Scapes of Wellness:

Supported Living Housing For The Intellectually Disabled

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Research Report
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Cover Image: The ideal bedroom.
Collage created during fieldwork by a resident
of Petagma, a supported living house in Athens,
Greece. The materials were provided by me.

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Supported Living Housing For The Intellectually Disabled

TUDelft
BKBouwkunde

Dedicated to the memory of
my father

Contents

Abstract

This booklet presents the body of research conducted in the course of the graduation studio *Designing for Health and Care: Towards a Healthy and Inclusive Living Environment*. The aim is to illustrate the methodological steps in the direction of creating an architectural backdrop for the design of a supported living housing facility for people with intellectual disabilities located at Lelystad, Netherlands.

The driving force for this research was the rising need for additional supported living housing for intellectually disabled adults steering towards their social inclusion; besides all the efforts so far, there is a strong necessity to improve the architectural environment offered to this population.

The study of the relevant literature and the fieldwork conducted based on ethnographic methodology guided this inquiry towards biophilic design, a tool that can improve the quality of life of residents in supported living settings.

Taking into consideration the rights of this vulnerable group to independent living, social interaction and well-being, the main research question that guided the whole process leading to the formulation of the qualities on which the design process will be based was: *how can biophilic design be implemented to improve the quality of life of adults with intellectual disabilities who live in supported living environments?*

The findings of this research indicate that a small-scale living facility located in the heart of a neighborhood, accessible by public transportation and close to public functions, seems ideal for intellectually disabled residents who live in supported living arrangements. The program can benefit from hybridity, combining dwellings with recreational and therapeutic facilities that can enhance the health and well-being of both the intellectually disabled population and the neighborhood community.

Keywords: intellectual disabilities, quality of life, supported living environments, biophilic design

Introduction
Establishes the current societal context, issues concerning the population of adults with intellectual disabilities and the role architecture can play towards improving their built environment. Additionally, the main goal of the research and the guiding questions are determined.

Chapter 1
Presents the relevant review of literature in regards to four major areas:
a. people with intellectual disabilities and their rights to social inclusion and independent living,
b. supported living typologies,
c. quality of life for intellectually disabled individuals,
d. the architectural principles of biophilic design.

Chapter 2
Focuses on ethnographic research, the methods selected to gather empirical data during the research and fieldwork, aiming to answer the research questions and to validate the review of literature presented.

Chapter 3
Highlights the findings of the empirical data collected along with the reflections on the observations of the fieldwork and precedents studies.

Chapter 4
Summarizes the findings translating the data into architectural qualities leading to the design proposal.

Introduction

Intellectually disabled people (ID) are individuals with limitations in the cognitive domain -mainly in learning, problem solving and judgement- and in adaptive functioning of everyday life -primarily in independent living, practical skills and social interaction (American Psychiatric Association [APA], 2013). With a prevalence of 1-3% to the general population (Empower Org., 2016; Cervantes et al., 2019), they are a relatively small subgroup of the 8 million world population, as of mid-November 2022 (United Nations [UN], Department of Economic and Social Affairs, 2022). Yet, the number of people that are directly affected -legal guardians and relatives, caregivers, health professionals, local society- is much larger and predictions are that it will continue to grow (Empower Org., 2016; Woittiez et al., 2018).

The problem

Until the mid-20th century, ID individuals had been treated as mentally ill and had been excluded from society. The vast majority was marginalized, either living with their families, yet hidden from the 'outside' world, or in institutional settings, primarily psychiatric establishments (Matheis, 2019). In the onset of the 21st century, a better scientific understanding of intellectual disabilities and the human rights movement were the advocates towards the deinstitutionalization of ID people, defined as the transition from institutions to community-based housing environments (FRA-European Union Agency for Fundamental Rights, 2017).

In this respect, only quite recently, in December 2006, the United Nations adopted the Convention on the Rights of People with Disabilities, that is individuals with

physical, mental, intellectual or sensory impairments[1] and officially acknowledged their rights to be equal members of the society (United Nations, 2006). Article 19 of this convention stresses their right to self-determination, including independent living, meaning having the freedom of choice and control to decide where, with whom and how to live (European Network on Independent Living and Inclusion [ENIL], 2022) and social inclusion, which, for the ID population takes the form of creating an inclusive environment in which they can be themselves and their rights are respected (Matheis, 2019). In such a way, ID individuals are enabled to participate in community-based and societal activities.

Thereafter, many countries worldwide, including the European Union, initiated a process of deinstitutionalizing ID people by encouraging independent and individualized models of housing for them (FRA, 2017). As a result, in the recent decades **the need for housing that offers individualized support and meets ID people's needs has risen significantly** (Roebuck, 2021). Towards that direction, research indicates that the choice of the appropriate housing option is very important to the overall quality of life (QoL) - refer to section 1.3 – of intellectually disabled (Buntinx & Schalock, 2010; Bigby & Beadle-Brown, 2018). Unfortunately, **studies over the last two decades have shown that the QoL of ID individuals is lower, compared to individuals without disabilities** (Roos, J., et al., 2022). Consequently, one of the challenges our society faces regarding the vulnerable minority of intellectually disabled focuses on the housing options that offer a better quality of life.

Statistical data from the Netherlands showcase these challenges regarding housing arrangements for the ID population. As illustrated in figure 1, the Dutch Ministry of Health, Welfare and Sport estimates a prevalence of 2,5% (440.000 people) for both adults and minors

[1] The UN definition makes no distinction between the various types of disabilities and considers disabled people a group as a whole.

[2] Not all numbers used derive from the same database, thus the diagram is not 100% scientifically correct; nevertheless, it shows the scope of the housing problem concerning the ID people in the Netherlands, since not all of them needing residential care receive it.
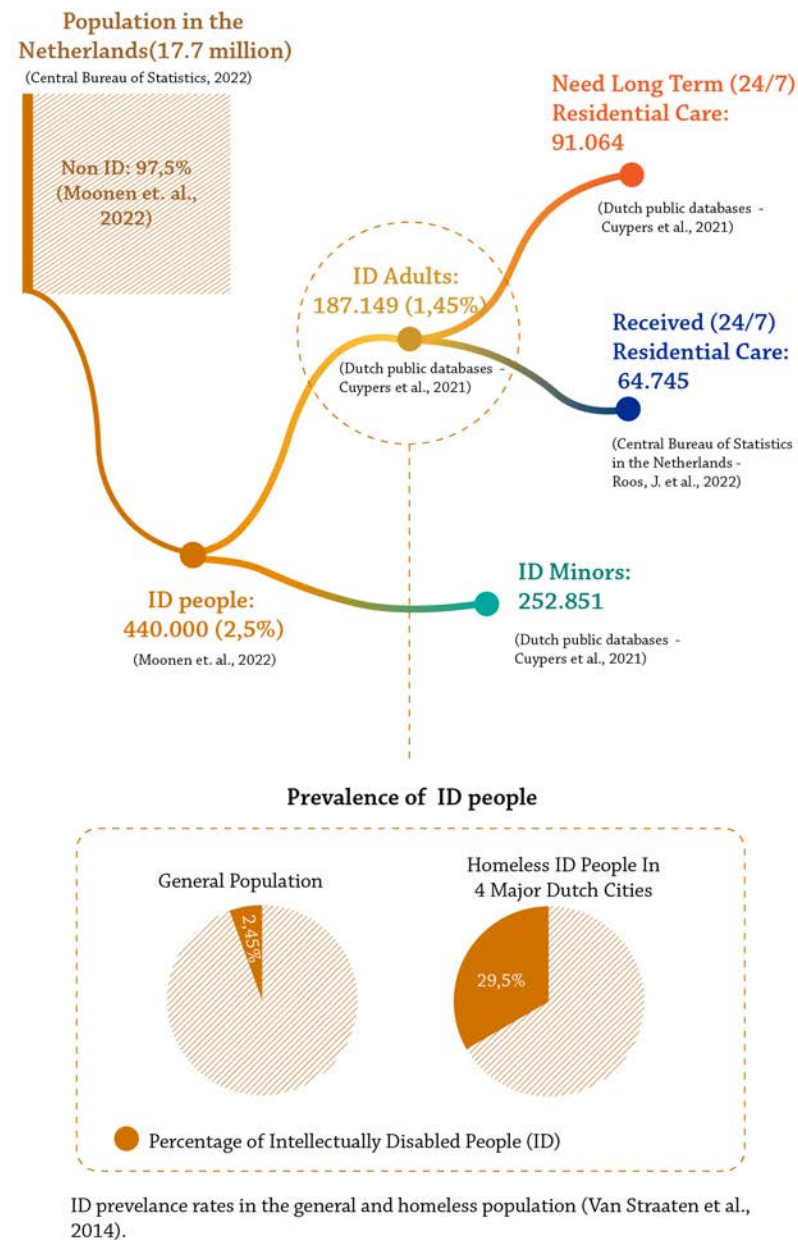

Figure 1. A partial view of intellectual disabilities in the Netherlands through numbers[2].

intellectually disabled (Moonen et. al., 2022). According to 2021 data provided by the Dutch public databases (Cuypers et al., 2021), the prevalence of ID adults in the general population is 1,45% (187.149 people). Half of them (91.064 individuals) need residential care and support in daily living (Central Bureau of Statistics as stated in Roos, J. et al., 2022), but the numbers show that not all of them receive it (Roos, J. et al., 2022). The ID prevalence is much higher among homeless people in the four major Dutch cities (Amsterdam, The Hague, Rotterdam and Utrecht). With this prevalence rising to 30% (Van Straaten et al., 2014), pressing attention should be put towards affordable housing for ID adults. **Overall, the current annual growth rate of the demand in care and support for ID in the Netherlands is around 7%** (Woittiez et al., 2018). However, more important than numbers is the fact that society must give back to the intellectually disabled their deprived dignity and a better quality of life, since for centuries they were treated as social outcasts.

Towards a solution - The role of architecture

Undoubtedly, architects, as mediators between humans and the built environment, are accountable for the formation of an environment catering the well-being of ID individuals. Data from the field of healing architecture which, by definition, refers to the creation of an environment that promotes physical and psychological health and/or leads to a fast recovery (DuBose et al., 2016), suggest that there are designing methods that can improve the QoL of patients in medical facilities and ID housing settings (Valera Sosa, 2019; Möhn et al., 2022). Moreover, evidence-based design may offer valuable guidance to the design process; it is the type of design that is grounded on research outcomes and in the healthcare settings it aims to improve health and well-being (Menezes et al., 2022; Valera Sosa, 2019).

Healing architecture and evidence-based design applied to the needs of ID population lead to biophilic design - refer to section 1.4. The application of biophilic design lies on a set of principles that aim to create different types of connections with nature and fosters the way people experience it within their built environment. According to research findings, biophilic design is beneficial to reducing stress, enhances cognitive function, helps the healing process and improves the overall wellness (Browning et al., 2014). Thus, the ultimate purpose of the implementation of biophilic design is to create habitats for humans as biological beings, to reevaluate the relationship with nature and to improve people's health, fitness and long term well-being (Kellert & Calabrese, 2015).

Therefore, the implementation of biophilic design patterns along with the empirical findings from this research will bridge the gap of the existing housing arrangements available for ID and those that better meet their needs and promote an adequate QoL.

Research Objectives

The driving force for this research is the rising need for additional supported living housing for ID adults and the fact that, besides all efforts so far, there is a strong necessity to improve the architectural environment offered to this population. Thus, having in mind their right to independent living, social interaction and well-being, the goal of this research is **to explore the architectural tools that can formulate the framework to design a new housing model towards improving the quality of life of people with intellectual disabilities.**

The main research question that follows and the four sub-questions that additionally arose will further guide the process:

Research Questions

How can biophilic design be implemented to improve the quality of life of adults with intellectual disabilities who live in supported living environments?

