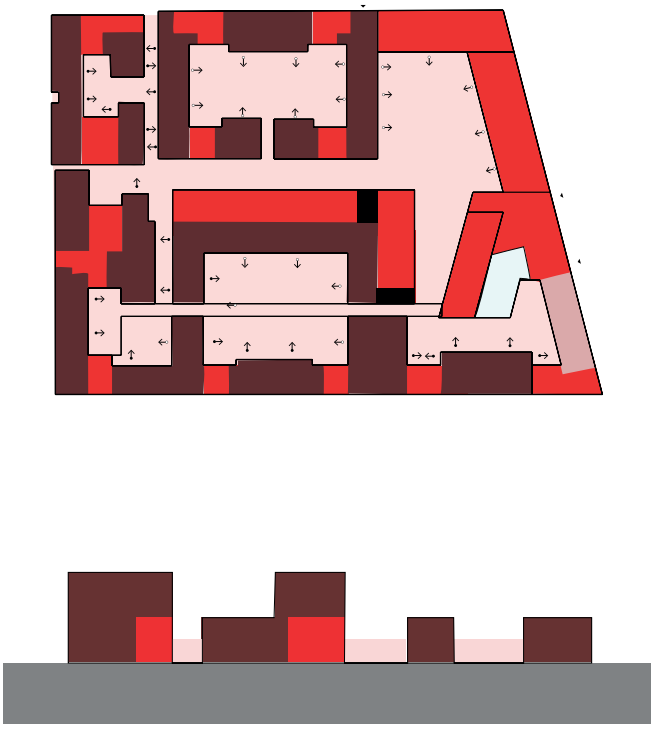
18. Het Hallehuis, Amersfoort



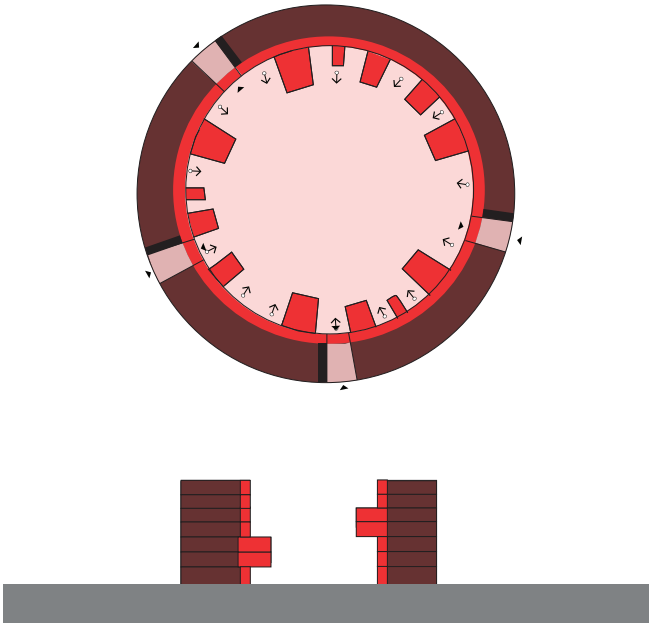
19. Vlieland cohousing, Vlieland



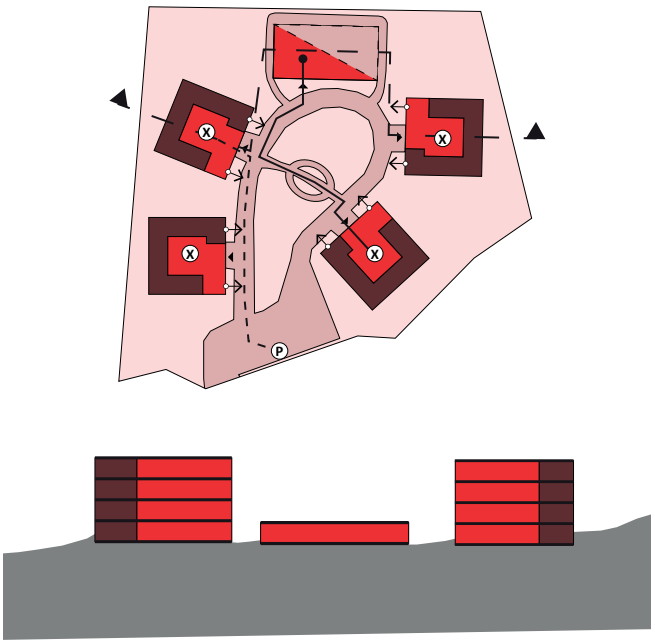
20. De Hogewyk, Weesp



21. Tietgen Dormitory, Copenhagen, DK



22. Student campus, Terschelling



OVERVIEW PER CASE

1. QUAYSIDE VILLAGE , Vancouver, CA

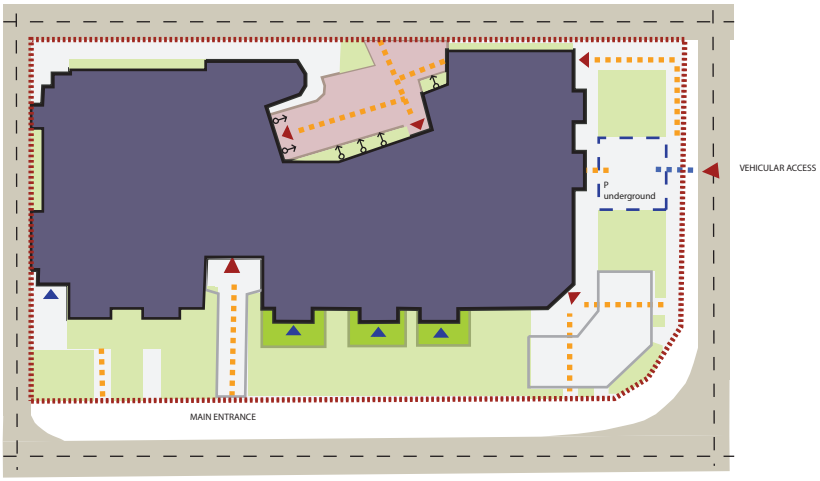


fig. 1 Scheme layout

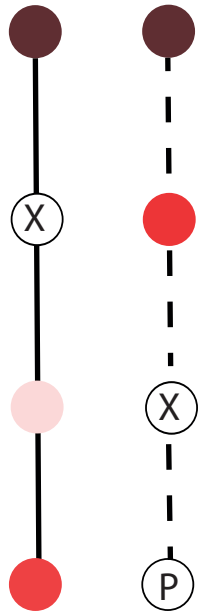


fig. 2 Routing

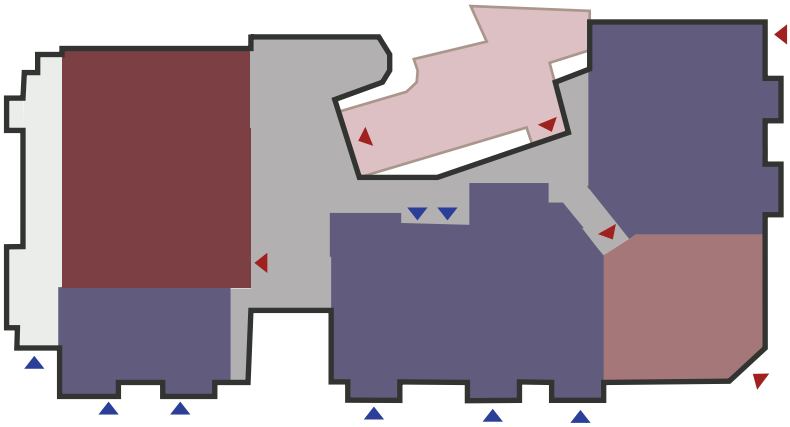


fig. 3 Scheme private-public, groundfloor plan

fig. 4 View to couryard

fig. 5 View to coutyard

fig. 6 General view

2. WINDSONG COHOUSING, UK

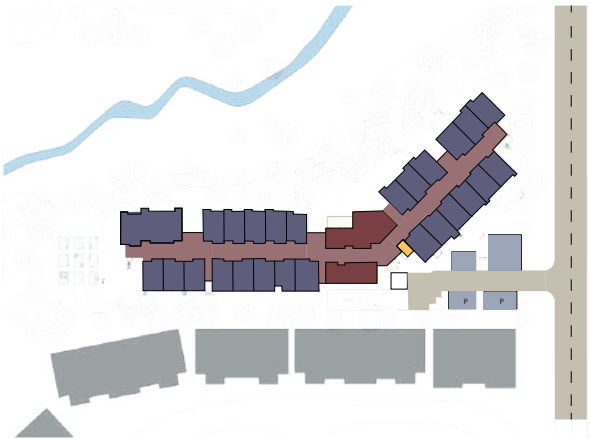


fig. 7 Scheme private-public, groundfloor plan

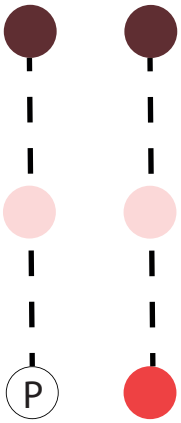


fig. 8 Routing

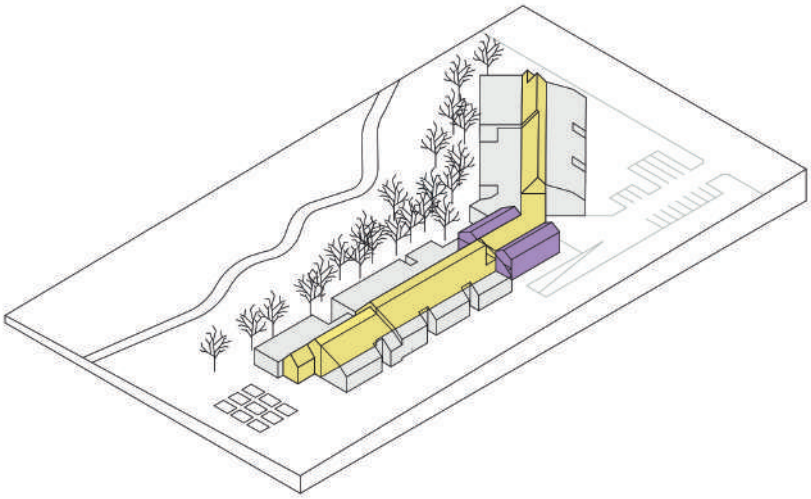


fig. 9 3D impression

fig. 10 General view

3. WOONPROJEKT, Wien, AT

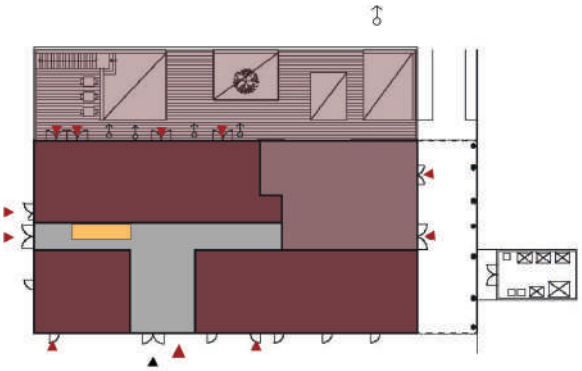


fig. 11 Scheme private-public, basement

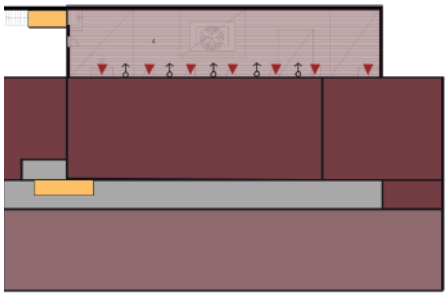


fig. 12 Scheme private-public, groundfloor plan

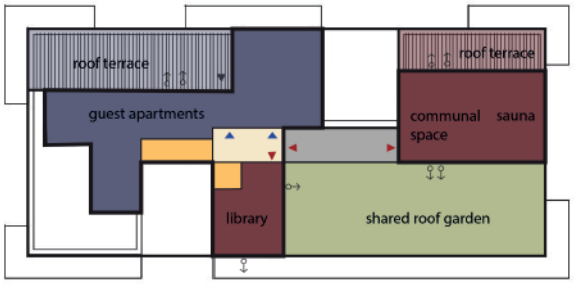


fig. 13 Scheme private-public, rooftop

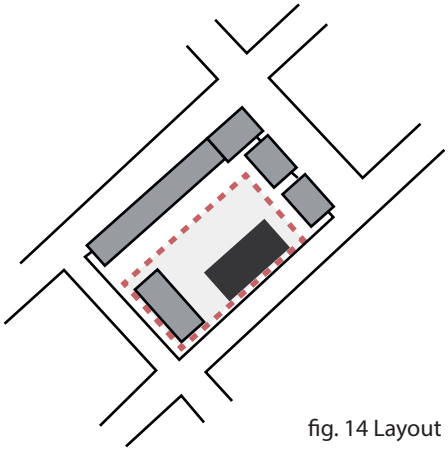


fig. 14 Layout

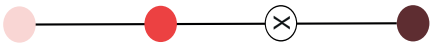


