TU Delft
Delft University of Technology
Faculty of Architecture
and the Built Environment

BIND BY WATER

Kelly Wong

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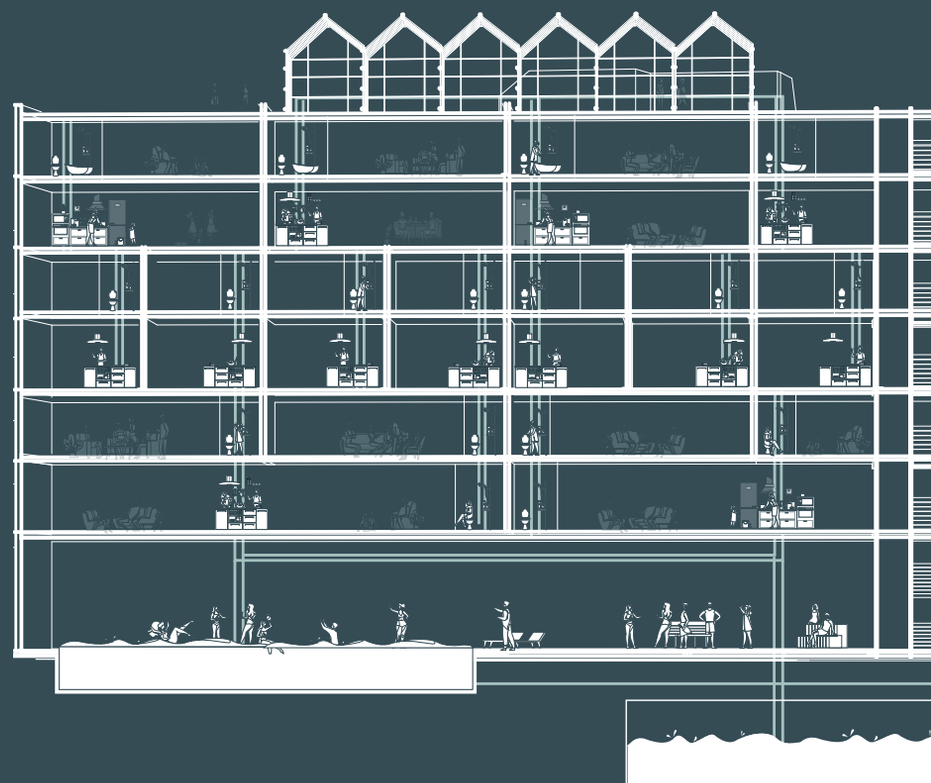
BUILDING A COMMUNITY AMONGST SOLO DWELLERS THROUGH WATER INFRASTRUCTURE



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2021-2022

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Delft University of Technology
Faculty of Architecture and the Built Environment
Academic year 2021-2022

MSc Architecture and the Built Environment
AR3AD100
Advanced Housing Design - Ecology of Inclusion

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Date:
November 11th, 2022

ACKNOWLEDGEMENT

The completion of this research report would not have been possible without the following people which I would like to give my warmest thanks to.

First of all, Anne Kockelkorn, for guiding me through this whole research process. With her help and constructive feedback, the research theme and structure of this report took shape. And I enjoyed working on it this past year. Olv Klijn, for pushing me in the design process to strive for the best and most intriguing result. Ferry Adema, for the insightful and fun building technology meetings. And my fellow students from the design studio, for all the refreshing discussions and many laughs.

Secondly, I would like to thank my friends back at home. For supporting and encouraging me throughout these many years. And my friends from the faculty, for always extending me a helping hand when needed. They have unequivocally shaped my entire student days into the most pleasurable and gratifying experience.

Lastly, I would like to thank my big and little sisters, for always being there for me. The many 'you got this!' have helped me, and meant more to me, than they would probably ever realize. My parents, for supporting me in every stage of life. And often providing me a home, an oasis, away from my hectic and stressful student life.

I have an abundance of amazing, loving, and supporting people surrounding me. And for this, I am eternally grateful.

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BUILDING A COMMUNITY AMONGST SOLO DWELLERS THROUGH WATER INFRASTRUCTURE

AND SO THEIR RESEARCH BEGINS...

01. INTRODUCTION

The Advanced Housing Graduation Studio 2021-2022 focuses on the topic of Ecology of Inclusion. The societal problem that is being addressed in the studio goes beyond the quantifiable task of building one million homes before 2035 in the Netherlands. Its focus is on the question of how a housing project in an urban neighborhood like Blijdorp, Rotterdam (the design site) could generate social inclusion, as well as reduce the resident's ecological footprint.

During the first phase of the studio, we as students were asked to develop an urban analysis of the site set in Walenburghof (Blijdorp) that directed the topics of material cycles/ re-use, energy, climate, healthy living, political economy, urban typologies, historical context, and social context. Whilst all these topics are relevant for the comprehension of an Ecology of Inclusion, to establish a new manner of urban and architectural design, the conclusions of the climate and social context analysis were what spoke to me the most.

The urban analysis of the social context of Blijdorp indicated that between 2018 and 2035, the number of single-person households will increase the most in Rotterdam (Figure 1). This trend is not only prevalent in Rotterdam but also extends to the household numbers of the entirety of the Netherlands (Faessen, 2002). Therefore, this increase in single-person households will be the first topical (social) issue that I address in this research report.

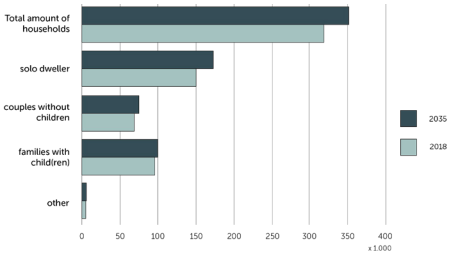


Figure 1: Number of households, by type, in Rotterdam in 2018 and 2035
(source: van der Zanden, et al., 2018)

Furthermore, in the climate analysis, the topic of water infrastructure was very pertinent in the climate adaptation strategy of Rotterdam. The city is facing many challenges regarding water management such as flooding, drought, and depletion. In this research report, I will show how sustainability and community building through water infrastructure can function together. Thus, the second topical (ecological) issue which I will address whilst executing this research.

1.1 Problem statement

Throughout history, human civilization has arranged itself around living with others instead of solo. However, during the last half of the century humankind has embarked on a significant social undertaking in which large numbers of people all over the world began to dwell as singletons (Klinenberg, 2012). This development is provoked by the wealth that is created by economic development and social security accounted for by contemporary welfare states. Humans are learning how to live independently and are constructing new means of living whilst doing so.

The Netherlands also shows this augmentation. The prognosed total number of households in 2060 increases to 8.8 million as shown in Figure 2 (van Duin, et al., 2018). This growth is mainly due to the increase in single-person households. In 2018, 38% of the total number of households consisted of single-person households. This increases to 43% in 2045. The aging population plays a big role in this increment of households (van Duin, et al., 2018).

Living alone can be demanding. It requires positioning oneself in an intimate environment whilst also facing new circumstances which provoke an extraordinary set of personal demands (Klinenberg, 2012). Encountering profound challenges like facing loneliness or the daunting image that living alone might be

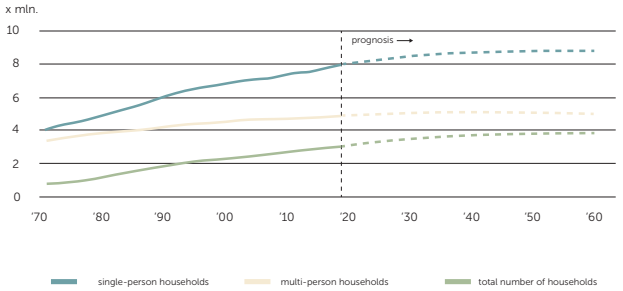


Figure 2: Prognosed number of households in the Netherlands
(source: van Duin, et al., 2018)

an indication of social incompetence. This impression of incompetence to maintain meaningful and lasting relationships and seclusion is also frequently significant in the media portrayal of those living solo (Jamieson & Simpson, 2013).

With the single-person household as fast-growing and the soon-to-be superior housing form, an increase in loneliness may arise. (Franklin & Tranter, 2011). "Loneliness was defined as the negative emotional experience of social isolation, which involved a 'mentally distressing and physically stressful way of feeling and being alone" (Ettema et al. 2010, p.3). Recent research on loneliness revealed that this tangible emotional occurrence is not related to the total amount of social contacts that one has, but rather the quality of the connections (Franklin & Tranter, 2011). For instance, various inquiries confirmed an extensive discrepancy between the loneliness of an individual and the determined number of social connections in his or her network. Therefore, it is not the quantity, but the quality of social connections that could forecast potential loneliness.
There is evidence that most people need a minimum amount of positive, meaningful, and lasting interpersonal relationships that contribute to a sense of belonging (Mellor et al., 2008). If this demand is not being satisfied, the lack of belongingness might lead to the perception of social alienation, isolation, and loneliness.

Besides this forthcoming social problem amongst solo dwellers, there is also an ecological problem Rotterdam is facing and will continue to face. I wish to address this issue in both this research report and my design. The city is dealing with many water management challenges.

Water is a physical element connecting all life on earth. This natural resource is limited due to the interference of humans, as their anthropogenic processes can provoke subtle but severe alterations in quantity and quality. Consequently, this could change the ecosystem related to the resource (Meire et al., 2008; Wagner, 2013).

The United Nations World Water Development Report of 2021 states that approximately two billion humans are currently living in regions facing water stress. It is estimated that the world will encounter a 40% water deficit by 2030 (UNESCO, 2021). The three main aspects comprising water scarcity are water demand, water resources, and water pollution, and all three are deeply affiliated with the development of economic and population growth, as well as with shifting consumption patterns (Boretti & Rosa, 2019). This contemporary condition of water resources emphasizes the necessity for the improvement of water resource management. The cascading consequences of rising water scarcity, water stress, pollution, flooding, loss of ecosystem services, and biodiversity remain to be accounted for. This vigorously emphasizes the demand

to alter the means of water valuing (Damania et al, 2017).
Acknowledging, measuring, and voicing the worth of water, together with integrating, its decision-making, are essential to accomplish equitable and sustainable water resources management and achieving the Sustainable Development Goals (SDGs) of the United Nations. In the 2030 Agenda for Sustainable Development the significance of water is acknowledged in SDG 6: Ensuring availability and sustainable management of water and sanitation for all, accompanied by diverse dimensions of water values which are indicated by different targets which comprise drinking water, water quality, sanitation, water use efficiency, ecosystems, and Integrated Water Resources Management (IWRM) for example (UNESCO, 2021).

Climate change will possibly increment seasonal variability, generating a more uncertain and erratic water supply. Therefore, aggravating existing issues in water-stressed regions and possibly fabricating water stress in areas where it has thus far not been a persistent problem (UNESCO, 2021). The resiliency in resources in water infrastructure is crucial for the ability to restore or even evade rapidly from adversity, shocks, and stresses.
Extreme rainfall and flood have increased by over 50% in the previous decade (UNESCO, 2021). It is anticipated that climate change will expedite the severity and frequencies of droughts and floods even further (EASAC, 2018)

The city of Rotterdam endured a long battle against water. Nevertheless, the heavy rainfall in 2016 caused flooding in the city and subsequently raised awareness of the vulnerability of Rotterdam. Due to climate change, the heavy rainfall will only intensify over shorter periods of time. It is estimated that by 2015, the extreme rainfall will multiply by five (Figure 3). As a result, disruption may occur as the current water and sewage system are incapable of processing such rainfall capacity. (Gemeente Rotterdam, n.d.). By employing rainwater for everyday use, the water footprint of residents could be reduced. Yet, most rainwater flows directly into the sewage system without further utilization, even though rain is a renewable

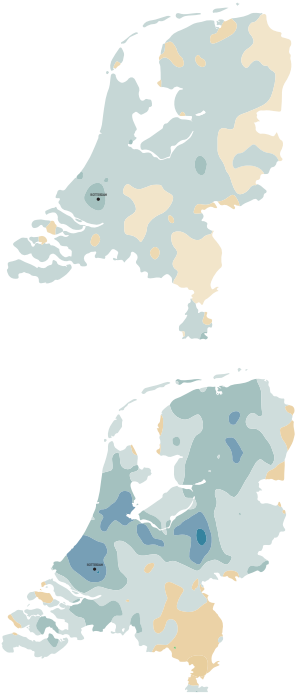


Figure 3: Intensity of Rainfall in the Netherlands in 2020 & 2050
(source: Esri Nederland (n.d.) ArcGIS-apps)

water resource that could be used for non-potable domestic functions (Krozer, et al., 2010).

The water consumption for humans is generally abstracted from surface water and groundwater (Krozer, et al., 2010). The system provides for drinking water and discharges pollutants adequately, although it demands lengthy transport components (Inman and Jeffrey, 2006; Wilderer and Schreff, 2000). 40% of the drinking water supply in the Netherlands is accounted for by surface water (Rijksinstituut voor Volksgezondheid en Milieu, 2011). However, surface water as a resource for drinking water might not be sufficient throughout dry periods up to 2040 due to climate change. The quality of the surface water is affected by the emissions of industries and sewage treatment plants during these dry periods, as it will deteriorate due to salinization and the relatively large contribution of discharges. Moreover, will heavy rainfall and temperature fluctuations have a significant impact on the water quality (Rijksinstituut voor Volksgezondheid en Milieu, 2011).
Water supply companies with Maaswater as its source, are facing limitations in available quantity. To cope with this development, possible measurements such as switching to alternative sources are being investigated. This is necessary when lower discharges occur during dry summers, as the water demand is higher during these periods. An impending substitute in the built environment contains the division of streams that can comprise on-site reuse, employment of rainwater harvesting as a renewable water resource, and in-house saving. This could enable more prudent water use and is also cost-effective (Krozer, et al., 2010).

Apart from this ecological benefit of employing sustainable water resource management, there is also a social benefit that could result from this. The presence of "blue space"—water sources in the form of lakes, rivers, ponds, oceans, and even swimming pools— enhances people's physical and mental health ". Being in or near water environments may lead to relaxation, improved social interactions, better brain health, enhanced physical activity, and relief from stress, according to emerging research" (Hart, 2019, p208). In addition, single-person households use more resources (e.g., energy and water) per person, compared to people living in multi-person households (Luising & Teeuw, 2005; Williams, 2007) (Figure 4). Incorporating rainwater as a water resource within the water infrastructure of a residential building could reduce the monthly water cost for residents.
The use of rainwater could be integrated into a new bathing infrastructure of a residential complex. Introducing a new lifestyle, in which communal bathing becomes substantial in residents' daily routine, could enhance the social making and community building qualities of the building design. This is demonstrated by many historical examples such as Roman bathhouses, which were the most significant meeting place during the Roman period and generated a strong sense of community. I will therefore also investigate how introducing a new form of bathing culture could foster social encounters amongst the residents.

	total household consumption	total consumption per person
1-person household	**52.000 L**	**52.000 L**
2-person household	99.000 L	49.500 L
3-person household	145.000 L	48.333 L
4-person household	191.000L	47.750 L

Figure 4: Average annual water usage according to the number of people in a household
(source: Waternet, 2016)

1.2 Research question

This sociological problem of loneliness amongst the rising household type of solo dwellers, together with the ecological problem of not adequately exploiting the high quantity of rainwater for sustainable water resource management in Rotterdam were all components that formed my research topic. I will be investigating whether community building through water infrastructure could be a possible solution to tackle both problems. The main research question which is central within this research report is, therefore: **How could community building amongst solo dwellers be enhanced through water infrastructure?** I will answer this question by first investigating sub-questions that revolve around the topic of the solo dweller, building a community, and community building through water infrastructure.

1.3 Methodology

The main body of this research report is structured in three chapters, with each its own theme related to the main research question. In each chapter, I will carry out a literature review and case study analysis. The three chapters and accompanying sub-questions are:

The solo dweller
- Why did the solo dweller rise as a prominent household type in Western societies?
- Which type of solo dwellers are there?
- What are the housing needs of solo dwellers?

Building a community
- How is a community built?
- How can a community be built amongst different types of solo dwellers?
- How can communal spaces foster social interaction and community building in a residential building?

Community building through water infrastructure
- Which domestic spaces relate to the water infrastructure of a building?
- What is the meaning of water in different cultures compared to the Netherlands?
- How has bathing culture developed historically in Europe, and how can these (historical) examples be implemented in a contemporary context like Blijdorp?
- How can bathing infrastructure and the social spaces of bathing impact the lifestyle of residents, and, in consequence, dwelling typologies?

1.3.1 Case study analysis

In the first two chapters, the same three case studies will be investigated. However, each chapter centralizes its own theme (solo dweller and community building). Therefore, each chapter requires different analytical criteria/layers of the case studies which will be analyzed. In the first chapter on solo dwellers, the analytical criteria are *dwelling typologies, dwelling sizes, private & communal spaces & shareability of amenities*. In the second chapter on building a community is *spaces of interaction*, and how social interaction is simulated within the project.

The case studies that I will be investigating are:

Image (left): Exterior Tietgen Dormitory
(source: Archdaily)

TIETGEN DORMITORY

Architect:	Lundgaard & Tranberg Architects
Location:	Copenhagen, Denmark
Year:	2015
Type:	Student Housing
User:	Students
Area:	26515 m²
Dwelling:	360

PROJECT DESCRIPTION

The Tietgen Dormitory is designed by Lundgaard & Tranberg Architects and was completed in 2005. The project is in Ørestad North and is located in close proximity to the University of Copenhagen. The circular shape of the building responds to its urban context, granting a bold architectural remark on a newly developed region. The circularity symbolizes community and equality, whilst the jutting extensions articulate the individual residents. The project aspired to generate encountering of the individual and collective. The individual units of the residents are situated on the perimeter of the building, with a view of the buildings' surroundings. Whereas the communal spaces are facing the inner courtyard; reinforcing the notion of community.

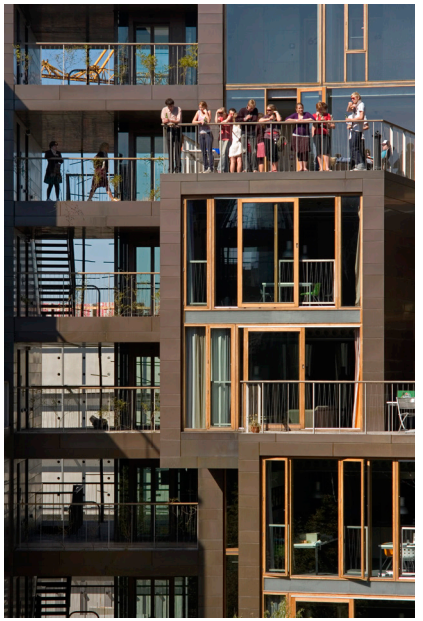


Image (top left): Accesible communal balcony
(source: Archdaily)

Image (top right): Courtyard, enclosed by circular building
(source: Archdaily)

Image (middle right): Interior studio space
(source: www.tietgenkollegiet.dk)

Image (bottom right): common room on ground floor
(source: www.tietgenkollegiet.dk)

Image (left): Exterior Sargfabrik
(source: BKK-3)

SARGFABRIK

Architect:	BKK-2 (now BKK-3)
Location:	Vienna, Austria
Year:	1996
Type:	Co-operative housing
User:	Co-operative members
Area:	2747 m²
Dwelling:	112

PROJECT DESCRIPTION

"Living – culture – integration" – the motto of the Sargfabrik, a bottom-up housing project designed by BKK-3 (then BKK-2) in 1996. The adaptive reuse of a previous coffin factory into a housing complex was accomplished by a non-profit housing association that had a clear view on a new innovative lifestyle. The project is exemplary in showcasing how bottom-up enterprises could maneuver in the bureaucratic spere effectively to achieve their goal. Sargfabrik is respected by many due to its extraordinary mixture of private and public, the utterance of the individual desire, and a remarkable example of the achievement of a group of people sharing the same mission.

The residential project has an evident cultural and social message with clear social goals. These goals focus on social equality and integration amongst the residents as well as its broader neighborhood. Forming a space of integration that builds an urban place within itself, comprising many communal areas, and a shared roof garden. The restaurant, cultural house, conference room, kindergarten, and twenty-four-hour bathhouse are publicly accessible and establish a meeting space for all people of different backgrounds and ages.

Image (top left): Preservation of old coffin factory character
(source: BKK-3)

Image (top right): Balconies of dwellings looking over the pond
(source: www.sargfabrik.at)

Image (middle right): Bathhouse
(source: BKK-3)

Image (bottom right): Bathhouse
(source: www.carrcabinet.com)

SOCIAL

ECOLOGY

SOLO DWELLERS

COMMUNITY BUILDING

WATER INFRASTRUCTURE

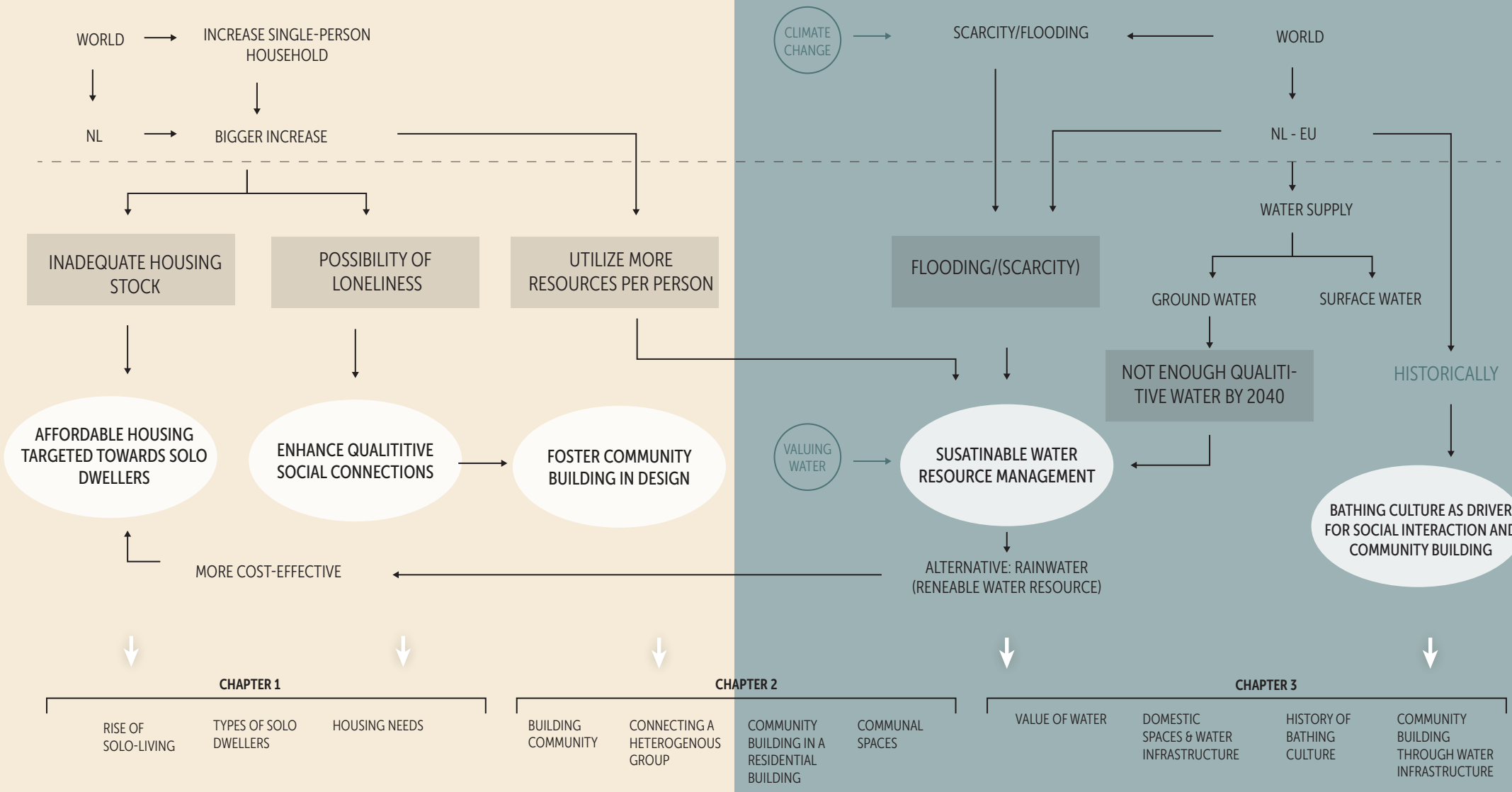
DEVELOPMENTS

PROBLEM STATEMENT

POSSIBLE SOLUTIONS

RESEARCH TOPICS

PROJECT GOAL



ENHANCING COMMUNITY BUILDING AMONGST SOLO DWELLERS THROUGH WATER INFRASTRUCTURE

02. THE SOLODWELLER

2.1 The rise of solo-living

SOLO-LIVING DEVELOPMENT THROUGH HISTORY IN WESTERN SOCIETIES

Over the past half-century, humankind took on a significant social undertaking in which a substantial number of inhabitants from all over the world began to dwell as singletons (Klinenberg, 2012). This development, in which the individual became more prominent, progressively advanced throughout the Western world in the course of the nineteenth and beginning of the twentieth centuries. Yet during the second half of the twentieth century, it had its greatest influence on modern civilization as four other extensive social occurrences unfolded that generated circumstances in which the individual could blossom: the feminist uprising, the communication and longevity revolution, and lastly the mass urbanization (Klinenberg, 2012; Nelson, 2018).

The emergence of working-age adults that live solo all has its roots in demographic transitions that comprise postponing marriage, deferral of beginning a family, fertility lower than the population replacement rate, and the tolerance of cohabitation prior to marriage (Goldscheider, 2000). This tendency of solo living has its origin in this stage of independence and is more apparent in wealthier countries that predominantly assemble in the 'global north' (Jamieson & Simpson, 2013). In the European settler societies of New Zealand, Australia, North America, and Northwestern Europe, this shift of demographic transitions is due to the high degree of relationship dissolution and a significant total of single-parent families and 'non-resident fathers' who do not live with their offspring's (Jamieson & Simpson, 2013).

In Western cities, the number of single-person households encompasses between one-third and one-half of all the households (Fleming, 2007). The countries with the topmost solo dwellers are Denmark, Norway, Sweden, and Finland, where approximately 40-45% of all households contain only one person (Jamieson & Simpson, 2013; Klinenberg, 2012).

In the present day, with the prevalent presence of digital media and constantly growing social networks, living solo could provide many prerequisites, like the space and time for recuperative seclusion. By living solo, one protects oneself to a certain extent by creating a buffer against the intensive constraints of vocational and social life. This approach of self-protection signifies something more distinctive for affluent and middle-class solo dwellers than it does for the ones with low socioeconomic status (i.e., poor, physically frail, or (mentally) ill). There are often two negative stereotypes that iterate during discourse concerning solo dwellers: a narcissistic, insouciant person who is ignorant of the responsibilities of kin, family, or community, and the lonely, dismal, and disregarded person (Jamieson & Simpson, 2013).

Thriving professionals see living solo as a way of self-protection by the establishment of one's dwelling as their oasis of protection in the city which could provide the pursuance of solitude and self-exploration. When Klinenberg (2012) interviewed disadvantaged men, it became apparent that the opposite could occur. Living solo could induce a precarious extreme in which domestic autonomy is prevalent as well as hoarding, reclusiveness, and additional antisocial demeanor that pivots a safe home into a dismal grave. The middle and upper classes are less frequently lonely when compared to the lower class (Franklin, 2011). It is easier for solo dwellers in a good emotional, financial, and physical state to find a correct harmony. Contrary to poor and sick people who often struggle with acquiring the benefits of living alone such as restoration, privacy, and personal growth, and are more prone to fall into a perilous mode that cultivates mistrust in other humans and organizations.

DUTCH CONTEXT

The rate of single-person households is the highest in

single-person households as per cent of all households (countries ranked high to low by latest year for which date available)

Rank	Country	1950	1980	1990	2000	2010
1	Sweden	21	33	44	47	49
2	Finland	18	27	32	37	41
3	Norway	15	28	34	38	40
4	Denmark	14	30	34	37	39
5	Germany	12	30	35	36	39
6	Switzerland	-	29	32	36	37
7	The Netherlands	9	22	30	33	36
8	Austria	18	28	28	30	36
9	Estonia	-	-	-	34	35
10	Belgium	16	23	28	31	34

Figure 5: Single-person households as a percent of all households ranked from high to low
(source: Jamieson & Simpson, 2013)

Northwestern European countries as shown in Figure 5. In this region, it is most convenient to live solo at the start of adulthood and throughout working ages due to the primal independence of the youth, partner dissolutions, and informal coupling (Jamieson & Simpson, 2013). The Netherlands ranks 7 on this list.

For a long period, the growth in the number of households in the Netherlands has been more significant when compared to the growth in the number of inhabitants (van Duin, et al., 2018). Since 1971, the number of inhabitants has increased by a small one-third, whereas the number of households has doubled. As a result, the average number of inhabitants per household also decreased from 3.2 to 2.2 (Figure 6). This decrease is due to the shrinkage in family size and increase in childlessness on the one side and the emergence of the solo dweller on the other side.

During the seventies, only the first two factors were the main drivers of this development, but the latter also became a contributing factor in the eighties and nineties. However, since the new century, this factor of the emergence of the solo dweller has been dominant (van Duin, et al., 2018).

At the beginning of 2018, the Netherlands had 7.9 million households, of which 3.0 million were single-person households. This number is predicted to even grow to 3.8 million in 2060. This increase is not only correlated with the population growth, but also due to the aging population, less partnering, and an incremented risk of divorce. There are currently also many widowed elderlies amongst the post-war generation. The growth of the number of solo dwellers is predominately accounted for by the increase in single elderly as shown in Figure 7. Between 1971 and 2018 the

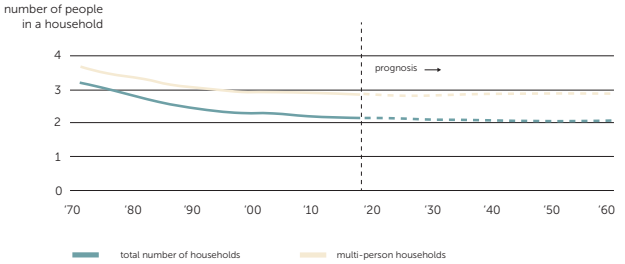


Figure 6: Average number of inhabitants per household in the Netherlands
(source: van Duin, et al., 2018)

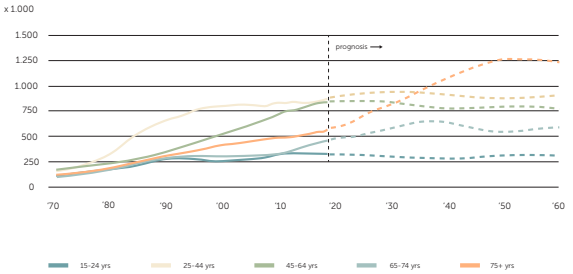


Figure 7: Number of single-person households by age in the Netherlands
(source: van Duin, et al., 2018)

single elderly above the age of 75 multiplied by five.
The number of single-person households aged fifteen to twenty-four will remain the lowest. Young adults in the Netherlands leave their parental home less often compared to older statics (van Duin, et al., 2018). The average age at which young adults move out of their parental home increased from 24,6 in 2014 to 25,2 in 2017.

ROTTERDAM CONTEXT

The rise of the solo dweller is also prevalent in Rotterdam. From 2015 to 2035 it is predicted that the number of households will expand by 40.000 from 321.000 to 361.000 as shown in Figure 8 (Hoppesteyn, 2016).
This surge of single-person households in the past years is mainly caused by the growth in inhabitants between the age of 55 and 74 (Figure 9). This group will expand even more in the forthcoming years, and when the age of 75 is reached it will result in an enlargement of the solo dweller in this age group.

Apart from the single-person households, the number of single-parent households will also increase, yet less significantly. As shown in Figure 10, this growth holds its roots fully in the enlargement of single parents aged 35-54 and 55-74. The trend of divorce and children leaving their parental home at a later age have a hand in this development (Hoppesteyn, 2016).

household type prognosis in Rotterdam until 2035						
	2015		2035		development 2015-'35	
	abs.	share	abs.	share	abs.	share
single-person households	147.888	47%	173.000	49%	25.000	117%
couples without children	67.063	21%	68.000	19%	1.000	101%
couples with children	59.728	19%	67.000	19%	7.000	112%
single-parent household	33.638	11%	40.000	11%	7.000	120%
other	4.513	1%	5.000	1%	0	106%
private households	312.830	100%	352.000	100%	40.000	113%
institutional population	8.961		9.000		0	
total	321.791		361.000		40.000	110%

Figure 8: Prognosis of households by type in Rotterdam until 2035
(source: Hoppesteyn, 2016)

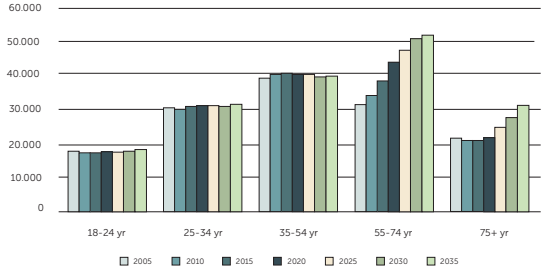


Figure 9: Prognosis of number of single-person households by age
(source: Hoppesteyn, 2016)

2.2 Types of solo dwellers

There are many types of different solo dwellers, and therefore there is not just one narrative to be told when speaking about this household. Solo living can assist in pursuing important contemporary values which endeavor aspects of freedom, individualism, self-realization, and personal control (Klinenberg, 2012). Their gravity persists from adolescence to the last days of life.

It is difficult to assign one evident definition of a single-person household, as in reality, the border of the classification in human arrangement becomes indistinct (Jamieson & Simpson, 2013). If for instance a partner or child with a different residence in another place frequently and consistently visits and spends the night, should they be classified as a member of the household or just solely a regular guest? From a sociological perspective, the opinion and recognition of those involved might weigh heavier than the conventional classificatory regulations by governmental institutions.

Besides this ambiguous classification of regular guests, there is another facet that makes the definition border of a single-person household more indistinct: sharing spaces or other household facilities with others. Individuals living in a single-room apartment will usually also be classified as solo living. For instance, in so-called 'bedsits' in low-cost rented residencies in Great Britain where one has their own bed, sink, sitting areas, and kitchen facilities but shares bathroom facilities with other residents. People could regard themselves or be regarded as solo dwellers if one respectively has his or her own room with access to shared spaces which do not conduct to a sense of constituting a household (Jamieson & Simpson, 2013). I will therefore also utilize this definition of a solo dweller in the remainder of this research report.