Sub-questions:

1. What cognitive and adaptive challenges do ID individuals who live in supported living housing face on a daily basis?
2. What types of supported living housing are currently accessible to ID adults to accommodate their right to independent living?
3. How is the quality of life (QoL) defined for people with intellectual disabilities (ID) and what is its relevance when it comes to the built environment?
4. What principles of biophilic design can be used as tools to propose a new model of supported living housing for ID people?
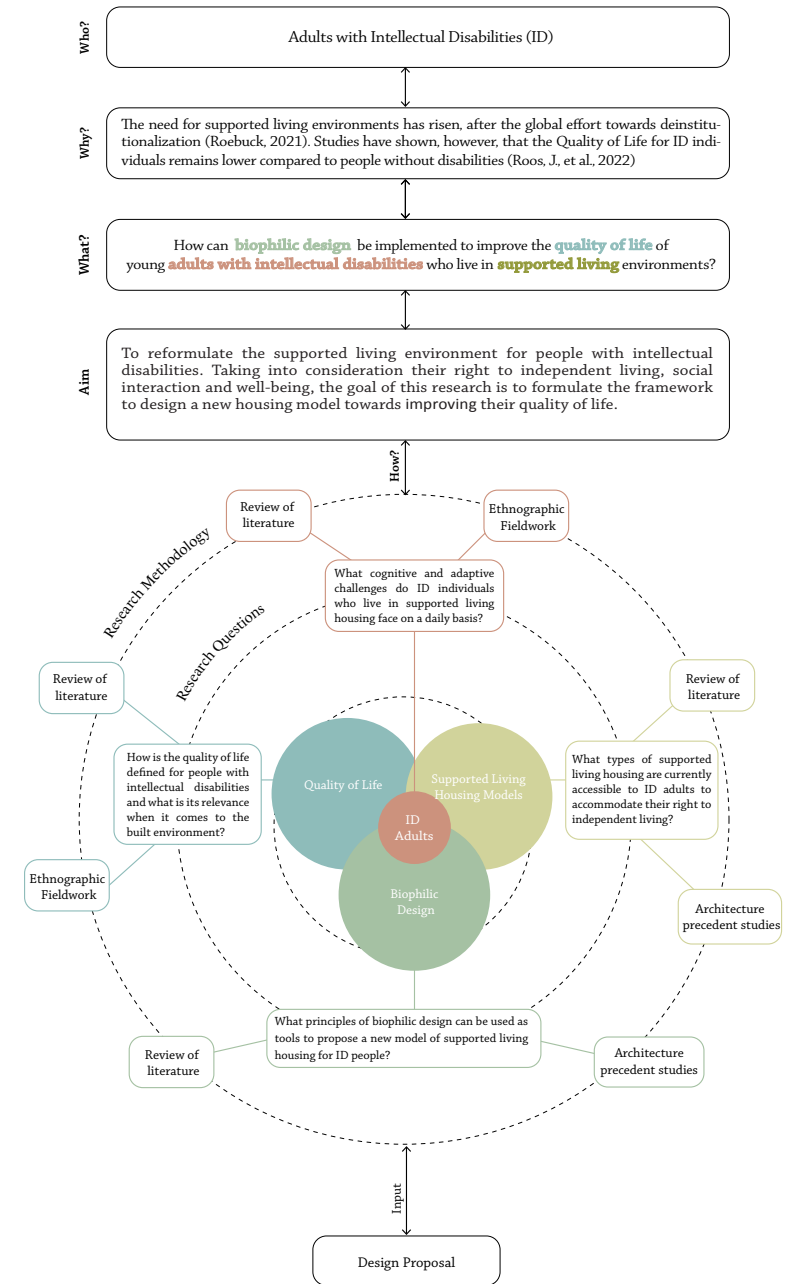

Figure 2. Research scheme.

Chapter 1 │ Literature Review

The literature review is rooted on academic publications in regards to four major areas: a. people with intellectual disabilities and their rights to social inclusion and independent living, b. supported living typologies for ID population, c. quality of life related to ID individuals, and finally d. the architectural principles of biophilic design.

1.1 Intellectually disabled and their right to social interaction & independent living

Giving a functional definition for intellectual disability isn't an easy task. The Convention on the Rights of People with Disabilities (UN, 2006) abstains from defining the various types of disabilities. In the European Union not all Member States have a legal framework on disability, in general, and intellectual disability, in particular. Thus, in EU there isn't a definition on intellectual disabilities unanimously accepted (Lecerf, 2021). The definition offered by APA and presented here is widely used by governmental agencies and professional associations, the Dutch policies included (Woittiez et al., 2018).

Intellectual disability (ID), formerly known as mental retardation, is a neurodevelopmental disorder (IDD), a condition of the nervous system and the brain (see figure 3); it may coexist with other physical impairments (National Institute of Child, Health and Human Development [NICHD], n.d.) that causes deficits in the intellectual and adaptive functioning of an individual before the age of 22 (American Association on Intellectual and Developmental Disabilities [AAIDD], n.d). This type of disability affects the cognitive functioning, especially in the areas of learning,

problem solving, judgement and the adaptive behavior, mainly connected with practical skills needed in everyday life. The severity of intellectual disability is classified as mild, moderate, severe or profound (AAIDD, n.d; APA, 2013). In some cases, intellectual disability coexists with other physical impairments, developmental disorders (DD) and challenging behaviors, resulting in more complex limitations and requiring a long term individualized special support (Larson et al., 2021; Roos, B. et. al, 2022).

Before 2013, the ID diagnosis was based primarily on the cognitive factors and the IQ of the individuals; nowadays IQ testing is a complimentary diagnostic tool, with the evaluation of the adaptive functioning being the main one (Cervantes et al., 2019). The 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) presents in detail the areas of the adaptive functioning affected:
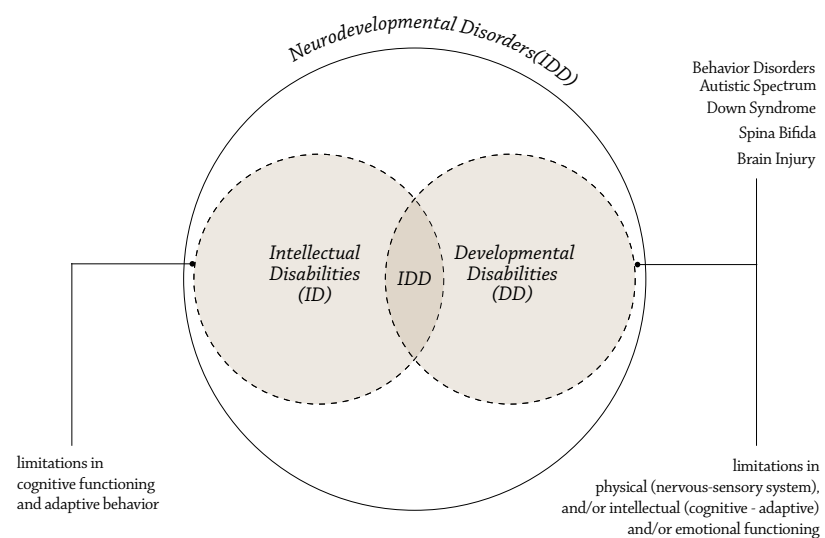
*"**Conceptual** – language, reading, writing, math, reasoning, knowledge, memory.*
***Social** – empathy, social judgment, communication skills, the ability to follow rules and the ability to make and keep friendships.*
***Practical** – independence in areas such as personal care, job responsibilities, managing money, recreation, and organizing school and work tasks" (APA, 2013).*

This emphasis on the limitations of adaptive functioning of ID people is greatly associated with their ability to live a more or less autonomous life. The diagnosis of severity level based on adaptive functioning emphasizes the environmental and social aspects of the disability and has a more practical value for assessing and providing the level of support ID individuals need (Cervantes et al., 2019). It also underlines the ability of ID people to learn the skills needed in everyday life (Matheis, 2019). Social inclusion and independent living are also feasible, as the UN Convention suggests (United Nations, 2006).

Moreover, over the last 20 years, intellectual disability is seen in a more holistic and socio-ecological context. In many countries it is associated with the person and his/hers interaction with the environment (*social model of disability*) than with the IQ measurements and adoptive behavior characteristics (*medical model of disability*) (Buntinx & Schalock, 2010). Matheis (2019) explains how the philosophy of care of ID individuals is gradually changing: in the past, social inclusion was perceived as a normalization process of social integration and ID people were expected to adapt their skills to the way non-disabled people live. On the contrary, nowadays, social inclusion refers to the obligation of the non-disabled to create an inclusive environment where ID people's individual characteristics must be respected.

Figure 3. Diagram showing the most common neurodevelopmental disorders (IDD).

Within this framework, the right of ID individuals for independent living deriving from the UN Convention to freely decide where, with whom and how to live becomes a feasible goal, provided that their strengths, challenges and needs are taken into account. The ENIL makes clear that living independently does not exclude receiving care and support; it is "about having choice and control over your life and having the same range of opportunities as a non-disabled person" (ENIL, 2018).

1.2 Supported Living Typologies

Does independent living equals totally autonomous way of life for every ID individual? The answer is negative. Not all ID people can live in totally independent home settings; in most cases, the severity of their condition in cognitive and adaptive functioning and other medical and personal factors determine the most suitable housing option. Thus, the commitment of the global community to respect the rights of ID people regarding housing options gave room to the emergence of new housing typologies to foster their needs (figure 4), ranging from a skilled nursing facility for the profound and severe cases, supported living arrangements for those needing supervised or occasional support, to the fully autonomous housing for those who feel confident living by themselves (Roebuck, 2021).

The names of the housing typologies for ID individuals vary, depending on the legal terms and social insurance system of each country. Figure 4 demonstrates an overview of the evolution of living environments for the ID along with the definitions of each term, from the time they were totally institutionalized to the most typical independent models that are available nowadays; it is based on the related literature review found in Bowers, 2019; Connery, 2016; ENIL, 2018; Larson et al., 2021;Martin et al., 2019; Roebuck, 2021.

Which of these housing options offer, according to research, an optimal quality of life to intellectually disabled, in terms of independent living, social interaction and well-being? The review of relevant literature indicates that not all ID individuals with the same diagnosis have the same strengths and challenges and, consequently, the same housing needs (Connery, 2016; Roebuck, 2021). As a rule of thumb, we may say that the more the housing environment enables its residents to live independently, the more beneficial it is for them. The architectural challenge, however, comes when QoL is taken into consideration while designing.
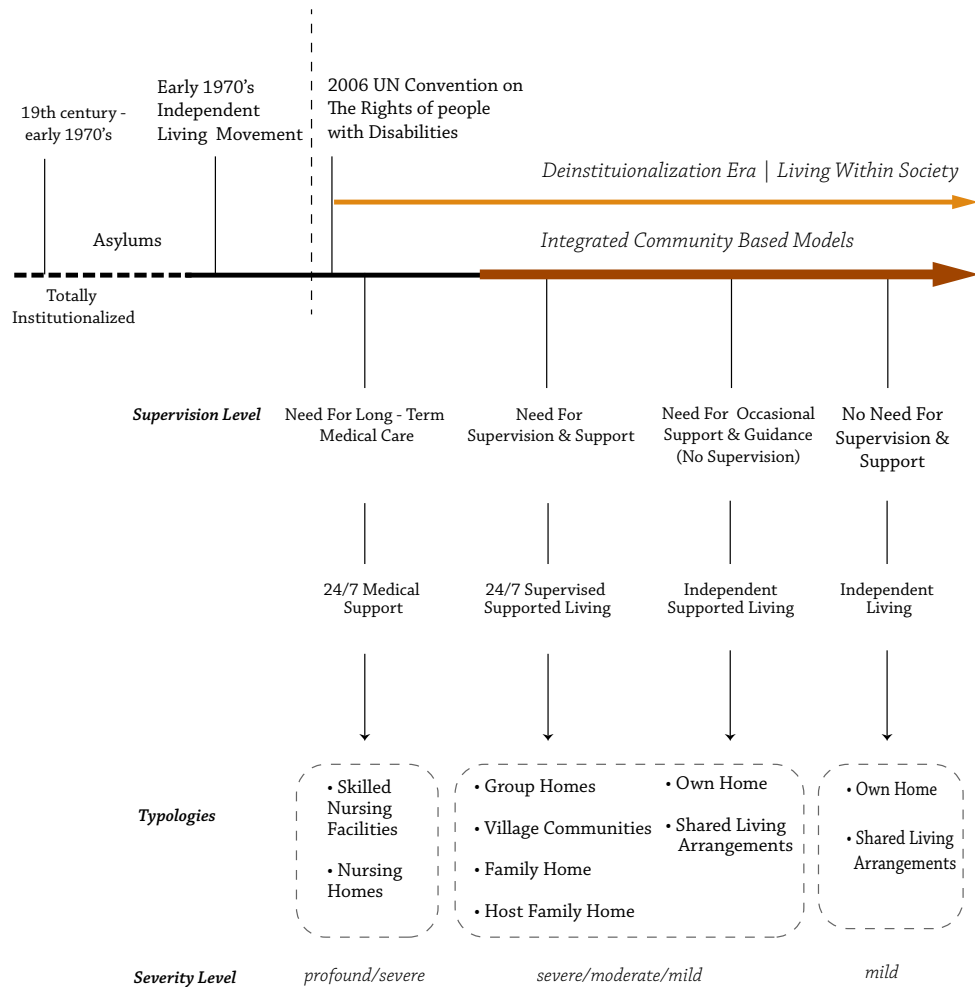
Figure 4. Housing typologies available for ID people.

Family home:	a residence shared by a person with ID and his or her related family members.
Group home:	a 24/7 supervised housing establishment where two or more people with disabilities live and receive support.
Host family home:	ID people live with a family other than their biological and receive support.
Independent living:	ID people live by themselves and receive no support.
Independent supported living:	ID individuals live in their own or with roommates, and receive occasional support according to their needs.
Institution:	a large public facility where many people with disabilities live
Nursing home:	a private residential care facility for disabled individuals and elderly people.
Shared living:	an ID person lives with a roommate, who is usually paid to provide support.
Skilled nursing facility:	a residential care facility staffed with medical professionals.
Supported living:	various types of housing, where usually 2-8 ID individuals live and receive 24/7 supervision and support.
Village community:	a type of clustered housing where the support is provided by volunteers who live communally with ID people.

More detailed definitions and references are provided in Appendix II.

1.3 Quality of Life

Quality of life (QoL) is a multidimensional construct and essential component of human rights. One fundamental question researchers of ID have been aiming to answer is focused on its definition and weather the QoL criteria are the same to all people, disabled or not.

