Multi-generational Co-living for Care

A Socially Inclusive and Caring Environment to Maximize Independence for Elderly

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Multi-generational Co-living for Care
Living in a Socially Inclusive and Caring Environment to Maximize Independence for Elderly

Studio:
Architecture and Dwelling/AR3AD110
Designing for Care in an Inclusive Environment

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Preface

The architectural field of 'Dwelling' or 'Housing' has been quite an underexposed topic during my personal bachelor years; a topic that didn't get the attention it deserved looking at the problems on the housing market in The Netherlands and the aims our country has for it in the future. However, during my internship at 'KOW Architecten' in The Hague, I immediately noticed and experienced the importance of housing in the current world of architecture. Durable, affordable, future-proof and modular housing were the subjects I came into contact with, every single day, during this educational period in between finishing my first year of the Architecture Master track and going into my graduation year. 'Architecture and Dwelling: Designing for Care in an Inclusive Environment'; that is the title that caught my attention while I was in the process of figuring out the graduation studio I was going to partake in. It was a subject I totally did not consider or think to be among the available choices. The combination of architecture, dwelling and care was something I had no experience with or knowledge about whatsoever. Therefore I was very eager to learn more about it and discover the challenges it would have in store for me.

Although I had no immediate, emotional or personal motivation for choosing this studio, quite quickly some situations in my direct environment got me thinking a lot more about housing for elderly (in need of care). My mother's experiences of her volunteer work in a nursing home and a so called 'logeer-huis' (guest-house or stay-over-house) brought me some inside information, stories and problems within such an environment.
'A positive example involves the excellent location of the nursing home in the centre of the town, with views on the town square, surrounded by a supermarket, primary school and café, causing commotion, things to happen outside and social interaction with passers-by. Next to that, independent living seniors on the top floor (which do not belong to the nursing home) help the more dependent elderly with everyday tasks like gardening, taking a walk together or doing groceries. More negative and problematic examples are experienced in the building itself. There is no main collective space for bigger activities, festivities or celebrations. Rooms for personnel meetings are too little and there are not enough of them present in the building. Dwellings on the ground floor have direct access to the exterior space, but materialization of the surface is not suitable for wheelchairs, walkers, scooters or weaker elderly in general'.
These stories and findings from a practical perspective got my designing mind already rambling and thinking about a built environment in which the oldest generation of our society could live pleasantly, socially and mostly independent, with all the needed facilities and functions in the vicinity.

This would also be the moment to show my appreciation and gratitude towards multiple people. I would like to thank my tutors Birgit Jurgenhake (Architecture), Frederique van Andel (Research) and Lex van Deudekom (Building Technology) for their help, support and motivation regarding their expertise during this project. Thanks also goes to Peter Boerenfijn from Habion, for his great introduction to the housing for elderly in need of care in the Netherlands, to my fellow students within the 'Designing for Care' studio and to my family and friends for their constant support during this project and over the years.

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1 Introduction

Ageing is a familiar phenomenon in recent times. The so called 'baby-boom' right after the Second World War caused a *massive increase of people reaching the age of 65 by 2011* and this will not stagnate for a while (fig. 1.1). Currently there are 1.3 million people with an age above 75 years living in the Netherlands; in 2030 this number is expected to be approximately 2.1 million. Many of them are physically well, but a decent amount needs some kind of care (Ministerie van Volksgezondheid, Welzijn en Sport, 2018). As the composition of the Dutch population is in a process of change, the housing and further built environment needs to undergo a transformation, providing the right facilities and living conditions for the elderly in need of care.
The ageing of the Dutch population is a process we can't avoid or prevent, neither as the problematic consequences that come with it. It creates problems not only for the elderly themselves, but for the population of The Netherlands as a whole.

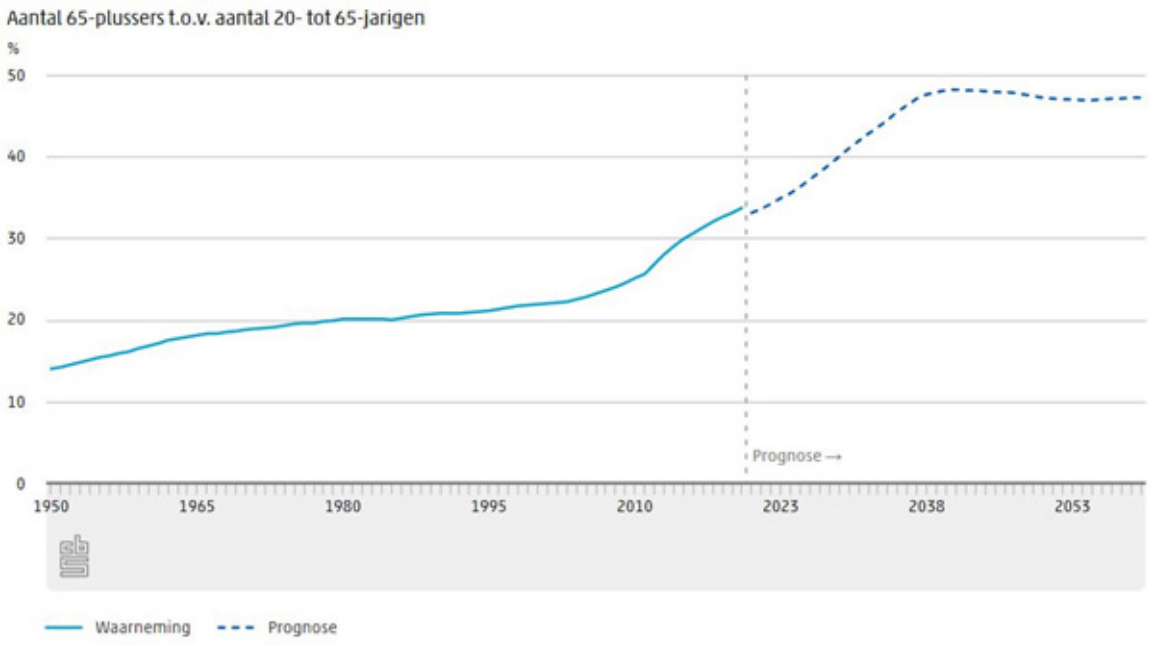


Fig 1.1: The amount of over-65s in comparison to people between 20 and 65 years old + prognosis (CBS, 2021)

Multiple age groups say they feel alone, but especially the elderly suffer from ***loneliness***. On the 20th of March 2018 the Dutch Ministry of Health, Well-being and Sports launched their action program 'One against loneliness', spreading lots of information concerning this subject. It states that 43% of all adults experiences loneliness and among the elderly this percentage is even higher: 54% (of which 11% has a strong feeling of loneliness). In 2018 this were 700.000 lonely elderly, but in 2030 this number could rise to 1.1 million. This high percentage has many causes: the loss of a partner, losing a network of friends, family and acquaintances and the emergence of health problems like ones mobility, hearing or sight, stopping someone to easily go somewhere to meet or participate in activities. (Ministerie van Volksgezondheid, Welzijn en Sport, 2018)

The housing market shows a considerable shortage, for starters and young families, as well as for seniors. In 2021 this number is around 300.000, which is the number of households that is forced to have no home of their own. Branch organization Aedes states the following: *'Flow is an important point as well. The elderly often stay in a social rental home, because of* ***a shortage in proper homes for the elderly.***' (NOS, 2021) A lot of seniors still live a family/household home, the type of dwelling starters and young families are dying to move into, but which are very scarce at the moment. Already in the 80's, it was known that the future of the ageing population of today would put a brake on the flow in the housing market. One of the reasons for this is the fact that generally older people/households do not move house as often as younger households (fig. 1.2). This is usually not a matter of 'not wanting to', but a matter of 'not being able to', because of a lack of supply. Besides, if all seniors with a wish to move would succeed in doing so, then that would bring 250.000 homes for sale on the housing market (De Groot, 2021). The flow of these seniors from a family home to proper elderly homes would be a great start to solve problems multiple age-groups have to deal with in the housing market. In the Netherlands the need for housing arrangements purely for elderly is definitely needed, as 92% of the over-75s lives independently and even two-thirds of the over-90s still lives on their own (Rijksoverheid, 2019).

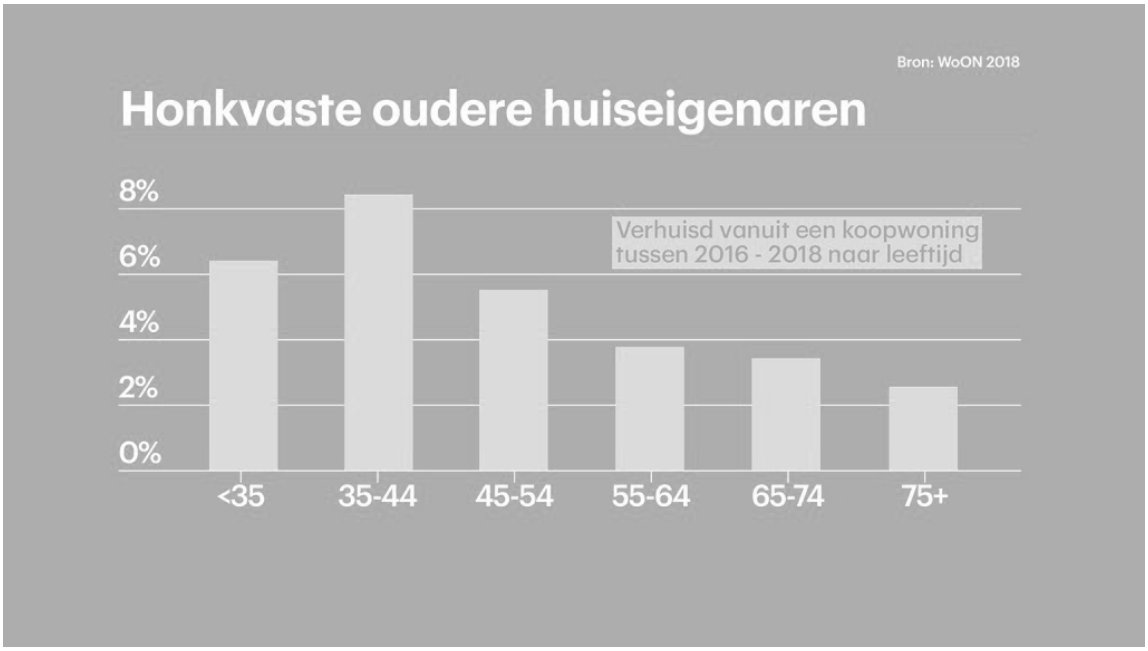


Fig. 1.2: People that moved from a owner-occupied home between 2016-2018, by age (WoON, 2018)

2 Getting to know the elderly

Numbers, statistics and general facts are only the start of getting to fully understand a specific subject. A closer look is necessary to get more information, most of which is not discovered at first glimpse or will pass by entirely. This certainly applies to people or a target group that characterizes itself with specific activities, ways of dealing with daily chores, (dis)abilities and who are in a unique phase of their lives, like the elderly. Therefore, personal experiences and being among the older aged people were the first steps or "exercises" within this research project to eventually define the more specific subject to focus on within the broader spectrum of 'designing for the elderly'. Two types of fieldwork were set out to dive into the daily lives and living conditions of the elderly population: experiencing being old via simulating physical and visual impairment and analysing the daily lives of the elderly by staying in a nursing home for a week. Both types of research were valuable in their own way and formed a head start to define the topic for the rest of the project.

2.1 Experiencing old age: physical and visual impairment

2.1.1 Physical impairment: the wheelchair

As a first simulation of being old, wheelchairs were used to traverse the city centre of Delft. The purpose of this activity was to experience and document the possibilities, but most of all the barriers and obstacles the built environment of a Dutch city contains. Even one day, including a couple of hours of actually being and moving around in a wheelchair, totally changes the perception on the world we normally experience as a fully, physically capable person. Findings and analysis of this wheelchair experience were collected and documented as annotated photographs and drawings.

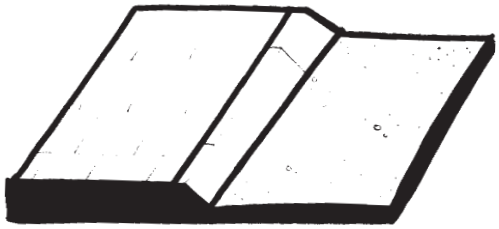


Fig. 2.1 (by author): 'Quickly noticeable was that even the smallest hill or threshold can be annoying for a wheelchair user, especially if it is too steep. The power that is needed to push that last bit is quite big, which elderly persons can often no longer produce at their age.'

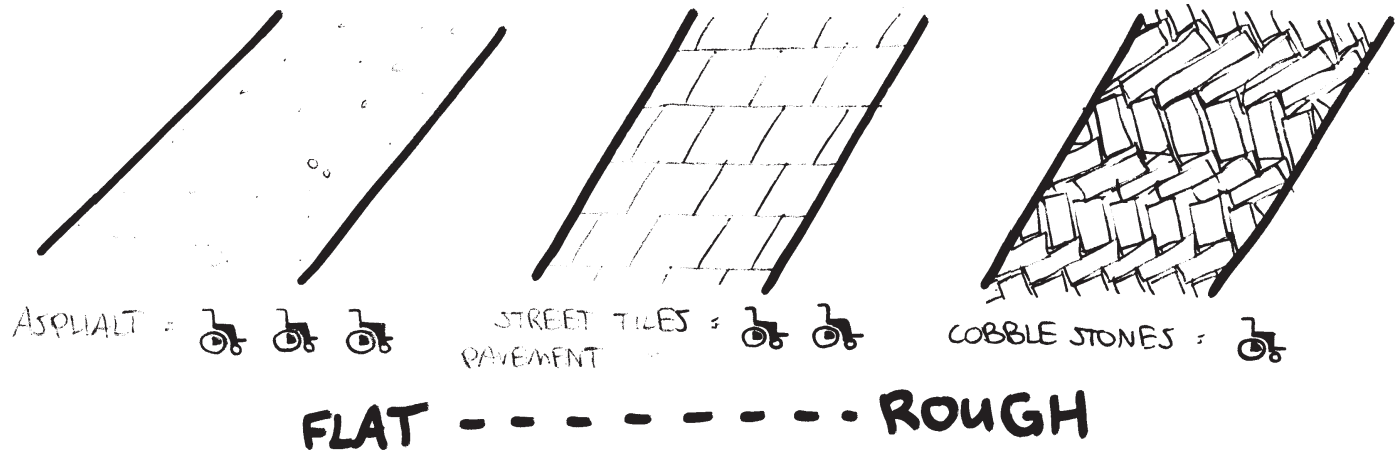


Fig. 2.2 (by author): 'The very first experience in the wheelchair we had was the difference in surface together with the comfort of traversing over it; how rougher the surface, how more difficult and uncomfortable it is to go over it. For example, cobblestones themselves can already be quite bumpy, but especially uneven ones in older parts of the city are very unpleasant.'

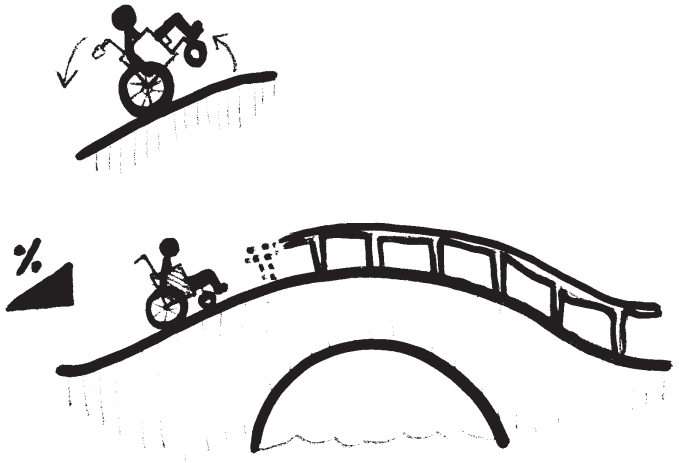


Fig. 2.3 (by author): 'Sloping streets or bridges can add even more difficulty for wheelchair users due to the extra strength and balance playing a factor.'

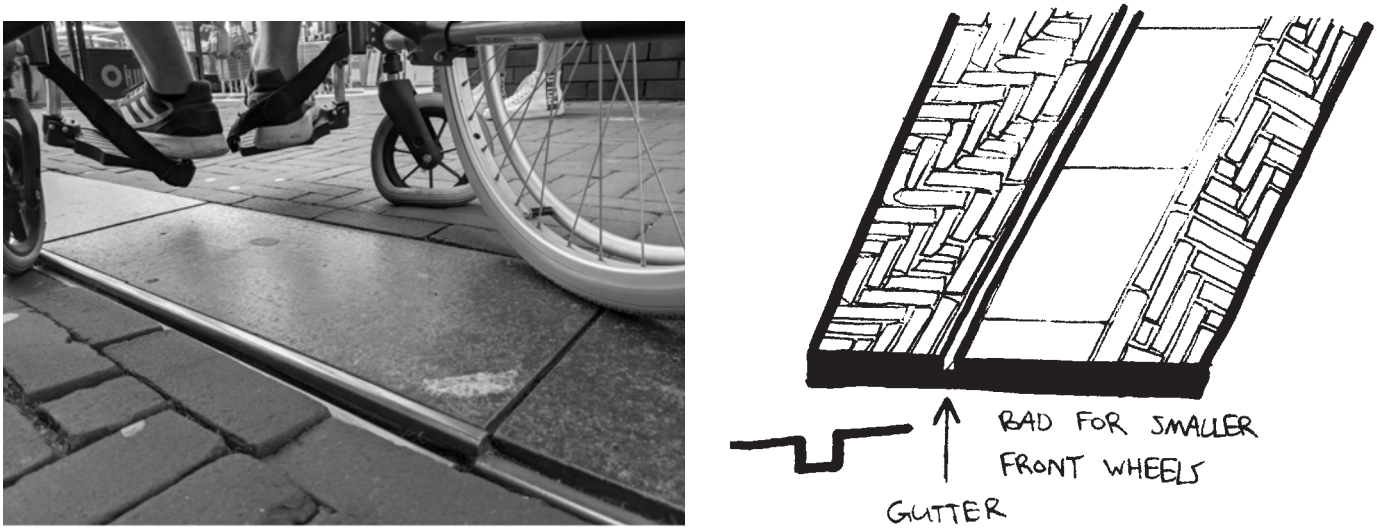


Fig. 2.4 (by author): '(Small) gutters are problematic for the wheelchairs' wheels. They could get stuck or the rubber tire itself could come off, probably resulting in a situation the user can not solve on its own.'

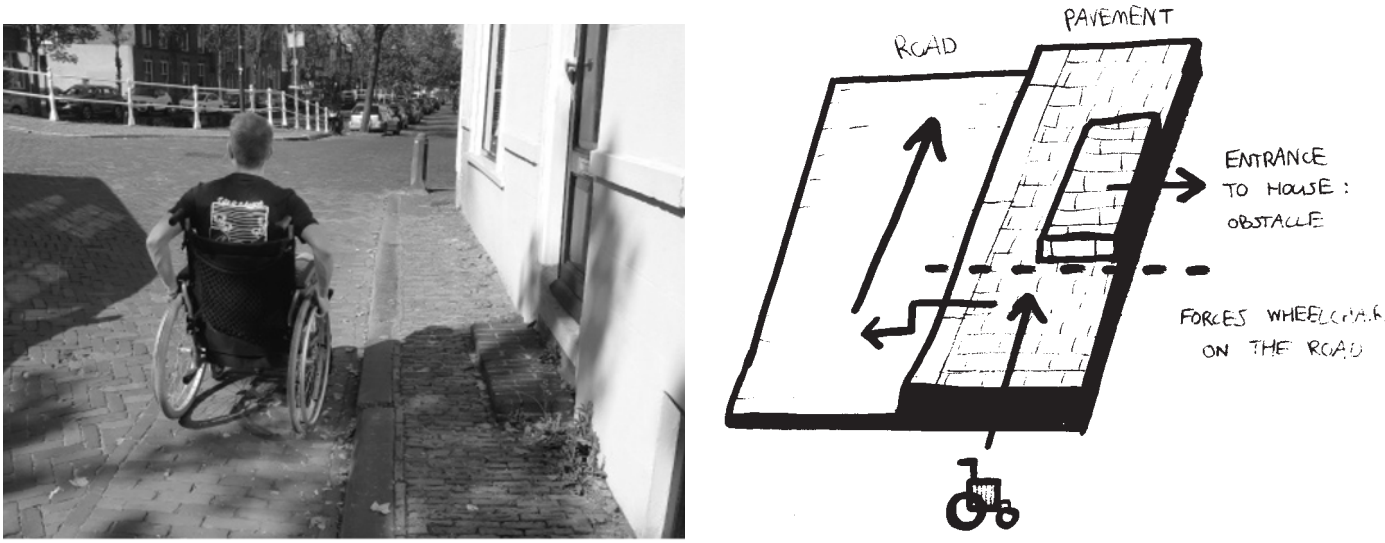


Fig. 2.5 (by author): 'Obstacles on small pavements like a stepping stone can force the wheelchair user to continue on the road, forming a danger for themselves and other road users like cyclists, scooters or cars. Especially in narrower streets this is a problem.'

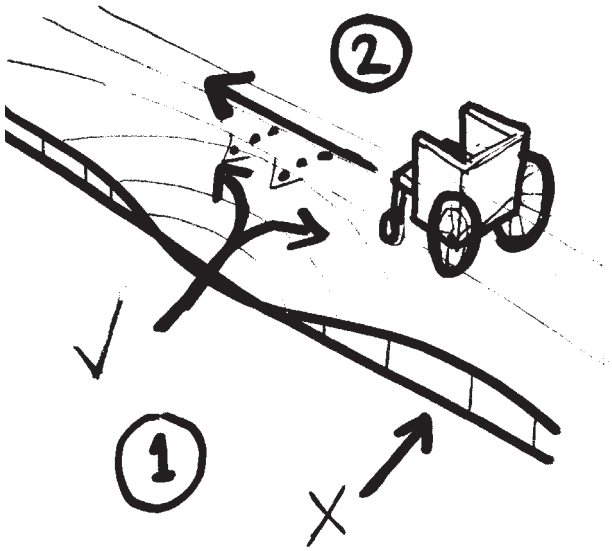


Fig. 2.6 (by author): 'Even slopes specifically made for wheelchairs to traverse better trough a city environment can cause issues. A gradual hill in the pavement gives access to it (1), but going perpendicular to the slope causes you to bend towards the main road (2).'

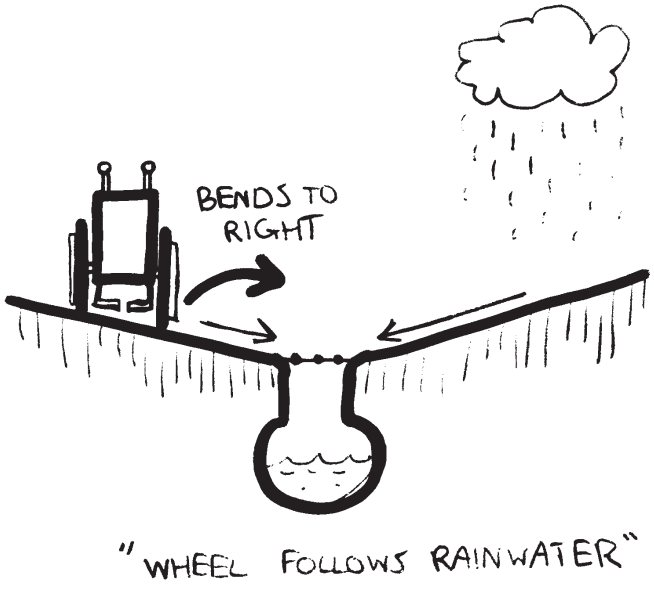
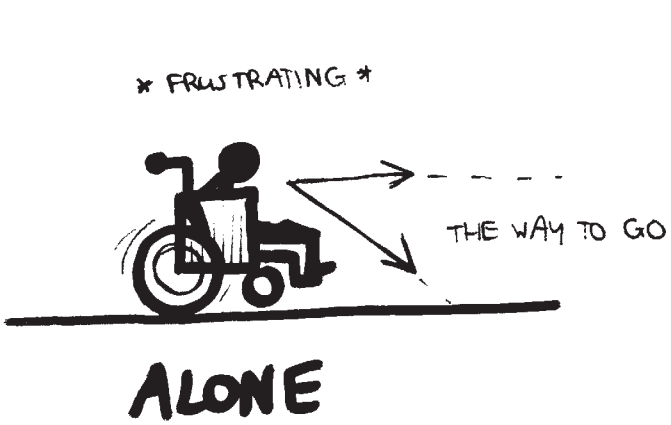
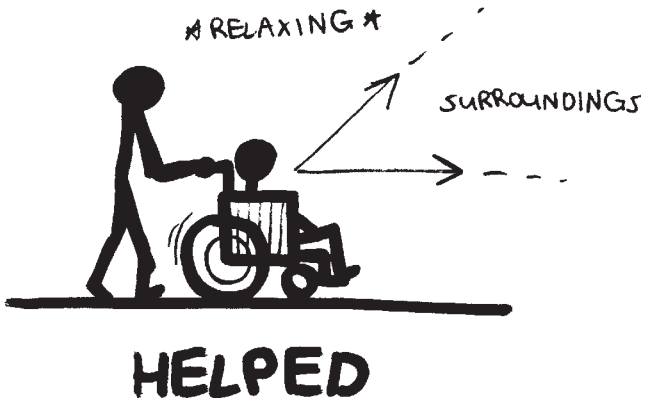


Fig. 2.7 (by author): 'Small hills and slopes (rain)water would run down, automatically makes the wheelchair bend that direction. The wheels tend to roll down, just as gravity lets the rain flow to the lowest point. This especially makes travelling on your own more difficult and annoying.'





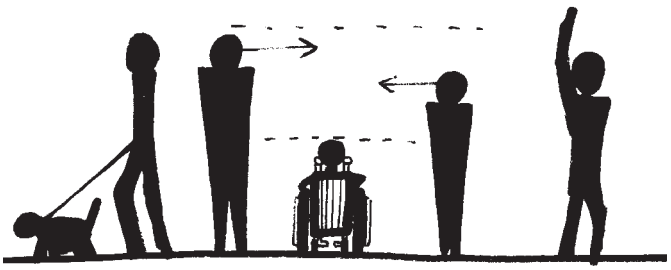


Fig. 2.8 (by author): 'We experienced different perceptions of being in a wheelchair. Travelling alone in a wheelchair causes the user to concentrate on the way to go to prevent any accidents. This could go hand in hand with feelings of powerlessness or weakness, being in need of help, disconnection with others and feelings of being a hindrance to others. However, when the wheelchair user is helped and pushed, the concerning person is able to enjoy the surroundings and interact with it more.'

Fig. 2.9 (by author): Movable furniture blocking the way ***(barrier)***

Fig. 2.12 (by author): Wheelchair lifts in public buildings (Delft library) ***(aid)***

Fig. 2.10 (by author): Sloped entrances to shops/restaurants etc. ***(barrier)***

Fig. 2.13 (by author): Subtle slopes to reach podiums or platforms ***(aid)***

Fig. 2.11 (by author): Awkward taps in public buildings ***(barrier)***

Fig. 2.14 (by author): Wheelchair friendly elevators ***(aid)***

2.1.2 Visual impairment: sight-decreasing goggles

A comparable method of analysing and documenting has been done on another impairment simulation; one focussed on eye sight. In general, people's visual capabilities decrease as they get older. This adds another set of difficulties and obstacles in daily life next to the possible physical disabilities. 'Sight-decreasing goggles' were used to make an experimental walk through a familiar or unfamiliar area, together with a guide for safety. Eventually, the aim was to document the encountered barriers and obstacles, but also the emotional feelings that arose.

Fig. 2.15 (by author): 'These pictures visualize the difference in 100% vision and +/-10% vision; 'Your field of view is nothing more then areas of colour, which, in outdoor spaces, mostly are consisting of green, grey, white, red/brown and blue.'

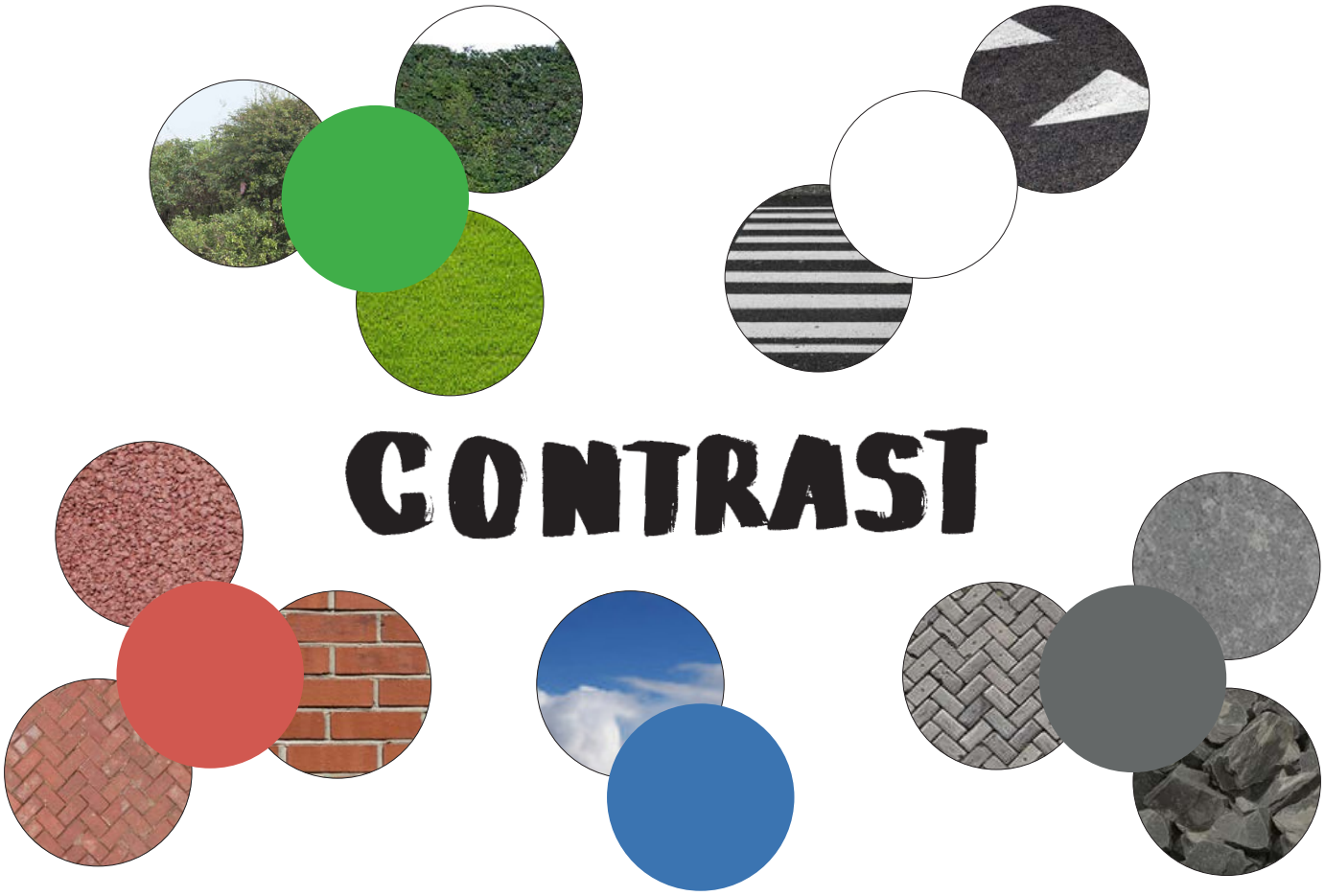


*Fig. 2.16 (by author): 'Sunny (and therefore light) environments resulted in more **contrast** between the colours, which helped to distinguish the different spatial elements, materials, objects and surfaces. This contrast will make the direct environment more clear, easier to read and therefore more safe and manoeuvrable.'*

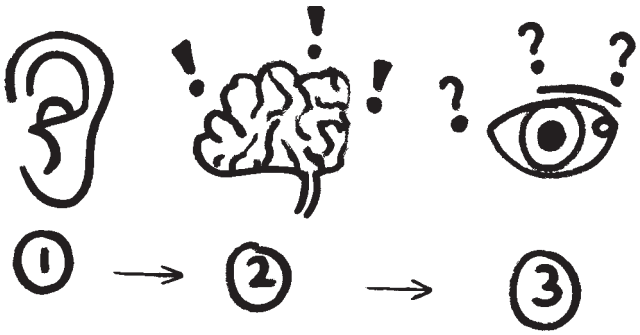


Fig. 2.18 (by author): 'The way of perceiving the surroundings totally change when your visual impulses are barely there. Sound becomes way more important. Often you become aware of something or someone by hearing, following by the visual action: looking in the direction the sound came from. Most of the time this does not actually let you see what or who has made the sound because of the visual impairment.'

Fig. 2.19 (by author): 'Recognizing people from any distance is close to impossible. Your ability to see any detail is gone. Sometimes even the presence of a person will only be noticed when they're a few meters in front of you, but it still could be anyone.'

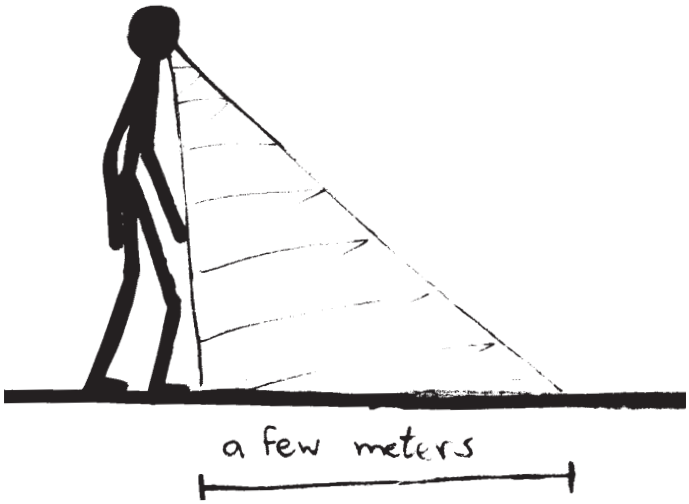


Fig. 2.20 (by author): 'Due to the visual impairment, you can not avoid looking just a few meters ahead to see where you are going, to look if it is safe and to prevent yourself from getting hurt. Even the smallest, little bump or an incorrectly laid tile can cause a fall and injury, especially if you are old. The concerned obstacle is even harder to notice when it is the same colour as the walkway/paving itself, causing it to be close to invisible.'

2.2 Living among the elderly: Huis Assendorp, Zwolle

After we experienced being old by the wheelchair and visual impairment exercises, we were able to dive deeper into the direct living environment of the elderly. On September 2021, me and three other students went to a nursing home for a midweek to do fieldwork with the aim of getting to know the daily lives, activities, personal stories and opinions of the elderly people and other residents there. Our stay and fieldwork took place in the neighbourhood Assendorp near the city centre of Zwolle: in 'Huis Assendorp'. *'The former, old-fashion nursing home, called 'De Molenhof', is transformed and renovated to reflect the character of Assendorp itself, with a mix of young and old residents and the possibility for local residents and visitors to meet, which creates a fresh dynamic and a familiar environment within the building. Well-arranged and affordable homes, a diverse arrangement of collective spaces and several commercial facilities make Huis Assendorp fully equipped for the residents' needs. The building is set up and furnished together with the inhabitants, making it an open and lively residential community all about freedom, independence, self-esteem and reciprocity.'*

This description of the "nursing" home is given by Huis Assendorp itself, together with 'Habion' (2021), the housing association in charge of the renovation and implementation of this new housing and living concept. ***Next to getting to know the elderly, we as architecture students gave ourselves the task to find out if this "utopian living environment" and concept really worked as well as stated here, through fieldwork, observational research and analysis.***

As soon as the location for this particular week was announced, Google-Maps was a quick first tool to get some first impressions of the building, its lay-out and environment. Floor plans provided to us later gave the possibility to get a better insight of the actual architecture. These already showed something remarkable: the building lay-out consisted of 3 wings. Two of these wings contained the residential apartments, parallel to each other. The third one contained all the collective and public spaces, perpendicular to the other two wings, and connected them together (fig. 2.21).

The strategy for this week was to keep an open attitude towards the residents for the first few days, to see if there are any topics that stood out or particularly raised our interest, which would then be further discovered during the remaining days. Methods used

Fig. 2.21: Lay-out of Huis Assendorp, showing the two residential wings and the collective wing connecting everything (plan provided by Huis Assendorp, Zwolle; analysis by author)

to get information from the residents were direct and indirect interviews/questionnaires, joining meetings and conversations, observations, taking notes and sketches. For the direct interviews the aim was to get answers from a target group as varied as possible. Luckily the multi-generational living concept of Huis Assendorp made it possible to interview all kinds of age groups; from young adults and seniors to a handicapped resident and an external acquaintance of the community. The indirect questionnaire on the other hand consisted of two questions on scrolls on the wall: What do you like about living here? and What do you rather see different here? This method had some startup problems, but eventually gave a lot of useful information about the residents' wishes and opinions about their direct living environment. To summarize the findings from our fieldwork, interviews and conversations, they are divided into 'positive', 'wishes' and 'negative':

Positive:

- Coffee/tea moments in the common rooms
- The multi-generational co-living concept, making the building feel as a 'stacked neighbourhood'
- Home-care present in the complex
- Independence and room for resident initiatives
- Mutual help and support
- Privacy in relatively affordable dwellings
- Great position of the building near urban facilities and the city centre of Zwolle

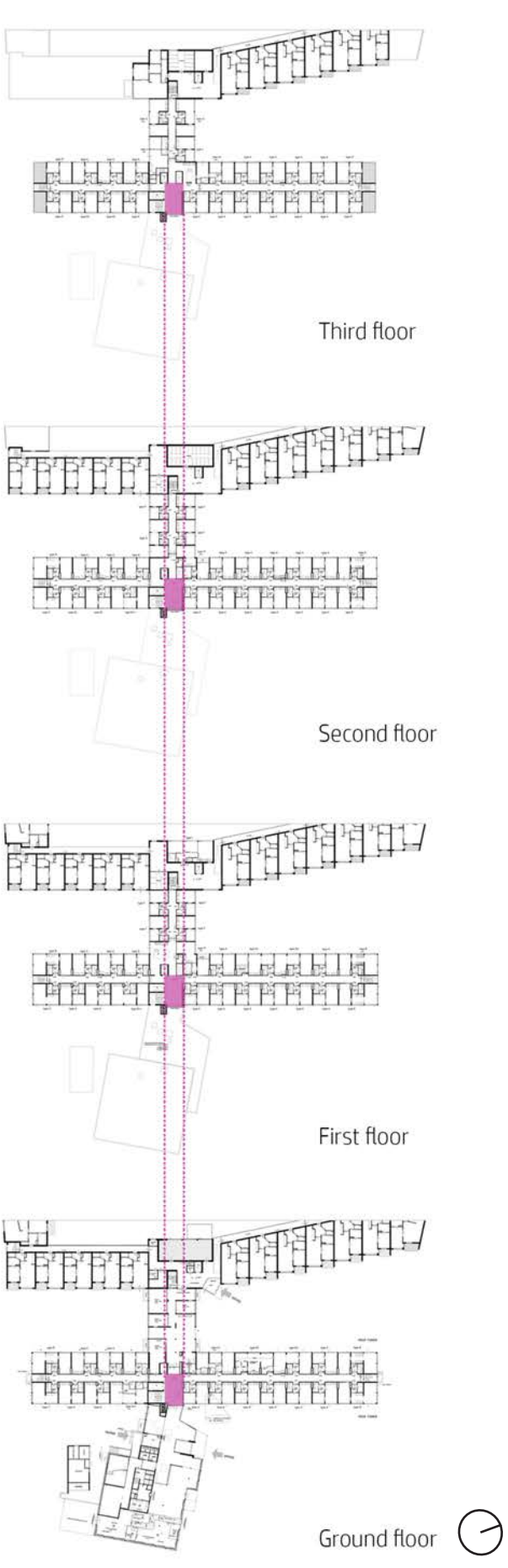
Wishes:

- More independence for the elderly (in need of care)
- More variety and initiative for collective activities
- Take aging into account; 'Help each other!'
- Better and more facilities in building: parking and storage for scooters, indoor climate system, hobby rooms, elderly- and/or disabled-friendly design, bigger vegetable garden, own private garden, fitness space
- Stricter criteria for admission within the multi-generational co-living concept

Negative:

- Low participation in activities or new initiatives: desired changes and goals will not be achieved
- Oldest residents barely leave their home
- Some spaces are not designed for the target group of the elderly (fig. 2.25)
- Negative gossip between residents; primarily between the two residential wings

Fig. 2.22: The commercial functions, located right in the middle of the two residential wings, adds to the social disconnection between them. This causes most of the residents to meet and interact in their corresponding collective spaces instead of mixing throughout the building (plan provided by Huis Assendorp, Zwolle; analysis by author)



3. Library

2. Common kitchen

1. Art studio

0. Mailboxes

Fig. 2.23: Not essential rooms are underused due to their size (art studio) or bad location within the building (library on the top floor). Nonetheless, the idea of spreading the collective realm along all floors is good (plans provided by Huis Assendorp, Zwolle; analysis and photos by author)

- Size of community is too large to work within one building/living-concept
- Belongings in the hallways (due to lack of storage) become obstacles (fire safety)
- Some functional spaces are severely underused due to their bad location within the building (library, music room) (fig. 2.23)
- Dwellings are too small to be attractive for starters/ younger people
- Contrast and division between two residential wings because of dwelling size, facilities, age and rent
- Former collective spaces now claimed by commerce
- Bad structure (bent lintels) and indoor climate system (ventilation, heating, cooling)

A lot of the topics pointed out by the residents have to do with personal and individualistic opinions or ways of seeing things; 'a building is nothing without its users', but the more users it has, the more difficult it becomes to do justice to everyone's wishes and needs. Although, there are also a lot of points stated by the residents about the architectural design of the building in regards to its capability to facilitate a co-living community. Looking back to this week, this huge variety of residents, their personalities, opinions, thoughts and role within the multi-generational community of Huis Assendorp is the thing that immediately comes to mind. ***This was also the first trigger for the research topic of this project; the concept of a multi-generational community for the elderly***. Everyone feels free to express their thoughts, positive or negative, and they do this regularly during the several tea/coffee moments every day while coming together in the multiple collective spaces on the ground level, like the 'great hall' or the so called 'Theetuin' (Tea garden) (fig. 2.22, 2.25). Specific groups could be distinguished, with every one of these groups taking a specific spot within the common spaces (fig. 2.22). It shows that their community is divers enough for every individual to find company and that they don't have to be alone. However, almost every day the same people joined the collective coffee hours, which means that a large part of the community was still at home. This is not a bad thing necessarily: some people (maybe the elderly even more) really value their privacy and the community concept gives freedom to the residents to act accordingly.
Especially due to the fact that this new, multi-generational co-living concept was implemented in an already existing nursing home, the possibilities of newly built complexes with the same particular housing and living concept in mind are certainly a topic to research and explore further (fig. 2.26).