There is also no clear categorization in terms of types of solo dwellers. Sources use different categorization that varies in specification from age, profession, or stage of life.
As the design site of the studio is set in Rotterdam, I will also employ the age groups provided by the mu-

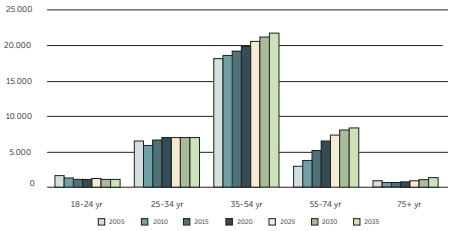


Figure 10: prognosis of number of single-parent household by age
(source: Hoppesteyn, 2016)

nicipality of Rotterdam regarding the inhabitants and household prognoses (Figure 9).

To come to a more comprehensive type of solo dweller, I linked the age groups with the correlated life stage of the inhabitant. The different types that I thus distinguish are:

- Students (18-24 yr.)
- Starters (25-34 yr.)
- Middle-aged (35-54 yr.)
- Active elderly (55-74 yr.)
- Elderly (75+ yr.)

STUDENTS (18-24)

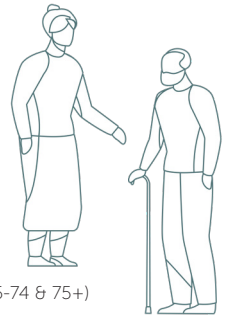
The smallest group of solo dwellers in Rotterdam is students. And this is expected to remain in the future. There has been a development in the Netherlands in which young adults/students leave their parental home at a later age due to the changes implemented in the law on student finance that took effect from the 2015-2016 academic year onwards (van Duin, et al., 2018). As a result of these changes, leaving their parental homes got more expensive for students.
When students move out of their family home, they wish to sustain similar circumstances of having a private bedroom and a great deal of personal time and space (Klinenberg, 2012).
On the current-day campuses of universities, many new dormitories provide abundant amounts of single rooms along with suite-style accommodation where students have their own personal room with a bed and table but share a common space.

STARTERS (25-34)

Many young adults who are living as solo dwellers perceive it as an intermediate stage and not as the definitive destination (Klinenberg, 2012). Whether they are actively seeking a partner or not, in any case, they are presuming to find one and ultimately get married and settle down. However, the average age of first marriage has increased and was never so high.
Often young adults view living solo as a way of establishing themselves as an independent adult (Jamieson & Simpson, 2013). This occurrence correlates with the academic literature suggesting residential and economic independence displaced cohabitation and marriage as an important marker of the stage of adulthood for many young adults in Northwestern Europe (Arnett, 1997; Benson and Furstenberg, 2007; Holdsworth and Morgan, 2005).

MIDDLE-AGED (35-54)

In Rotterdam, the biggest group of solo dwellers are middle-aged. When working-aged solo dwellers were interviewed, most deemed the personal relationship with close family and friends as most important. Close relations with colleagues and neighbors were also frequently mentioned (Jamieson & Simpson, 2013). Middle-aged female solo dwellers are also more likely to be employed full-time compared to women of the same age who live with others. A significant rate of them lives with and takes care of children.



(ACTIVE) ELDERLY (55-74 & 75+)

One aspect enabling the elderly to live solo is their improved financial resources. This improvement provided the option to adjust their living situation to their preference, or their offspring for independent living. (Jamieson & Simpson. 2013; Klinenberg, 2012).

Young and Grundy (2009) indicated from several studies that solo living elderly risk a higher chance of poor health, love life quality, and psychological health in comparison to elderly living with others. To a certain extent, this is due to the absence of prospective benefits in social and financial resilience and the lack of care and companionship that would be obtainable with co-habitation. There is a comprehensive body of gerontological studies that associate solo living amongst the elderly with a negative impact on psychological and physical well-being in North American and European contexts.

The Netherlands is currently facing an extensive aging population, as it is predicted that in 10 to 15 years, half the residents in most municipalities are over the age of 65 (van Grinsven & den Haan, 2018). On average, elderlies today are more vital, have a higher income, and obtain higher education compared to the pre-war generation.
The age at which Dutch elderly live independently increases and requires more care and support. Not everyone has adequate resources in terms of income, education, or social network) to manage this. This means this aging population necessitates different health care and housing demands.

The connection between the well-being and health and housing arrangement of the elderly is obscure, and the underlying influences are complicated to unravel. Presumably, there is a health selection as the elderly capable of living solo are often the ones dealing with less severe bad health (Jamieson & Simpson, 2013).

SINGLE PARENT

One group which I initially did not distinguish as a solo dweller type but does live as a solo dweller for generally half of the time is single parents. Women are fundamentally still the primary caregivers for children. This is an essential contributing factor to why more men than women are living solo in countries where this tendency is foremost. When couples with children separate, usually the woman becomes the single-parent household, and the man generally becomes the solo dweller (Jamieson & Simpson, 2013).

As shown in Figure 11, the largest age group in the Netherlands that currently belongs to the single parent group are the parents who are just over the age of 45 (van Duin, et al., 2018).

The expected peak slightly shifts towards 49 years old in 2060. This deviation is mainly a result of women

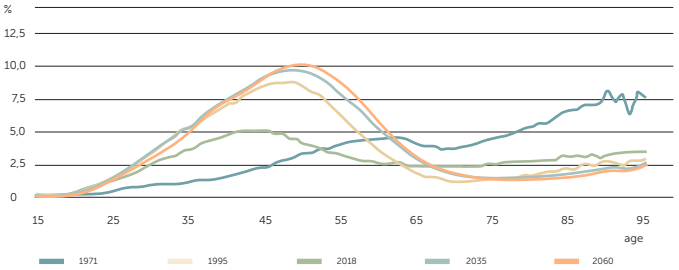


Figure 11: Number of parents in a single-parent household by age
(source: van Duin, et al., 2018)

getting pregnant at an older age. It is predicted that the number of single parents will increase to 660.000 around 2050.

2.3 Housing needs of the solo dweller

There are various types of single-person households, each with its own perspectives and preferences. It is therefore not possible to classify them as one homogeneous group when identifying their housing needs and wishes (Faessen, 2002; Jamieson & Simpson, 2013). Except for the elderly, many solo dwellers see this kind of dwelling not as a permanent condition. The majority, yet not all solo dwellers, will eventually determine they seek the closeness and companionship of a domestic partner.

Unlike their predecessors, present-day solo dwellers cluster collectively in metropolitan regions and dwell in all areas of the country (Klinenberg, 2012). In 1998, over half of the single-person households (57,3%) dwelled in a highly urbanized municipality (Faessen, 2002).

The anticipated rapid increase in the number of single-person households will only expand the requirement for (new) dwellings in developed societies (Tervo & Hirvonen, 2020). It is important to note here that solo dwellers are often being discriminated against by housing associations and real estate agents (Klinenberg, 2012).
Insights into the dwelling typologies that are favored by single-person households need to be obtained, to create new dwelling design programs for single-person households (Faessen, 2002). Questions such as how broad the diversity in current housing is amongst single-person households and how various types of single-person households differ in their preferred housing arise.

Even though the research on the home-related social life of solo dwellers offers some indications of their spatial desires, the housing space characteristics stay absent (Tervo & Hirvonen, 2020). Without this understanding, there could be a hazard that the development of the housing stock is attributed to the stereotyped and probably outdated impression of the needs of solo dwellers (Jamieson & Simpson. 2013). In the case of the Netherlands, this discontentment is also shown in the satisfaction rate of the living environment of solo dwellers (and single-parent households) (Figure 12). However, depicting a suitable domestic space is complex because of the special qualities of housing and the subjective experience of residents (Morgan & Cruickshank, 2014).

Most European countries, including the Netherlands, have a space size requirement that determines the functional demands of a dwelling (Williams, 2005). As reported by the National Building Decree of the Netherlands, a residential area has at least the floor

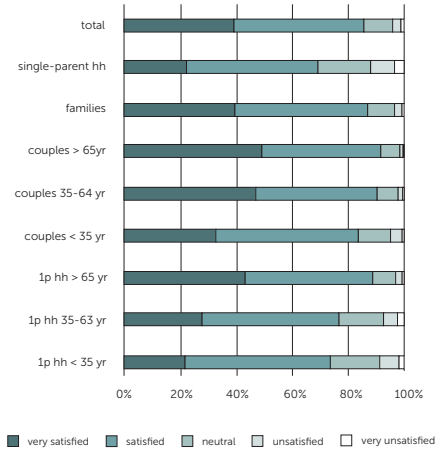


Figure 12: Satisfaction rate of the living environment of dwellers, according to their age and household type in the Netherlands in 2018
(source: WoON., 2019)

area of a non-communal area of 18m^2. In addition, an occupied area (like a bedroom) within the residential area requires a minimum floor area of 11m^2 and a width of 3 meter (Ministry of the Interior and Kingdom Relations, 2021).

In the Netherlands, solo dwellers predominantly dwell in the rental sector. Most of them rent an apartment, however, as shown in Figure 13, the number of (older) solo dwellers renting a single-family dwelling has increased over the past years (WoON, 2019).

In December 2015, the BPD (Bouwfonds Gebiedsontwikkeling), an area developer active in the Netherlands and Germany conducted qualitative research on the housing needs of the heterogeneous group of solo dwellers in the Netherlands. The conclusion of this research indicated that the solo dwellers dislike apartments between the floor area of 30 to 50 m^2 and would prefer to live in apartments bigger than 60m^2. The most favored number of rooms is three: a living room, bedroom, and spare room. This desire for a spare room is connected to the need to provide hospitality, as solo dwellers desire a guest bedroom.

Furthermore, all respondents considered an outdoor space a necessity. Most solo dwellers were not in favor of shared spaces, as sharing a kitchen or laundry room could invade their privacy (BPD, 2015). For others, this sharing economy would only be interesting if sharing a laundry room would entail a bigger kitchen for example.
The housing preference research conducted by the BDP has, like many other research studies, the tendency to prompt unrealistic housing demand. It stems from the fact that the financial resources of the household as well as the compound restrictions that steer actual decisions are dissociated within the research methods (Salen & Zimmerman, 2003).

In the BK Talks lecture: *Why together? Rethinking living environments through collaboration*, Ruby (2021) mentioned that by implementing more communal spaces among residents, in cluster apartments, for instance, sharing residents do not miss out on space, but in fact, gain it. She uses the example of the cooperative housing project Mehr als Wohnen in Zürich, where the apartment sizes vary between 30 to 41 m^2 (private area). The total square meter per person however increases to 125 m^2 due to the common area.

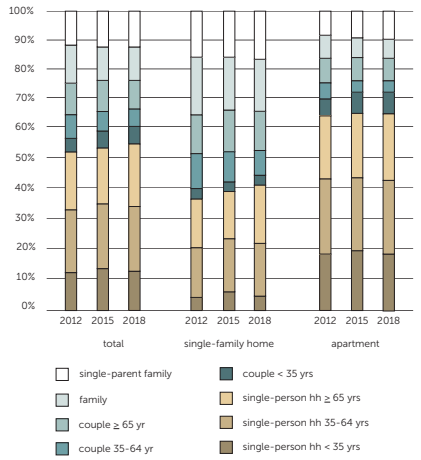
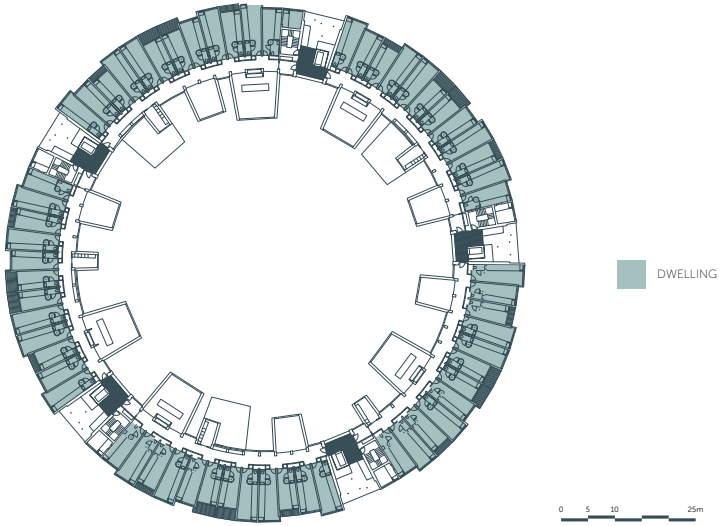


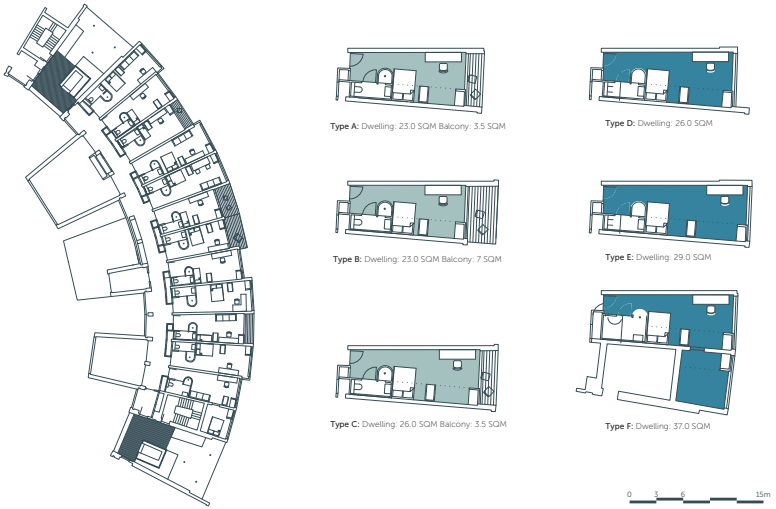
Figure 13: Renters according to their age, household type, and dwelling type in The Netherlands in 2012, 2015, and 2018
(source: van Duin, et al., 2018)

This rise in shared economy transpired due to the increase in environmental sustainability, a sense of community that was new, the rise of single-person households, inadequate affordable housing, and insufficient housing area in dense urban regions (Pirinen & Tervo, 2020). This indicates the necessity to employ shared facilities and spaces in new urban housing concepts, by rethinking the connection between private and shared domestic spaces (Nelson, 2018). The requirement for affordable housing amongst solo dwellers is also stressed by the notion that the income of a single-person household is lower compared to multi-person households.

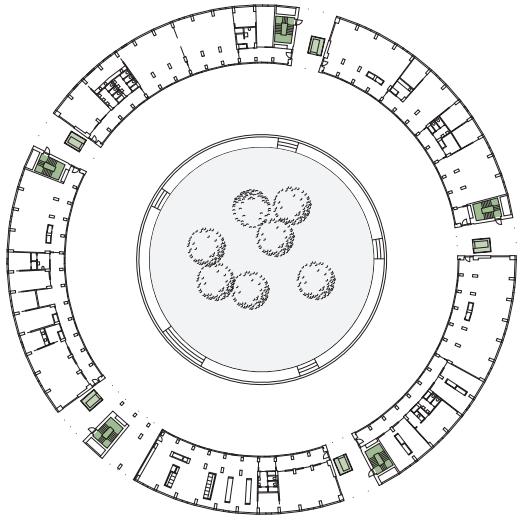
These collective housing solutions provide for a secure, social, and affordable lifestyle, but are also regarded as a way of reducing consumption and the negative impact on the environment which is caused by the rise of single-person households (Williams, 2007). As solo living enhances the needs for housing units and attached services, there is a necessity to create a housing alternative that is more resource-efficient for single-person households.



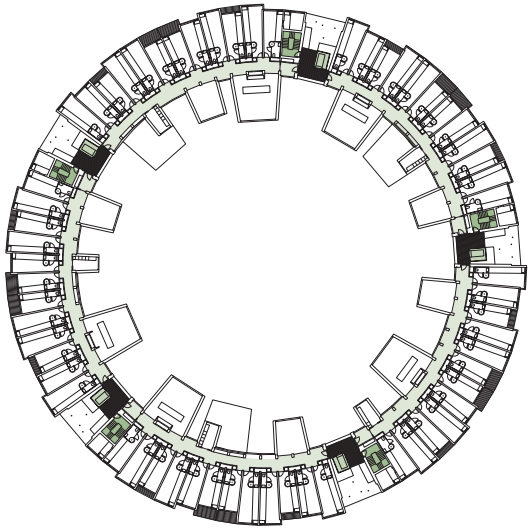
Analysis 1: Dwelling positioning in floorplan
(source: own illustration, adapted from Lundgaard & Tranberg Arkitekter)



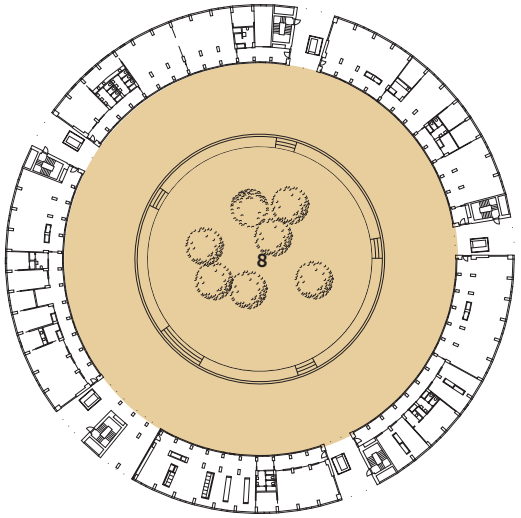
Analysis 2: Dwelling typology variations + area
(source: own illustration, adapted from Lundgaard & Tranberg Arkitekter)



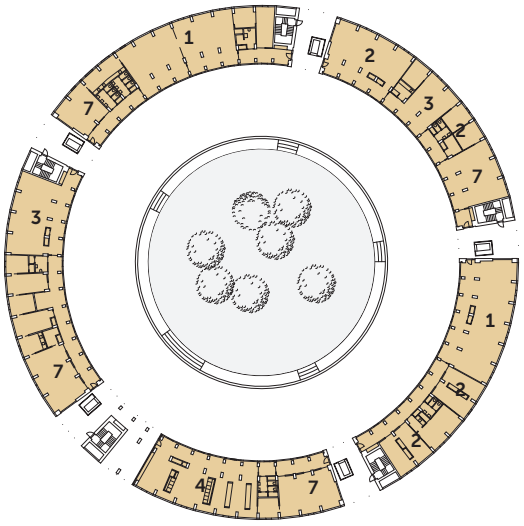
Analysis 3: Ground floor - circulation core entrances
(source: own illustration, adapted from Lundgaard & Tranberg Arkitekter)



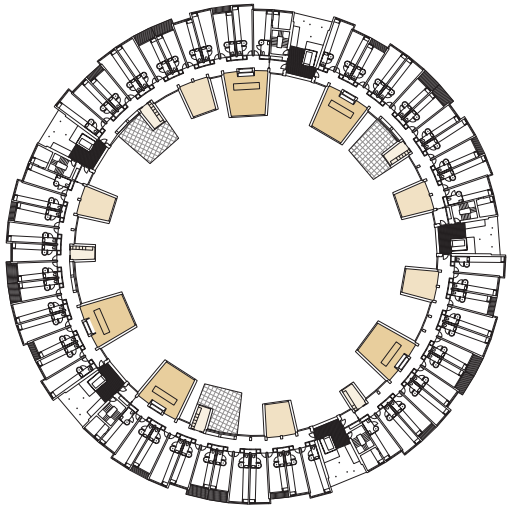
Analysis 4: Upper floor plans - corridor inbetween communal spaces and private units
(source: own illustration, adapted from Lundgaard & Tranberg Arkitekter)



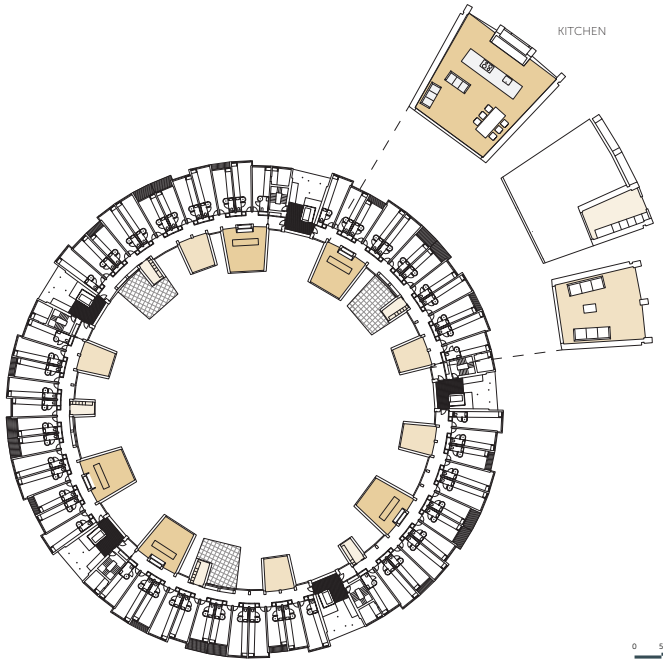
Analysis 5: Ground floor - public/communal inner courtyard
(source: own illustration, adapted from Lundgaard & Tranberg Arkitekter)



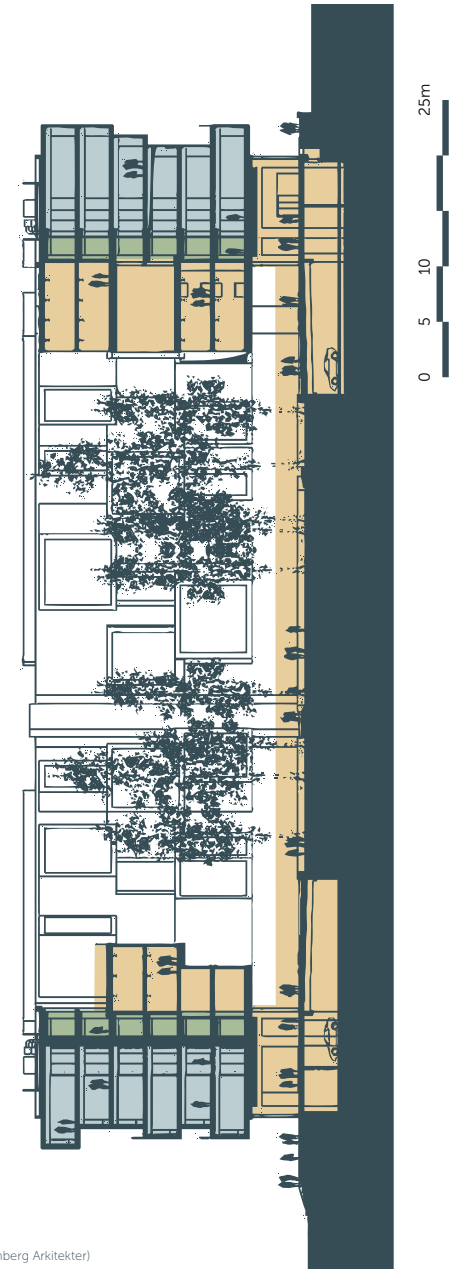
Analysis 6: Ground floor - communal spaces shared with all tenants
(source: own illustration, adapted from Lundgaard & Tranberg Arkitekter)



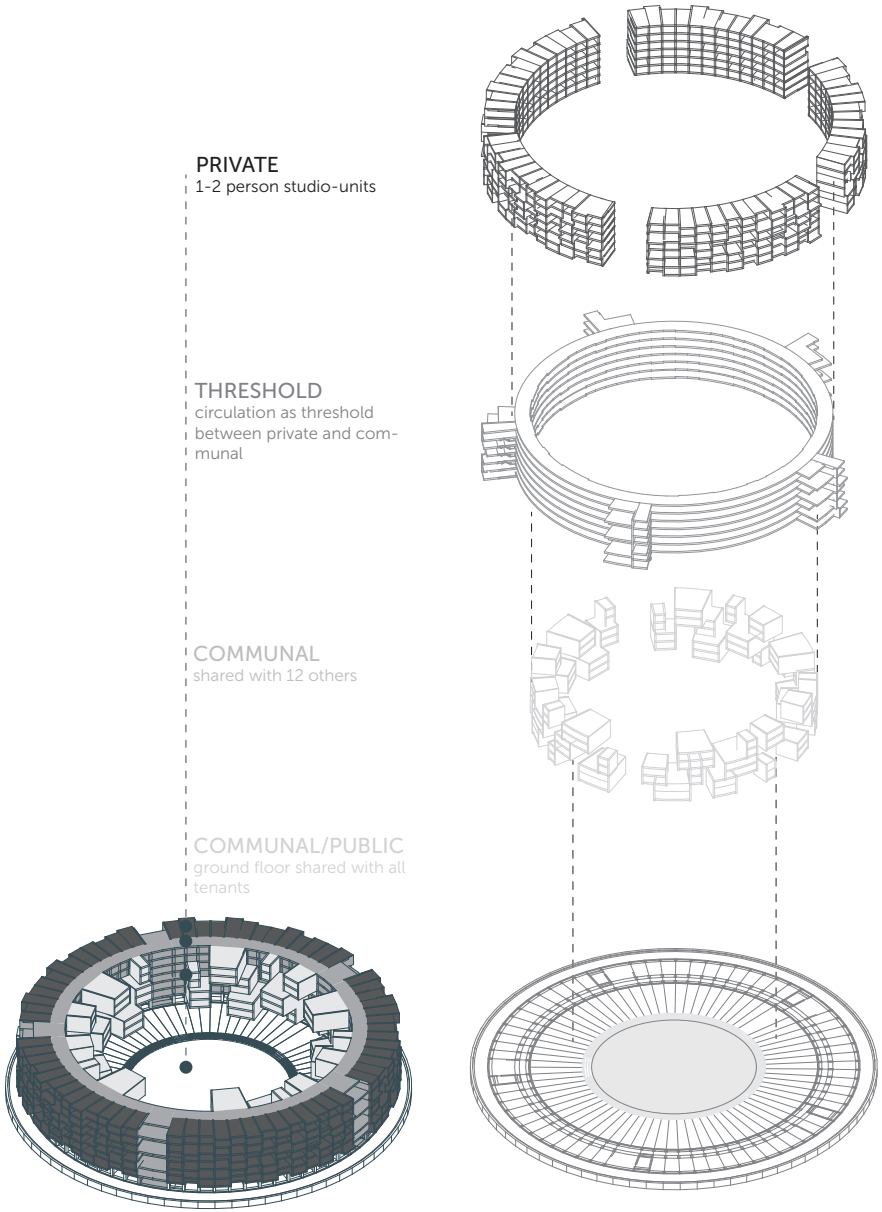
Analysis 7: Group of three communal spaces shared with 12 people
(source: on illustration, adapted from Lundgaard & Tranberg Arkitekter)



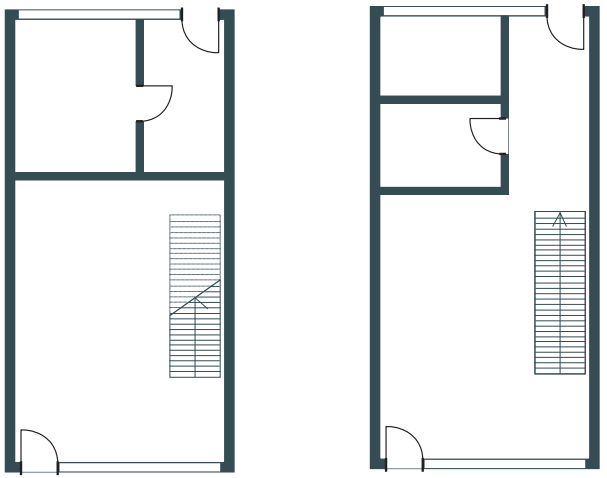
Analysis 8: Group of three communal spaces - function
(source: own illustration, adapted from Lundgaard & Tranberg Arkitekter)



Analysis 9: Section private/public spaces
(source: own illustration, adapted from Lundgaard & Tranberg Arkitekter)



Analysis 10: Concluding diagram private/public
(source: own illustration)



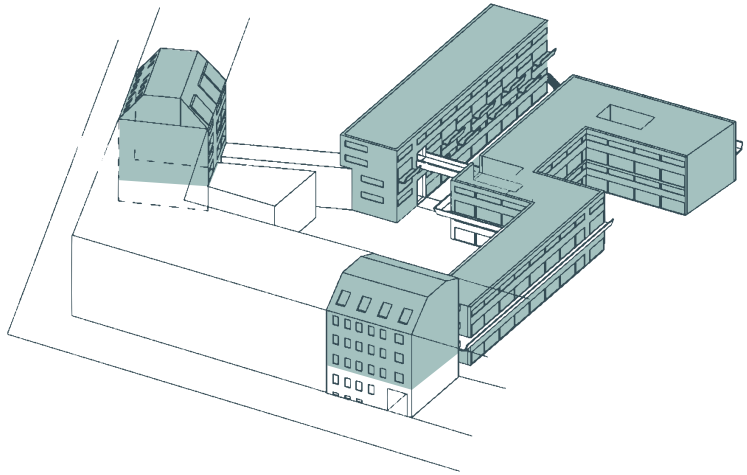
Analysis 11: Basic dwelling unit of Sargfabrik
(source: own illustration, adapted from https://issuu.com/nushratj/docs/sargfabrik-_booklet)

Combination of basic units

The basic unit is a simple "box" that can be combined in various manners to generate separate units. Housing units range from 32 m2 for a single person to 400 m2 units for eight adults and six children. All public areas are wheelchair accessible

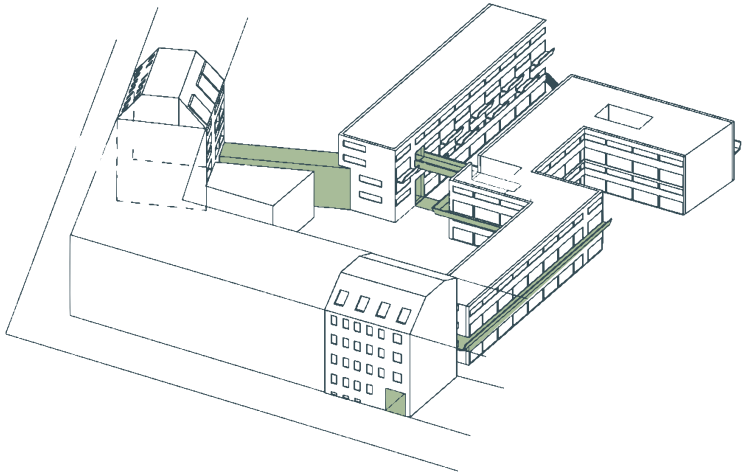
The housing units were arranged within the block. This established two layers of privacy and outsiders could communicate easily with the occupants without having to enter the housing units

Analysis 12: Placement of units on ground floor
(source: own illustration, adapted from https://issuu.com/nushratj/docs/sargfabrik-_booklet)

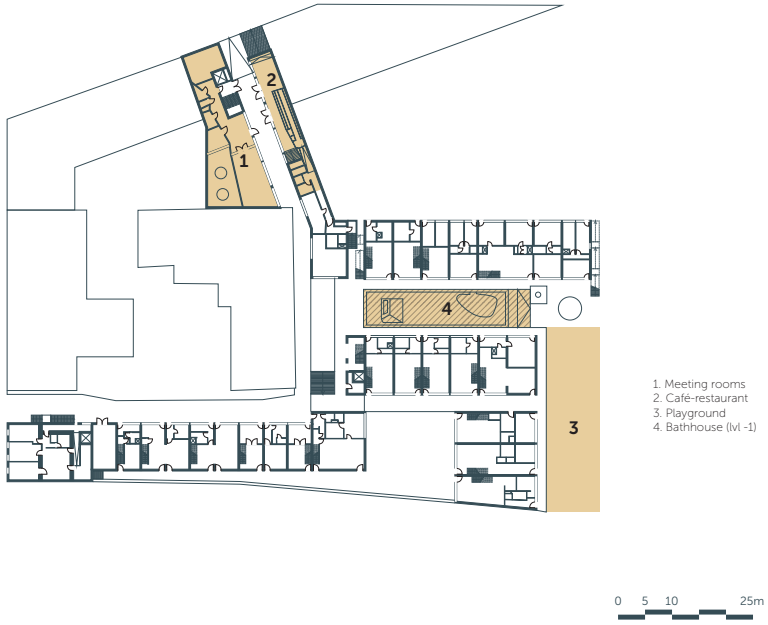


Analysis 13: Housing situated within the entire project
(source: own illustration, adapted from Celeketic & Cervenkova, 2014)

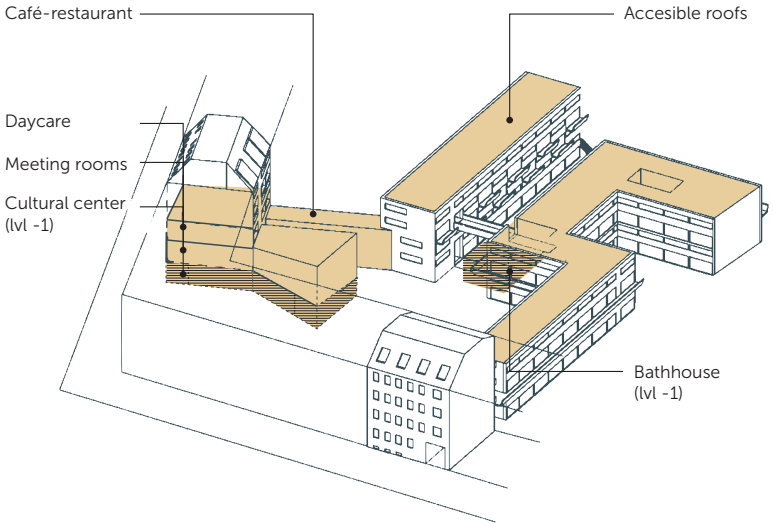
Analysis 14: Circulation on the ground floor
(source: own illustration, adapted from https://issuu.com/nushratj/docs/sargfabrik-_booklet)