Until now, there isn't a universally agreed definition of the QoL; yet yet, as Memisevic & Djordjevic (2019) mention, there are two that are most widely accepted. The first, defined by the World Health Organization [WHO], is based on more subjective indicators: each individual perceives the concept of the quality of his/hers life on the areas of physical and psychological health, social relationships, and environment (WHO, 2012). The second, which is widely employed in studies regarding ID individuals (figure 5), focuses on the social dimensions of functioning, rather on the subjective perception, and covers three main domains: independence, social participation and well-being (Memisevic & Djordjevic, 2019).
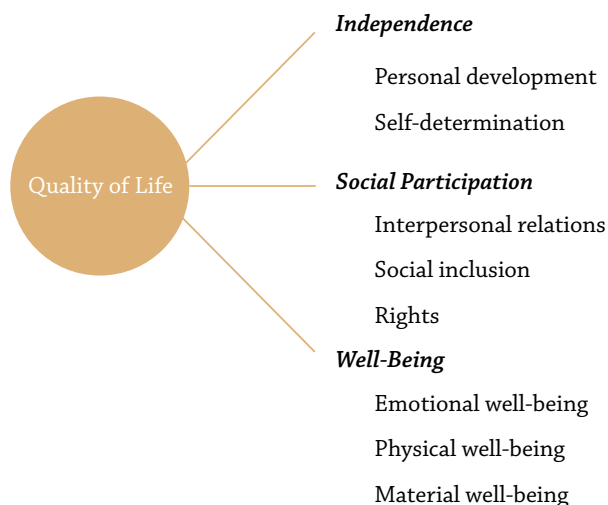
Independence

Personal development

Self-determination

Social Participation

Interpersonal relations

Social inclusion

Rights

Well-Being

Emotional well-being

Physical well-being

Material well-being

Quality of Life

Figure 5. Domains of quality of life.

The authorship of the social dimensions of QoL belongs to R. Schalock who researched extensively the QoL of ID individuals. His pioneer work consolidated their human rights and led to the conclusion that QoL consists of the same factors for all people and has subjective and objective components, grouped in eight areas: (1) emotional well-being, (2) interpersonal relations, (3) material well-being, (4) personal development, (5) physical well-being, (6) self-determination, (7) social inclusion, and (8) rights (Schalock, 2004; Schalock et al., 2011; Verdugo et al., 2012); Schalock's theory makes QoL measurable for the ID and also correlates it with the built environment (material well-being).

Indeed, in the last 20 years, limited but significant research is focusing on the variables that associate QoL with the built environment of ID people. Simões & Santos (2017) analyzed the environmental characteristics that can affect or predict better QoL for ID individuals; they found that the type of residential setting and other living conditions that promote independent living affect positively their well-being. Towards this direction, Bigby & Beadle-Brown (2018) conducted a realist review of literature researching the factors that improve the QoL of ID individuals living in supported accommodations. They found that small-scale community settings between 1-6 people with a home-like environment provide a higher QoL. Similar findings are reported by Bertelli et al. (2013) who also mention that according to research evidence, the housing environment that is safe and pleasant has healing qualities as it minimizes stress and reactive behaviors.

All these findings support the idea that architecture can 'make a difference' in the living arrangements of ID people. Nevertheless, J. Roos et al. (2022) have recently conducted a scoping review on the impact the built environment has on the QoL of ID people living in long term facilities, and reported that the research done on the design components is limited. Therefore, more action needs to be taken.

1.4 Design Tool: Biophilic Design

Taking into account the three domains on which QoL is based – social participation, independence and well-being – biophilic design can play an incentive role in the composition of an architectural language that caters for all three, when it comes to the design of health and care facilities that promote healing (Valera Sosa, 2019; Woodwarth, 2022). Biophilic design may be highly based on the research outcomes of an evidence-based design (Woodwarth, 2022), a strong prerequisite to a user-center approach of the design process (Browning et al., 2014).

Since the onset of the 21st century, the theory of biophilia - "the inherent human inclination to affiliate with nature" (Kellert & Calabrese, 2015, p. 3)- has been used primarily in social sciences and architecture, to stress the benefits of the human interaction with nature in the built environment (Browning et al., 2014; Zhong et al., 2021). Biophilic design is the strategy that puts biophilia theory into practice, creating a positive relationship between the built and natural environment, amplifying the benefits of this co-existence for the users: it is defined as the design process that lies on the inherent relationship of human beings with nature and contributes positively to their health and well-being (Bolten & Barbiero, 2020; Kellert, 2018).

The application of biophilic design lies on the reconnection of people, as biological beings, with nature. The elements of biophilic design that can be used in the design process, should be user-centered and vary depending on the project's specifications, such as location, demographics, characteristics of the local architecture, local climate, programmatic implication, users' needs and preferences (Browning et al., 2014). Additionally, as Stephen Keller, -one of the most prominent representatives of biophilic design- points out, the essence of biophilic buildings should be centered around three domains concerning the experience (figure 6): direct experience with nature, indirect experience with nature and experience of space and place (Kellert & Calabrese, 2015).

Biophilic Design: Experience Categories

Experience	Architectural Materialization
Direct Experience With Nature/ Nature In The Space	Diffuse & Dynamic Light Visual & Non Visual Connections Air/ Natural Systems Plants Nature & Outdoors Fire Presence Of Water
Indirect Experience With Nature/ Natural Analogues	Symbolic Use To Evoke Nature Representation Of Nature Natural Materials Objects Textures Colours Ornamentation Artwork Patterns
Experience Of Space And Place/ Nature Of The Space	Spatial Configurations Organized Complexity Mobility (Linking Inside With Outside) Prospect & Refuge (Discerning Long Distances From Protected And Secure Space) Transitional Spaces

Figure 6. Biophilic design: experience categories .

Numerous proponents of biophilic design have suggested various frameworks as the conceptual basis to interpret and apply biophilic design in practice. Although there is no consensus as to which and how many attributes biophilic design must have, they all point out the importance of sensory stimuli such as water, air, daylight, plants, animals, landscape, weather, time and seasonal changes and formal qualities such as geometry, mechanisms, images, natural materials, complexity and order and prospect and refuge (Zhong et al., 2021).

For this research, in order to set a design framework that improves the living environment of ID adults, nine patterns were chosen to inform the design process (Browning et al., 2014) (figure 7):
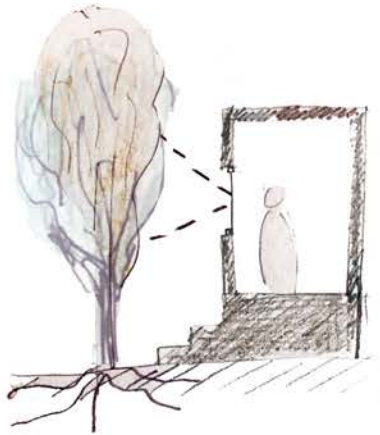
  i.   **visual connection with nature** – offers direct views to natural scenes

 ii.   **non-visual connection with nature** – implements auditory, haptic, olfactory or gustatory stimuli that reference nature

iii.   **thermal airflow variability** – controls of airflow to mimic a natural environment

 iv.   **presence of water** – creates a condition where seeing, hearing and touching water is enhanced

  v.   **dynamic and diffuse light** – constructs varying intensities of light and shadow to resemble nature

 vi.   **connection with natural systems** – takes into account natural seasonal and temporal transitions

vii.   **material connection with nature** – uses minimally processed materials that are sourced locally, and close to the biodiversity of the chosen location

viii. **prospect** – provides unobstructed views with large focal lengths

 ix.   **refuge** – provides different scales of intimacy where users can disengage.

[3] As Mador mentions: "What a special catalogue for an element that essentially has no persona of its own. Water as a liquid has no shape, yet it is readily defined by its surroundings. Water has no hardness; it is completely yielding to the touch, yet it is hard as concrete when impacted at high speed. Water has no color when viewed in a transparent container, yet becomes vividly green or blue as an ocean, and readily reflects at tis surface everything around it. Pure water was no taste, yet it readily absorbs and transmits the taste of any suspended or dissolved substance. It has no smell, yet, as atmospheric humidity, readily distributes the aromas of its surroundings. This ubiquitous part of our environment truly has a protean personality, readily changing to assimilate its surroundings" (Mador, 2008, p. 45).

The selection of these patterns offers architectural guidance that can potentially form spaces with various atmospheres, experience and spatial qualities that can benefit their well-being of the users. Moreover, the patterns offer design guidance at all scales of design: site, building and interior. The integration of these patterns in user-centered design enhances health, productivity and the well-being (Kellert, 2018). Specifically, the positive impacts of biophilic design on health include reducing stress and negative emotions, relieving pain, contributing to illness recovery, amplifying positive emotions, improving cognitive function, and lowering blood pressure (Browning et al., 2014; Kellert, 2018; Zhong et al., 2021). No need to mention the economic benefits in the long term (Woodwarth, 2022), as an investment in biophilic design will alleviate the health care system and will result in happier individuals.
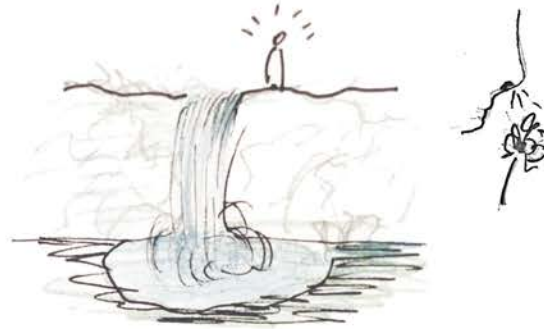
For this research, the element of water is important as its inherent qualities do not only benefit the health of the user, but can also play an instrumental role as a design element. Seeing, hearing and touching the water reduces stress, increases the feeling of tranquility and lowers the heart rate and blood pressure (Zhong et al., 2021). Additionally, for ID people, water-based interventions, such as hydrotherapy and swimming, can have a positive impact on their functional skills, as well as on their psychology (Naumann et al., 2021).

Water exists in visible and invisible forms and is necessary for life. Additionally, it has a special trait of 'transforming' depending on its surroundings and external forces[3] (Mador, 2008). Therefore, for this research, the practical and symbolic image of water acts as a force to shape the spatial qualities, program, atmosphere and experience to create an environment that promotes the quality of life of ID people living in supported living housing.
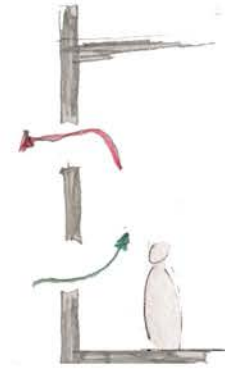
1. Visual Connection with Nature

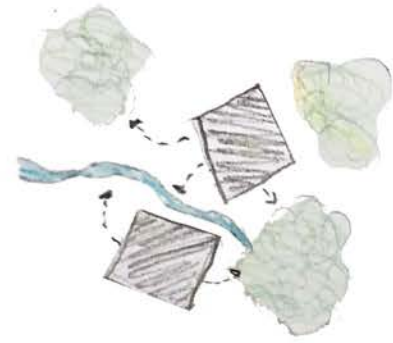*2. Non Visual Connection with Nature*

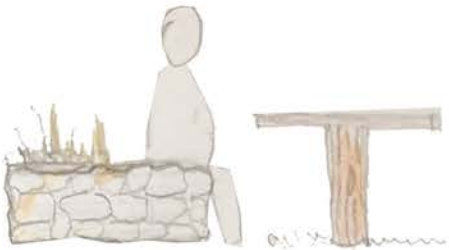*3. Thermal Airflow Variability*
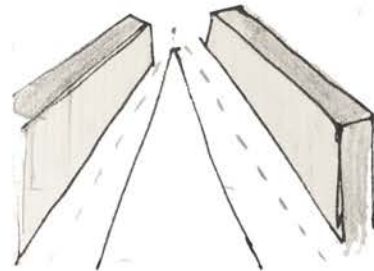

4. Presence of Water

5. Dynamic and Diffuse Light

6. Connection with Natural Systems

7. Material Connection with Nature

8. Prospect

9. Refuge

Figure 7. Selected biophilic patterns.

Chapter 2 | Methods of Empirical Data

The main strategy to gather empirical data related to the research questions and to validate the review of literature presented was qualitative-ethnographic research: a process of collecting data by fieldwork, mainly through observation, interviews and other tools of qualitative research (Groat & Wang, 2013). Ethnographic research gives the opportunity for a better understanding of ID people's real-life situation by using various methodological tools for data gathering and their interpretation (Groat & Wang, 2013).

During the course of the fieldwork in Greece and the Netherlands, I conducted research at supported living facilities for ID individuals, as well as in locations where ID people work and interact with the public realm: a cultural centre with a café, and a day care centre. Ethnography, helped me collect data on the behaviours, challenges and strengths of ID people and shed light on how they interact with the built environment. The main ethnographic tools I used were:

2.1 Observations and Note Taking

During the course of this research, it was important to get introduced to the perspective users of my design. As the basis of this research is humans, the focal point of the visit to various facilities was to identify behaviors and patterns of the target group. Additionally, observations on their built environment gave me the opportunity to create a holistic idea of what their homes feel and look like.

I used two types of ethnographic observations: a. when I didn't want to interfere with ID people's routine but to focus on a pre-selected objective, I was engaged in selective/non-participant type of observation, that is observation in which the researcher pre-determines its focus and concentrates only on the selected objective (Kras, 2018), and b. when I wanted to energetically participate in the everyday life practices of ID individuals, I used active-participant observation (Groat & Wang, 2013; Lucas, 2016; Kras, 2018; Sheridan, 2018), the type of observation in which the researcher is part of the group being observed (Kras, 2018). I was a non participant observer to collect emperical data on the built environment of the supported living residences, the day care center and the coffee shop where ID people worked, to focus on their behavior while interacting with others. I used the active-participant observation when I wanted to be part of their activities, such as dance therapy, and feel the challenges and limitations they confront.