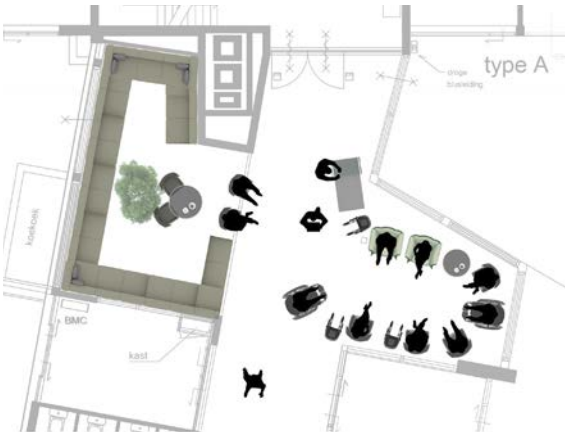


Fig. 2.25: Tea garden ('Thee tuin'): inhabitants get creative with seats due to the dysfunctional designed sitting area for the elderly (plansprovided by Huis Assendorp, Zwolle; analysis by author)

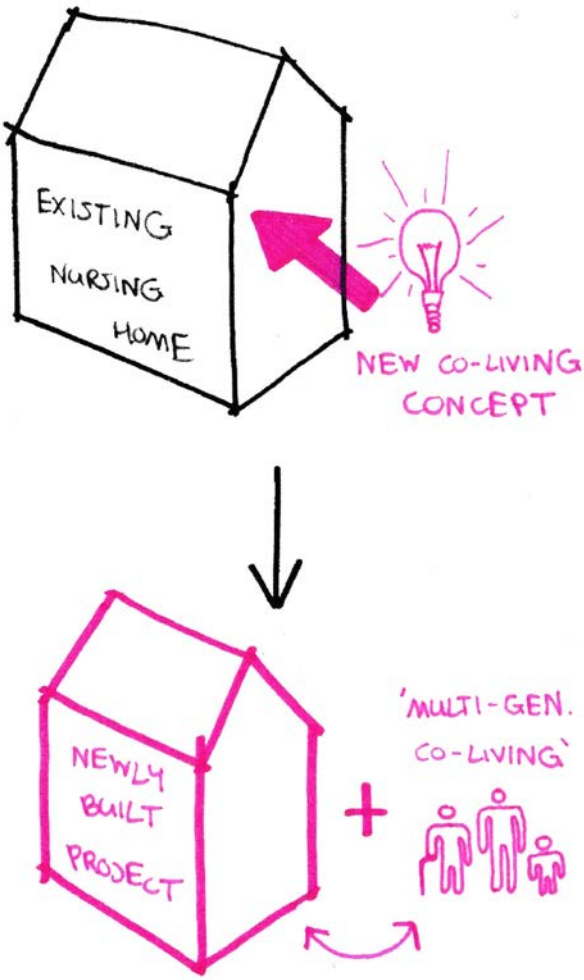


Fig. 2.26: Possibilities and opportunities for newly built complexes with the multi-generational co-living concept in mind (by author)

3 Problem statement

3.1 Less and less available healthcare staff

Unfortunately, while the number of elderly people is growing, ***the amount of available (health)care staff is decreasing.*** In the worst case there will be a shortage of 74.000 healthcare personnel in 2022, but this prognosis was done before the COVID-19 crisis, so the actual number will be even higher. This shortage will negatively impact the elderly/home care. It is getting more problematic when knowing that an estimated 2 million persons working in the care are needed in 2040 in comparison to the 1.4 million in 2020. At the moment, 1 in 7 working people have a job in (health)care; in 2040 this needs to be scaled up to 1 in 4 people to deal with the care demand. Less people having to do the same amount of work results in a higher workload and consequently causes more absenteeism, burn-outs and other fatigue complaints. The COVID-19 crisis even increases the workload at the moment. The care demand gets worse when the increasing group of elderly gets multiple diseases or difficulties at once, due to the higher skill level that is needed from the caregiver. When looking at aging, the group of elderly in need in care is not the only group that is growing; the amount of retiring healthcare staff is increasing as well.

A logical solution would be a greater influx of new healthcare staff. Although the group of youngsters that decides to follow care- and welfare education is growing the past few years, it is still not enough to match the demands and fill the gaps (Sterenborg, 2021).

3.2 Housing market; no balance between supply and demand

'Many elderly people feel the need to live together/near other elderly or households, with facilities nearby'. (Rijksoverheid, 2019). Simultaneously, relatively young seniors (55+'ers), who are still in the middle of life and are vital, start to consider their future living situation; where, how and with whom do I want to live and grow old? They are already taking steps to be able to live independently and pleasantly in the future for as long as possible, thinking about and searching for housing types that can facilitate that. For elderly in need of (long-term) care (which already could be possible from a relatively young age) this can be a logical thought as well. Especially for this group, housing arrangements in combination with care facilities would be an interesting opportunity. ***Unfortunately, the current supply and construction of this type of housing/living for elderly (in need of care) is still lagging behind demand***, forcing the elderly to keep living in a family home which is not suited and destined for them. On top of that, it keeps this highly requested type of housing of the market, which already shows a significant shortage (Ministerie van Volksgezondheid, Welzijn en Sport, 2021).

3.3 Gap between current Dutch built environment and promising multi-generational living concept

The trigger for this research project, the implemented multi-generational co-living concept in the former nursing home Huis Assendorp, is already a step in the right direction; sustainable renovation of an existing building for a new way of housing and living for the elderly and other age groups. However, in this case, in which the new living concept is substantially different from the function it was originally designed for, the architecture itself is a bump in the road towards its full potential. A building which is not designed and constructed with its current (or future) function in mind will never function optimally (fig. 3.1). ***Here is where the gap is: while realised examples of this new, multi-generational living concept like Huis Assendorp show great potential for the elderly (in need of care), proper architecture and housing projects regarding this concept are missing in the Dutch built environment.***

So, as described do problems occur on both the small and bigger scale within the housing and care for elderly. These problems will grow as the years go by due to the aging of the elderly and the shortage in proper homes and health care workers. This design research will be done to discover possibilities for architecture to form a solution for the stated problems, on the physical level of the building as well as the social level of the people; possibilities to put it in practice. ***Architectural design will play a huge roll in facilitating this new concept of multi-generational co-living, as the current architecture doesn't support it.***

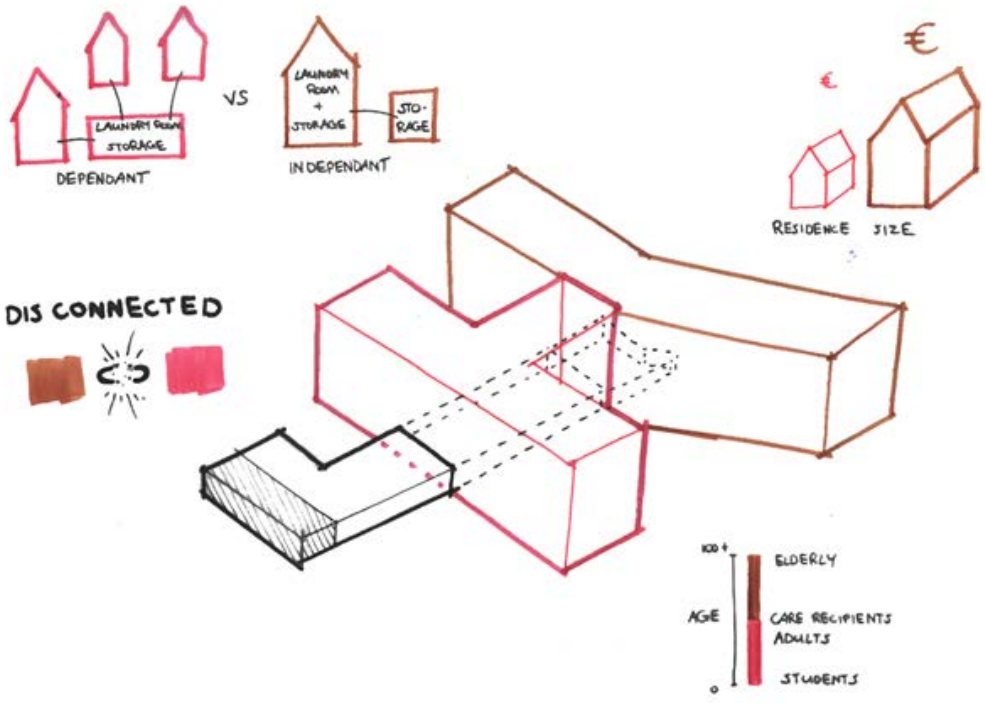


Fig. 3.1: The building's original architecture (lay-out, distribution of spaces/functions/residents) causes a disconnection, working against its current collective living concept (by author)

4 Research questions

The vast majority of the housing and care arrangements focusses on the target group of the elderly, instead of a mix of target groups. However, multiple studies show that the elderly are generally more interested in residential communities with young and old people mixed together, rather than those only with elderly people; to live, after their working life, in an environment that structurally provides more contact options in comparison to their previous place of residence. They want to stay connected with and contribute to society, which still seems to be a challenge. On top of that, mutual services contribute to older people being able to live independently for longer (Aedes-Actiz Kenniscentrum Wonnen-Zorg, 2008). Next to that, there are reports of psychosocial benefits of interaction between different, generational groups, including a broader view of self, reduced depression, an increase in social connectedness, increased positive thinking toward the other, reduced stereotypic thinking and more hope for the future (Knight et all., 2014). *Concepts and projects concerning 'multi-generational co-living' could bring these different target groups together, combined with the mutual benefits and opportunities these groups could bring to the table.*

4.1 Main research question

To properly find architectural solutions for the found problems, a focused research needs to be done, supported by several research questions, starting with the main research question.

How can architectural design effectuate multi-generational co-living in which elderly (in need of care) can live integrated and independent for as long as possible?

4.2 Definitions and terminology

Some terms from the main research question must be defined or made clear to be able to do a more focused research. The set definitions also form a frame of criteria as a base for setting up further sub-questions and for example the search for useful case studies.

4.2.1 'Architectural design'

The 'Master of Architecture in Collective Housing, MCH, a collaboration of Universidad Politécnica of Madrid (UPM) and Swiss Federal Institute of Technology (ETH) states the following description of 'architectural design': *'a mix of design, understood as the creative process, and architecture, which is based on the creation and presentation of built solutions at a technical level, that focuses on covering and meeting the needs and demands; to create living spaces, using certain tools and especially, creativity'.*

4.2.2 'Multi-generational'

The definition of this term is the following: *'consisting of, relating to or involving multiple generations, as of a family or society'* (Merriam-Webster dictionary, 2021; Dictionary.com, 2021). Connecting this adjective term with 'community', it tends to lean more towards the use of 'multiple generations of society', but this does not exclude 'multiple generations of a family' living (closely) together within a community. It can also be interpreted as 'multiple generations of a family, but from different households in society', for example a student, an adult couple and an elderly woman living in separate houses but within the same unit of dwellings, sharing several facilities.

4.2.3 'Co-living'

The term 'co-living' (or 'communal living) can be described as the following: *'the practice of living with other people in a group of homes that include some shared facilities (areas, rooms, equipment or services for particular activities)'* (Cambridge dictionary, 2021).

4.2.4 'The elderly (in need of care)'

The Dutch National Institute for Health and Environment sets the criteria for being 'an elderly person' as *'they were born at least 65 years ago'*, so 65 years old and above. However, when looking at 'the elderly in need of care' this number needs to be adjusted, as from the age of 75 the risk of illness and limitations clearly increases and the perceived health and physical quality of life decrease (RIVM, 2011). As this research is done in the field of 'Designing for Care', *the age of 75+* will be chosen to define 'the elderly in need of care' from now on.

4.3 Sub-research questions

A selection of research sub-questions is made to further elaborate/divide the needed background information to eventually find a suitable solution for the stated problems. These are the following:

1. Which age/generational groups would fit in a co-living community together with elderly people and why?

2. How can 'care' be categorized in 'formal care' and 'informal care' and to what degree does 'informal care' play a role in the care for elderly who need it?

3. What are suitable dimensions (numbers, size, density) for a co-living community?

4. Which architectural typologies could facilitate a multi-generational co-living community best?

5. Which variety and mix of dwellings, facilities and spaces should be offered to make the co-living arrangement meet the needs of the multi-generational target groups?

6. Which design features does the inclusion of care and support in a co-living environment entail?

4.4 Hypothesis

A hypothesis for this research and the supporting research questions would be an architectural typology designed in such a way, that it stimulates and facilitates social cohesion, interaction and care between the younger and older or stronger and weaker individuals within the community, without counteracting the possibility for privacy. Informal care from communal residents could replace some of the professional care less and less healthcare staff is able to provide. Furthermore, in this way the unprofessional care can be arranged among all age groups within the co-living project; adults to the elderly, elderly to the children, and so on. The elderly can still live independently with care nearby at any time, integrated with society due to all the other generations living besides them. The other target groups, like students or starters for example, could get subsidized to live in the community for doing communal tasks, providing help and care, while simultaneously getting a home in these times of great housing shortages.

5 Objectives, Methodology and Relevance

With the research questions and definitions being formulated, certain objectives will be set to give direction, aim and purpose to the subjects that will be covered. Thereafter, the methods that will be used to achieve the objectives and to find the answers to the questions will be discussed.

5.1 Objectives

Both the main and sub-research questions are composed with clear objectives in mind; goals, of which the combined entirety can eventually be used as a guide or 'toolbox' for the design process of the architectural project. These objectives will make the search for sources and (indirectly) the answers to the questions more focussed and will help to leave out any redundant information.
The following objectives are directly related to the sub-research questions from paragraph 4.3, using the corresponding numbers:

1. To discover which mutual benefits elderly (in need of care) and other, different generational groups show between each other, to eventually determine the composition of residents within the co-living community.

2. To find out in what way formal and informal care differ from one another, but most importantly how they overlap; to what degree informal care can be a substitute for formal/professional care.

3. To determine if there is a "golden number" regarding the size of a co-living group, at which it functions best on a social level.

4. To draw up a list of possible typologies that show the attributes to be able to facilitate housing and co-living for multiple households with different generations.

5. To discover which private, collective and public spaces should or could be present in a co-living arrangement and how these spaces interrelate with each other. Eventually this information could be the foundation of the program of requirements for the co-living project to be designed.

6. To determine architectural design tools to facilitate care and support in the direct living environment of the (elderly) co-living residents.

5.2 Methodology

5.2.1 Literature research

Literature studies will provide needed information regarding the concept of co-living in general and the multi-generational variant of it, in which different age groups can complement each other by living together and mutually support one another. This is especially significant for a project about elderly (in need of care) in an inclusive environment. Next to the composition of such a community, the dimensions of the co-living group is also something to look into; to determine the scale and size of the future project. Further research will determine in what degree 'informal care' from neighbours in the community can substitute the 'formal care' from professional care givers and where the lather is essential no matter what ***(Bonsang E. (2009), Does informal care from children to their elderly parents substitute for formal care in Europe?).*** Many of the sources contain fieldwork data from many different nursing homes and co-living arrangements.
The next step, after the social and care aspects, the field of architecture starts to play a bigger role in the research process. Starting on the largest scale, information about different co-living typologies will be gathered, including specific typologies for people/ elderly in need of care ***(Stavenuiter M., Van Dongen M. C. (November 2008). Gemeenschappelijk wonen: een literatuurstudie).*** Diving more into the architectural building itself, co-living shows a noticeable importance

for the balance between collectivity and privacy ***(Linden, K. P. (1992). Community and Privacy in the Swedish Collective House).*** This balance also impacts the spaces within the architecture; public, collective and private spaces, their function and the relation between them ***(Fromm, D. (1991). Collaborative Communities: Cohousing, Central Living, and Other New Forms of Housing With Shared Facilities.)***
The findings of the literature research will provide design tools in the form of schemes, diagrams and drawings to eventually combine and use in the architectural design process of the multi-generational co-living community.

5.2.2 Case studies

A useful source for finding design tools, next to literature, are case studies on recent architecture projects concerning the same subject of multi-generational co-living. The discovered information from the literature research will form criteria for selecting the cases and this same information can eventually be checked and compared with the designs of the chosen cases during the analysis as well. The most important topic for analysis will be the relation between collectivism and individualism (from the scale of the entire project to dwelling-scale), communal space/dwelling variety and distribution, the included outdoor space and presence of public functions for people outside the co-living group.

Criteria: the cases need to:
- be a co-living arrangement
- be a multi-storey building
- contain both communal functions/spaces and independent, private dwellings
- include a variety of dwellings to house different generational target groups within the project
- accessible for elderly to live in
- (bonus) contain care facilities and/or facilities for the surrounding neighbourhood

Eventually, two cases were found that met the criteria ánd provided enough material to actually do all the essential analysis. *The first one is a Norwegian project called 'Vindmollebakken', by Helen&Hard Architects.* This co-living arrangement consists of a variety of private dwellings surrounding a semi-public outdoor courtyard and an assemble of indoor, collective spaces. Different levels of collectivity and privacy can be found throughout the project, giving the residents the opportunity to live in a direct living environment they prefer, together with like minded neighbours. *The second project is located in Vienna and is called 'Zwei+plus', by Trans_city Architects.* Four comparable building blocks are placed in a way that they create semi-enclosed, green courtyards together with collective gardens and playing areas. Most of the collective functions are located on the ground floor. Examples of these spaces are assisted living for elderly, a common house/café and a kindergarten with playground. Residents settle in this project as pairs, resulting in a community with mutual support and company, where there is always someone familiar close-by.

5.3 Schematic overview

The diagram on the following page shows a total overview of the research structure (fig. 5.1). It includes from top to bottom:

- Main research question
- Sub research questions
- Hypothesis regarding the main research question, including its main focus points from the sub-questions, the problems concerned and how these interconnect
- Research methods

The scheme simultaneously implies the structure and order the following research chapters will contain. From left to right it starts with the social/people scale, followed up by the larger architectural scale (urban scale) and finally on the right is the smaller architectural scale (building and dwelling scale).
In this way the findings will start mostly textual and theoretical, but becomes more architectural and design orientated in the process of the research.

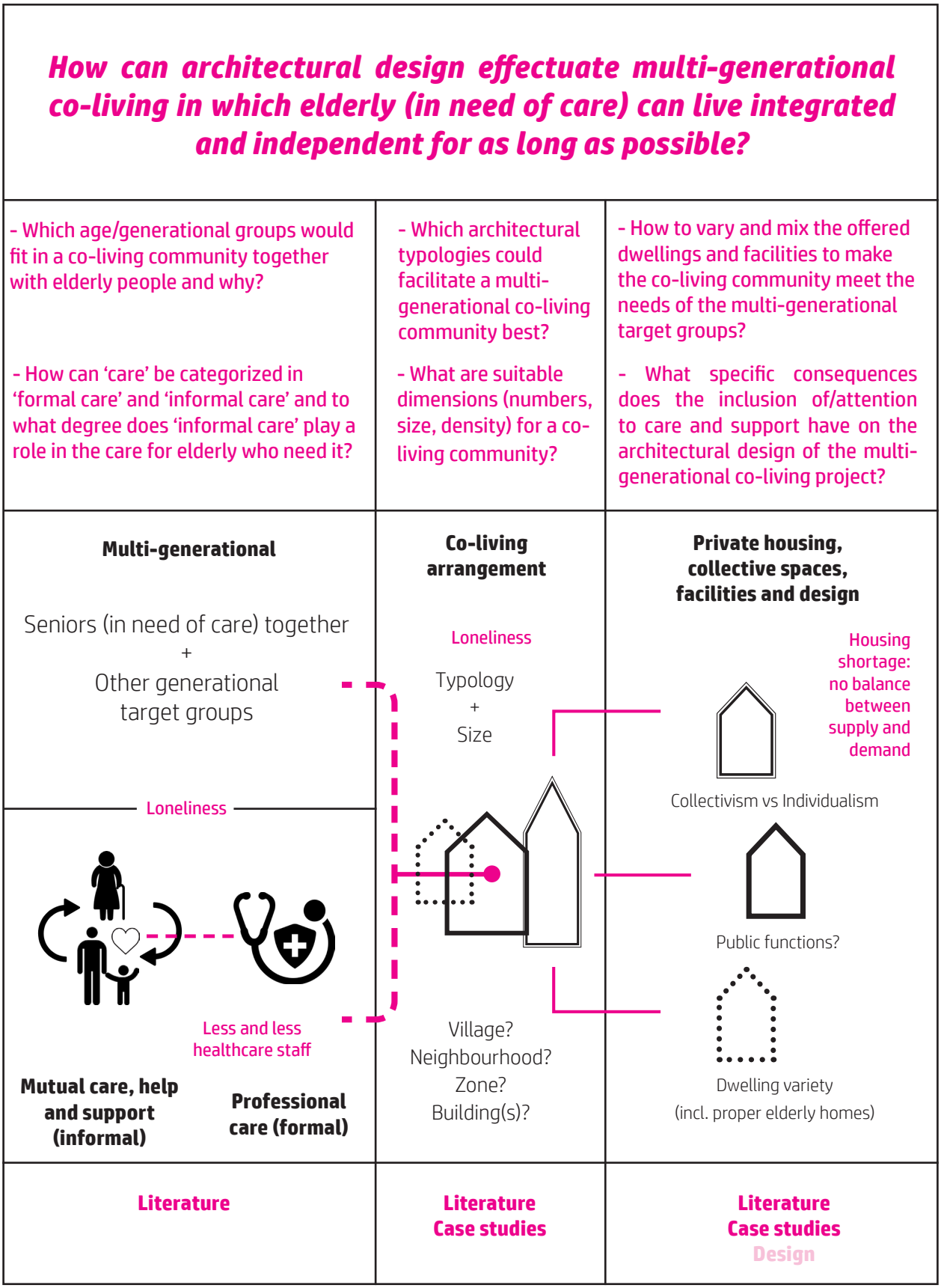


Fig. 5.1: Research structure overview, including from top to bottom: main research question, sub research questions, hypothesis + research subjects and their relations and finally the research methods (by author)

5.4 Relevance

The combination of an aging society, an ever improving health care system and a modern world in which autonomy, independence and freedom have great significance, results in a need for change in the built environment for the elderly. As mentioned in earlier chapters, many seniors who are living alone in a single family home (or with their partner) do not feel the necessity of living in such a relatively large house anymore. However, they are forced to stay there, because of the noticeable shortage of proper (and often smaller) elderly homes in the current Dutch housing market; a direct living environment which could contain economical, physical and social benefits for the elderly. Independent co-living for elderly with other generations currently forms a relatively new way of housing, but examples from countries like Sweden and Denmark show its opportunities for their residents and the surrounding community.

While studies on intergenerational activity, interaction and their mutual benefits are done, the role this can play in the daily lives and living environment of the elderly is still neglected. Especially the positive impact of architecture and its facilitating role in this scenario is barely explored.
Although there are experiments done where, for example, a small amount of students live together among elderly in need of care, which shows positive outcomes for both groups, the possibilities for multiple, generational target groups are still largely undiscovered. Residential care is a housing concept for the elderly that we are already familiar with for a long time, but combining this with the urge and wish of the elderly to live integrated with society, surrounded by a variety of households, is something that deserves more attention.

This research will therefore aim to discover how architectural design can create an environment in which the possible mutual benefits between different generations can add to the needs and wishes of the modern elderly (in need of care) and the role it can play in solving the problems our aging society is facing in the near future. Could multi-generational co-living be a “new product on the market” for people to choose as their way of housing and living? Could it form an appealing environment to both grow up and grow old in?

6 Multi-generational co-living: Group composition

The first part of this research is focused around the composition and members of a multi-generational co-living community with the emphasis on elderly in need of care. Specific generational groups and their social interaction, mutual benefits (and drawbacks) and overall role within a such a community will be discussed, as well as the position of (in)formal care within this particular living concept. Most information has been discovered through literature studies, of which many contain findings from fieldwork in countless co-living arrangements all around the globe and from different periods from the 20th and 21st century.

6.1 Co-living as a concept

The scheme of 'co-living' (or 'co-housing') can be described as a housing scheme in which people live together and share needed functions, but it is as cooperative as the residents like to make it. It is a type of housing that contains facilities and spaces for joint use by all inhabitants who are able to maintain their independence and privacy in their own houses and apartments as well: 'living together on one's own'. Other names for this same concept are 'central living', 'collaborated communities' and some even call it 'a small village', in which there is space for interpersonal companionship next to the private and public areas (Choi, 2004; Pedersen, 2015; Rusinovic et all., 2019; Labit, 2015).

Originally brought to daylight in Denmark, the concept of co-living has come to be from a desire for ***a practical and social living environment, as a possibility to strengthen social connections by shared activities and values, for getting to know one another, to learn from each other and to provide mutual assistance; between peers, but also between different generations.*** The feeling of community brings trust among its residents, which creates a sense of security and safety. Diversity in age, gender, etc. can make a community like this more sustainable and inclusive, while it also gives the residents a chance to get involved in the planning and everyday-management of their environment; doing things in groups for the common good and fulfilling responsibilities, causing a feeling of empowerment. In some countries like Australia and New Zealand they even see co-living as a solution for environmental issues and as a contribution to sustainability by sharing facilities, equipment and space (Choi, 2004; Labit, 2015; Rusinovic et all., 2019; Jolanki, Vilkko, 2015, Stavenuiter, Van Dongen 2008).

However, a sense of community can also bring conflict and disagreement, especially among different generations due to their different perspectives. This can include management issues, like the use of collective spaces or how the community should be run, or everyday problems, like noise or tidying. Fitting together individual wishes and needs and those of the community as a whole is not an easy job, but is essential for a community to be successful. To actively seek for solutions and to prevent it from getting out of hand, several researched communities showed the positive effects of specific methods like communication techniques under supervision of internal or external mediators or coordinators (Labit, 2015; Rusinovic et all., 2019; Jolanki, Vilkko, 2015). But environments where real people can live real lives is not a maximum controlled facility without risks and romances, even for elderly people; *'a certain degree of friction is what makes life lively'* (Arentshorst et all., 2019).

The opportunities for multi-generational co-living surely are there and the Aedes-Actiz Kenniscentrum Wonen-Zorg (Knowledge Center of Residential Care) (2008) expects communal living to play a bigger role in the housing market of the future. However, setting up such co-living communities needs a number of conditions to be met, with maybe most important the human factor; how are the living groups put together,

how will they function in a communal environment where individualism and collectivism have to balance and how will the elderly receive the care they need? (Labit, 2015; Rusinovic et all., 2019).

6.2 The multi-generational variant

Seniors, especially those who have lost their partner and who are not satisfied with their current social network, are more keen to live in a mixed-age environment than one only with other elderly people. Most of them want to continue contributing to and stay connected with society after their working life, while still living as independently as possible for as long as possible (Aedes-Actiz Kenniscentrum Wonnen-Zorg, 2008; Stavenuiter, Van Dongen, 2008). Furthermore, concerning the rights of the elderly, the UN states that *'Older persons should remain integrated in society, participate actively in the formulation and implementation of policies that directly affect their well-being and share their knowledge and skills with younger generations'*, that *'Older persons should be able to seek and develop opportunities for service to the community and to serve as volunteers in positions appropriate to their interests and capabilities'* and that they *'should be able to pursue opportunities for the full development of their potential'* and *'have access to the educational, cultural, spiritual and recreational resources of society'* (United Nations, 1991; Petersen et all., 2021). These significant wishes and rights of the older generation play simultaneously with contrasting demographic, economic, technological and social changes in European society, which have led to generations becoming more segregated from one another (Buffel et all., 2014). This is also concluded in a study comparing elderly living in sheltered housing and those living in community dwellings. First of all, the reported mental health of the elderly living in community dwelling was higher than those living in sheltered housing. Second, elderly only living with people of their own age unwillingly causes the elderly to become their 'ingroup'; the group of people they see themselves belonging to. As a result they might consider they are not attractive and interesting enough for younger people (their 'outgroup'), widening the gap between generations (Bodner et all., 2011). ***Well thought out and designed multi-generational interventions will therefore honour the rights of the elderly and could form a possible solution for the stated problem of segregation, closing the gap between older and younger generations by including them both in the same 'ingroup'. This could as well be an addition to the growing need of diversity in housing arrangements, in particular the residential care*** (Aedes-Actiz Kenniscentrum Wonnen-Zorg, 2008).

The following paragraphs will go through different generational groups, being seniors/elderly (in need of care) themselves, students and children (and their parents), and how they can mutually complement each other in social living and interaction (fig. 6.1). Furthermore the possibilities and opportunities for formal and informal care among the residents themselves and healthcare givers will be discussed.

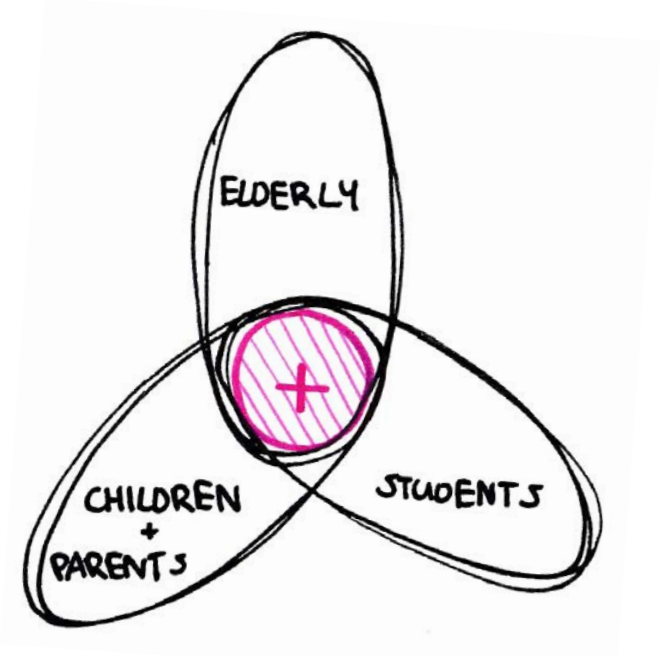


Fig. 6.1: Mutual benefits between different generational groups (by author)

6.2.1 Elderly (in need of care) together

More and more seniors are getting interested in living their later years in an environment where there is companionship with neighbours, mutual help, support and a feeling of security. This mutual attitude among the elderly is very common; maybe more on the basis of affinity than conscience collectivity. Especially the current generation of seniors, which lived through the important social changes of the '70s like feminism, ecology and have consequently rejected solitude and passivity, desire this companionship. Multiple studies on co-living conclude that it contributes to ageing well and heightens an individual's quality of life in later years (Choi, 2004; Labit, 2015; Pedersen, 2015).

Multiple researched studies involved results of questionnaires among residents from several different senior co-living arrangements and compositions. All of them show a strengthening effect on the social network among residents, who get to know each other well and more easily. Some move into such a

collective living environment with this specific social motive (Pederson, 2015). The social contacts and activities during the day for example are experienced as compensation for the more lonely hours in the evening, as most elderly live by themselves and/or have lost their partner. Apart from their private living situation, many seniors also experience a shrinkage of their circle of acquaintances and friends due to, for example, their decreased physical mobility. Emotional loneliness is a part of many elderlies' lives and can not be solved completely by co-living, but the easier access to emotional support and a feeling of cosiness and belonging to the community can definitely alleviate it (Rusinovic et all., 2019; Sung, 2015). The interviewees also stated that the way the community was set up made it relatively easy to make contact with their fellow residents if they wanted to and perceived them as *'more than just neighbours'; 'good neighbours' they trusted, who can easily look out for each other and who make people feel comfortable, safe and secure, which is particularly important for the weaker and older seniors* (Rusinovic et all., 2019; Jolanki, Vilkko, 2015). Especially this mutual support concerning both emotional and practical matters gives living in a co-living community such a positive look (Stavenuiter, Van Dongen, 2008).

While this communal character of a co-living arrangement has a lot of social and mental benefits for the elderly, the value of privacy can not be underestimated. Seniors need to be given the chance and possibility to withdraw from active life, because at a certain stage, a contemplative interpretation of life can be of great significance for the well-being of the elderly (Stavenuiter, Van Dongen, 2008). *The individual life, one's own time and space, needs to be balanced with the community life and a possible life outside the co-living community* (fig. 6.2) (Jolanki, Vilkko, 2015).

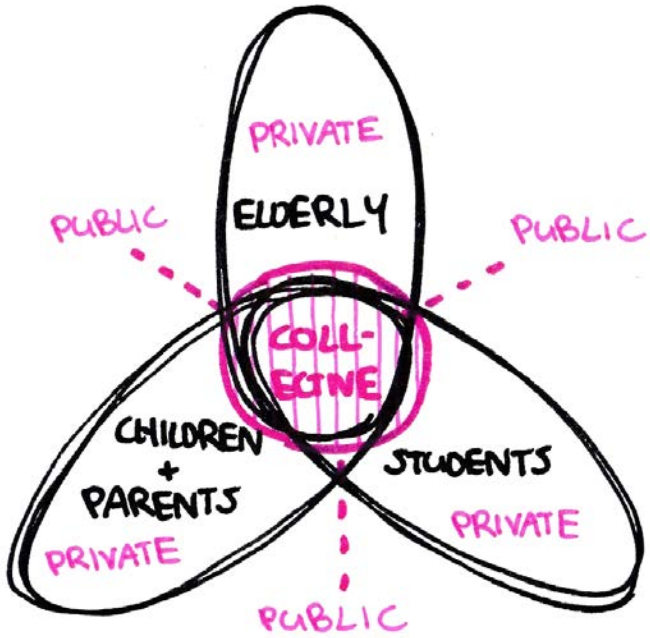


Fig. 6.2: Privacy and collectivity within the multi-generational co-living community, plus the possible space for the public/surrounding neighbourhood (by author)

Next to the social aspect, another attractive characteristic of co-living/-housing for the elderly is the shared spaces and utilities and therefore the smaller size of the personal dwellings. The smaller houses require less maintenance than the former houses of most seniors, which is often a reason for the elderly people to move to a co-living facility (Pedersen, 2015).

"Aging in place" is a concept that has become guiding policy concerning housing and care for the elderly;. It is about creating environments, including dwellings, in which seniors can grow old independently, receive services and in which their residence can be adapted to changing healthcare needs (Jolanki, Vilkko, 2015; Stavenuiter, Van Dongen, 2008; Buffel et all., 2014).

This all can be realized by giving the older generation access to enabling living environments; an environment in which the focus is on the value, possibilities and options of these people, instead of their disabilities, limitations and needed cure and care. This decreases the need for proper institutional living (Jolanki, Vilkko, 2015, Arentshorst et all., 2019).

6.2.2 Students and the elderly

An important aspect of living in a co-living community is not only interacting with people who show similarities, but maybe more important is getting to know new people, with different abilities, competencies and life experiences: people who have different perspectives on things. Residents who have been living in a co-living community for quite a while state that the sense of community is a continuous process developing over time, strengthening its social capital. Living there gives them a chance to learn from each other, but also to share their knowledge, contributing to the community (Jolanki, Vilkko, 2015). A well fitted generational group to combine with elderly would be students. The difference in age is large, meaning that the students have grown up in a totally different era and environment than the elderly and are in a different stage of their life. However, at the same time, the students are old enough to share their different experiences and skills by being able to join adult conversation (Buffel et all., 2014).

A case study on 'Humanitas' in Deventer, a co-living and residential care facility for elderly and a couple of students, show that ***the daily lives of the students and the interaction with them adds a whole new level of experiences to the elderly and skills they are able to learn from them.*** One paragraph of this document clearly shows the variety of social interaction between these two generations: *'Instead of having no new conversation subjects except different medications and doctors' appointments, the love lives of the students are the subject of the day and reconnect the residents with their own romantic selves and remembering their own youth, including pick-up lines. The students share their experiences when coming home from class, a concert, or a party and form a connection to the outside world for the elderly residents. They also help residents with their computers, tablets, and telephones, which, for example, resulted in online connections between residents and students via Facebook and Instagram, and other digital connections of residents with family and friends. Together the residents and students play games, both traditional Dutch games and college drinking games, go to the shopping mall, go to restaurants, and so on'* (Arentshorst et all., 2019).
Next to the social and practical benefits students can give the elderly people, living in such a community also has very particular advantages for the students themselves. Student housing in The Netherlands has always been limited, expensive and most rooms are tiny. ***Multi-generational co-living communities make it possible for this younger generation to find an accommodation where they do not pay with money (or pay remarkably less), but with their time and by being a 'good neighbour'. Successful initiatives like 'Humanitas' show a stimulation in solidarity between young and old and both generations valueing the mutual companionship they have*** (Arentshorst et all., 2019).

6.2.3 Children (+ parents) and the elderly

Another age group that shows mutual benefits in social interaction with elderly are children. ***The intergenerational relations between seniors and children are notably relevant since both groups are characterized by need for close long-term connections, an urge for teaching and learning and more leisure time, creating a natural and reciprocal partnership between the two*** (Peters et all., 2021). Evidence shows that the inclusion of both younger and older people makes for a more sustainable community, as they normally both tend to have less access to services and resources and living within a community or neighbourhood is especially important for elderly and children. Despite the relatively large amount of time both age groups spend in their neighbourhood, they are the last to be involved in any decision-making concerning the neighbourhood or society; they are 'being part of the city', but are often excluded from 'taking part in the city' (Buffel et all., 2014). Multi-generational co-living is a concept in which the youngest and oldest generations can be more involved in the management of their own housing and living environment.