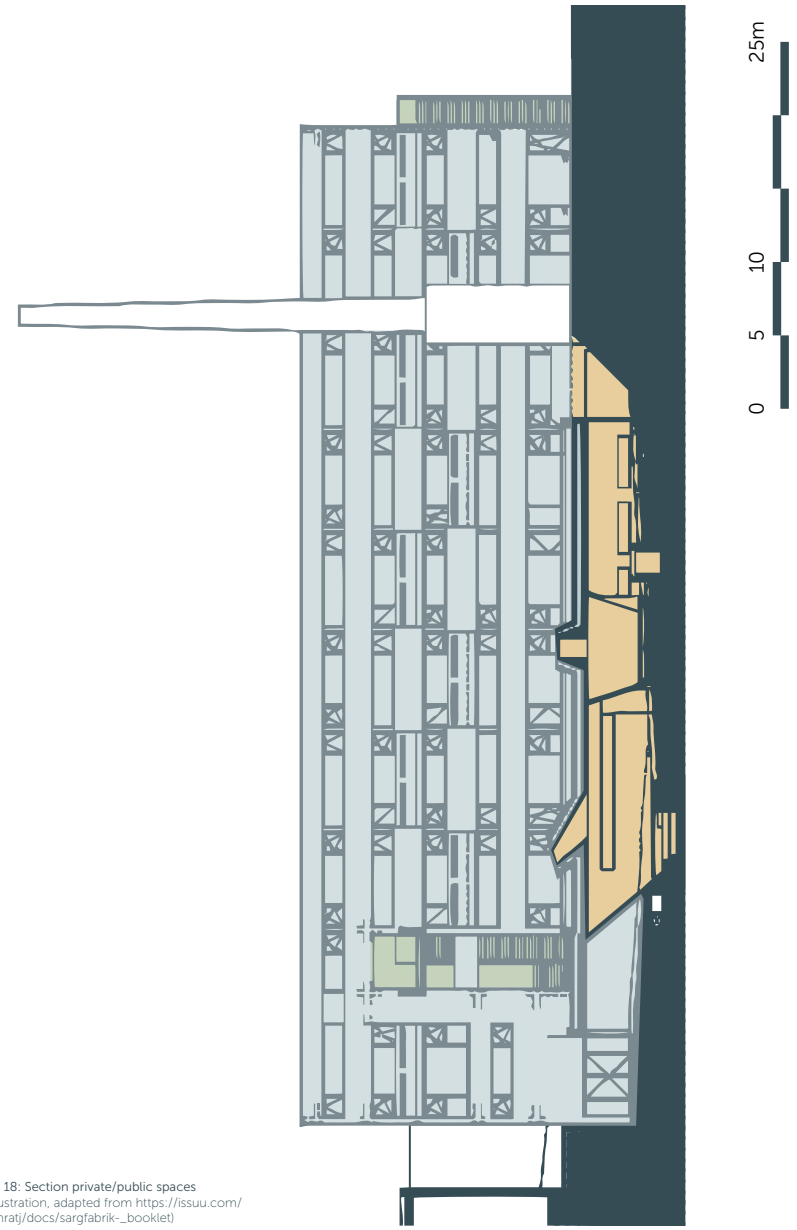
Analysis 15: All circulation is situated on the outside of the entire project
(source: own illustration, adapted from Celeketic & Cervenkova, 2014)



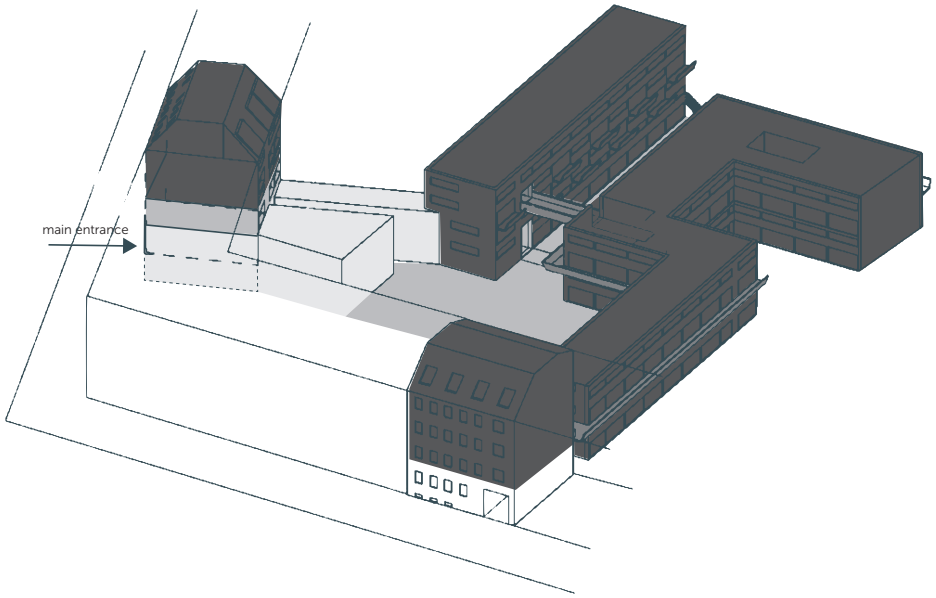
Analysis 16: Communal spaces and functioning on the ground floor
(source: own illustration, adapted from https://issuu.com/nushratj/docs/sargfabrik-_booklet)

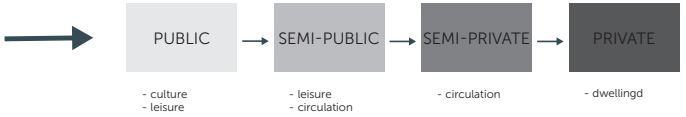


Analysis 17: All communal spaces and functioning situated within the entire project
(source: own illustration, adapted from Celeketic & Cervenkova, 2014)



Analysis 18: Section private/public spaces
(source: own illustration, adapted from https://issuu.com/nushratj/docs/sargfabrik-_booklet)





Analysis 19: Concluding diagram private/public
(source: own illustration)

2.4 Conclusion

This rise in shared economy transpired due to the increase in environmental sustainability, a sense of community that was new, the rise of single-person households, inadequate affordable housing, and insufficient housing area in dense urban regions (Pirinen & Tervo, 2020). This indicates the necessity to employ shared facilities and spaces in new urban housing concepts, by rethinking the connection between private and shared domestic spaces (Nelson, 2018). The requirement for affordable housing amongst solo dwellers is also stressed by the notion that the income of a single-person household is lower compared to multi-person households.

These collective housing solutions provide for a secure, social, and affordable lifestyle, but are also regarded as a way of reducing consumption and the negative impact on the environment which is caused by the rise of single-person households (Williams, 2007). As solo living enhances the needs for housing units and attached services, there is a necessity to create a housing alternative that is more resource-efficient for single-person households.

03. BUILDING A COMMUNITY

3.1 Building a community

The ubiquitous allure of community is prevalent in all disciplines ranging from politicians to criminal justice officials to real estate developers (Sampson, 1999). Real estate developers propose new perspectives on housing arrangements that encourage social connections with neighbors, local relations, and physical common spaces with architectural integrity. All for the purpose of restoring a certain resemblance of community.
It begs the question of what community precisely signifies. Does it pertain to geographic localities or common participation in some group or association, with a common set of values strong commitments? In this era of modern mobility and technology, the sense of community is not restricted to a certain geographic area. Nonetheless, the near proximity to neighbors allows for exceptional possibilities for social support and interactions, like looking after children in an emergency, picking up mail, and supervising of neighboring homes (Francis, et al., 2012).
Communities are a significant area to accomplish common beliefs and retain efficacious and social supervision. Therefore, generating essential public goods, or what is also referred to as 'social capital' concerns formats of human well-being and social organization. The feeling of security and safety, volunteering, voting and civic participation, and enhanced well-being are all affiliated with a sense of community (Davison & Cotter, 1991). This sense of community is commonly specified as a members' feeling of belongingness, of member's feeling that they are of importance to one another and the group (Francis, et al., 2012). The dedication to be together strengthens the collective faith that members' desires will be met. By stimulating more vibrant communities, social capital will be rebuilt (Williams, 2005). Social interactions create a better understanding for residents of a community of their fellow inhabitants and social organization. This results in more trust and possibilities for social exchange to take effect and generates connectedness amongst residents (Pretty & Wards, 2001).

In much social research, it has become prevalent that most people require a minimum, amount of significant positive and lasting interpersonal relationships that produce a sense of belonging (Franklin, 2011; Maslow, 1954). If these desires are not met, a person could descend into loneliness. Therefore, the absence of belongingness might steer to a feeling of social alienation and isolation.
The recent psychological and sociological studies have put more focus on the importance of the quality of social connections. In this context, the policy instruments to ameliorate solitude should not persist, but rather emphasize dealing with secluded lifestyles or developing stronger connections that resonate within the current economic and social context.

Efforts in determining and evaluating social connectedness attempt to comprehend the modification of social circumstances, which comprise an increase in migration, urbanization, and new opportunities for online connectedness (Jamieson & Simpson, 2013). This expanding prominence of digitalization today raises concern about the changing social relationship to and within localities which could result in social disengagement.

Studies indicate that the participation of local residents in community affairs is impacted by the social environment (determined by the general degree of social cohesion) and the physical environment (accentuated by results of communal space) within a neighborhood (Zhu, 2015). Remarkably, communal spaces positively contribute to the indirect influences on constitutional participation by promoting the progress of neighborhood connection and local social capital.

When I interviewed Hans Boekelaar, chairman of Bathhouse and Sauna Da Costa (the only social bathhouse still to exist in the Netherlands), he explained how this was also the case for the local residents in the neighborhood of Amsterdam-West, where the bathhouse is located. (More information on this bathhouse will be provided in chapter 4 of this research report).
Boeklaar explained that the neighborhood inhabitants are very engaged with the bathhouse institution. During the covid period, the bathhouse had a difficult time with a compulsory closing of approximately six months (a large part of their revenue model to keep it running). Through generous donations from local residents, the organization received a helping hand to get through this tough period. Neighbors think it is wonderful that there is still such an organization in their neighborhood and often support the bathhouse by bringing bathing supplies or other necessities.

3.2 Connecting a heterogeneous group (of solo dwellers)

The signification of 'home' to a solo dweller, and how he or she goes about approaching and converting a dwelling into a home, is exceptionally telling. In several cultural backgrounds, the notion of home commonly revolves around intimacy, family or kin, or belonging to a broader community (Jamieson & Simpson, 2013). The growth in solo living is frequently considered indicative of dislocation from moorings to people of origin and location. Demonstrating a social process of individualization. Solo dwellers are more vulnerable to being depicted as separated, alongside having a lack of connections with friends, family, and community networks. From research conducted by Franklin (2011), 40% of the solo dwellers declared that their experience of loneliness was a severe problem. This indicates a paradox by which the desire for connectedness coexists with cultural standards which advocate for the gathering of private property and self-reliance (Sargrisson, 2010).

Enhancing the networks of individuals is most certainly to be successful when focusing on significant problems to encourage communication and drive participation (Chaskin, 2001). An emphasis on an attempt to construct intimate relations is inclined to delude. Friendship cannot be legislated. Nevertheless, there are opportunities to operate on constitutional barriers to the production of social capital by emphasizing safety, residential stability, and physical revitalization endeavors, that foster a sense of security and social interactions (Sampson, 1999). In the same manner that humans can form feelings about a place, so can place also form social interactions (Jamieson & Simpson, 2013).

Sharing resources and domestic space is an ordinary phenomenon for residents living with their family, kin, or partners in multi-person households. Due to the rise of solo living, new perceptions on sharing domestic space arise (Jarvis, 2011; Pirinen & Tervo, 2020). Solo dweller housing seldom contains any communal or shared spaces, especially in the form of apartments or blocks buildings (Franklin, 2011). However, quick, and successful integration of students into community life in student accommodations has proven to be prosperous due to the shared spaces included in universities and colleges. The responsibilities for, and the shared space itself, serve explicitly for what is frequently lacking: a binding, enduring common interest.

3.3 Community building in a residential building: communal spaces

People often participate in social endeavors in accordance with their sense of place (Hashem, 2013). The sense of a place is a component that alters space into a significant place, conforming to the users' emotional and behavioral characteristics (Hardi, et al. 2020). The sense of space could be defined as a mixture of the connection between the communal space and the social affairs that take place in it (Hashem, 2013). It encapsulates complex connections,

Figure 14: Different scales of Sense of Place
(source: Hasmen, 2013)

interactions, and associations amongst occupants and their subjective experience (due to personal and cultural, experience and memory factors), and the influence of their extrinsic environment) (Lesmana, et al., 2021). Everybody has distinct experiences, intellectual backgrounds, and motivations that can shape the dissimilar sense of a place (Perkins, et al., 1990).

To indicate the sense of a place of users, there can be six communal space scales distinguished (Hashem, 2013) (as shown in Figure 14):

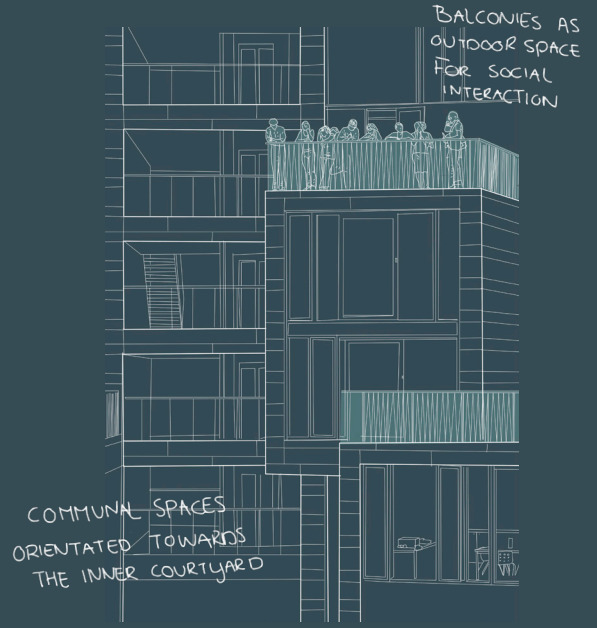
- Knowledge of being in a place
- Belonging to a place
- Attachment to a place
- Identifying with the place goals
- Involvement in a place
- Sacrifice for a place

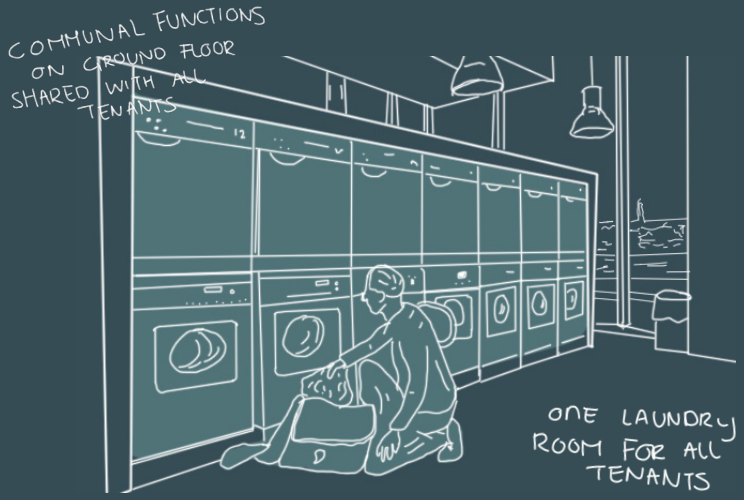
In the design of a residential building, I think it is therefore important that the communal spaces can provide the (solo) dwellers with a sense of place on the scale of at least the last three (identifying, involvement, and sacrifice for the communal place).

Some elements of the extrinsic environment that could influence dwellers' sense of place in the utilization of communal space in a residential building are (Hardi, et al., 2020):
- If the location of the communal space is hard to reach, dwellers will less likely come to socialize.
- Physically uncomfortable to have conversations and lack of privacy, due to many people passing by
- Incomplete facilities in the communal spaces, making them less attractive as places for social encounters and interaction.

Communal spaces grant exquisite circumstances for social interaction (Schmid, 2009; Williams, 2005). They require good qualitative spaces, which are appropriate for their use, whilst simultaneously being flexible (Durret & McCamant, 1989). In terms of the building layout, the communal facilities should be central (Fromm, 1991; Durret & McCamant, 1989). In the role of essential activity spots, the communal spaces should be located on shared pathways, thereby maximizing the potential social interactions inside a residential building. A gallery that is not for passers-by, could for example form a space for social interaction or a place for children to play (van Dorst, 2005).

TIETGEN
DORMITORY



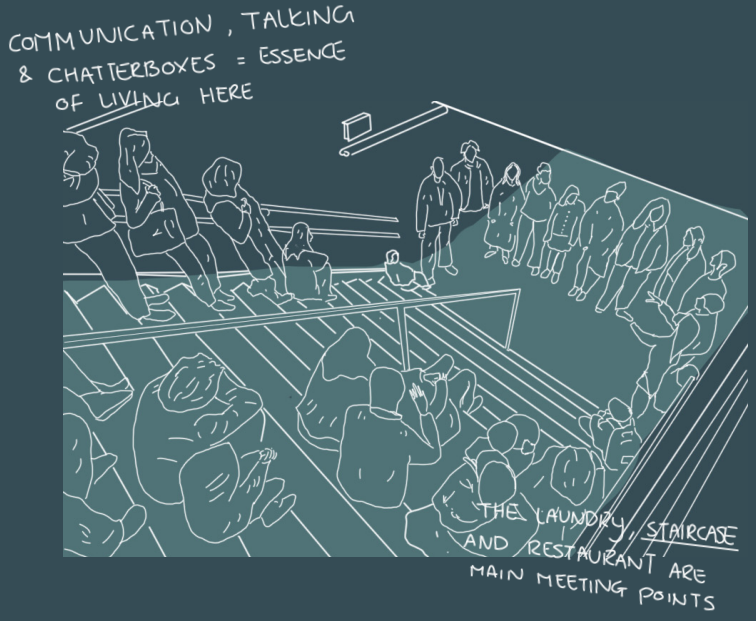

COMMUNAL FUNCTIONS
ON GROUND FLOOR
SHARED WITH ALL
TENANTS
ONE LAUNDRY
ROOM FOR ALL
TENANTS


SHARED WITH
TWELVE OTHERS
ON LARGE SHARED
KITCHEN PER HALLWAY
WITH DINING AREA

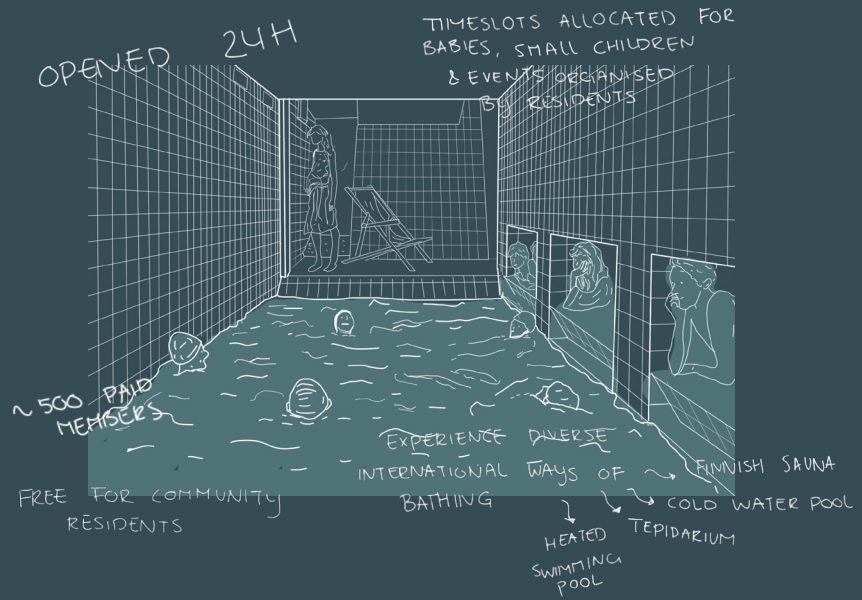

COMMUNAL FUNCTIONS
ON GROUND FLOOR
SHARED WITH ALL
TENANTS
GROUND FLOOR INCLUDES
FUNCTIONS SUCH AS
STUDY AREA, BIKE STORAGE
& COMMON ROOMS

SARGFABRIK


CAFÉ - RESTAURANT SITUATED
RIGHT AT THE ENTRANCE
OF BUILDING
CULINARY
+
SOCIAL MISSION
OFFER 50+ PEOPLE A JOB
TO INCREASE THEIR PROFESSIONAL
KNOW-HOW
↳ THEREFOR ALSO THEIR
JOB MARKET CHANCES
A FAVOURITE MEETING PLACE FOR
NEIGHBOURHOOD INHABITANTS
+ PEOPLE FROM OTHER
PARTS OF VIENNA


COMMUNICATION, TALKING & CHATTERBOXES = ESSENCE OF LIVING HERE
THE LAUNDRY, STAIRCASE AND RESTAURANT ARE MAIN MEETING POINTS


SARGFABRIK PHILOSOPHY
LIVING CULTURE & INTEGRATION
CULTURE EVENTS ARE VERY POPULAR ATTRACTIONS AND VITALISE THE NEIGHBOURHOOD
OPEN SPACES IN BUILDING FORM SPACES FOR SOCIAL INTERACTION


OPENED 24H
TIMESLOTS ALLOCATED FOR BABIES, SMALL CHILDREN & EVENTS ORGANISED BY RESIDENTS
~500 PAID MEMBERS
FREE FOR COMMUNITY RESIDENTS
EXPERIENCE DIVERSE INTERNATIONAL WAYS OF BATHING
FINNISH SAUNA
COLD WATER POOL
TEPIDARIUM
HEATED SWIMMING POOL


VISITORS ALSO INCLUDE PEOPLE FROM THE DISTRICT
THE ORGANIC STAND "BIOSTAND" IS A WEEKLY FIXED POINT

3.4 Conclusion

This chapter was focused on the question of how a community could be built amongst solo dwellers in a residential building.
Due to the increase of single-person households, new perceptions about sharing domestic space arise (Jarvis, 2011; Pirinen & Tervo, 2020). The lack of meaningful relations could result in loneliness amongst solo dwellers. The design of the residential buildings which are targeted toward solo dwellers seldom contains any communal or shares space. Yet, these communal spaces do provide exquisite environments for social interaction (Williams, 2005). The responsibilities for, and the shared space itself, serve explicitly for what is frequently lacking: a binding, enduring common interest.

The participation of the dwellers in social endeavors is in accordance with their sense of place.
In the design of a residential building, I think it is therefore important that the communal spaces can provide the (solo) dwellers with a sense of place on the scale of identifying, involvement, and sacrifice for the communal place. Like the case of Sargfabrik, the communal spaces should be appropriate for their use yet also be flexible. To provide a lower threshold for dwellers to go from their private space to communal, the communal spaces should be central within the building layout, as well as be located on shared pathways to maximize the possibility of social encounters and interactions.

04. COMMUNITY BUILDING THROUGH WATER INFRASTRUCTURE

Loneliness is actively entangled in a variety of severe physical and mental health problems and is most prevalent in certain tenure groups (Franklin, 2011). It is notably associated with specific household types such as single-person households and single-parent households, which are both rising as a share of all households. By designing a residential building that fosters positive and significant interpersonal relationships, a sense of belonging could be generated

A knowledgeable classification of community in the architecture of bathing is an elective community: a community that is formed by an understanding of common experience.

"*This community space invites to establish new types of connection in which we attempt to construct a sense of connection over what we share in spite of our differences*" (Pearson, 2020. p.76). In this chapter, I will investigate how water infrastructure (and mainly activities revolving around this water infrastructure) could promote community building.

4.1 Water infrastructure in the domestic sphere

Water plays an important role in the built environment. It is being utilized for transportation, recreation, and consumption. It is a basic need of humans, essential for drinking purposes, supports sanitation and hygiene, and sustains health and life. Water and sanitation are human rights (UNGA, 2016).

The Hierarchy of Water use for humans is illustrated in Figure 15. The domestic spaces which relate to the 'Hierarchy of Water use' that I distinguish here are the kitchen, bathroom, laundry room, and garden. The activities which produce the highest amount of domestic wastewater are the shower and the toilet, together forming 64% of the total household water consumption (Luising & Teeuw, 2005).

Reducing the required water consumption is needed (Gommans, 1998), as high consumption has many disadvantages such as dryland, use of chemicals for purification, or the energy consumption required for drink water preparation. Harvesting rainwater and utilizing it within a building could contribute to a lower drinking water consumption as well as prevent excessive exhaustion of surface water (Luising & Teeuw, 2005).

4.2 The meaning of water: cultural differences

Water always had a significant role within civilization, merely as a facet of survival, yet in culture too. It is famed for its use as a source of energy, physical as well as metaphysical (Croutier, 1992). Although many societies established various means of accomplishing physical contact with water, compiling the temperament and philosophy of humans and their environment, there appears to be a similarity in the reoccurring elements of spirituality, therapeutic, hygiene, and social.

The cultural heritage, outlook on the world, norms, and codes of ethics of people shape their connection with, and perception of water (Johnston et al., 2012; Krause and Strang, 2016). Culture has a direct effect on how water values are recognized, acquired,

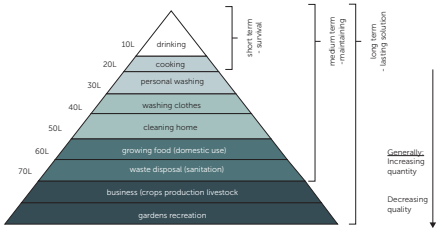


Figure 15: Hierarchy of Water use
(source: WHO, 2005)

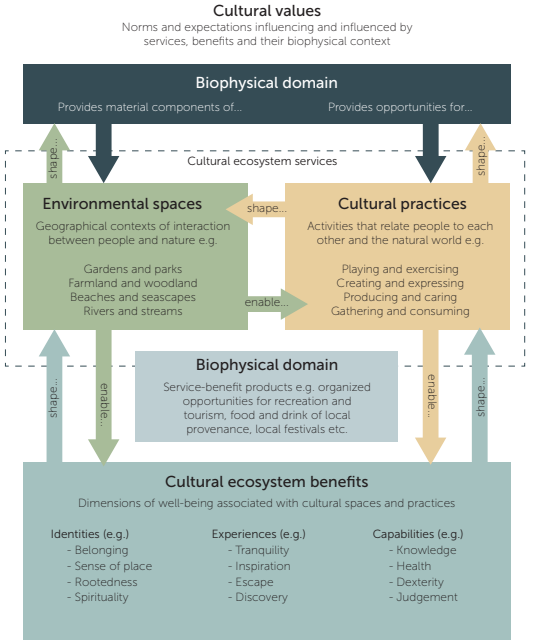


Figure 16: A conceptual framework for cultural ecosystem services
(source: UNESCO, 2021)

and utilized (UNESCO, 2021). Water-related values are frequently rooted in the collective social imaginary. Various cultural values associated with water can be viewed as cultural ecosystem services (UNESCO, 2021). Cultural ecosystem services are the non-material advantages that humans can acquire from nature and can be classified as shown in the conceptual framework of feedback circuits for cultural ecosystem services (Figure 16), which can assist in comprehending the services and how they partake in a broader system of cultural values (UNESCO, 2021).

VALUE OF WATER IN THE NETHERLANDS

Water has always played an important part in Dutch culture (Luising & Teeuw, 2005). The significant role of the Water Boards is related to the value of water in the Netherlands. Climate change has caused an increase in the threat of flooding which led to the establishment of a special Water Management Committee for the twenty-first century (WB21). This committee argues for initial retentions of water, then storing it, whereafter it will be drained. This has put a sustainable approach to (rain)water management as a high priority on the national agenda.

At the municipal scale, problems can be tackled at the source and the corresponding opportunities such as water retention, prevention of diffuse pollution, and limited use of drinking water can be exploited (Luising & Teeuw, 2005). The strategies for sustainable water resource management are often aimed at saving drinking water within the built environment.

Water and the Netherlands are inextricably connected

and have had a unique historical bond. The allure and affluence of the country are partly shaped by water. This positive value of water can also be acquired in the cultural value that water can convey (as shown in Figure 16). These cultural water values could provide opportunities for cultural practices and that in terms can enable cultural ecosystem benefits such as identities (for solo dwellers, the aspect of belonging and sense of place are most relevant here), experiences, and capabilities (UNESCO, 2021).

4.3 History of bathhouse typologies and bathing culture in Europe

"The role that bathing plays within a culture reveals the culture's attitude towards human relaxation. It is a measure of how far individual well-being is regarded as an indispensable part of community life." (Giedion, 1948. p.628).

The history of Europe is rich with intriguing bathing cultures, in which the bathhouse was the primary place for social meetings and interaction (Pearson, 2021). Today's society is so used to daily showering and bathing that it is almost unimaginable how this previously used to be. From history, we see how body hygiene was subject to customs and rituals with psychological and philosophical significance (Kenyon, 2021). The cult of the bath echoes the bathers' attitudes towards their bodies, nudity, sin, religion, and relaxation (Snare, 2011). The most ancient form and most frequent and extensively practiced form of hydrotherapy is bathing (Molvar, 2020).

Through the Mediterranean, the influences of bathing culture in the Middle East reached Western Europe in Greece (Crete) and Italy (Parent, 1987). Around 500 BC bathing facilities were established, and the public baths served water for the multitude and endorsed cleanliness (Snare, 2011). Bathing became progressively prominent in daily life. The wealthy soon had their own bathroom, and the first independent public bathing facilities arose for the poor.

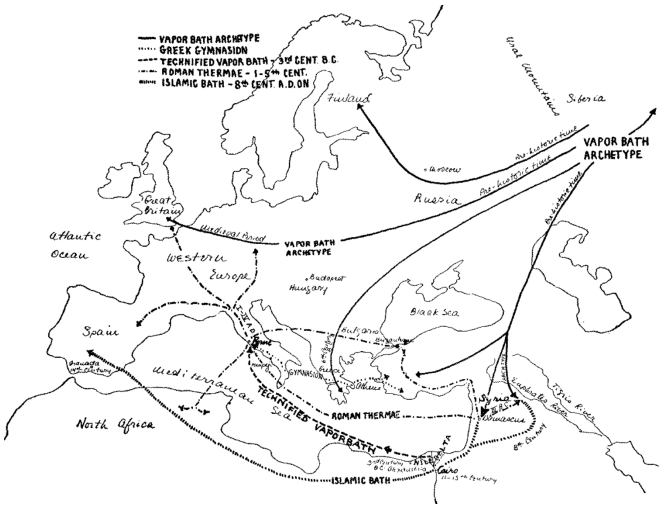


Figure 17: Itinerary of the Regeneration Types. Tracing the path of different bathing archetypes
(source: Giedion, 1968, p.638)

THERMAE
[**Precedent I**]

The Greek baths served as a model for the construction of the Roman baths (Figure 17).
Gradually, as prosperity increased in Rome, Greek customs and the hot bath became widely accepted. This was the impetus for a complete change in bathing. The ancient Roman combined social, spiritual, and therapeutic values of bathing, and exhilarated them into art (Snare, 2011). Their holistic comprehension of health encompassed the social and the physical. These large public bathing institutions (thermae) were established around the 4th or 5th to 1st century BC and served whole towns or communities. Visiting a bathing facility became part of people's daily regime after work.

Bathing consisted of undressing, staying in the warm air (to acclimate and prepare the body ahead of entering the hot water bath), hot water bath, cold water bath (to close the pores and rejuvenate the body), drying (massage), scraping the skin, and ointment. Essentially, there were three rooms required (Parent, 1987):

- the tepidarium, for warming up (lukewarm air bath);
- the caldarium, the warm water bath;
- the frigidarium, the cold water bath.

When the bathers were relaxed after this bathing process, they would socialize in the additional facilities of the complex. The Roman bath grew into a multifunctional facility that included meeting rooms for lecturing, music and poetry, libraries for studying, and gardens to promenade (Snare, 2011). The thermal baths could be visited for little money or even for free, and there was little distinction between class or rank (Yegül, 2010).

But with declining prosperity and wealth, it was difficult to maintain all these luxuries. Some of the blame for the outbreak of the plague was placed on the baths and combined with the rise of Christianity, resistance to the baths increased (Aaland, 1987).

HAMMAM
[**Precedent II**]

The Islamic hammam in Turkey was influenced by the Roman baths, mainly due to their proximity to the Mediterranean Sea (Walton, 2017). Even though the tradition of Roman baths deceased, the hammam prevailed well into Medieval times. The hammams are also a place for spiritual and physical purification and employ a series of hot and cold baths. There were different facilities for women and men, where the hammam for the men was a significant location of collective masculinity deprived of aggression, for women it was the most vital religious and social activity (Snare, 2011).

INDUSTRIAL REVOLUTION

The principle of the public bath building that has similarities with the Roman baths made a comeback during the Industrial Revolution in the nineteenth century in Europe. In contrast to the thermal baths (a venue where everyone could enjoy themselves to the best of their ability), the public bath in the nineteenth century was anything but. With the increment of industrialization, the increase of urban slums and diseased loomed (Walton, 2017). The new ideal for public baths soon became the antithesis of historical bathing culture, which by then mainly focused on the social. There was strict segregation by class, age, and gender (Parent, 1987). And the emphasis was on efficiency, separation, and individual bathing cells (Walton, 2017).

THE DUTCH BATHHOUSE

The first bathhouses in the Netherlands appeared in the 1890s and were simply furnished for workers and their families to provide showering and bathing for a small fee (Voorn, 2000). The initiators were concerned citizens and physicians who sought improvement in the hygiene and health of the lower classes. The urban population had rapidly grown, and the poor neighborhoods were becoming overcrowded. Pollution, diseases, and epidemics were noticeable consequences.

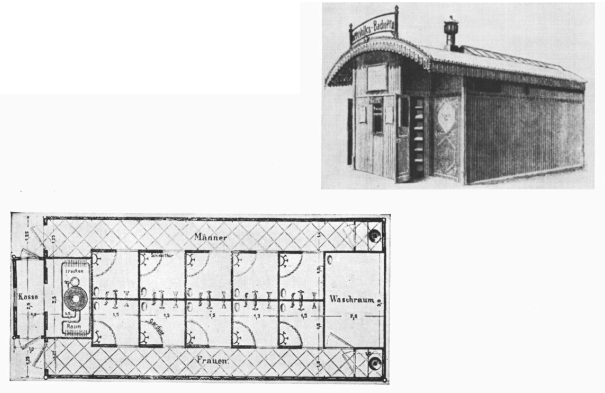


Figure 18: German 'Volksbrausebad' introduced by Lassar in 1883
(source: Parent, 1987)

Until the 1890s, only a few bathhouses existed in the Netherlands for the less prosperous. In other Western European countries, inexpensive bathing facilities had been common for years as local governments had committed to building and managing them. The German 'Volksbrausebad', a small and simple bathhouse, was particularly admired. This type of bathhouse was first introduced by dermatologist Oskar Lassar during the exhibition for hygiene in Berlin in 1883 (Bureau Monumenten & Archeologie, 2013; Parent, 1987). With his bathhouse typology (shown in Figure 18), Lassar had the ambition to make bathing and washing better and more easily accessible for the big masses. Francken (1889) propagated this model in the Netherlands in the late 1880s. Not long after, the first bathhouses appeared. It was not the local governments but various private organizations that took this initiative. The main initiators were the Kruisverenigingen and the Maatschappij tot Nut van 't Algemeen (Voorn, 2000).