2.2
Interviews with Residents, Supporting Staff, Caregivers and Architectural Professionals

The additional ethnographic tools were informal/unstructured, and semi-structured interviews with residents, supporting staff, caregivers and architectural professionals. As Finesurrey (2018) mentions, informal unstructured interviews take the shape of an informal conversation, but they are helpful in gathering background information. Semi-structured interviews have a prepared set of structured questions and a list of open-ended ones, or let the interviewee add personal comments and insights (Finesurrey, 2018). I've chosen these types of interviews since are more friendly and non-threatening (Lucas, 2016; Finesurrey, 2018).

During the semi-structured interview with professional architect Andrea Möhn, that occurred before conducting the fieldwork, we talked about the importance of observing and arriving at meaningful conclusions guided by our architectural positions and the importance of developing an intuition about what people with ID really need. The insight I gained during this interview helped me better organize my discussions with ID residents and their supporting staff and caregivers.

2.3 Sketches, Photographs and Maps

Drawings, diagrams and maps are valuable tools for the architectural research (Groat & Wang, 2013; Lucas, 2016). Using these tools in my research gave me the opportunity to create concise, descriptive and first-hand graphic representations while capturing aspects of the life of ID individuals.

2.4 Architectural Precedent Studies

An architectural precedent is a type of case study analysis focused on the characteristics of an architectural structure in its built environment and gives empirical data of a built environment in "real life-context" (Groat & Wang, 2013, 421). Analyzing existing projects of supported living housing as references was used as a tool to study architectural principles and design qualities that are implemented in real settings, aiming to cater the needs of people with intellectual disabilities.

2.5 Site and Context Analysis of the Site Location

To illustrate the qualities of the region, neighbourhood and intervention site in Lelystad, the tools of mapping

and drawing were used to generate different layers of information that play a catalytic role in design decision making. In addition, conversations with urbanists Nikè Ruijter and a site visit gave me the opportunity to get insight into the urban history of the region, make personal observations and take photographs.

Chapter 3 │ Fieldwork Research Findings

Chapter 3 presents the findings of the empirical data collected and my reflections on the observations I made that will guide the design proposal.

3.1 Interview with Architect Andrea Möhn

Andrea Möhn is an architect based in Rotterdam, whose work is centrally focused on healthcare design. Part of her design process is based on ethnographic research and focused towards   the creation of a humanized environment, as explained through her diagram (figure 8).
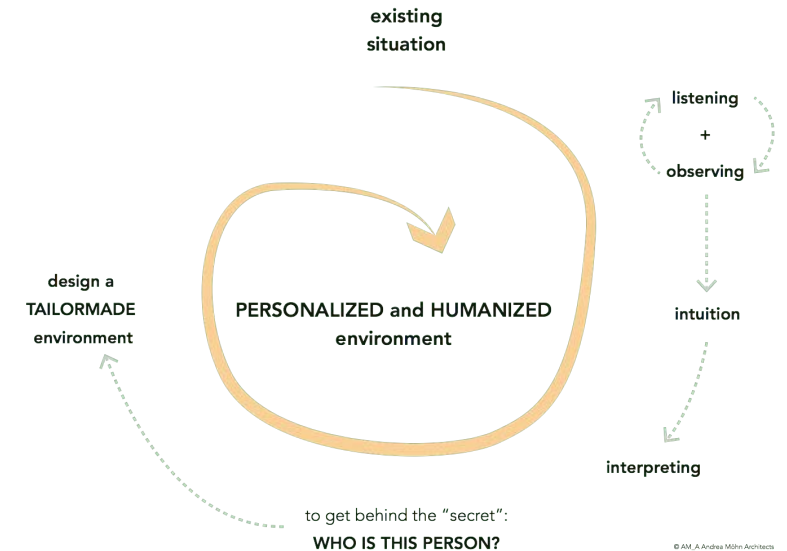

Figure 8. How to create a humanized environment.

During our conversation, several architectural qualities useful to the design for ID were pointed out. Firstly, in her designs Möhn pays close attention to the forms and proportions of the building; avoiding harsh geometries and straight lines makes the architecture softer and people feel invited, as if the building is hugging them. Additionally, orientation is important when designing for people with disabilities, especially ID ones, because wayfinding should come in a natural way with minimal signage. She also pointed out the importance of acoustics, as harsh sounds can often irritate people with developmental disabilities. Lastly, light, both natural and artificial, can play a huge role in the quality of a space.

3.2 Visiting Supported Living Housing

3.2.1 Petagma, Athens Greece

https://www.petagma.gr

The first supported living housing facility for ID adults I visited was '*Petagma'* in Athens, Greece, run by the Parents Association of the residents. *Petagma*, in Greek, is the act of a bird flying away. This name encompasses the philosophy that guides everyday life in this house: molding an individualized and creative environment where ID young adults can 'fly' towards independence (Petagma, n.d.). The professional team that supports the residents not only provides the necessary help when it comes to everyday life tasks, but also encourages them to act on themselves, by planning common joint activities towards social interaction and inclusion (Petagma, n.d.). During this fieldwork, I had the opportunity to make several observations that fall into three categories: legibility, living dynamics and spatial qualities.


Figure 9. Photograph of the Petagma supported living home, Athens, Greece.

Legibility

The building of *Petagma* is a repurposed apartment building with a pilotis, in the middle-class neighborhood of Vrilissia. The rear part of the pilotis accommodates administration offices and parking spots, while a small vegetable garden is located in the lateral part of the yard. The front part of the yard is used for physical and social activities: the residents have the opportunity to cultivate their own vegetables, play, have parties, or just socialize around the big wooden table of the patio (figure 10).

Part of my selective observations was focused on the *openness* to the neighborhood, since social interaction and inclusion in the local community improves the QoL of ID population (Bigby & Beadle-Brown, 2016). Activating the exterior space does not only let the residents have outdoor activities, but also allows for visibility to the rest of the neighborhood. During the informal interviews with the residents and staff, they all highlighted their preference to go on daily walks around the neighborhood, shop from the local stores and regularly visit the café at the nearby park. Architecturally, the formal language of the building also translates this openness (figure 10). The front fence of the facility was low, to allow for a visual connection to the pilotis. Additionally, while the administration office is open, the doors are open to visitors. This openness to the neighborhood can benefit the residents in terms of their social interaction, that is inherently connected with the QoL.

1 Car Entrance
2 Main Entrance
3 Vegetable Garden
4 Recreation Area
5 Entrance Hall
6 Accessibility Ramp
7 Administration Office
8 Kitchenette & Bathroom
9 Utility Room
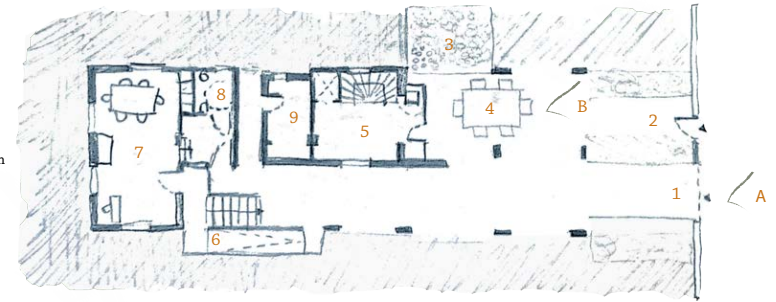
View A. Perspective sketch of entrance

Railing 1.2m high

Entrance door 0.8m high

View B. Outdoor recreational area with garden

Building Entrance

Vegetable Garden

Figure 10. Diagrammatic sketches of pilotis and entrance.

Living dynamics

The building has two additional residential levels; each one has four bedrooms (around 11 m² each, except for the cases of studios with individual bathroom, where the room doubles in size), a bedroom for the caretaker (around 10 m²), a kitchen (around 17 m²), a living room and common spaces (around 50 m²) and several balconies. As mentioned by the administrative staff, it is really important to keep the number of the residents as low as possible, with four being a satisfactory number and nine being the maximum, as determined by the Greek law.

1   Entrance
2   Office Space
3   Kitchen
4   Living Room I
5   Living Room II
6   Dinning Area
7   Caretaker Room
8   Bedroom
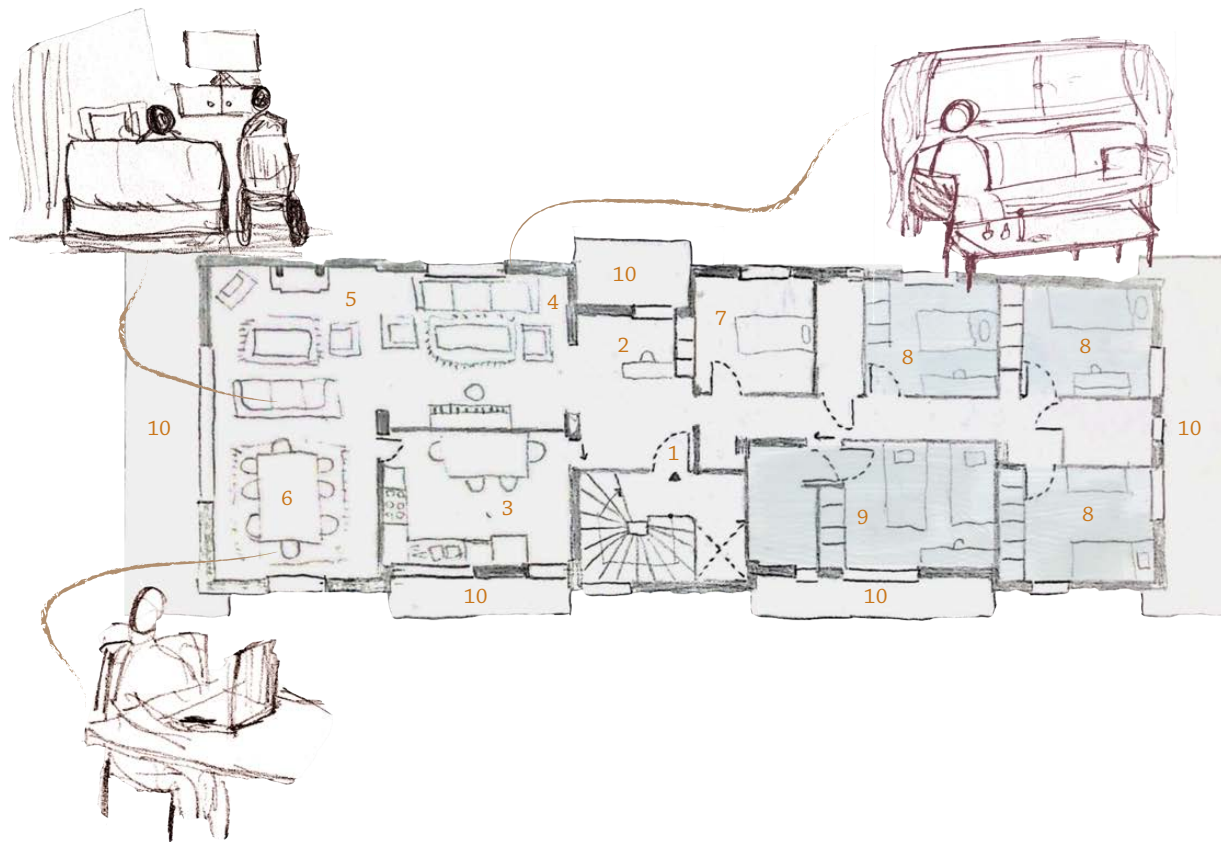9   Bedroom II - with Caretaker
10   Balcony

Figure 11. Petagma: diagrammatic sketch of the residents' favorite corner & floor plan of the first floor.

The level of ID severity of the residents varies; in general, on the first floor the residents tend towards a medium to severe level of impairment and on the second towards medium to mild. When I asked the residents if they like to spend time in their own bedroom or in the common spaces, unanimously expressed their preference towards staying in the living room. Yet, each person has a favorite corner, when they want to do an individual activity (figure 11).

On a daily basis, the residents of each floor have a stable routine, such as going to specialized IDD day schools, having dinner together and spending time in the common spaces, where they do jointly several activities. I had the opportunity to do participant observation during one of these activities, dance therapy, which is a form of therapy through movements and dancing (figure 12).

Spatial qualities and atmosphere

As I decided to selectively observe the spatial qualities of this supported living facility, I noticed that the living room is used as a multi-purpose hall for workouts, art activities, watching television or reading. It would be beneficial if there was a separate room for the art and physical activities, in case not all residents want to participate in them. Moreover, most rooms don't have individual bathrooms and there is not a guest room or a space for sessions with the psychologist and other professionals. These observations were very helpful, since they will guide the future program of the design.

Nevertheless, the lack of space is compensated by the positive atmosphere of the facility, which was very friendly and homelike, a feature that has a positive effect on the QoL of supported living residents (Bigby & Beadle-Brown, 2016). That was defined by all the objects

To the sound of the music the residents move freely and are encouraged to think of 'images' that make them feel good.

Each resident makes a move (1,2,3,4) to get the body warmed up and the rest follow and repeat this movement.