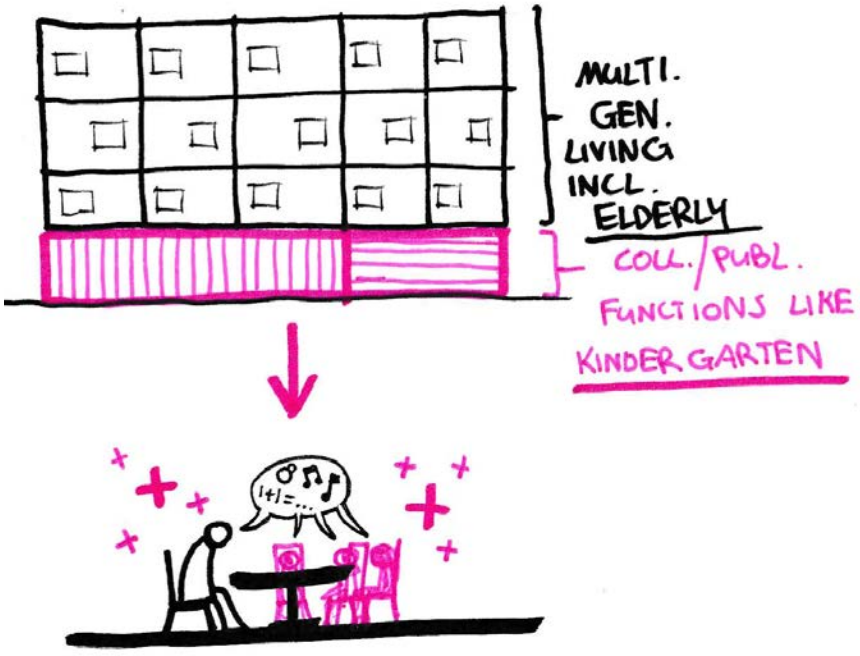


Fig. 6.3: (see also case study 'Zwei+plus', paragraph 7.3.2) A multi-generational co-living arrangement combined with a collective/public function like a kindergarten would facilitate social interaction and mutual benefits between young and old (by author)

Multi-generational co-living could be seen as an indirect method of (non-familial) 'intergenerational practice', which can be defined as *'an active process that aims to bring people together in purposeful, mutually beneficial activities which promote greater understanding and respect between generations and contributes to building more cohesive communities'* (Peters et all., 2021). At the base of this inclusive method are the positive qualities both the younger and older generation have to offer each other and everybody around them (Peters et all., 2021). ***An example of this method can be seen in activities showing a mentor-mentee companionship between seniors and children: while the sharing of their wisdom and knowledge results in a feeling of healthy aging, increased well-being and integrity of the older generation, the use of this new learned knowledge leads to a sense of development of purpose and personal meaning in the younger generation*** (fig. 6.3) (Knight et all., 2014; Sung, 2015). Research from Generation United shows that young children who lived and interacted with elderly in multi-generational facilities achieved higher social and personal development by 11 months in comparison to those who lived in regular dwelling. Children who only have interaction between themselves are missing opportunities to learn cultural values from the older generation and get a more complete view of the world of adulthood (Sung, 2015). Starting at an individual, new knowledge will always flow into their social network and the community as a whole; friends, family, classmates, etc. (Buffel et all., 2014; Sung, 2015).
Multiple studies on the interaction between elderly and younger generations have resulted in a list of social, mental and, consequently, sometimes even physical benefits for both age groups.

Benefits for the elderly (Peters et all., 2021; Knight et all., 2014; Buffel et all., 2014):
- *Perceived usefulness, development and growth*
- *Enhanced self-esteem and self-worth*
- *Reduced loneliness, depression, anxiety and boredom*
- *Improved communication and transfer of knowledge*
- *Appreciation for diversity*
- *Improved activity/physical functioning*
- *Reduced stereotypic thinking towards the other generation*
- *Hope for the future generations*

Specific benefits for children (Peters et all., 2021; Buffel et all., 2014):
- *Reduction in age stereotyping*
- *Intergenerational solidarity*
- *Improved empathy and self-esteem*
- *Improved sense of social responsibility*
- *Better school results/attendance*
- *Less involvement in offending and drug use; better personal resilience*

6.3 Care: formal and informal

Socializing, talking, sharing and all other forms of social interaction are important for every human being, although there is a subject which gets even more significant as people get older: care. In general, as people age, especially above the age of 75, the risks of illness, limitations and overall weakness naturally increases and the independency declines. The aging population in The Netherlands causes a remarkable growth of this particular age group as well as the labor that is needed to fulfill their (long-term) care needs (Arentshorst et all., 2019).

6.3.1 Exclusive elderly co-living: drawbacks

Research shows noticeable drawbacks for the elderly in terms of care related factors in co-living arrangements where only seniors live together. The high average of age of the inhabitants can cause a handicap in the group, as a large part of the inhabitants might have to deal with the same limitations and difficulties simultaneously. Many elderly worry about independency, asking themselves what will happen when they get mentally or physically incapable; if they are still able to contribute to and participate in the group or community (Labit, 2015). However, also the difference in health can cause problems among the senior residents. The signs of disability from fellow residents, their 'ingroup' (see paragraph 6.2), can be perceived as characteristics and symptoms of old age, causing the healthier seniors to label them as such and avoid them. *'When we run out of positive perceptions of our 'ingroup', we prefer to desert it or try to decrease our sense of belonging to it.'* (Bodner et all., 2011) With severe care needs, proper care services and facilities are essential, something not included in a general (senior) co-living arrangement. ***The risks and flaws of a homogeneously aged community could indicate that more variety in the group is necessary and a multi-generational composition could be a suitable solution, especially those in which proper care facilities for the residents are included (fig. 6.4)*** (Rusinovic et all., 2019).

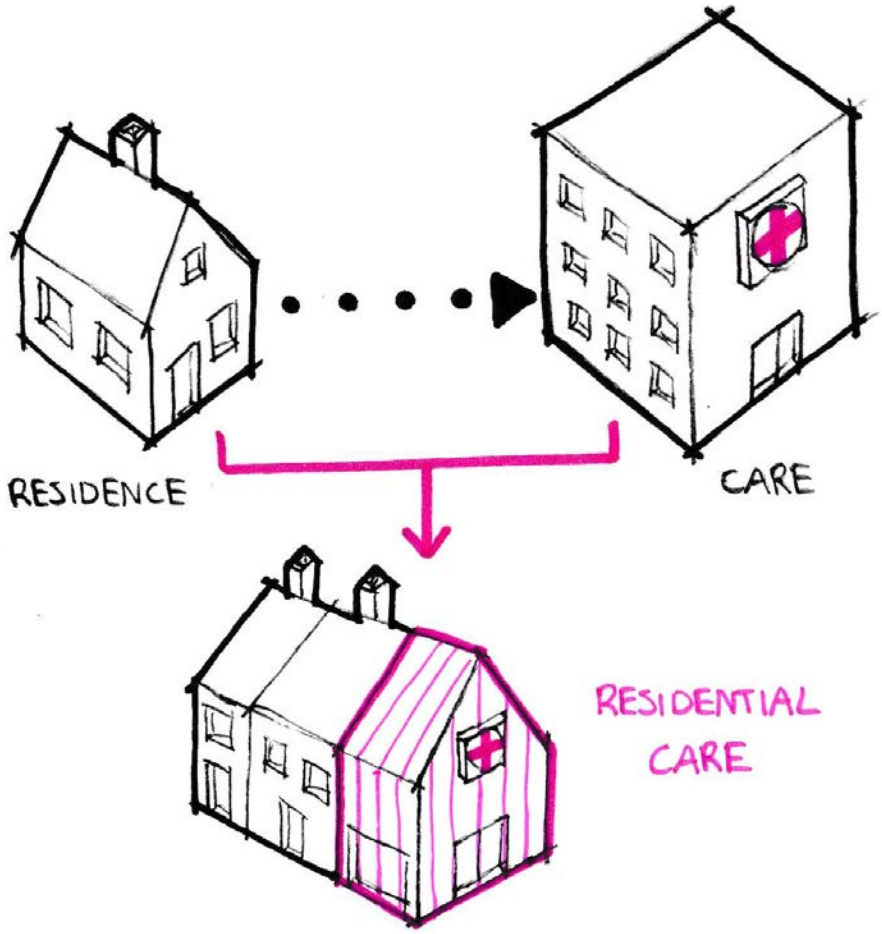


Fig. 6.4: Residential arrangements, in which care facilities are included, as a possible typology for improving home care for the elderly (and others) in need of care (by author)

6.3.2 Multi-generational care and support

The mutual and reciprocal characteristics of multi-generational co-living, as described in the previous paragraphs, can help the residents by prolonging their independence in daily life and postpone the moment external services are needed (Choi, 2004; Aedes-Actiz Kenniscentrum Wonen-Zorg, 2008). Possibilities to combine both the informal and formal side of care are shown in the previously mentioned concept 'Humanitas' in Deventer for example. The people from 'Humanitas' state that their *'...health care delivery changed from care provided TO people to care provided FOR people'*, by the healthcare staff as well as the residents (Arentshorst et all., 2019). They changed the meaning of needing and receiving care from something negative to being able to live a life based on needs, wishes and abilities; not dis-abilities. All this has been developed as a reaction to the more generally known 'serviced housing' of seniors, in which elderly in need of care are "objectified" and receive the most cost-efficient help, as well as the less available staff (Arentshorst et all., 2019; Jolanki, Vilkko, 2015).

6.3.3 Formal vs. Informal care

To get more information about the role of different care givers within a multi-generational co-living community (the residents themselves and the healthcare staff), the difference between formal and informal care needs to be clarified first. The study of Brenda Roe et all. (2001) 'Elders' perceptions of formal and informal care: aspects of getting and receiving help for their activities of daily living' gives clear definitions of 4 different kinds of care (most) elderly come in contact with:

- Formal care: *'health or social care that is provided by unlicensed or licensed (registered) professionals under the direction of a health professional'*

- Informal care: *'care provided by people known to the elders from informal networks such as family, friends or neighbours or unlicensed (unregistered) personnel, as part of a community care program'*

- Personal care: *'assistance with personal activities of daily living, such as assistance with personal hygiene or bathing, dressing, mobility which includes locomotion and transfer, going to the toilet and feeding'*

- Instrumental care: *'assistance with instrumental activities of daily living, such as assistance with using the telephone, shopping, meal preparation,*

housekeeping, laundry, taking medication, managing transportation or financial affairs' (Roe et all., 2001) ***Formal and personal care often go hand in hand, which is also the case with informal and instrumental care. The differences between the types of care set the first boundaries between what can be expected from fellow residents to provide or help with and what not.*** Personal care, like assistance with dressing or bathing, is seen as something done by professionals (or close family), as most tasks involved have a higher level of privacy. Instrumental care on the other hand involves more everyday tasks, with which a wider group of people could assist; friends or neighbours for example. Seniors could help young parents with childcare, as they often become 'adoptive grandparents', while young adults or students can help the elderly with daily chores or teach them modern technology skills. ***However, the closer the relationship between non-familial residents, the more the limits of care and support can be stretched*** (fig. 6.5) (Aedes-Actiz Kenniscentrum Wonen-Zorg, 2008; Sung, 2015; Labit, 2015; Pedersen, 2015; Rusinovic et all., 2019).

While the difference between formal and informal care is clear based on the definitions, more important is the question in what degree could informal care by non-professionals be a substitute for formal care by professionals. This is the same question Eric Bonsang asked in his research called '*Does informal care from children to their elderly parents substitute for formal care in Europe?*' (2009). Bonsang concludes his research by stating that there is a substitution interrelation between formal and informal care: *'informal care is found to decrease low-skilled home care use (paid domestic help* (instrumental care)*), while it is a complement to high-skilled home care* (nursing/ personal care). This interrelation also depends on the physical/mental disability level of the elderly person involved. When the level of disability gets too high and the burden for the senior's children (or, partner/ close neighbour/friend) as care giver becomes too heavy, then the situation requires high-skilled care, which only professionals can give. The informal care giver keeps contributing to the care together with the professional though, as this relative or close friend helps to protect the elderly's autonomy. As a suggestion for the aging population, Bonsang ends his article with the following: ***'...substitution between informal and formal care only holds for unskilled care for elderly suffering from low disability level, limiting the potential role of informal care to cope with the future needs of the growing share of older individuals in the population'*** (Bonsang, 2009).

Solidarity between generations, between residents and between functions does not come naturally, especially if proper services for elderly in need of care have to be implemented as well. This uncommon co-living environment needs extra attention to design and use of private and collective spaces, communication, mutual support and involvement in the community. At different levels, all this needs be thought out and organized right from the start; first by the architect and afterwards the users of the project (Labit, 2015).

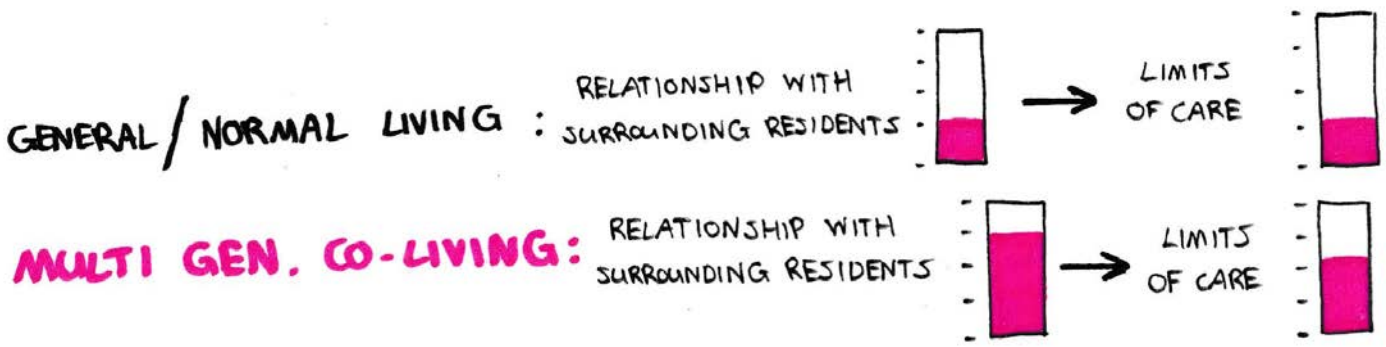


Fig. 6.5: Correlation between the level of relationship with surrounding residents and the limits of care giving; general/normal living vs multi-generational co-living (by author)

6.4 Co-living community dimensions

6.4.1 Group size

The social and mental benefits different generational groups can provide to each other does not appear out of thin air. Social interaction has to occur to share thoughts, values, opinions and knowledge, which are the ingredients for complementing one another. ***Something which significantly influences social interaction is group size; the size of the community in this case. Communities which are too large tend to result in less social interactions, as residents are more unknown to their fellow inhabitants. Consequently, this causes more anonymity among the residents and a smaller tendency to socially interact. Very small groups, on the other hand, will often face another problem: a lack of privacy. This may cause a conscious decision to withdraw from or avoid socially interacting with others*** (Williams, 2005).

A researcher that more or less draws the same conclusions about group and community size is Dorit Fromm in his book *'Collaborative Communities; Cohousing, Central Living and Other New Forms of Housing with Shared Facilities'* (1991). Being a relative early source of information regarding collaborative living, this book primarily uses references from the precursors of the concept; Denmark, Sweden and later The Netherlands. *'The differences in sizes are connected to cultural biases, to different ownership types and to the degree of collaboration felt necessary'.* In general, Fromm states that community sizes can be categorized into the following three scales:

- Up to 15 households: communities that are more intimate, but show more social friction as well.
- 16 to 35 households: a community which is small enough for all the residents to know one another well, but it also gives them the chance to determine their level of association and commitment to the group.
- Over 35 households: communities that can afford more and larger shared facilities, however a bigger part of the inhabitants will not participate as much in common activities, like dining, or in the community in general.

These categories are established by a huge set of examples and references, ***but the amount of community residents can reach up to 200 people.*** Both the Dutch and Swedes mention reasons for significantly larger community sizes above 35 households. *'Fifty families is a golden number. With fifty households we can give a concert for the whole community, but not twenty. We couldn't keep our bar open three nights a week or have as many cultural evenings. With too many more, you forget who is who; with fewer dwellings there are fewer possibilities to create common facilities'* and '*You have to take the long view. In fifty years, a community of 200 will remain, whereas smaller communities of 10 or 30 families will disappear'* (Fromm, 1991).

The number '50' as the right size for a community/ co-living group has also been established in a study from Robin I.M. Dunbar and Richard Sosis (both anthropologists) called '*Optimising human community sizes'* (2017). In this study, large sets of data from three kinds of collective societies, dating back to the 19th century, were used and compared with pre-determined data from other studies regarding hunter-gatherer societies. Their leading question was: *'Do such communities have an optimal size, and hows does size affect community survival and longevity?'.* As results, the moment and size of the community during a fission (splitting of the total group into multiple 'daughter communities' with different locations) were most important. ***The values of 50, 150 and 500 were suggested and concluded to be optimal sizes for a community*** (of which the 500-value was related to the entirety of a town or village). Communities exceeding 150 individuals functioned less well, both socially and economically, '*...because basic relationships of kinship and affinity were insufficient to maintain social cohesion'.* (Dunbar, Sosis, 2017). At this point, communities with comparing sizes fissioned into smaller daughter communities to make them more socially (and economically) viable individually and to increase their changes of survival and longevity (Dunbar, Sosis, 2017). ***According to this study, a multi-generational co-living group or community would function best with a total amount of residents of 50 or 150. This could eventually result in a larger, singular building with approximately 150 residents or a project including multiple buildings, each with around 50 inhabitants functioning as a socially stable, co-living group (fig. 6.6). However, combining the different studies together, a conclusion can be drawn that there is no ideal community size and a large set of data from realised co-living projects supports this statement (fig. 6.7) (Fromm, 1991).***

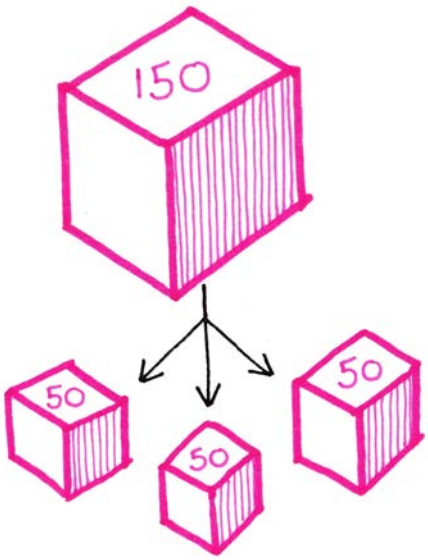


Fig. 6.6: Optimal community sizes; bigger value of 150 individuals split in three equal values of 50 (by author)

Typology is another factor that can influence the co-living group dimensions. The mid-rise (or high-rise) projects known from Sweden are able to cope with a '*denser population*' because of both the horizontal and vertical circulation through the buildings. ***A higher density** of population in co-living is often achieved by clustering houses closer together; next to each other, on top of each other or a combination of both. Higher density projects have multiple advantages:*

- Cost savings as more people use a smaller area of developed land
- More space for qualitative outdoor space for common use by all residents and people from the surrounding neighbourhood
- A greater, possible variety in residents

(Fromm, 1991)

Table 2.1 Data for Danish Collaborative Housing

Project	Ownership[a]	No. of Residents	No. of Units	Site Size: Square Meters	Site Size: Acres	Building %[b]	No. of Units: per Hectare[c]	No. of Units: per Acre	Land Purchased
Andedammen	Co-op	51	18	6,400	1.59	32	28	11.33	1983
Askebakken	Co-op	44	17	4,820	1.19	35	35	14.16	1983
Bakken	Owner	88	28	22,000	5.44	17	12	4.86	1976
Blåhøjen	Co-op	74	25	10,000	2.47	25	25	10.12	1983
Bofælleden	Co-op	31	8	9,500	2.35	14	8	3.24	1980
Bofællesskabet I Gug	Owner	66	22	17,000	4.20	16	13	5.26	1979
Drejerbanken	Own/rent	50	20	15,000	3.71	15	13	5.26	1976
Drivhuset	Co-op	51	18	10,600	2.62	20	17	6.88	1983
Fladengrund	Owner	45	12	12,300	3.04	14	10	4.05	1979
Frugthaven	Owner	45	12	14,000	3.46	14	9	3.64	1977
Gyldenmuld	Owner	49	12	15,000	3.71	12	8	3.24	1975
Gyndbjerg	Owner	54	14	11,100	2.74	22	13	5.26	1976
Håndværkerparken	Rental	55	32	7,599	1.88	33	42	17.00	
Ibsgården	Co-op	53	21	6,040	1.49	33	35	14.16	1982
Jerngården	Owner	28	8	2,300	0.57	44	35	14.16	1976
Jernstøberiet	Owner	53	21	8,150	2.01	29	26	10.52	1980
Jystrup Savværket	Co-op	70	21	12,500	3.09	17	17	7.00	1981
Kolbøtten	Owner	26	6	6,960	1.72	14	9	3.64	1980
Leerbjerg Lod	Owner	104	30	28,000	6.92	14	11	4.45	1977
Mejdal	Owner	48	12	13,900	3.43	14	9	3.64	1977
Nonbo Hede	Owner	54	16	22,000	5.44	11	7	2.83	1973
Nørgårds Plantage	Co-op	56	24	15,150	3.74	16	16	6.48	1981
Overdrevet	Owner	93	25	28,000	6.92	13	9	3.64	1979
Skråplanet	Owner	138	33	24,750	6.12	21	13	5.26	1968
Sol og Vind	Owner	96	30	20,000	4.94	17	15	6.07	1979
Stavnsbåndet	Owner	96	26	13,000	3.21	31	20	8.09	1977
Sættedammen	Owner	100	27	20,000	4.94	28	14	5.67	1969
Tinggården	Rental	218	79	25,600	6.33	32	31	12.55	1975
Tinggården 2	Rental	162	76	25,000	6.18	33	30	12.14	1982
Tornevangsgården	Owner	25	6	4,400	1.09	21	14	5.67	1977
Trudeslund	Owner	115	33	18,000	4.45	22	18	7.28	1979
Uldalen	Co-op	57	18	5,050	1.25	35	35	14.16	1982
Vejgård Bymidte	Owner	75	40	4,720	1.17	70	85	34.40	1981

Source: STATENS BYGGEFORSKNINGSINSTITUT (SBI Rapport 187).
[a]Owner: Similar to condominium ownership, where the resident owns the dwelling and has an ownership share in the common areas.
Co-op: Government financed where the resale value is restricted.
Rental: Owned by private nonprofit housing associations.
[b]The building percentage is the percentage of the site that has been built up.
[c]A hectare is a metric unit of area equal to 2.5 acres.
[d]Range = range of unit sizes. For square footages, multiply the square meters by 10.76 square feet.

Fig. 6.7: An example of the variety in dimensions/size of Danish co-living projects, highlighting the number of residents and dwelling units, varying from 6 to 79 units and from 25 to 218 residents (Fromm, 1991)

6.4.2 Generational group proportions

Suggestions and references for a co-living group size have been done, but the amount of future residents from the different multi-generational groups within the total project still has to be determined.

The aim for the co-living arrangement is to create an inclusive living environment for the elderly, of which a significant part will need care, surrounded by multiple generations from society: elderly themselves, students and families with children (mentioned in paragraph 6.2). A predicted division or prognosis of these age groups in our Dutch society of 2050 could provide needed information to determine the right group proportions. A diagram from the Central Bureau of Statistics (CBS, 2021) shows the observed ageing of the Dutch society and a prognosis up until around 2050. The prognosis shows that around this time close to 50% of the population is aged 65 or above in comparison to those aged from 20 to 65, while currently this value is around 33% (see fig. 1.1, in chapter 1). ***This value of 50% would therefore be the estimate of elderly (in need of care) within the multi-generational co-living project.***

Another set of data, also provided by the CBS (2021), shows the current age group-division of the neighbourhood where the multi-generational co-living arrangement will be located: Hillegersberg Noord, in Hillegersberg-Schiebroek, municipality of Rotterdam. The high percentages of the older age groups already show the ageing, but more important for now are the values of the younger age groups; the generational groups the elderly (in need of care) will live together with. ***The '15-25' category will be considered as the group of students in the co-living group (+/- 10%) and the '0-15' combined with the '25-45' for the families (+/- 35%), together forming 45% of the inhabitants within the neighbourhood (fig. 6.8) (CBS, 2021). As family households are obviously bigger than those of students, the 35% will be pushed to 40%, completing the multi-generational co-living group distribution to 100% (fig. 6.9).***

Residents by age:	Hillegersberg Noord
0-15	1145 (14,5%)
15-25	755 (9,6%)
25-45	1615 (20,5%)
45-65	2195 (27,8%)
65+	2185 (27,7%)

Fig. 6.8: Demographic data of the concerned project location Hillegersberg-Noord (CBS, 2021)

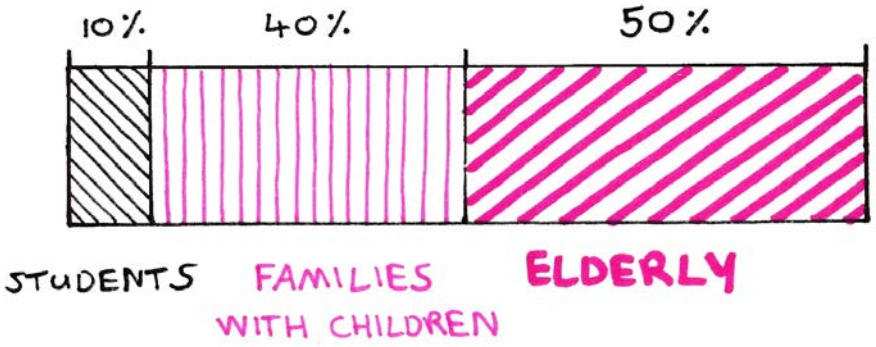


Fig. 6.9: Estimate of group proportions within the multi-generational co-living project (by author)

7 Multi-generational co-living: A built environment

The suitable members of a multi-generational co-living community have now been determined, including the social, mental and physical mutual benefits the elderly and other age groups have on each other, the informal care they can provide and the impact of the formal care. From this point onwards, the focus will shift towards the built environment for these particular residents and other stakeholders. A built environment for a mix of different aged people with a variety in daily lives, needs, wishes and necessities has to be designed in a way that it can facilitate all these demands, especially when the biggest group of people within this community consists of elderly (in need of care).

On the bigger scale, the architectural typology that can compose the different dwellings, residents and functions in a harmonious way is important. Concerning this composition, the role of individualism, collectivism and the so called 'transition-zone' in between the two (Lindén, 1992) has great importance. The distribution and design regarding these subjects will most of all determine the way people can interact with each other and the sense of community. This is already leaning towards the smaller scale; the scale of the building or buildings and the interconnection between the in- and external spaces. Next to the private dwellings of the residents and their shared spaces, the building or buildings could also contain functions more focused on the surrounding neighbourhood. This, together with analysis and research on both the big and smaller scale, will be looked into in the next paragraphs. Methods that will be used are literature studies together with case studies on projects with comparable target groups and living concept.

7.1 Typology

7.1.1 General co-living

The basic framework of a co-living arrangement is usually the same; a collection of private dwellings with most often their own kitchen and bathroom, accompanied with at least one communal facility. These *collective spaces and facilities might take up approximately 15-20% of the total floor space of the building, excluding exterior spaces* (Woodward et all., 1989). However, this framework can be further implemented in all kinds of different typologies, as several different studies have shown. Denmark and Sweden, the two countries where the concept of co-living has found its origin in the past, already show a significant difference in typology for such a community.

In *Denmark*, *low-rise dwelling units* are most frequently used in co-living projects. Often the housing units are positioned as clusters or row houses on the outer edges of the plot as a ring, leaving a collective area or garden with the common house in the middle, accentuating 'togetherness' as the social connection of the project (fig. 7.1). The common house is often placed on the corner of the building plot too, leaving the middle as an open, communal garden or square (Vestbro, 2000; Choi, 2004; Pedersen, 2015; Stavenuiter, Van Dongen, 2008). Residents of the communities, as well as the architects, mentioned it to be essential to pass or traverse trough the collective area, because it stimulates incidental meetings and interaction with fellow residents. It is also about social control; knowing and seeing what is going on in your housing environment (Pedersen, 2015).

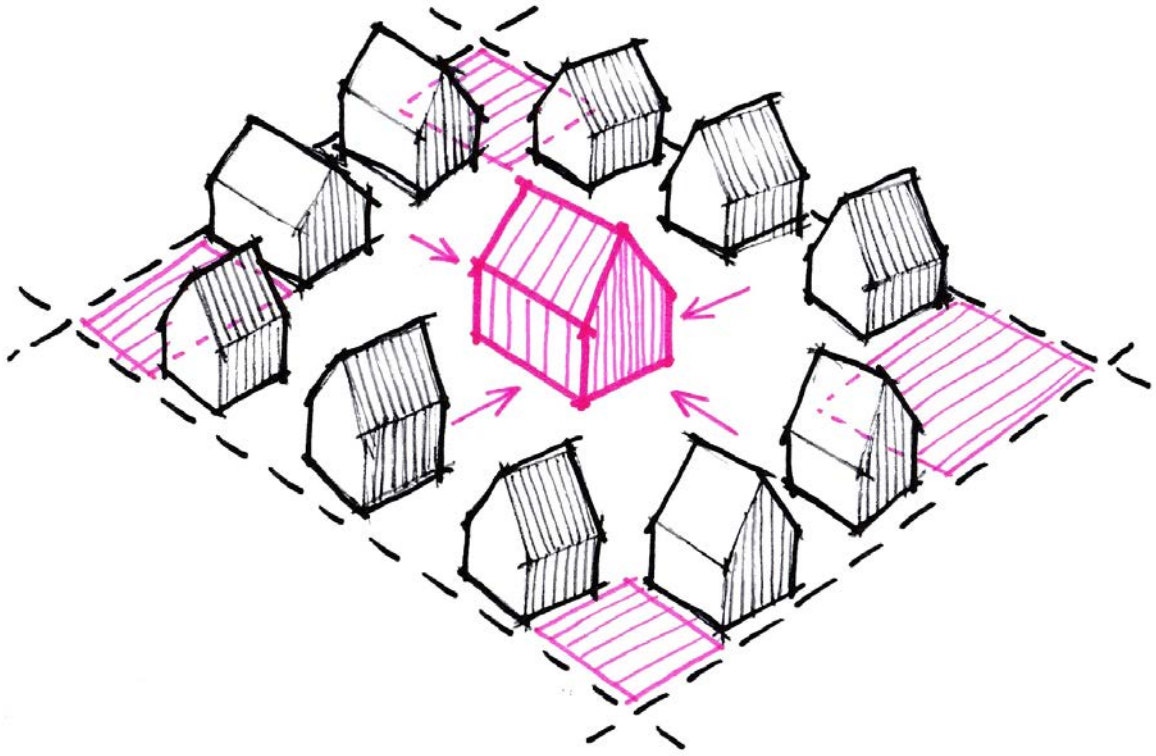


Fig. 7.1: Danish example of co-living: a common house surrounded by independent, private dwellings (by author)

In ***Sweden*** on the other hand, ***high- or medium-rise, multi-storey buildings*** are found more often as the typology for co-living arrangements. It causes the apartment-like dwelling units to get a higher density in the project, next to more direct, indoor communication between residents, collective spaces and communal facilities. Generally, the common house or main communal spaces are placed next to the entrance on the ground floor for easy drop-in (fig. 7.2), but this location can differ per project. Usually the private dwellings are smaller compared to the houses of the Danish 'ring'-typology (Vestbro, 2000; Choi, 2004; Pedersen, 2015).

Multi-storey buildings, however, increases the distance between the residents on higher floors and possible *'short-term and spontaneous, stationary activities (barbecues, socializing in gardens, eating outside private units and sporting activities/games etc.)* and thus decreasing the urge to join in. ***Low- or medium-rise buildings will result in a stronger connection between the private dwellings and the surrounding, collective outdoor (and indoor) areas, increasing the potential social interaction and the mental benefits that come with it*** (Williams, 2005).

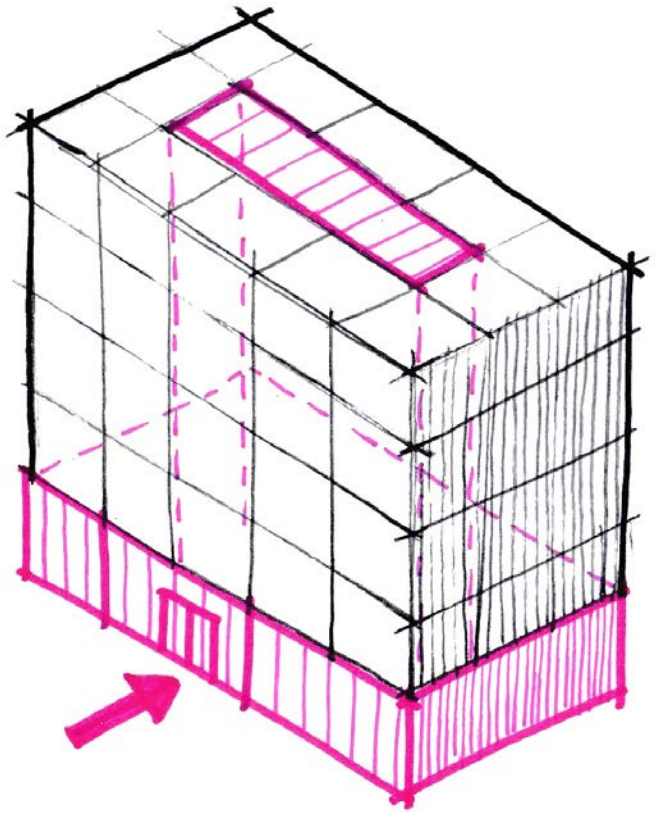


Fig. 7.2: Swedish example of co-living: mid- or high-rise buildings, generally with the common spaces on the ground floor (by author)

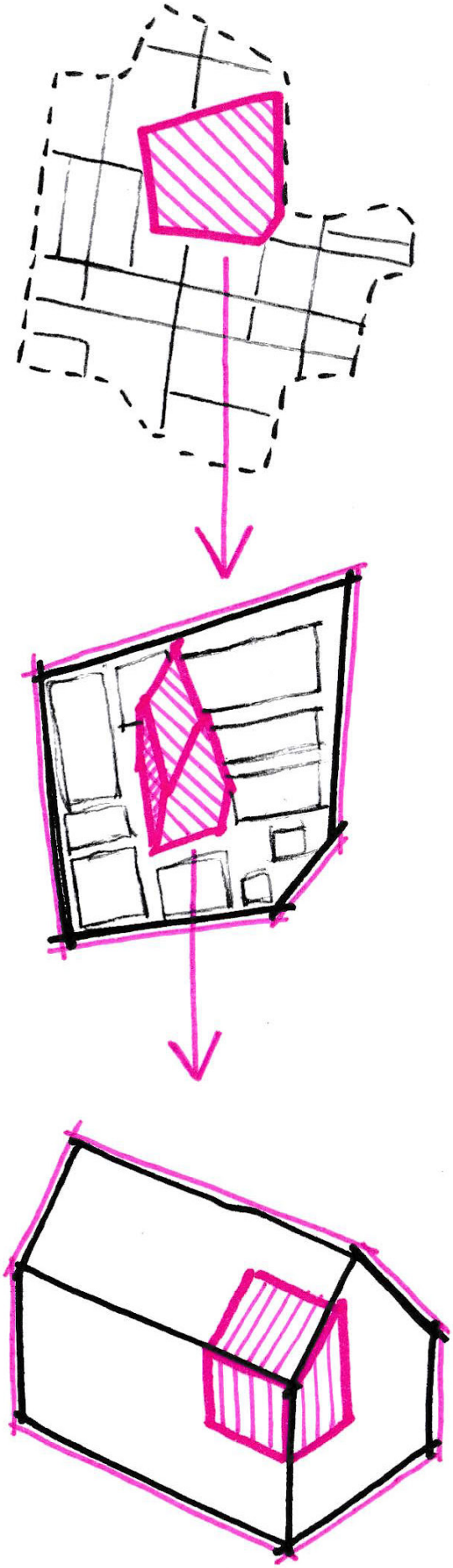


Fig. 7.3: From top to bottom: residential care zone, residential care complex and life-resistant homes (by author)

7.1.2 Co-living for elderly in need of care

The examples of Norway and Sweden already give a first view on the possible typologies for a multi-generational community, but what must not be forgotten is the important role and spot for the elderly in need of care within the project. A literature study by Monique Stavenuiter and Marie Christine van Dongen from the Verwey-Jonker Institute (2008), at the request of the Federatie Gemeenschappelijk Wonen (FGW; Federation of Communal Living), about this specific way of living and the opportunities it might have for the well-being and care position of the elderly, mentions different arrangements of residential care in different scales; the urban scale, building(s) scale and the individual dwelling (fig. 7.3).

- Residential care zone (urban scale): this typology does not only concern one building or set of buildings; it includes a (part of a) town, neighbourhood or street in which optimal conditions are created for living in combination with needs of care. So this not only includes the homes of the elderly, but also the surrounding living environment: (social) infrastructure, mobility, a variety of nearby facilities, accessibility (of public transport) and security. Often, public spaces in neighbourhoods for example are not designed to facilitate the needs of older (and younger) generations, making them feel out of place. Creating these spaces with all generations' needs in mind will result in more liveable and age-friendly urban areas (Buffel et all., 2014). Even the smallest, urban elements like street furniture can have a significant impact. A neighbourhood service centre or care support centre is often the core of a residential care zone, just like the common house/space forms the core of a co-loving project.

- Residential care complex (building scale): this typology is a step down in scale and consists of a complex of independent dwellings combined with care and service facilities within that same complex, which could in theory serve as care support centre for the surrounding neighbourhood. Attention has been paid to sheltered and safe living, with a contractual separation between living, care and service, but all are easily accessible as all functions are present under one roof. A built environment like this gives elderly people in need of care the chance to receive the (in) formal care and support they need at home and at the same time profit from the mutual, social and mental benefits co-living with other residents (and/or other generations) can provide. Mostly, these projects nowadays are new built and high- or medium rise,

thus containing at least one elevator next to the usual staircases to make all different floors easily accessible for everyone. Unfortunately there seems to be a shift to a higher level of privacy, resulting in bigger dwellings with more/better utilities at the cost of qualitative collective spaces and facilities; something that will not improve the sense of community.

- Life-resistant homes (dwelling scale): these are considered as dwelling typologies and can be described as homes that are suitable for daily living at old age. They can already be designed and built for people's later phase of life, but they can also be flexibly designed in a way that it is very easy to change specific interior elements in favour of the inhabitants' needs. The concept of 'aging in place' goes hand in hand with this housing typology for the elderly. Another housing typology that fits well with the life-resistant homes are the so called ***'kangaroo houses'***. Consisting of two independent but interconnected dwellings, this arrangement can house elderly (in need of care) together with their family/children or another younger household. In this way, if desired by both parties, there is always someone in the vicinity to help, support or provide some kind of care. Especially in combination with a residential care complex as a whole, this smallest scale typology could make any formal or informal care to be well within reach for the elderly (Stavenuiter, Van Dongen, 2008), no matter the level of illness or disability. (More info on the concrete design of these life-resistant homes will be discussed in paragraph 7.2.5).

7.2 Building scale

7.2.1 Collectivism and individualism

As residents of co-living communities have specifically chosen to live in such a collective environment, they must be well aware of the importance of the community socially functioning well and the significant role every individual inhabitant must and can fulfil. The high level of collectivism makes a co-living arrangement unique, but the possibility for individualism, privacy and to withdraw into an independent dwelling or other space in the project is as equally important (fig. 6.2). Every human is different, has different life patterns and habits, so everyone needs the freedom to organize their daily lives in their own way. However, in case of a co-living projects, the dedication for the community and the certain expectations that come with it have to be considered as well.

In 1992, during the relative early days of co-housing, Karin Palm Lindén did a Ph.D. thesis on the specific balance between collectivism and individualism, called *'Community and privacy in the Swedish collective house'* (Lindén, 1992). The most important questions asked in this thesis were regarding the spatial organization of the architecture to provide both privacy and community and how this lay-out facilitates and influences social interaction between the residents. ***Significant for this social interaction is the 'transition zone'; the area where private flows into collective/public and vice versa (fig. 7.6).*** The main research method Lindén used were case studies, including spatial analysis of ten chosen, co-housing buildings with different typologies and functional organizations. ***Lindén distinguishes between a 'tree-like' lay-out, seen in multi story buildings with one main circulation core between floors, and a 'ring road' lay-out, seen in multi story buildings with multiple, vertical circulation cores.***

Projects with the ***'tree-like' lay-out*** were concluded to be the most segregated, as the transition zone gets very deep, especially on the top floors, where the hallways may even feel semi-private. In taller buildings the common rooms were most often located on the lower floors, thereby positioned closer to the public areas outside the building then the actual residents' dwellings inside the building. This causes the collective rooms to attract people only when they pass the entrance, instead of when they reach their home. However, when positioned on a higher floor, the common rooms become more integrated and will probably be visited more spontaneously by the residents (fig. 7.4, 7.5).