DUTCH BATHING RITUAL

To be able to utilize the bathing facilities, people had to pay a fee that would differ depending on the (time of) day and location of the bathhouse (de Vries, n.d.). In some bathhouses a towel and a piece of soap were gifted, however, often people were ought to bring these supplies themselves. There was a separation of women and men in the bathing facilities and the waiting rooms (Figure 19).
Showering and bathing time was not unlimited, and when users reached their limited time the bath attendant would knock on the door or even spray cold water into the shower cabinet (De Oud-Rotterdammer, 2015).

MARNIXBAD (BEYOND THE DUTCH BATHHOUSE)
[**Precedent III**]

The newest municipal washing, bathing, and swimming facility, the Marnixbad, was opened in the Jordaan district in 1955. Because of the delayed construction, the program was able to expand to also include a school instruction pool. Combining a washing, bathing, and swimming facility in one building, architecturally designed in a high-rise, proved to be a rarity in mainland Europe at the time (Bureau Monumenten & Archeologie, 2013)
The laundry room, which the women made use of was located on the ground floor. The first floor accommodated the bathhouse with twenty-seven shower stalls and two tub stalls, to be used by both men and women. In front of this, however, there were separate waiting rooms, where visitors could wait for the bathing rounds which was a maximum

Figure 19: Female waiting room of bathhouse Da Costa in Amsterdam
(source: Badhuis en Sauna Da Costa, n.d)

of 25 minutes. The pool was located on the second floor.
The Dutch bathhouses existed mainly between 1900 and 1980. Most bathhouses disappeared during the first half of the twentieth century. With the discovery of natural gas and the incorporation of sanitary facilities in private homes, the bathhouses slowly became obsolete (Parent, 1987).

THERME VALS (CONTEMPORARY EXAMPLE)
[**Precedent IV**]

The bath as we currently know it in this contemporary context has greatly impoverished upon the historic bathing culture history (Snare, 2011). Bathing culture has transgressed and transformed into a spa culture that encompasses a passive and leisure experience, dissimilar to the former active experience.

This transition is instant within the Therme Vals design in Switzerland by architect Peter Zumthor. The Therme Valse is a spa and hotel that is completely equipped with a sensory experience (Snare, 2011). It has some resemblance to the Roman baths in terms of its programmatic layout (comprising a sequence of arriving, disrobing, acclimating, immersing in hot and cold, and relaxing and reposing) and usage of primitive materials such as stone, glass, and steel (Walton, 2017). However, the bathhouse design by Zumthor puts more emphasis on exclusive experience and conveys rejuvenation and self-reflection contrary to space for socializing.
Some examples of bathhouse typologies that prevailed in social and open experiences are the public baths in Budapest, Finnish saunas, and the Japanese sentō (Snare, 2011).

JAPANESE SENTŌ (OUTSIDE EUROPE)
[**Precedent V**]

At the end of the 18th century, the mere beginning of the sentō (the first one was built in 1591) has expanded to be a substantial foundation for city dwellers' daily routine and treasured hygiene (Ishiyama, 2009). It became an integral component of social life, forming a central hub of communication, gossip, and a place to bond with friends and discuss issues. When private baths became to emerge, the number of sentō declined. There have been nonetheless new developments in re-inventing the sentō. In which owners mainly stress the social factors of a neighborhood bathhouse (Walton, 2017). The evolution of the super sentō generated a bathhouse that encompasses diverse services beyond bathing such as saunas and jacuzzi, but also massages, fitness centers, and medical baths.

BATHHOUSE TYPOLOGY PRECEDENTS

ANALYSIS

(all analysis illustrations made by author)

THERMAE OF DIOCLETIAN (ROME) - PRECEDENT I

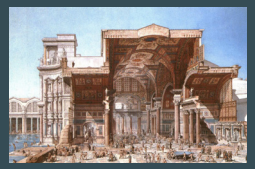


Image 1: Cross-section drawing (source: https://colosseum-rometickets.com)
Image 2: Birds view drawing of Diocletian (source: http://omeka.wellesley.edu)
Image 3: Exterior of the bath-house (source: https://en.wikipedia.org/wiki/Baths_of_Diocletian)

OTTOMAN HAMMAM - BEY (THESSALONIKI) - PRECEDENT II

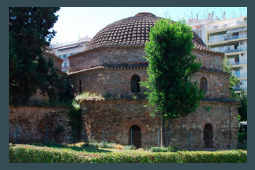


Image 4:Exterior of Bey hamam (source: https://www.islamicarchitecturalheritage.com/)
Image 5: Section of hammam (source: Tsikaloudaki, et al., 2013T)
Image 6: Men's quarter (source: https://gcube.milliyet.com.tr/)

MARNIXBAD (AMSTERDAM) - PRECEDENT III



Image 7: Exterior of Marnixbad (source: https://geheugenvan-west.amsterdam/)
Image 8: Swimming pool on the second floor (source: https://i.pinimg.com/originals/)
Image 9: Interieur of the laundry room (source: Bureau Monumenten & Archeologie. (2013)

THERME VALS (VALS) - PRECEDENT IV

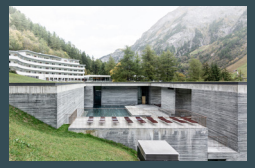
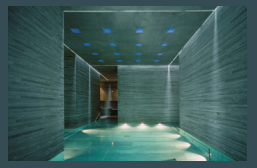



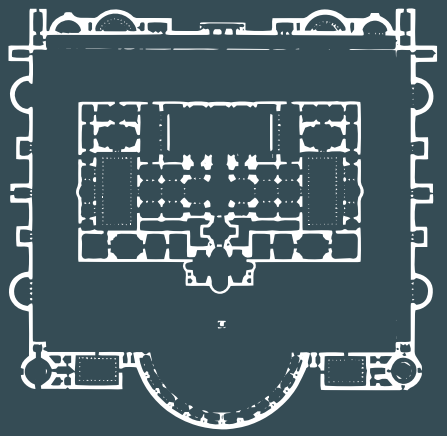

Image 10: Exterior Therme Vals (source: https://www.archdaily.com/13358/the-therme-vals)
Image 11: Interior Therme Vals - roof light (source: https://www.atzwanger.net/)
Image 12: Interior sensuous space (source: https://www.archdaily.com/13358/the-therme-vals)

JAPANESE SENTO (TOKYO) - PRECEDENT V

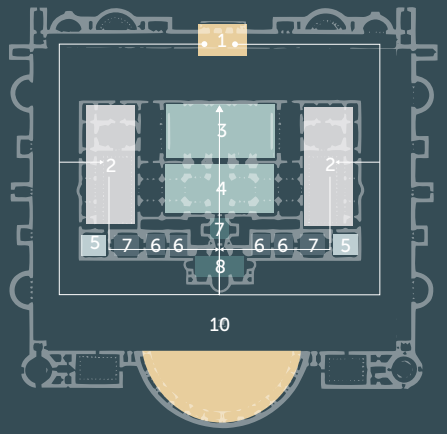


Image 13: Inside sento man's section (source: https://www.dezeen.com/)
Image 14: Inside sento women's section (source: https://www.dezeen.com/)
Image 15: Bandai in front of the entrance (source: https://www.dezeen.com/)

FLOOR PLAN



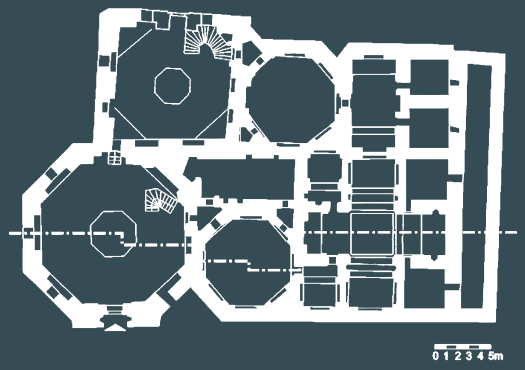
PROGRAM + CIRCULATION



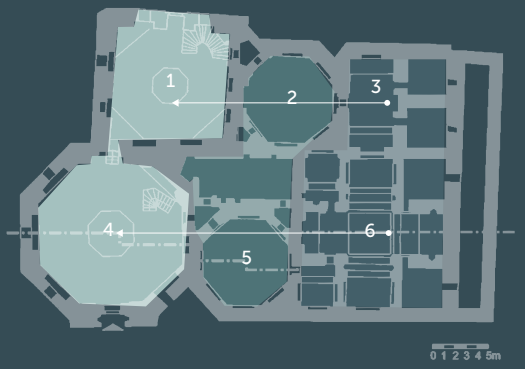
entrance + leisure | cold | warm | hot | changing room | bathing related | other function

1. entrance
2. palaestra (gym)
3. natatio (swimming pool)
4. frigidarium (cold bath)
5. unctorium (exfoliate)
6. sudatorium (sweat room)
7. tempidarium (warm bath)
8. caldarium (hot bath)
9. exedra (outdoor recess)

FLOOR PLAN



PROGRAM + CIRCULATION

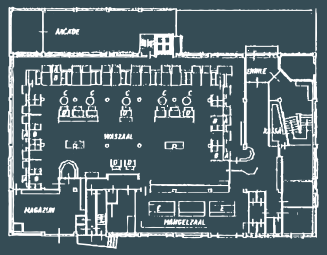


entrance + leisure | cold | warm | hot | changing room | bathing related | other function

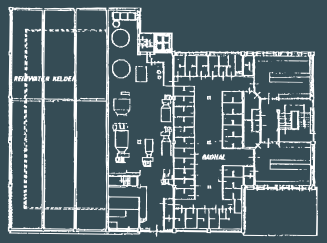
1. cold chambers (women)
2. tepid chambers (women)
3. hot chambers (women)
4. cold chambers (men)
5. tepid chambers (men)

MARNIXBAD - PRECEDENT III

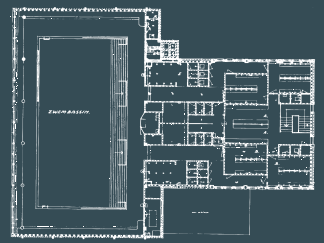
FLOOR PLAN



ground floor

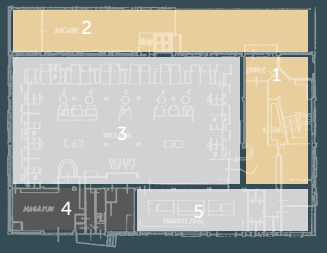


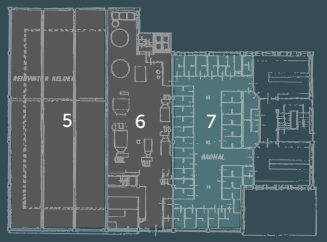
first floor

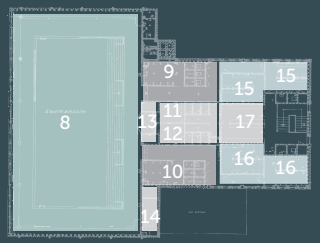


second floor

PROGRAM







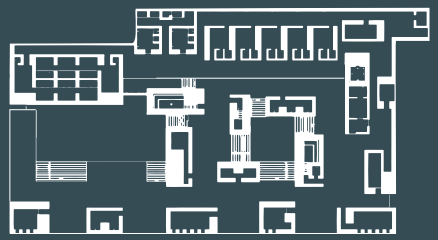
entrance + leisure | cold | warm | hot | changing room | bathing related | other function

1. entrance
2. arcade
3. laundry facility
4. stockroom
5. clean water storage
6. filter and vents
7. bathing hal
8. swimming pool

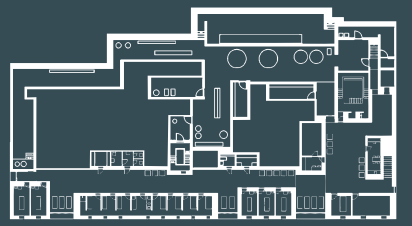
9. shower & toilets (women)
10. shower & toilet (men)
11. cloakroom (women)
12. cloakroom (men)
13. instructor's room
14. EHBO room
15. changing room (women)
16. changing room (men)
17. waiting room

PRECEDENT IV - THERME VALS

FLOOR PLAN

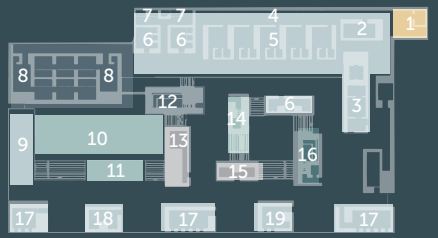


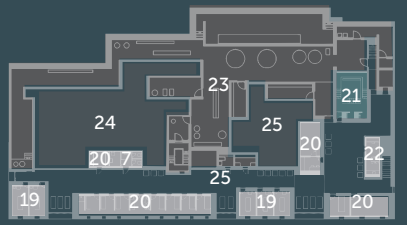
ground floor



basement

PROGRAM + CIRCULATION

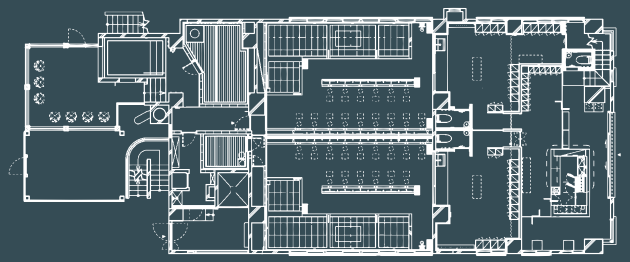




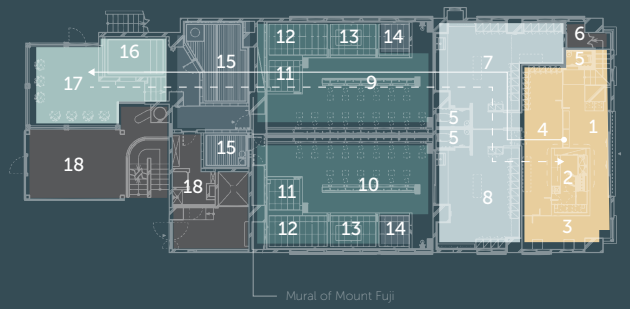
1. entrance
2. make-up room
3. disabled toilet & cloakroom
4. hallway
5. changing rooms
6. showers
7. toilets
8. sweat stone spa
9. sun bathing terrace
10. outside bath
11. rock pool
12. fire bath
13. drinking water
14. cold bath
15. sound stone
16. flower bath
17. rest space
18. outdoor shower
19. massage room
20. treatment room
21. aquatheraphy
22. tea kitchen
23. (technical) services
24. wastewater tank
25. freshwater tank

entrance + leisure | cold | warm | hot | changing room | bathing related | other function

FLOOR PLAN

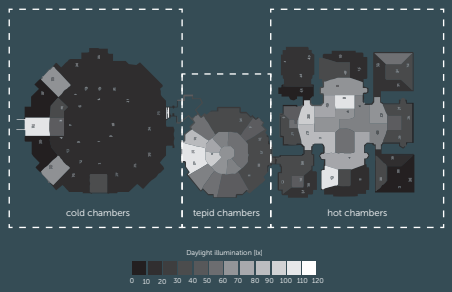


PROGRAM + CIRCULATION

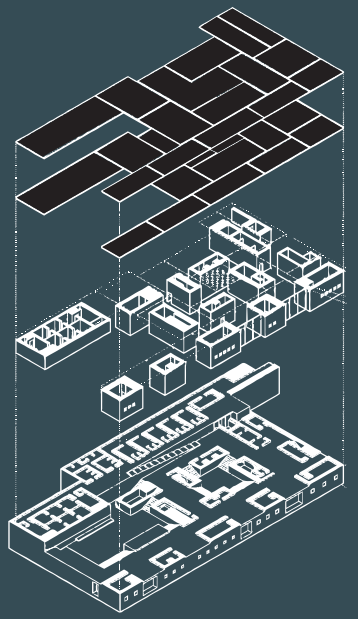


entrance + leisure | cold | warm | hot | changing room | bathing related | other function

1. entrance
2. bandai
3. beer bar
4. lobby
5. toilet
6. storage
7. changing room (men)
8. changing room (women)
9. bath area (men
10. bath area (women
11. water bath
12. carbonated bath
13. medicated bath
14. hot bath
15. sauna
16. cold bath
17. air bath area
18. machine room



OTTOMAN HAMMAM



THERME VALS

Lighting in a bathhouse

(Day) lighting appears to be an important aspect of the bathhouse design. Daylight is in many cultures associated with spiritual and divine powers, and frequently symbolized purity, truth, and life (Tsikaloudaki, 2013). This is also the case in hammams, in which lightning provides a sense of spirituality to spaces. The distribution and levels of light are linked to the architectural design and functioning of the space.

In the case of Therme Vals, lighting is employed to direct different sensuous atmospheres inside the spaces. The roof design manages how much light is let through in the bathhouse.

Research & Design

Many compelling design elements could be extracted from the analysis of these (historical) bathing typologies and implemented within the design of a contemporary bathing infrastructure in Blijdorp. The bathhouse typologies have similarities in terms of program and circulation. The different sequences of spaces (often warm-hot-cold) and accompanying atmospheres provoke a rich bathing experience. Additional functions, besides the bathing, support the social making aspect of the bathhouse. In my bathhouse design, I deem therefore two design principles important:

- A sequence of different atmospheric spaces, generation a sensuous bathing experience
- A hybrid program, to enhance the possibility for more social encounters

4.4 Community building through water infrastructure in a residential building

THE SOCIAL ASPECT OF BATHING CULTURE

Deriving from ancient Greek and Roman baths to the Islamic hammam, or Japanese sentō, bathing has been essential to communal life across the ages. The history of humans bathing is one of shared spaces. However, nowadays many societies across the globe have disregarded the vibrant cultural bathing legacy (Withers, 2017).
Past eras treasured the whole person: intellect, imagination, feelings, sensuality, and desire for connection and relationship to life's rhythms on a scale bigger than that of the individual (Giedion, 1968). The bath transformed into an enameled, standardized steel component. In which one person barely fits, defeating the bath's aspiration for regeneration and civic and social function.
To envision a contemporary environment of regeneration is to discover unique opportunities to fabricate meaningful connections between landscape, built form, experience, and social life (Pearson, 2020). By dismissing any of these elements, we cannot cohere with the present-day bathhouse typologies such as the sauna or hammam, which are yet an inextricable feature of communal bathing. Communal bathing spaces necessitate architecture to restore what currently is intimate or private back into the public.
Attempts to cease the recession of contemporary communal bathing facilities could be vital for inhabitants who would otherwise miss the social interaction without the bathhouse (Pearson, 2020).

BATHHOUSE AND SAUNA DA COSTA (AMSTERDAM)

During the 1970s, many municipal communal bathhouses lost their function in the Netherlands (NCRV, 1998). The only social bathhouse that is currently still operating in the Netherlands is the Badhuis en Sauna Da Costa in Amsterdam, established in 1903. When more dwellings became equipped with private bathrooms towards the end of the 20th century, the Da Costa was the only bathhouse that still received daily visitors (Badhuis en Sauna Da Costa, n.d.). With the persistence of volunteers, users, and the municipality of Amsterdam was able to reopen, after its closing in 1988 (Figure 21). The bathhouse organization became a foundation, with the newly integrated sauna being the most important element of the revenue model.

A weekly user in 1988 explained how the only social interaction she had during the week was in the bathhouse (NCRV, 1988, Timestamp 5:23). Being a widower with no kids, the bathhouse provided a place for her where no one is being judged and everyone is welcome.

Figure 20: Bathhouse Da Costa in Amsterdam
(source: Badhuis en Sauna Da Costa, n.d)

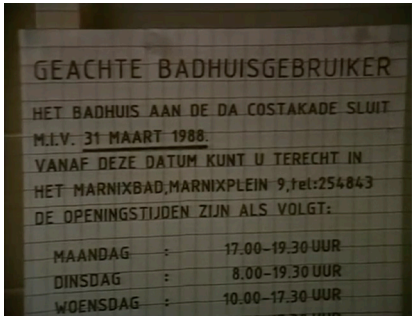


Figure 21: Announcement of the closing of the Da Costa bathhouse (screenshot of video)
(source: Badhuis en Sauna Da Costa, n.d)

This inviting atmosphere is still prevalent within the current operation of the bathhouse. The Bathhouse and Sauna Da Costa is a place for residents, students, tourists, but also homeless people. The addition of the sauna to the bathhouse supports the establishment to keep showering and bathing prices low (€1,50 and €2,50) (Badhuis en Sauna Da Costa, n.d.).

The chairman Hans Boekelaar states in the interview I conducted with him (appendix A), that the existence of the social bathhouse is a matter of trial and error. Currently, only volunteers are employed, allowing the bathhouse to continue to exist. The number of visitors only increases, as it has almost doubled in the past five years, with over 11,000 visitors in 2021. Boekelaar explains there are two types of visitors; in the morning the bathhouse visitors are welcomed until one o'clock, while the sauna only opens at two o'clock.
Good hygiene is vital for protection, comfort, and a sense of well-being (Simões-Figueiredo, et al., 2018). Boekelaar thinks the greatest feature of the bathhouse is that all are welcome to take a shower or bath. Inhabitants from the neighborhood visit the bathhouse as well and are very involved. The bathhouse exceeds the program of just washing and drying, people come to meet each other, sit down, and have interactions with a cup of coffee.

THE BATHHOUSE: A PLACE FOR SOCIAL MAKING

By reimagining baths as shared spaces, they could provide society with more generosity and flexibility, and acknowledge our desire for others at all stages of life (Pearson, 2020).
The bathhouse as a public place offers a unique timbre: a space of synthesis, vulnerability, and reconciliation, where the armor of everyday life is abandoned together with one's clothes. Toivonen (2015) specifies the bathhouse as an environment free from competition, conflict, and hierarchy. The phenomenology of bathing initiates all the senses toward the social and physical world (Pearson, 2020). The bathhouse could perform as an institution, heterotopia (Foucault & Miskowiec, 1986), counterpublic (Warner, 2002), and a momentary autonomous area (Bey, 2003), where the script will be continuously rewritten by whoever

Figure 22: Interior Da Costa bathhouse
(source: Badhuis en Sauna Da Costa, n.d)

turns up.

The urban public bath should contribute to a setting that congregates existing communities, whilst also providing possibilities for new communities to develop (Pearson, 2020). Local communal bathing facilities could cater for space for conversations between people which establish a brief, but genuine sense of connectivity that would otherwise have never occurred without this stimulating institution providing a surrounding for spontaneous and improvisational communal exchange.

With bath culture transitioning from a historical active experience to a passive one, the bathhouse requires a programmatic mixture or hybrid institution which would be suitable for a place beyond bathing (Snare, 2011). A hybridized program is essential to understanding the richness and spectacle of bathhouse cultures. In addition, did such a hybrid program generate intricate spatial institutions which truly made bathhouses public organizations of the time.
The bathhouse program should contain the ritual of bathing, but also accommodate accompanying spaces to generate a hybrid program that could enhance a rich bathing experience. This experience should initiate diverse opportunities for social interactions due to the extraordinary design of each bath and space.
To bathe is to be bounded by water, to soak and seek renewal and (daily) regeneration (Raleigh, 2016). The ritual should be slow, and not rushed. Bathing regards the engagement in the experience and the bathhouse as a meeting space. Whilst bathers go through the sequence, opportunities that enhance interaction arise, as bathers become more comfortable (Raleigh, 2016). Fabricating spaces with varied atmospheric qualities allow the skin to relish the pleasure of being completely ingrained in the tactile environment. This quality of tangible immersion could be accomplished in all spaces; however, this exploration is usually only executed by contemporary artists instead of architects.

INTEGRATING BATHING AND LIVING IN BLIJDORP

Currently, the tradition of public bathing that prevails within the Netherlands lacks the resemblance of the fundamental principles, the extent of sensory immersion, or typological rituals that delineate the significance of an eternal bathing experience. The superior way of bathing at present is showering, yet there are indications that show the willingness to explore bathing in different ways (Kuijer & De Jong, 2011).
With this research report, I present an imperative case for why a communal/ semi-public bathhouse in a residential building could not only exist within the current Dutch landscape, but additionally, the reason for its existence, and which form it should take.
Water infrastructures can be crucial for promoting social contact with neighbors and friends of all ages (Thomson, et al., 2003). These social contacts are directly connected to our mental health, as the health benefits could reduce isolation and stress relief.

Research & Design

In the design of a new residential building in Blijdorp, it is of essence to reimaging a new way of integrating bathing and living into one building. A bathhouse on the ground floor could enhance more social interactions amongst the residents (in this case, the solo dwellers).
As mentioned in chapter 3 of this report, the participation of dwellers in social endeavours is linked to their sense of place. Therefore, it is imperative that the communal bathhouse provides a sense of place on the scale of identifying, involvement, and sacrifice.
A possible way to achieve this, is by the dismissal of bathrooms in certain dwelling units. However, this removal should be perceived as an offering for the solo dweller, as he or she should gain more qualitative bathing infrastructure due to the deployment of the bathhouse on the ground floor.

Image (left): Facade Just sleep
(source: Archdaily)

JUST SLEEP JIAOXI

Architect:	LHR ARCHITECT & ASSOCIATIES
Location:	Jiaoxi township, Taiwan
Year:	2015
Type:	Hot spring hotel
User:	Guests
Hotel units:	138

PROJECT DESCRIPTION

Just Sleep Jiaoxi is a hot spring hotel located in Jiaoxi township in Taiwan. The design concept of the hotel was to organize an arrangement of 'bathhouses' along the façade. The balcony and attached vertical wooden louvers indicate and enclose the baths. The façade is coated with dark stone paint.
Within the hotel, there are 138 units, all with a private bathhouse incorporated. This integrates a sense of relaxation into the room, as well as stimulates a highly restorative and sensuous experience.

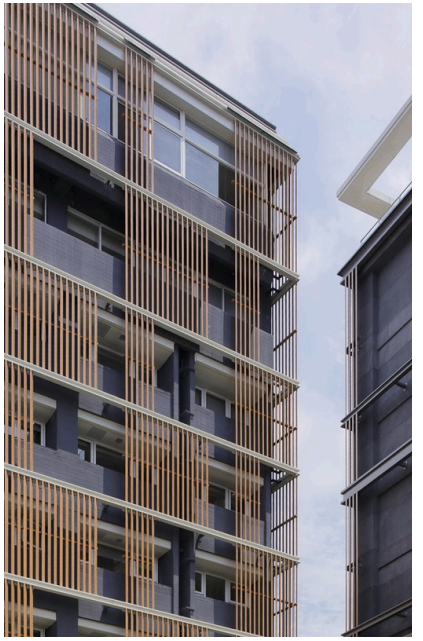


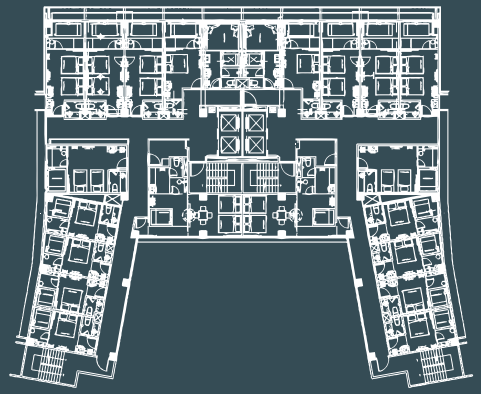
Image (top left): Facade with stone paint and wooden louvers
(source: Archdaily)

Image (top right): Hotel room with bathhouse
(source: Archdaily)

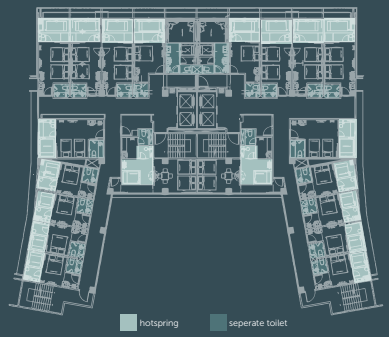
Image (middle right): Outside bath ground floor
(source: www.justsleep.com.tw)

Image (bottom right): Inside bath ground floor
(source: Archdaily)

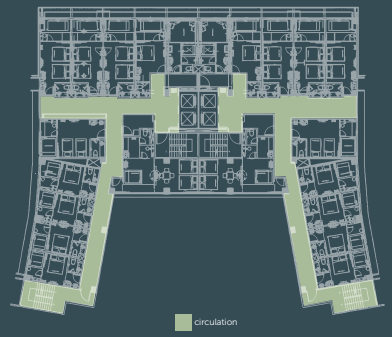
FLOOR PLAN



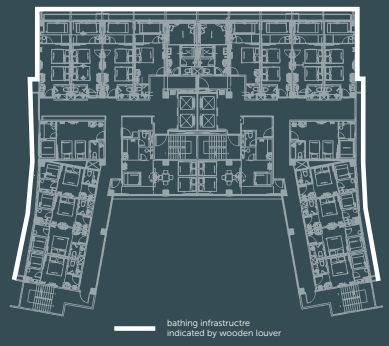
WATER INFRASTRUCTURE



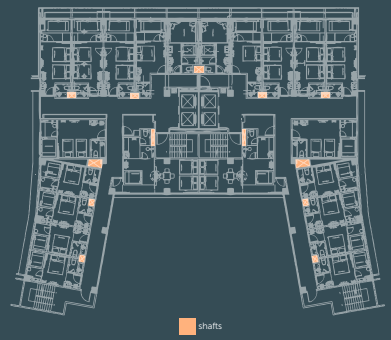
CIRCULATION



BATHING IN FACADE



SHAFTS



Jeest sleep Jiaoxi - integration bathing & living

The design of the hotel puts a lot of emphasis on highlighting the bathing infrastructure within the architectural exterior and interior design of the building. The hot springs are situated along the façade. Using wooden louvers, this is displayed on the exterior. The less important elements of the water infrastructure, such as the toilet, are situated inside the building layout. Also, the circulation of the hotel is regulated through inner corridors, along which also the shafts are located. These shafts are placed next to the toilet, and not the hot springs.

Research & Design

The design of the hotel corresponds in many ways with the design strategy I would like to employ in the design of a new residential building in Blijdorp. In Just Sleep Jiaoxi, hotel guest should be able to access the bathing facilities on the ground floor (in their robe, so to speak), without having to go outside. Therefore, the circulation of the hotel is solved internally.
This design solution of an inner corridor should also be used in my design.

The contrast between bathing and non-bathing function inside the hotel is also established by the materialization (externally and internally) as shown in the images on page 73 of this report. The bathing infrastructure is enriched by the employment of natural materials such as timber and stone.
Utilizing materialization to enhance this contrast is something which should also be established within my design.

4.5 Conclusion

This chapter revolved around the topic of water infrastructure in a residential building, and in particular, bathing infrastructure. I investigated historical bathhouse typology examples and extracted aspects from them, which could be implemented within a contemporary context such as Blijdorp. A bathing infrastructure on the ground floor of a residential building in combination with dwelling typologies targeted toward solo dwellers could generate a new way of living. It requires reimagining a new way of integrating bathing and living into one building. How this could take form, was the last section investigated in this chapter.

When investigating the history of Europe, a rich abundance of bathing cultures can be distinguished. However, present-day society is accustomed to daily showering and bathing, so it becomes incomprehensible how this formerly used to be, and how the ancient Greek and Roman bath were vital for communal life. Efforts to cease the recession of contemporary communal bathing facilities and the introduction of new ones are essential.
By employing a local communal bathing facility, a space could be produced in which people could have a brief, but genuine connection, which would otherwise have never happened.
When speaking to Boekelaar, it became apparent that this was also the case for the neighborhood where Badhuis en Sauna Da Costa is located. The bathhouse generated an involved and engaged community. The bathhouse exceeds the program of just washing and drying and forms a space for social interactions.

At present, the tradition of public bathing that prevails within the Netherlands is absent of the resemblance of fundamental principles, the extent of sensory immersion, or typological rituals that delineate the significance of an eternal bathing experience.
In this research report, I introduce an imperative case for why a communal/ semi-public bathhouse in a residential building could not only exist within the current Dutch landscape, but additionally, the reason for its existence, and which form it should take. As water infrastructures can be imperative for stimulating social contact with neighbors and friends of all ages.

From the precedents analysis of bathhouse typologies, there were two design principles I deemed important for the design of my bathhouse:
- A sequence of different atmospheric spaces, generation a sensuous bathing experience
- A hybrid program, to enhance the possibility for more social encounters

How this bathing infrastructure could be integrated into a residential building was investigated in the last segment of this chapter.
The dismissal of bathrooms in certain dwelling units, whilst in return providing a new qualitative communal bathing infrastructure on the ground floor could provide a possible solution. From the analysis of Just Sleep Jiaoxi hotel, there were two design solutions that I think are of relevance for this integration of bathing and living into one (residential) building. These are the internal circulation spaces and the contrast between bathing and non-bathing functions created by the employment of different materials.

05. CONCLUSION

5.1 Conclusion

The purpose of this research report is to address both a social and ecological problem that Rotterdam is facing and will continue to face in the future. With the single-person household as fast-growing and the soon-to-be superior housing form, an increase in loneliness may arise among solo dwellers. If solo dwellers lack qualitative social connections, an absence of a sense of belonging might occur. As a result, this possibility of loneliness will take form.

In addition to this social problem amongst solo dwellers, there is also an ecological problem concerning sustainable water resource management I addressed in this report. Solo dwellers consume more resources per person, in comparison to people living in a multi-person household. In addition, there could occur a shortage in surface water in the future, due to the deficiency of sustainable water resource management. By employing rainwater for everyday use this problem could be partly solved, and the water footprint of solo dwellers could be reduced.

The objective of this research report is to examine if there is a solution that addresses both these social and ecological problems. Therefore, I investigated how a community amongst solo dwellers could be built through water infrastructure. The main research question of this report was: **How could community building amongst solo dwellers be enhanced through water infrastructure?**

To answer this question, this report was divided into three main chapters, revolving around the topics of the solo dwellers, building a community, and community building through water infrastructure.

