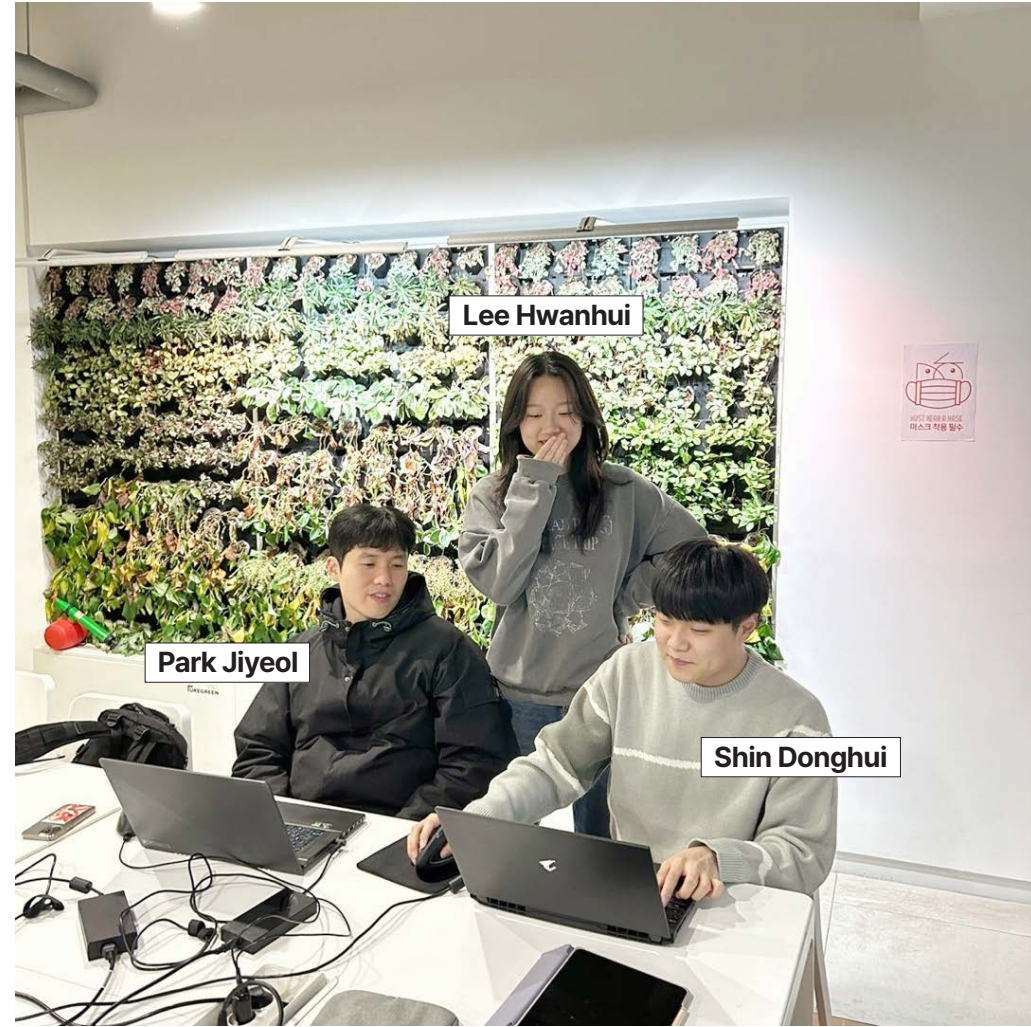




From Boundary to Gateway

LEE HWANHUI - PARK JIYEOL - SHIN DONGHUI