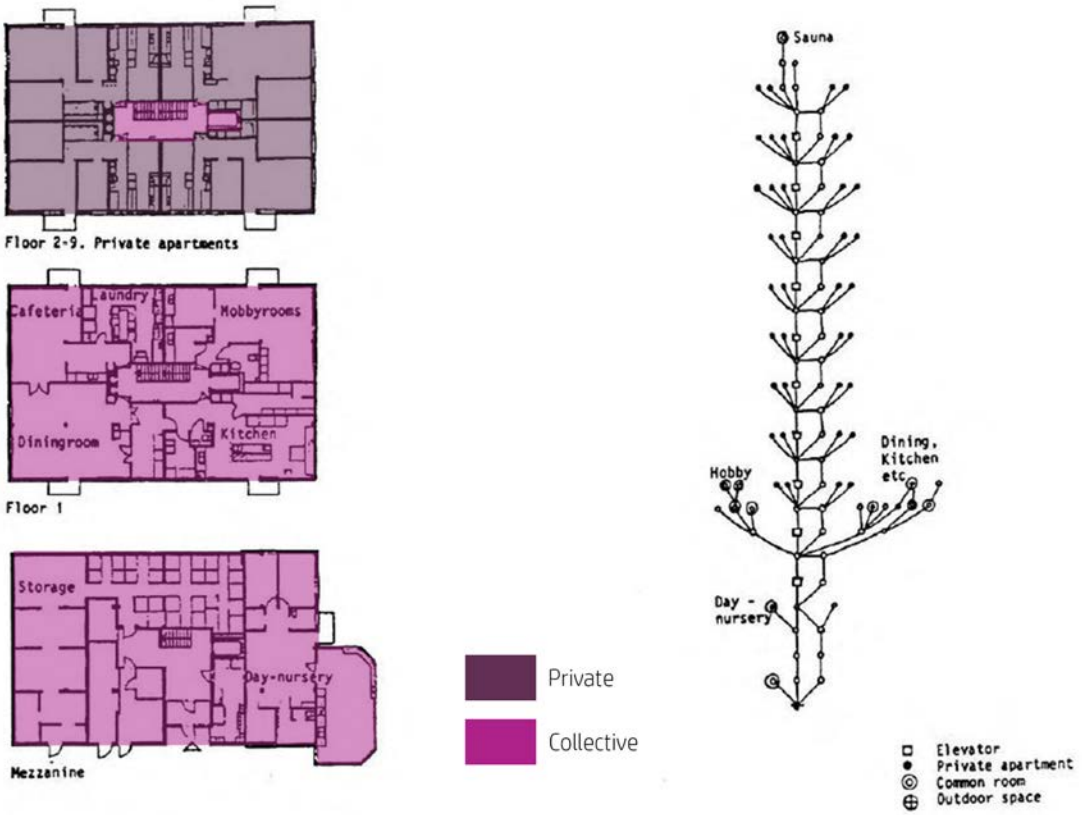


Fig. 7.4: 'Trädet', Sweden; typical floor plans + graph of 'tree-like' layout of the transition zone (Lindén, 1992) (coloured analysis by author)

Fig. 7.5: 'Stacken', Sweden; typical floor plans + graph of 'tree-like' layout of the transition zone (Lindén, 1992) (coloured analysis by author)

When the private dwellings are gathering around the common rooms, the organization gets more integrated and allows for more social control, increasing the sense of community in the building; ***'introvert'*** *when the collective rooms are distanced from the outside world and* ***'extrovert'*** *when the connection between the outside world and the private homes is comparable.* The distribution of spaces can in this way result in highly integrated common rooms, even when they are located on the ground floor. Combined with multiple vertical circulation cores (elevator and staircases), the integration level increases. Connecting these cores by a collective hallway or "indoor street" adds to the transition zone between private and collective on all floors and creates a choice of different routes, thus creating a *'ring road' lay-out* (fig. 7.7,7.8) (Lindén, 1992).

The transition zone (or semi-private/buffer zone) can function as a barrier to protect privacy and prevent overexposure, but on the other hand it can be an interactional space as well, being positioned adjacent to the collective or public zone. 'It increases the potential for surveillance of the public space for prolonged periods, which increases opportunities for potential meetings'. Being able to see and hear others from residents' private dwelling plays a significant role in creating a sense of community (Williams, 2005).

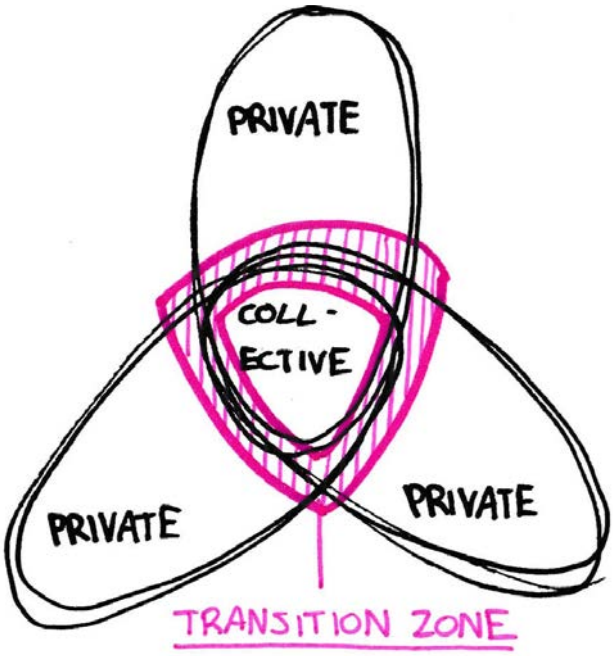


Fig. 7.6: The 'transition zone': the area where private flows into collective/public and vice versa (by author)

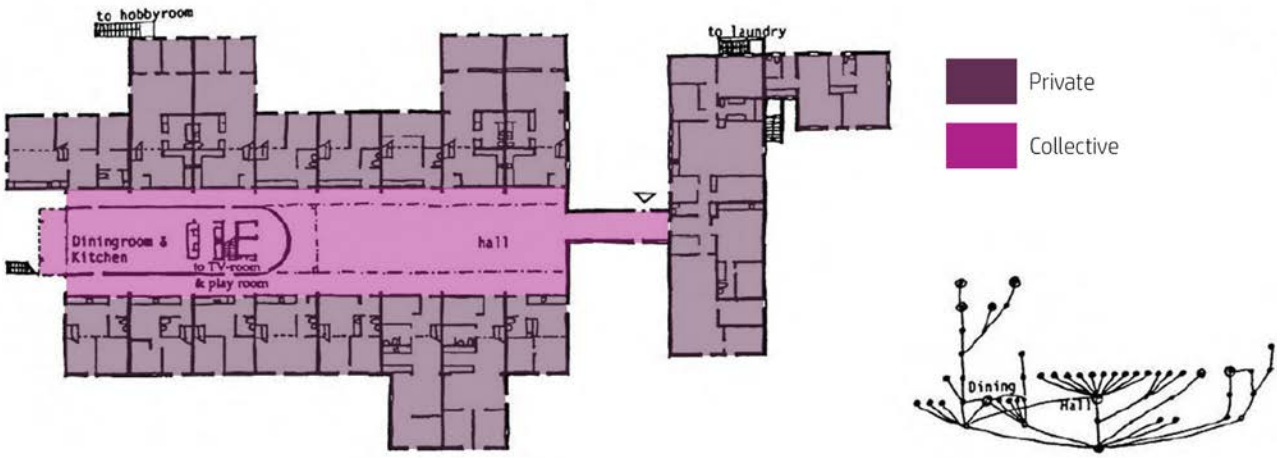


Fig. 7.7: 'Jernstoberiet', Sweden; introvert floor plan + graph of (semi-) 'ring-road' layout of the transition zone (Lindén, 1992) (coloured analysis by author)

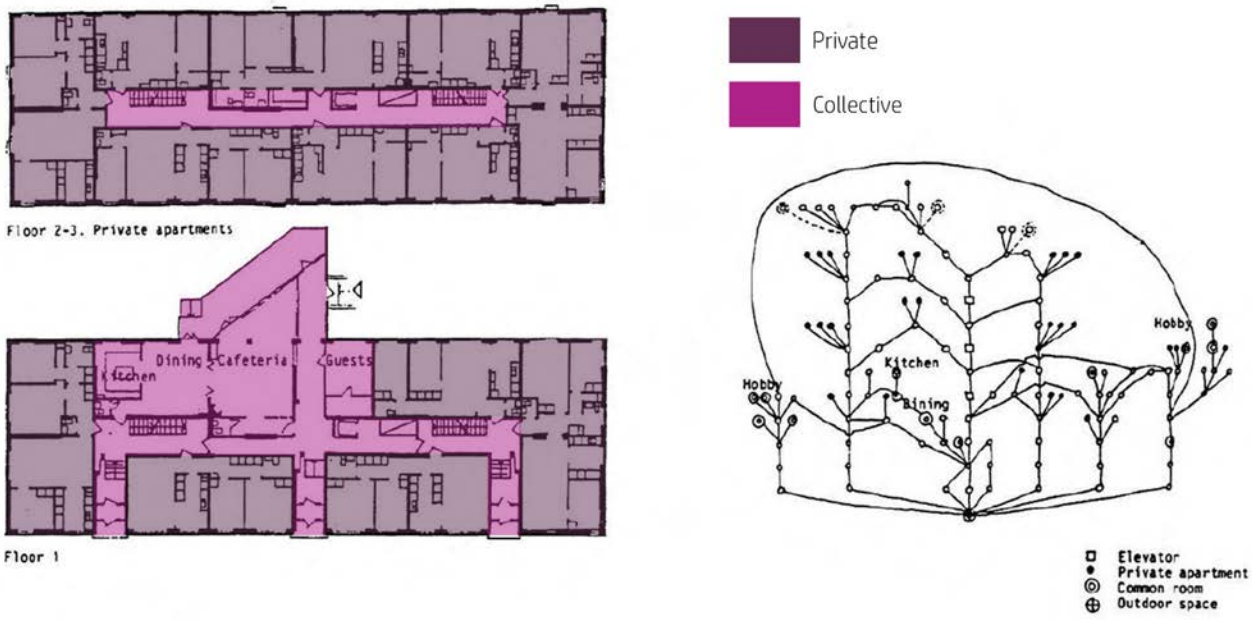


Fig. 7.8: "Yxan', Sweden; extrovert floor plan + graph of 'ring-road' layout of the transition zone (Lindén, 1992) (coloured analysis by author)

7.2.2 Social architecture

Residents living closer together, in whatever shape or form, have a greater chance of having a meeting with each other. This may implicate ***"physical distance', the literal measured distance from dwelling unit to dwelling unit'****, but another way of scaling togetherness is with* ***"functional distance': distance depending on positioned relationships determined by design'.*** These design aspects can vary endlessly; from the orientation of the dwellings' entrances to the similar routes residents take for daily habits or activities. The smaller the distance, the bigger the chance of a meeting and the higher the probability to form social connections or friendships with neighbours or other fellow residents (fig. 7.9) (Abu-Ghazzeh, 1999).

Decreasing both physical and functional distance, in other words 'increasing proximity by design', will increase the amount of *'passive contacts'* between people. For example, living next to a staircase within a building results in more spontaneous interaction with residents from upper and lower floors, while those who live more distanced from it will socialize more with their direct neighbours (Williams, 2005). While these staircases, or 'points of circulation', may increase the amount of meetings between residents, the more staircases there are in the building, the more routes the residents can take and the greater the level of privacy gets (fig. 7.10) (Fromm, 1991). *'A passive contact is the unintentional encounter of two persons. This unintended encounter presents the opportunity for acknowledgement of one another's presence and a chance to discover the others nature through observation and conversation... It is thus in determining the 'repeated occurrence' of passive contacts among individuals that architecture through physical and functional distance is expected to be an influential variable in the formation of social relations'.* (Abu-Ghazzeh, 1999). Architectural design must not force social connections, as this may conflict with some residents' level of desired privacy, but it should create an environment where repeated occurrences can take place to increase social connection and therefore the sense of togetherness and community.

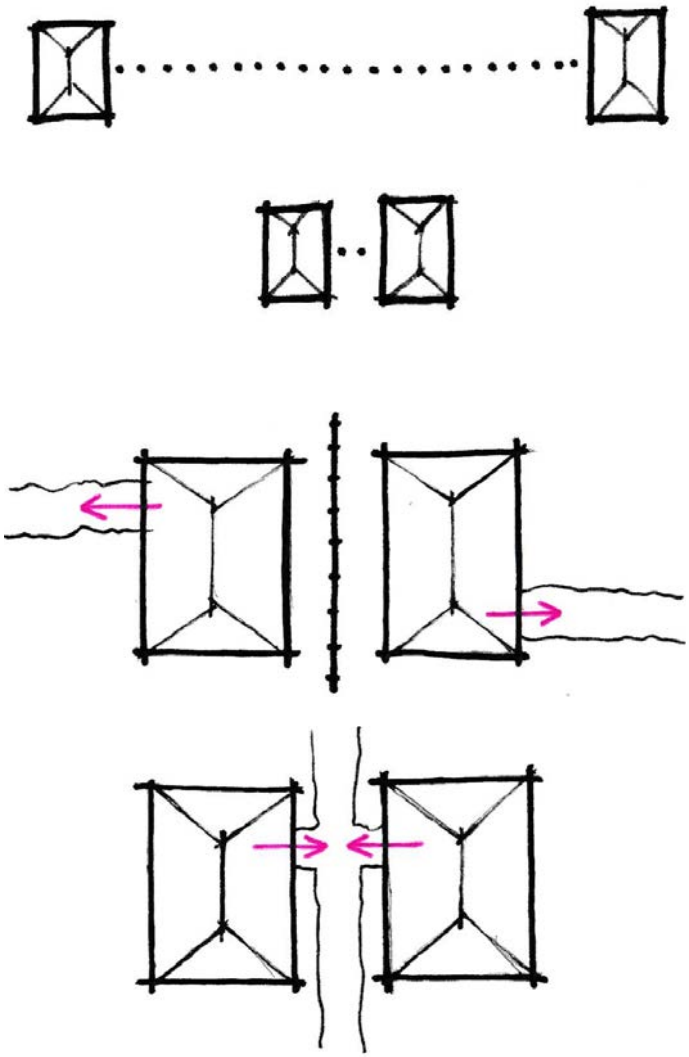


Fig. 7.9: Physical distance (top) vs. Functional distance (bottom). Architectural design aspects like orientation and positioning are essential for determining not only the physical distance, but the functional distance as well (by author)

7.2.3 Communal and public spaces

In a co-living environment people share more in their daily lives than neighbours would do in general housing. Although the residents have to be able to decide in what degree they share their everyday life, comparable expectations and intentions about living together, helping each other and doing things

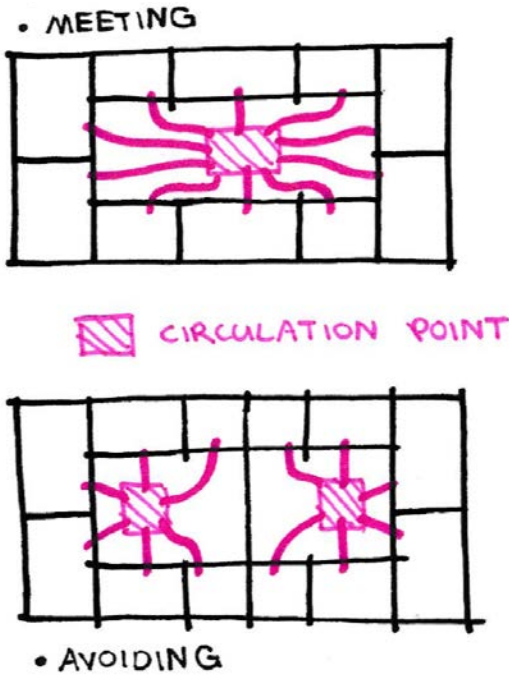


Fig. 7.10: Difference between a single or multiple circulation points (by author)

together are important within the community (Choi, 2004). ***Regarding the shared activities, the co-living arrangement is especially convenient for the older (and therefore physically or mentally weaker) generation, because the barriers of looking for and joining said activities are smaller due to the better accessibility within the direct living environment.*** Less effort has to be made to meet and do things with other people and some elderly specifically choose for co-living to stay active, instead of staying at home. Next to that, staff or a moderator can help organizing the activities and informing and encouraging of the residents (Bodner et all., 2011; Aedes-Actiz Kenniscentrum Wonen-Zorg, 2008; Rusinovic et all., 2019).

The most mentioned social activity in studies containing fieldwork at (multi-generational) co-living communities and/or nursing homes is that of having the possibility to have a meal or a drink together. This varies from drinking a cup of coffee or tea together to having a communal meal with a big part of the co-living group. There is more to it than just the food or drink itself; making plans about the needed supplies, preparing the food together, teaching other generations recipes or cooking in general, and eating together. On top of that, the dining table is an excellent location to have a conversation, to meet new people and to get to know each other. It improves the social ties and *'contributes to a sense of belonging'* (Rusinovic et all., 2019), just as all collective activities will. However, in general, the more mundane and everyday the activity is, the more people will participate (Choi, 2004; Labit, 2015).
In most cases, the space where communal meals or coffee-hours are held is called the ***'common room'*** (or 'common house' in Danish typologies, as here it is a separate building). This is probably the most flexible space within a co-living arrangement, as it can facilitate the biggest variety of activities due to its size. The space could function as a ***dining room,*** as well as a ***living room.*** Most functions around/attached to the common room, mentioned by multiple sources, are a ***kitchen, meeting room, laundry room, hobby room, individual and collective storage, guest room and a collective outdoor space like a terrace or (roof)garden (fig. 7.11)*** (Choi, 2004; Pedersen, 2015; Jolanki, Vilkko, 2015; Stavenuiter, Van Dongen, 2008). The design and position of the common room in the project can greatly impact the use of the space. ***A certain transparency and visibility of the space is needed to encourage easy drop-in of the residents, as is its location near other, daily used facilities and***

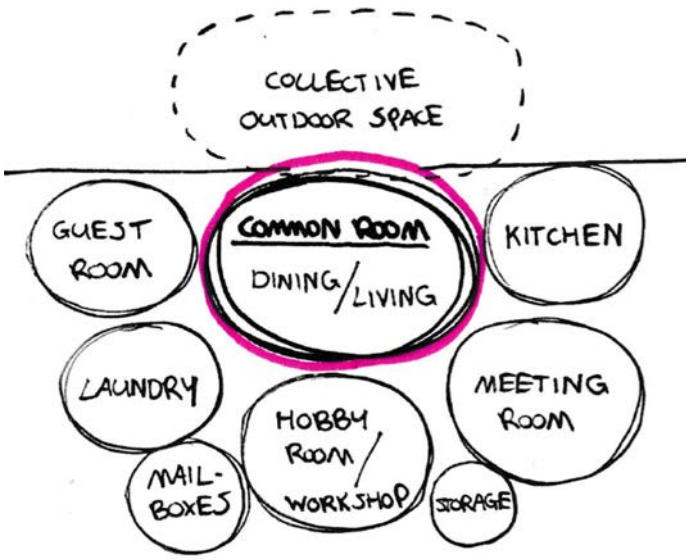


Fig. 7.11: The common room with surrounding/attached collective functions and outdoor space (by author)

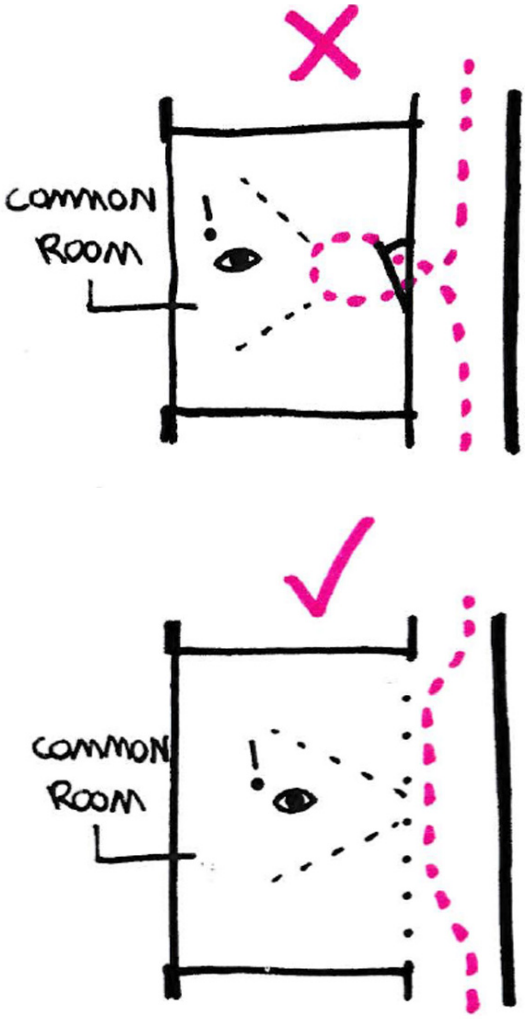


Fig. 7.12: Closed-off common room (top) vs. open/ transparent common room (bottom) (by author)

spaces. In this way, passing residents can easily see what is going on, which people are there and are thereby more often triggered to enter the space to join in or they can more easily decide to skip and walk along (fig. 7.12). Visual connections from the private dwellings themselves would further increase this unplanned participation of the common room(s) or space(s). However, especially in multi-storey buildings this is more difficult to achieve in comparison to for example the Danish, co-living typology, where all the private dwellings are positioned around the common house. Direct visual contact from within the private domain of the dwellings could be created, if possible, by adding windows towards the collective spaces. Indirect visual contact would be created by enabling a view towards the collective rooms just outside the private dwellings' entrances (fig. 7.13) (Choi, 2004; Fromm, 1991).

Using large spaces like the common room for non-resident activities and functions will create a link between the co-living community and the surrounding neighbourhood (Labit, 2015). In this case, the concerning common spaces should have an extrovert position and design within the project, making it more visible, attractive and accessible for other interested parties (fig. 7.14). This extrovert position would also make the connection between the interior common room and an attached, collective outdoor area better, although level differences between these two domains need to be avoided to allow for a good flow between them (Abu-Ghazzeh, 1999).

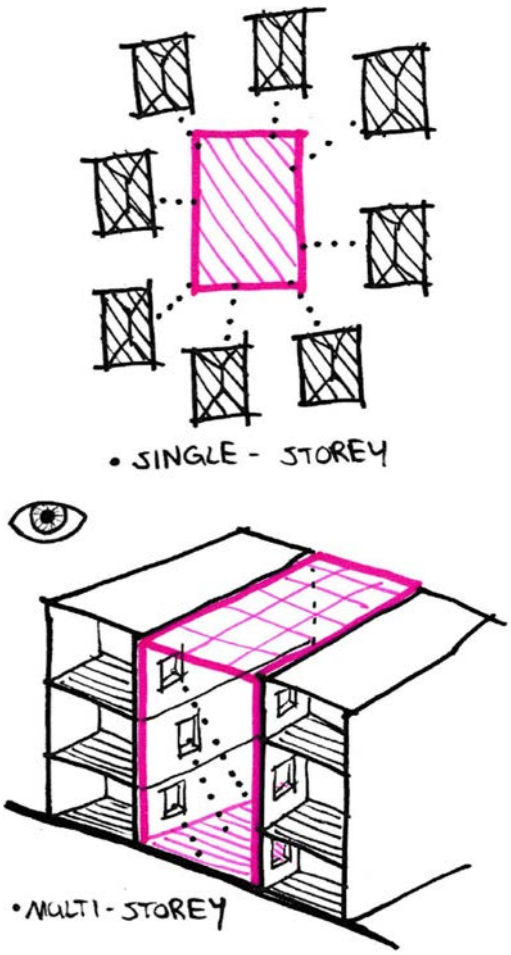


Fig. 7.13: Visual connection between private dwelling and common room(s)/space(s); single-storey vs. multi-storey (by author)

The ***outdoor area or garden*** of the multi-generational co-living community should contain attributes that can be used by all age groups among the residents. In general it should contain sitting areas to have a chat and to meet, open areas for bigger outdoor events and activities and it should be interconnected with the existing urban network to create a link with the surrounding neighbourhood.

Especially for ***kids***, specific design elements have to be implemented to make it fun and suitable to play with brothers or sisters, friends, their parents or other age groups from the community. *Safety and supervision* is important for young children though. Dwellings or communal spaces need to be in close range of the kids' playing area (no more than 50 meters) for the parents or other adult residents to keep an eye on the children (fig. 7.15). *Variety* is important as well, because children's preferences can change quite quickly while growing up. More open, grassy fields could for example be alternated with paved areas for

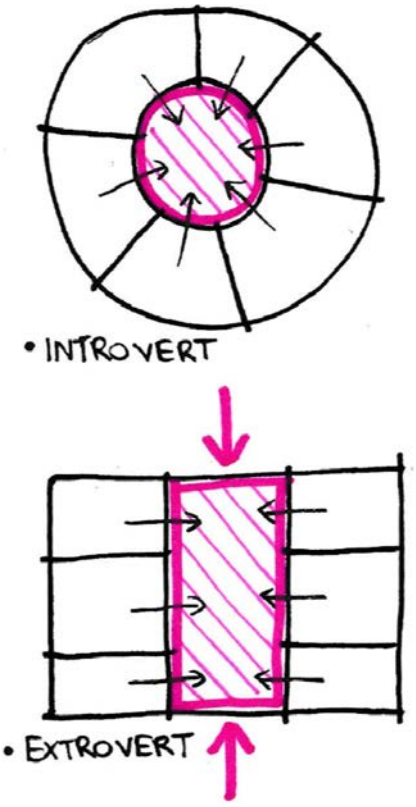


Fig. 7.14: Common room position in the project; introvert, closed to the outside vs. extrovert, open to the outside (by author)

wheeled playing equipment, a sandbox or proper play structures with ground covering for safety (Fromm, 1991).

The ***elderly*** and children show a similarity in the amount of leisure time in comparison to other age groups (paragraph 6.2.3), but this results in different activities and needs due to their age and physical capabilities. The ***interconnection with the neighbourhood*** will stimulate and encourage the seniors to step out of their direct living environment and make a walk through the neighbourhood; alone or together with other residents, keeping them active and healthy as long as possible (fig. 7.16). Next to that, during the field trip at Huis Assendorp in Zwolle, the older residents showed a great interest in ***gardening***; both outside as inside the building. The inhabitants on the ground floor with a ***private garden*** were very pleased to have their own green space directly outside their dwelling and the others often spend time in the ***communal gardens*** or had their own spot in the vegetable/kitchen garden (fig. 7.17). Another important aspect of the elderlies' daily life is ***'commotion': seeing things happen or seeing others interact or doing activities***. This does not only have a positive effect on the social safety of the co-living community as a whole (Stavenuiter, Van Dongen, 2008), but it also provides more spontaneity and variety to the lives of the elderly. Even the seniors who won't or can not go outside, should have a view from their private dwelling's interior or balcony on for example a collective area, a playground or a street.

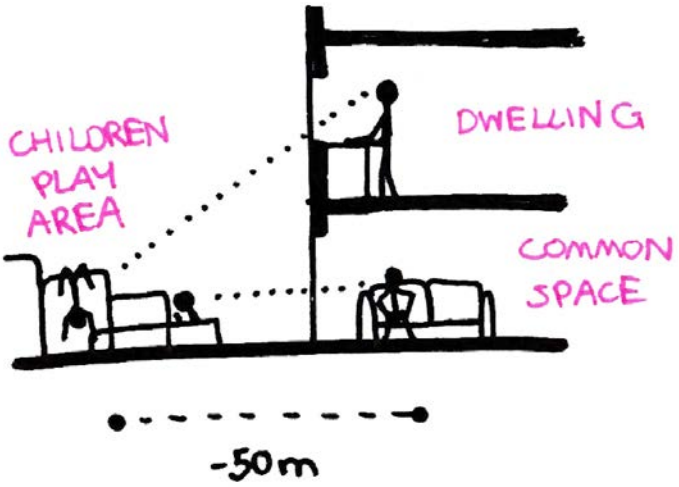


Fig. 7.15: Supervision on kids' play area from interior common space or dwellings (by author)

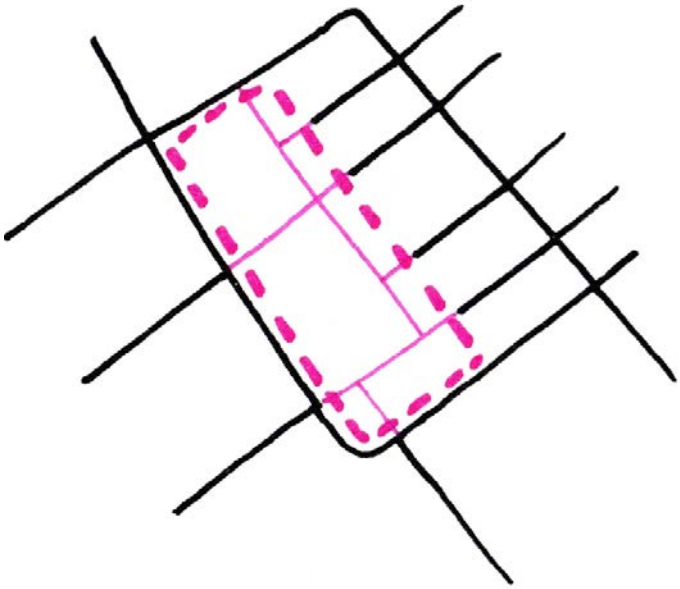


Fig. 7.16: Project outdoor area interconnected with existing urban network (by author)

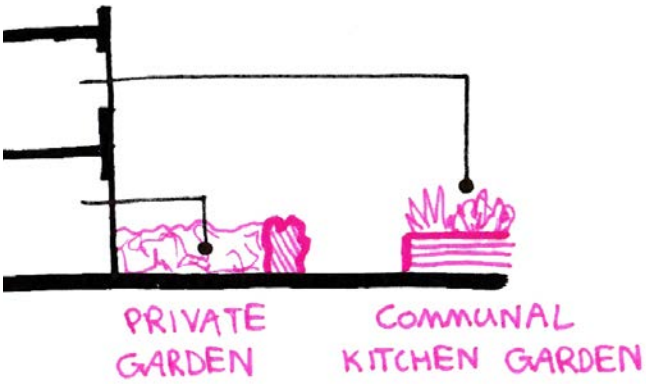


Fig. 7.17: Gardening for the elderly; private or communal (by author)

7.2.4 Care- (and health-)promotive design

Besides spaces, functions and other design aspects for elderlies' everyday life, the need of care and the design of a caring and health-promotive environment will have a significant importance to prolong independent living for seniors. ***Essential elements, like the care-staff rooms, storage for medical supplies and rooms for meetings or conversations concerning (health) care, could have synergy with architectural design promoting healthy living and care through the entirety of the project.***

A study that shows the great value of health- and care promotive design is *'Health-promotive ambitions related to building design - the case of Angered Nearby Hospital'*, by Elke Miedema et all. (2017). 'Angered Nearby Hospital' is the first of its kind; a new healthcare building typology focussed on accessibility and equality. The study was done on the built environment itself (the final 'product', the building), but also the process of designing it was taken into account. While the label of a 'healthcare building' must not be put on

the final multi-generational co-living arrangement, the elements that could stimulate healthy living and care in a living environment will be of great relevance for those who regularly need this stimulation and care. A definition for ***'health promotion'***, later reformulated by Elke Miedema herself, shows its significance not only for the (vulnerable) elderly, but for every individual and even communities as a whole: ***'a process devoted to empowering (vulnerable) individuals and communities to take over the factors that positively influence their health and quality of life, including their social, natural and built environment'*** (Miedema, 2020).

Accessibility for all was achieved by the building's location near public transport and parking, as well as the visibility of the complex from these infrastructural components and the rest of the neighbourhood. Public functions on ground level and play areas for kids scattered throughout the building add to the vision of creating a *'welcoming and empowering environment'*. Physical mobility is one of the main factors to improve healthy living, especially for the elderly, and this is encouraged by designing ***accessible/easy walking and space for activities.*** An example is the simplification of stairway usage by paying attention to its orientation and location within the building (fig. 7.18); *'...the staircases are the first thing you see; we want the patients* (or, in case of this particular research, elderly residents) *to walk up to the first or second floor. However there are also elevators of course'* (Miedema, 2017). ***Accessibility is strongly connected with freedom, openness and choice; being able to be wherever and with who one wants to be.*** This statement is made in a case study of Heather House: a residential care facility for elderly, selected for studying because of its contemporary vision on care and the resulting innovative design (Van Steenwinkel et all., 2017). The openness is used as a design tool for easy access throughout the building and was directly implemented in combination with glass. This resulted in visual access, both in the open plan of the collective spaces between the dwelling units as in the views to the surrounding greenery and neighbourhood outside: *'...this helped the residents to stay in contact with different places, (and see, e.g., when visitors entered,) and enhanced the dwelling unit's legibility'*. The only two-floor height of the building improved this connection with outdoor spaces (Van Steenwinkel et all., 2017). Glass panels and doors can be used to provide visual access and more daylight to spaces deeper in the building, which would otherwise be obstructed by doors, closed walls and/or ceilings (fig. 7.19) (Miedema, 2017).

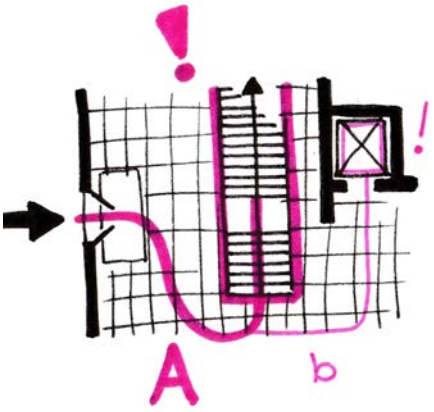


Fig. 7.18: The prominent location and orientation of the stairway, promoting its use and physical mobility benefits in comparison to the elevator (by author)

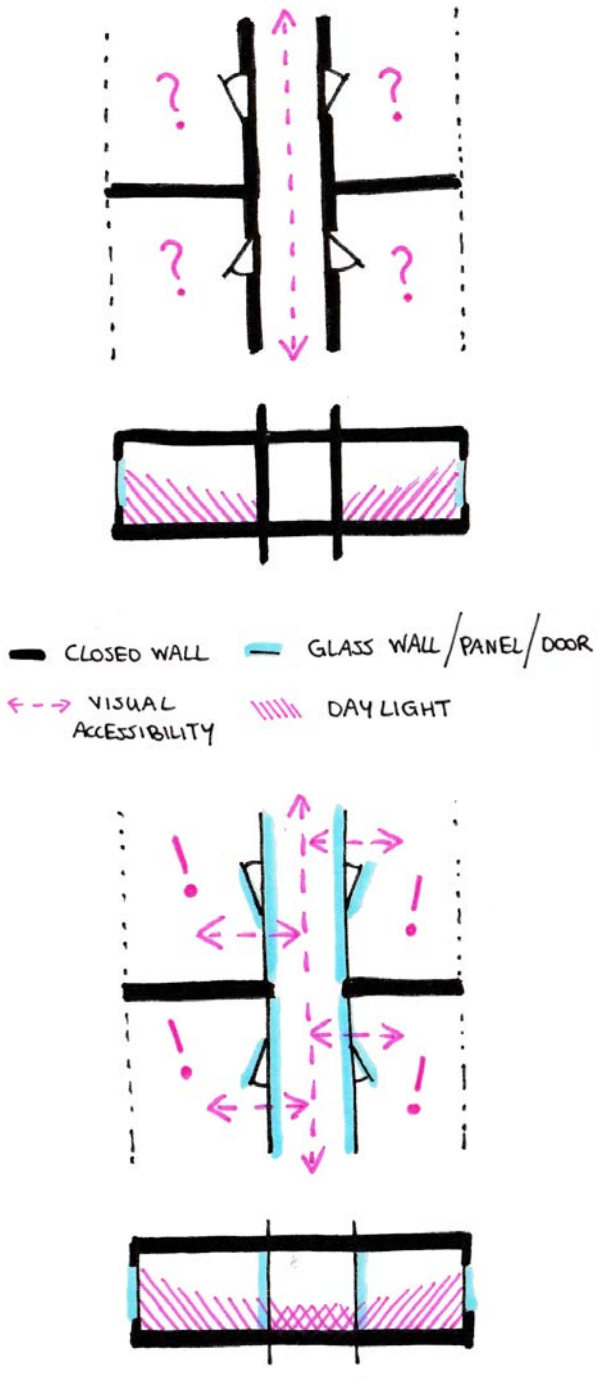


Fig. 7.19: Glass/translucent elements adding both visual access and daylight to a building's interior (bottom) in comparison to closed walls and doors (top) (by author)

The available, open space and especially the variety in spaces allows the residents to be very socially involved, but also to seek out and avoid specific people or withdraw themselves in a more private nook within the collective zone. In this way, the (in) formal caregivers can more effectively discover and attune to the preferences and capacities of residents. Forced close proximity of individuals can cause friction and collisions, so the possibility of distancing must be taken into account. In addition to that, multiple common rooms instead of one, big room were perceived as more 'homey' and pleasant by both the residents and the caregivers. This plurality of collective rooms in combination with varying furniture, design and equipment creates spaces suitable for different activities, adding to the topic of freedom, choice and independence (fig. 7.20) (Van Steenwinkel, 2017). The opportunities for *personalization* as a personal influence on both the private and collective environment plays a role in this topic as well. *It stimulates the residents' feeling of ownership and contribution to their direct living environment (fig. 7.21)* (Miedema, 2017).

Concerning floors and their possible height differences, centimetres (and sometimes even millimetres) can cause difficulties for wheelchair users or older residents who shuffle their feet along the floor while moving through the building. Also difference in colour or material between floors could be an issue, especially for the visually impaired or residents with dementia, as this contrast could be perceived as a level difference (Van Steenwinkel, 2017).

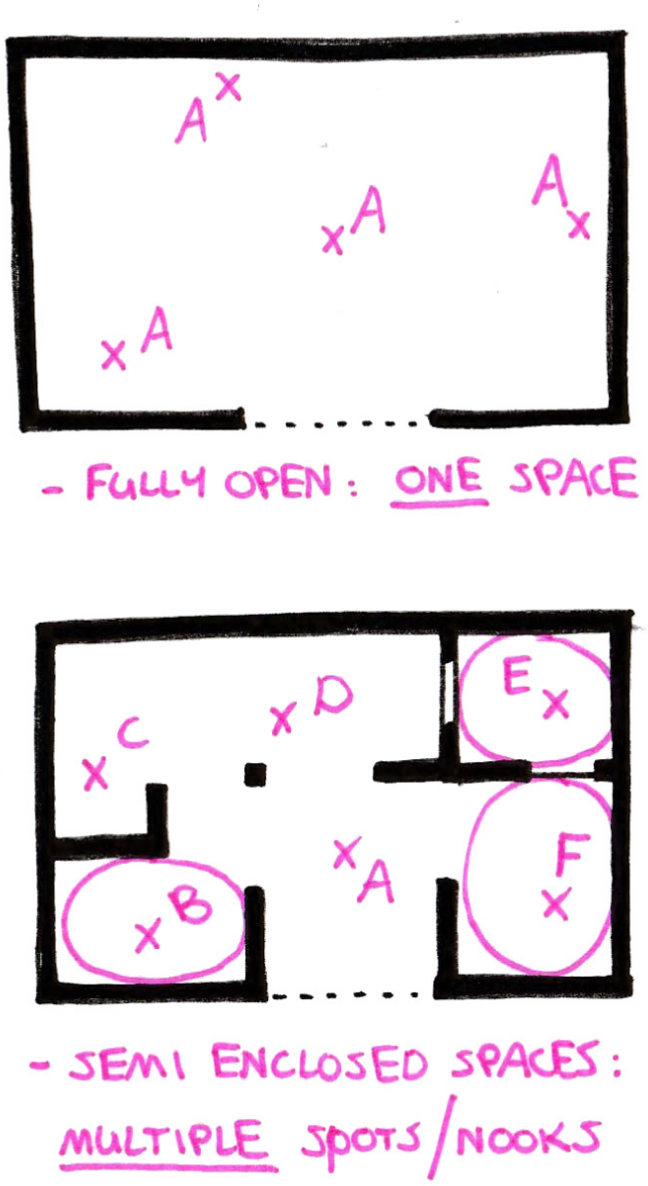


Fig. 7.20: The plurality of spaces within the collective domain/room (bottom) results in multi-functionality + choice and freedom for the residents and other users (by author)

7.2.5 Variety of private dwellings

Typical for a co-living is the combination of both shared collective spaces and private dwellings. All residents, young or old, need a house; a private domain to withdraw into and live independently. As already discussed, the 'transition zone' in between the collective and private areas needs to be designed with care and thought; to encourage and stimulate social interaction, but keeping the opportunity for privacy. Especially with a varied group of individuals, like a multi-generational community, the preferences regarding their daily lives can range from very collective to very private and this could even change over time.

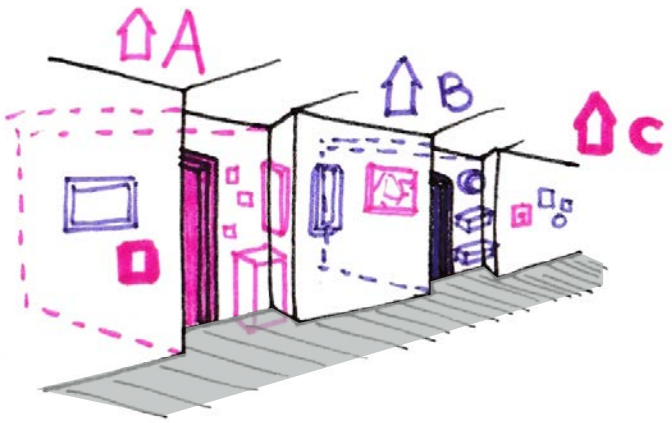


Fig. 7.21: Residents' opportunities to personalize both their private space as well as the collective zone (dwelling entrance, hallway/corridor, common space, etc.) adds to a feeling of ownership of the direct living environment (by author)

The multi-generational community will contain different households (paragraph 6.2):

- *single or coupled elderly (in need of care)*
- *children and their parents*
- *students*

Different household with different individuals and requirements will lead to different sized dwellings with varying amounts of rooms. Especially in a co-living arrangement, some spaces or utilities are not needed in the dwellings themselves, due to the shared facilities in the project. Residents indirectly give up some privately owned space in exchange for more quality, communal space for collective use. The relatively smaller dwellings should have a certain *'standardization and flexibility'* (Fromm, 1991). A standardization in dwelling dimensions (volume, square meters, etc.) per type of household could be combined with flexibility within the interior, creating typologies with possibilities for individualization (fig. 7.22) (for more info about dwelling typology variety for different households and residents, see the case studies in paragraph 7.3).