fig. 15 Routing

fig. 16 General view

fig. 17 Outdoor shared space

fig. 18 Indoor shared space

fig. 19 Flexible spaces, interior

4. KALKBREITE, Zurich, SZ

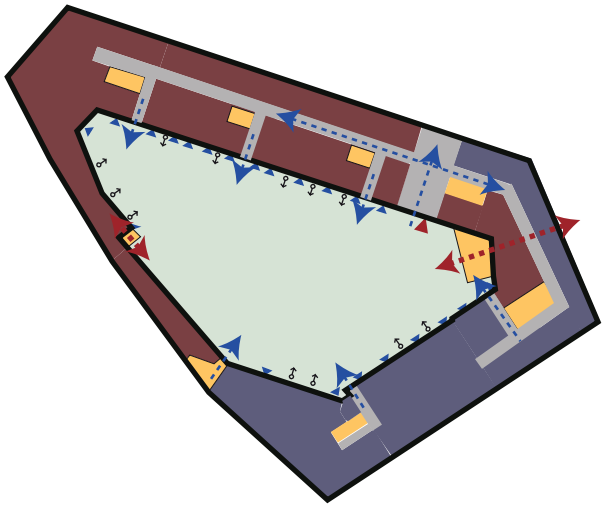


fig. 20 Scheme private-public, groundfloor plan

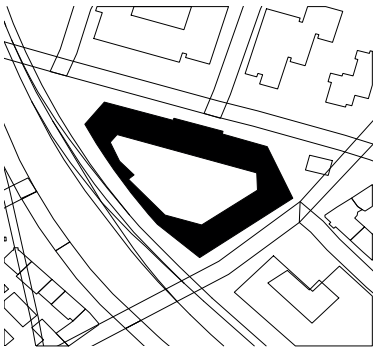


fig. 22 Layout

fig. 23 Routing

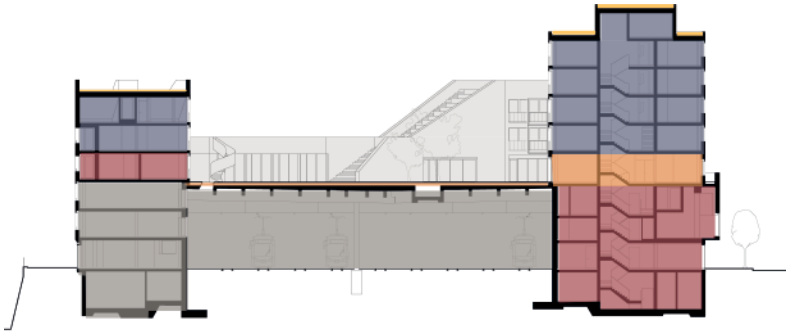


fig. 21 Scheme private-public, section

fig. 24 General view

fig. 25 View entrance hall

fig. 26 View main stair

5. SPREEFELD, Berlin, DE

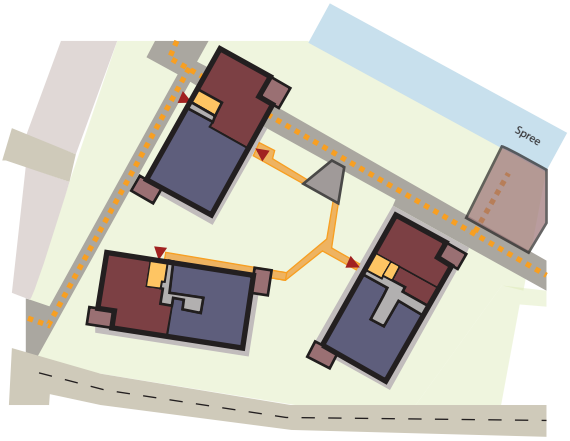


fig. 27 Scheme private-public, groundfloor plan

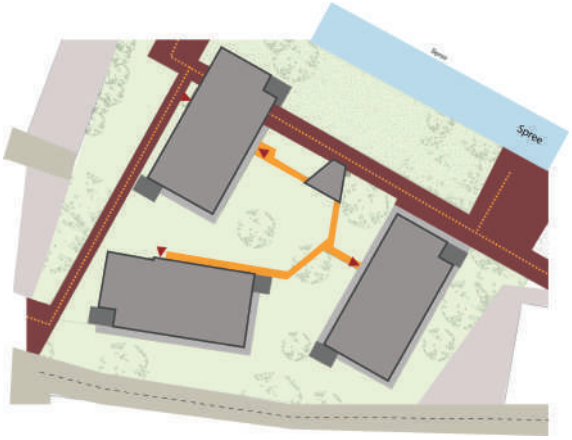


fig. 28 Layout

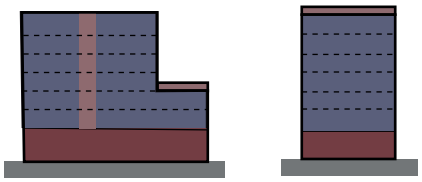


fig. 29 Scheme private-public, sections

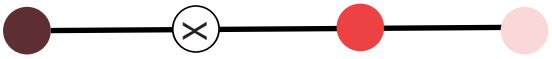


fig. 30 Routing

fig. 31 View from the terrace

fig. 32 Communal garden

fig. 33 Community living room

fig. 34 Community cafe

6. NEW GROUND COHOUSING (OWCH), UK

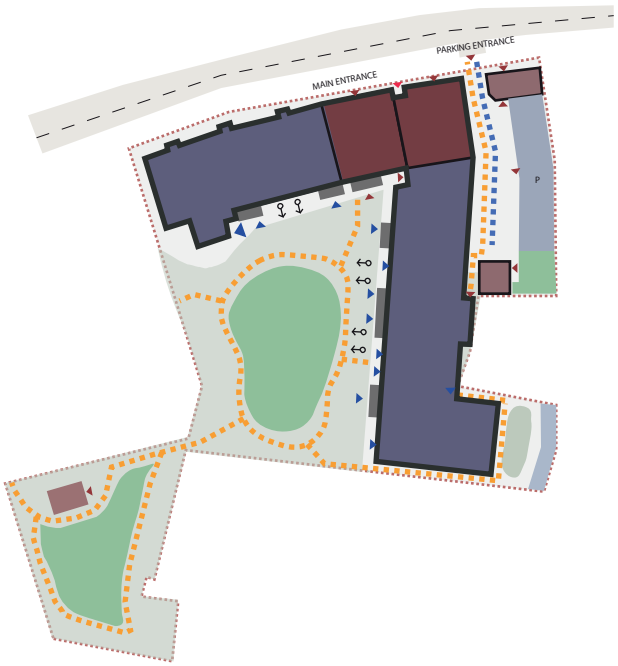


fig. 35 Scheme private-public, groundfloor plan

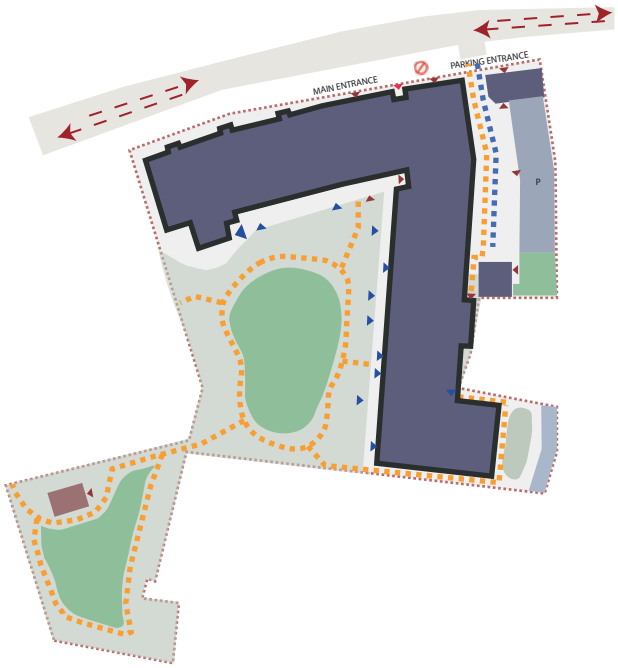


fig. 36 Layout

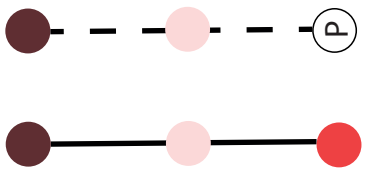


fig. 37 Routing

fig. 38 General view

fig. 39 Facade

7. NIGHTINGALE 1, AU

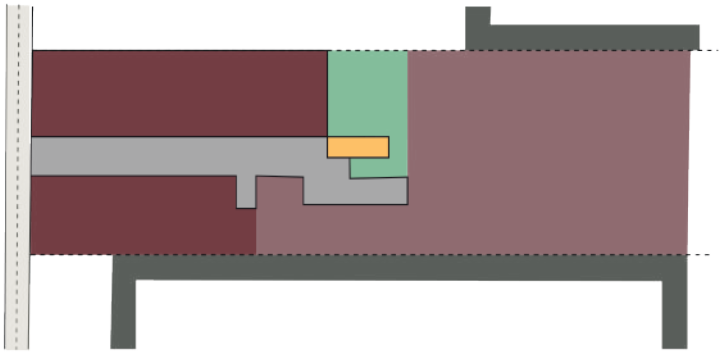


fig. 40 Scheme private-public, groundfloor plan