Chapter two of this report centered around the subjects: the rise of solo-living, types of solo dwellers, and the housing needs of the solo dweller.
The increasing uprise in solo living in the world is also prevalent when investigating the prognosis of household types in Rotterdam. This homogenous group of solo dwellers can be found in all the adult age groups and stages of life. This diverse group has a commonality that in general, they earn the smallest monthly income when compared to multi-person households. They are mostly renters of studios, (small) apartments, or live in cluster apartments. Yet, developments indicate an increase in (older) solo dwellers renting single-family homes. For the design of a residential building in Blijdorp targeted toward solo dwellers, it is therefore essential all these dwelling typologies are present to cater to the need of this diverse group of solo dwellers.
By employing more communal shared spaces, the design can provide a reduction in resource consumption and the negative impact that single-person households have on the environment. Therefore, the design could render a new way of living, combined with more resource-efficient alternative housing for solo dwellers.

Chapter three focused on the question of how a community could be built amongst solo dwellers in a residential building. The increase of single-person households results in new perceptions of sharing domestic spaces. The design of the residential buildings which are targeted toward solo dwellers often does not accommodate any communal or shared spaces. However, these communal spaces are exquisite in providing an environment for social interaction, whilst generating a binding, enduring common interest.
The participation of the dwellers in social endeavors is in accordance with their sense of place.
In the design of a residential building, it is therefore imperative that the communal spaces can equip the (solo) dwellers with a sense of place on the scale of identifying, involvement, and sacrifice for the communal place. To establish a lower threshold for dwellers to visit the communal space from their private space, the communal spaces should be centrally located in the residential building. In addition, the communal space must be located on shared pathways to expand the possibility of social encounters and interactions.
The last main chapter of this report, chapter four, revolved around the topic of water/bathing infrastructure. Historical bathhouse typologies were examined, and features of these typologies which were of relevance for the design of a contemporary bathhouse in Blijdorp were extracted. A bathing infrastructure on a residential building's ground floor, combined with dwelling typologies designed to cater to the need of solo dwellers, could generate a new way of living. It requires reimagining the way how bathing and living could be integrated into one building.

The rich, historical (European) abundance of bathing cultures is currently not prevalent in the washing/ bathing regimen of today's society. Attempts to halt the recession of contemporary communal bathing facilities and the introduction of new ones are essential. By introducing a local communal bathing facility, a space could be established in which people form connections, which otherwise might not have occurred. The bathhouse should exceed the function of mere washing and drying and provide space in which social interactions are stimulated. This ritual of communal bathing is currently lacking in the Dutch tradition of bathing.
In this research report, I examined why and how a communal/ semi-public bathhouse in a residential building could transpire in a contemporary Dutch context like Blijdorp. Introducing a new form of communal bathing infrastructure in a residential building can be imperative for stimulating social contact amongst residents.

Four design principles that can be employed in the design of the bathhouse, and the integration of bathing and living into one building are:

- A sequence of different atmospheric spaces, generation a sensuous bathing experience
- A hybrid program, to enhance the possibility for more social encounters
- Internal circulation spaces
- A contrast between bathing and non-bathing functions, by utilizing different materials.

In conclusion, this research report centered around the question: How could community building amongst solo dwellers be enhanced through water infrastructure?
To combat loneliness amongst solo dwellers, and in addition, build a community amongst them, a new residential building model should be introduced which reimagines how bathing and living could be integrated into one building. By incorporating a bathhouse on the ground floor, solo dwellers obtain a common interest, whilst entering the communal spaces also can become part of their daily routine. The bathhouse forms an environment for spontaneous communal exchange and should exceed the program of mere washing and bathing. By employing a hybrid program, the bathhouse becomes the primary place for social interaction amongst solo dwellers.

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THERMAE

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APPENDIX A

INTERVIEW INFORMATION

Interviewee: Hans Boekelaar (Chairman of Badhuis en Sauna Da Costa)
Date of interview: April 9th, 2022

INTERVIEW QUESTIONS

History:
- The bathhouse Da Costa emerged during the time when multiple bathhouses were opened throughout the Netherlands, when these bathhouses were slowly disappeared; How did your bathhouse develop between that time and now to still remain as a social bathhouse?
- How has the bathhouse been able to (financially) sustain itself?

Organization:
- How did you come to join the bathhouse? What are the activities as chairman?
- How does the organisation work within the bathhouse? Are they mostly volunteers working in the bathhouse?

Users:
- By whom is the bathhouse used?
- Do many interactions take place between people users who do not know each other? If so, what kind of interactions?
- What do the residents in the neighbourhood think of the bathhouse? Do they make use of it themselves? What are their views on the bathhouse?

Social aspect
- Are there any areas in the bathhouse especially designed to enhance more interaction between users? If so, which spaces?
- Why do you think the bathhouse is a place for everyone?

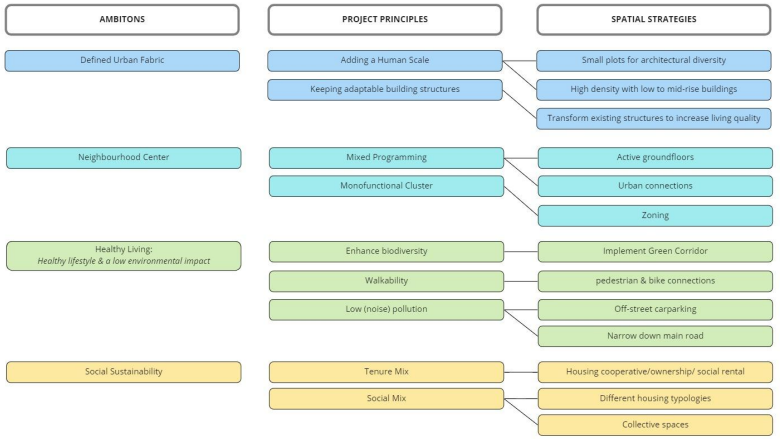
My project
- For my graduation project I am designing a housing complex for single-person households. This household group is very diverse, from students, starters, and elderly. The bathhouse on the ground floor of the housing complex should really become a meeting place for the residents. What spaces within a bathhouse do you think are essential for these social encounters to take place?

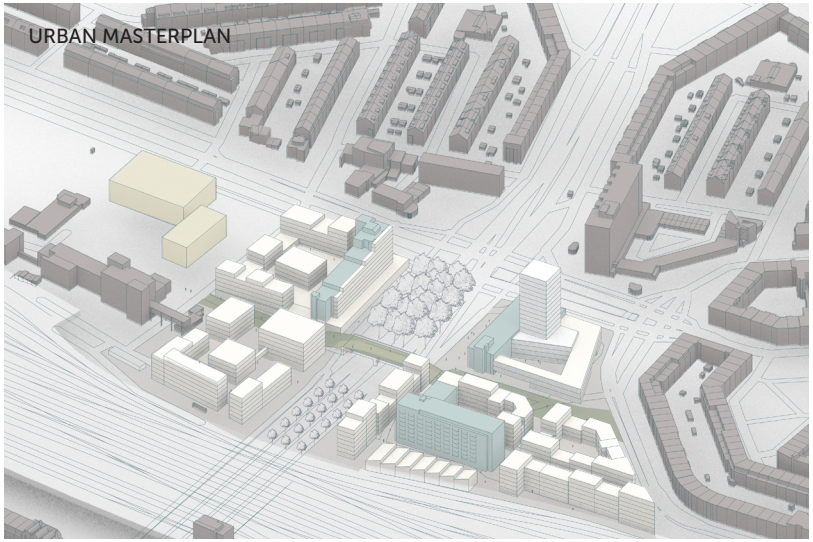
8. FINAL DESIGN

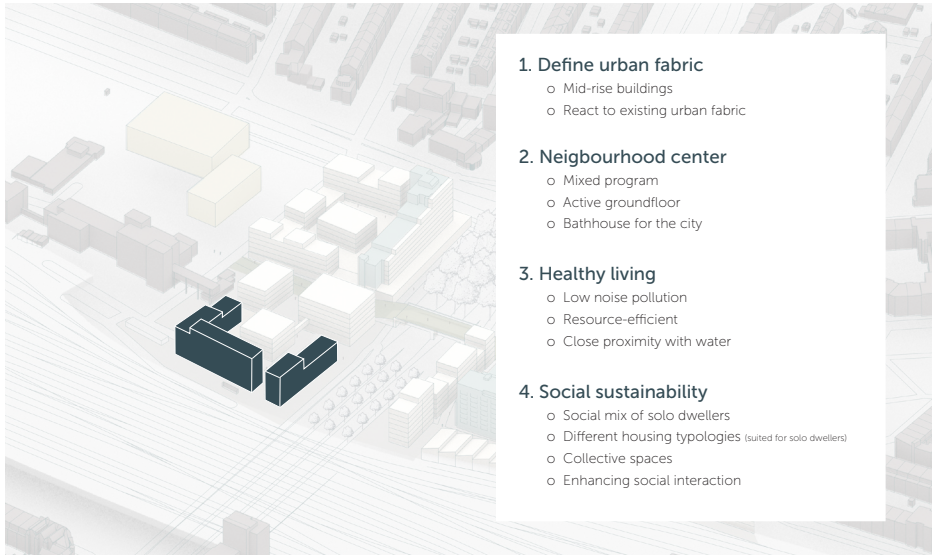
PROJECT STATEMENT

In my project design, I wish to tackle both the sociological and ecological problems that we identified during the urban analysis at the beginning of the studio. From the social context analysis, we concluded that the prognosis of the demographic of Rotterdam is characterized by a rise in single-person households. The growth of solo dwellers could generate future sociological problems amongst the citizens of Rotterdam as they face profound challenges such as the possibility to feel loneliness. To combat this potential problem, it is of essence to stimulate qualitative social connections. In addition, do solo dwellers utilize more resources (i.e., energy and water) per person, compared to people living in a multi-person household.
Besides this sociological issue, the city of Rotterdam is also facing and will face in the future, an ecological problem. From the urban analysis on climate, it became apparent that water management has been an important component in municipal management. The city has been dealing with flooding in the past, however, due to a lack of sustainable water resource management, this renewable water resource is not being exploited in residential use.

The project aims to combat both these problems through the means of community building. The design will provide an adequate housing project for a heterogeneous group of solo dwellers, whilst exploiting water infrastructure as a key component in community building. The re-introduction of bathing culture will be apparent by the implementation of a bathhouse on site. This could generate a space in which social interaction is simulated amongst all different age groups and cultural backgrounds. Not only for residents but for the entire city.



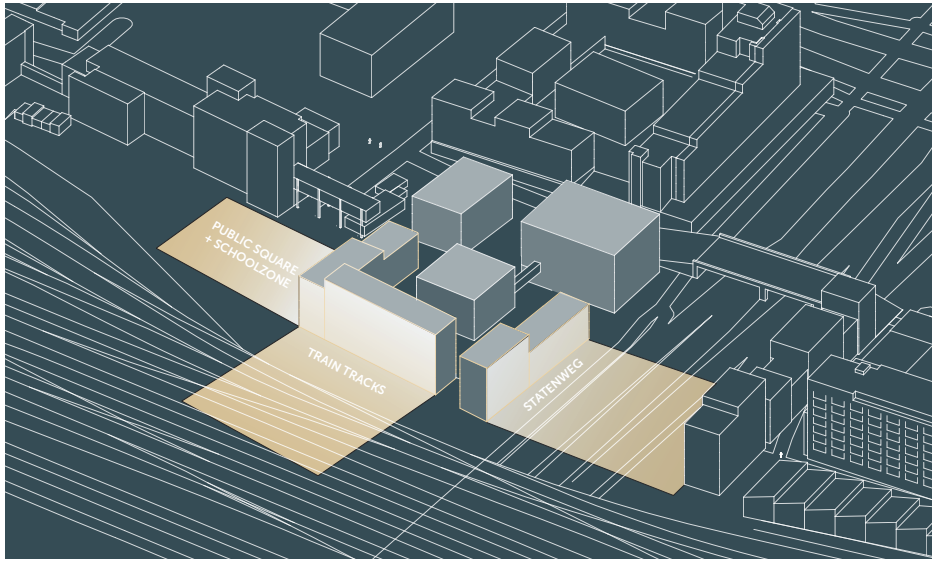




ROLE OF PROJECT IN URBAN MASTER-PLAN

During the development of the urban masterplan, we specified four ambitions that became the main driver for the masterplan:
1. Defining the urban fabric
2. Creating a neighborhood center for Blijdorp
3. Generating healthy living (both through a healthy lifestyle and low environmental impact)
4. Social sustainability

My project contributes to our ambitions by implementing mix-rise buildings and reacting to the urban fabric (1). Creating a mixed program, having an active ground floor, and implementing a bathhouse for the entire city (2). Lowering the noise pollution in the built environment and a focus on resource efficiency (3). And lastly, designing a variety of housing typolofies for a social mix of solo dwellers, and collective spaces to enhance social interaction.



THE SITE

The project is located in a challenging, yet, interesting site. Characterized by three adjacent environments; The school zone on the west, train tracks on the south, and the Statenweg on the east, the project deals with many noise pollution. This necessitates the need for design solutions combating these problems.

In addition, does the neighboring student-colleague project (three fat-type buildings on the north) contain urban kitchens. Making the in-between space a lively and pleasant environment.

DESIGN PRINCIPLES

project ambition

A VARIETY OF HOUSING TYPOLOGY

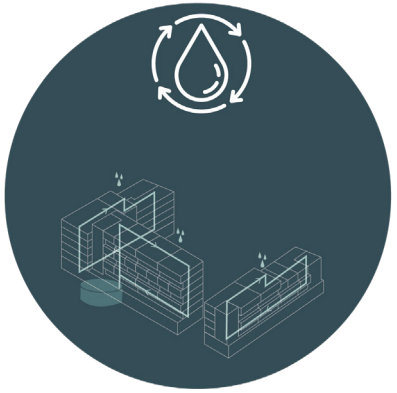
for the heterogenous group

INCORPORATE COMMUNAL SPACES

to enhance social interaction

USE INNOVATIVE WATER TREATMENT SYSTEMS

sustainable water resource management)



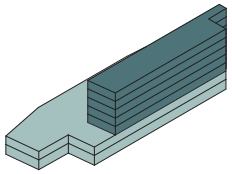
EXPLOIT COMMUNAL BATHING + BATHHOUSE

as a means to connect solo dwellers and reduce their water footprint

DESIGN CONCEPT

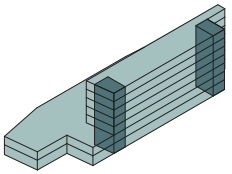
building mass

1



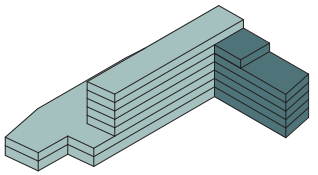
bathing infrastructure 'heart'

2



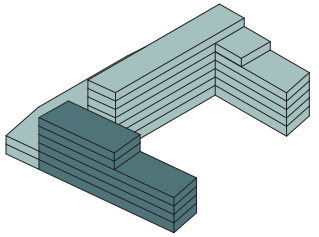
circulation cores on both sides

3



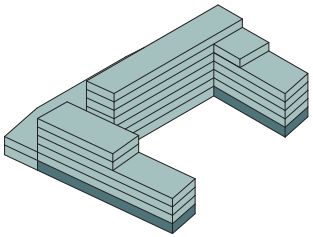
introduction of dwelling typologies with
no bathrooms + inner corridor

4



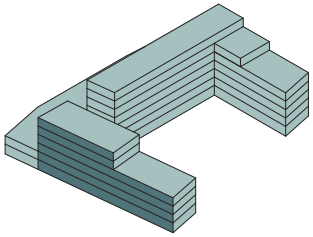
introduction of dwelling typologies with
limited bathrooms + inner corridor

5



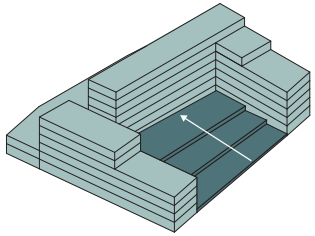
adding ground floor functions
stimulating healthy living