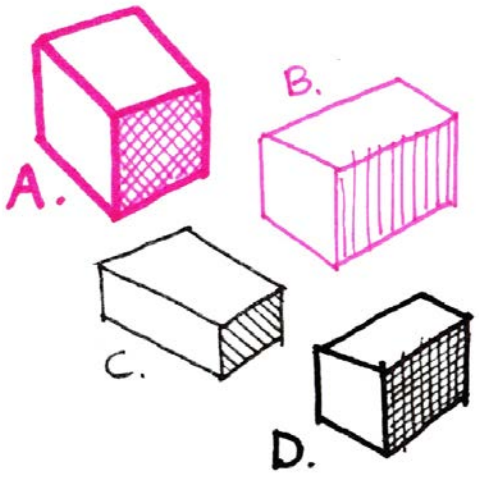


Fig. 7.22: Dwelling typologies for the different generational groups from the co-living community (by author)

While the smallest student units and those for families do not need specific design attributes, tools and strategies for care and aid, the final project's most common elderly dwellings will. The concept of ***'aging in place'*** (already referred to in paragraph 6.2.1) or ***'living in place'*** (Faloon, 2014) have originated from the desire of seniors to prolong living at home, even when their physical and/or mental health is lowering or their need for specific aids is increasing.
A study that contains useful information regarding this topic of designing for care on the dwelling-scale is by A. Eijkelenboom et all., called *'Architectural factors influencing the sense of home in nursing homes: An operationalization for practice'* (2017). While the research itself uses and refers to datasets concerning proper nursing homes, the findings are focussed on the private living spaces (or "homes") of the elderly in care and will therefore be of significant use in this research. In the study, these findings are concluded by proposing a transformation of an 'old-fashion nursing home unit' into a senior dwelling unit, with special attention to (home)care, aid, clarity and a feeling of hominess.
A clear floor plan in both use and navigation is configured like a snail's shell; logically, interconnected spaces, leading from semi-public/collective to the most private spaces, like the bed- and bathroom (fig. 7.23). Open plans are generally used to directly

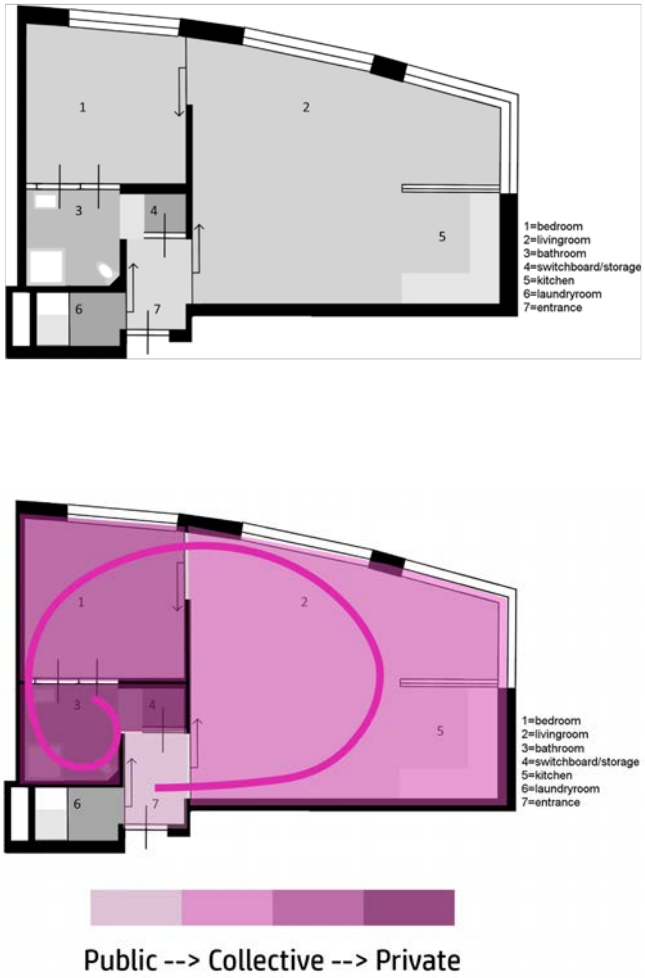


Fig. 7.23: 'Snail's shell'-floor plan (from most public to most private): entrance, living+kitchen+dining, bedroom, bathroom (drawing by Eijkelenboom, 2017, and analysis by author)

connect functions (the living, dining and kitchen for example), but some spaces ask for flexibility between open and private. The implementation of ***sliding doors*** could arrange this by being able to be opened or closed to some extend, controlling the level of privacy and visual access (7.24). Another advantage of these doors is their more convenient use for people in a wheelchair. Wheelchair users have a limited reach while moving around or doing everyday tasks, so their private living environment needs adjusted design (or a universal design), like for example the height of the counter top and refrigerator, levers instead of doorknobs and level floors (Eijkelenboom, 2017; Woodward, 1982). Different mobility aids like a walker or scooter (and other items) need space for storage and recharging to prevent them for taking up space in the living area of the home and to *'keep the apartment free of excessive visual stimuli'* (Eijkelenboom, 2017).
Another method of clarifying the boundaries between the different zones and spaces is the use of ***contrast in the interior design***: different coloured walls in comparison to the floors, lighting and texture, reinforcing the notion of location and depth for the possibly visual or mentally impaired (Eijkelenboom, 2017; Woodward, 1982). Colour is also able to add a specific ambiance to a space: soft and cold colours for quiet and private spaces and more strong and warmer colours for active/living spaces.
Technological and electronic attributes will add safety, comfort, flexibility and the possibility of monitoring older residents' health and behaviour. A smart floor system with sensors can detect falls and will inform this to the care takers (professionals or neighbours. Even the beds could contain technology to monitor heart rate or movement, connected to an emergency response system. More practical and everyday solutions for elderly in need of care would be wall-mounted toilets with adjustable height, grab bars and foldable seats in the shower or bath and a swinging sink for washing bed-bound people (Eijkelenboom, 2017; Faloon, 2017; Winters, 2003; Woodward, 1982).

While the previous interior design elements are discussed in a private dwelling context, some of them could also be implemented in the collective living environment outside the residents' homes. Easy way finding from the entrances of the building to the common spaces as well as the private dwellings is important for every single user of the final co-living project. Contrast between floors and walls, and zones within the collective space can make it more easily readable as well, creating pleasant areas to stay.

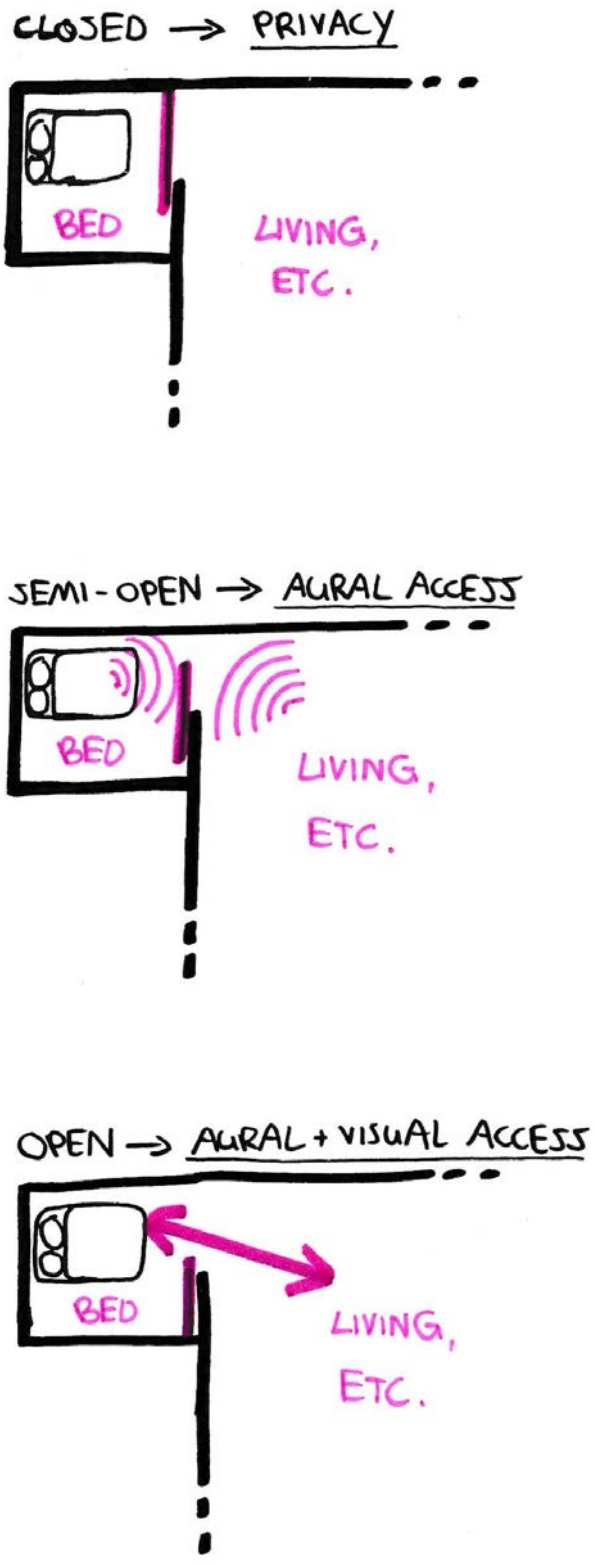


Fig. 7.24: Sliding doors opened/closed to some extend to control the level of privacy and access (by author)

7.3 Case studies

In the field of architecture, theory and practical examples or elaborations of said theory go hand in hand, especially in research with a set of design tools as its main objective. Case studies on thoroughly selected, realized projects, matching with criteria for the research, is a commonly used method to determine these design tools.
For this research, a list of criteria was set up to find useful projects to analyse, get information out of and to take inspiration from, concerning to topic of 'multi-generational co-living (for care)'.

The cases need to:
- be a co-living arrangement
- be a multi-storey building
- contain both communal functions/spaces and independent, private dwellings
- include a variety of dwellings to house different generational target groups within the project
- accessible for elderly to live in
- (bonus) contain care facilities and/or facilities for the surrounding neighbourhood

Two projects were found that met the criteria and could provide enough material (drawings, photos, schemes, etc.) to analyse the regarding built environments: *'Vindmollebakken', by Helen&hard Architects (2019), and 'Zwei+plus', by Trans_city Architects (2018).*

7.3.1 'Vindmollebakken', by Helen&Hard Architects, Norway

'Gaining by sharing' is the subtitle the people from Helen&Hard Architects have given to the 'Vindmollebakken' project. This title was supported by two noticeable questions and goals: *' How do we build socially sustainable living spaces that reduce our carbon footprint and improve quality of life for its residents?'* and '*How can architecture help prevent loneliness?' (Helen&Hard Architects, 2021).* Eventually, the realised co-living project, constructed entirely out of wood, shows answers to those questions and achievement of the established goals.

On the urban scale, the project is directly connected to a public park/play area and includes more semi-public walkways, giving access to the 4 townhouses, 8 apartments and 40 co-living units. In this case study the focus is on the latter; the ensemble of co-living units. It is located in the centre of the project-site and is designed around a semi-public, outdoor courtyard (fig. 7.25). Strongly connected to the outdoor courtyard is the variety of shared spaces on the ground floor; the 'collective heart' of Vindmollebakken. Due to the closed design of the courtyard, the collective space get a more introvert character towards the outside world. While most prominent on the ground floor, the collective domain between the private dwellings flows over several floors. The common room/dining, kitchen and greenhouse are connected with the common lounge on the first floor via the amphitheatre, functioning both as a stairway and stand (seating element) (fig. 7.26-7.35). With the main entrance in the centre of the project, in the 'collective heart', and the private dwellings positioned on the outer edges, a schematic gradient can be pinpointed: from the semi-public courtyard, through the 'collective heart', to the private co-living units. However, nuances are present in this gradient, as the top floor contains a relatively big area of collective space in the shape of a common glass house, attic and terraces. This gradient can be seen in both plan and section. The routes, from entering the co-living part of the project to the private dwellings of the residents, most frequently go through collective spaces and provide a visual connection with it. This results in awareness of activity within the community and stimulation of social interaction (fig. 7.36-7.40).

The division of collective and private space is also reflected in the façades. Where spaces with a collective function have open and glass/transparent façades, the private spaces (dwellings) show a more closed facade, adding to the readability of the building (fig. 7.41-7.42). In the interior, this division between collective (open) and private is more subtle, showing transitional borders between the two. Closed walls, glass panels, windows and movable objects like plants all have the same separating and connecting function in the transition zone, but their impacts differ significantly (fig. 7.43-7.44). Dwellings units' interior windows provide direct visual interaction with the adjacent collective spaces, but they also let daylight in coming from the glass atriums. Most of these windows are belonging to private living spaces, like a kitchen, dining or living room (fig. 7.45-7.48).

The most private zones, the co-living units, are designed to house a variety of households, which is noticeable by the different sizes. So called 'minimal'-, 'standard'-, 'standard + attic'- and 'family'-units can be distinguished. These different dwelling typologies are scattered throughout the co-living part of Vindmollebakken, mixing and integrating the residential target groups. A certain level of flexibility

can be seen in the units' plans (fig. 7.49-7.53).
The almost modular co-living units show a structural system in which different dwelling typologies can be logically stacked. A 'family' unit, for example, consists of a 'minimal' and 'standard' unit together in size (FIG). This almost modular system and grid of both the private and collective spaces is more structurally used in the southern part of the project, while it is more freely and playfully used in the northern part, where the relation between collective and private is not as strong (fig. 7.54-7.55).

Fig. 7.25: Level of collectivity of the exterior spaces in the close vicinity of the project + hierarchy of the ways of mobility (paths, streets, etc.) (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

Fig. 7.26: Public/collective functions + vertical circulation; floor -1 + 0 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

Fig. 7.27: Common greenhouse + amphitheatre (Helen&Hard Architects, 2019)

Fig. 7.28: Communal courtyard (Helen&Hard Architects, 2019)

Fig. 7.29: Common room/dining (Helen&Hard Architects, 2019)

Fig. 7.30: Common amphitheatre (+1) (Helen&Hard Architects, 2019)

Fig. 7.31: Common lounge (Helen&Hard Architects, 2019)

Fig. 7.32: Public/collective functions + vertical circulation; floor 1 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

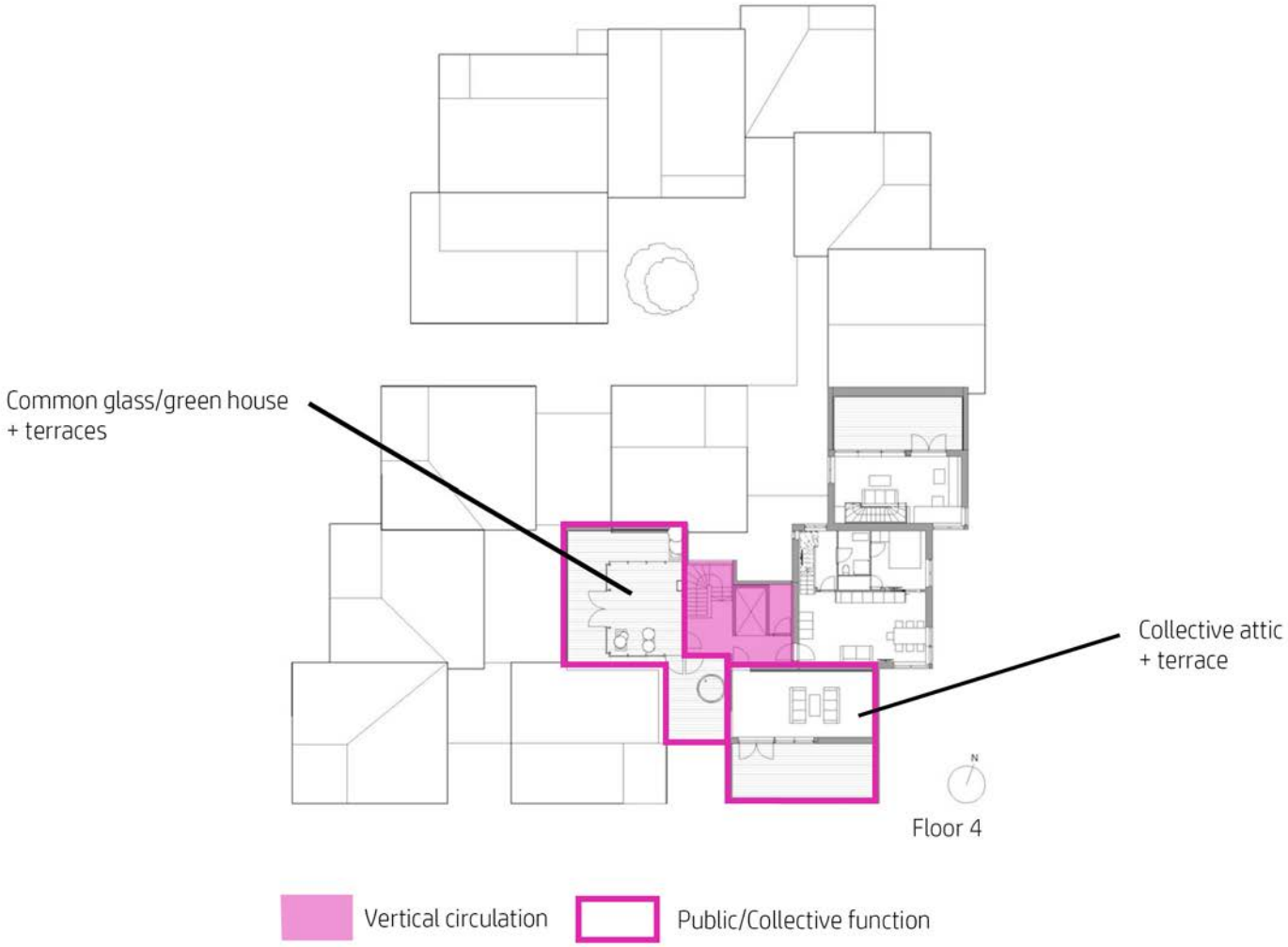


Fig. 7.33: Public/collective functions + vertical circulation; floor 4 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

Fig. 7.34: Common glass/green house (Helen&Hard Architects, 2019)

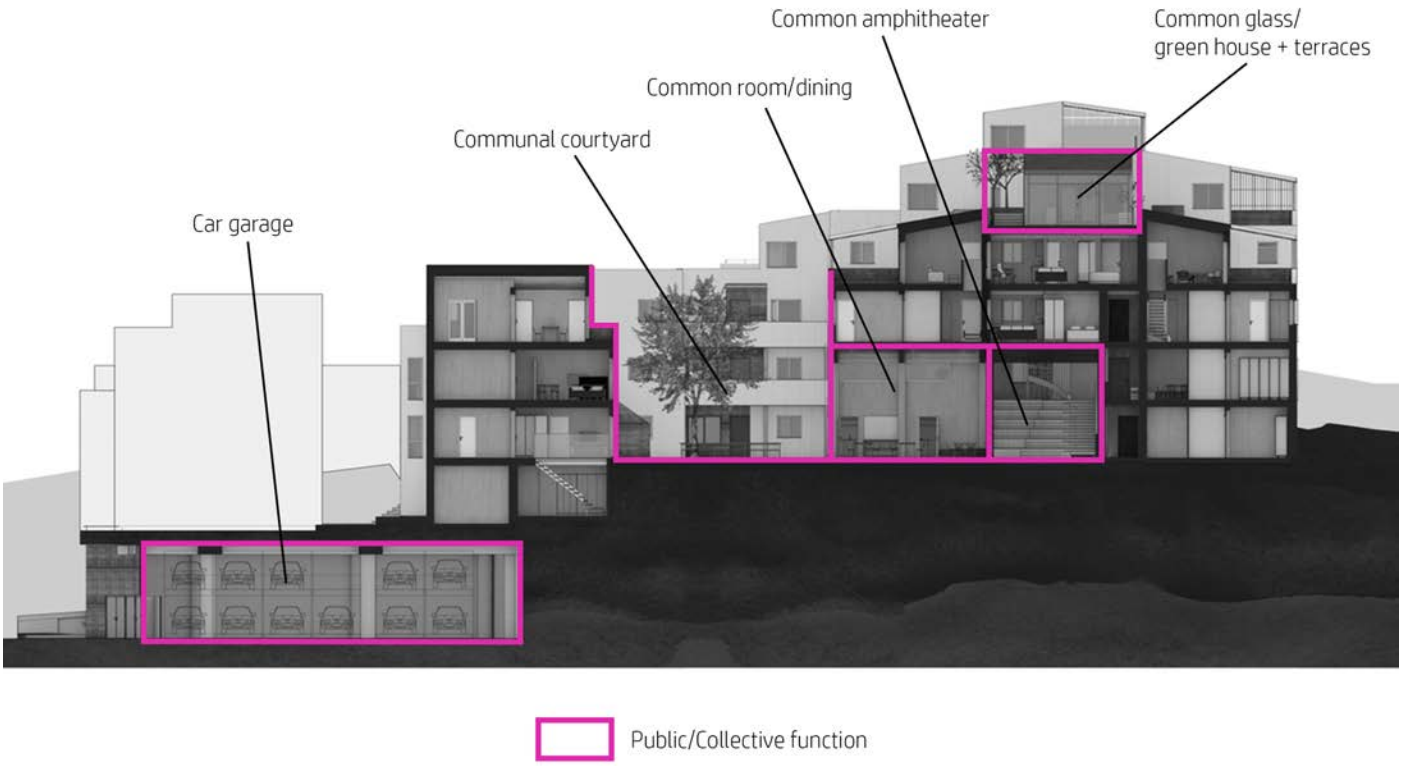


Fig. 7.35: Public/collective functions, in section (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

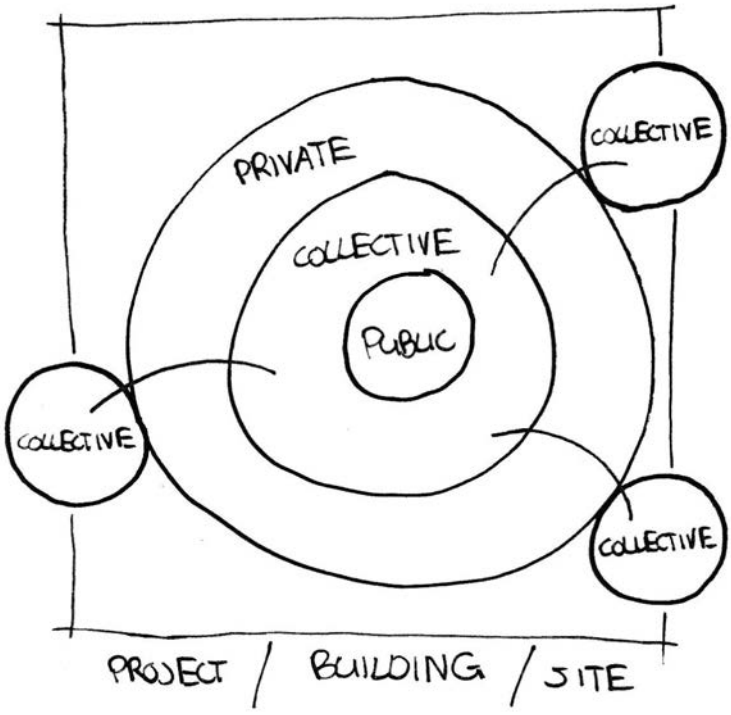


Fig. 7.36: Co-living arrangement scheme: from public in the centre, to collective, to private on the outer edges. However, exceptions are not present: for example a collective function (garden, glass house) on the top floor (by author)

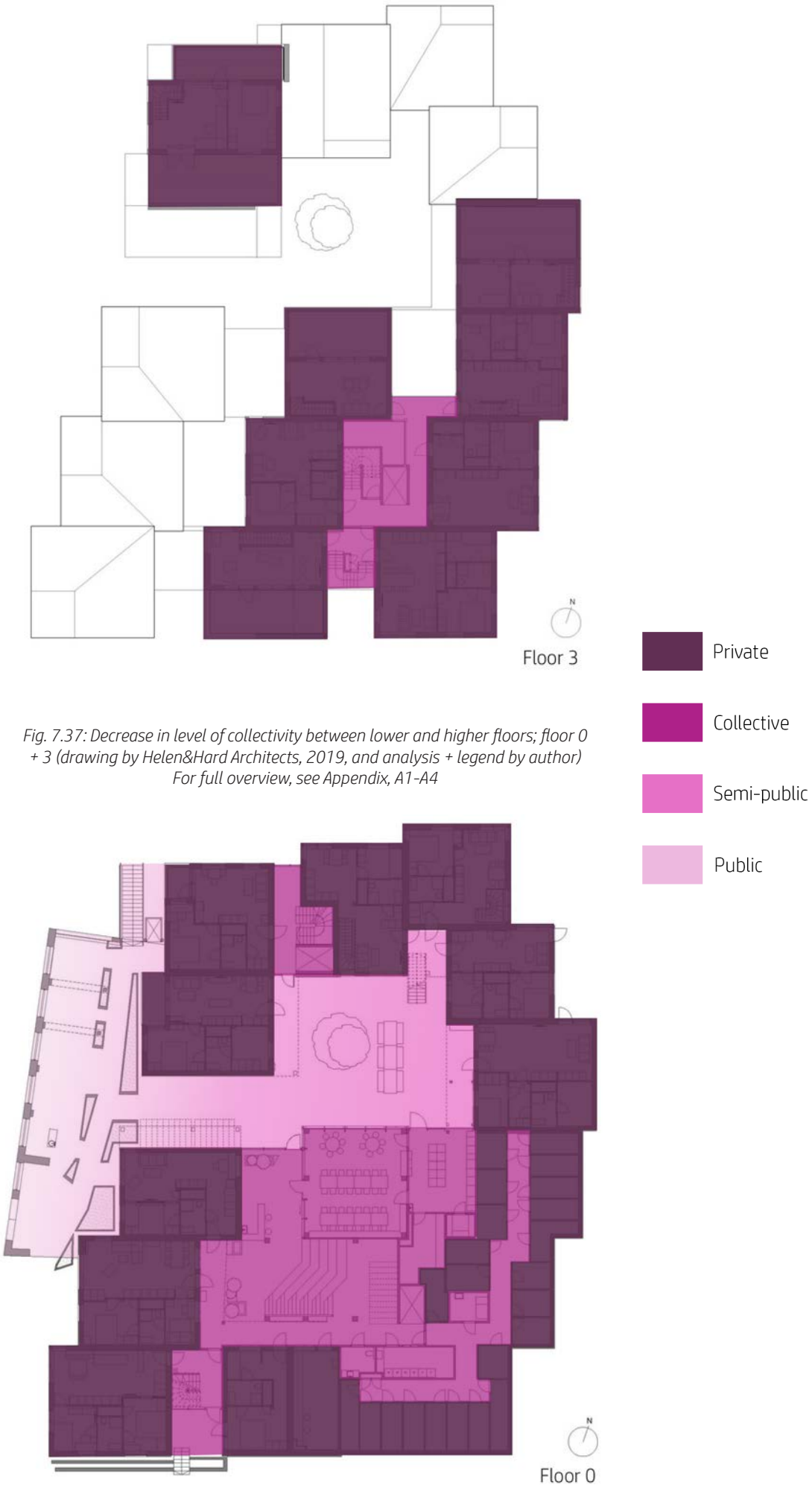


Fig. 7.37: Decrease in level of collectivity between lower and higher floors; floor 0 + 3 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author) For full overview, see Appendix, A1-A4

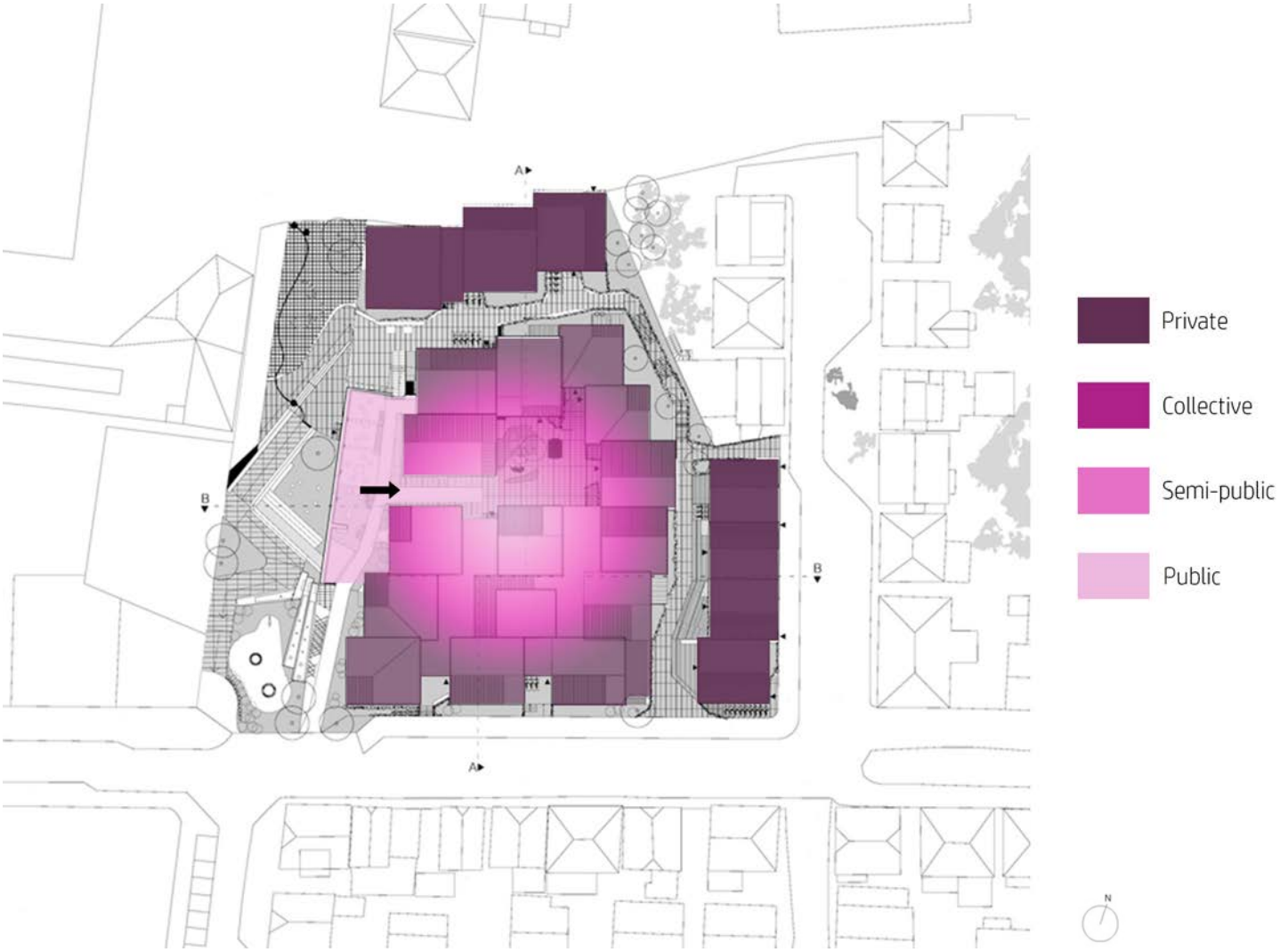


Fig. 7.38: Schematic gradient (plan); from most public in the 'heart' of the project to most private at the outer edges (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

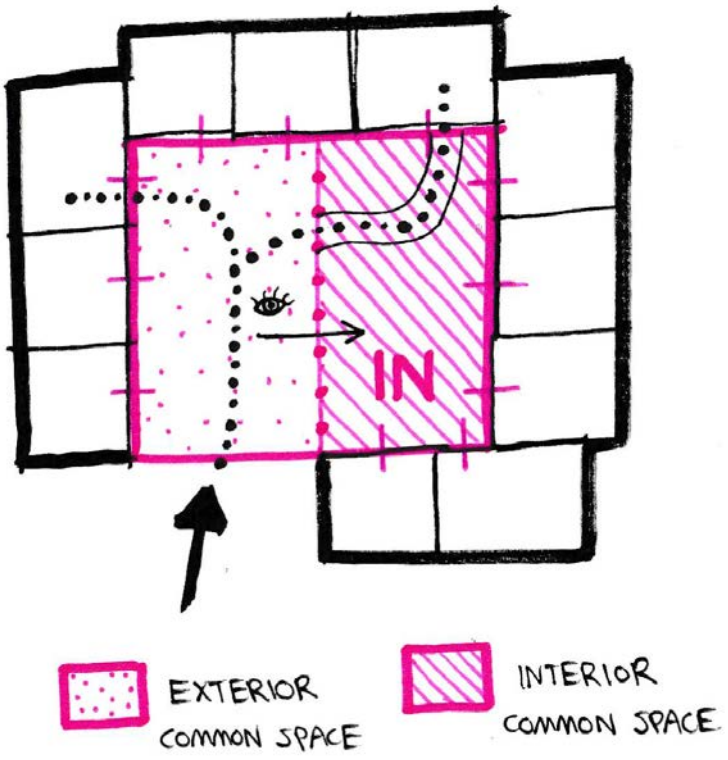


Fig. 7.39: The routes from entering the building/project to the private dwellings of the residents most frequently go through collective spaces and provide a visual connection with it, resulting in awareness of activity within the community and stimulation of social interaction (by author)

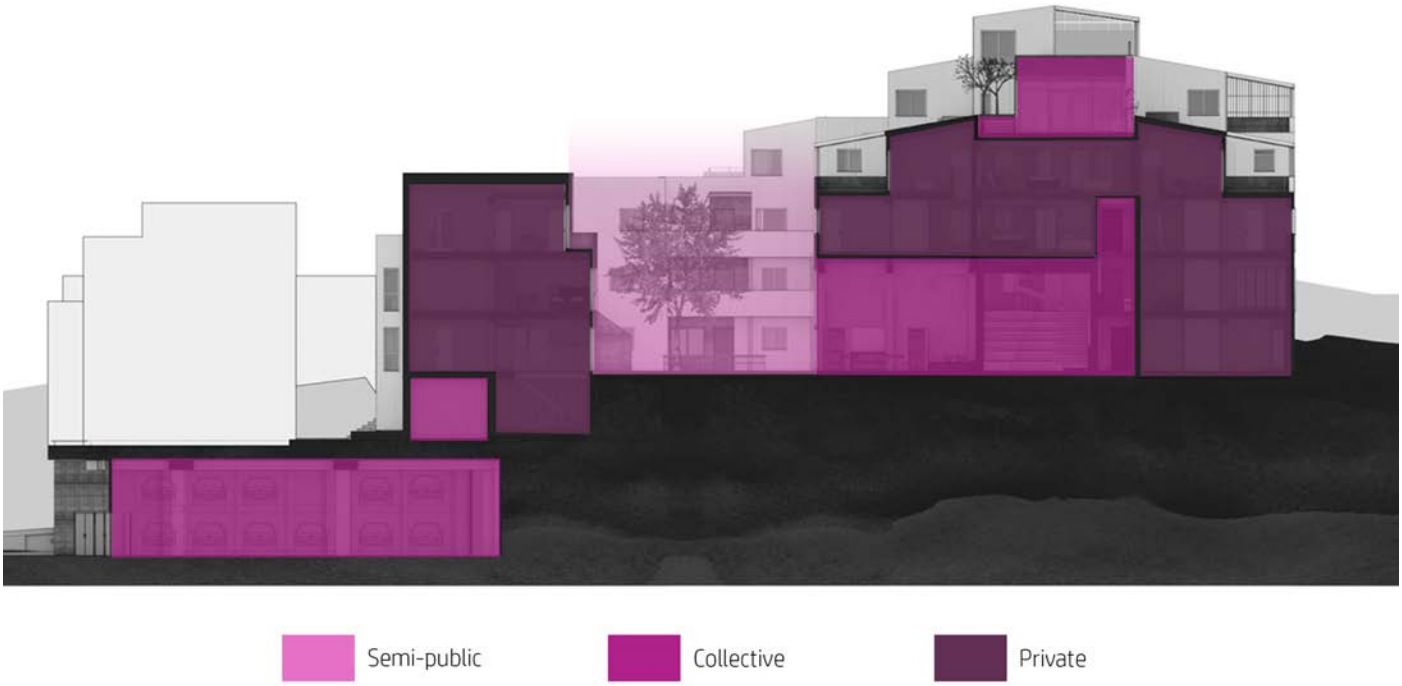


Fig. 7.40: Level of collectivity (top) + schematic gradient (bottom), in section; from most public in the 'heart' of the project to most private at the outer edges, with the exception of a collective roof garden/terrace (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

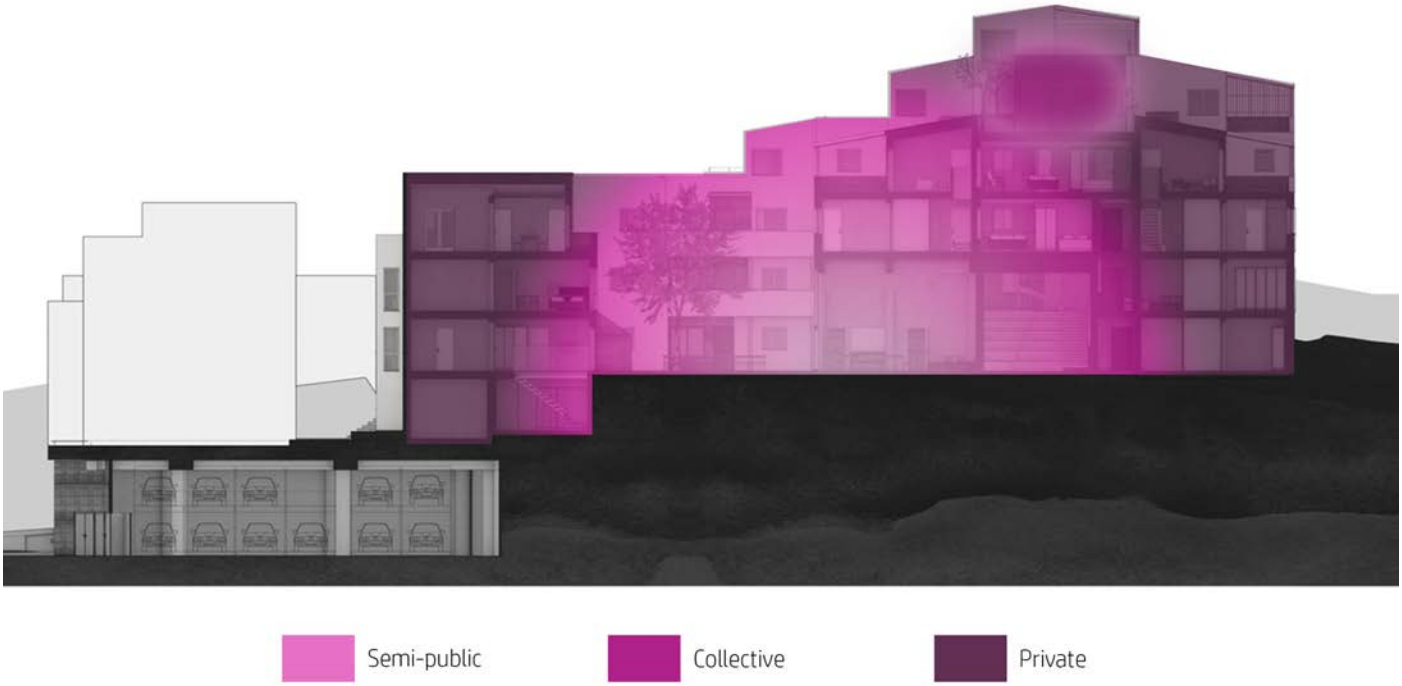


Fig. 7.41: Communal courtyard: the semi-public character of the outdoor space flowing over in the collective character of indoor spaces (photos and drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