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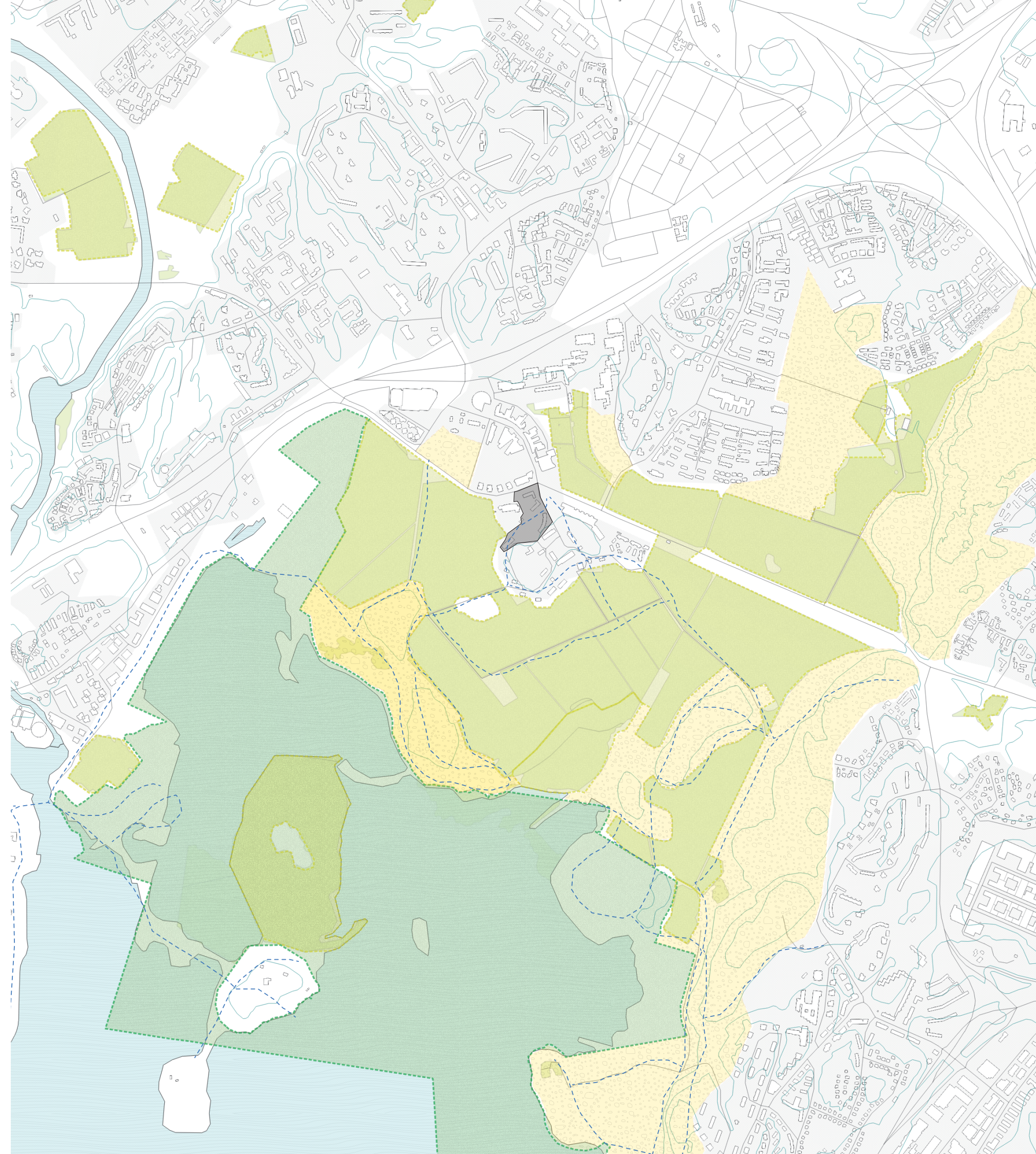
01