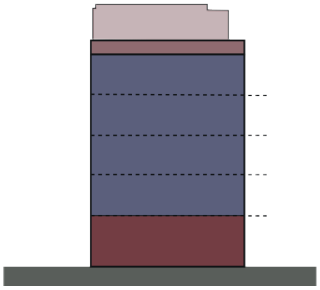


fig. 41 Scheme private-public, section

fig. 42 Routing

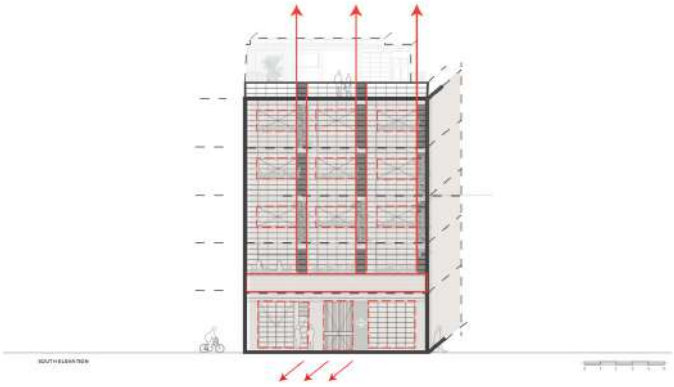


fig. 43 Scheme facade

fig. 44 General view

fig. 45 Interior

8. MARMALADE LANE, UK

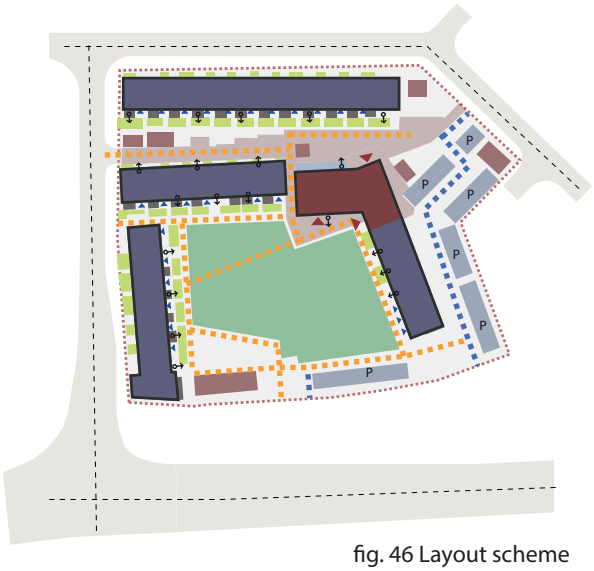


fig. 46 Layout scheme

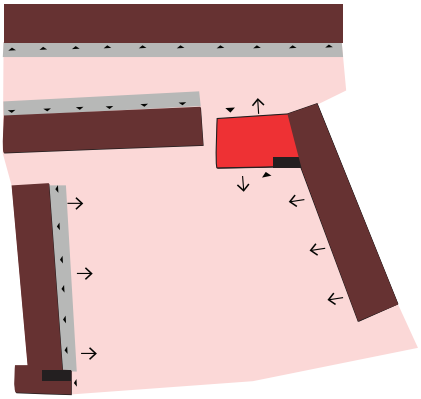


fig. 47 Scheme private-public, groundfloor plan

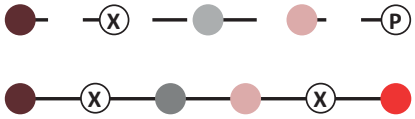


fig. 48 Routing

fig. 49 Scheme private-public, section

fig. 50 General view

fig. 52 Communal space, interior

fig. 51 View to the pedestrian street

fig. 53 Common green

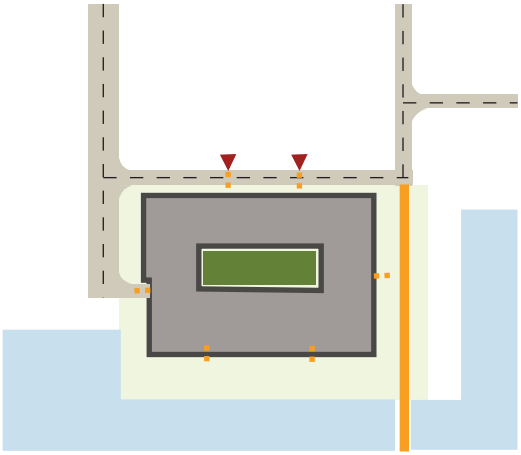


fig. 54 Layout scheme

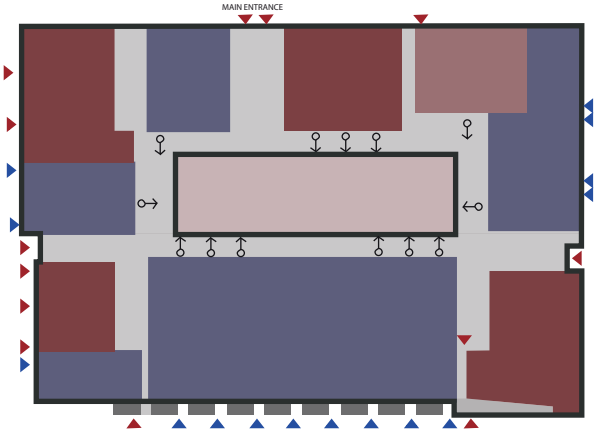


fig. 55 Scheme private-public, groundfloor plan

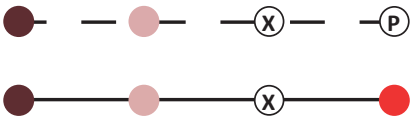


fig. 56 Routing

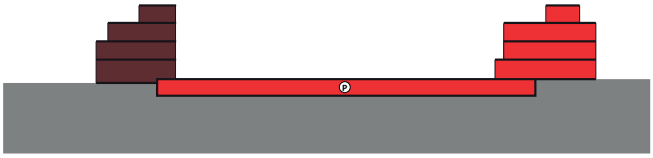


fig. 57 Scheme private-public, section

fig. 58 General view

fig. 59 Elevated deck

fig. 60 Courtyard

fig. 61 Communal cafe

10. VINDMOLLEBAKKEN, NO

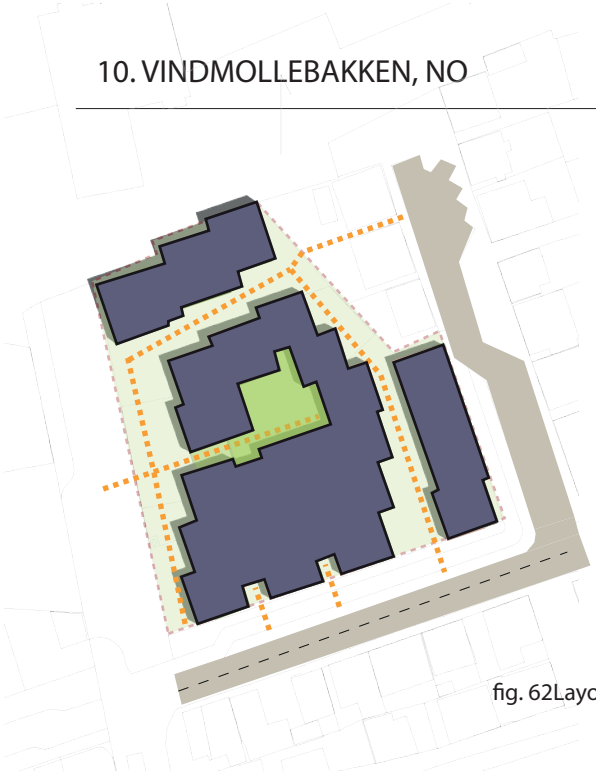


fig. 62Layout scheme

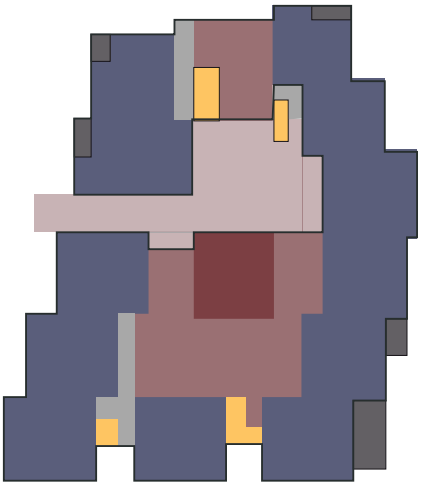


fig. 63 Scheme private-public, groundfloor plan

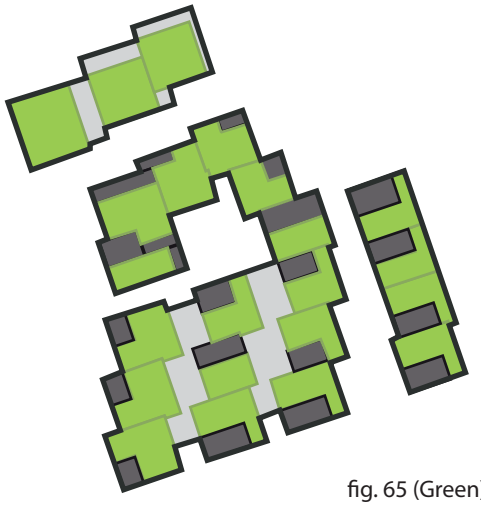


fig. 65 (Green) rooftop scheme

fig. 64 Routing