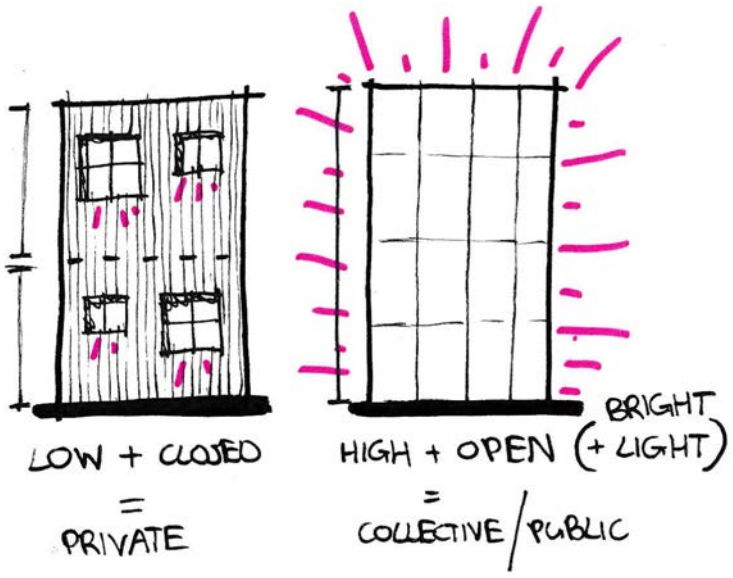


Fig. 7.42: Closed façades used for private spaces; transparent façades for collective/public spaces (by author)

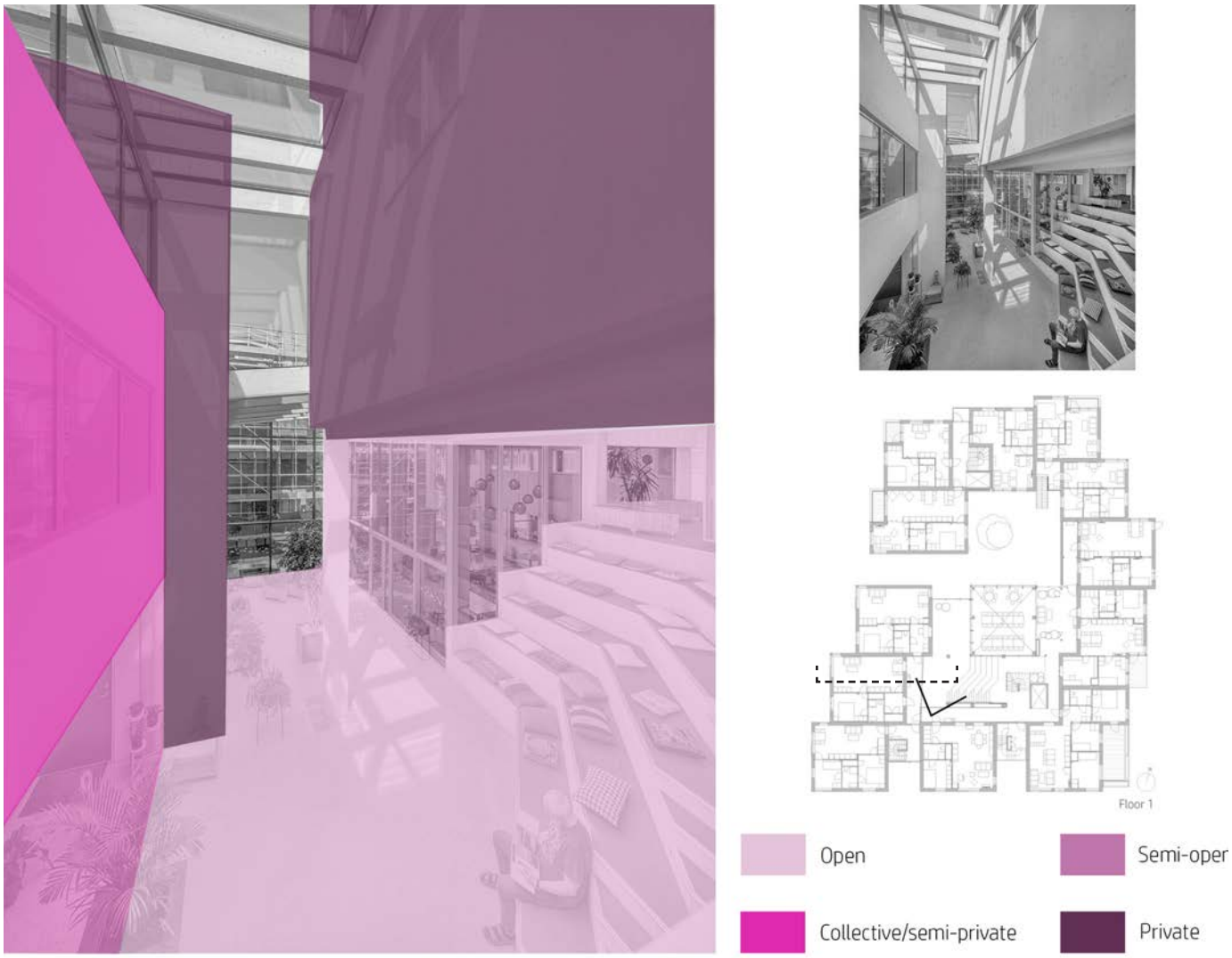


Fig. 7.43: Common greenhouse: the open, collective space surrounded by private dwellings, showing different designs of the 'transition zone' (photos and drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

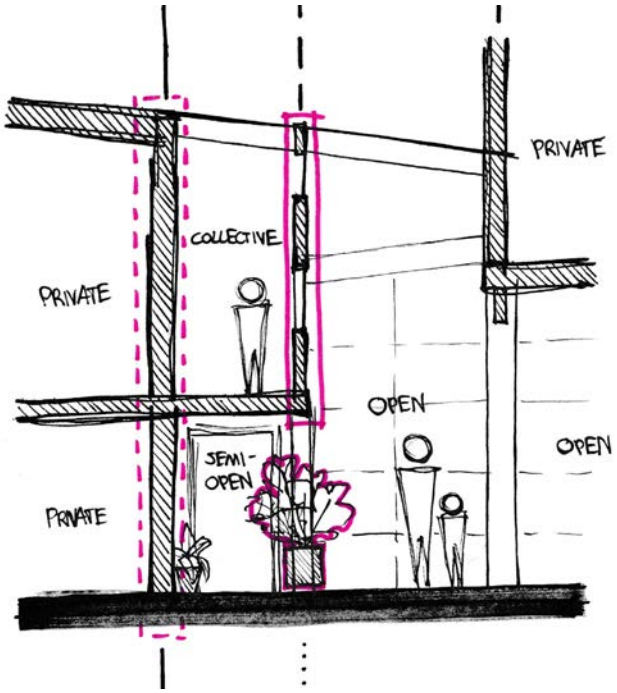


Fig. 7.44: (section in plan fig. 7.49) 'Transition zone' with different borders; closed wall, transparent wall with windows and movable objects like plants (by author)

Fig. 7.45: Common lounge: a collective space where interaction takes place between collective and (semi-)private + indoor and outdoor by providing visual access through windows and doors (photos and drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

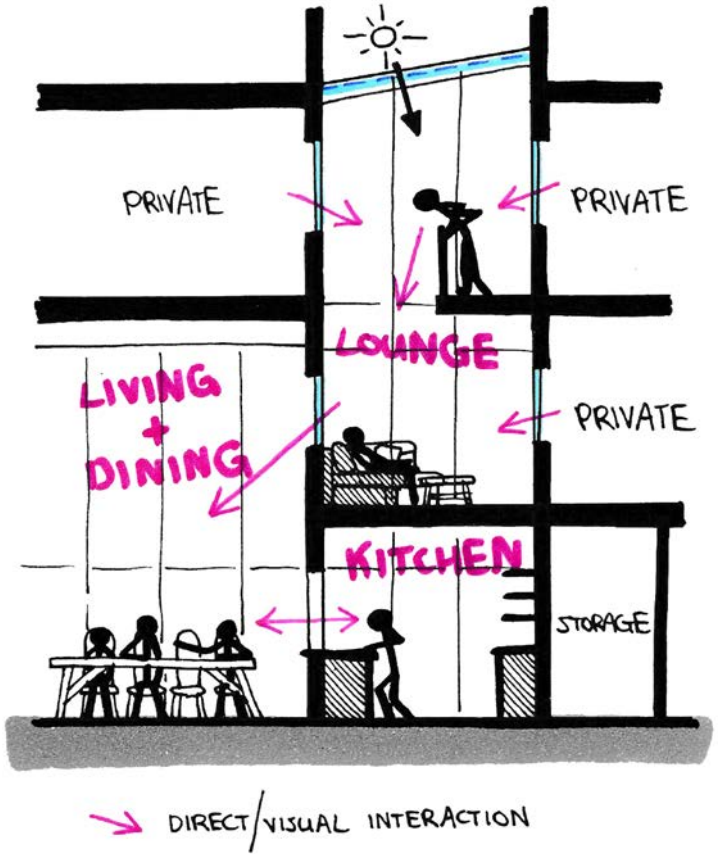


Fig. 7.46: (see section in plan fig. 7.47) A sectional drawing of the common lounge and surrounding collective and private spaces showing a multitude of interaction possibilities (by author)

Fig. 7.47: Private dwelling spaces located adjacent to interior, collective spaces, resulting in visual connection and possible interaction; floor 2 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author) For full overview, see Appendix, A5-A7

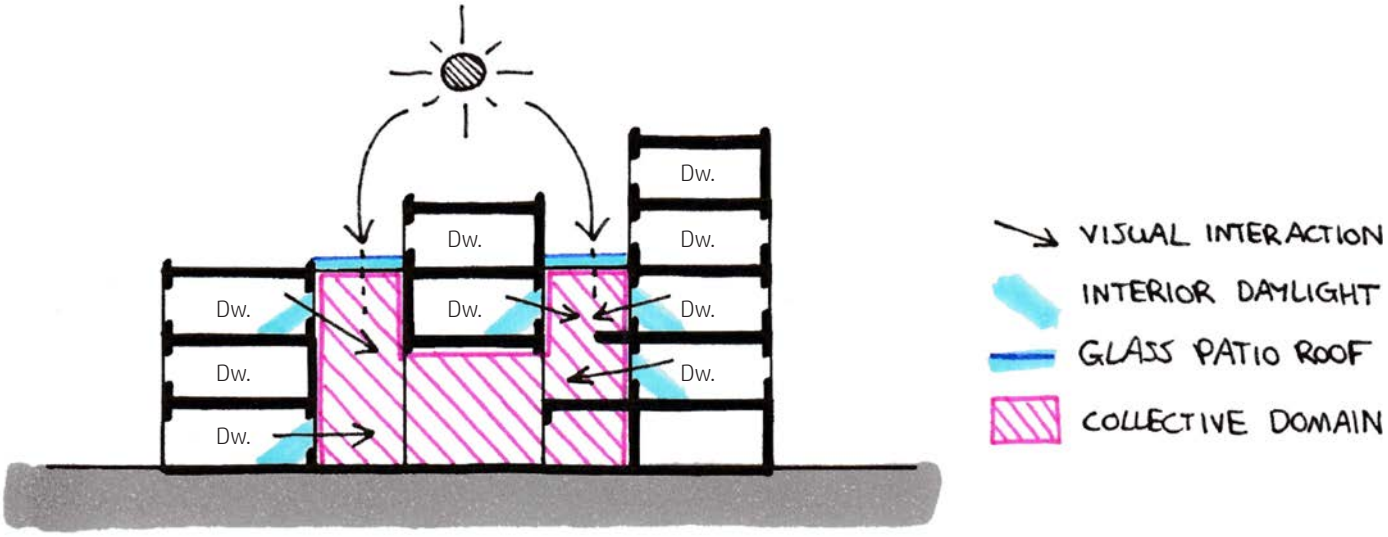


Fig. 7.48: The dwellings' interior windows provide visual interaction with the collective domain, as well as, in combination with the atriums' glass roof, extra daylight to the units ('Dw.' in the drawing) (by author)

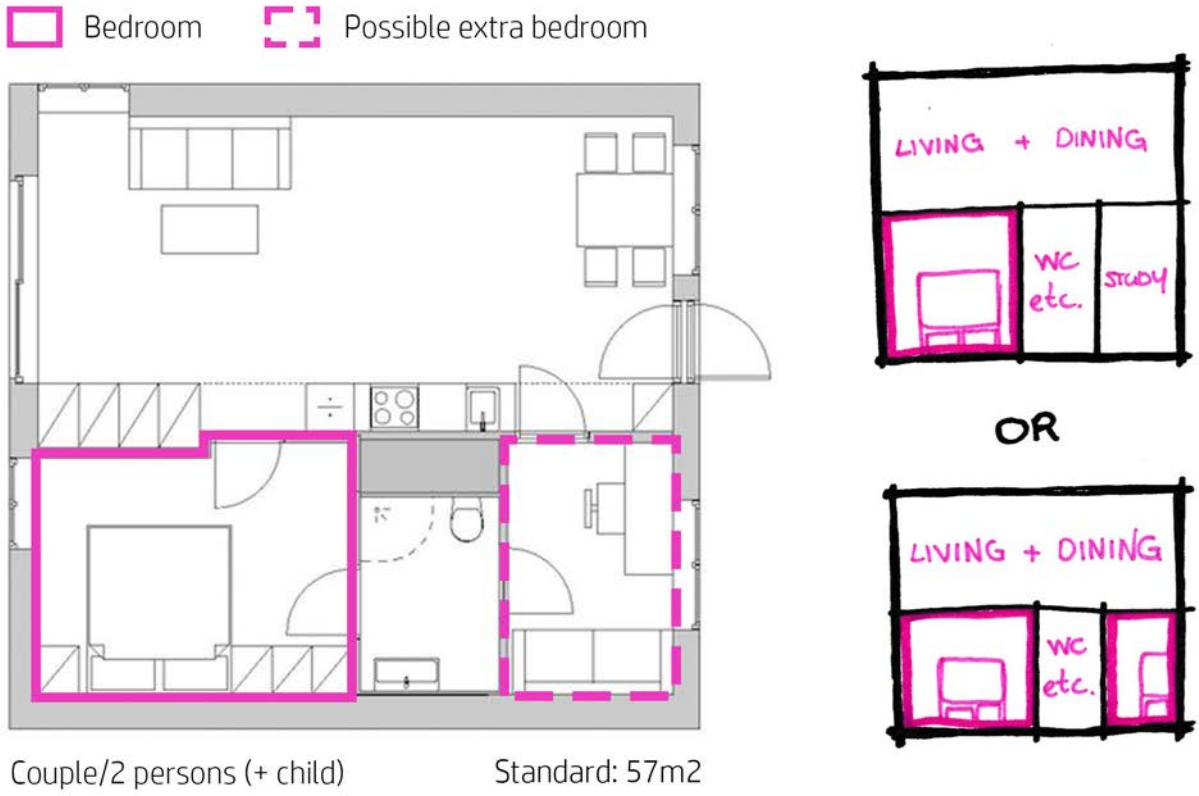


Fig. 7.49: Dwelling variety: Minimal (bottom) and Standard (including flexible use; top) (drawing by Helen&Hard Architects, 2019, and analysis + legend and sketch by author)

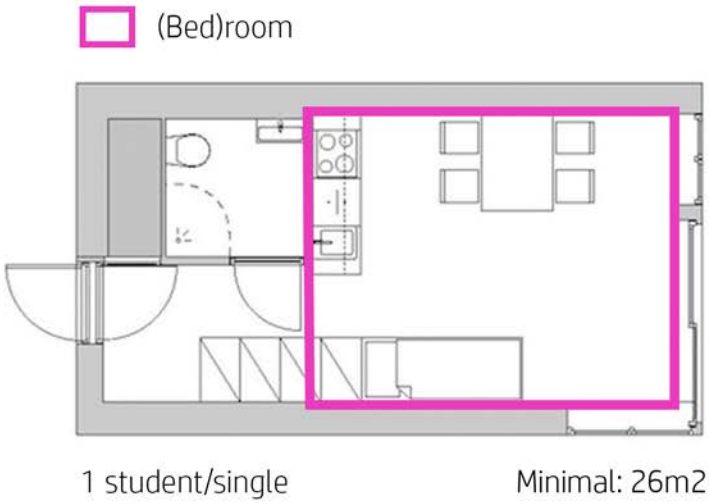


Fig. 7.50: Dwelling variety: Standard + attic (including flexible use) (drawing by Helen&Hard Architects, 2019, and analysis + legend and sketch by author)

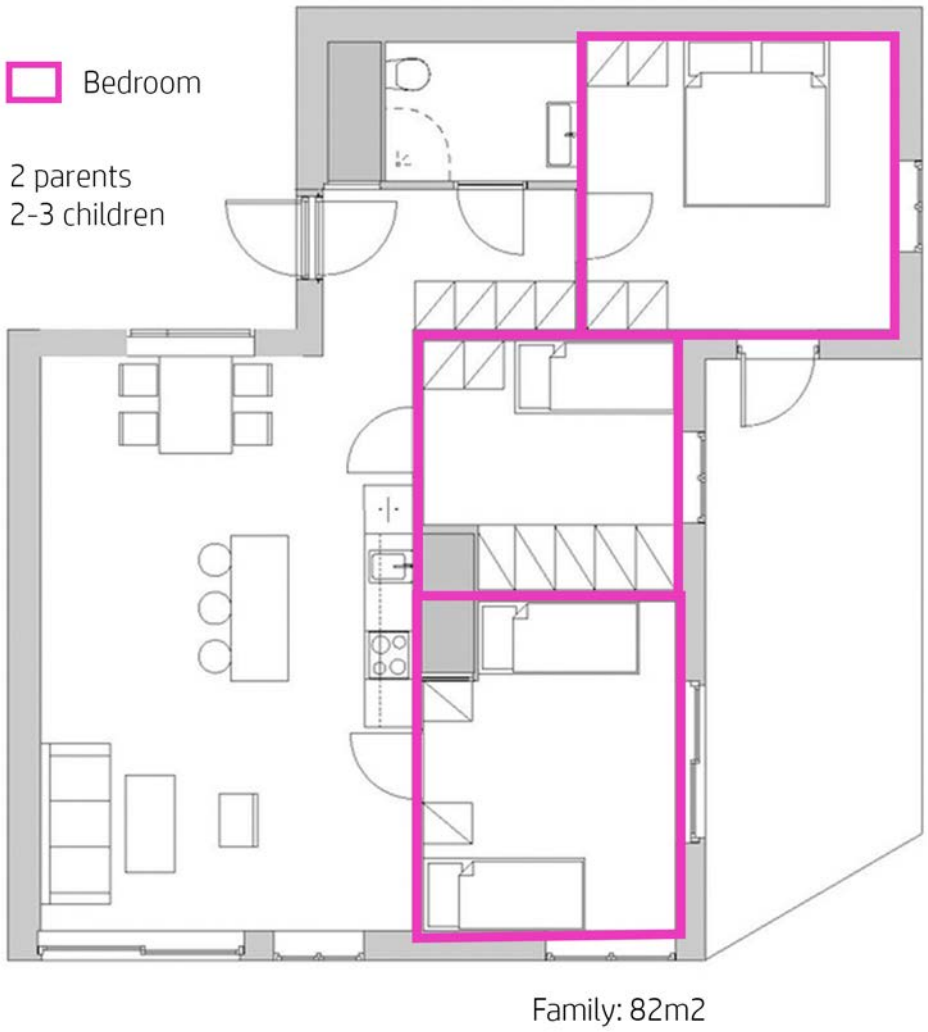


Fig. 7.51: Dwelling variety: Family (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

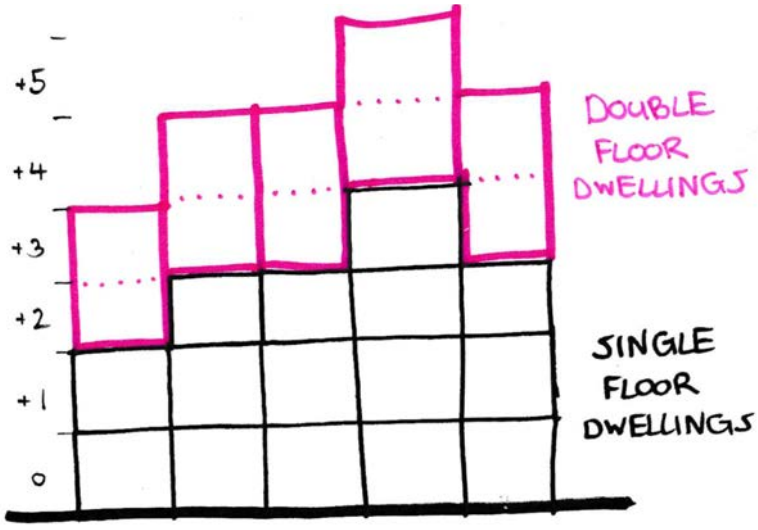


Fig. 7.52: Double floor dwelling typologies (including a roof terrace) located at the top floors (by author)

Fig. 7.53: Dwelling variety; floor 1 + 2 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author) For full overview, see Appendix, A8-A11

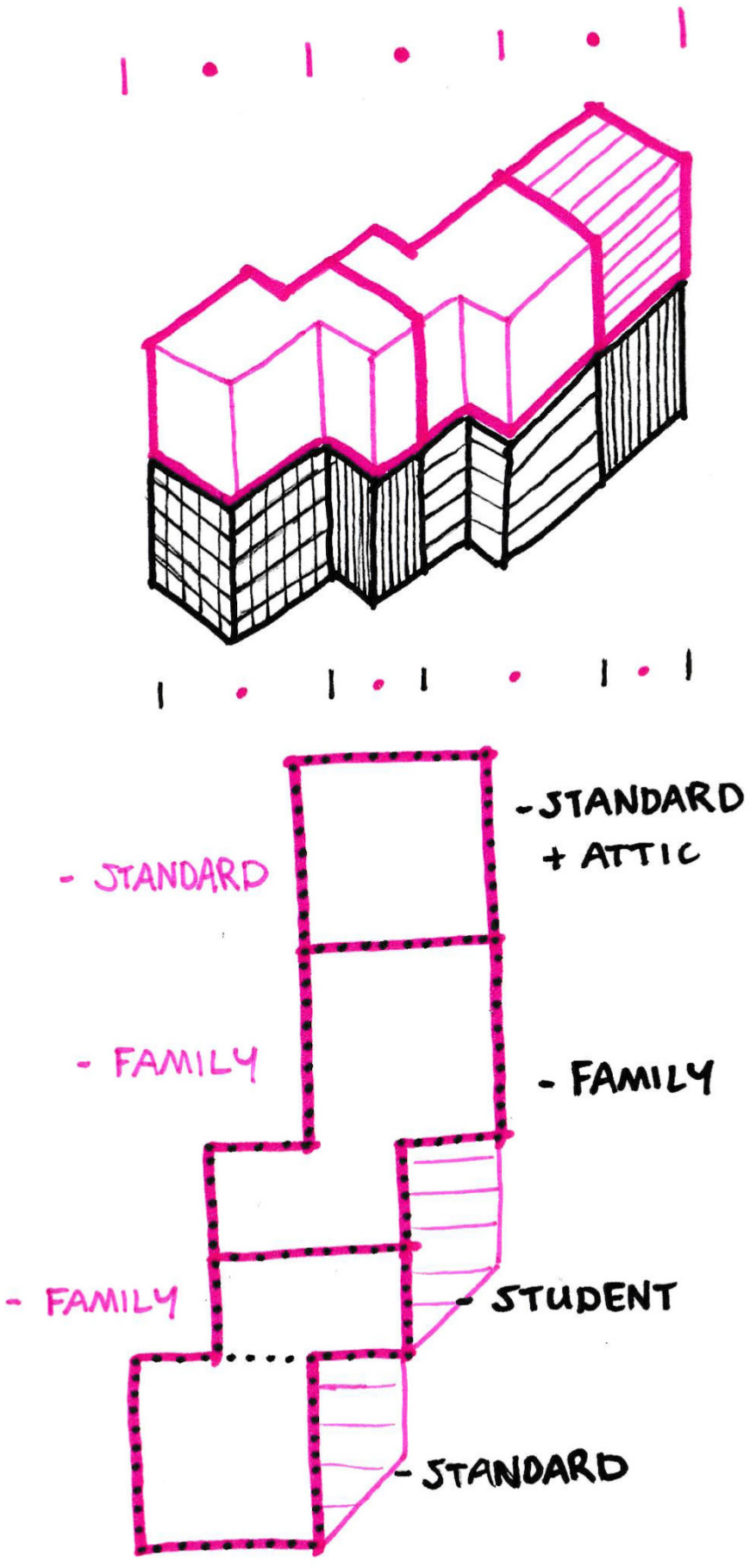


Fig. 7.54: Stacking of the various dwelling typologies, showing the significance of a simple and flexible structure-system (by author)

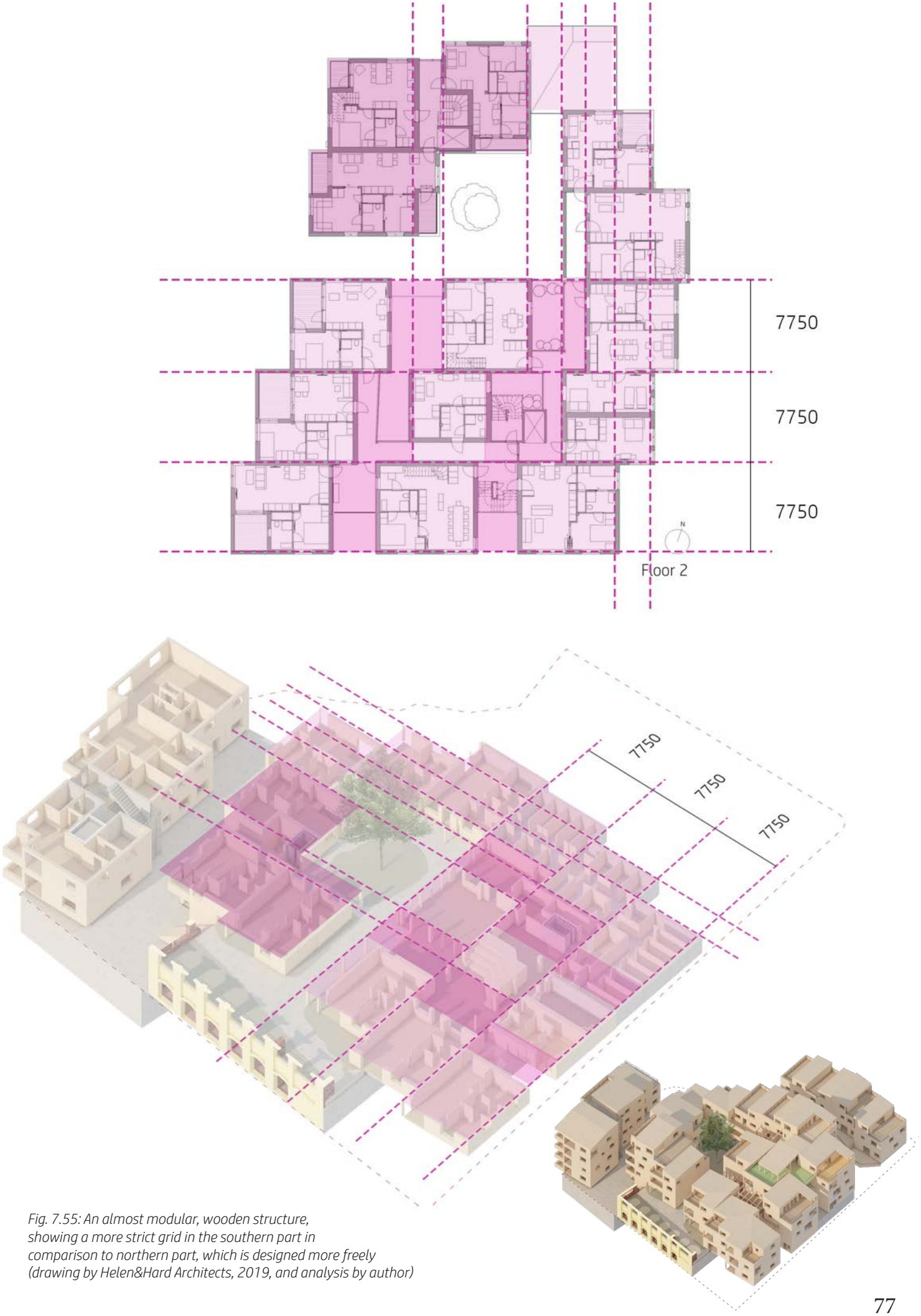


Fig. 7.55: An almost modular, wooden structure, showing a more strict grid in the southern part in comparison to northern part, which is designed more freely (drawing by Helen&Hard Architects, 2019, and analysis by author)

7.3.2 'Zwei+plus', by Trans_city Architects, Vienna

- Photos: Hertha Hurnaus, Leonhard Hilzensauer -

The name for the intergenerational, co-living project 'Zwei+plus' is dedicated to the unique concept it is designed with. A description given by Trans_city Architects itself explains it best: '*It is subsidized social housing whose units are let in pairs to two cooperating, intergenerational households. These tandem households can be family or just plain friends, but they must move in concurrently and commit themselves to mutual cooperation and support. In a time where independent living is treasured yet social support networks are needed, zwei+plus provides tandem households with the chance to live together in the same estate: their paired yet spatially separate units are close enough for interaction and assistance, yet far enough apart, that privacy is preserved (fig. 7.56).'* (2018)

The project's communal functions and their distribution show its intergenerational character; a common house, including a living, dining, kitchen and meditation garden, coexists with an assisted living instalment for the elderly and a kindergarten for the youngest generation. Resident-staff can provide care, support and help to the elderly where needed and there are synergies between especially the assisted living residents and the kindergarten. Elderly are able to contribute to the daily operations of the kindergarten or they can provide supervised child-care. The largest variety of collective spaces and functions are located on the ground floors of the 4 buildings, varying from car parking to a kids play room. All have an extrovert character towards the surrounding public area. On higher floors, only the hallways/galleries can be considered collective; except for the top floor, where the sky gardens are located (fig. 7.57-7.61). Schematically, the project can be described as 4 buildings with a collective ground floor, core and roof, positioned around semi-public outdoor space, with every one of the four buildings having its own signature function: 'assisted living', 'community', 'kindergarten' and 'parking' (fig. 7.62).
The indoor variety on the ground floor matches with the several different, semi-public communal gardens, courtyard and playgrounds, providing a pleasant and qualitative outdoor space for all residents and generations. Only some of the assisted living units are provided with private gardens (in contrast to the private balconies every apartment on higher floors is designed with) (fig. 7.63-7.65).

Comparable to the public/collective/private-gradient from to Vindmollebakken project, Zwei+plus shows public courtyards giving access to the collective ground floors with higher up the more private floors including the dwellings. Again, the top floors with their collective sky garden is an exception to the rule (fig. 7.66-7.67). What is remarkable, however, is the concept of the 'front porch' as a semi-private, interactional space, connecting the private units of the residents with the collective gallery and showing an interesting interpretation of the 'transition zone' (fig. 7.68).

Just like Vindmollebakken does the the Zwei+plus project include a wide variety of dwelling unit sizes and typologies. Most noticeable, besides the multiple single, couple and family units, are the previously mentioned (paragraph 7.2.1) assisted living units and the so called 'kangaroo-houses'. These kangaroo-houses' floor plans have a flexible design due to the possibility for 2 households to live in the same unit. A smaller and practically independent unit is directly connected to a main living unit, of which the living room, dining, kitchen and outdoor loggia can be used collectively (fig. 7.69-7.73). For example, an elderly person needing daily care and help can live together with his or her child's family.

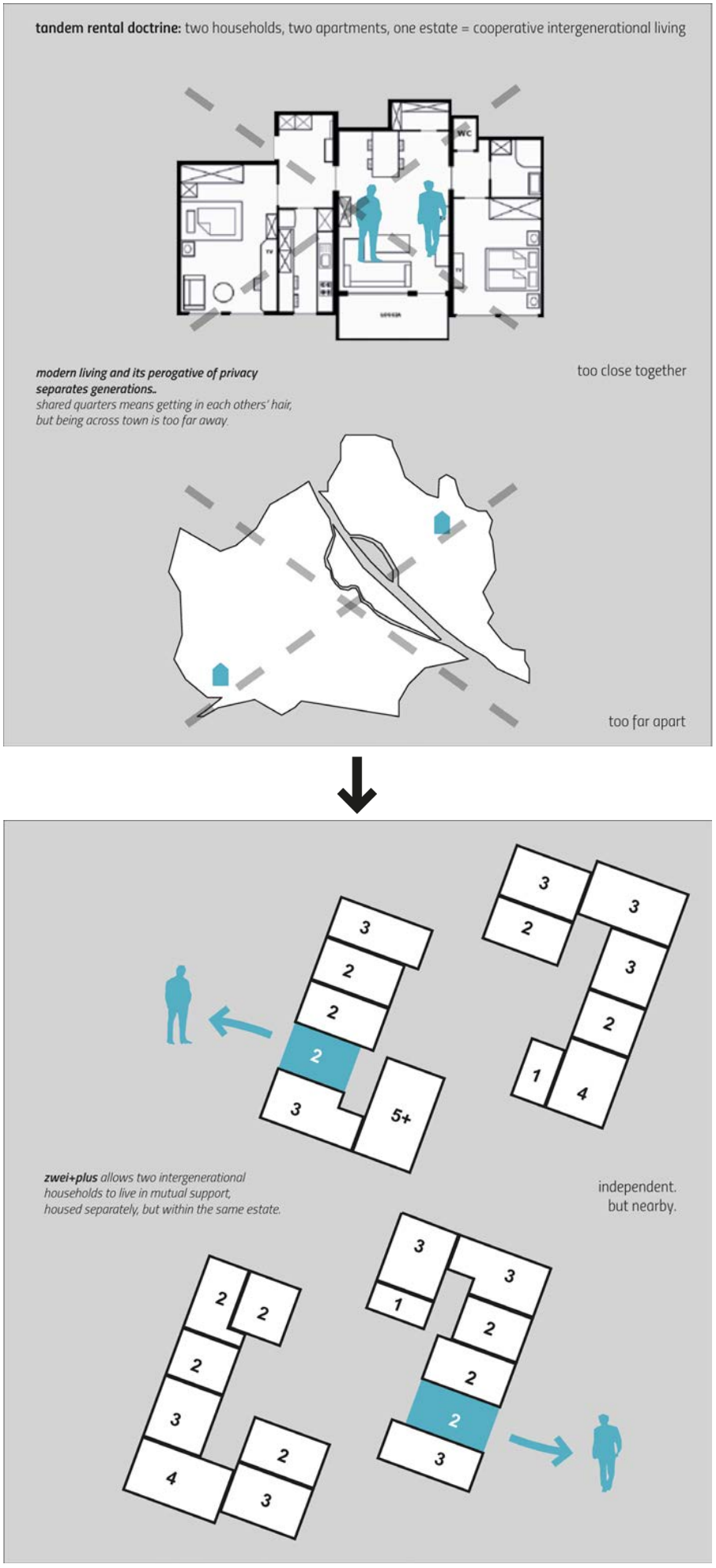


Fig. 7.56: 'Zwei+plus' 's 'Tandem Housing'-concept, promoting and facilitating cooperative intergenerational living (Trans_city Architects, 2018)

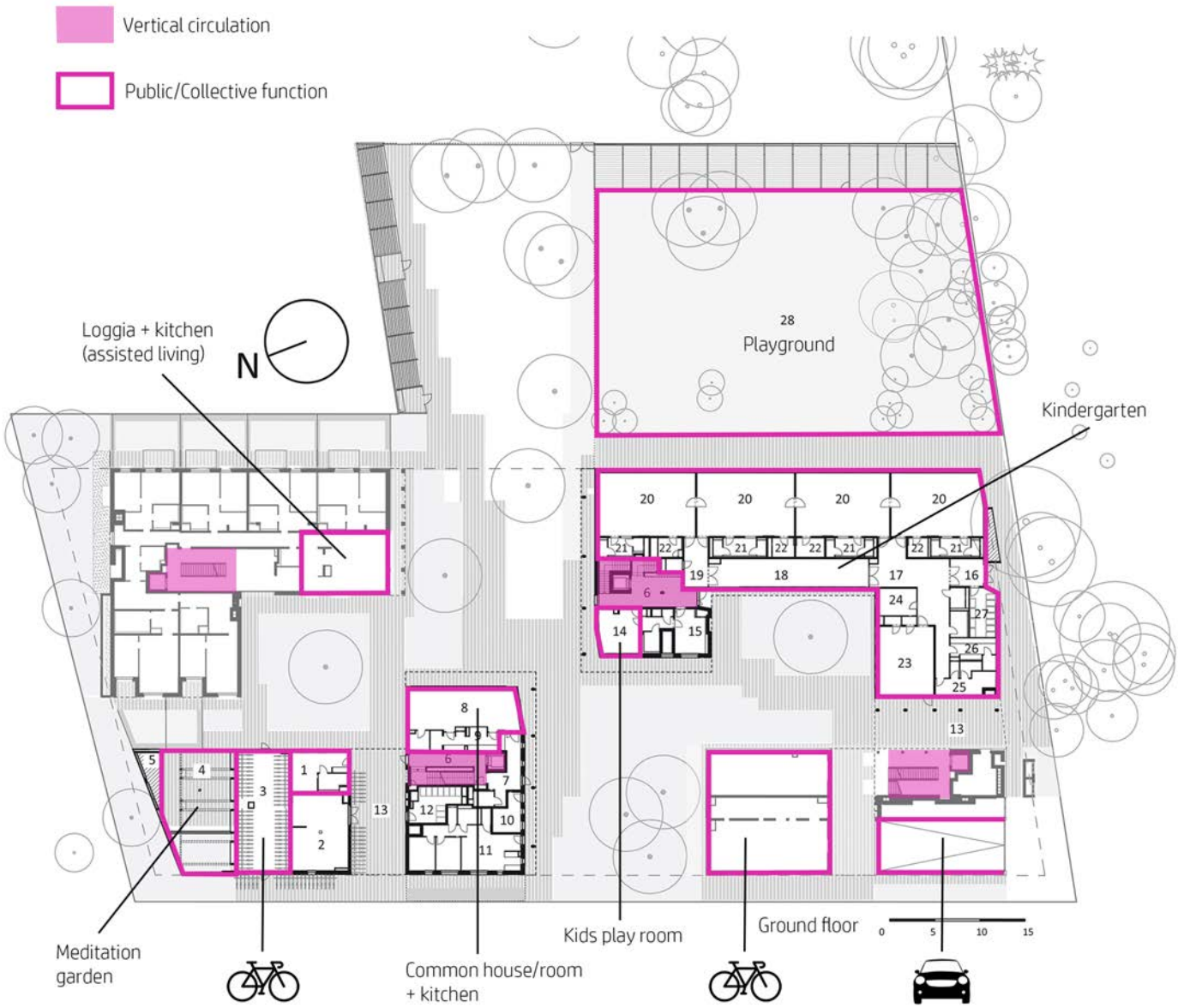


Fig. 7.57: Public/collective functions + vertical circulation; floor 0 (drawing by Trans_city Architects, 2018, and analysis + legend by author)

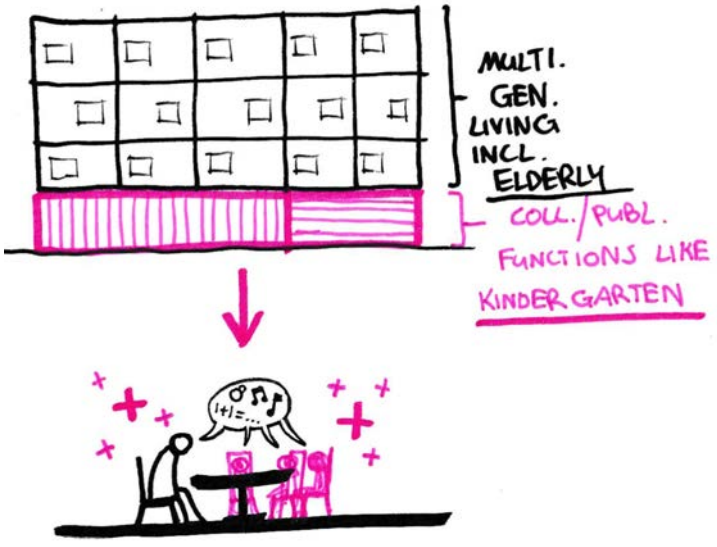


Fig. 7.58: Mutual, social benefits between elderly and children in a multi-generational co-living project including a kindergarten and/or daycare (by author)

Fig. 7.59: Common house/room + kitchen (Hertha Hurnaus / Leonhard Hilzensauer)

Fig. 7.60: Public/collective functions + vertical circulation; floor 1-4 + 5 (drawing by Trans_city Architects, 2018, and analysis + legend by author)

Fig. 7.61: Sky garden (Hertha Hurnaus / Leonhard Hilzensauer)