6



adding site specific design elements

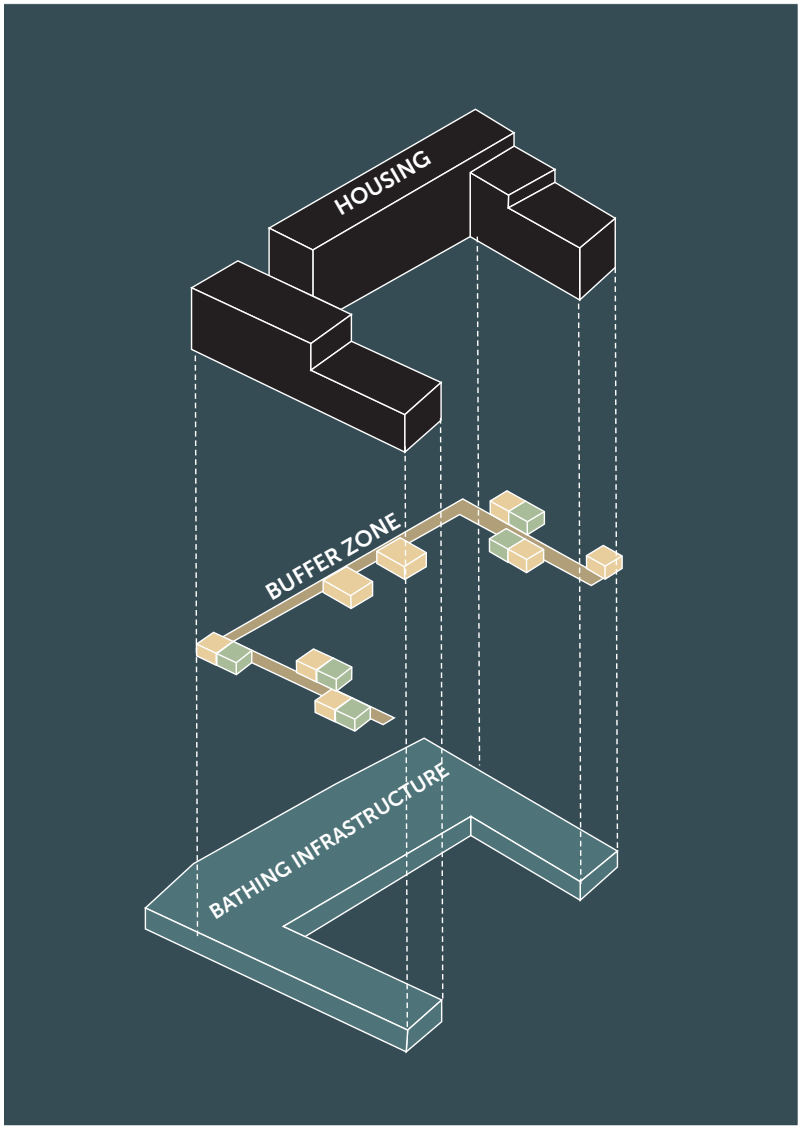
7



utilize adjacent outdoor space to create
inviting atmosphere

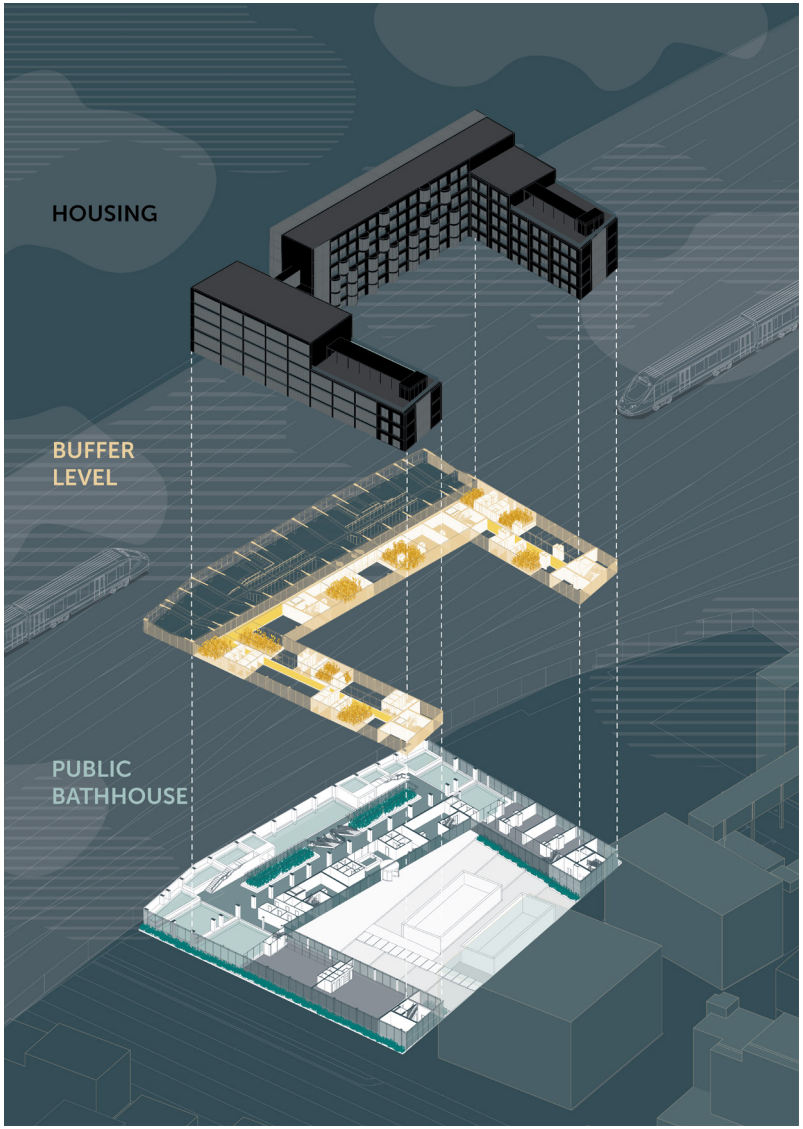
BUILDING PROGRAM

function mass



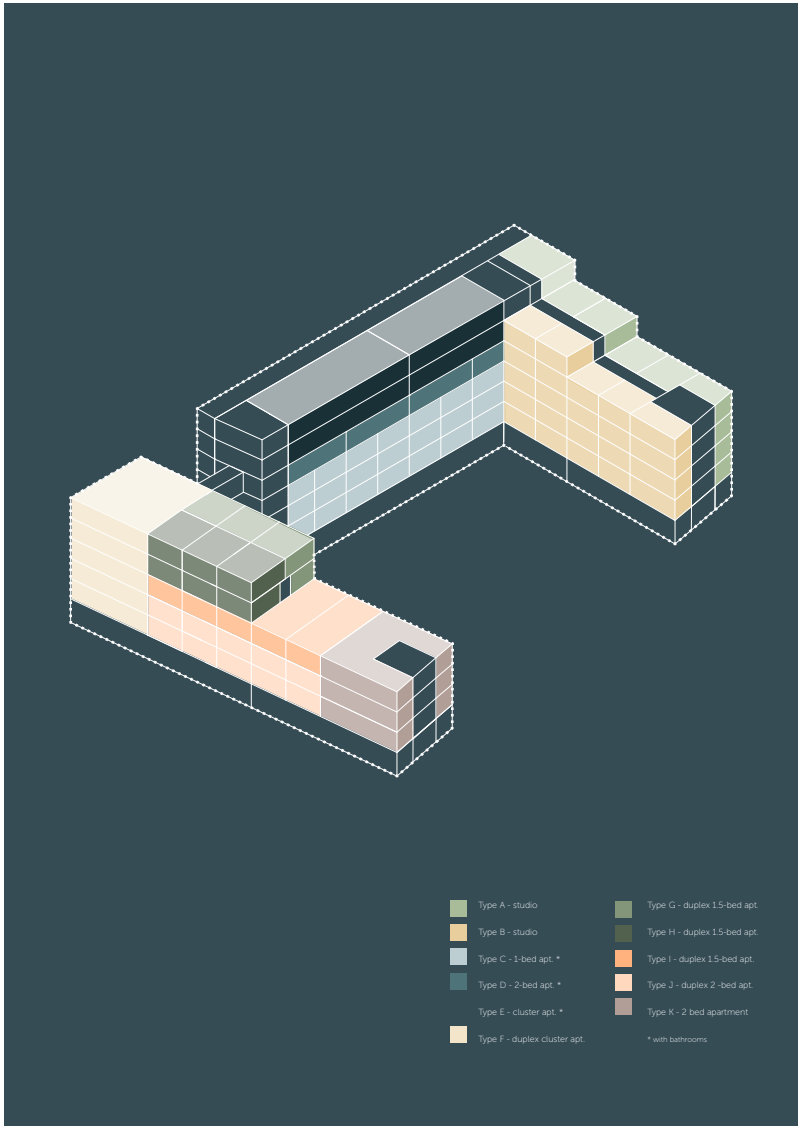
BUILDING PROGRAM

mass development



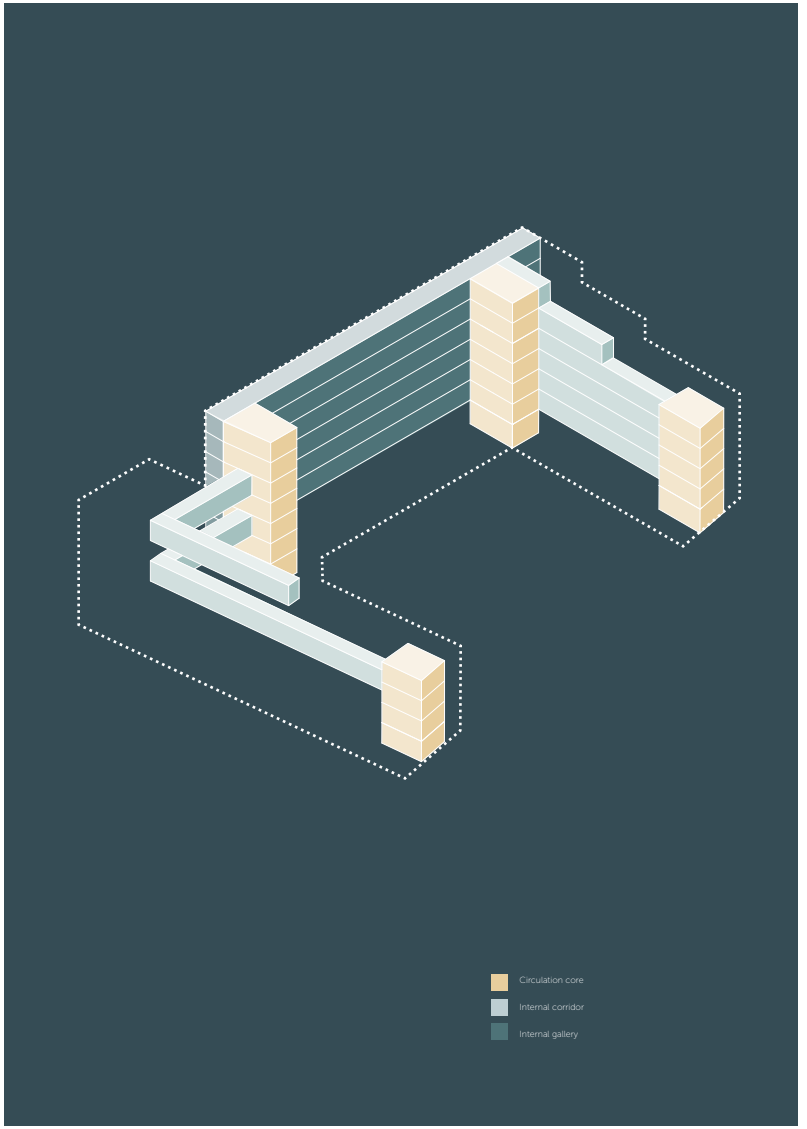
DWELLING TYPOLOGIES

building diagram



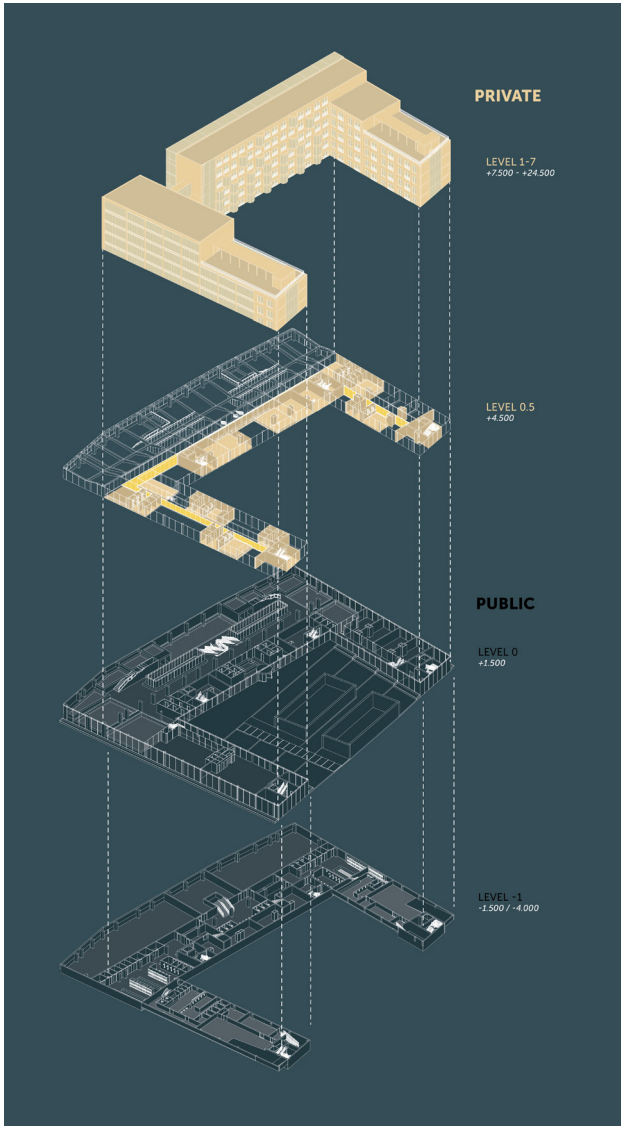
CIRCULATION

building diagram



PRIVATE/PUBLIC

building partition



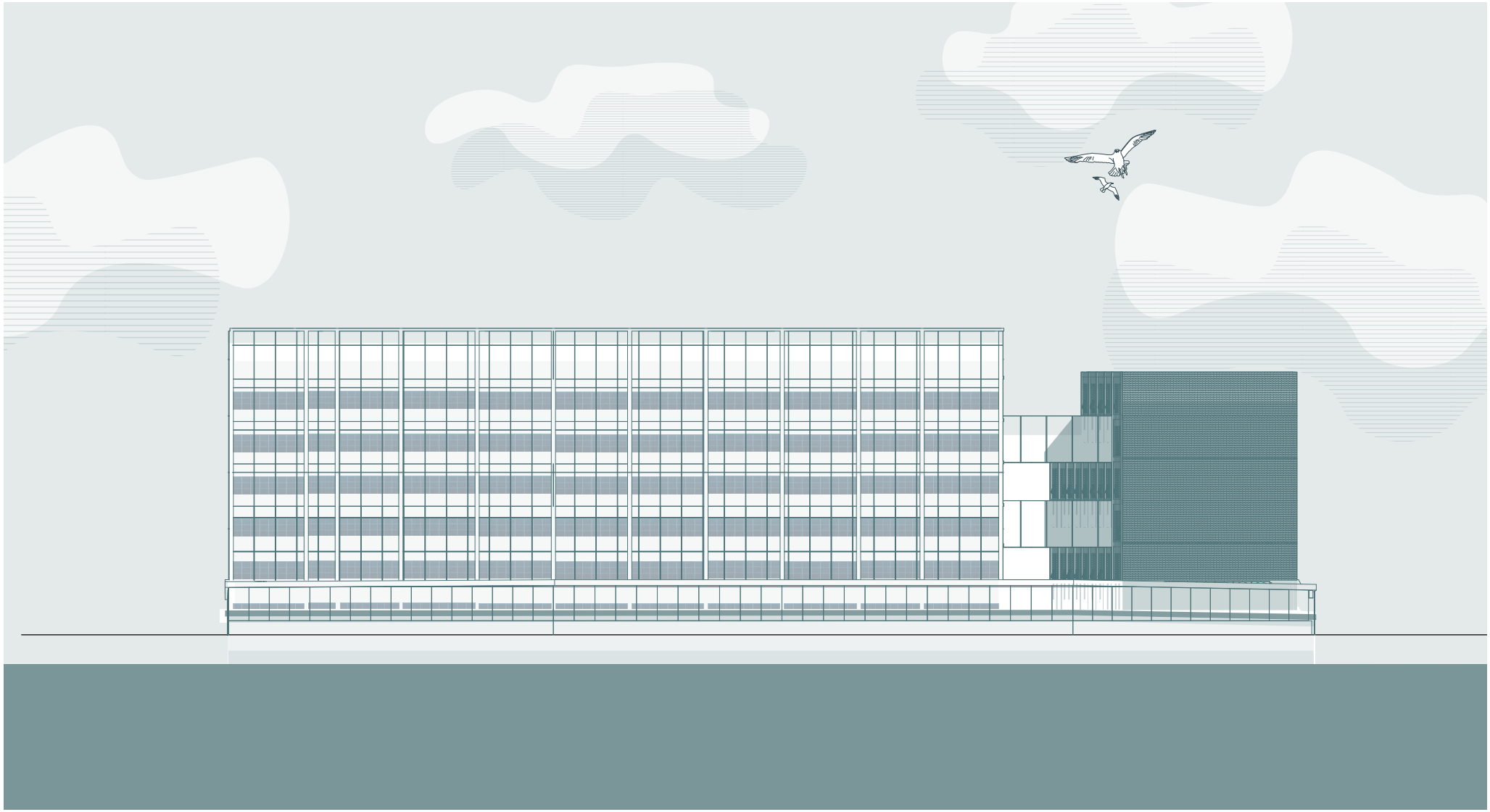
EXTERIOR

north facade

0 2.5 5 10m

EXTERIOR

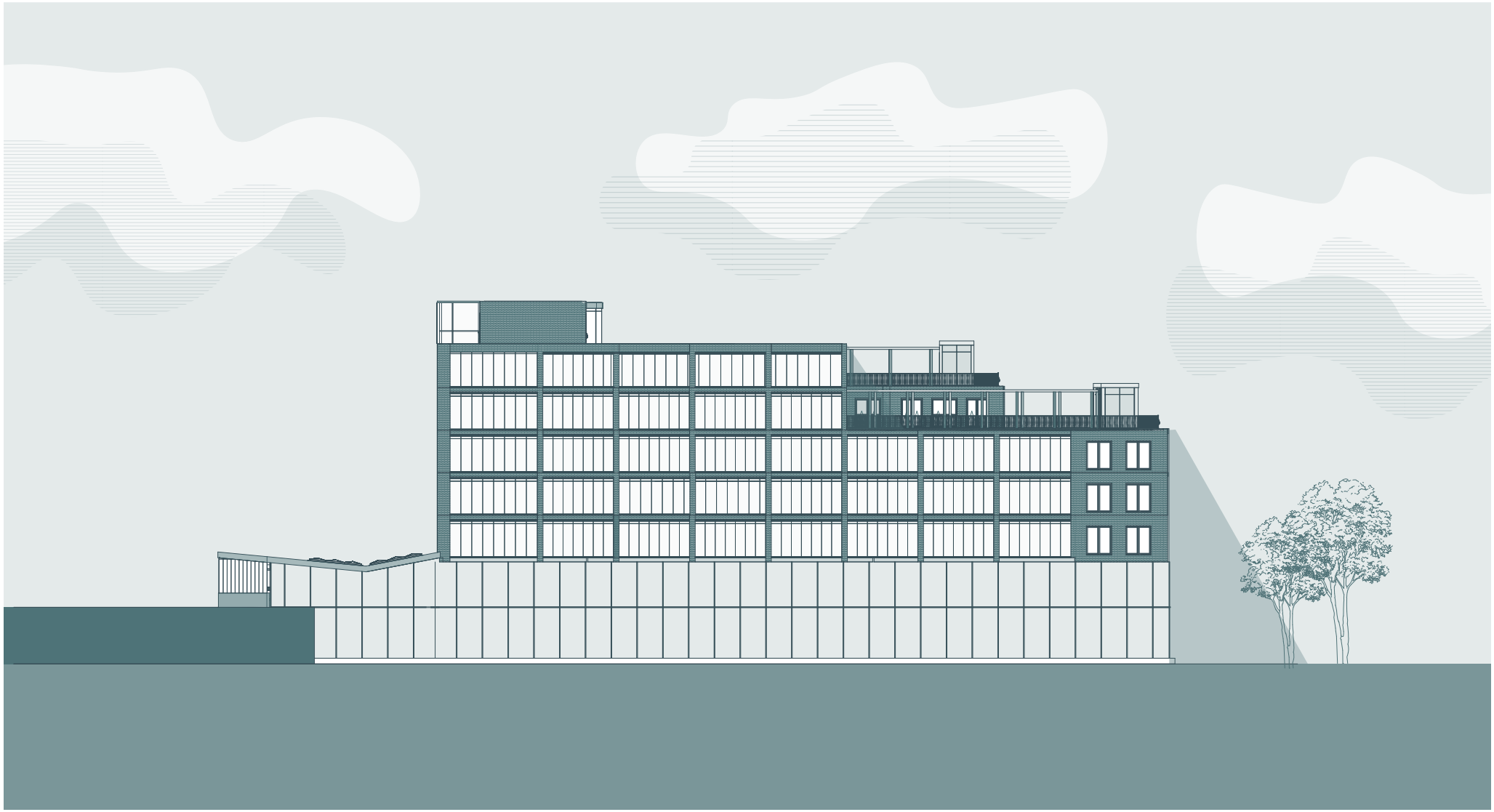
south facade



0 2.5 5 10m

EXTERIOR

east facade



0 2.5 5 10m

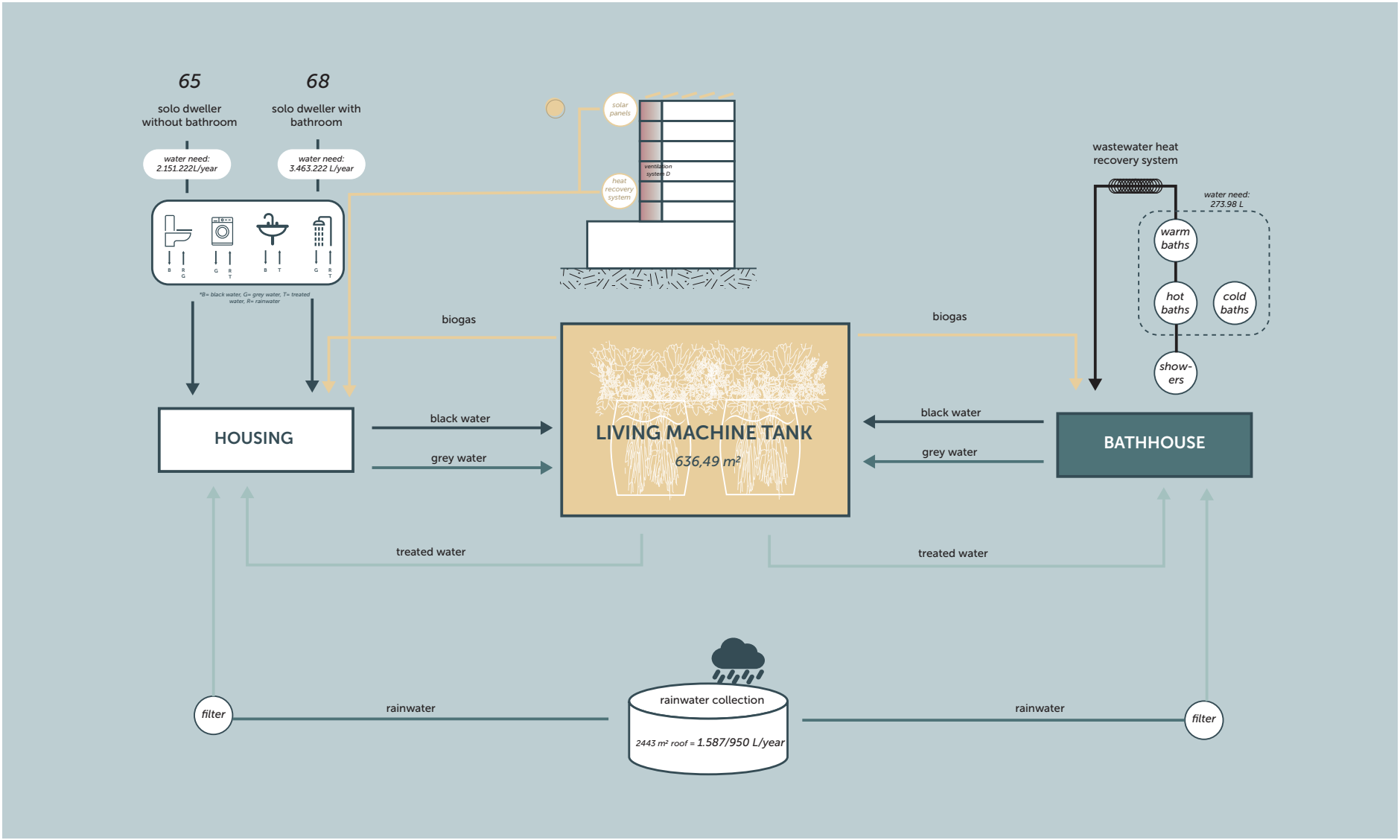
EXTERIOR

west facade

0 2.5 5 10m

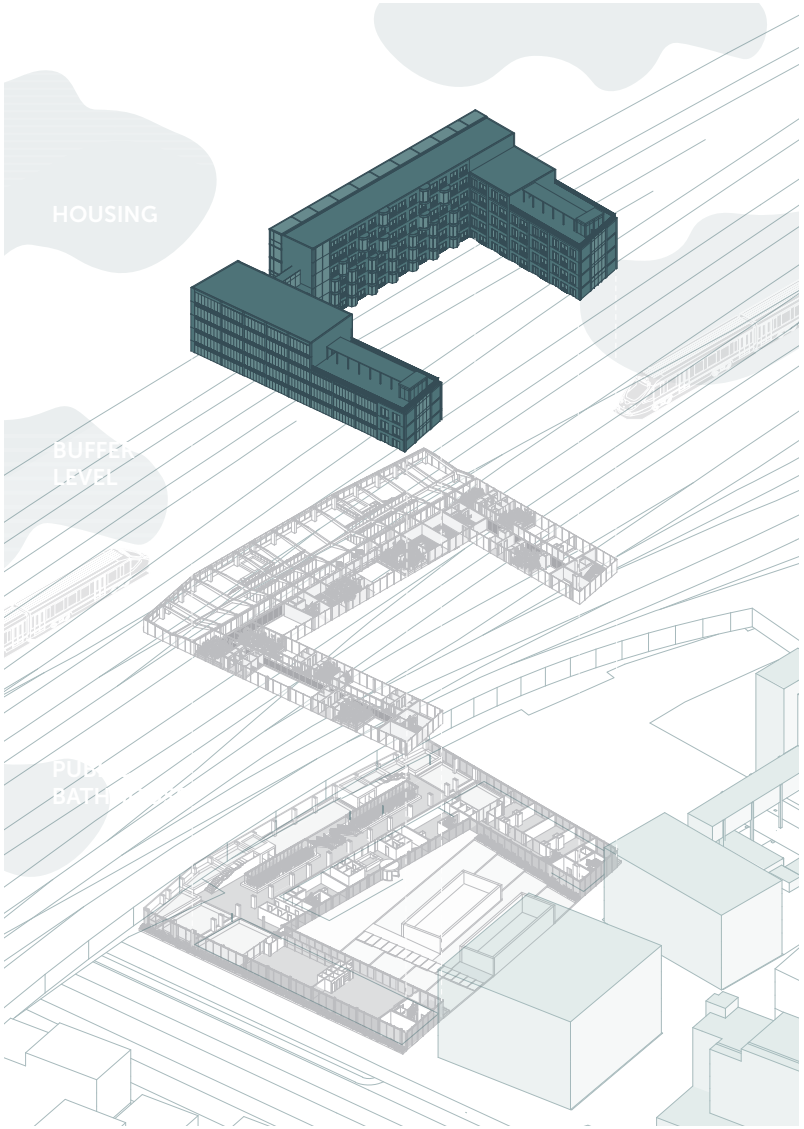
TECHNICAL SYMBIOSIS

water and energy concept



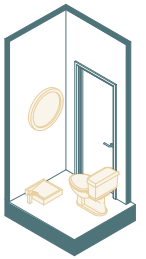
HOUSING

products/drawings

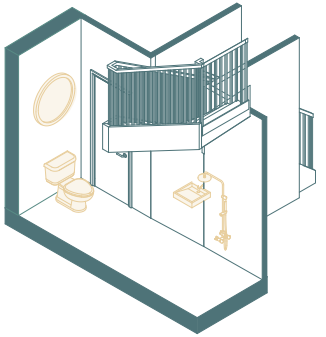


BATHROOM

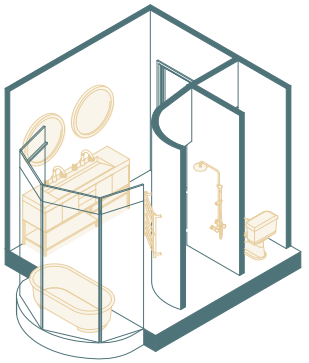
typologies



1. no bathroom



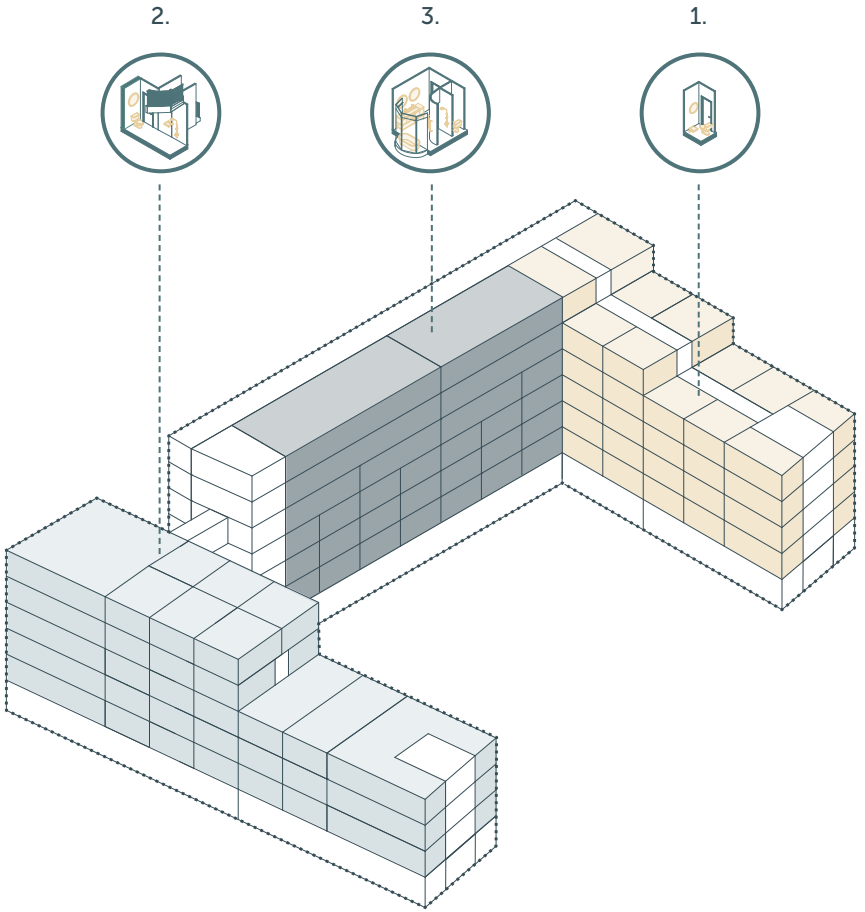
2. limited bathroom



3. extravagent bathoom

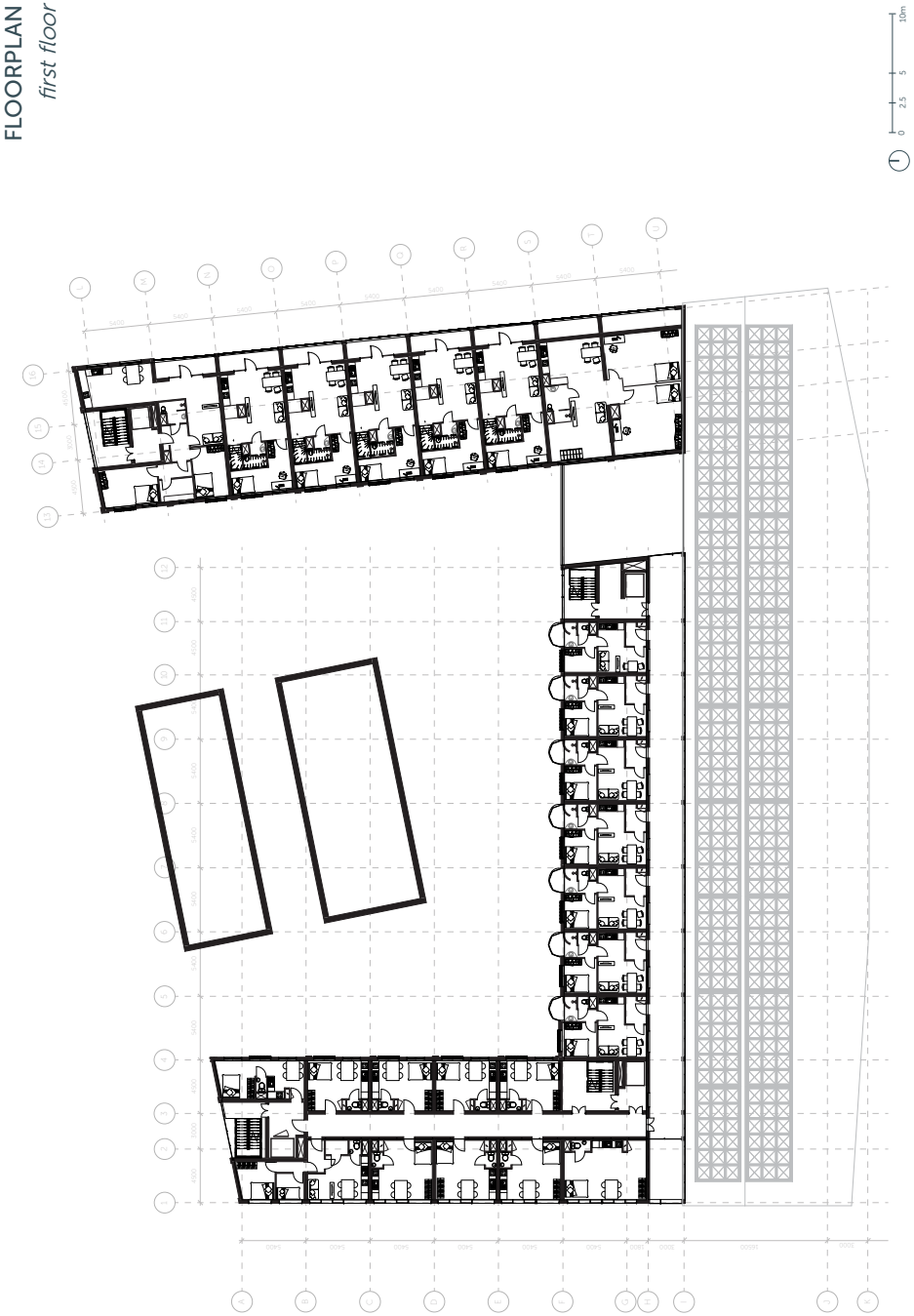
BATHROOM TYPOLOGIES

building diagram

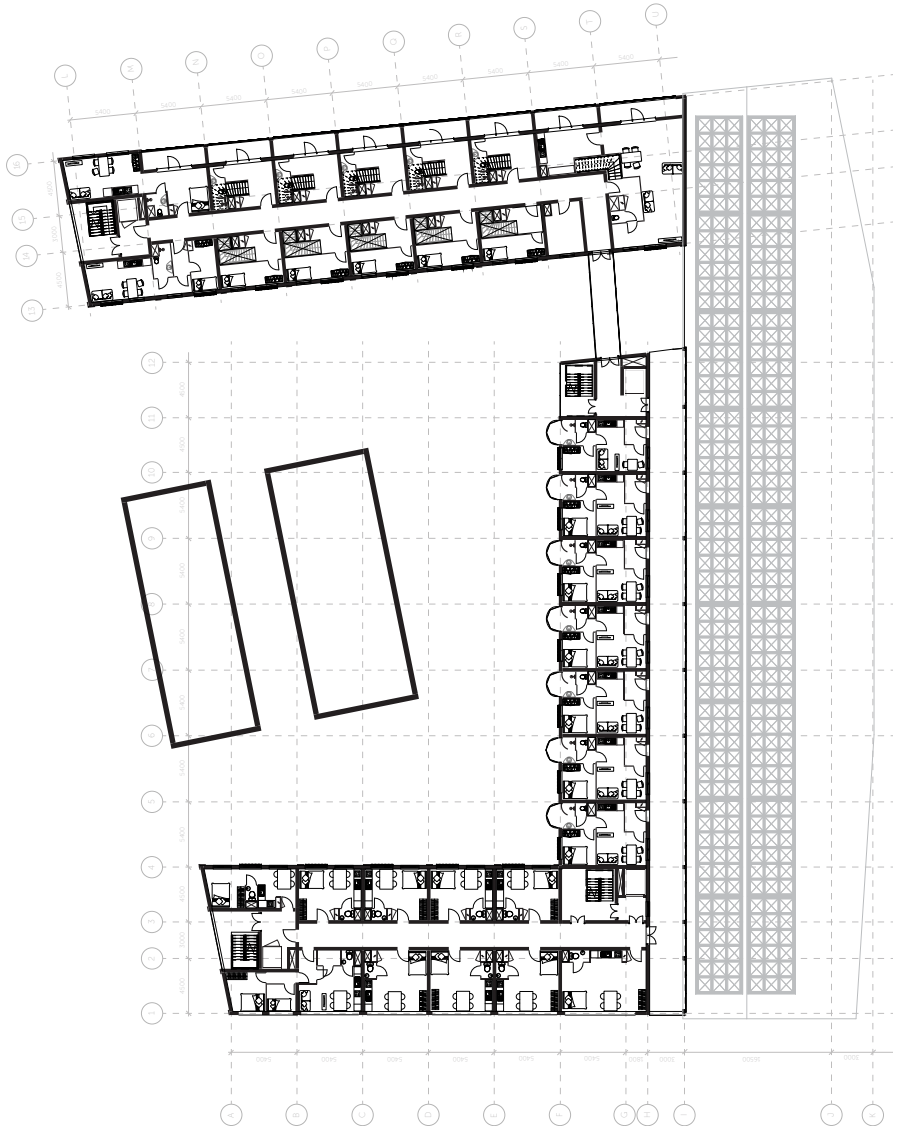


FLOORPLAN

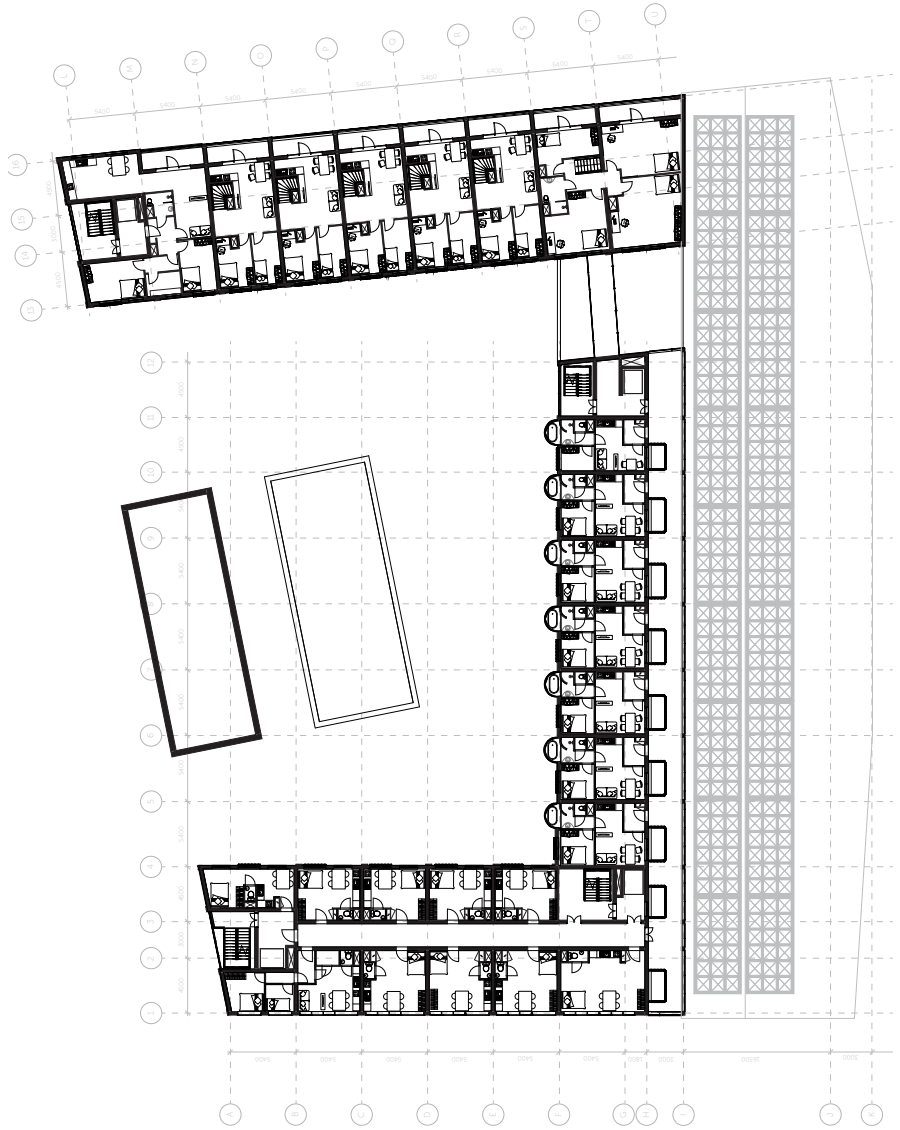
first floor



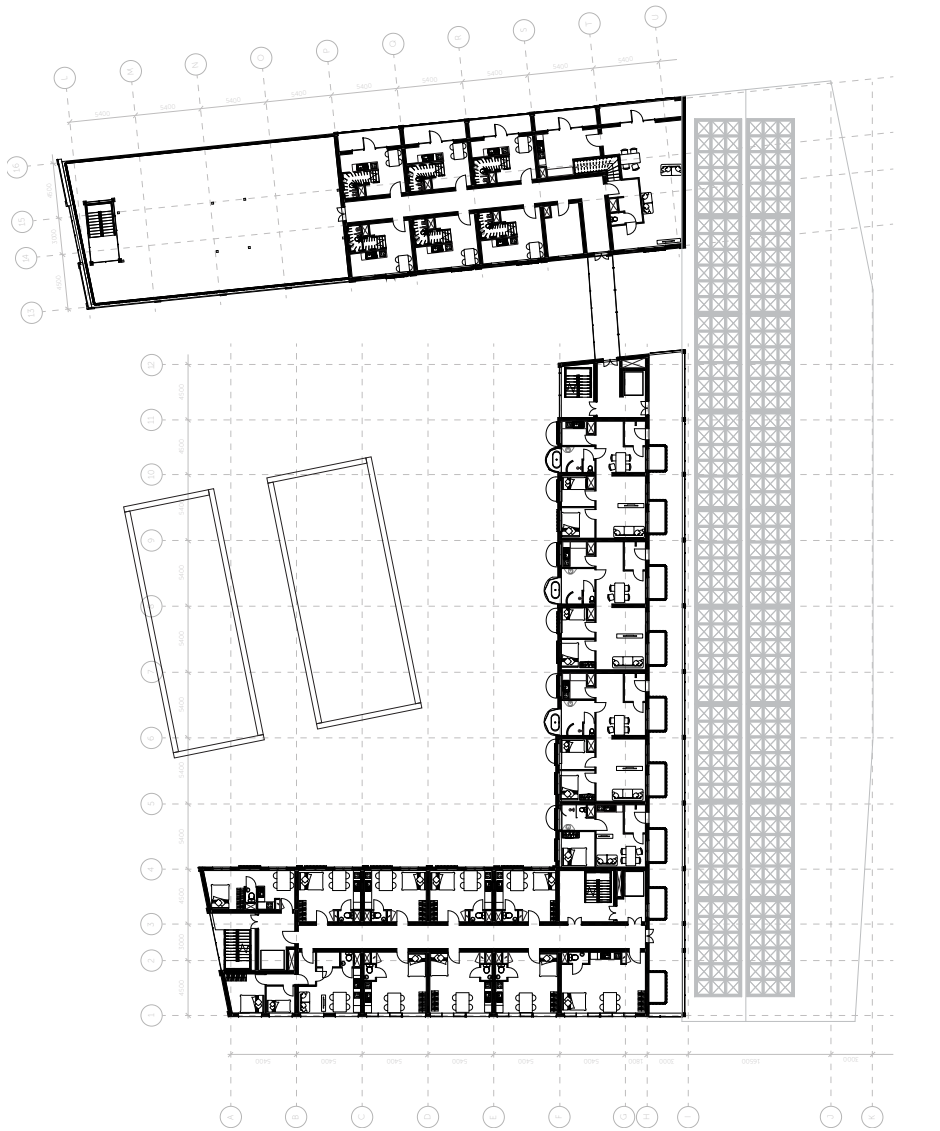
FLOORPLAN
second floor



FLOORPLAN
third floor

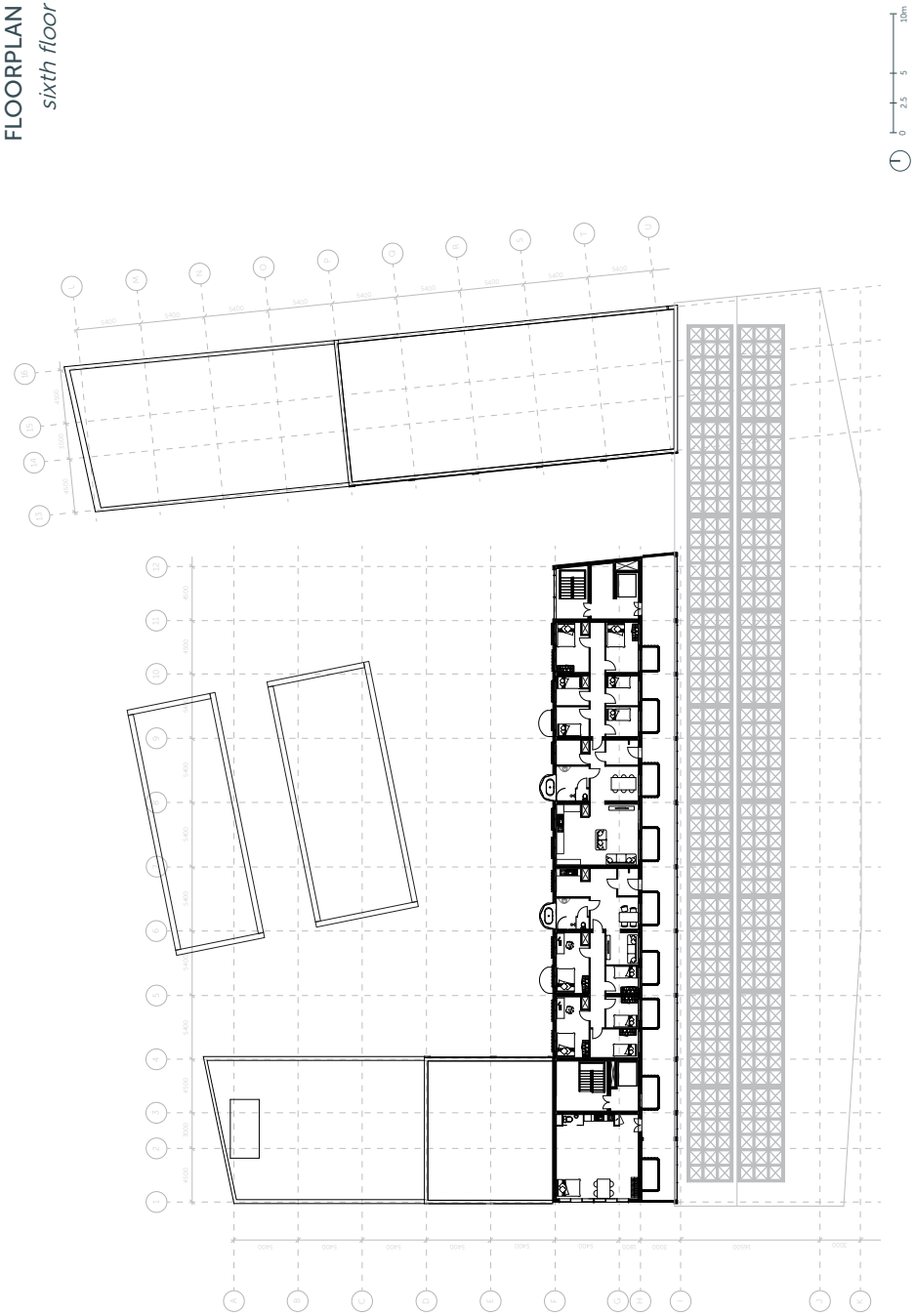


FLOORPLAN
fourth floor

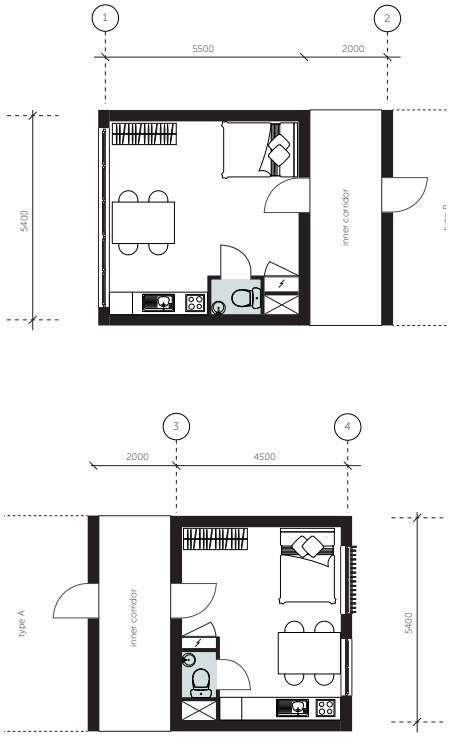


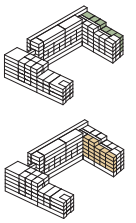
FLOORPLAN
fifth floor

FLOORPLAN
sixth floor



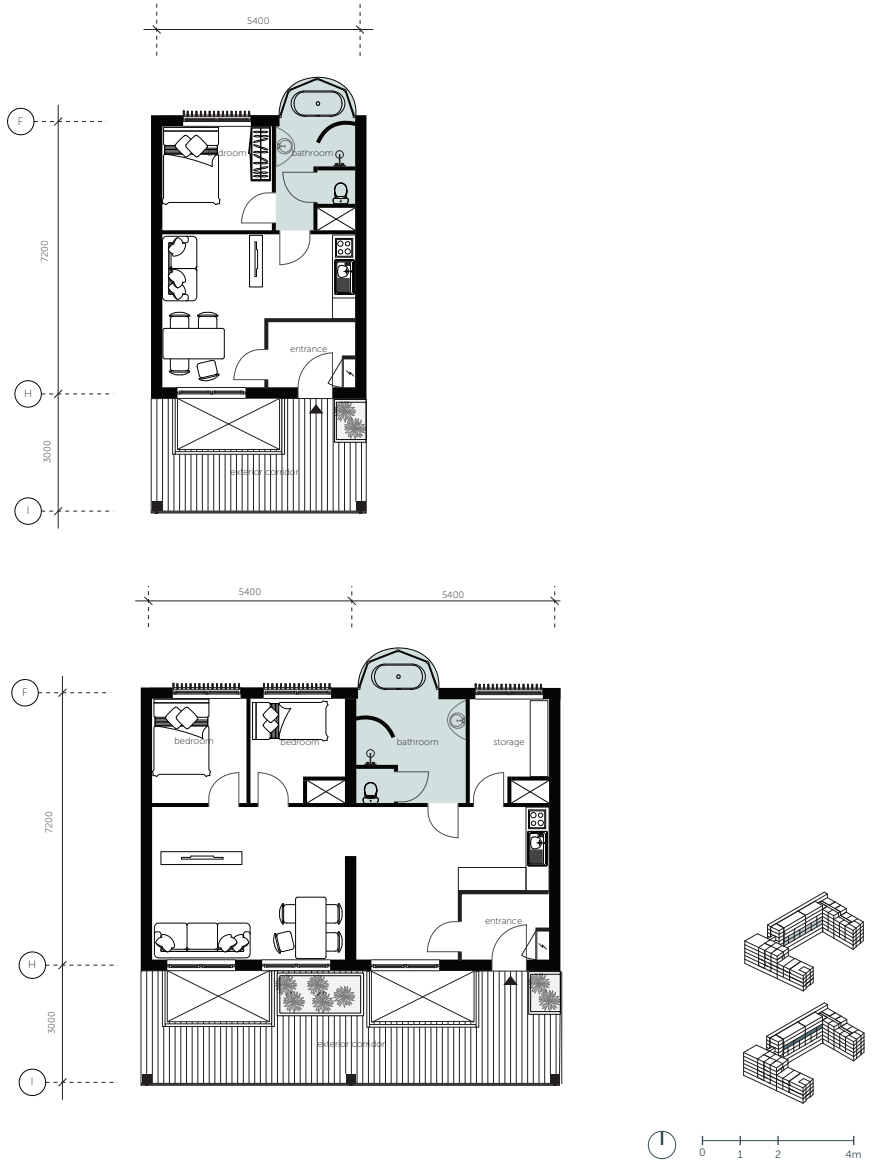
TYPOLOGIES
type A (top) - type B (bottom)