fig. 66 General view, main entrance

fig. 67 Interior main hall

fig. 68 General view, rooftop

fig. 69 Interior

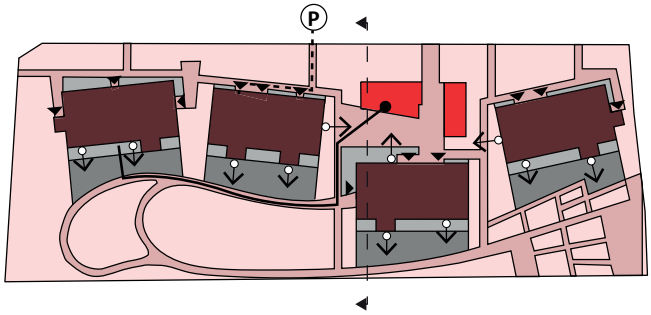


fig. 70 Scheme private-public, groundfloor plan

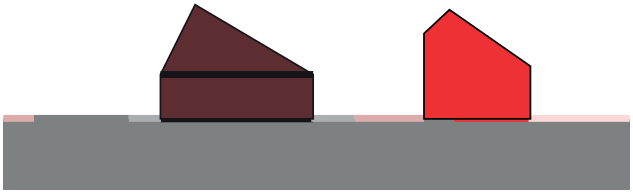


fig. 71 Scheme private-public, section

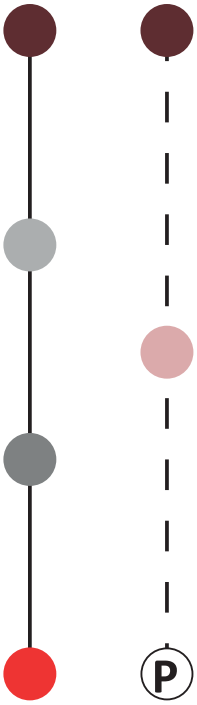


fig. 72 Routing

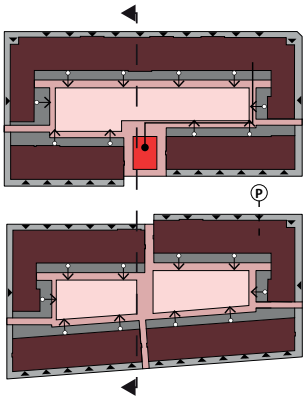


fig. 73 Scheme private-public, groundfloor plan

fig. 74 Scheme private-public, section

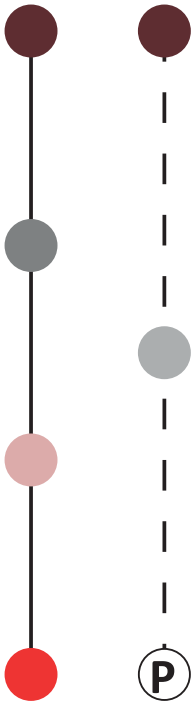


fig. 75 Routing

13. HET EIKPUNT, Lent, NL

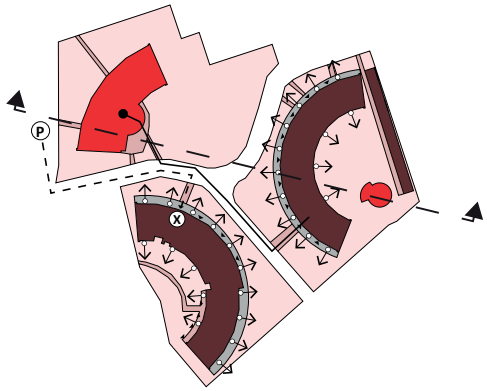


fig. 76 Scheme private-public, groundfloor plan

fig. 77 Scheme private-public, section

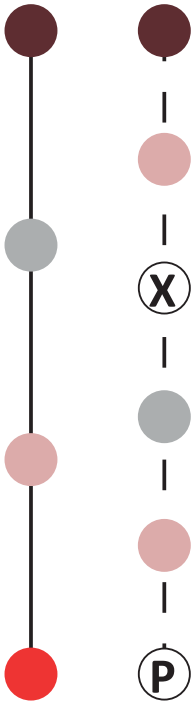


fig. 78 Routing

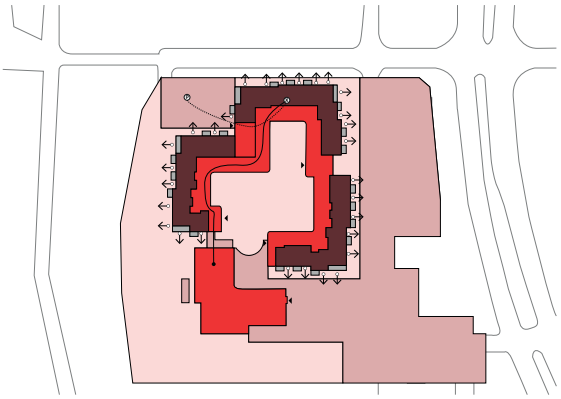


fig. 79 Scheme private-public, groundfloor plan

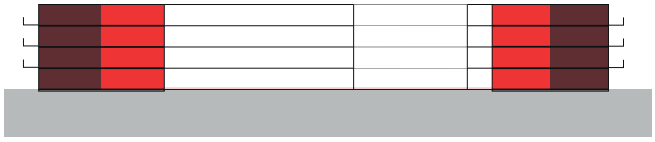


fig. 80 Scheme private-public, section

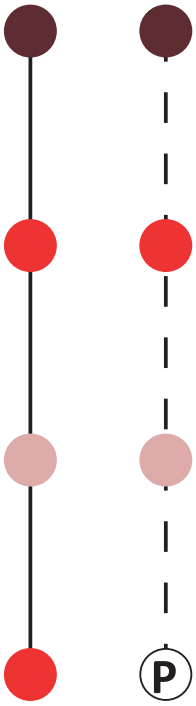


fig. 81 Routing

15. SOLUND NURSING HOME, Copenhagen, DK

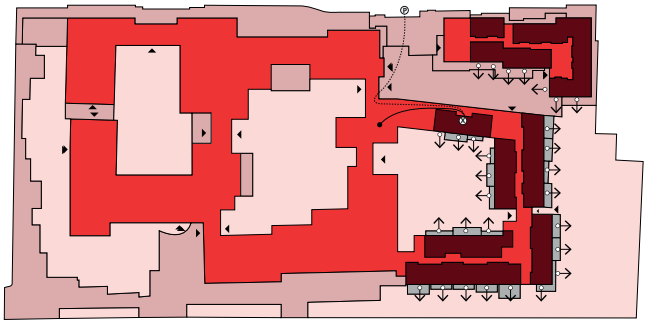


fig. 82 Scheme private-public, groundfloor plan

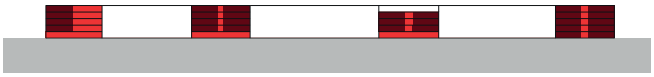


fig. 83 Scheme private-public, section

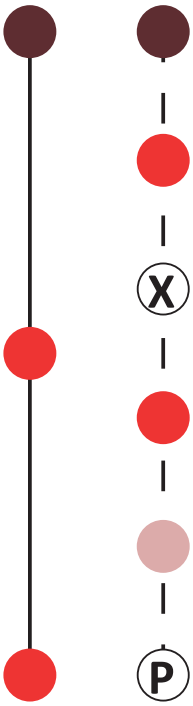
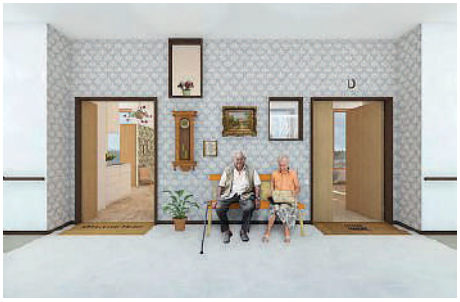