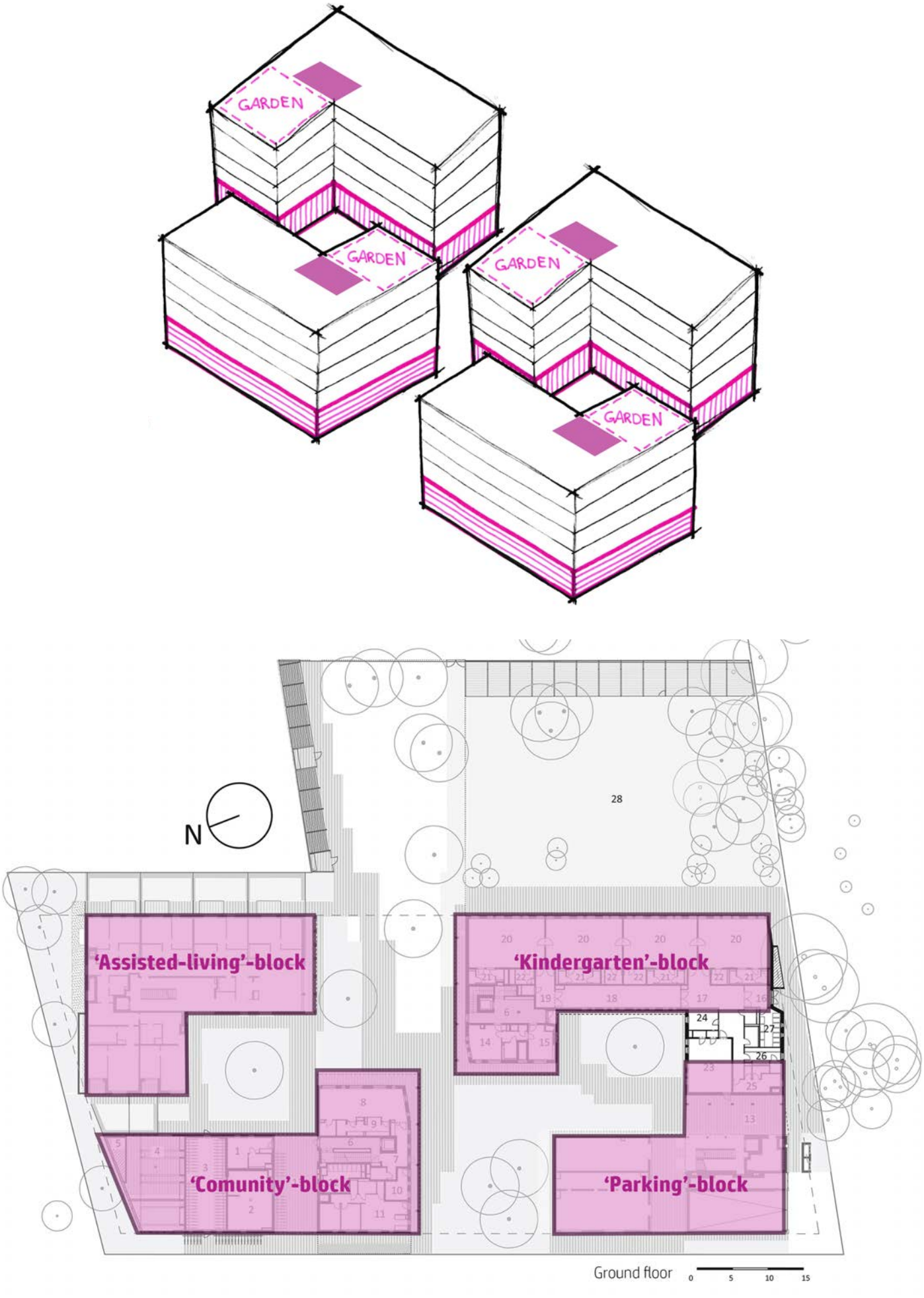


Fig. 7.62: Scheme; 4 similar building blocks with all a different, functional ground floor (drawing by Trans_city Architects, 2018, and analysis + sketch by author)

Fig. 7.63: Public/collective functions: outdoor space around the 4 building blocks (drawing by Trans_city Architects, 2018, and analysis + legend by author)

Fig. 7.64: Residential green courtyard (Hertha Hurnaus / Leonhard Hilzensauer)

Fig. 7.65: View on community gardens and (over the fence) the kindergarten playground (Hertha Hurnaus / Leonhard Hilzensauer)

Fig. 7.66: Difference in level of collectivity between ground floor and higher floors: floor 0 + 5 (drawing by Trans_ city Architects, 2018, and analysis + legend by author) For full overview, see Appendix, B1-B2

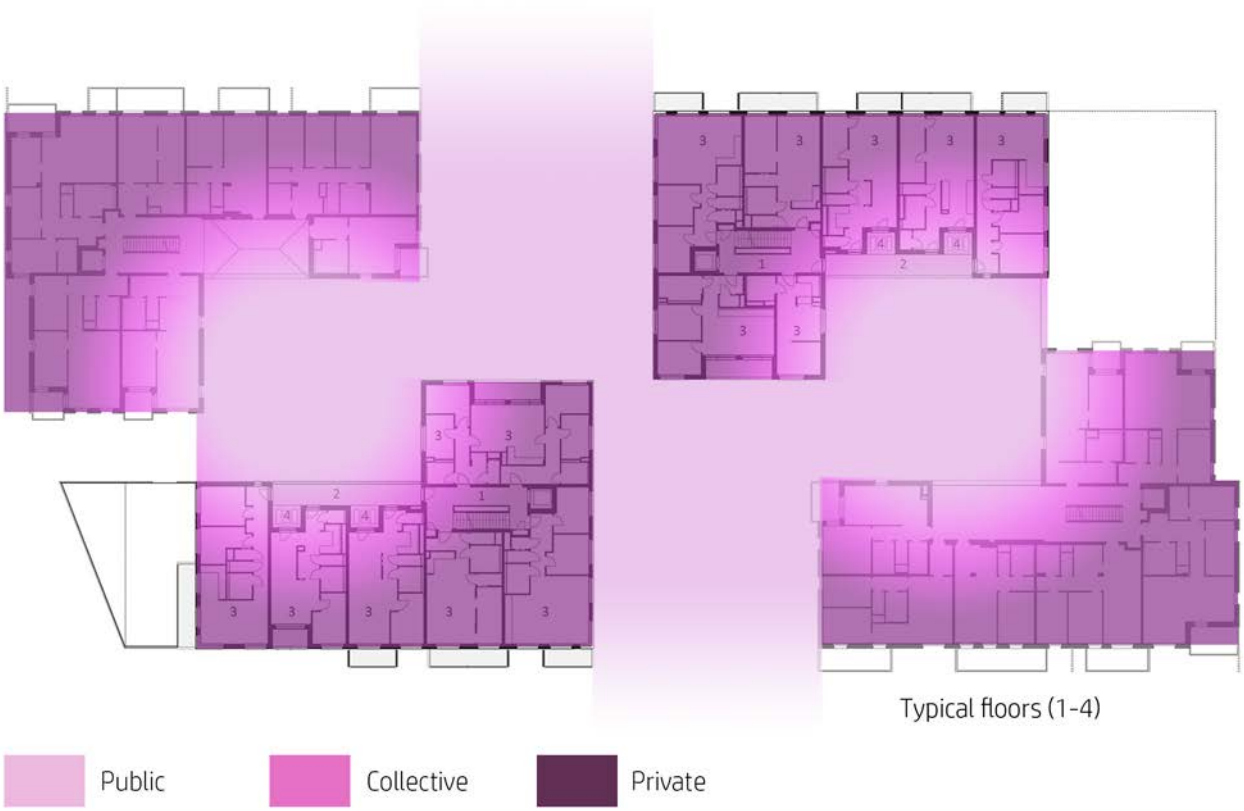


Fig. 7.67: Schematic gradient from most public in the centre of/between the building blocks to most private towards the outer edges (drawing by Trans_city Architects, 2018, and analysis + legend by author)

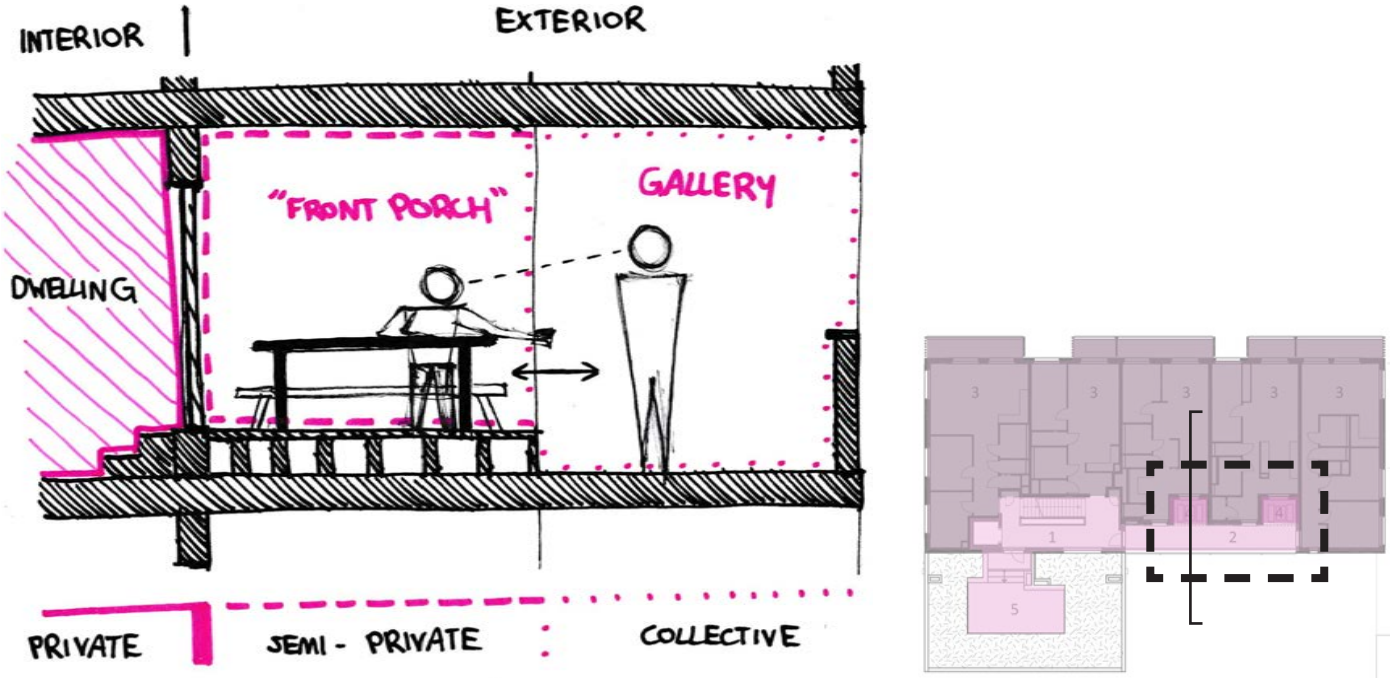
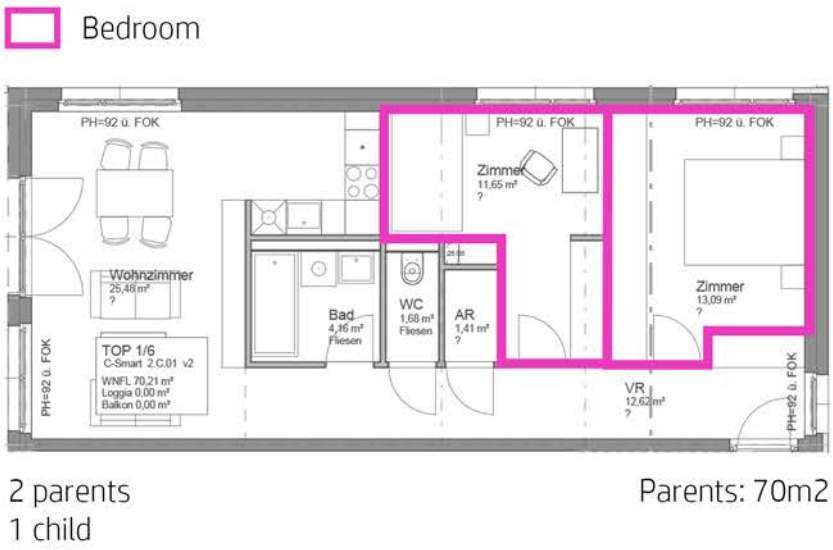
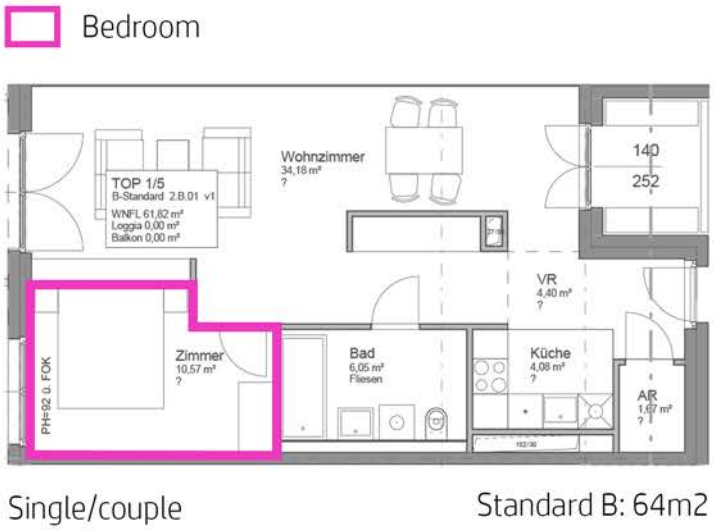


Fig. 7.68: Front porch: transition zone between private apartments and collective gallery (drawing by Trans_city Architects, 2018, and analysis + legend and sketch by author)

Fig. 7.69: Dwelling variety: Minimal (bottom), Assisted living; senior unit A (middle) and B (top) (drawing by Trans_city Architects, 2018, and analysis + legend by author)





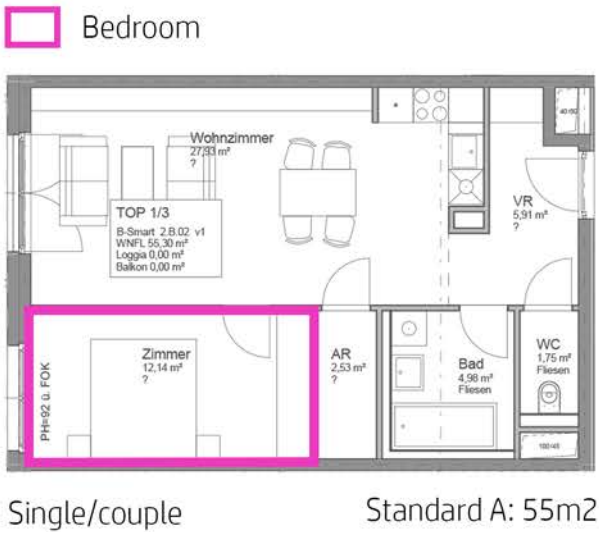
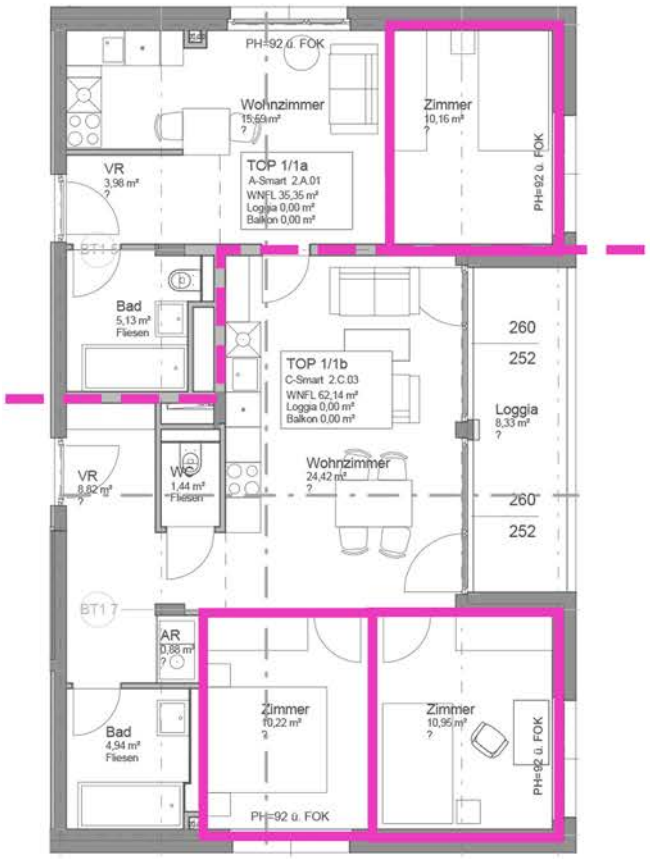
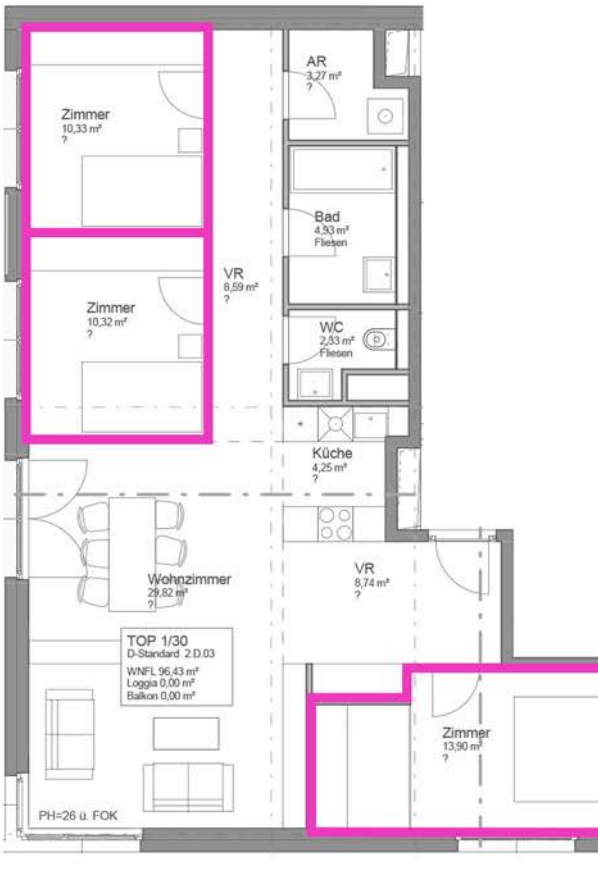


Fig. 7.70: Dwelling variety: Standard A (bottom), B (middle) and Parents (top) (drawing by Trans_city Architects, 2018, and analysis + legend by author)



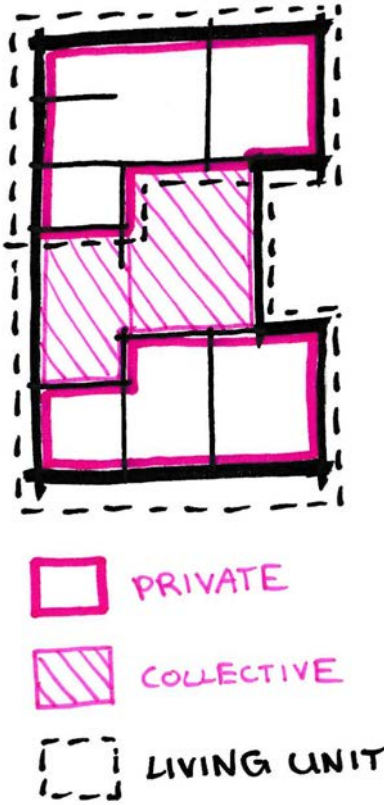
2 parents
1 child
1 senior (grandparent)

'Kangaroo'-living: 97m2
(62 + 35)



2 parents
2 children

Family: 88m2



Bedroom — — — Living-unit border

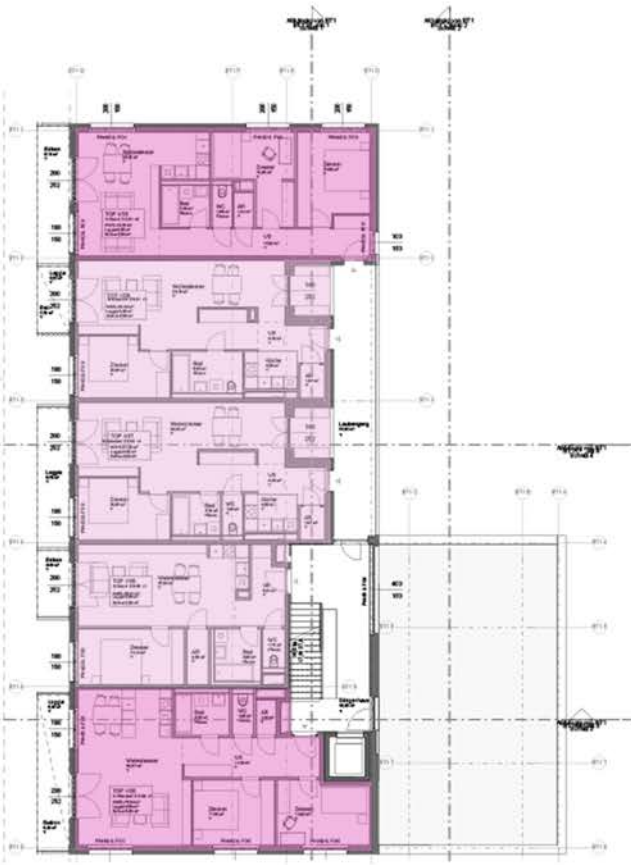
Fig. 7.71: Dwelling variety: Family (bottom) and 'Kangaroo'-living (including collective use of the dwelling unit; top) (drawing by Trans_city Architects, 2018, and analysis + legend and sketch by author)

Fig. 7.72: Dwelling variety: Assisted Living Block (floor 0-6) (drawing by Trans_city Architects, 2018, and analysis + legend by author)

Floor 6

Fig. 7.73: Dwelling variety: Community block (floor 1-6) (drawing by Trans_city Architects, 2018, and analysis + legend by author)

Floor 1-4



Floor 5

8 Conclusions and Discussion

Starting with personal simulations as a physically impaired senior and experiences of a multi-generational nursing and co-living arrangement not functioning optimally, this research was set up to discover the possibilities of such a living concept, focussed on the elderly (in need of care). First, a conclusive summary will be given to reflect the findings from both the literature and case studies, as answers to the sub-research questions. After that, a formulation of the answer to the main research question will follow, supported by a visual summary for the literature research and case studies separately.

* Text in this font will refer to findings from the case studies of 'Vindmollebakken' and 'Zwei+plus

8.1 Conclusions

Co-living residents

Which age/generational groups would fit in a co-living community together with elderly people and why?

The concept of 'co-living' includes housing with shared functions, spaces, daily activities and values, in which the residents live together socially and practically; an environment that eases social interaction and mutual support between peers and, in case of the 'multi-generational' variant, different generations too. As many seniors are more keen to live in a mixed-age environment, multi-generational co-living will keep them included in society by closing the gap between younger age groups, while simultaneously being able to live independently for as long as possible due to the companionship with neighbours. Next to other seniors, studies show significant, mutual benefits between elderly and students, and elderly and children. Successful initiatives like 'Humanitas' in Deventer indicate that especially students (or independently living adolescents) could "pay" with time, help and being a 'good neighbour', instead of high rent, stimulating the solidarity between young and old. The intergenerational relations between the elderly and children, on the other hand, are noteworthy since both age groups show a need for close connections, an urge for teaching and learning, and more leisure time. **The 'Zwei+plus' project by Trans_city Architects (Vienna) embraces this unique relationship implementing a kindergarten and day-care within the multi-generational co-living arrangement, increasing the possibilities for both groups to experience their mutual benefits.**

Formal and informal care

How can 'care' be categorized in 'formal care' and 'informal care' and to what degree does 'informal care' play a role in the care for elderly who need it?

The reciprocal character of a co-living group can help the elderly residents to prolong their independence in daily life and postpone their need for external services. However, there is a clear difference between informal (instrumental) care from fellow residents and formal (personal) care from professionals. The substitution between informal and formal care reaches a barrier when the level of disability of the concerned senior gets too high, after which external, high skilled care is inevitable. Closer relationships can stretch these limits of informal care and that is why a co-living environment with informal, mutual care and support in combination with easy access to professional care would be really convenient for the elderly to live independently at home.

Community dimensions

What are suitable dimensions (numbers, size, density, proportions) for a co-living community?

Regarding the size of a co-living community; if it gets too large, there will generally be a lack of social interaction. If it gets too small, however, it can result

in a lack of privacy. Studies on historical collective societies show a suggested, optimal community size with values of 50 and 150, due their high chances of survival and longevity. However, other studies show either much lower numbers of community members or even higher numbers of people living together. As every individual has their own preferences, biases, norms and values, an environment in which the residents could choose a particular sized living group would be desired. The different sized groups would be realised easier in a higher density project.
To get an indication of the generational group proportions, statistics and prognoses from the Dutch society as well as the concerned neighbourhood of the project (Hillegersberg Noord in Hillegersberg-Schiebroek) were utilised. The suggested ratio of elderly, families with children and students are respectively 50%, 40% and 10%.

Typology

Which architectural typologies could facilitate a multi-generational co-living community best?

Two precursor typologies of co-living arrangements were found: the Danish, low-rise typology, consisting of private dwelling units around a common house, and the Swedish, high- to mid-rise typology, consisting of multiple storey buildings with the collective (and public) spaces generally positioned on the ground floor. Medium-rise buildings will contain a higher dwelling and resident density, while being able to realise a stronger connection between the private dwellings and collective in- and outdoor areas. Research shows that the collective spaces take up approximately 15-20% of the total floorspace of the building(s).
Both case study projects are multi-storey, mid-rise buildings with collective functions, spaces and zones on all floors. The 'amphitheatre' (or 'podium stairway') of 'Vindemollebakken' helps spreading the collective domain over different floors, although the seating element itself is not that elderly friendly.

Different arrangements of residential care could form suitable co-living environments for elderly in need of care on different scales:
- Residential care zone (Urban scale): part of a town, neighbourhood or street with optimal conditions for living in combination with needs of care.
- Residential care complex (Building scale): a complex of independent dwellings combined with care and service facilities within that same building, which in theory could serve as a care support centre for the surrounding neighbourhood.
- Life-resistant homes (Dwelling scale): homes that are suitable, equipped and designed for daily living at old age. A sub-type of this are 'kangaroo-houses' **(also found in the 'Zwei+plus' case study)**, consisting of two independent but interconnected dwellings, which can house seniors in need of care together with their family, children or other caregivers.
The 'assisted living'-block of 'Zwei+plus' shows characteristics of the building-scale as well as the dwelling-scale, containing proper homes for the elderly on the ground floor together with qualified resident staff nearby for care, help and support.

Building scale

Which variety and mix of dwellings, facilities and other spaces should be offered to make the co-living arrangement meet the needs of the multi-generational target groups? And in which way should these different spaces be designed in relation to each other?

Diving even more into the architecture of any co-living arrangement, the importance of a right balance between collectivism and individualism stands out. The area in between these two, the 'transition zone' where private and collective/public flow over into one another, is really significant as well. This particular zone can function as both a barrier for privacy and a interactional space. 'Tree-like' and 'ring-road' types are distinguished as kinds of transition-zones, of which the 'ring-road' type creates the highest level of integration of the collective domains relative to the private dwellings. Furthermore, the collective and/or public spaces can either have an 'introvert' or 'extrovert' character, being respectively distanced or more connected with the world outside the building.
As the four building blocks of 'Zwei+plus' are gathered around a semi-public outdoor space, all collective spaces on the ground floor show an extrovert character, especially the kindergarten with adjacent playground.

Social interaction and relationships in a built environment will increase if there occur many 'passive contacts' in a repetitive pattern, by decreasing both physical and functional distance between residents. This can include their private dwellings, but also similar routes through the project or often used, shared facilities outside their homes. Especially for the elderly, generally being physically (and/or mentally) weaker, this high accessibility to social interaction, help, care and other facilities can play an essential role in their desired independent daily lives at old age.

A gradient from most public and collective in the core of the project to most private in the outer edges stands out in both case studies. Although, both projects contain collective spaces on the most outer edges too: the roof (Vindmollebakken: attic, terrace and greenhouse. Zwei+plus: sky garden). 'Vindmollebakken' shows this both in plan and section, making the residents more frequently go through a collective, shared space before they reach the entrance of their private dwelling, increasing the amount of passive contacts. Different architectural elements, like walls, windows and moveable objects, regulate the barrier-level between collective and private in the transition zone. The interior transition zone of 'Zwei+plus' is less integrated, however the 'front porch'-concept connecting private and collective shows potential.

The space(s) within a co-living arrangement with the highest collective character is the 'common room', which often functions as a living and dining room and can further be multifunctionally used for other activities. A certain transparency and openness of this space (from the private domains, if possible) is necessary to stimulate and encourage unplanned drop-in of residents, especially if it is also accessible for the surrounding neighbourhood and has in this way a public function as well. **Transparent, glass façades and interior windows of the dwellings result in a strong visual connection between collective and private and plenty of daylight in 'Vindmollebakken'; from both the interior as exterior.**

Other collective functions seen in co-living arrangements are:
- kitchen
- meeting room
- laundry room
- hobby room/workshop
- guest room
- individual and collective storage

The case studies show more specific collective spaces in the regarding projects:
- communal courtyard
- meditation garden
- greenhouse
- amphitheatre
- lounge
- roof terrace/sky garden
- kids play room
- collective galleries/hallways

Personal experiences during the early phases of the research (the wheelchair and visual impairment goggles) show the relevance of flat/smooth surfaces and sufficient space for wheelchair users and the importance of contrast in the environment for the visually impaired. Lifts and subtly sloped ramps will be essential for the elderly in and around the project, to live as independently as possible.

Connected to collective indoor spaces are collective outdoor spaces. Especially in a multi-generational co-living community, this area must contain specific design elements for all age groups, but especially for those with the most leisure time: the elderly and children. Playing areas for the kids with possible visual supervision and communal (and/or private) gardens for the elderly would be essential in the project, interconnected with the existing urban network of the site.
Especially the semi-public outdoor space of 'Zwei+plus', interwoven between the four building blocks, shows a big variety of functional spaces for different generational target groups: young, old and everything in between.
Equally important to the collective spaces are the private spaces; the independent dwellings where residents can enjoy their privacy and where they can withdraw into when preferred. Especially in multi-generational co-living a variety of house types is needed, with a certain level of 'standardization and flexibility' to deal with personal wishes, preferences, household compositions and changes.
The two case studies both show a variety of dwelling types, assignable to different households: seniors, students, singles and small/big families. Some of these are specifically designed for flexible use (the 'kangaroo-houses' from 'Zwei+plus') and others could in practise be used by different households or combinations of them. Especially 'Vindmollebakken' shows this variety in combination with an almost modular building system and grid.

Dwelling unit size > / Dwelling unit type v	'Vindmol-lebakken', Helen&Hard	'Zwei+plus', Trans_city Architects
Minimal	26m²	32m²
Ass. Living A	x	44m²
Ass. Living B + Standard	57m²	55-64m²
Small family (1 child)	75m²	70m²
Big family (2-3 children)	82m²	88m²
'Kangaroo' unit	x	97m² (62+35)

Care- (and health-)promotive design

Which design features does the inclusion of care and support in a co-living environment entail?

Independent living and housing for elderly in need of care requires architectural design that promotes and stimulates health and care. Next to the collective character of the built environment to ease social interaction, accessibility is also of great importance, strongly connected with freedom, openness and choice. Accessible/easy walking (thus physical activity) is stimulated by the prominent position and orientation of the stairways, next to the presence of elevators and equally levelled floors.
Visual accessibility on the other hand enhances a building's legibility and routing by the use of glass walls, panels and doors. Glass in the building's design can also provide spaces with daylight, adding to the health aspects of a built environment.
Different spots and nooks in the collective spaces are perceived as more 'homey' and help the caregivers to better attune to the preferences of the ones in need of care.
A feeling of ownership is created by the ability to personalize parts of the collective living spaces, very close to or distanced from the private dwellings.

Concerning the private dwellings, those of the elderly (in need of care) will require special design tools to prolong independent living ('aging in place') and to facilitate the care-giving they need. A floor plan, configured like snail's shell, will result in a sequence of spaces from most public (entrance and living) to most private (bed- and bathroom), which can also distinguish themselves by colour, material or texture. Sliding doors in between the spaces make the level of privacy and access controllable for the owner.
More high-tech utilities and attributes can add safety, comfort, flexibility and the possibility for monitoring the behaviour and health of the elderly in need of care.

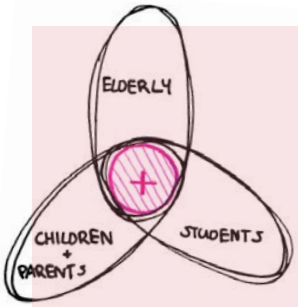
How can architectural design effectuate multi-generational co-living in which elderly (in need of care) can live integrated and independent for as long as possible?

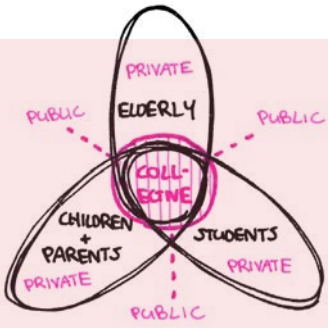
First of all, the human factor plays a significant role in (1) the composition of a multi-generational co-living community, (2) the integration of the elderly (in need of care) with society and (3) providing care, support and help to those who need it. Mixing elderly with both the young generation (students and children) and the older generation (adults and other seniors) will create a living environment in which the variety of people adds richness and companionship, together with the other mutual benefits the different age groups have with each other. The presence of a care facility and professionals within the co-living arrangement will provide the residents (especially the elderly in need of care) with both formal and informal care, prolonging independence and postponing institutionalisation.
In terms of architecture, a building typology with multiple floors will be needed to add density to the project, increasing the opportunity, space and budget for the previously mentioned care facilities, a variety of collective spaces for the residents and public functions for the whole community/neighbourhood to use. The multi functional, public outdoor spaces will blend into the indoor collective spaces on the ground floor. Examples of these spaces are a common living, dining, kitchen, hobby room, lounge and roof garden, which will increase the amount of passive contacts and social interactions, stimulating relationships and the feeling of togetherness. Easily accessible stairwells (and elevators) will provide access to the upper floors, which gradually get a more private character due to the increase of private dwellings in comparison to the shared spaces. Here, the design of the 'transition zone' gets more important, as this both connects and divides the collective and private realm on these floors. This zone gives the multi-generational residents the choice and freedom to increase social interaction or to avoid it. It can also form the space for personalization, increasing the feeling of the residents' ownership over their direct living environment next to their private home. Architectural design for care on the smallest scale will be most noticeable in the private dwellings of the elderly in need of care, where spacial design and technological features will facilitate care giving, comfort, legibility and safety.

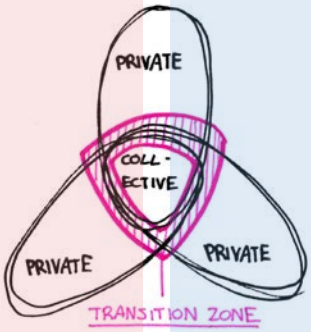
(The next pages contain a visual summary of the design tools found through the research)

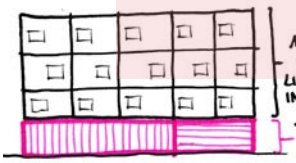
8.2 Discussion

During the earlier phases of the research process, the research method of 'fieldwork' has been of great value to determine the specific direction and subject within this project. It could have been a significant method to use during the later phases of the process as well, but the COVID-restrictions eliminated possible visits and fieldwork trips to any nursing arrangements due to the greater risks there are for the elderly. Next to that, because of the scarcity of multi-generational co-living projects in The Netherlands, it was near to impossible to get any personal information from within such a specific living environment (which, on the other hand, added to the relevance of the research). Usable examples needed to be found and selected beyond our borders, hence the case studies from Norway and Austria.
At the start of the process, multi-generational co-living as a type of housing was expected to be specific enough to narrow down the different topics that would be involved in the project. However, the variety of residents, building users, functions and spaces ended up to be too broad for all be explored to the same extent; choices had to be made. Eventually, because of the "scaling down"-structure of the research (from the users of the building, to the typology, interior spaces and private dwellings), the decision was made to tackle all the topics up until a certain level, resulting in a collection of findings that is usable for different phases in the following design process. As with all architectural projects, not every subject can be fully researched through knowledge from literature and case studies. The design process itself, including among others the context of the building site, forms a big part of the research as well. With that in mind, this research was set up to provide the foundation for the final design; a toolbox to use and build upon during the design phase of the project, during which more specific and detailed research will be done to make the fictional 'realisation' of the project possible.
Assuming that in the future people will grow old, (and therefore needing care and support) in their private living environment, more research needs to be done regarding the role architecture can play in facilitating formal and informal care. Multi-generational co-living needs to be included in this research, as this might as well become a main form of housing for elderly and other age groups in the coming decades.







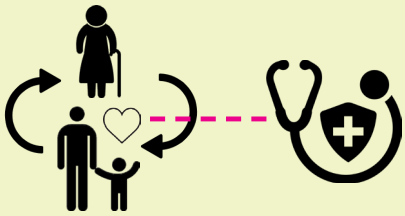


LITERATURE

Multi-generational

Seniors (in need of care) together
+
Other generational target groups

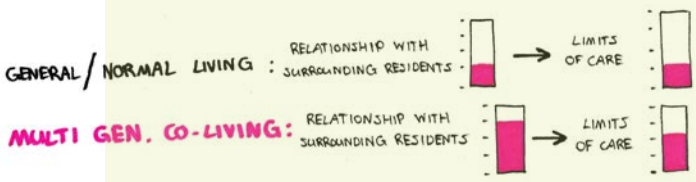
Loneliness

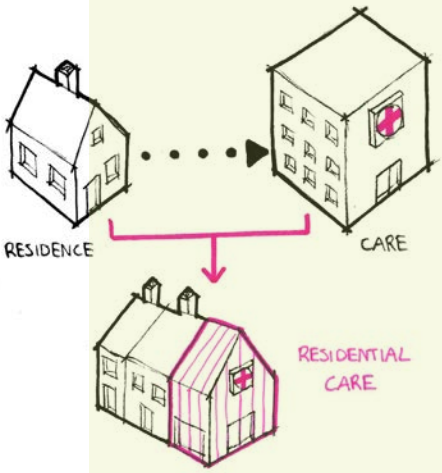


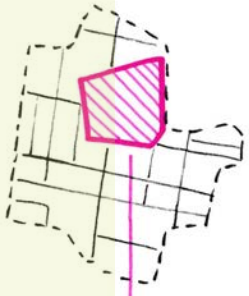
Less and less healthcare staff

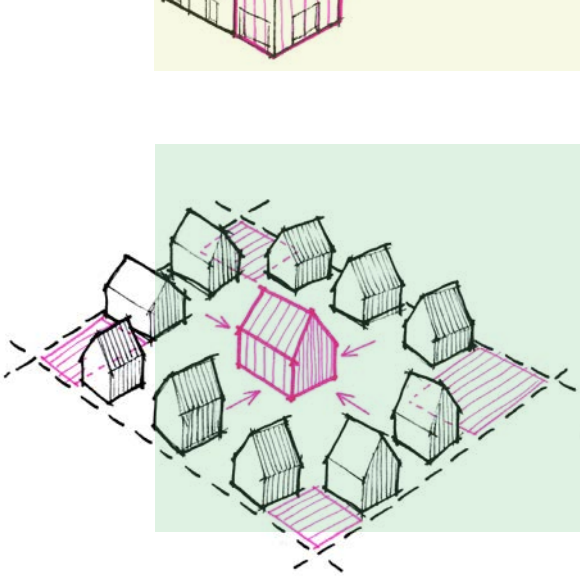
Mutual care, help and support (informal)

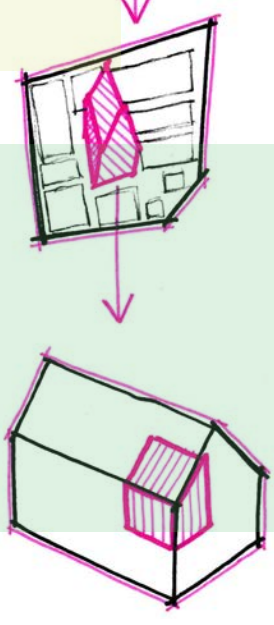
Professional care (formal)

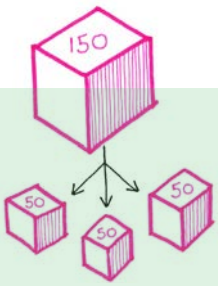


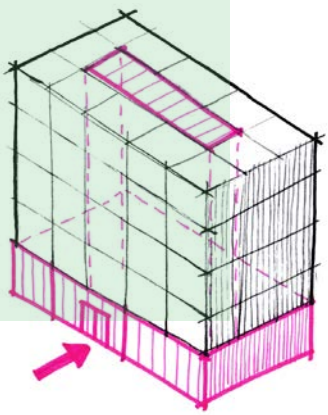


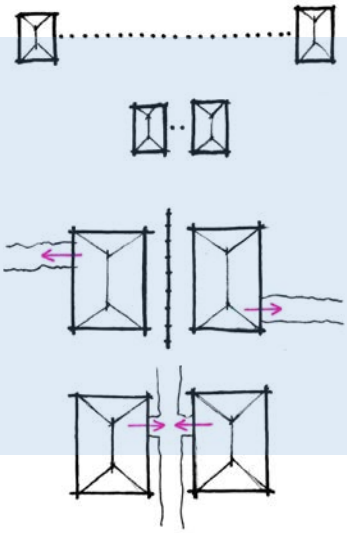


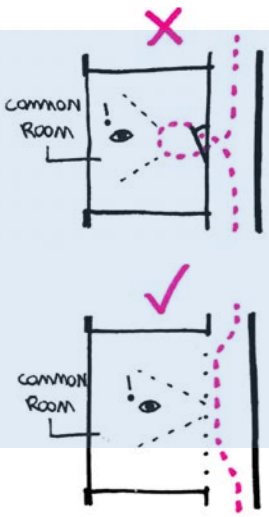


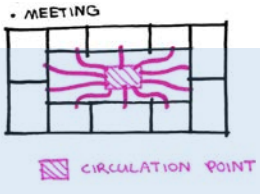


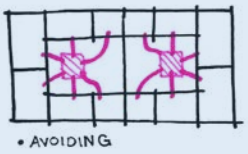


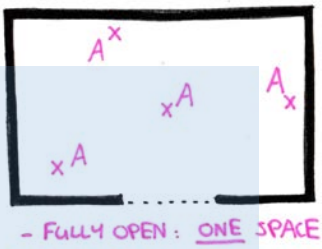


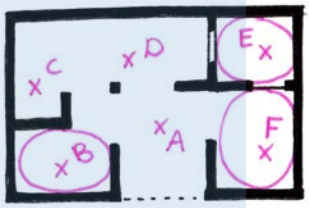


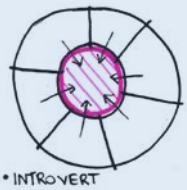


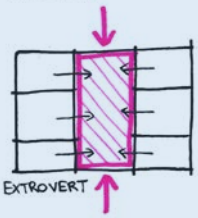












Visual Summary / Toolbox

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ding(s)?