First, they pretend to be drinking coffee and at the end, while moving their arms and legs, they act like swimming in the ocean.
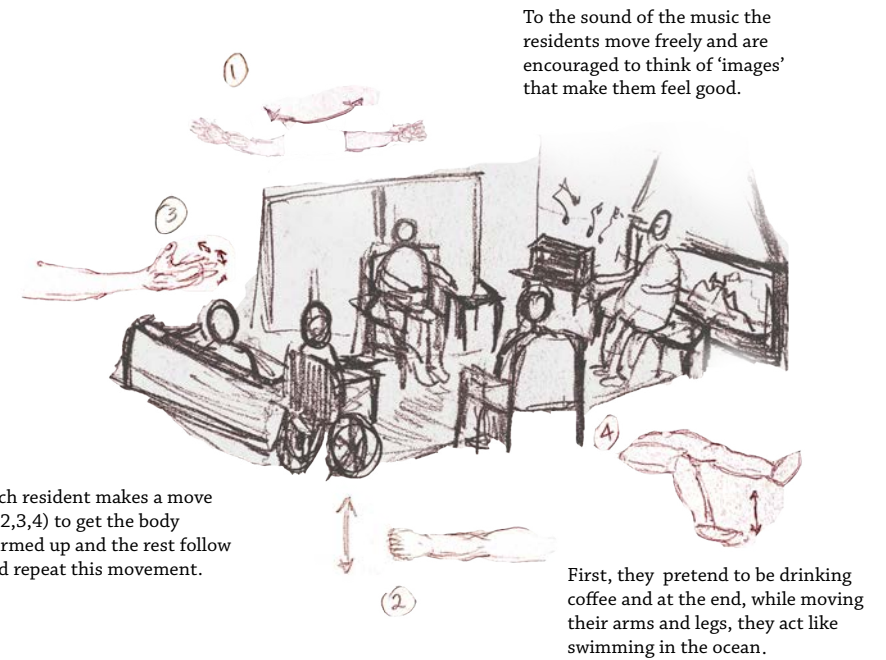
Figure 12. Petagma: diagrammatic sketch of dance therapy.

Figure 13. Petagma: collage of objects of various rooms.

that were located throughout the residents' rooms and common spaces: photographs of their families on their walls, schedules of their week timetables, religious icons, pillows, drawings and creative art made by themselves (figure 13). Each room was different and every resident had the opportunity to customize the room and furniture, which seems to be really important in creating an environment that does not resemble to an institution and respects ID people's right to self-determination (United Nations, 2006).

3.2.2 Jongerenwoonvorm Dawesweg, Rotterdam, Netherlands

https://pameijer.nl/locaties/
jongerenwoonvorm-dawesweg

To better understand how supported living homes for ID are structured in the Netherlands, it was important to also visit such a facility. Unfortunately, even though we contacted several supported living organizations, it was extremely difficult to get permission to visit a home independently, or as a group (2-3 students), especially if we didn't speak Dutch. As the administration of the facilities mentioned, due to the population being too vulnerable, our presence would create discomfort. This led me to think that despite the thoughtful act of protecting their residents, this practice could also be harmful for their social interaction, a very important domain of their QoL.

Nevertheless, we got permission to have a tour of the Jongerenwoonvorm facility in Rotterdam, that hosts ID adolescents and young adults (from 14 to 20 years old) who have intellectual disabilities combined with challenging behavior. An important asset for the location of this house was the tram station of Romeynshof being
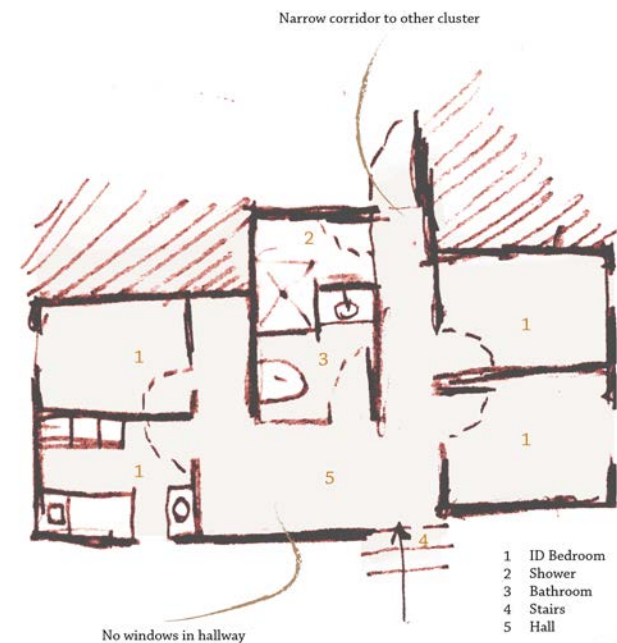

Figure 14. Jongerenwoonvorm: diagrammatic sketch of the first-floor plan with the bedrooms.

Figure 15. Jongerenwoonvorm : sketch of the exterior patio.

right outside the house, which gives the opportunity to the residents to independently visit the city. Each resident has an individual room and shares the kitchen, living room and bathroom. During my visit, the residents were not at home, therefore, my observations were non-participant and mainly architecturally focused.

The house is a two- story repurposed building. On the first floor there is the common kitchen and living room. The four bedrooms (around 8 m² each) are located on the second floor and they all share common bathroom and shower. All the rooms come with the same set of furniture, a bed, a desk and an additional sink (figure 14). Thus, the only option to customize the room is through objects and decorations. The upper floor of the house had limited natural light in the corridors, and the bathroom seemed outdated.

Yet, more attention was put on the newly renovated common spaces of the first floor, where the residents, according to the caretakers, prefer to spend most of their free time. Big windows allowed for views outside. Additionally, there was an outdoor patio garden, that was not fenced out (figure 15); this gives the opportunity to the residents to stay willingly at the house feeling that they live in an open facility that is not institutionalized. As the caretakers mentioned, the predominant goal of this facility is to teach residents to live independently, as a transitional state towards autonomous living.

3.3 Intellectually Disabled and the Public Realm

In order to get acquainted with the everyday routine of the target group and visualize the program for the design proposal, it was important for this body of research to also visit facilities that touch on the public domain, where ID supported living residents get educational training or/ and work. Thus, I visited two locations where IDD people spend the day outside the house, either working or doing extracurricular activities.

3.3.1 Myrtillo Café, Athens, Greece

https://myrtillocafe.gr/

Myrtillo Café is a social cooperative enterprise (café and cultural center for seminars and creative activities) located at a park in a central neighborhood of Athens and is run mostly by IDD young adults. The patio outside the café with the round tables and chairs is immersed in the nature and creates a getaway from the dense urban environment of the neighborhood (figure 16). The

Figure 16. Myrtillo Café: sketch of the exterior patio.

selection of the location of Myrtillo café promotes the biophilia theory and helps people who work or visit it connect with nature -refer to section 1.4.

During the informal interview I had with the waiters and the manager of the facility, I asked them about the spatial adjustments they had made to cater for the employees' needs; their predominant consideration was to have enough space for people with physical restrictions. My selective observation of the flow of employees with hyperactivity led me to the same conclusion: ID people need spacious environments to freely and safely move, in order to cater for their physical and material well-being, that is inherently linked with the QoL. (figure 17).
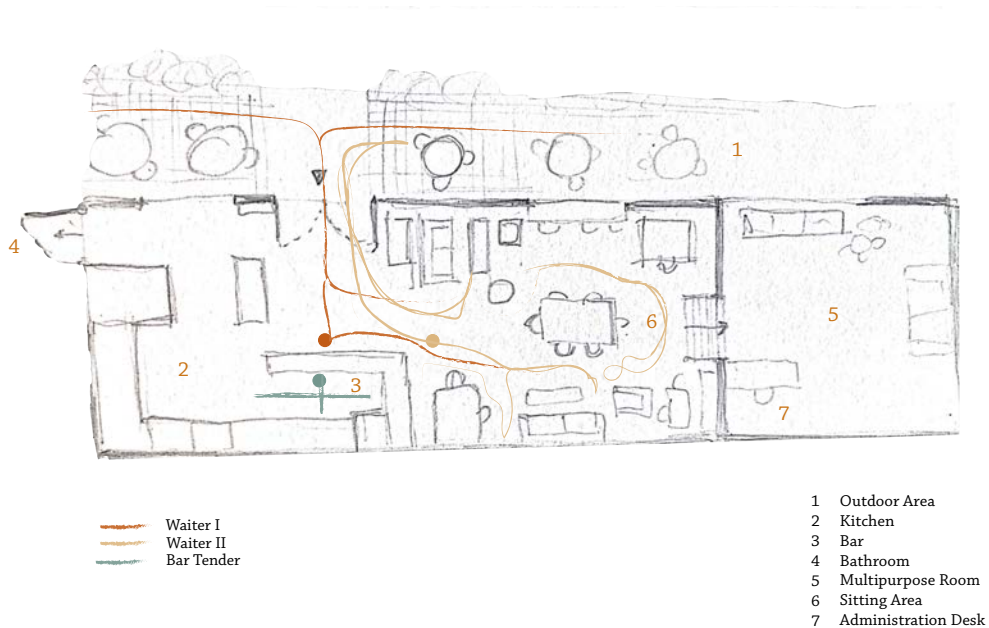
The interior of Myrtillo is filled with art and furniture that create intimate settings for the clients and employees, who feel like being in their living room. The couches, pillows, lamps, wall decorations, armchairs and tables are reminiscing of a domestic living room space, creating a welcoming atmosphere (figure 18).

Waiter I
Waiter II
Bar Tender

1   Outdoor Area
2   Kitchen
3   Bar
4   Bathroom
5   Multipurpose Room
6   Sitting Area
7   Administration Desk

Figure 17. Myrtillo Café: diagrammatic floor plan showing the circulation flow.

Figure 18. Myrtillo Café: perspective sketch and collage of objects.

3.3.2 Willlem Felsoord Daycare Center, Delft, Netherlands

https://www.ipsedebruggen.nl/ dagactiviteitencentrum-willem-felsoord

The last IDD facility I visited was a daycare center in Delft, that offers various activities for adults 18-65 years old. Willlem Felsoord Daycare Center is a repurposed building, renovated by Andrea Möhn and Bouman Architects. The interventions of the architects were focused on the façade, applying thatch, traditionally used in Dutch architecture on the roofs of houses, that is ecological and creates a domestic atmosphere (figure 19). The building is a two story structure with several creative art rooms, a gymnasium, low stimuli rooms for people to withdraw and meditation rooms (figure 20).
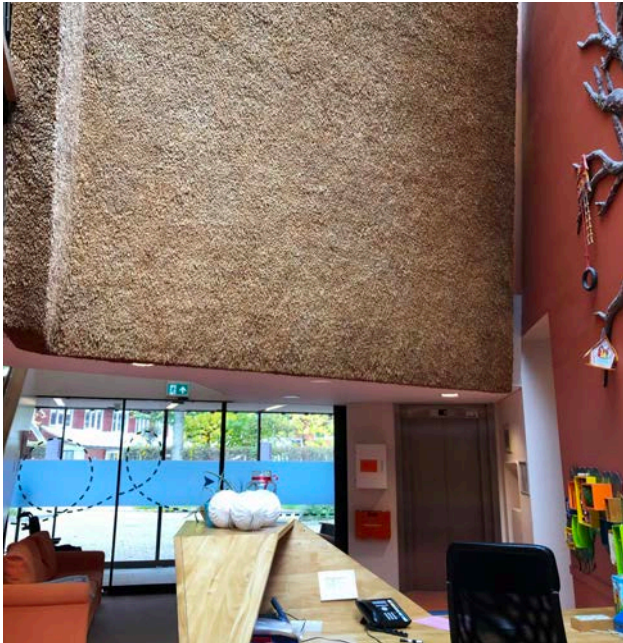

Figure 20. Willlem Felsoord Daycare: Photograph of the art room.

Figure 19. Willlem Felsoord Daycare: photograph of the entrance.

Figure 21. Willlem Felsoord Daycare: photograph of a room with beds.

The architect, by extending the materiality of the thatch to the main entrance, brings the outside in, and creates a calming atmosphere; this feeling is additionally enhanced by the selection of the warm colors such as the burnt orange and the artwork on the walls (figure 20). Yet, there were some objects, such as old steel beds, that were reminiscent of institutional settings (figure 21).

Observing the materiality in different scales, I noticed various objects available in the most of the rooms to stimulate the senses of the individuals: installations that play with seeing and hearing, water that brings calmness to the observer, various artificial light sources to change the atmosphere of the room and boards with diverse materials that exercise the sense of touch (figure 22).

The architectural interventions in Willlem Felsoord Daycare Center carry many qualities of healing architecture, regarding materiality. As DuBose et al., (2016) mention, the built environment doesn't have the ability to heal; but it can evoke emotions and behaviors that lead to healing. And I think that IDD people who visit this daycare center feel happy and relaxed going there.

Figure 22. Willlem Felsoord Daycare: collage of sensory objects around the building.

3.4 Precedent Studies of Supported Living Housing

Besides observing various facilities in real-life context, the study of existing supported living housing as precedents enriches this research in understanding the value architecture can add to the QoL of people with intellectual disabilities. This chapter presents three projects, that highlight some fundamental qualities bringing - in my opinion - value to the living environment of this target group: ***scale, identity, relationship with the surrounding environment, flexibility and privacy***.

3.4.1 Zig Zag

Architects: Andrea Möhn + Bouman Architects
Location: Nieuwveen, the Netherlands
Year of construction: 2015
Area: 4800 m^2

Figure 23. Zig Zag: photograph on top of the ramp.

Zig Zag is a supported living facility for IDD people. Before designing it, the architects had a conversation with their clients (IDD people) who had expressed the wish 'to live in a real house, like normal people' (Morgan-School of Architecture and Planning, 2019). For this reason, the façade of the building resembles the image of a typical house with a pitched roof (figure 23).

Human Scale

The building is a two story structure 110m long with individual apartments located on both first and second floor. A ramp wraps around the existing trees, creating an accessible path through the site that allows all residents to meander, touch and be besides the trees and the natural environment. In order to avoid the massiveness of the length of the building, the structure is broken into smaller volumes, rotated in different angles that create intimate exterior spaces that 'hug' the trees (figure 24). The reference of the trees can also be seen through the verticality and materiality of various objects in the interior and exterior of the building, bringing the image of nature to the built environment. In sum, this structure is based on biophilic qualities -refer to section 1.4- integrated in a human scale design (figure 25). This idea of integrating the building with the surrounding environment in multiple scales brings the architecture to a human scale, avoiding the image of institutionalization.