fig. 84 Routing



16. ZEISTERWERF, Zeist

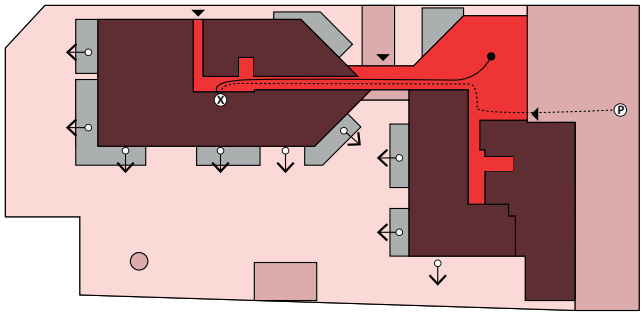


fig. 85 Scheme private-public, groundfloor plan

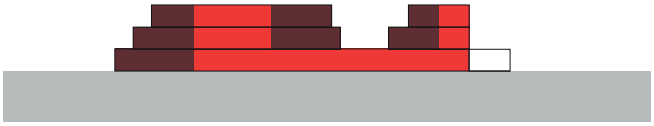


fig. 86 Scheme private-public, section

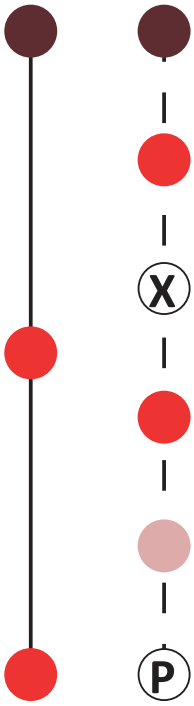


fig. 87 Routing

17. LUCA II, Antwerpen, BE

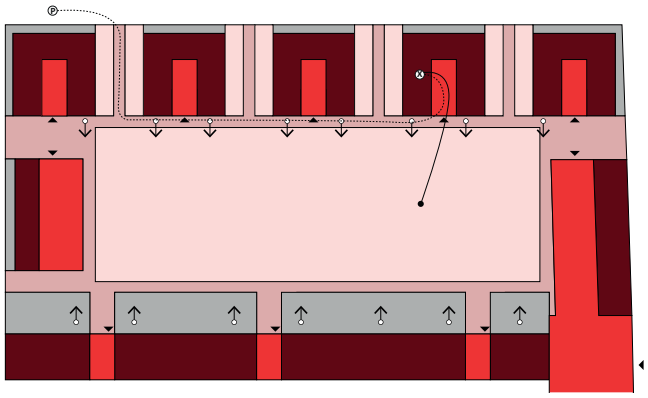


fig. 88 Scheme private-public, groundfloor plan

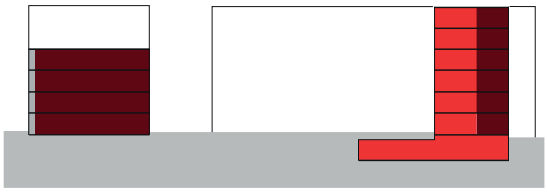


fig. 89 Scheme private-public, section

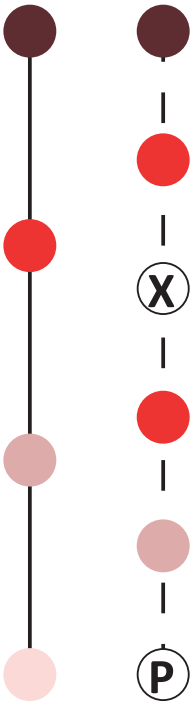


fig. 90 Routing

18. HET HALLENHUIS, Amersfoort

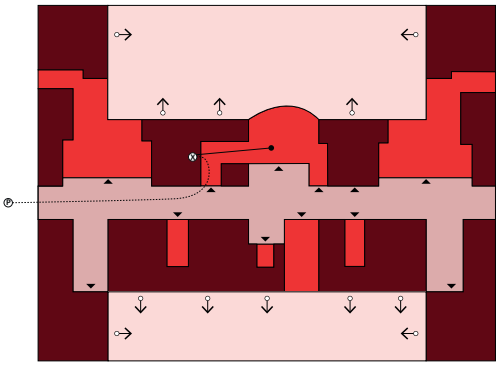


fig. 91 Scheme private-public, groundfloor plan

fig. 92 Scheme private-public, section

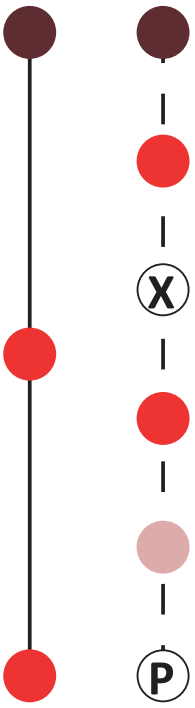


fig. 93 Routing

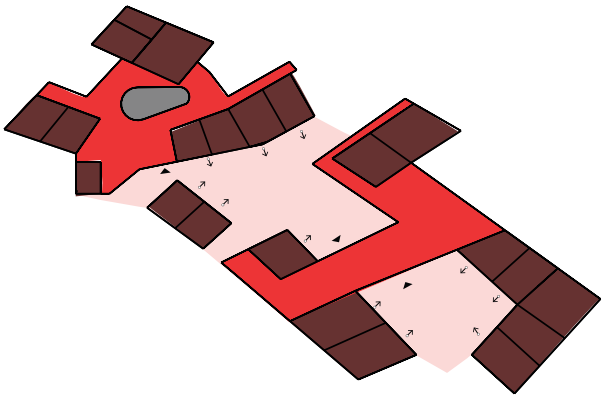


fig. 94 Scheme private-public, groundfloor plan

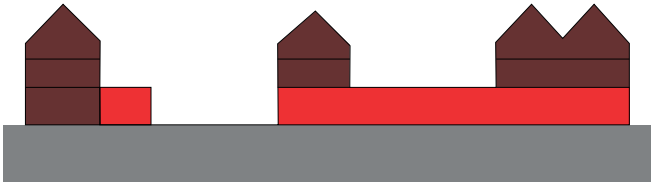


fig. 95 Scheme private-public, section

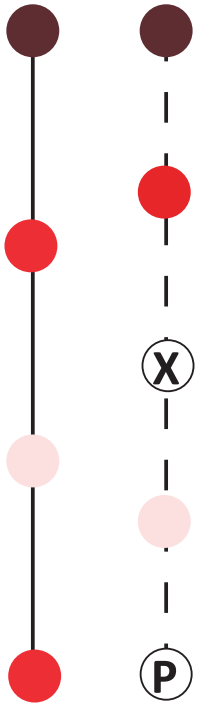


fig. 96 Routing

20. DE HOGEWYK, Weesp, NL

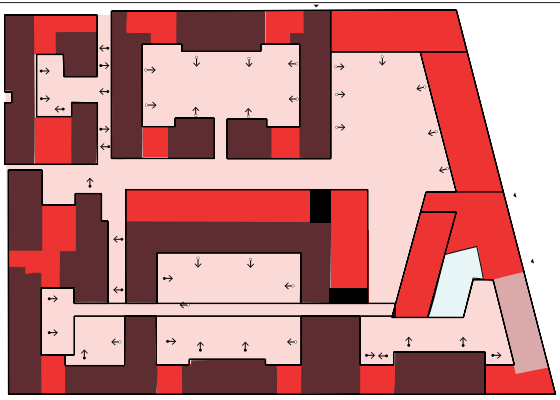


fig. 97 Scheme private-public, groundfloor plan

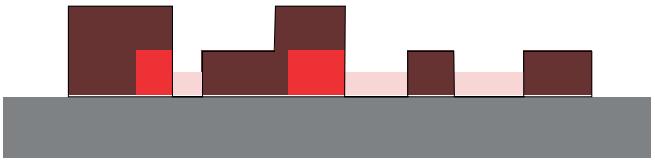


fig. 98 Scheme private-public, section

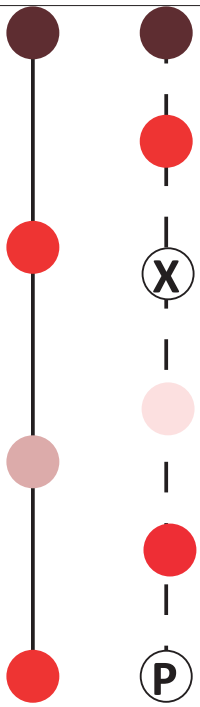
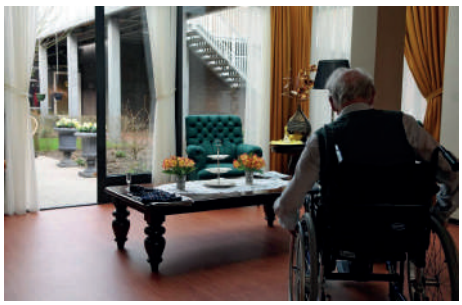