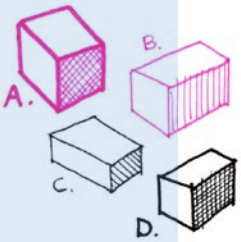
Private housing, collective spaces, facilities and design

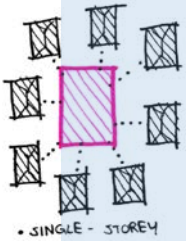
Housing shortage: no balance between supply and demand

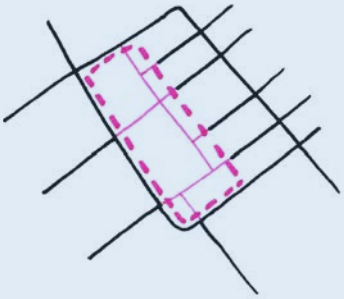
Collectivism vs Individualism

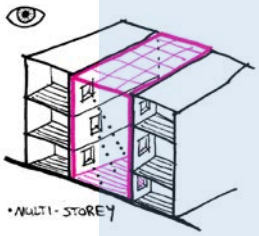
Public functions?

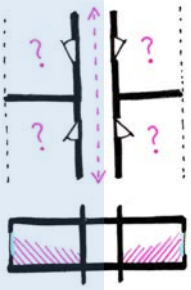
Dwelling variety
(incl. proper elderly homes)

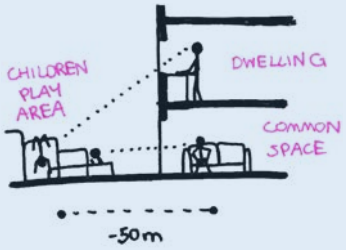


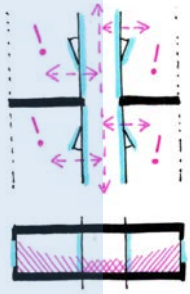


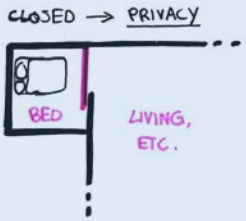


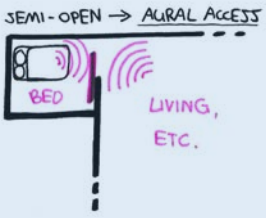


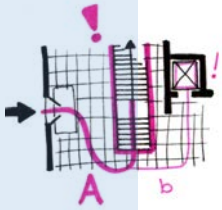


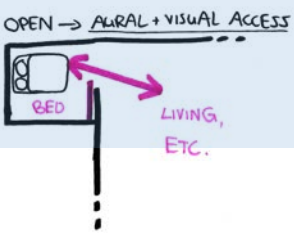


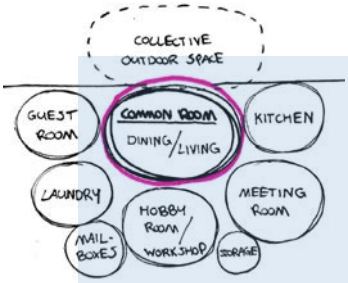


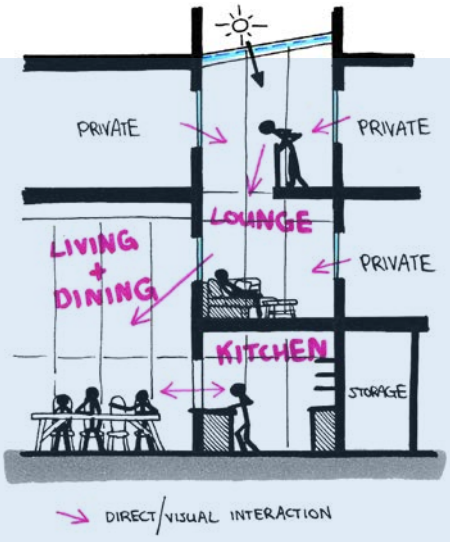


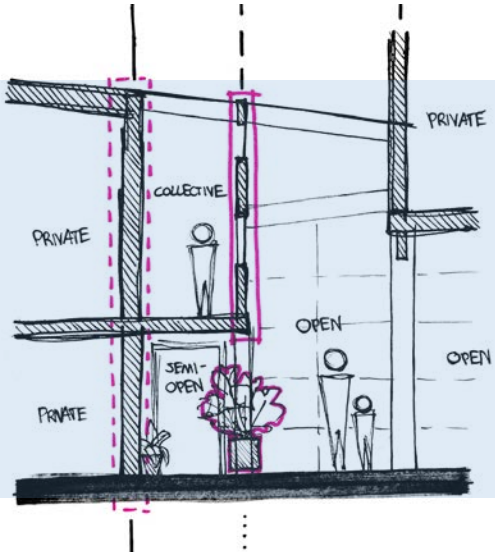


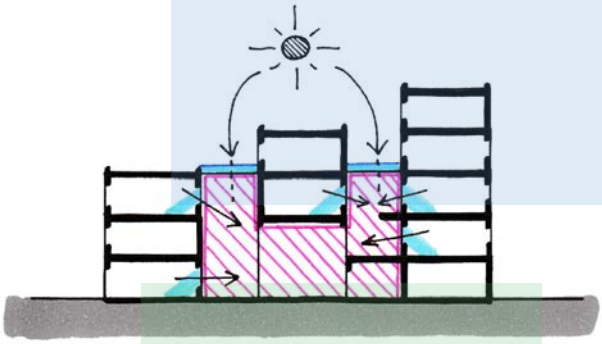










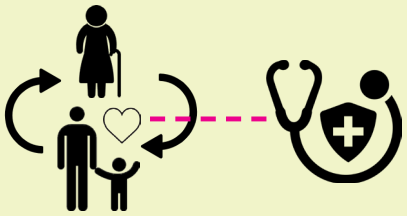


CASE STUDIES

Multi-generational

Seniors (in need of care) together
+
Other generational target groups

Loneliness



Less and less healthcare staff

Mutual care, help and support (informal)

Professional care (formal)

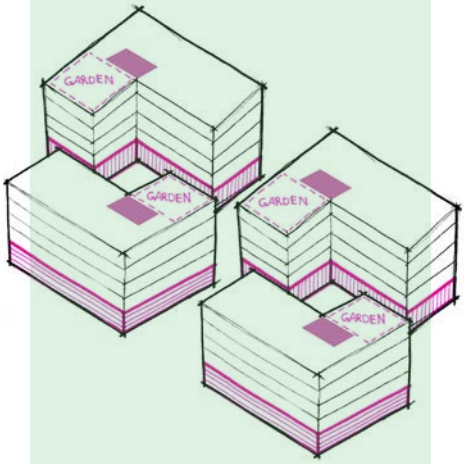
Co-arran

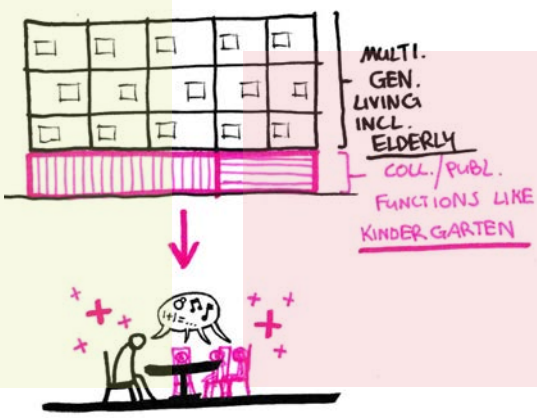
Lo

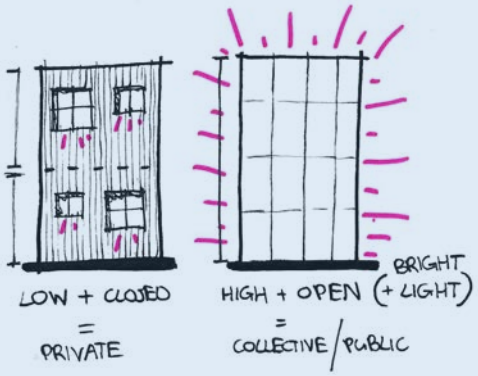
Typo

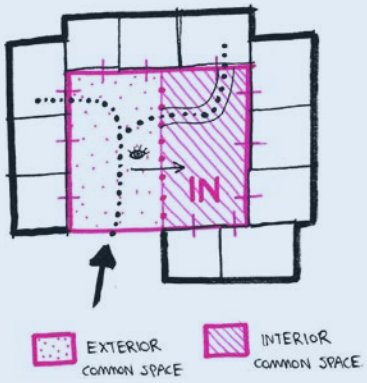
Si

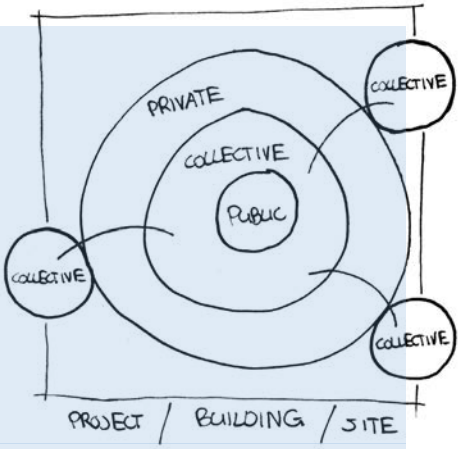
Vil
Neighb
Zo
Build











Visual Summary / Toolbox

-living
ngement

neliness

ology
+
ze

lage?
ourhood?
one?
ding(s)?

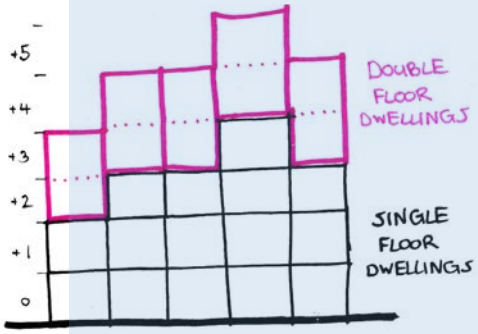
Private housing, collective spaces, facilities and design

Housing shortage: no balance between supply and demand

Collectivism vs Individualism

Public functions?

Dwelling variety
(incl. proper elderly homes)



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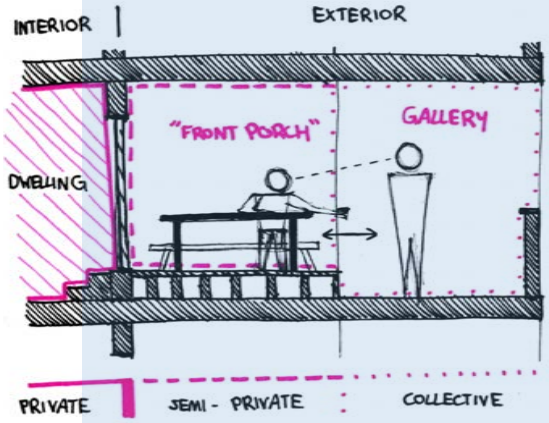

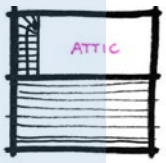

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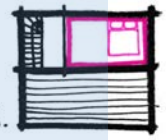

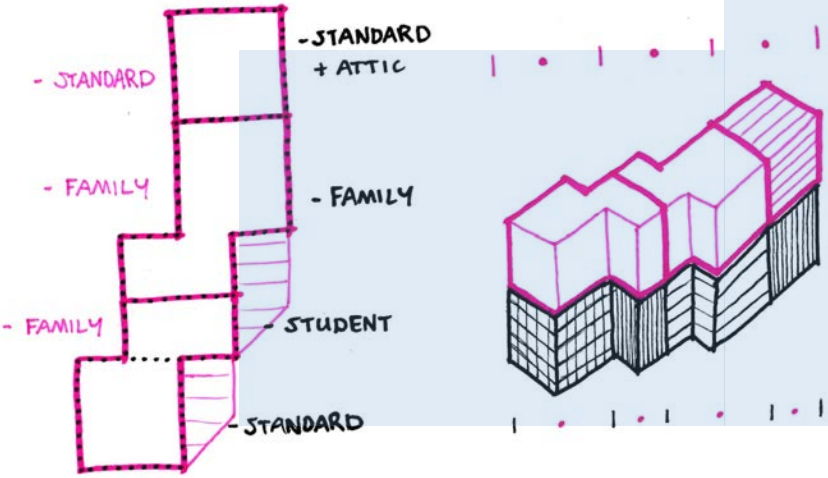

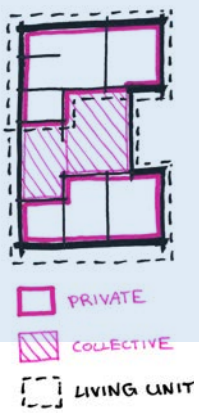

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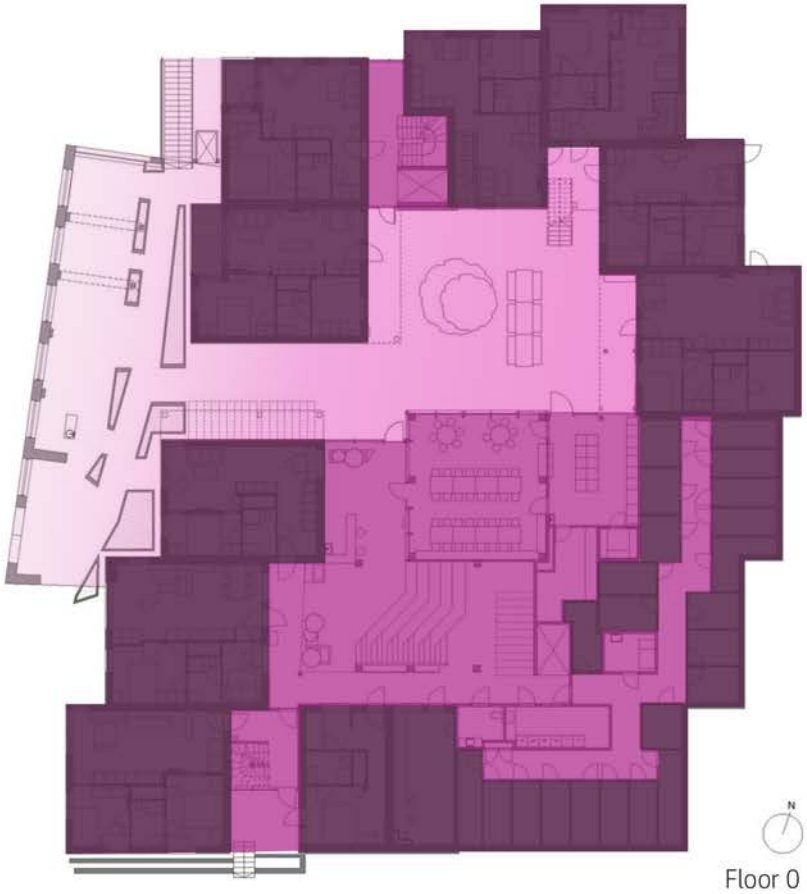
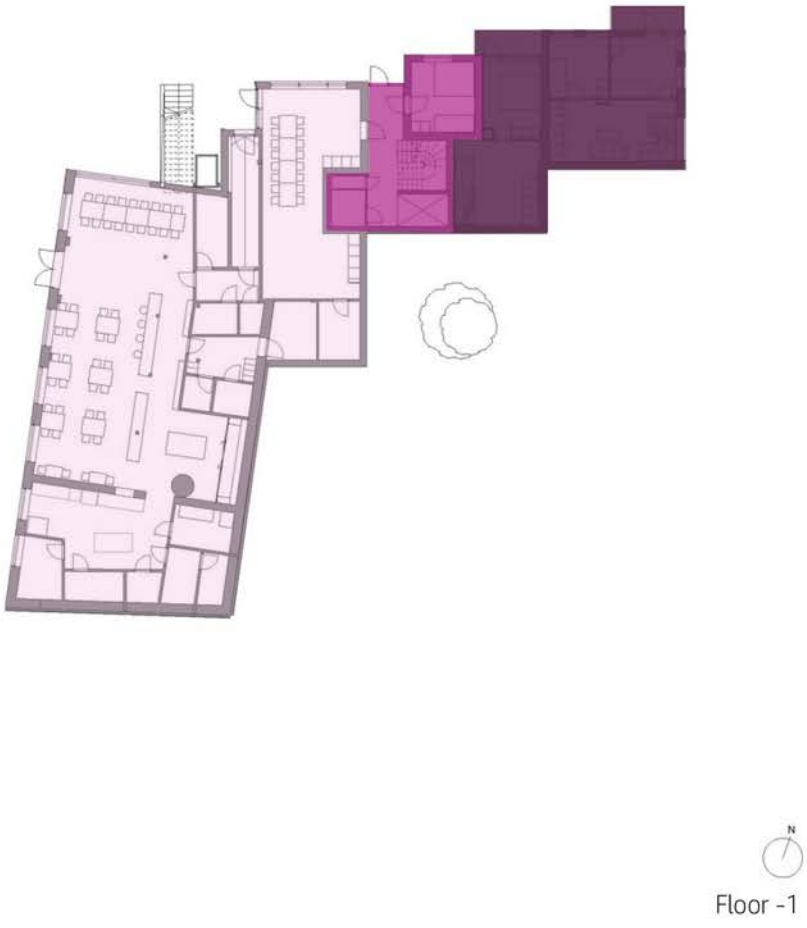
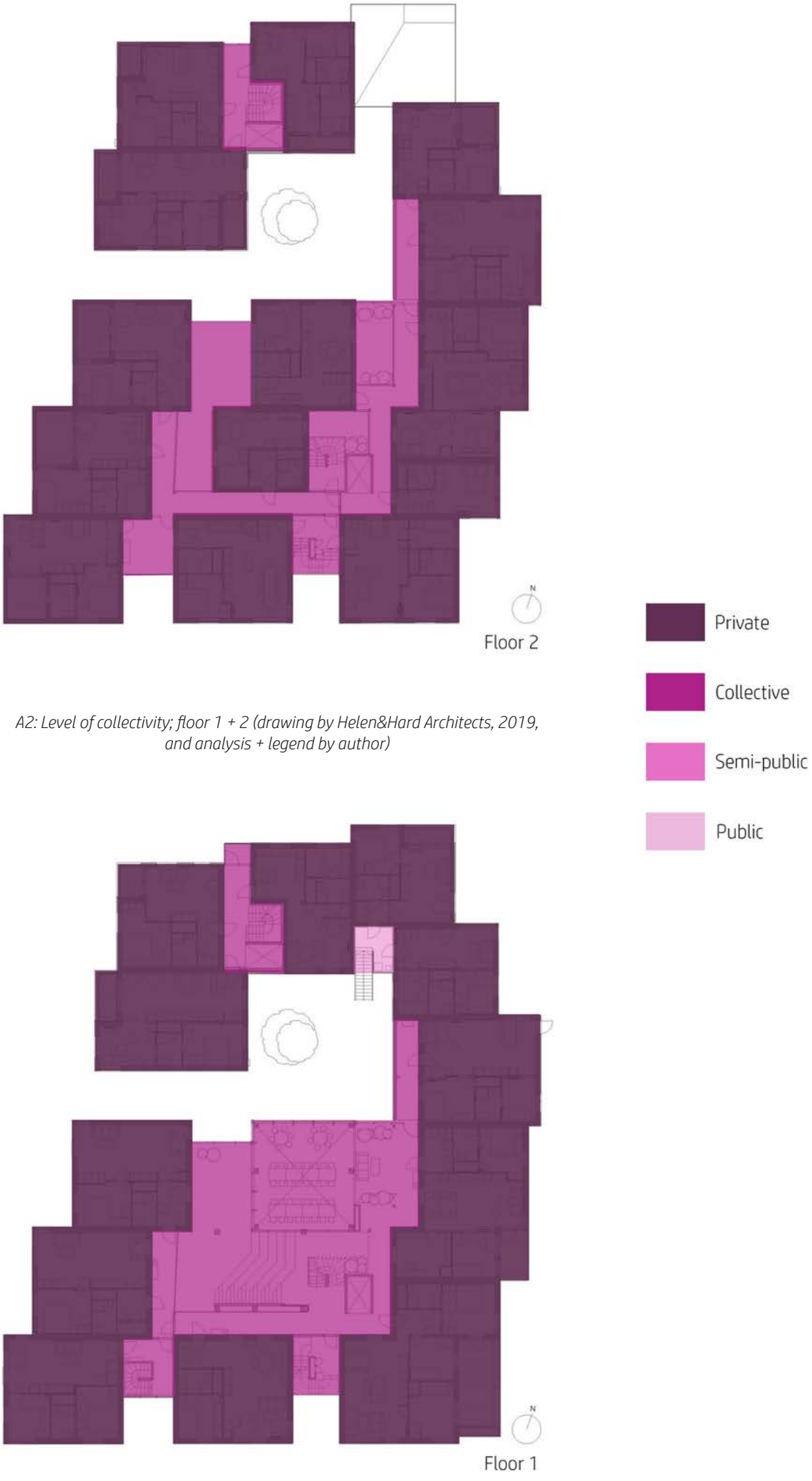
Appendix A:
Case study ‘Vindmollebakken’

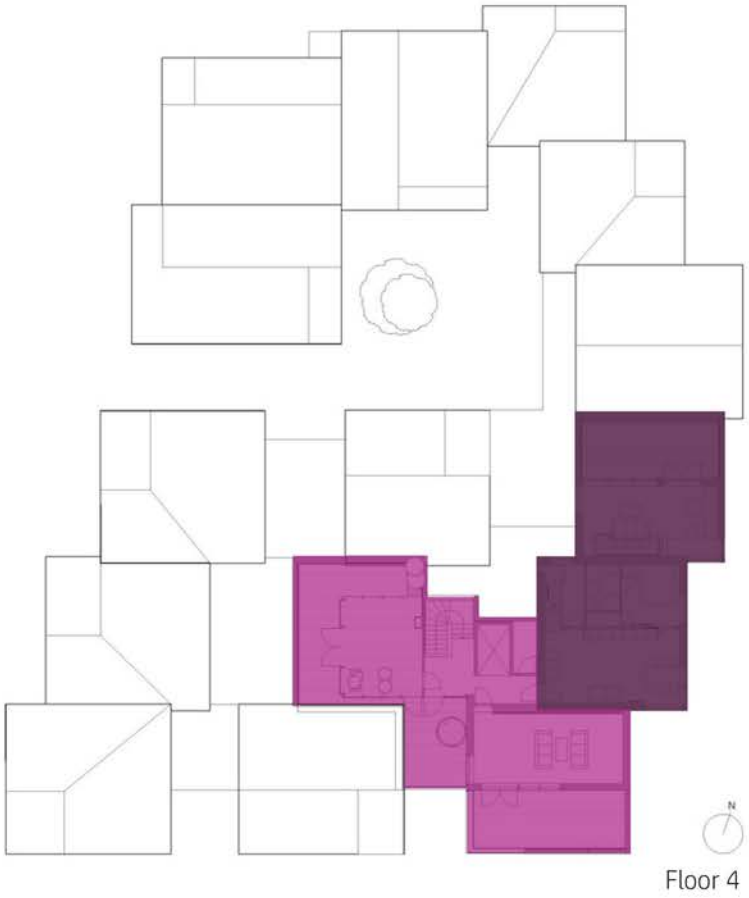


A1: Level of collectivity; floor -1 + 0 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

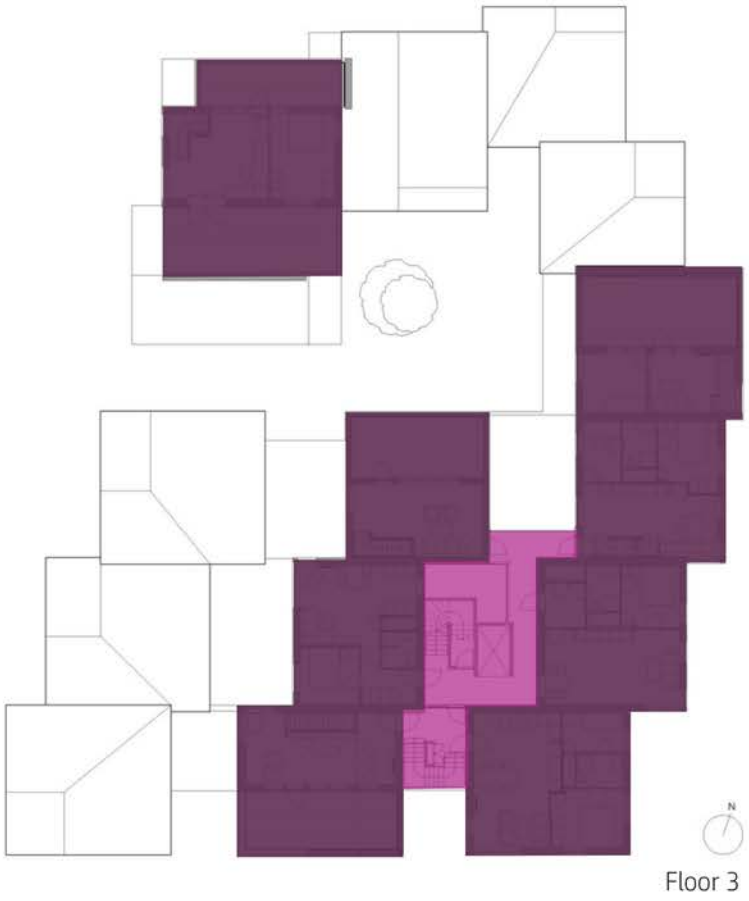




A2: Level of collectivity; floor 1 + 2 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)



A3: Level of collectivity; floor 3 + 4 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

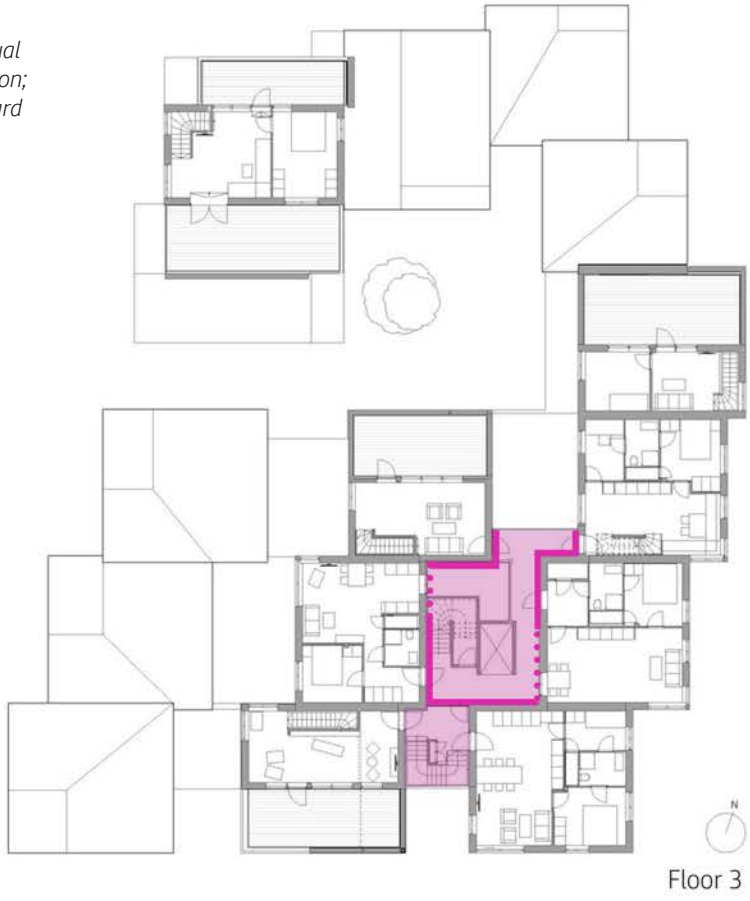


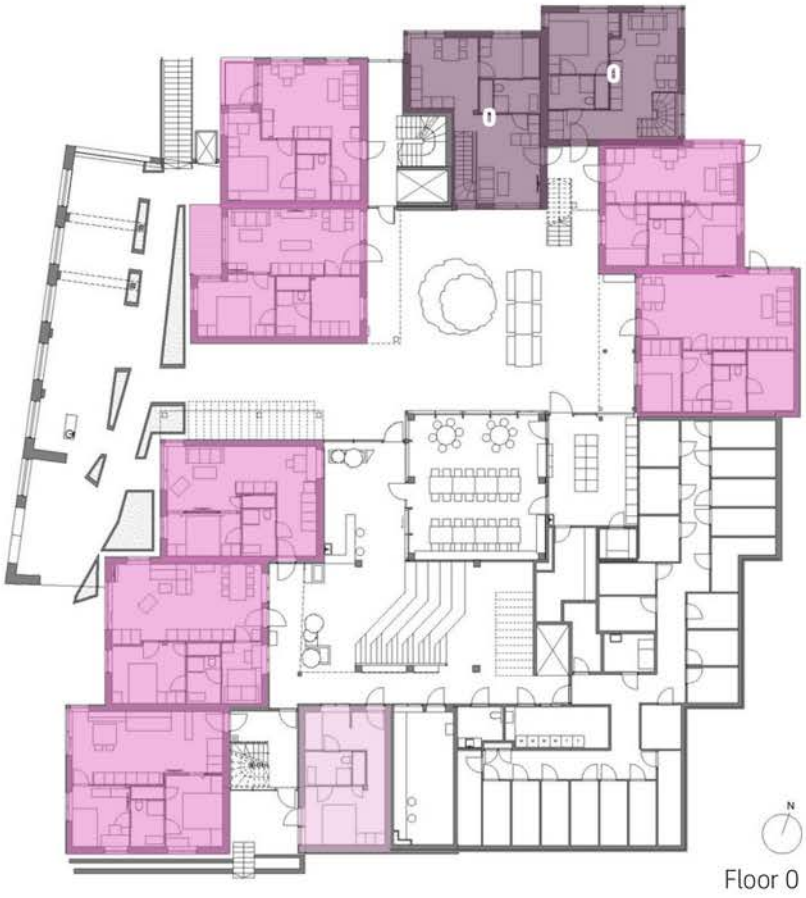
A4: Level of collectivity; floor 5 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

A5: Private dwelling spaces located adjacent to interior, collective spaces, resulting in visual connection and possible interaction; floor 0 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

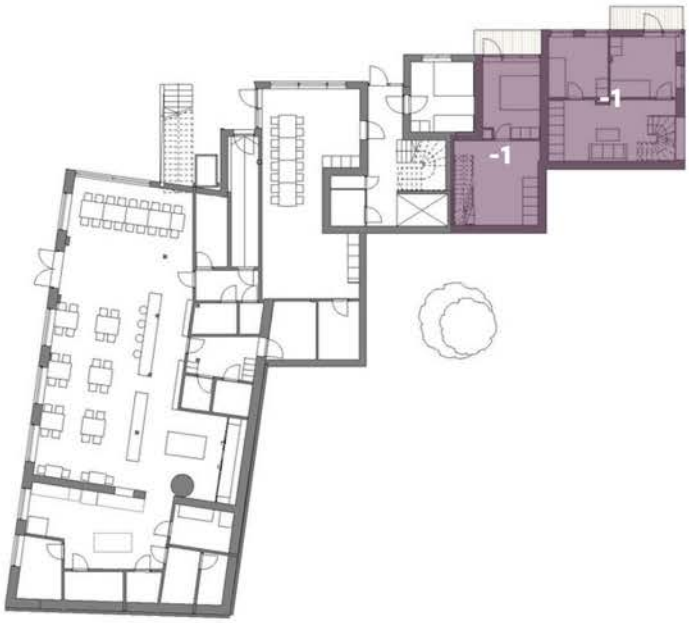
A6: Private dwelling spaces located adjacent to interior, collective spaces, resulting in visual connection and possible interaction; floor 1 + 2 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

A7: Private dwelling spaces located adjacent to interior, collective spaces, resulting in visual connection and possible interaction; floor 3 + 4 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

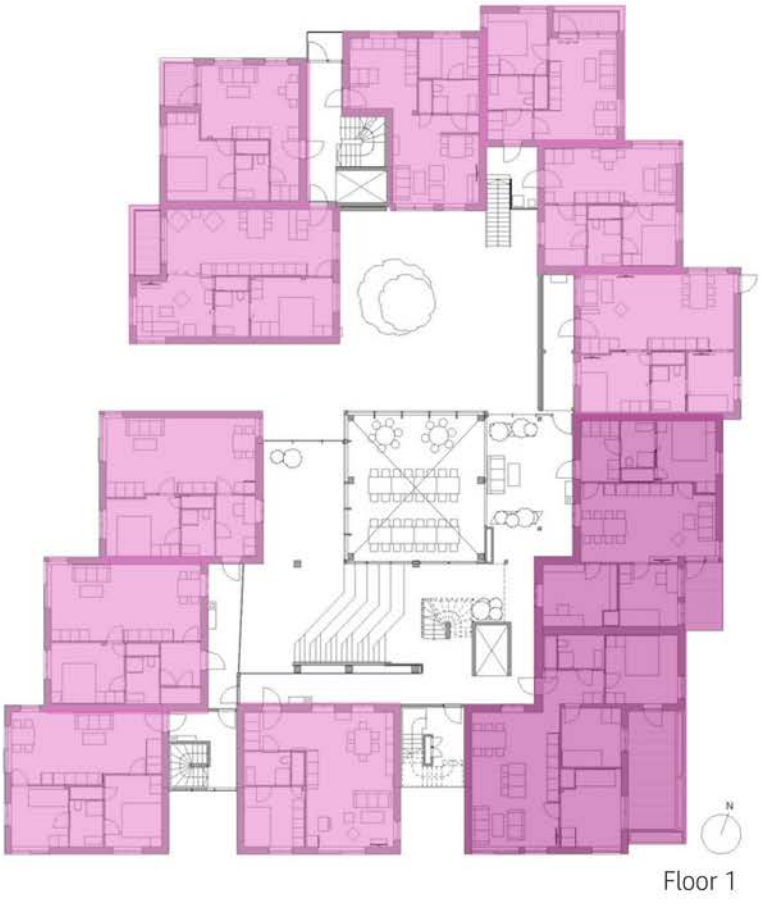


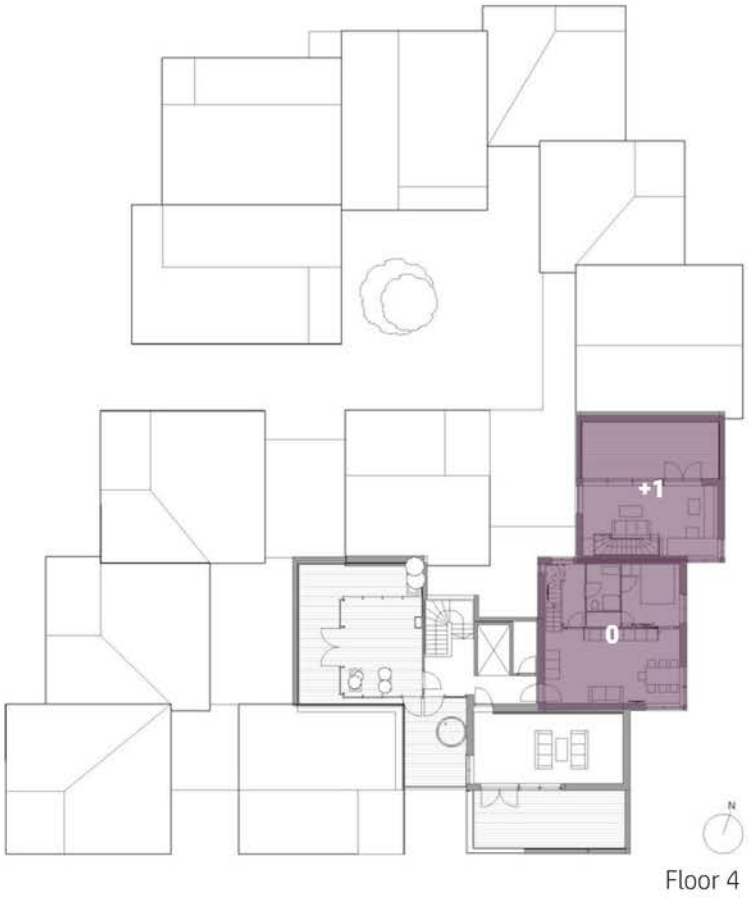


A8: Dwelling variety; floor -1 + 0 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)



A9: Dwelling variety; floor 1 + 2 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)





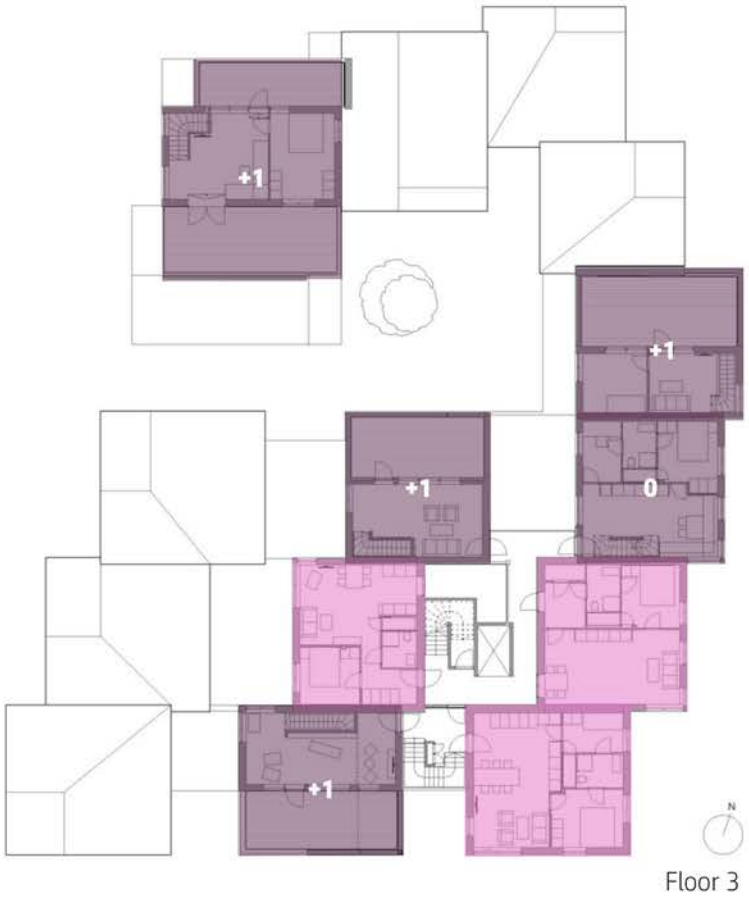
Family : +/- 82m2

Std + attic : +/-75m2

Standard: +/-57m2

Minimal: +/-26m2

A10: Dwelling variety; floor 3 + 4 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)



A11: Dwelling variety; floor 5 (drawing by Helen&Hard Architects, 2019, and analysis + legend by author)

Appendix B: Case study ‘Zwei+plus’

B1: Level of collectivity: floor 0 + 1-4 (drawing by Trans_city Architects, 2018, and analysis + legend by author)

B2: Level of collectivity: floor 5 + 6 (drawing by Trans_city Architects, 2018, and analysis + legend by author)