Identity

Besides keeping the character of the site, the architects respected the rights of disabled people to live independently in supported living environment -refer to section 1.2- and created a house having an identity for each resident and, at the same time, establish a feeling of equality. Therefore, each of the four volumes has an individual and identical entrance, with a bench that makes
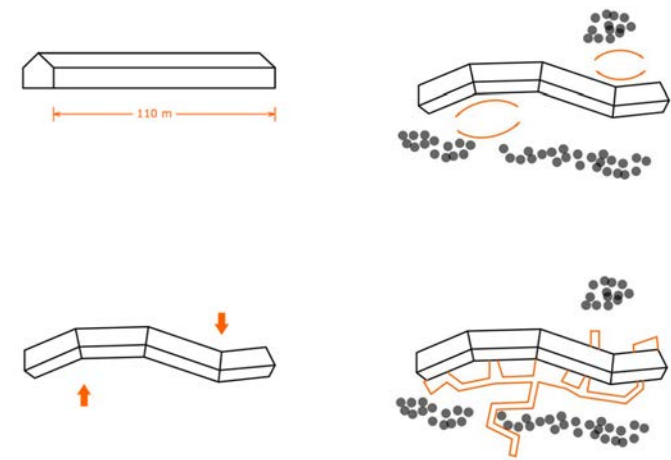

Figure 24. Zig Zag: diagram explaining how the volume is broken into smaller ones.

Vertical exterior railing

Vertical interior railing

Raised platform with vertical posts

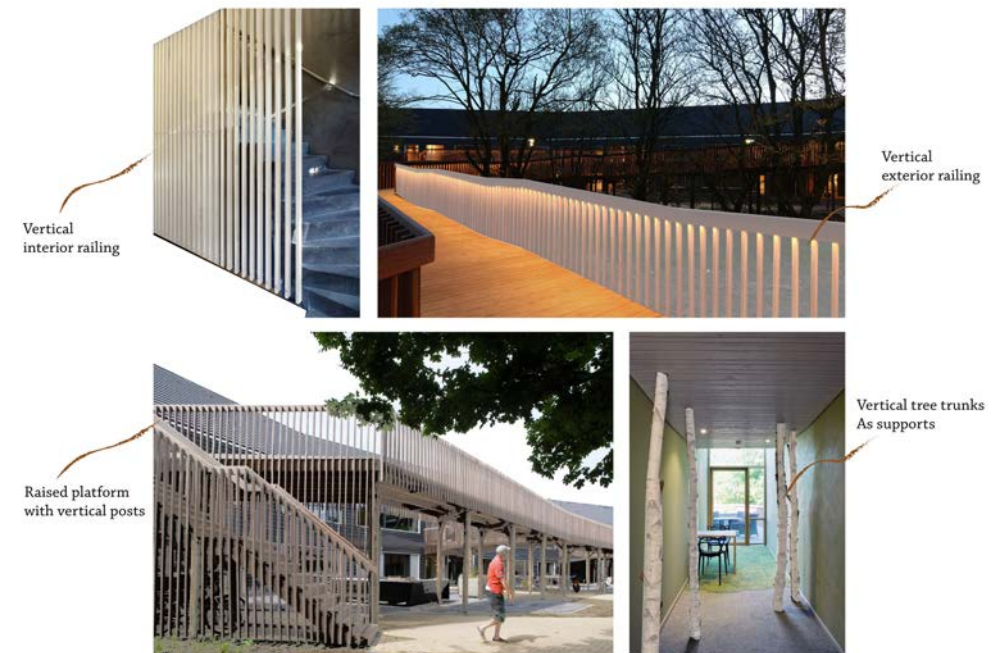Vertical tree trunks As supports

Figure 25. Zig Zag: collage highlighting the vertical elements.

the transition from inside to outside. The exterior of the building is covered with dark wood and the entrance is carved out of the volume, creating a white nook, that feels more private, but is also distinctive as it contrasts the dark façade (figure 26). The choice of the white color was made deliberately, to create a friendly atmosphere and lightness, as the weather in the Netherlands is dark most of the time (Morgan - School of Architecture and Planning, 2019). In the interior, they offer retreat green zones (figure 27), featuring moss-clad floors and birch trunks and communal kitchens where the residents can cook together.

Figure 26. Zig Zag: photograph of the entrance.

Figure 27. Zig Zag: photograph of a retreat room.

3.4.2 Huis aan 't laar

Architects: 51N4E
Location: Zoersel, Belgium
Year of construction: 2012
Area: 1320 m^2

Monnikenheide is a residential care complex in Belgium funded by the parents of an IDD boy in 1972 to create a more inclusive supported living model (Boie, 2022). It is comprised of several residential facilities, of different typologies, scattered in the Kempen region, offering care at suburban as well as more natural settings (figure 28), with the ambition to operate as 'substitute' families (Boie, 2022). Throughout the years, various typologies emerged experimenting with different architectural and spatial qualities.
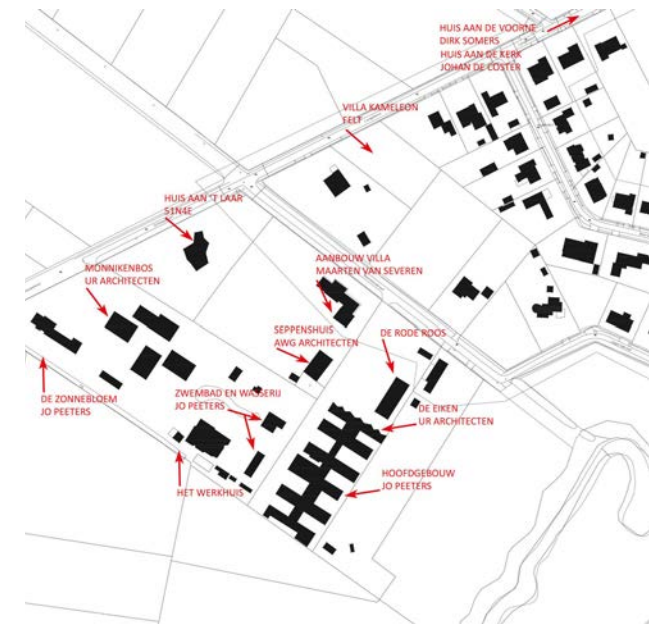

Figure 28. Map with the different typologies offered at the Monnikenheide residential complex.

One of these is Huis aan 't laar by 51N4E constructed in 2012. The architects designed a residential space in the forest of Zoersel for 16 young ID adults (Van Gerrewey, 2012). Divided in groups of eight, the individuals live in this house with the help of two caregivers (figure 29).

Integration in the natural environment

Although Huis aan 't laar, is located in the forest, the building volume does not superficially sit on the site. On the contrary, the formal qualities of the building are affected by the surrounding trees. The footprint of the building is irregular, yet carefully adapting to the unevenness of the surrounding natural forest, moving inward and outwards to encircle the trees (figure 30). The way the

building responds to the surrounding environment can enhance the direct and indirect experiences the residents have with nature, values that are closely connected with the principles of biophilic design -refer to section 1.4. The materiality of the façade, made out of carbonized Siberian larch, creates a black canvas contrasting the surrounding nature (Van Gerrewey, 2012). Thus, even though the house is visible from the far, it is hard to know of its actual function.

Figure 29. Huis aan 't laar: photograph of the building camouflaged behind the trees.

Figure 30. Huis aan 't laar: the building volume responding to the surrounding environment.

Flexibility

51N4e Architects respected the rights of ID residents for independent living, privacy and their additional needs -refer to section 1.1. As requested from the client, for the specific residents it would be better not to have direct contact with each other on a daily basis, therefore the façade acts like a shell that camouflages two identical houses. This separation is only visible through the core of the circulation. The split central staircase, therefore, becomes the connecting point of the two buildings. As indicated by the architects, this allows for a 'living-apart-together' living condition for the residents (51N4e Architects, n.d.). The irregular floor plan in the interior creates studios (around 27 m² each) that are all distinct, yet they can be divided in different living areas such as sleeping, lounge area or a sitting area. As a core value, every studio has at least one corner and two windows that look in different angles (figure 31). Therefore, each studio has distinct views, lighting conditions and atmosphere, something that plays an important role for the a quality of life that a habitat offers as suggested by the biophilic design principles as well.

Figure 31. Huis aan 't laar: the irregularity of the plan and placement of the windows allow for natural cross ventilation and distinct views.

3.4.3 Emiliani

Architects: UR
Location: Lokeren, Belgium
Year of construction: 2018 - competition
Area: 1300 m²

This project is the design product of UR architects for a competition coordinated by Emiliani, an organization that offers supported living housing to intellectually disabled adults. The facility accommodates 22 ID adults living in four single story homes for 5 to 6 residents each, that are interconnected with a corridor (Team Flemish Government Architect , n.d.).

Figure 32. Emiliani: photograph of the model for the proposal.

Spatial Configuration

The architects used four core principles for the design concept that meet the needs of ID adults for supported independent living, social interaction and privacy in an exemplary way -refer to sections 1.1 & 1.2. Firstly, each house has access to green space, offering four alternating gardens. Secondly, the rooms are spread out, distributing the residents throughout the building. This creates smaller cores of dwellings leading to an intimate family setting (figure 34). Additionally, each room has its own wheel chair accessible bathroom (around 20 m²) and every two rooms share a small porch. The orientation of each room differs, offering various views. Thirdly, the rooms have an inward and outwards orientation that allows for both views to the outside, and ample natural light, but also creates a connection with the communal spaces. The dining and living space are separated, placed diagonally to each other with varying ceiling heights, creating different atmospheres with the relationship to the environment (figure 33). Lastly, the four housing units are interconnected via a central corridor that does not only connect, but also 'thickens' to accommodate for the communal spaces. Therefore, the boundary between 'utility' and living space is blurred (figure 35).
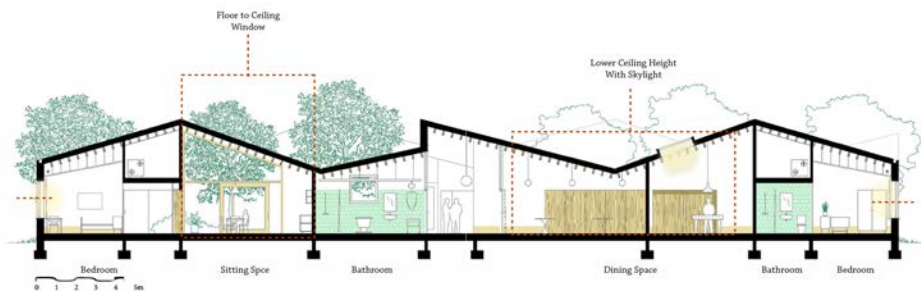

Figure 34. Emiliani: the bedrooms are spread out creating four dwelling cores.

Figure 33. Emiliani: the inward outward orientation and the various ceiling heights create different atmospheres.

Figure 35. Emiliani: the corridor 'thickens' to become the shared spaces.

Thresholds

One of the most distinctive features of this housing complex - and an important aspect for the living conditions of people with intellectual disabilities - is the protection of the individuality and privacy of the residents. For this reason, this project provides more open or closed pockets of spaces to gather or spend time alone. Terraces, verandas, bay windows, entrance portals and room niches offer different scales of intimacy providing more public or private spaces (figure 36). In addition, the gardens become a form of threshold that are designed to stimulate the senses; seasonal vegetables usually attract a variety of insects and birds bringing attention to biodiversity, scent and taste.
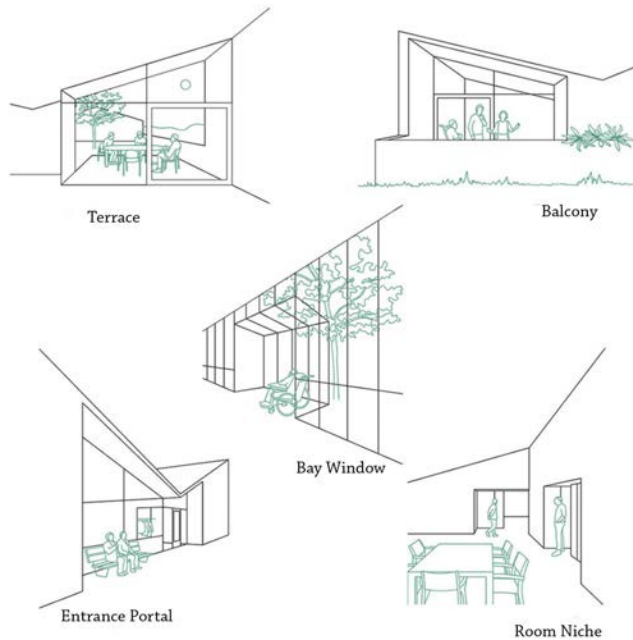

Figure 36. Emiliani: examples of thresholds.

⁴ Research sub-question 1: What cognitive and adaptive challenges do ID individuals who live in supported living housing face on a daily basis?

Chapter 4 │ *Towards the Design:*

Discussion, Architectural Implementation, Conclusions

4.1 Linking research findings to the research questions

Shifting towards the design, the literature review findings of this research and the empirical data from the fieldwork will be translated into an architectural language guiding the design decisions. In all steps of this research, the driving force was the rising need for additional supported living housing that will promote a better quality of life for intellectually disabled adults steering towards their independent life, one of the focal aims of our society towards their inclusion.