TYPOLOGIES

type C (top) - type D (bottom)

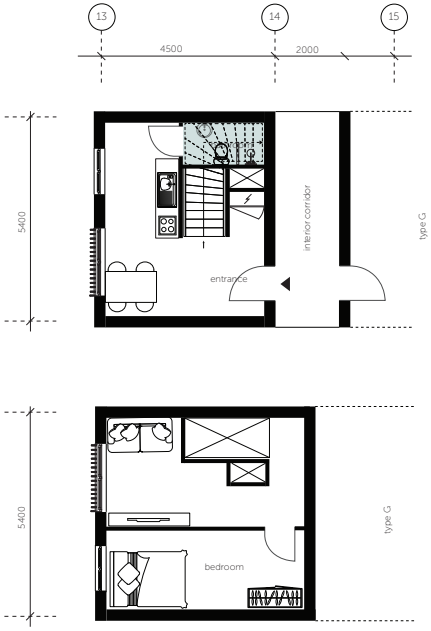


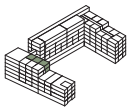
TYPOLOGIES

type E1 (top) - type E2 (bottom)

TYPOLOGIES
type F (duplex)

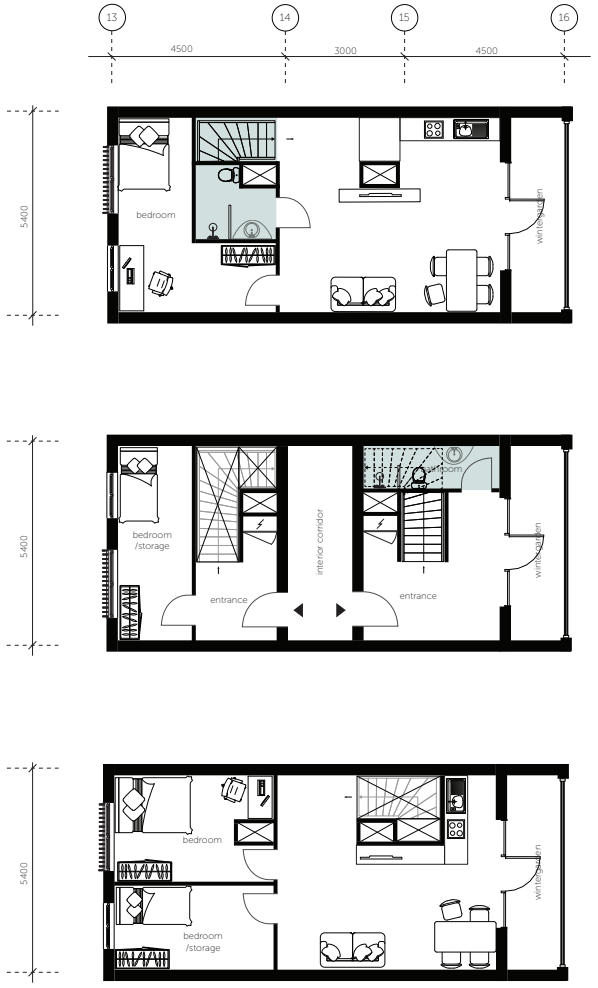
TYPOLOGIES
type H (duplex)

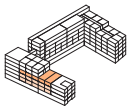




TYPOLOGIES

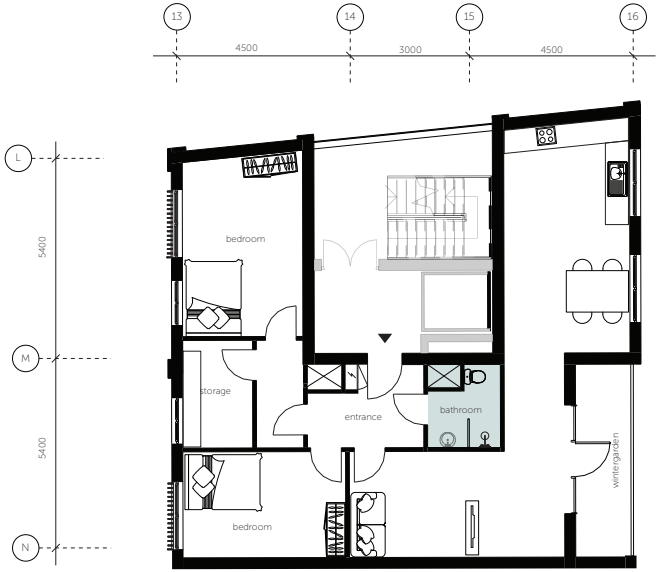
type I (top) - type J (bottom) (duplex)

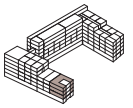




TYPOLOGIES

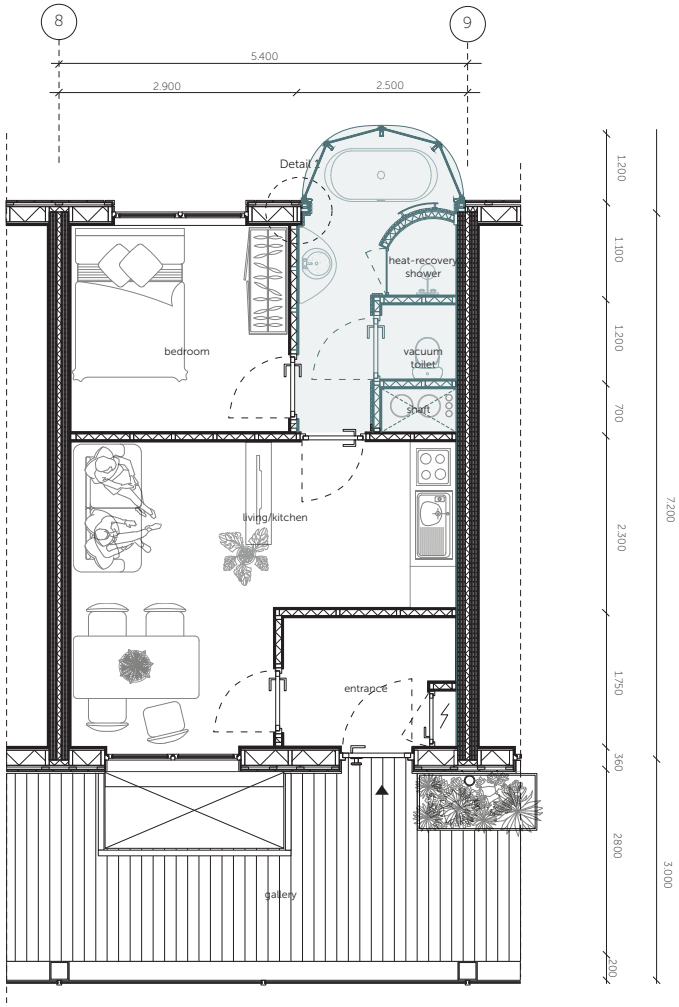
type K





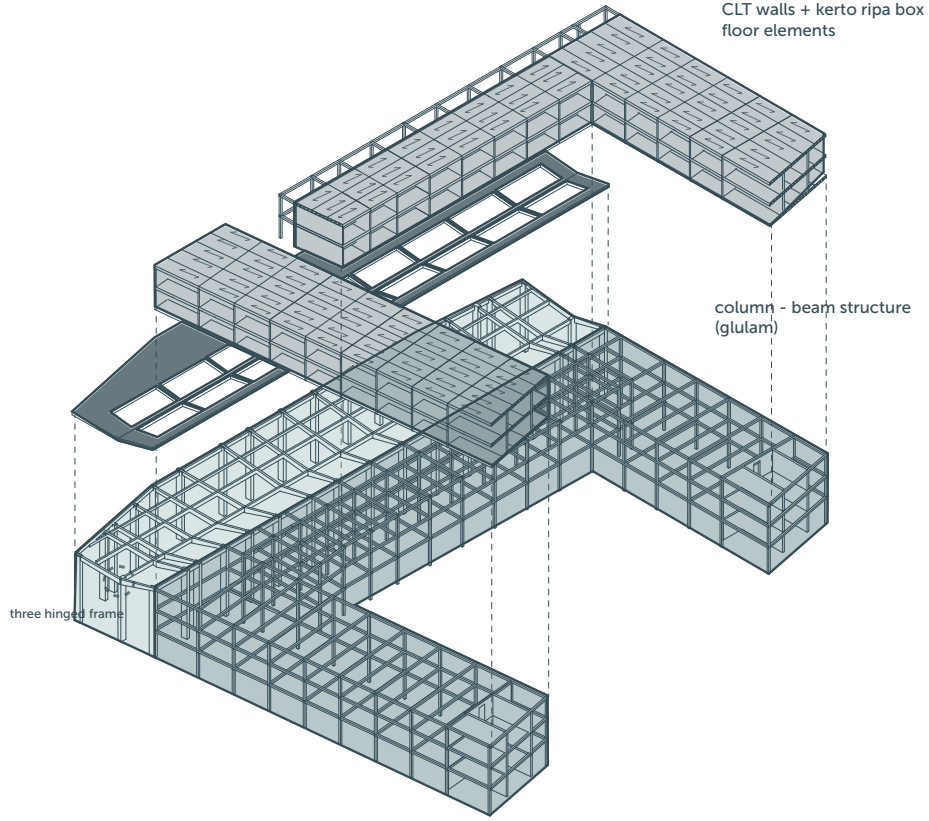
DWELLING FLOORPLAN

type C



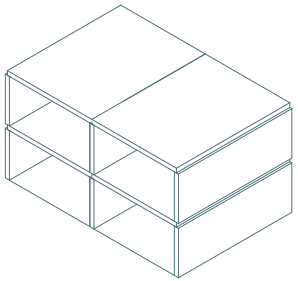
STRUCTURE

building diagram

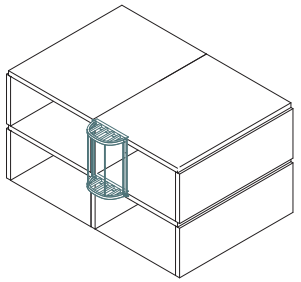


BATHROOM ASSEMBLY

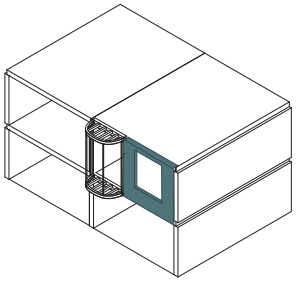
construction order



1. load bearing CLT walls + kerto ripa slab elements



2. prefab bathroom steel construction



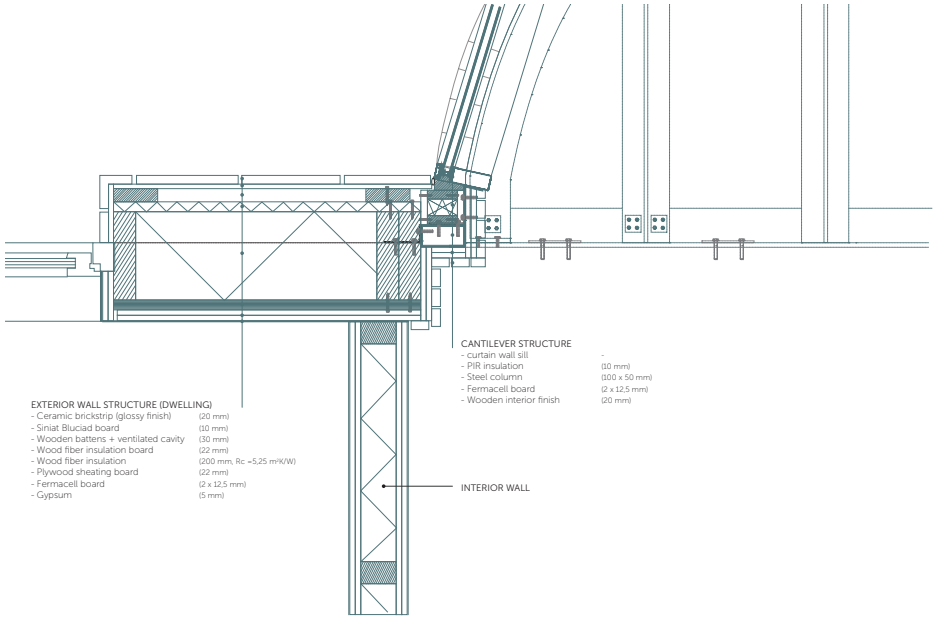
3. prefab facade panel attached to timber structure and steel bathroom construction

FACADE FRAGMENT

north facade

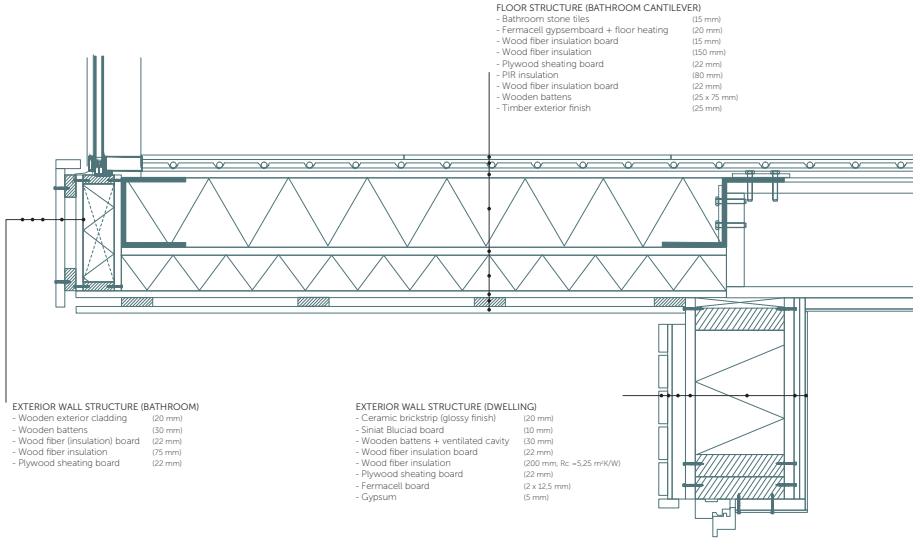
DETAIL 1

bathroom cantilever (hor.)



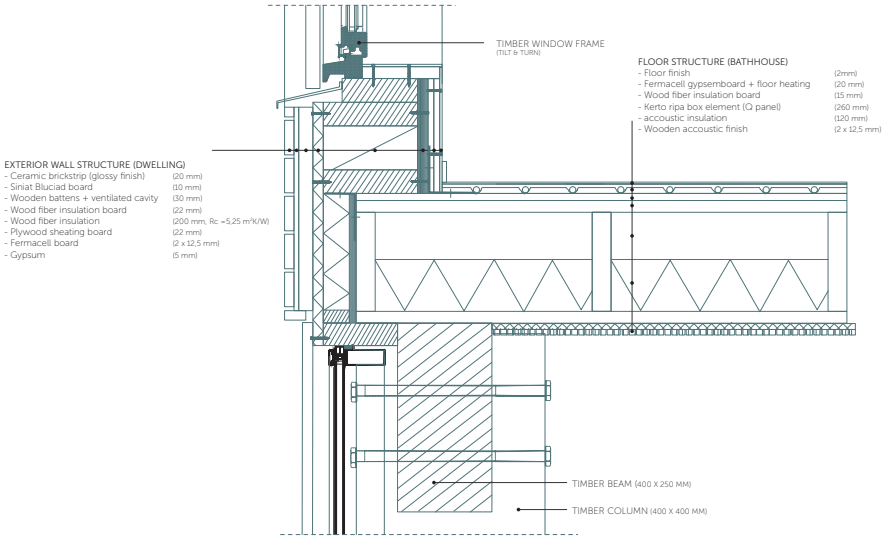
DETAIL 2

bathroom cantilever (ver.)



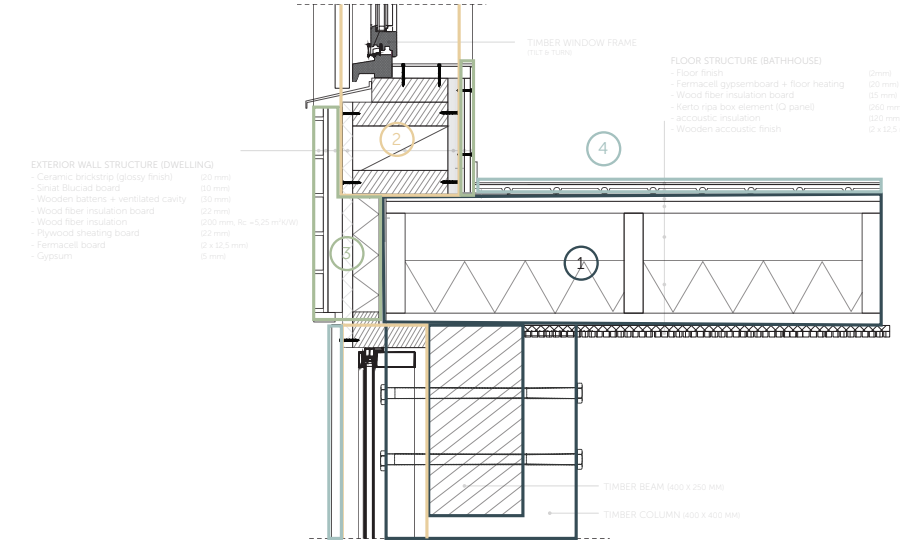
DETAIL 3

transition housing/bathhouse (ver.)



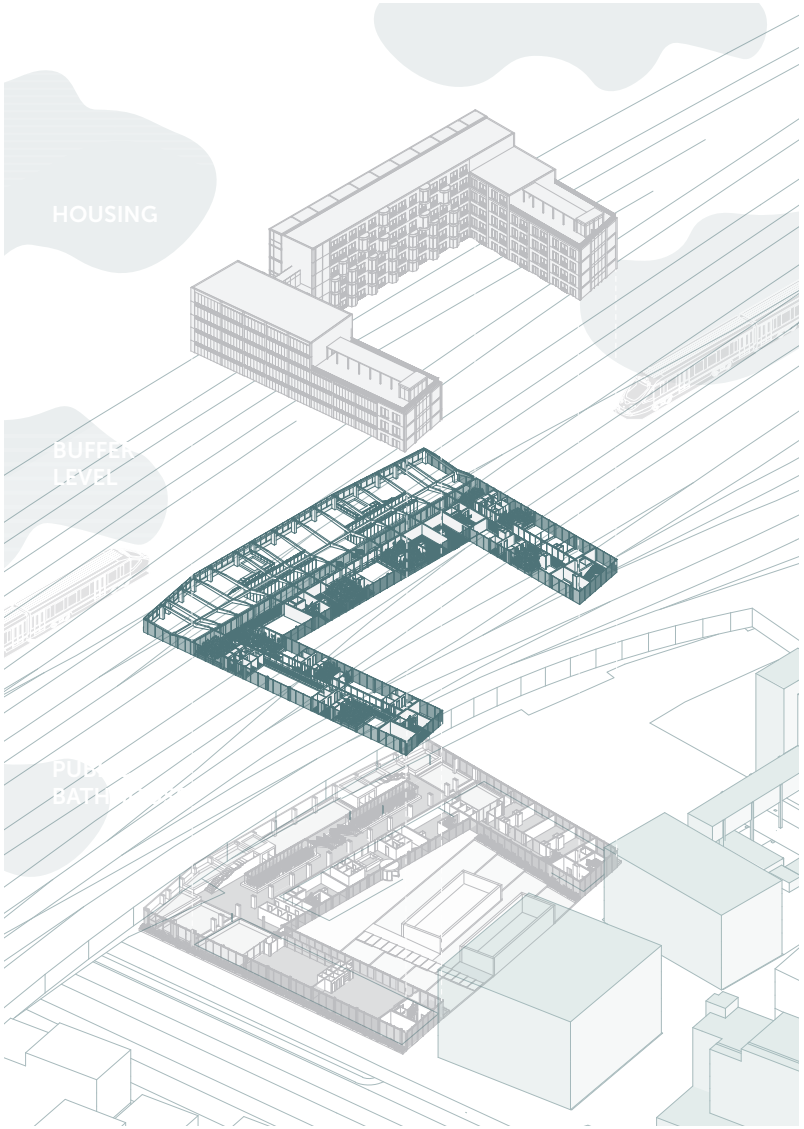
ORDER OF ASSEMBLY

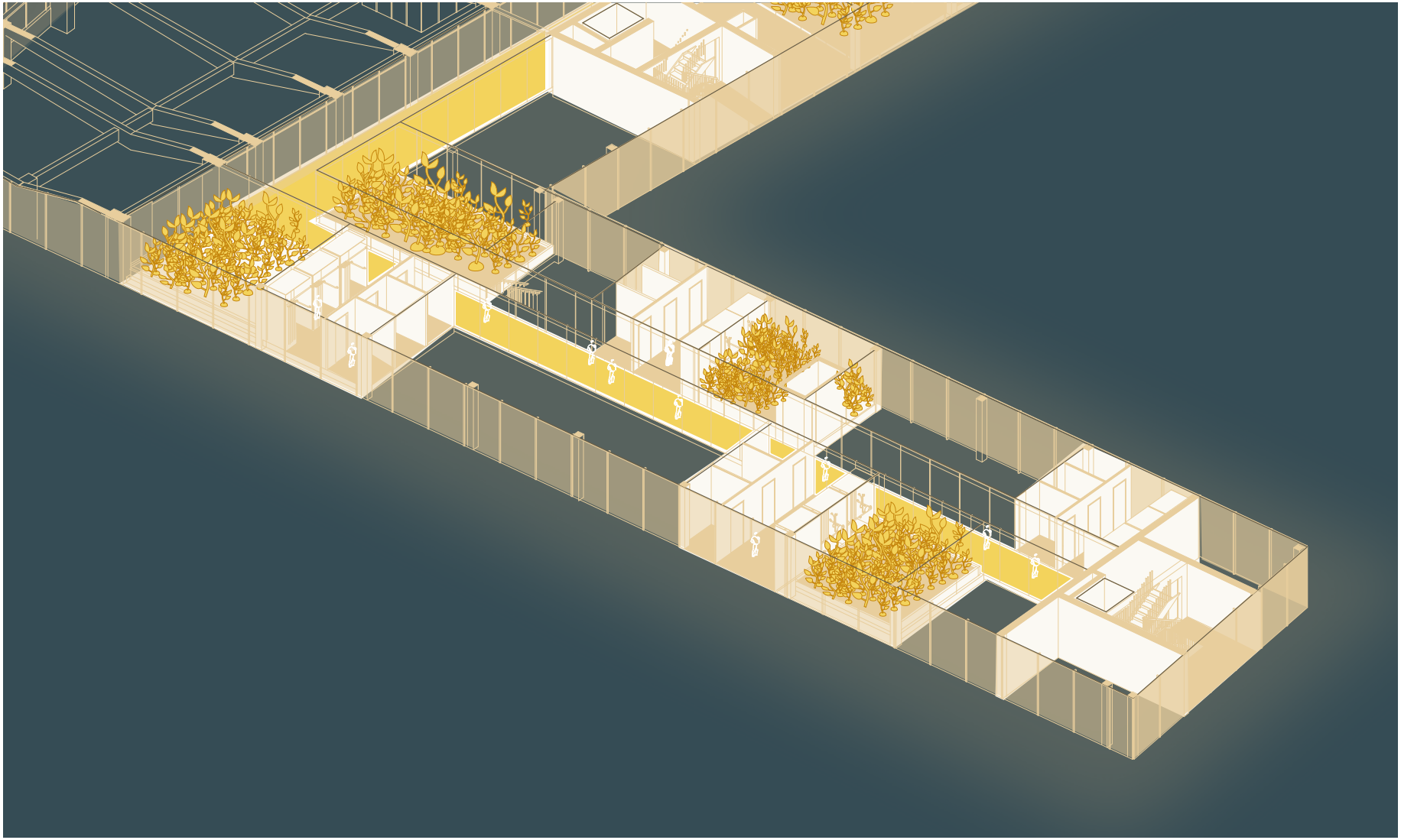
detail 3



BUFFERZONE

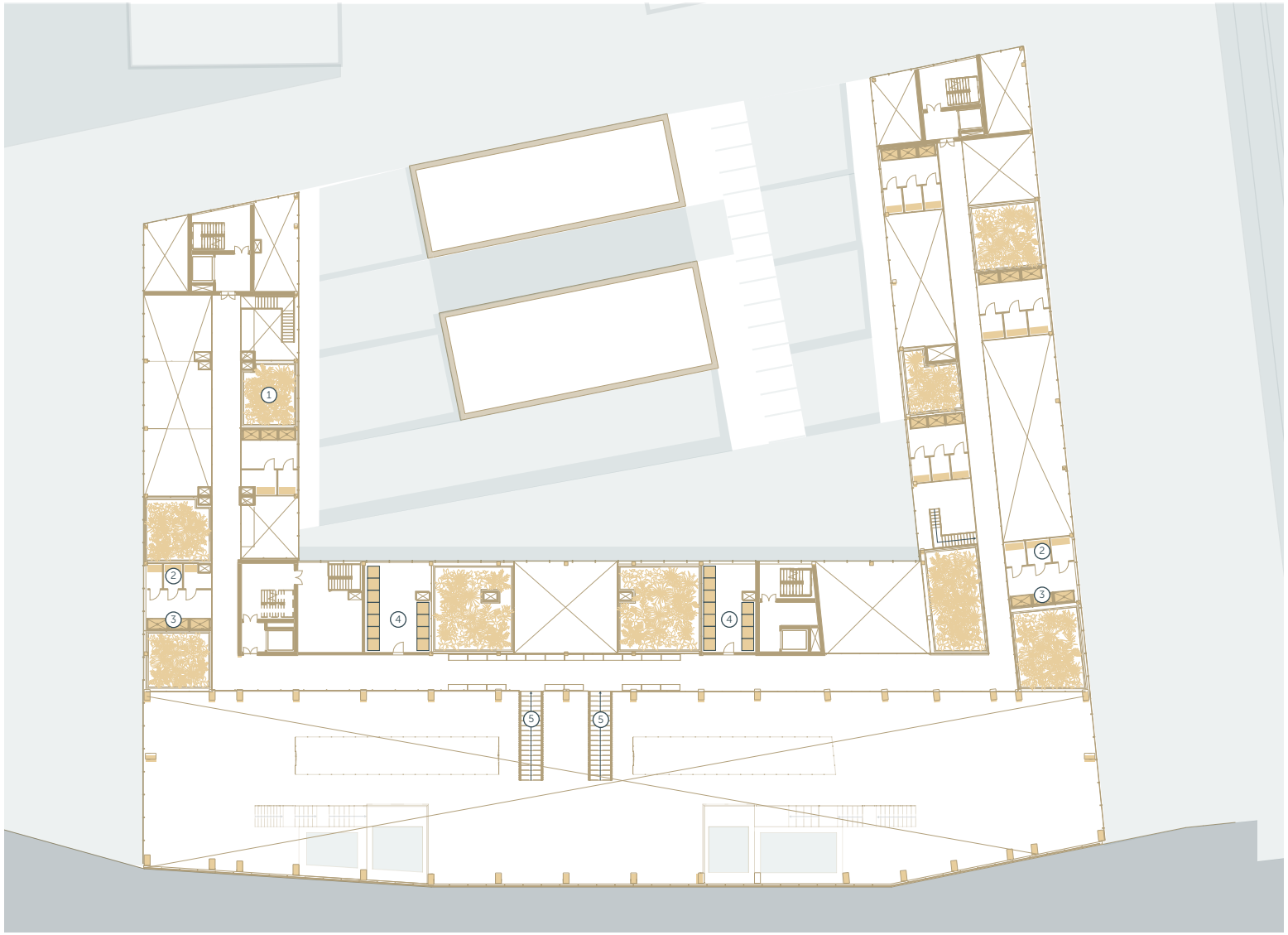
products/drawings





FLOORPLAN

bufferzone (lvl 0.5)

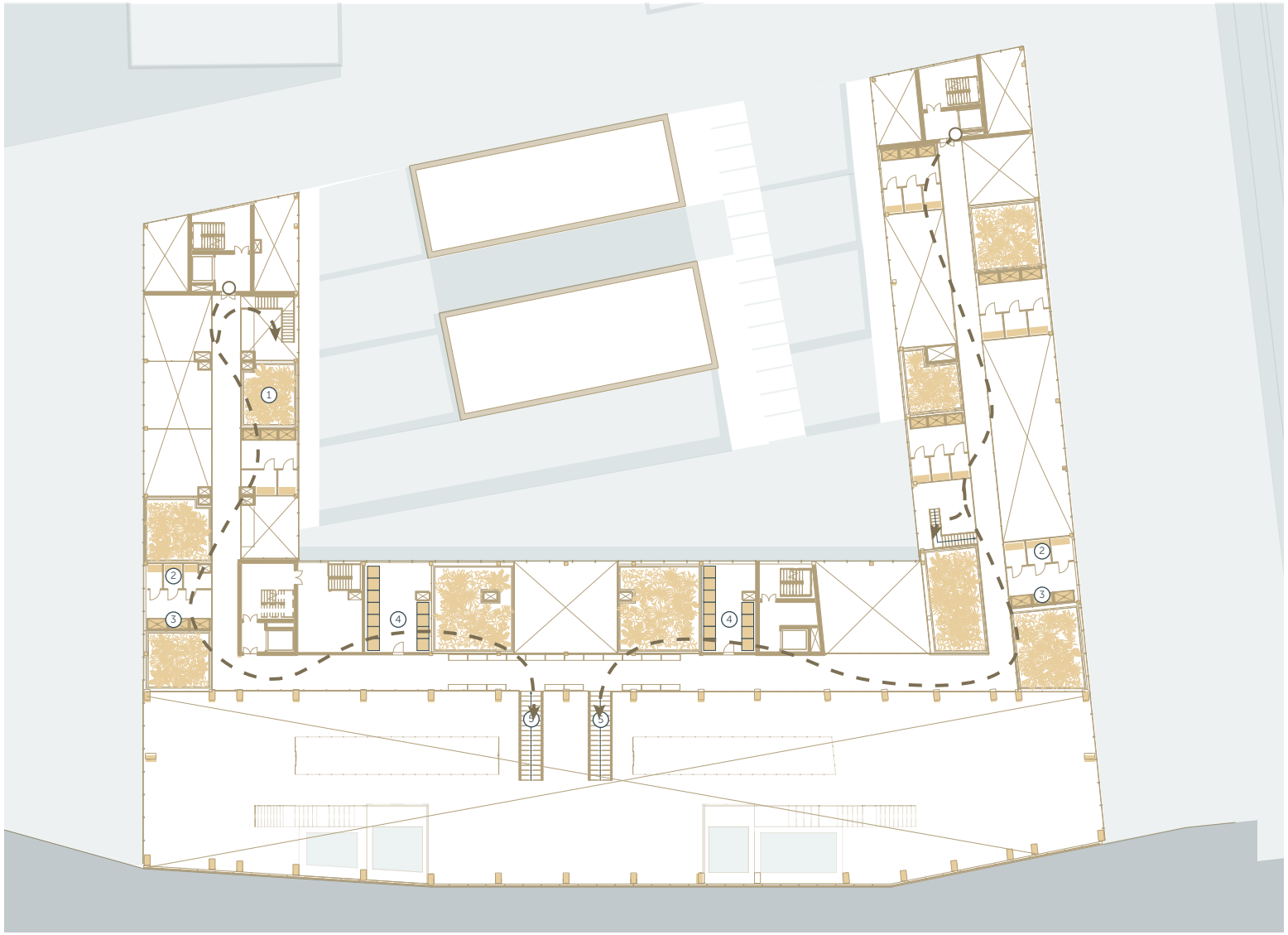


1. living machine tanks
2. private changing room
3. private showers
4. laundry room
5. staircase to bathhouse

0 2.5 5 10m

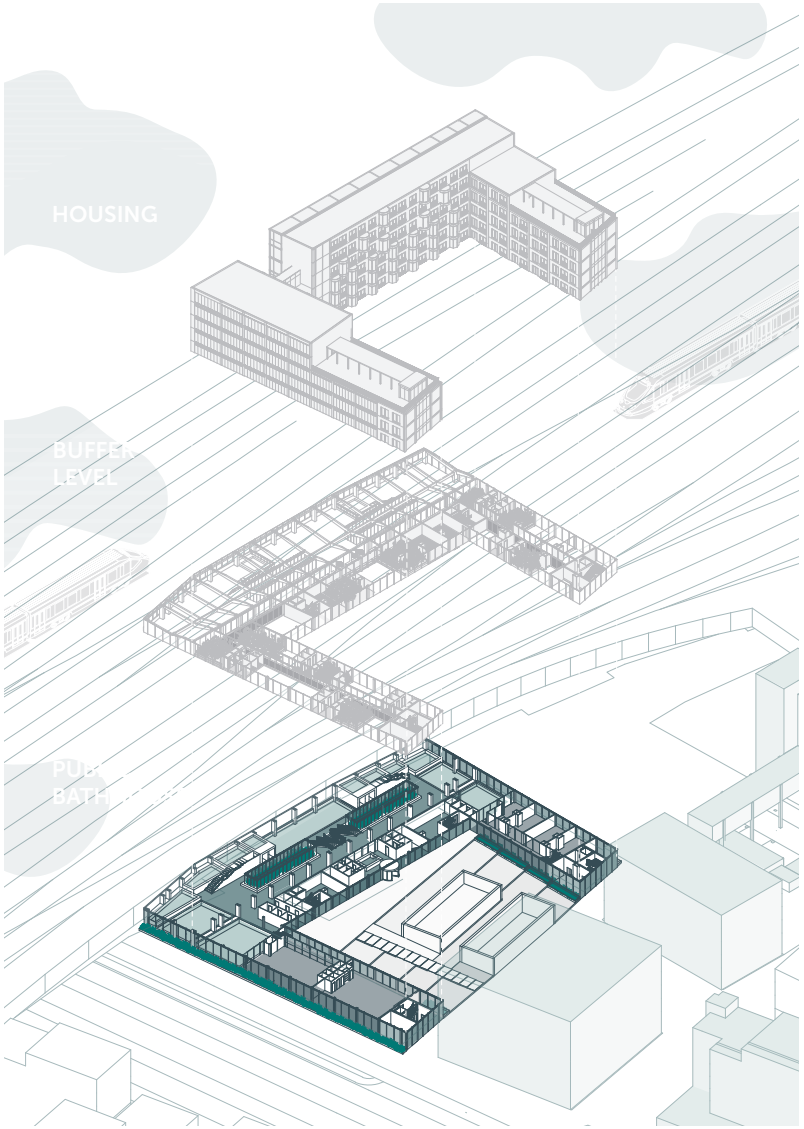
FLOORPLAN

bufferzone (routing)