fig. 99 Routing



21. STUDENTENCAMPUS TERSCHELLING, NL

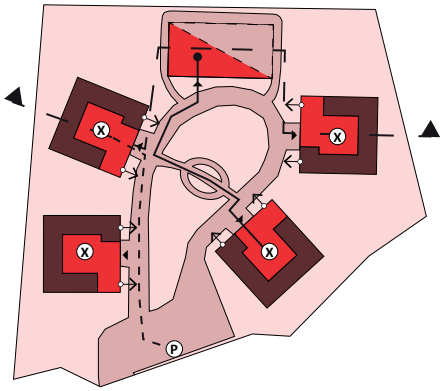


fig. 100 Scheme private-public, groundfloor plan

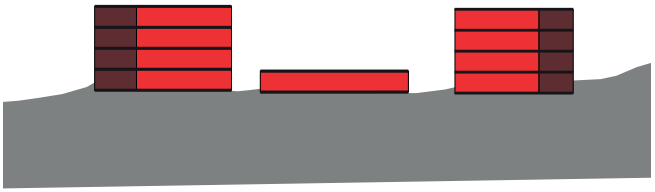


fig. 101 Scheme private-public, section

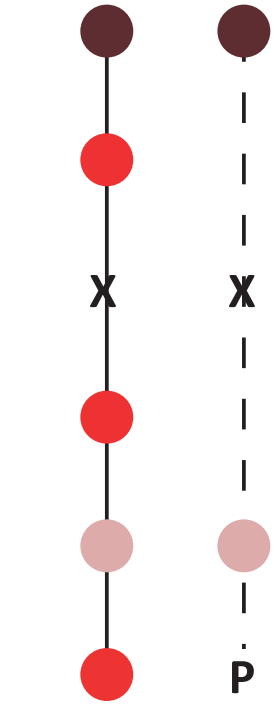


fig. 102 Routing

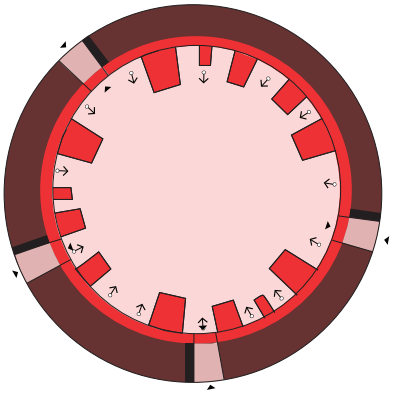


fig. 103 Scheme private-public, groundfloor plan

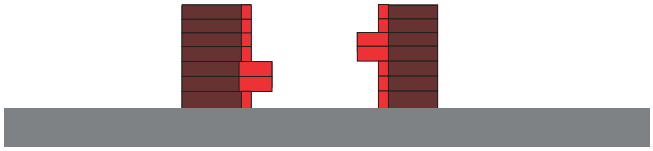


fig. 104 Scheme private-public, section

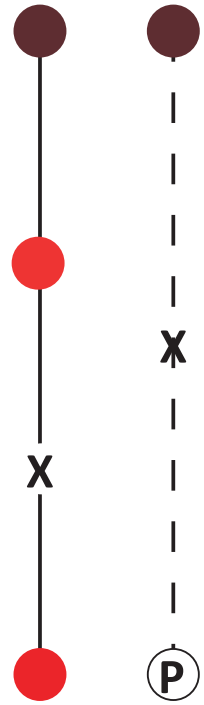


fig. 105 Routing

LIST OF IMAGES:

Fig. 24: *General view*. (2021, October 20). [Photograph]. Retrieved from https://www.dearchitect.nl/architectuur/blog/2019/02/blog-gemeenschappelijk-wonen-kalkbreite-zurich-door-muller-sigrist-architekten-101206237

Fig. 25: *Entrance Hall*. (2021, October 20). [Photograph]. Retrieved from https://www.dearchitect.nl/architectuur/blog/2019/02/blog-gemeenschappelijk-wonen-kalkbreite-zurich-door-muller-sigrist-architekten-101206237

Fig. 26: *Intern stair*. (2021, October 20). [Photograph]. Retrieved from https://www.dearchitect.nl/architectuur/blog/2019/02/blog-gemeenschappelijk-wonen-kalkbreite-zurich-door-muller-sigrist-architekten-101206237

Fig. 31: Zscharnt, U. (2021, October 20). *View from the terrace* [Photograph]. Retrieved from https://www.archdaily.com/587590/coop-housing-project-at-the-river-spreefeld-carpaneto-architekten-fatkoehl-architekten-bararchitekten

Fig. 32: Zscharnt, U. (2021, October 20). *Communal garden* [Photograph]. Retrieved from https://www.archdaily.com/587590/coop-housing-project-at-the-river-spreefeld-carpaneto-architekten-fatkoehl-architekten-bararchitekten

Fig. 33: *Community living room*. (2021, October 20). [Photograph]. Retrieved from https://righttobuildtoolkit.org.uk/case-studies/spreefeld-genossenschaft-berlin/#

Fig. 34: *Community cafe*. (2021, October 20). [Photograph]. Retrieved from https://righttobuildtoolkit.org.uk/case-studies/spreefeld-genossenschaft-berlin/#

Fig. 38: *General view*. (2021b, October 20). [Photograph]. Retrieved from https://www.dezeen.com/2016/12/09/pollard-thomas-edwards-architecture-first-older-co-housing-scheme-owch-uk/

Fig. 39: *Terrace*. (2021b, October 20). [Photograph]. Retrieved from https://www.dezeen.com/2016/12/09/pollard-thomas-edwards-architecture-first-older-co-housing-scheme-owch-uk/

Fig. 44: *General view*. (2021c, October 20). [Photograph]. Retrieved from https://www.archdaily.com/912227/nightingale-1-breathe-architecture

Fig. 45: *Interior*. (2021c, October 20). [Photograph]. Retrieved from https://www.archdaily.com/912227/nightingale-1-breathe-architecture

Fig. 50: Butler, D. (2021, October 20). *General view* [Photograph]. Retrieved from https://www.archdaily.com/918201/marmalade-lane-cohousing-development-mole-architects

Fig. 51: Butler, D. (2021, October 20). *View to the pedestrian street* [Photograph]. Retrieved from https://www.archdaily.com/918201/marmalade-lane-cohousing-development-mole-architects

Fig. 52: Butler, D. (2021, October 20). *Communal space, interior* [Photograph]. Retrieved from https://www.archdaily.com/918201/marmalade-lane-cohousing-development-mole-architects

Fig. 53: Butler, D. (2021, October 20). *Common green* [Photograph]. Retrieved from https://www.archdaily.com/918201/marmalade-lane-cohousing-development-mole-architects

Fig. 58: *General view*. (2021d, October 20). [Photograph]. Retrieved from https://www.architectuur.nl/project/de-vrijburcht-amsterdam-ijburg/

Fig. 59: *Elevated deck*. (2021d, October 20). [Photograph]. Retrieved from https://www.architectuur.nl/project/de-vrijburcht-amsterdam-ijburg/

Fig. 60: *Courtyard*. (2021d, October 20). [Photograph]. Retrieved from https://www.architectuur.nl/project/de-vrijburcht-amsterdam-ijburg/

Fig. 61: *Communal Cafe*. (2021d, October 20). [Photograph]. Retrieved from https://www.architectuur.nl/project/de-vrijburcht-amsterdam-ijburg/

Fig. 66: *General view, main entrance*. (2021, October 20). [Photograph]. Retrieved from https://helenhard.no/work/vindmollebakken/

Fig. 67: *Main hall*. (2021, October 20). [Photograph]. Retrieved from https://www.archdaily.com/955333/nordic-pavilion-to-be-transformed-into-an-experimental-co-housing-project-for-the-2021-venice-biennale

Fig. 68: *General view, rooftop*. (2021, October 20). [Photograph]. Retrieved from https://helenhard.no/work/vindmollebakken/

Fig. 69: *Interior*. (2021, October 20). [Photograph]. Retrieved from https://www.archdaily.com/955333/nordic-pavilion-to-be-transformed-into-an-experimental-co-housing-project-for-the-2021-venice-biennale

Note: Selected external (visual) data, related to the study has been used and merged into the document to execute the current research. The data (graphic schemes and pictorial examples) has been proposed by students from the Built Environment faculty from the Technical University Eindhoven (TU/e), who took place in a Graduation studio course, academic year 2020/2021. The data has been used with the knowledge and permission of the involved students, their university supervisor(s) and members of the Graduation Committee: Prof. dr. ir.Masi Mohammadi, dr. ir.Olivia Guerra Santin, ir.Maarten Willems, ir.Leonie van Buuren.

Images related to cases 11 till 22 have no indicated reference source, therefore they are not listed in section 5 (References / List of images).