The research corpus has been a product resulted both from academic and ethnographic research, seeking the answer to the main research question *"how can biophilic design be implemented to improve the quality of life of adults with intellectual disabilities who live in supported living environments?"*

As the relevant literature suggests -refer to section 1.1-, the target group, individuals with intellectual disabilities (ID), face challenges⁴ on a cognitive and adaptive level of functioning, affecting learning, judgement and the practical skills needed for independent living. In some cases, their everyday life is more complex, as they

confront additional physical impairments, developmental conditions or challenging behaviors. The qualitative-ethnographic research I conducted and especially the fieldwork observations on supported living arrangements and the interviews -refer to chapter 3- validated these findings and additionally those related to *difficulties in orientation and wayfinding, sensory sensitivity*, and ID people's *needs for a well-established housing routine, privacy, social interaction, calmness and contact with nature*. The empirical research conducted, provided data on the behaviors, challenges and strengths of ID people and shed light on how they interact with the built environment.

The encouraging aspect the literature stresses is ID individuals' ability to learn the skills needed to live a more or less autonomous life, depending on their severity level. In most cases, living a self-reliant life is a feasible goal, given that *independent living is not a synonym of totally self-determining way of life and doesn't exclude receiving care and support*.

In such a context, in the last 20 years, new housing typologies have emerged -refer to section 1.2- to foster this vulnerable group's needs[5], ranging from skilled nursing facilities for the profound and severe cases, supported living arrangements for those needing supervised or occasional support, to the fully autonomous housing for those who feel confident living by themselves.

The choice of the type of housing is closely associated with the Quality of Life (QoL) -refer to section 1.3- of intellectually disabled[6], as the built environment is correlated with all the eight components of QoL, and especially with the material well-being. Unfortunately, *studies over the last two decades have shown that the QoL of ID individuals is lower, compared to individuals without disabilities*.

[5] Research sub-question 2: What types of supported living housing are currently accessible to ID adults to accommodate their right to independent living?

[6] Research sub-question 3: How is the quality of life (QoL) defined for people with intellectual disabilities (ID) and what is its relevance when it comes to the built environment?

Among the housing options available, supported living housing seems a very good option for a wide range of ID cases, as the caregivers live on site and offer individualized support; the relevant literature indicates that *a small-scale living facility between 1-6 people with a safe and pleasant home-like environment provides a higher QoL to them*. Fieldwork data - refer to section 3.2 - strongly suggest that when *located in the heart of a neighborhood, accessible by public transportation and close to public functions*, the supported living house seems ideal for intellectually disabled residents. *Such a program will also benefit from hybridity*, combining dwellings with recreational and therapeutic facilities that can enhance the health and well-being of both the intellectually disabled population and the neighborhood community.

All these findings support the idea that architecture can 'make a difference' in the living arrangements of ID people and can improve their independent living, material well-being and social interaction. The study of existing supported living housing as precedents enriched the above-mentioned data in understanding the value architecture can add to the QoL of people with intellectual disabilities.

Biophilic design, in particular, can play an incentive role in the composition of an architectural language that caters for all dimensions of QoL- refer to section 1.4; by creating a positive relationship between the built and natural environment, it amplifies the benefits of this co-existence for the users. *Biophilic qualities are extremely beneficial for the ID population, as they may reduce stress and negative emotions, relieve pain, support positive emotions and improve cognitive function*.

For this research, in order to set a design framework that improves the living environment of ID adults, nine patterns were chosen[7] to inform the design process: visual and non-visual connection with nature, thermal airflow variability, presence of water, dynamic and diffuse light, connection with natural systems, material connection with nature, prospect and refuge. The element of water, in particular, is important as its inherent qualities do not only benefit the health of the user, but can also play an instrumental role as a design element. Additionally, for ID people, *water-based interventions, such as hydrotherapy and swimming, can have a positive impact on their functional skills, as well as on their psychology.*

4.2 Limitations and Recommendations for Further Research

Intellectually disabled people form a relatively small group (1-3% of the global population) comparing to other developmentally disabled or broader disability groups. Moreover, until the late 20th century scientists believed that ID people were not easily trainable and, thus, most of them were institutionalized. As a result, little research has been done on the field of the built environment for the ID and the QoL associated with their housing options; *due to the limited research done so far, it was difficult to compare the findings from multiple research entries and have a sound theoretical guidance.*

Fieldwork and empirical data gathering on ID people's housing arrangements have also been proven extremely difficult in the Netherlands, especially for non-Dutch speakers. However, the insight gained by visiting supported living facilities for ID individuals in Greece and the Netherlands was extremely helpful - refer to section 3.2- in understanding the challenges and strengths of ID people and how they relate to the built environment.

[7] Research sub-question 4: What principles of biophilic design can be used as tools to propose a new model of supported living housing for ID people?

Nonetheless, *this limited theoretical research along with the empirical data collected provide evidence that it is worth investing on the housing facilities for this vulnerable population.* This is not only because the UN Convention on the Rights of people with Disabilities (2006) suggests it and the demand for the care of ID people rises every year, but mainly because the neurotypical population can benefit from interacting with them.

4.3. Implementation - Translating Data into Design Qualities

Setting the quality of life of ID people as the common denominator and the human scale as the umbrella that shields the design of a supported living environment, three themes arose that will guide the design process: social and spatial accessibility, scale and program and, finally, biophilia and atmosphere.

Figure 37. Translating data into design qualities, concept sketch.

4.3.1 Social and Spatial Accessibility

The first guiding theme that offers several architectural values to the design is **accessibility**, both **spatial and social**. A living arrangement that is a. **located in the heart of a neighborhood**, b. **accessible by public transportation** as well as by bike and pedestrian routes and c. **close to public functions** encourages social interaction and inclusion as well as the development of the social skills of ID adults: it gives them the opportunity to easily reach daytime activities, social events, the local market and their work, in case they have a job.

Openness to neighborhood is, thus, important not only for them but also for the local community; in fact, my observations led me to believe that this type of interaction is mostly beneficial for the non-disabled, as they have the opportunity to open-up and accept the many forms of diversity. Architecturally, the location of the site and the building can undoubtedly influence the relationship with the surrounding neighborhood which can also be enhanced programmatically by offering shared activities that are tightening the bonds of the whole community.

Additionally, for the ID population **privacy** and **safety** are equally important. Even though research suggests minimal fencing to prevent institutionalized settings, various types of **thresholds** can be utilized to maintain those qualities, while, at the same time, they may offer diverse spatial options to cater for individuality and ID people's right to shelf determination. Therefore, for the architectural language, the **strategic use of landscaping, water and green spaces** plays a catalytic role in the creation of soft boundaries between public, semi-public and private use at the site scale and building scale (figure 38).
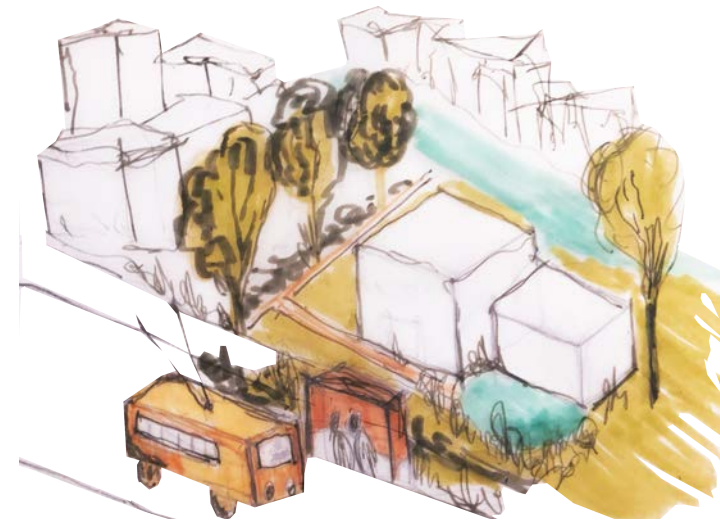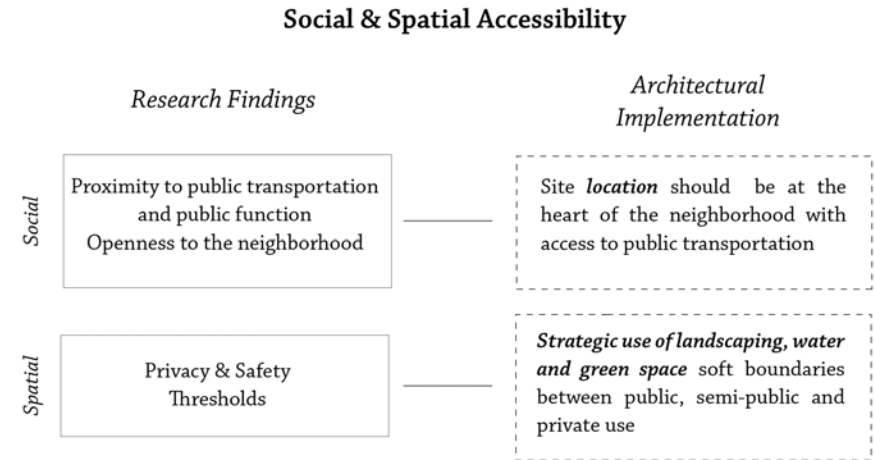

Social & Spatial Accessibility

	Research Findings		*Architectural Implementation*
Social	Proximity to public transportation and public function. Openness to the neighborhood		Site *location* should be at the heart of the neighborhood with access to public transportation
Spatial	Privacy & Safety Thresholds		*Strategic use of landscaping, water and green space* soft boundaries between public, semi-public and private use

Figure 38. Social and spatial accessibility for ID people's supported living facilities: research findings and their architectural implementation.

4.3.2 Scale and Program

The second theme that influences the design process is **scale and program.** According to research, a small-scale living facility seems ideal for ID residents in supported living settings. No matter how large the area of the plot and the apartment complexes are, the ideal number of **residents per unit in most cases is four**, as the relevant literature suggests, with a provision of **one to two caregivers**. Additionally, for hygienic and privacy reasons, it is preferable that the facility offers **individual bathrooms**. Last, emphasis should be put on the **common spaces**, as they are usually used for long hours, when the residents are at home. However, it is important that the design provides **various scales of intimacy:** common spaces with intimate pockets, shared outdoor patios and individual balconies can cater for the preferences and personality needs of each individual. Within the building organization, **wayfinding and orientation** should be kept as straight forward as possible with minimal signage.

Taking into account residents' needs, the program of the facility can benefit from **hybridity**, combining dwellings with other types of buildings that cater activities enhancing the health and well-being of both the ID population and the neighborhood community. Towards that end, spaces for **recreational and therapeutic activities** such as creative (e.g. painting, music, drama, dance) and physical fitness ones (e.g. working out, swimming, water aerobics), although extremely beneficial, are better to be separated from the living environment of the 'home', for privacy reasons. Therefore, translating this into an architectural strategy, the use of a distinct **dwelling cluster that is linked to the communal and public facilities** may promote the physical and emotional well-being of intellectually disabled, ultimately improving their QoL (figure 39).
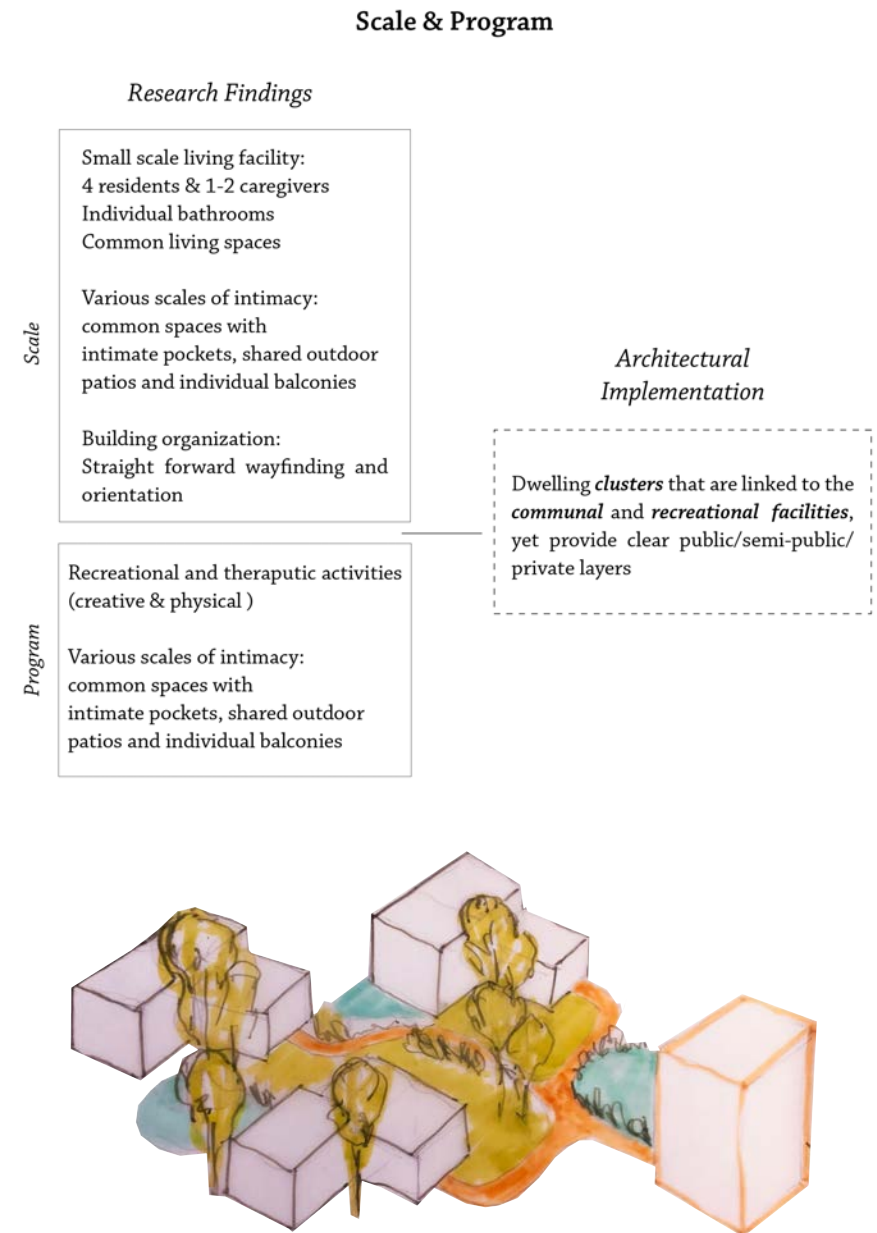
Scale & Program

Research Findings

Small scale living facility:
4 residents & 1-2 caregivers
Individual bathrooms
Common living spaces

Various scales of intimacy:
common spaces with
intimate pockets, shared outdoor
patios and individual balconies

Building organization:
Straight forward wayfinding and
orientation

Scale

Architectural Implementation

Dwelling *clusters* that are linked to the *communal* and *recreational facilities*, yet provide clear public/semi-public/private layers

Recreational and theraputic activities
(creative & physical)

Various scales of intimacy:
common spaces with
intimate pockets, shared outdoor
patios and individual balconies

Program

Figure 39. Scale and program for ID people's supported living facilities: research findings and their architectural implementation.