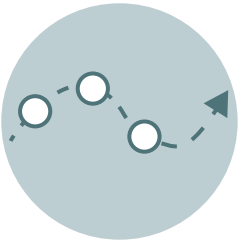
BATHHOUSE

products/drawings



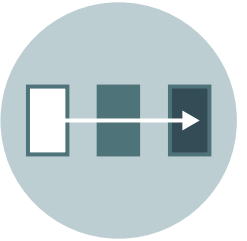
DESIGN PRINCINPLES

through research findings



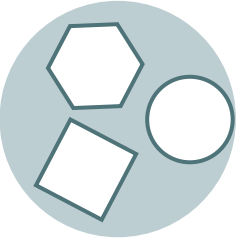
ROUTING

clear routing through bathhouse



SEQUENCE

from warm-hot-cold baths

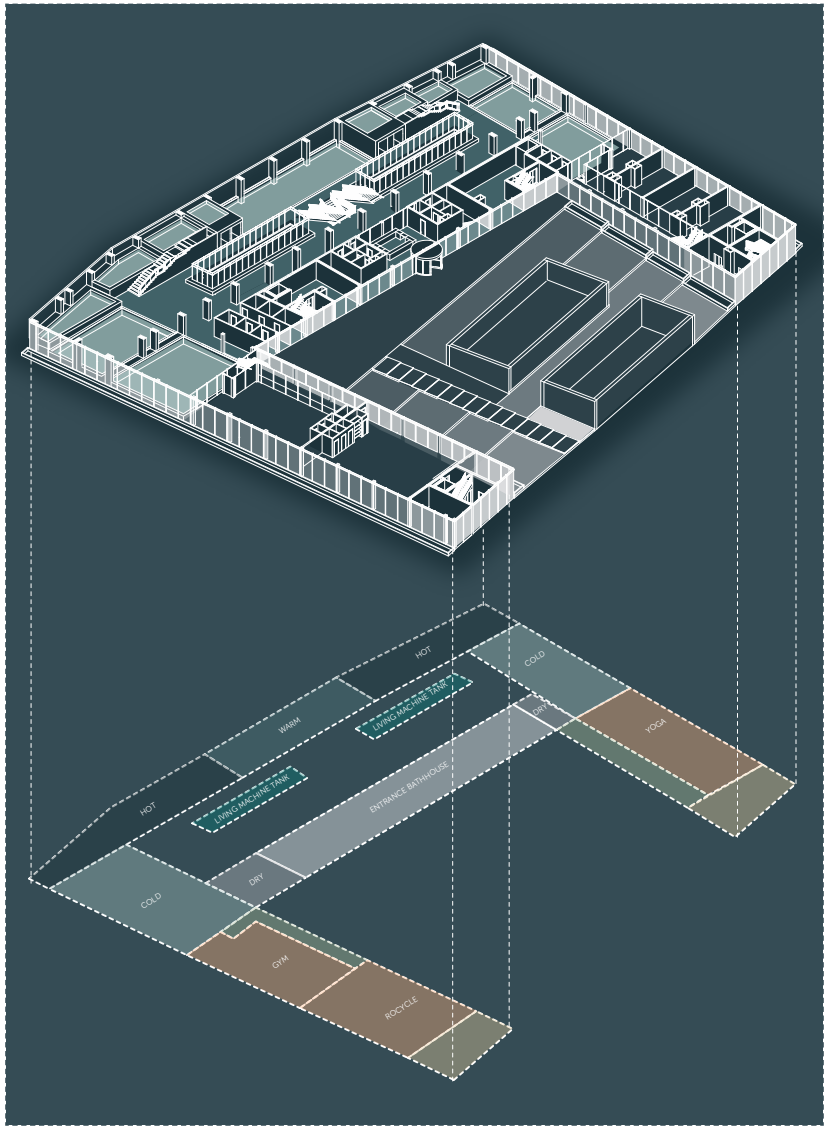


HYBRID PROGRAM

to attract broader audience

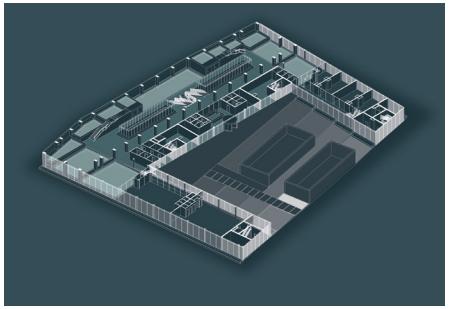
PROGRAM

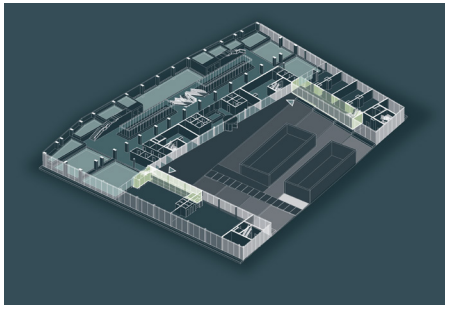
blueprint



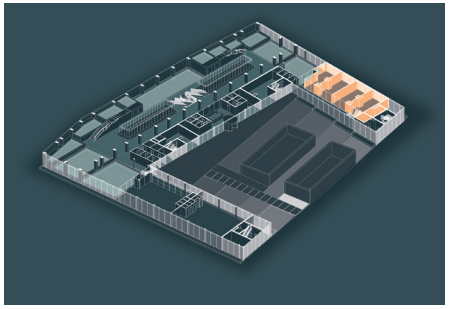
PROGRAM

sequence of active program

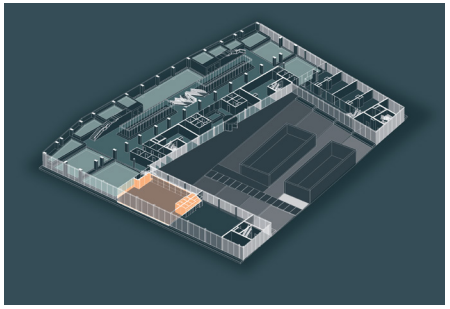




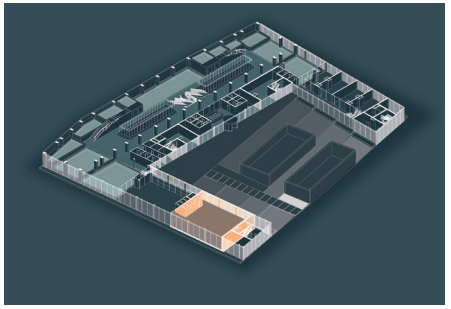
entrance active program



yoga studio's



gym facility



rocycling facility

FLOORPLAN

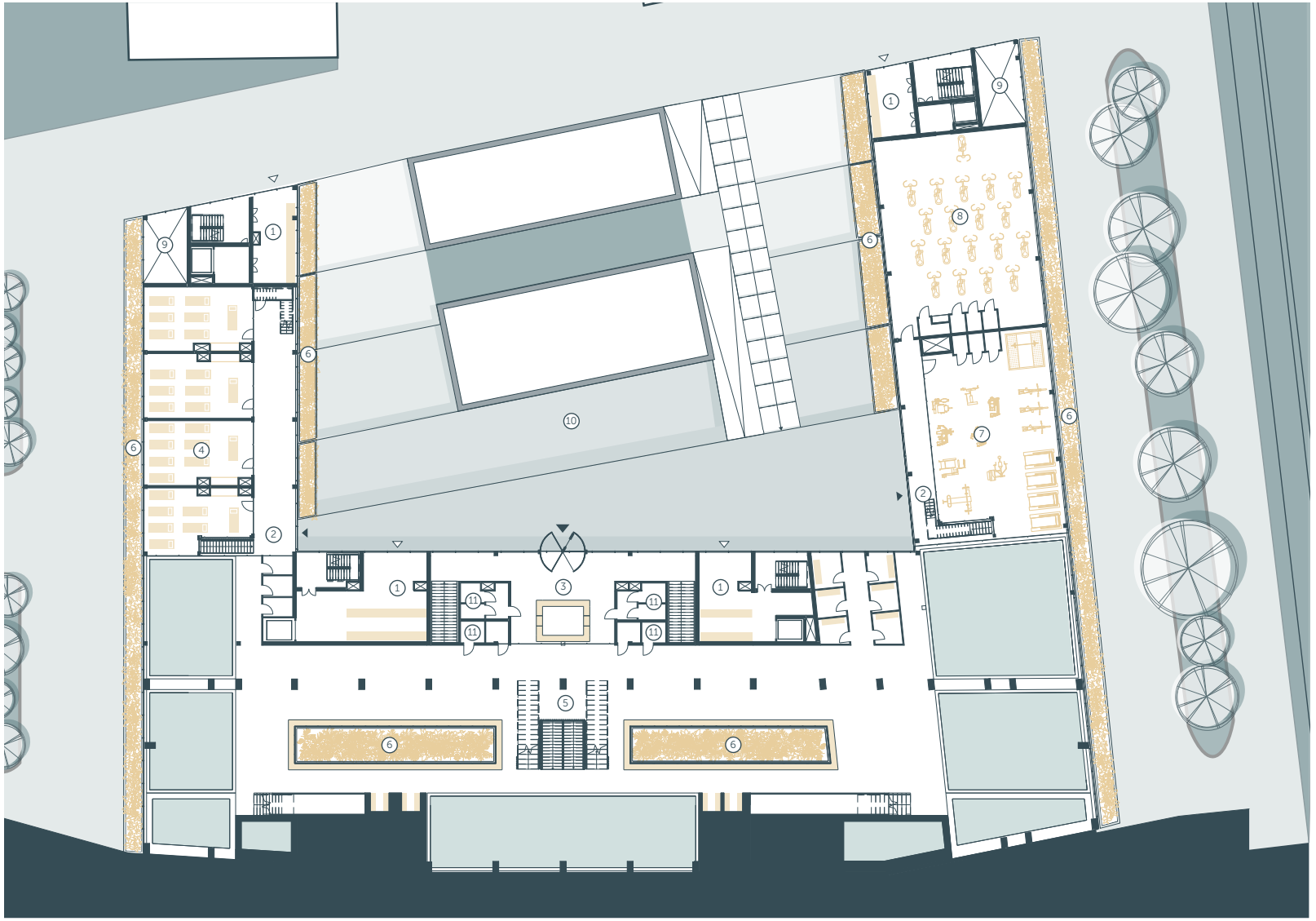
basement

1. bike storage
2. waste collection
3. technical room (housing)
4. showers + changing room (active program)
5. toilet
6. communal showers + changing room (bathhouse)
7. private showers + changing room (bathhouse)
8. barefoot corridor
9. stairscase to bathhouse
10. technical room (bathhouse)

0 2.5 5 10m

FLOORPLAN

bathhouse (ground floor)

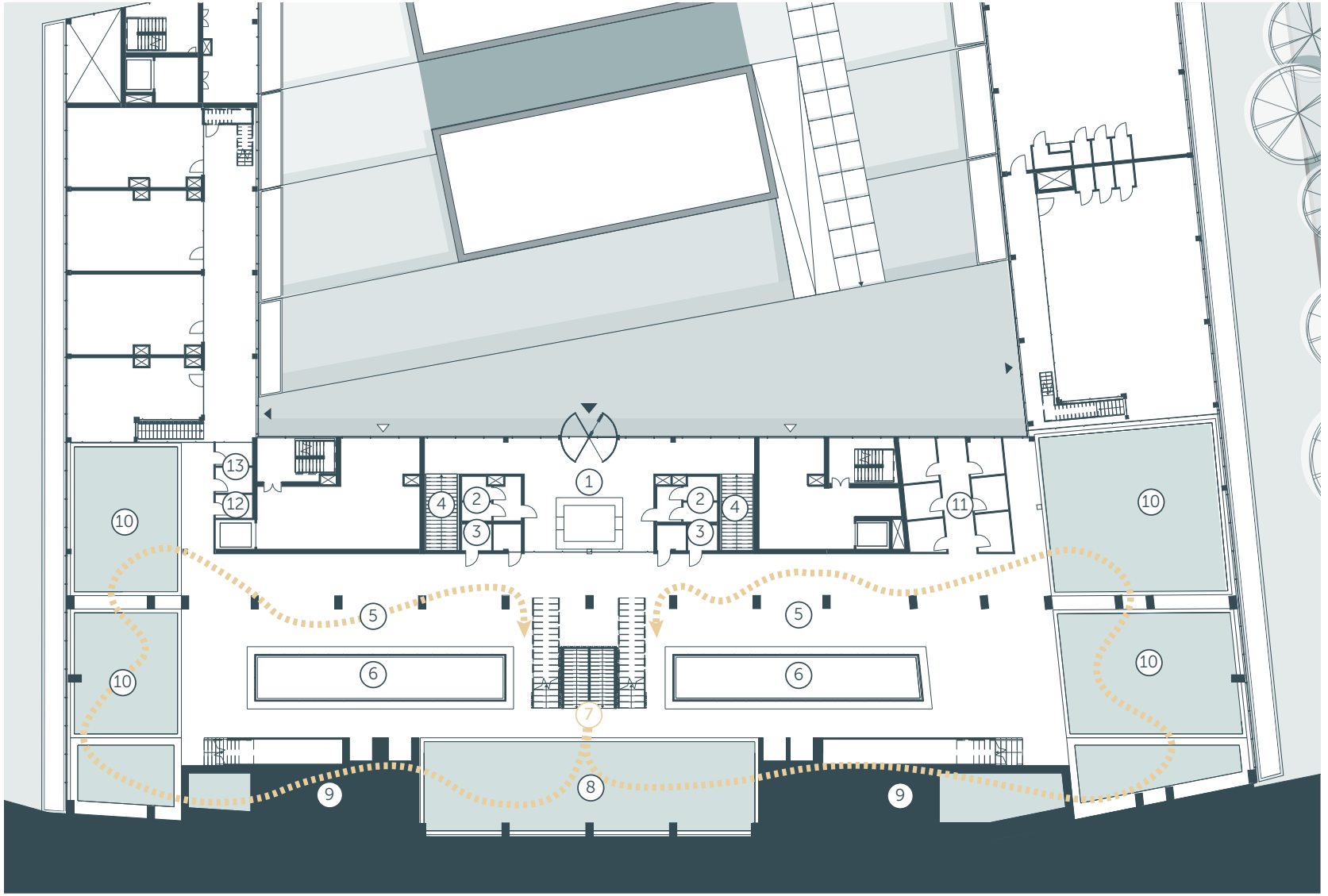


1. entrance hall (housing
2. entrance (active program)
3. entrance (bathhouse)
4. yoga studio's
5. bathhouse
6. living machine tanks
7. gym
8. rocycle facility
9. ramp to bike storage
10. outdoor public seating space
11. toilet

0 2.5 5 10m

BATHHOUSE

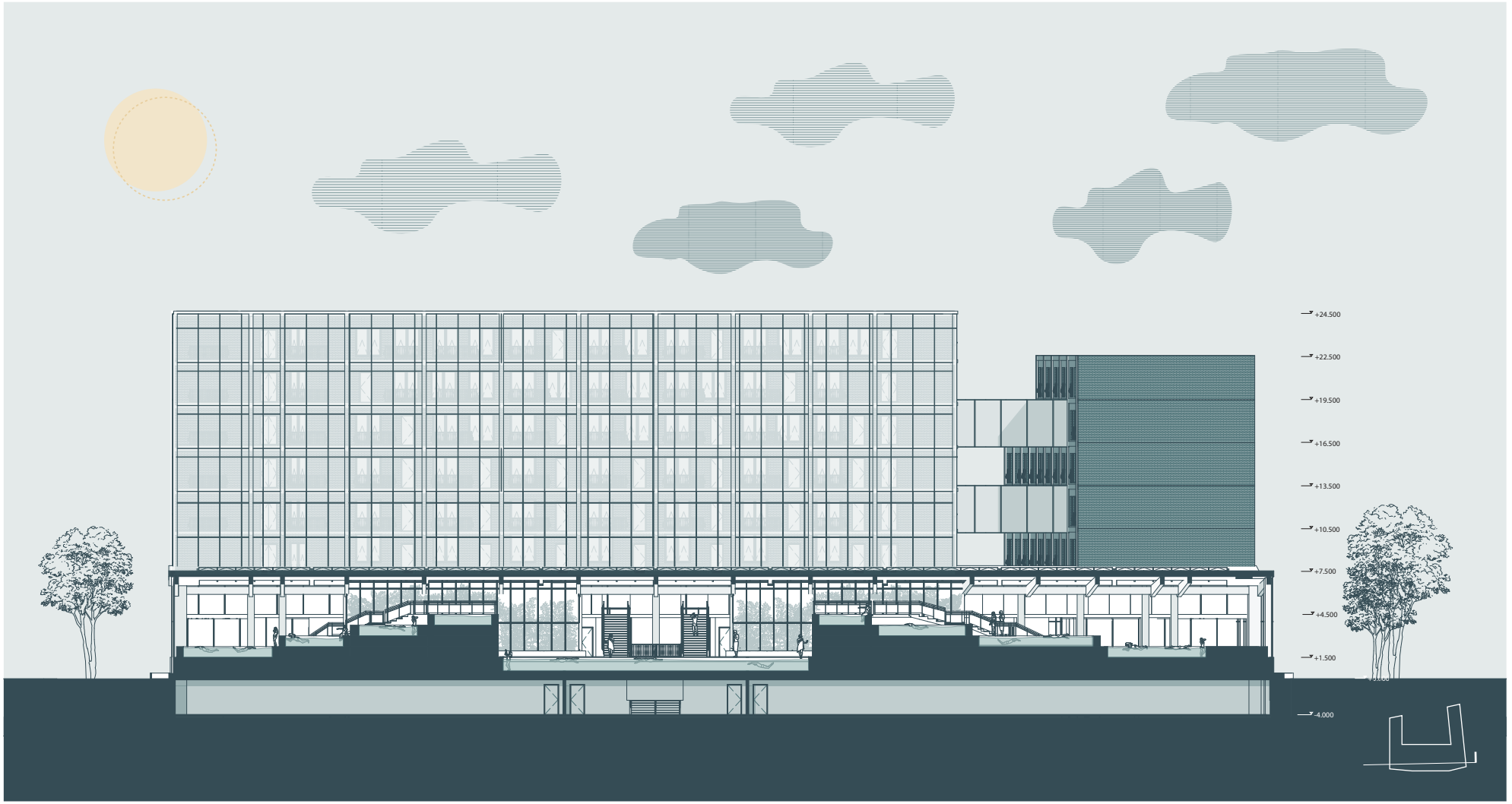
routing



1. entrance hall
2. toilet entrance hall
3. toilet bathhouse
4. staircase to changing rooms
5. circulation space
6. living machine tanks
7. point of arrival (visitor + dweller)
8. warm bath
9. hot bath
10. cold bath
11. treatment rooms
12. EHBO
13. instructors room

SECTION A-A

bathhouse



0 2.5 5 10m

SECTION B-B

bathhouse - bufferzone - housing

0 2.5 5 10m

SECTION C-C

housing - buffezone (voids)

IMPRESSION

building envelope + landscape

IMPRESSION

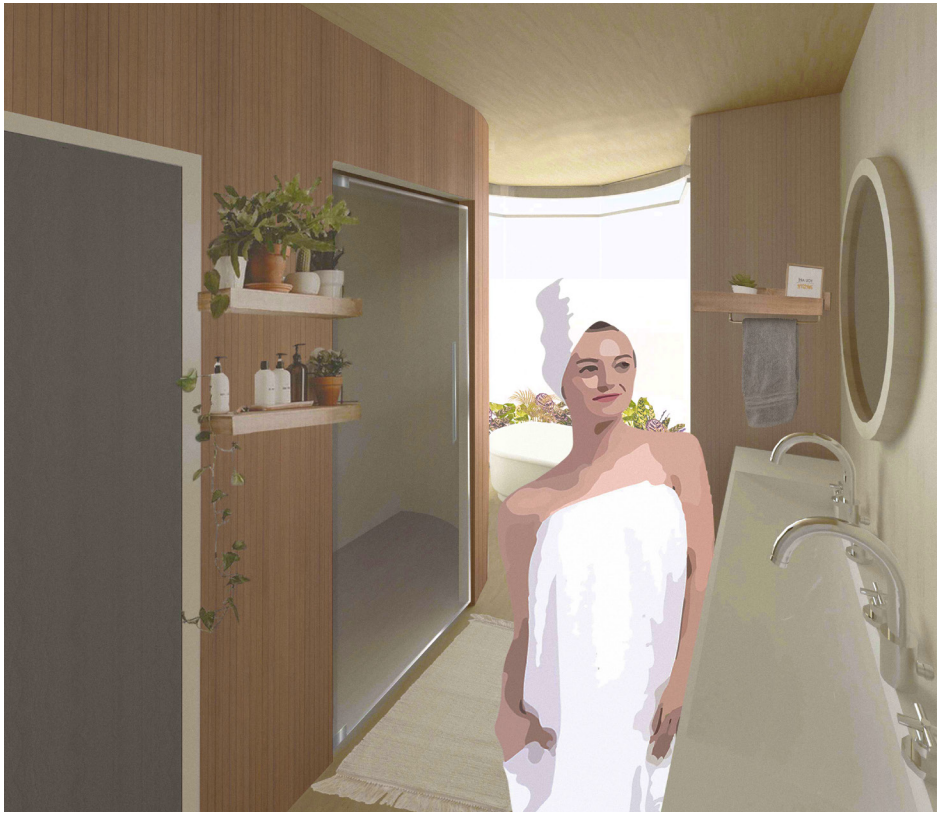
building envelope + landscape

IMPRESSION

gallery / space for social encounter

IMPRESSION

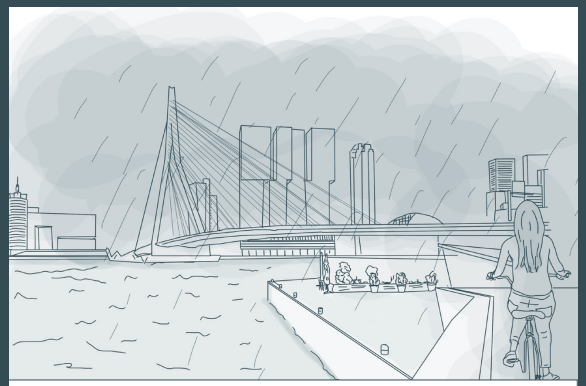
extravagent bathroom



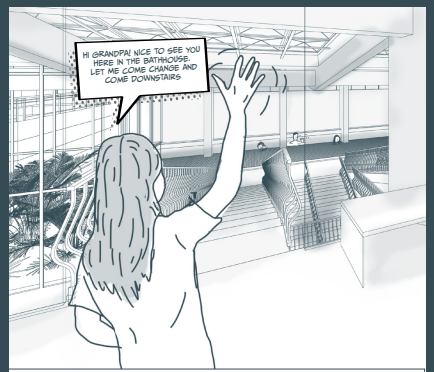
IMPRESSION

bathhouse

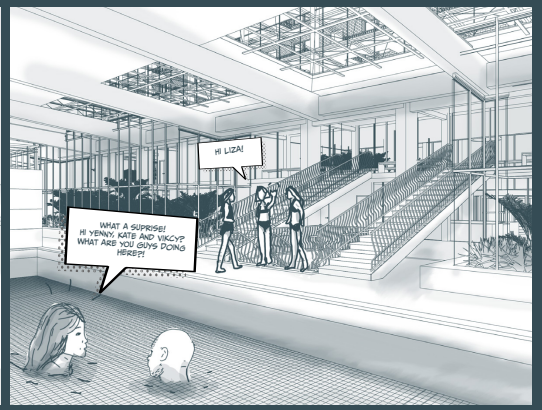
AFTER 5 YEARS, THE PROJECT HAS BEEN REALISED AND THE HOUSING PROJECT IS FULLY OPERATING

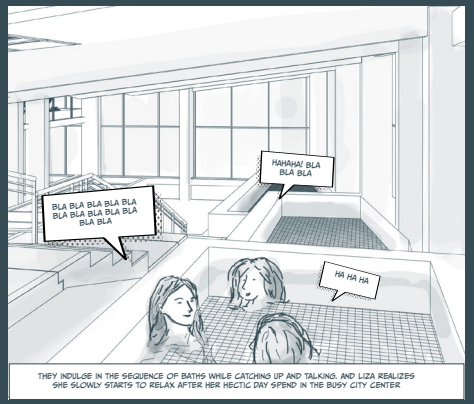


AFTER A BUSY DAY OF WORK, SHE BIKES TO HER HOME DURING A HEAVY RAINFALL



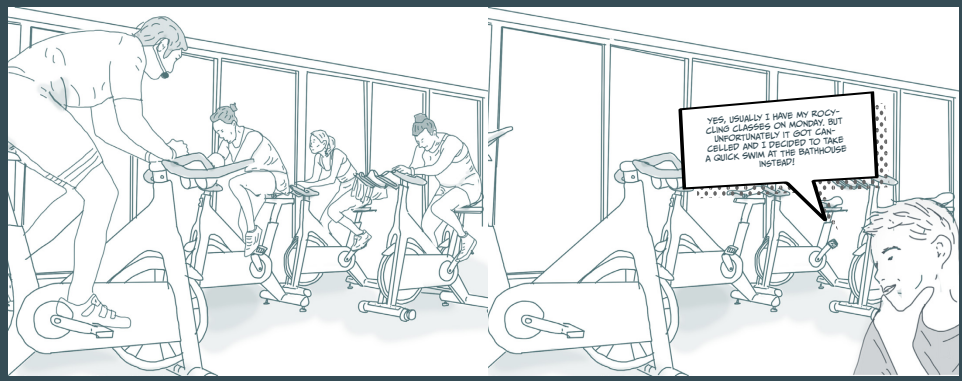
AS SHE IS WALKING ON LEVEL 0.5 OF THE BUILDING, SHE NOTICES HER GRANDPA, WHO IS ALSO LIVING IN THE BUILDING IS BATHING IN THE BATHHOUSE
INSTEAD OF TAKING A SHOWER, SHE DECIDED TO GO TO THE BATHHOUSE TO MEET HER GRANDPA.





THEY INDULGE IN THE SEQUENCE OF BATHS WHILE CATCHING UP AND TALKING. AND LIZA REALIZES SHE SLOWLY STARTS TO RELAX AFTER HER HECTIC DAY SPEND IN THE BUSY CITY CENTER

WHEN THEY ARRIVE AT THE GOLD BATHS, LIZA NOTICES HER NEIGHBOR IS THERE.



AFTER THEY FINISHED THEIR BATHING EXPERIENCE, THEY DECIDED TO MEET EACHOTHER AT THE ENTRANCE OF THE BATHHOUSE

010. REFLECTION

Where do you situate your project within Delft University of Technology (studio topic and master track?

The studio topic of "Ecology of Inclusion" is applied to teach architectural students the need for a holistic comprehension of dwelling as a social practice and the city as an ecology for them to tackle the problem of a constantly increasing world population. (van den Boomen, 2017).
The topic of my graduation project: community building amongst solo dwellers through water infrastructure, touches upon both the sociological and ecological issues prevalent within the scoop of the Advanced Housing studio.

How are research and design interrelated within your entire graduation project? How did your research and design investigations influence your final design?

The research question which was the focus of the research report was: *How could community building amongst solo dwellers be enhanced through water infrastructure?*

The main body of the research was separated into three chapters: (1) the solo dweller, (2) building a community, and (3) community building through water infrastructure. By means of literature review and case study analysis, a conclusion on this research question could be formed.
In the first chapter on solo dwellers, a diverse group of solo dweller types was detected. Therefore, there cannot just be one narrative told when determining their housing needs and demands. When designing a residential building targeted toward this target group, a wide variety of typologies should be provided. The conclusion of the case study analysis on the Tietgen Dormitory in Copenhagen provided spatial commonality for dwelling typologies targeted toward the solo dwellers (students in this case). And, how the circulation of the project forms a threshold between the private dwelling unit and the communal rooms shared with a cluster group, and the bigger communal spaces located on the ground floor (shared by everyone). This was also the case in the analysis of Sargfabrik in Vienna. In this instance, the circulation of the project is characterized by exterior corridors, forming a threshold between the dwelling units and communal and public functions such as the bathhouse and restaurant. In my design, I also explore the possibilities of how the circulation of the building can form a threshold between the private dwellings and communal bathing facility on the ground floor as its importance of it became prevalent within the conclusion of this first chapter.

In the second chapter, the significance of the 'sense of place' became apparent for the comprehension of how a community could be built amongst solo dwellers. Even though this is currently often lacking in the design of residential buildings targeted toward solo dwellers, the employment of communal spaces could provide environments for social encounters. In the design of the residential building, it was thus important the communal spaces can provide the (solo) dweller with a sense of place on the scale of mainly the highest three (sacrifice for the place, involvement in the place, and identifying with the place), as this could determine in which capacity the solo dwellers will participate in these social endeavors. In the design process, I explored possibilities on how this could be achieved (i.e., removing bathrooms in some of the dwelling units, whilst providing a new qualitative space for bathing on the ground floor).
Other aspects of the extrinsic environment which influence dwellers' sense of place (and which were therefore considered within the design process) were:

- Location of the communal space. If the space is hard to reach, dwellers will be less likely to reach it.
- If there is physical less comfortability to have conversations in the space due to the lack of privacy.
- Incomplete facilities in the communal spaces.

This resulted in the design of the bathhouse to be central within the building layout; the bathhouse design to provide spaces with different levels of seclusion; a hybrid program that goes beyond the program of bathing.
An additional conclusion in this chapter was on the location of the communal space, which should be situated on shared pathways to maximize the potentiality of social interactions. The exterior gallery in the design of the design is therefore also wider, providing not only a space for circulation but also social encounters.

In the last chapter, building a community through water infrastructure, I emphasized the potential benefits that could occur by reimagining a new way of integrating bathing and living into one building as an architect. The employment of a local communal bathing facility could provide a space where people have a brief, but genuine connection, which would otherwise have never occurred.
By analyzing a hot spring hotel (which contains the same fundamental design principles), conclusions could be extracted, that were relevant to my design. The two key take-aways which also resulted in the design principles for the residential building were the internal circulation with access to the bathing facilities on the ground floor, as well as the contrast between bathing and non-bathing functions by establishing a contrast in materialization.

What is the relation between your research method and your gained research insights?

I completed the research report by conducting a literature review and case study analysis. In addition, I interviewed the chairman of the only social bathhouse still to exist in the Netherlands. The literature review helped me in obtaining more knowledge on the topic of the solo dweller, community building, and (the history of) bathing culture. This gave me insights into the user group of the residential building and its characteristics. In the exploration to find a common ground, a common interest amongst this diverse group, the possibility to utilize bathing infrastructure to connect this heterogeneous group arose. The literature review supported me in gaining insight into how bathing infrastructure can facilitate such a social environment.

The case study analysis (of the residential buildings as well as the bathhouses) assisted me in forming design principles for the residential building with an emphasis on the integration of living and bathing. As well as to obtain a comprehension of how a bathing facility could foster a sensuous experience for the users, and which aspects generate this environment for social encounters. The case study analysis was the binding component to link the conducted literature review with my design, generating a link between research and design.

The interview with Hans Boekelaar provided me with more insights into how a social bathhouse operates in practice. But more importantly, it helped me validate the social capacity that a bathhouse can have to connect, to bind people from all different backgrounds and life stages. In this conversation, also the possible weaknesses of such a social bathhouse became prevalent. The financial aspects of the bathhouse have often been the main difficulty in sustaining the bathing facility. Yet, the sauna (which has a higher price for the users compared to the showers and baths) provided a revenue model for the bathhouse.

How does your project relate to contemporary societal issues and challenges including the changing role of the architect?

The topic and research theme of my graduation plan has previously been researched by other professionals and fellow students. The rise of solo living, as well as the need for sustainable water infrastructure/resource management, are frequently the focal point of this research. Yet, my research does differentiate from this, because both the problems (sociological problems which accompany the rise of the solo dweller, and theecological problem of lack of sustainable water resource management) are being tackled through the means of the employment of community build-

ing through water infrastructure. Bathing culture has been prevalent all over the world, however, the re-introduction of communal bathing might be something less conventional within the Dutch context.

This new design concept of a residential building with a bathing infrastructure heart, together with dwelling typologies containing limited to no bathroom, does currently not exist within the Dutch built environment and culture. However, the project could have an exemplary function, showcasing how by re-imagining new ways of communal bathing (with fellow neighbors and residents), water could become the (symbolic) binding factor between dwellers

Discuss the ethical issues and dilemmas you may have encountered in (i) doing the research, (ii, if applicable) elaborating the design, and (iii) potential applications of the results in practice. 150-200 words.

The possibility for solo dwellers to experience loneliness indicates some paradox in which the desire for connectedness coexists with the cultural standards which advocate gatekeeping of private property and self-reliance. To connect such a heterogeneous group should, and, cannot be forced as social relationships and friendships cannot be legislated.

Even though bathing/showering is part of people's daily routine, only assumptions can be made on whether the residents of the building will in practice utilize the bathing facility. In the role of a designer, only pleasurable and attractive conditions can be designed to stimulate and guide users to certain spaces. However, there is a possibility that in practice, if people do have the opportunity to shower/bath in their private dwelling units, they choose convenience over the likelihood of a social encounter.

Also, in the argumentation that the water footprint of the solo dwellers could be reduced through this new way of integrating bathing with living into one building, and (re)introducing communal bathing. can only prevail if rainwater is used as a water resource for the bathhouse, this is currently not 'officially' allowed within the Dutch regulation.