APPENDIX

LIVING LAB

OBSERVATION LISTS:

OBSERVATION LIST LAYOUT / OUTDOOR COMMON SPACE (COMMON GARDEN):

No	FACTOR	SOURCE	OBSERVATION ELEMENTS	EXPLANATION	OUTCOME
1.	**Location and neighbourhood context**		Location context, major facilities nearby		Urban context, complex good related to the city. Diverse facilities available nearby, like medical center, OV bus stop, supermarket, shops, pharmacy, dentist and neighborhood center within 1000m distance.
2.	**Layout access**			Main entrance to the plot / complex	Not accessible to public
3.	**Shared pathways and routing**	(Gehl, n.d.), (Fromm, 2000a), (Abu-Ghazzeh, 1999), (Kathryn & Charles, 2011)	Positioning parking Routing from private to parking / shared space(s)	Major routes and alleys, number, complexity, directions	Parking positioned in the building, underground. Direct access to the private dwellings. Apart entrances for the different building parts. No / limited shared pathways.
4.	**Outdoor shared spaces:**	(Fromm, 2000a), (Kathryn &	Type, Positioning	Positioning of the outdoor space within the complex, is it central	Shared garden, centrally positioned

		Charles, 2011)			
5.		(Fromm, 2000a), (Abu-Ghazzeh, 1999), (Kathryn & Charles, 2011)	Proximity to common space and major building complex elements (e.g., main access, dwelling units).		Direct access from the communal space to the shared garden
6.			Access / openness (physical & functional)	Is the shared open space accessible from outside / open to public	Closed, Not open to public
7.			Organization and hierarchy of spaces, zoning	Smaller intimate groups or bigger spaces, relation to the private and indoor shared spaces	Yes, diverse groups of sitting opportunities
8.			Activities	Gardening	Gardening club, residents, volunteers
9.		(Gehl, n.d.)	Places to sit	Are there places to sit available, number, are they used, are they grouped or placed apart, where are positioned, materials	Yes, variety, organized in groups

10.			Other elements	Other elements available (e.g,.barbeque corners, tables, etc…)	Not specially
11.		(Chan & Lee, 2008), (Dempsey et al., 2011)	Maintenance, safety		Very good maintenance
12.			Visibility	Visibility within the layout, from outside the complex, from the private units	Good visibility from one of the rental and the private-owned parts: spacious window and balconies; Not directly visible from private units other rental part

OBSERVATION LIST BUILDING COMPLEX:

No	FACTOR	SOURCE	OBSERVATION ELEMENTS	DESCRIPTION	OUTCOME
1	**Scale, area**	(Williams, 2005)	Human, industrial		Big scale, but non-institutional feel
2	**Density**	(Williams, 2005), (Baum & Valins, 1977)	Dw/ha, number of dwellings		No info
3	**Clustering**	(Williams, 2005)	Building configuration		Three building parts: two rental and one private owned (in the middle). One of the rental building parts consists of smaller and cheaper apartments with no own balcony and more complicated route / non direct access to the shared garden and common space (longer

					corridor). Public facilities on the ground floor, more open to the city.
4	**Building height**	(Gehl, n.d.)	Number of floors		8
5	**Access**		Main entrance(s), main hall(s), vertical connection (lifts, stairs)	Positioning, look (welcoming or institutional)	Multiple main entrances with lift/stair vertical elements for every building block (the private owned part has three). These are apart from each other and not proximate to the community space. Within the building part with cheaper apartments the entrance hall with mailboxes (traditional gathering place for spontaneous contacts of residents) is also not so welcoming compared to similar spaces in the other parts.
6	**Bufferzones**	(Williams, 2005)	Front yards, veranda's, terraces, etc.		Apartments in one of the rental parts don't have own balcony (but shared over the corridor)
7	**Surveillance opportunities**	(Gehl & Svarre, 2013), (Williams, 2005)	Windows, terraces, transparent walls, glass façade elements	Surveillance to open shared space and common space	Big windows and spacious balconies overlooking to the common garden, but only for two of the building parts; the third one has shared terraces, accessible through the corridor at the apartment entrances. These apartments are directly overlooking the street /city part.
8	**Organization of spaces**	(Gehl, n.d.)	Ground floor facilities and spaces		Yes, restaurant and public rental office spaces, physiotherapy, and related services on the ground floor, of one building parts. Greater part of the ground floor level (directly overlooking the common garden) consists of corridors and bicycle storage spaces (privately owned part). Apartments with ground floor terraces in the design of the other rental block.

9	**Hierarchy of spaces (private to shared),**		Routes private space to parking and (open) shared space		Direct routing prom parking place (underground) to private dwellings
10	**Interactive façade**	(Gehl, n.d.)	Dominant horizontal or vertical elements; openings, ground floor design		Dominant horizontal elements
11	**Identity**		Interactive design, special elements, added value for neighborhood,		Nice interactive design, a lot of light and air in spaces on the ground floor level. No specific design or added value building elements of characteristics. The most beautiful and special project element is the shared garden.
12	**Technologies**		Sustainability technologies, safety, social interaction	e.g., Video, doorbell, intercom, etc.	Doorbell / safety camera at the main entrance; no sustainability features or other (smart) technologies.

OBSERVATION LIST COMMUNAL SPACE:

No	FACTOR	SOURCE	OBSERVATION ELEMENTS	EXPLANATION	DESCRIPTION
	Scale		**Human scale** or institutional		Human, normal scale
	Positioning	(Fromm, 2000b), (Kathryn & Charles, 2011),		Central position or not	Central within the building / ground floor plan

	Proximity	(Fromm, 2000b), (Kathryn & Charles, 2011), (Williams, 2005)	Proximity to major building elements: main entrance, lifts, stairs, corridors		Relatively far from private dwellings and main entrance halls;
	Access		**Access** from private units, corridors, lifts stairs.	Is the shared space accessible in the same way from private dwellings?	Direct accessible from the common garden, restaurant, and bicycle storage;
			From outdoor shared space	Is the indoor shared space related physically to the outdoor shared space?	yes
			Openness physical and functional, publicly accessible		Regulated occasional access for customers from the restaurant and for seniors from the King Arthur dementia group
			Obstacles	Is it accessible for roll chairs?	No, the space is overall roll chair accessible
	Visibility	(Lee & Rodiek, 2013)	Visible on the **façade**?		Yes, good recognizable architectural design
			Visibility to outdoor or other major elements/spaces?		Not visible from main entrance(s) and entrance halls/ lift & stairs
	Hierarchy of spaces (private to shared)	(Williams, 2005)	Availability of buffer zones: terrace, front yard, veranda…		Terrace

			Places to sit for **private communication**	Zoning, grouping of furniture, e.g., coffee table with two chairs, etc.	Only one small table with two chairs indoor; coffee table with chairs outdoor (part of the restaurant)
			Availability of **places for passive observation** of the space/activities (inside/outside)	Sofa or chairs looking to the activity place	No sofa, no chairs looking to the billiard tables
			Places for **group activities**	e.g., big table, billiard table, tennis table	big table, billiard table
			Spatial elements giving sense of privacy, **shelter/ protection**	Partial walls, room dividers, big plants, niches, columns, elevated floors…	Room divider, columns
	Organization of the space		One space or several connected		One space open to other (non-community) spaces
	Flexibility (spatial, functional)	(Lee & Rodiek, 2013)	Flexibility of space, elements, and **functions/activities**		Room divider is movable, but the other furniture is heavy and difficult to replace
			Flexible construction elements		no
			Furniture elements / places to sit	Dominant heavy or easy to move/replace	Not easy to replace
			Spatial elements for zoning of the space	Partial walls, room dividers, niches, columns, elevated floors…	Room dividers

	Facilities, activities		Types of facilities	Kitchen corner, etc.	No coffee or kitchen corner. Limited.
			e.g. billiard table, big table for hobby and play		Billiard table, book shell, big table hobby/puzzle
			Space(s) for **creative activities** available?		Yes, big table
			Promotion / information of the activities		Pricking board entrance hall, common room. No social app
	Places to sit		Availability and types of places to sit		Chairs to coffee (restaurant) and big table (activities). No sofa
			Materials of sitting places (natural materials or plastic); **Comfort** of sitting places (e.g. sofa)		Wooden chairs
			Positioning	**Grouping**	Around big tables or coffee tables (restaurant)
	Place attachment	Lee & Rodiek (2013), (Zavotka & Teaford, 1997)	sphere	Home-like or institutional character?	Not home like and domestic, more functional

	Identity	(Zavotka & Teaford, 1997)	Conversation starters	**Special elements** and objects in the interior, like	Small book library
	Domesticity	(Lee & Rodiek, 2013) , (Quick et al., 2015), (Weenig & Staats, 2010)	**Furniture**: types, arrangement (intimate or bigger groups) , materials, look	Sofa, fauteuils, coffee tables, chairs. Groups of furniture? Intime groups of furniture?	No sofa, only one coffee table; more coffee tables on the terrace
			Arrangement of furniture / places to sit	Is the sitting **furniture** (sofa, chairs, tables) arranged in informal or formal way? (e.g., in a line or circle / around a table)	In a line around bigger rectangular tables; around smaller round coffee tables;
			Dominant **colors** within the space: e.g., furniture, walls, carpets…		Various colors, not always matching to each other
			Materials: natural or plastic / steal?		Both – wooden chairs, but vinyl floor
			Greenery: types of Greenery and plants	Pots, hanging green, green walls, etc.	One pot greenery pot inside ; not much
		Lee & Rodiek (2013)	Other **sphere elements** of the interior	Curtains, carpets, decorations…	Curtains, no other
	Comfort	(Williams, 2005)	**Light;** natural light and type of lighting	**Lighting:**	A lot of natural light