4.3.3 Biophilia and Atmosphere

Lastly, the chosen biophilic patterns -refer to section 1.4- and their atmospheric implications come in line with the needs and characteristics of individuals with intellectual disabilities. The **visual connection**, as well as the pattern of **prospect** can stimulate the senses of ID adults and offer them qualities that nurture their emotional well-being and functional skills, aspects that are closely linked to the QoL. In addition, ample **natural and artificial light** as well as **thermal airflow variability** that mimics the natural environment play a catalytic role in the atmospheric quality and the salutary condition of the spaces. At the design level, light and airflow play an important role to the building orientation and the placement of the openings, so that they offer both views and natural ventilation, as well as the connection to the outdoor spaces.

The **presence of water**, architecturally can take the shape of ponds and canals that form the landscaping, but at the same time water can been seen as a programmatic (e.g. swimming pools) and infrastructural (e.g. rainwater collection) tool; in such a way, the presence of water can offer various atmospheres throughout the design, while creating a multisensory experience for the residents.

This design approach can also be positively affected by the **connection with natural systems and the seasonal transitions**, by implementing various types of gardens, for instance, water gardens, herb gardens, and seasonal gardens; such interventions can also enhance the senses of smell, touch hearing and taste and promote the **non-visual connection with nature**. Moreover, **refuge**, as a pattern, influences the various scales of intimacy where users can disengage, an important aspect to take into account while designing for ID. At the design level, this can be implemented both at the exterior, providing varying scales of green space, and the interior with the creation of bay windows.

Last, but not least, **natural materials** are important while designing for ID people, as the tones and their atmospheric qualities can bring calmness and tranquility. Therefore, the careful consideration of materiality, catering towards the needs of the ID adults but also environmental sustainability will influence not only the QoL of this vulnerable group, but also the environmental impact of the facility (figure 40).
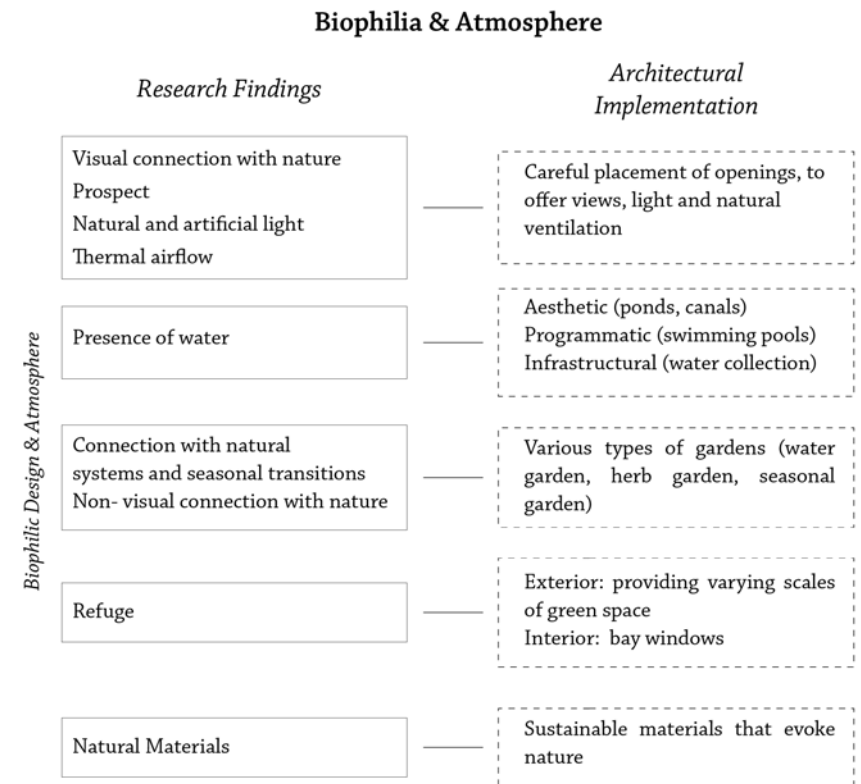
Biophilia & Atmosphere

Research Findings		Architectural Implementation
Visual connection with nature / Prospect / Natural and artificial light / Thermal airflow	—	Careful placement of openings, to offer views, light and natural ventilation
Presence of water	—	Aesthetic (ponds, canals) / Programmatic (swimming pools) / Infrastructural (water collection)
Connection with natural systems and seasonal transitions / Non- visual connection with nature	—	Various types of gardens (water garden, herb garden, seasonal garden)
Refuge	—	Exterior: providing varying scales of green space / Interior: bay windows
Natural Materials	—	Sustainable materials that evoke nature

Biophilic Design & Atmosphere

Figure 40. Biophilia design and atmosphere for ID people's supported living facilities: research findings and their architectural implementation.

Figure 41. Supported living housing, design concept sketch.

Retracing back to this research, I realized that the task of designing a supported living environment for ID adults is not easy, as it requires a thorough understanding of their specific needs. ***To improve their quality of life, it is important to architecturally respond to their needs and rights: independence, social inclusion and well-being.***

Promoting the independence of ID people is not an act of limiting caretaking and receiving help. It is rather an initiative to offer them ***spatial opportunities that promote social interaction and a safe space*** where they can spend time by themselves. Architecturally, at the scale of the home, this takes the shape of offering ***flexible common spaces as well as individual bedrooms***. Programmatically, ***spaces for social activities in the nearby wellness center*** -including a swimming pool, a café and a gymnasium- for the whole community is a way not only to promote ID peoples' social interaction with neurotypical people, but also a place for them to work and take care of their physical health.

Yet, researching and designing has been a reciprocal process, where one informs the other. While putting theory into practice, I studied more precedents, tried a couple of design ideas and discussed my thoughts and creative frustration with my design and built technology advisors during our weekly meetings. This constructive process led me to reevaluate my preliminary sketches and massing ideas a couple of times before reaching a feasible design suggestion.

Throughout the initial design process, I was wavering between the idea of an apartment building opposed to separate dwelling clusters. Although, for financial reasons,

the apartment building would be preferred as it can hold more apartments, I chose to base the design on the use of individual clusters that are connected with paths and various types of gardens. Architecturally, I thought that individual houses would create a simpler building organization and *straight forward circulation paths, desirable attributes for the target group of intellectually disabled*. At the same time, this specific organization of the clusters leads to a *direct connection with the natural environment, both on the ground level and the rooftops, linking the natural environment with the urban one*. Lastly, the individuality of the houses resembles a *small village, where a strong community can be formed and social interaction is encouraged*.

My final suggestion for the 6.400 m^2 site located at Lelystad, Netherlands, is based on biophilic design (figure 42); it consists of three clusters of supported living houses for ID individuals hosting 36 residents and their caretakers and a wellness center (gymnasium, swimming pool, multipurpose facility and a café) shared with the community. The dwelling clusters, with rooms having views to gardens and water (canal, water landscaping), are placed close to the canals so the residents have direct relationship with nature, and the wellness center is situated by the side of the street, to be accessible by the whole community. *The 'in-between' space acts as a boundary between the public and the private and becomes an opportunity for the creation of gardens*.

The integration of public functions is important both for the intellectually disabled people and the neighborhood at Lelystad, that is lacking amenities. According to my research, ID people and the local community would both benefit if engaged in common activities, such as being colleagues at a work environment. If properly trained, ID individuals can be very productive in low-skilled manual

jobs, helped by non-intellectually disabled personnel in management and digitalized procedures.

This research and its architectural implementation, places the humans in the center, setting the focal point to designing an environment that offers a good quality of life for individuals with intellectual disabilities. As Colomina and Wigley (2017, 127) put it:

"Human is a magic word invoked to make design seem more ethical, sensitive, organic, responsive, and responsible."

Figure 42. Implementation of research findings: site plan concept sketch.

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List of Figures

Appendix I

Intellectual Disability Definitions

Deinstitutionalization: the transition from institutions to community-based housing environments (FRA, 2017).

Disabled individuals: (often referred to as people with disabilities) Individuals with physical, mental, intellectual or sensory impairments (United Nations, 2006, article 1).

Independent living: having the freedom of choice and control to decide where, with whom and how to live. Supervision and support may or may not be provided (ENIL, 2022).

Intellectually disabled (ID) individuals/people: individuals with limitations in the cognitive domain - mainly in learning, problem solving and judgement- and in adaptive functioning of everyday life - primarily in independent living, practical skills and social interaction (APA, 2013).

Neurodevelopmental disorders (IDD): disabilities of the nervous system and the brain that may coexist with other physical impairments (NICHD, n.d.). See also figure 3.

Quality of life (QoL): a multidimensional construct, consisting of the same factors for all people that has subjective and objective components covering three main domains: independence, social participation and well-being (Memisevic & Djordjevic, 2019).

Social inclusion: participation in community-based and societal activities. In the case of ID individuals, social inclusion means creating an inclusive environment in which ID people can be themselves and their rights are respected (Matheis, 2019).

Appendix II

Housing Typologies for ID Individuals Definitions

Family home: a residence shared by a person with ID and his or her related family members (Larson et al, 2021).

Group home: the definition varies from country to country since a group home can be managed by a public or private organization or by the individuals themselves. In this research the term is used in its broad meaning: A 24/7 supervised housing establishment where two or more people with disabilities live and receive support.

Host family home: ID people live with a family other than their biological and receive support (Martin et al. 2019).

Independent living house: ID people live by themselves and receive no support.

Independent supported living house: ID individuals live on their own or with roommates, and receive occasional support according to their needs (Bigby & Beadle-Brown, 2018).

Institution: a large public facility where many people with disabilities live together (Connery, 2016).

Nursing home: a private residential care facility for disabled individuals and elderly people.

Shared apartment: often referred to as shared living arrangement, adult foster care or paid roommates. An ID person lives with a roommate who is paid to provide support (Connery, 2016).

Skilled nursing facility: a residential care facility staffed with medical professionals.

Supported/assisted living housing: often referred to as supervised supported living or supported community living arrangement. Various types of housing where usually 2-8 ID individuals live and receive 24/7 supervision and support (Bowers, 2019).

Village community: a type of clustered housing where the support is provided by volunteers who live communally with ID people (Roebuck, 2021).

APPENDIX III

Architectural Principles and Design Definitions

Biophilia:

the inherent human inclination to affiliate with nature that results in people's physical and mental health and well-being (Kellert & Calabrese, 2015).

Biophilic design:

the design process that lies on the inherent relationship of human beings with nature and contributes positively to their health and well-being (Bolten & Barbiero, 2020; Kellert, 2018).

Built environment:

a "human-made space in which people live, work, and recreate on a day-to-day basis. It involves building design, interior and outdoor spaces, decoration, and the use of art" (Roos, J., et. al, 297).

Healing architecture:

the architectural practice that leads to the creation of an environment that promotes physical and psychological health and/or leads to a fast recovery (DuBose et al., 2016).

Evidence-based design:

Design based on research outcomes. In the healthcare settings it aims to improve health and well-being (Menezes et al., 2022; Valera Sosa, 2019).

APPENDIX IV

Ethnographic Research Methodology

Active-participant observation:

observation in which the researcher is part of the group being observed (Kras, 2018).

Architectural case study analysis:

a study of the characteristics of an architectural structure in its built environment (Groat & Wang, 2013).

Ethnographic research:

a research method of collecting data by fieldwork mainly through observation, interviews and other tools of qualitative research (Groat & Wang, 2013).

Informal/unstructured interview:

informal conversation to gather background information (Finesurrey, 2018).

Selective/non-participant observation:

observation in which the researcher pre-determines its focus and concentrates only on the selected objective (Kras, 2018).

Semi-structured interview:

semi- informal conversation based on a set of questions but open to comments and additional ones (Finesurrey, 2018).