				Type of lighting (TL, hanging lamp, table lamp, sphere lighting	
			Temperature, humidity, acoustics		good
	Maintenance	(Williams, 2005)	Overall cleanness	Condition of the walls, floors – scratches, etc.	good
		(Chan & Lee, 2008), (Dempsey et al., 2011)	safety	Is the place easily accessible, walkable, safe to use	Yes, safe for seniors
	Technology		TV, beamer, radio, Wi-fi, computers….		Flat screen, but no info if it is working
			Safety and video/audio technology		No

SOCIAL FACTORS:

No	FACTOR	SOURCE	OBSERVATION ELEMENTS	EXPLANATION	DESCRIPTION
	Number of residents				98
	Residents' composition, homogeneity				Older adults 65+; residents from the three building parts don't mix much with each other
	Informal groups and organizations residents				Gardening commission Organization of ca 20 residents (have own community room)

	Social sphere		Overall social sphere		Conflicts between residents WZNL and the seniors from King Arthur group
	Activities	(Williams, 2005)	Types of activities available,		King Arthur sessions (morning) Neighborhood community: Diverse events open to public (Wednesday evening)
			Open or close group access, opening hours common space		
			Information method activities	How are residents informed about coming activities: e.g., posters, apps, info screens, social media.	Pricking boards
			Organization of the activities		Residents themselves

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Speaker 1 (00:02):

Okay. hello, I would like to ask you several questions about, the communal space. How is this space, used from seniors? And, my first question is generally how often in normal times, the communal space is used by seniors to meet, communicate, and socialized with each other. And, for what purposes and activities it is used general

Speaker 2 (01:16):

It used every day? Every day? It is used every day

Speaker 1 (01:20):

Day. Yes. Forms seniors from the complex or…

Speaker 2 (01:24):

Also, but also from the seniors of the king Artur group. Um, and sometimes from, uh, the restaurant. Yes.

Speaker 1 (01:39):

And seniors from the complex, do they do the spontaneous? Yes.

Speaker 2 (01:45):

For what? Yeah. There are, uh, activities, like painting or tafel tennis. But most of the times, especially in the summer, uh, they just come and drink a cup of coffee and enjoy the, everything is around them. <laugh>

Speaker 1 (02:17):

Yeah. So they just come spontaneously to the place, not only when they are activities

Speaker 2 (02:23):

Not it's a small group that, that only goes to activities, but a lot of people will come yeah. Just spontaneous

Speaker 1 (02:33):

And they have to, buy a cup of coffee of the restaurant or they just come and see

Speaker 2 (02:42):

As someone from the complex, it's, it is free to, to sit there. But when they like a cup of coffee, yes, they can buy a cup of coffee.

Speaker 1 (03:07):

They, use not only their space, but also in and the tables. And previous time you said that there are some conflicts between them. Yeah. How much is, is it the problem or?

Speaker 2 (03:25):

I think it's more that, uh, the people in the building think, they're not welcome. When people from the restaurants are there or, when the king artist who people are there, they think they're not welcome. But they are <laugh>. Yeah. Um, so it's not a real conflict, but it feels like a conflict.

Speaker 1 (03:57):

I mean, it's just not comfortable.

Speaker 2 (03:59):

Yeah. They don't feel comfortable to just sit there and, uh, with

Speaker 1 (04:05):

The others or

Speaker 2 (04:06):

With the others, not from the people in the building, but only from the people from the king Arter club and the restaurants. Yeah.

Speaker 1 (04:16):

And do you think that if they come in another, so, or if they're split, it'll be better or, uh, it'll be better to think about how to bring them together.

Speaker 2 (04:30):

We have managed time for the king art group and restaurants. So the king art hoop is there only in work days. And only from nine till five. So, um, about, uh, the tight step.

Speaker 1 (05:00):

Okay. Because previous time in January, according to the measurements, there, there was a problem that the space is not, the common spaces are not used enough from the residents. Yeah. So, maybe they're not active enough

Speaker 2 (05:28):

Or they're not the, the people in the building

Speaker 1 (05:33):

The people from the BU from the complex, we, we are not interested of

Speaker 2 (05:38):

Like, um, I don't know. Um,

Speaker 1 (05:43):

I try to figure out what the problem is.

Speaker 2 (05:47):

Yeah. But I don't know what the problem exactly is. <laugh> I mean, I, I think they, they don't feel welcome to, to come there. Um, and there's a small group that wants to go there. A lot of people in the building think, yeah, I'm living here and that's it. So I don't have to come over the floor come, uh, to the neighbors.

Speaker 1 (06:21):

Do you think that there could be some design or special aspects that contribute to this?

Speaker 2 (06:28):

Yes.

Speaker 1 (06:30):

And what they could be?

Speaker 2 (06:32):

Um, more facilities.

Speaker 1 (06:35):

Okay. There are no facilities. What kind of facilities

Speaker 2 (06:39):

Could be? I think if you, uh, if there's a coffee machine, for example. Yeah. People will come to meet each other there and there's a lot air ho. Yeah. Um, so I think more facilities will facilitate more that people come over to, to the the community.

Speaker 1 (07:08):

And also the communal space is a bit far from the main entrances. Yeah. So, uh,

Speaker 2 (07:15):

It's a long walk.

Speaker 1 (07:17):

Yeah. So it, it's not so easy to come to it. You, you have to have a purpose. Yeah. A plan to go. It's not spontaneous.

Speaker 2 (07:26):

No, it is not. When you go inside, you are there, but you have to walk a long time.

Speaker 1 (07:32):

Do you think that this could be improved for example, with more information or some technologies or boards

Speaker 2 (07:40):

Or, yeah, I think with the right border information. Yeah. More information and a to prescribing and maybe some advertising. So if you have free coffee, just advertise with it. <laugh>

Speaker 1 (08:08):

And, um, maybe the last question, what, in your opinion could be changed or improved, within the communal space or the complex in order to stimulate that social interaction and utilization and to bring people together. I mean, in social aspect, but also in spatial

Speaker 2 (08:36):

Science, I think more information signs. Um, but maybe also, when someone is new here, I just, uh, give them the papers and that's it, you know, and I can maybe, give them a tour to the building. Mm-hmm <affirmative> yeah, I think that's

Speaker 1 (09:00):

And from design and special aspects, what could be changed in the interior or exterior?

Speaker 2 (09:10):

Maybe a, a lounge, a bank. More, um, cozy.

Speaker 1 (09:17):

Yeah. It's not cozy.

Speaker 2 (09:19):

No, there are tables and yeah. Some books and that's it. It's not cozy

Speaker 1 (09:27):

It it's not, uh, hospitality. Yeah. Uhhuh <affirmative>

Speaker 2 (09:33):

So maybe met that kind of stuff.

Speaker 1 (09:39):

Yeah. And, uh, about cozy and the style you think about something more modern or, just something more that gives, uh, more homelike

Speaker 2 (09:51):

Feeling, more homelike feeling. Yeah. Yeah. And maybe, uh, some board games or puzzles give them more activities and a, a nice space and free coffee <laugh>

Speaker 1 (10:10):

And they will come.

Speaker 2 (10:11):

Yeah. And I think that is, that will be very good for the, for the building.

Speaker 1 (10:18):

Yes. For sure. And what about the routing? I mean, do you think that somehow there needs, they, they have to be separate from the restaurant or maybe it's not a good idea. I mean, visually, somehow functionally.

Speaker 2 (10:34):

No, I don't think that, I think it's, it's also good for the restaurant when that's open and, um, people like to come there they want to have their meal or, uh, take away their meal. Mm-hmm <affirmative> so very good thing that they, uh, don't have to go outside to go to the restaurants. Yeah. So I think that should be, uh, yeah, the same.

Speaker 1 (11:09):

Okay. And, we talk about, but are there other technologies or small technologies of something that could be implemented?

Speaker 2 (11:21):

I think more signs. Yeah. Also, we come here that there is a sign to, so go to the communal space. And also on the other side of the complex, you sign it? Yes.

Speaker 1 (11:40):

Okay. And what are the most common places that people come together?

Speaker 2 (11:52):

Um, I think here at the entrance

Speaker 1 (11:56):

And do you think we could somehow combine the two things or, at something also at the entrance?

Speaker 2 (12:08):

I think that's difficult because, um, she took my file Heights.

Speaker 1 (12:23):

Okay. What do you think about implementing more greener inside the space?

Speaker 2 (12:34):

Um, yeah, it could be, or maybe some, uh, new paint <laugh> uh, a nice color. No, it is very white and gray here. Yeah.

Speaker 1 (12:54):

In the common space

Speaker 2 (12:54):

Yeah. There's no, uh, floor bedecking. So it's, it's vynil that it's outdated. It's outdated.

Speaker 1 (13:09):
Yeah. So like materials and colors, what would you <affirmative> propose and what could be improved?

Speaker 2 (13:18):
Mm.

Speaker 1 (13:19):
You said that the power combination is not good.

Speaker 2 (13:24):
Um, and the materials. Yeah. Um, maybe, uh, floor decking

Speaker 1 (13:31):
I don't expect exact you.

Speaker 2 (13:36):
I think a new floor, um, and maybe wood or, uh, more natural. Yeah. More natural, more home feeling

Speaker 1 (13:50):
Yeah. That is important to be home feeling.

Speaker 2 (13:54):
Yeah. I think everyone

Speaker 1 (13:56):
Like a living group, uh, to make, yeah.

Speaker 2 (13:59):
It should be a nice place you go. So maybe more, uh, paintings on walls. Uh mm-hmm <affirmative> yeah <laugh>

Speaker 1 (14:22):
It's not so bad, but some, somehow something is missing. Yeah. <laugh> you, you go there.

Speaker 2 (14:29):
But no. Then actually new bank or a lounge <laugh> yeah.

Speaker 1 (14:43):
Thank you Speaker 2 (14:43):
You very much.