Introduction

Abstract

Site Analysis

Project Goal





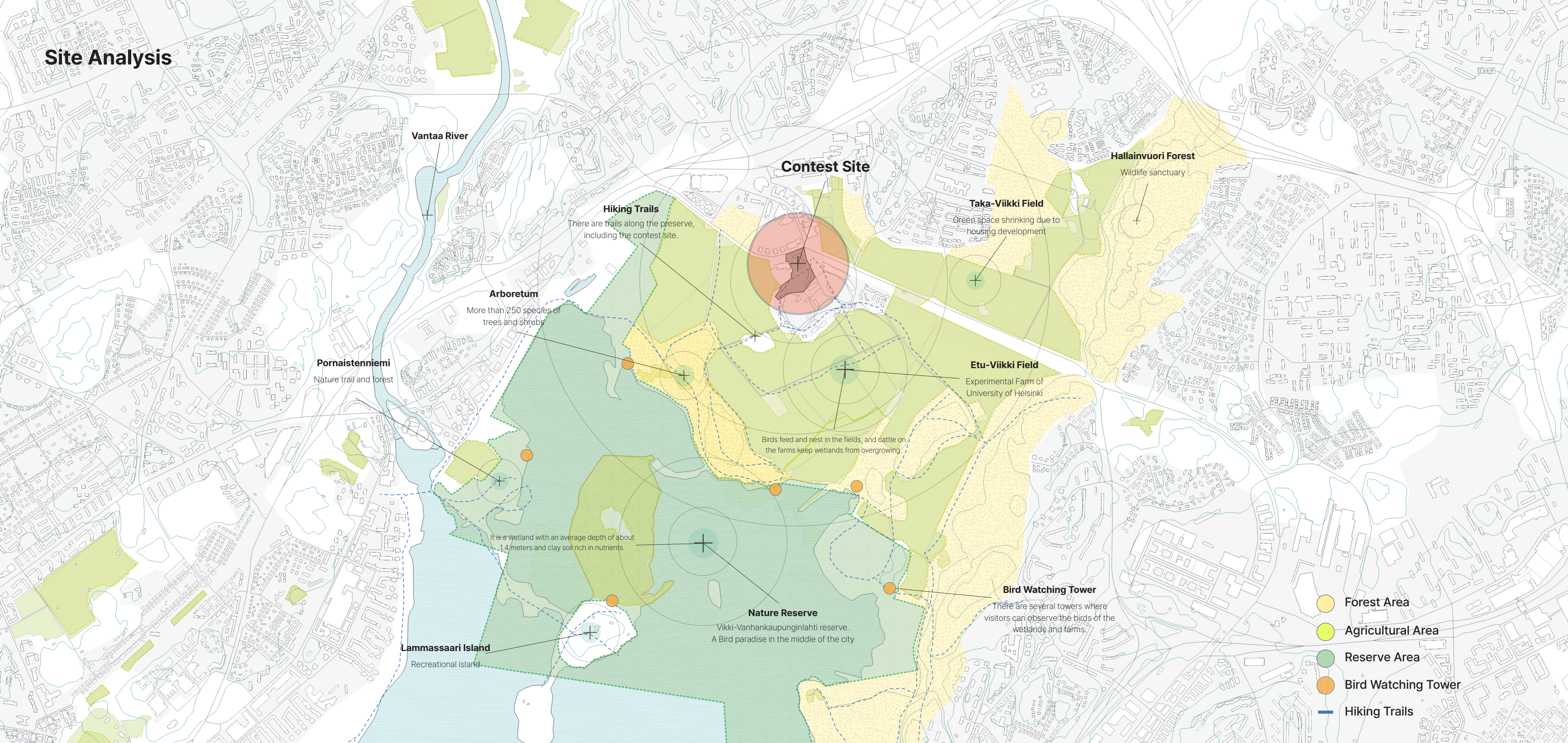
Abstract

This project offers nature-friendly experience for both residents and visitors, guiding them through the beautiful nature reserve surrounding the contest site. Recreational and enjoyable places are available along the way for various activities. All pathways and outdoor spaces are designed to follow the natural topography, enhancing the richness of the outdoor environment.

The project invites the light and nature of Finland into the interior space, creating a residence based on its locality. This main idea is represented by the concept of 'Barnacle', which is a medium that makes 'nature and light' an everyday presence over the project. The renovated building respects the original topography and creates more accessible environment by connecting circulation routes that were disconnected due to ground level differences. In terms of circularity, all buildings in the project adopted the flexible system based on the utility core, which can respond to changing future demand.

The old museum's outside wall is used for an outdoor exhibition, respecting the atmosphere and history of the building. Facing the nature of the reserve, it welcomes visitors and conveys a variety of information about the beautiful nearby nature, flora and fauna.

Site Analysis



Ecological Context : A paradise for both humans and nature

The contest site is surrounded by a beautiful and ecologically important natural environment. It is not far from the center of Helsinki, which makes it an educational and recreational space for citizens, as well as a habitat for birds and other plants and animals. Furthermore, to the south of the contest site is the University of Helsinki's experimental farm, which is connected by a walking path through the contest site, which leads to the reserve and is a frequently used trail.

Species Diversity in the Viikki Region

1 Bearded reedling

Panurus biarmicus



①

2 Caspian tern

Hydroprogne caspia



②



③



④

3 Citrine wagtail

Motacilla citreola



⑤



⑥



⑦



⑧

4 Eurasian bittern

Botaurus stellaris

5 Starling

Sturnus vulgaris



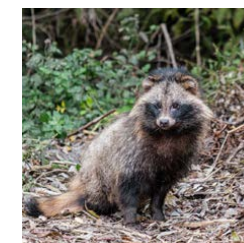
⑨



⑩



⑪



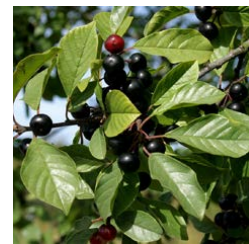
⑫

6 Water rail

Rallus aquaticus

7 Sedge warbler

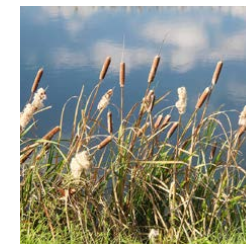
Acrocephalus schoenobaenus



⑬



⑭



⑮



⑯

8 Thrush nightingale

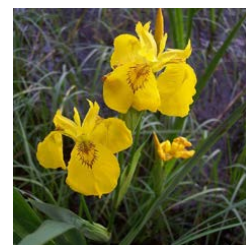
Luscinia luscinia

9 Marsh harrier

Circus aeruginosus



⑰



⑱



⑲



⑳

10 Northern lapwing

Vanellus vanellus

11 Raccoon dog

Chiroptera

12 Raccoon dog

Nyctereutes procyonoides

13 Alder buckthorn

Rhamnus frangula

14 Silver birch

Betula pubescens

15 Bulrush

Typha latifolia

16 Common alder

Alnus glutinosa

17 Yellow water-lily

Nuphar lutea

18 Yellow iris

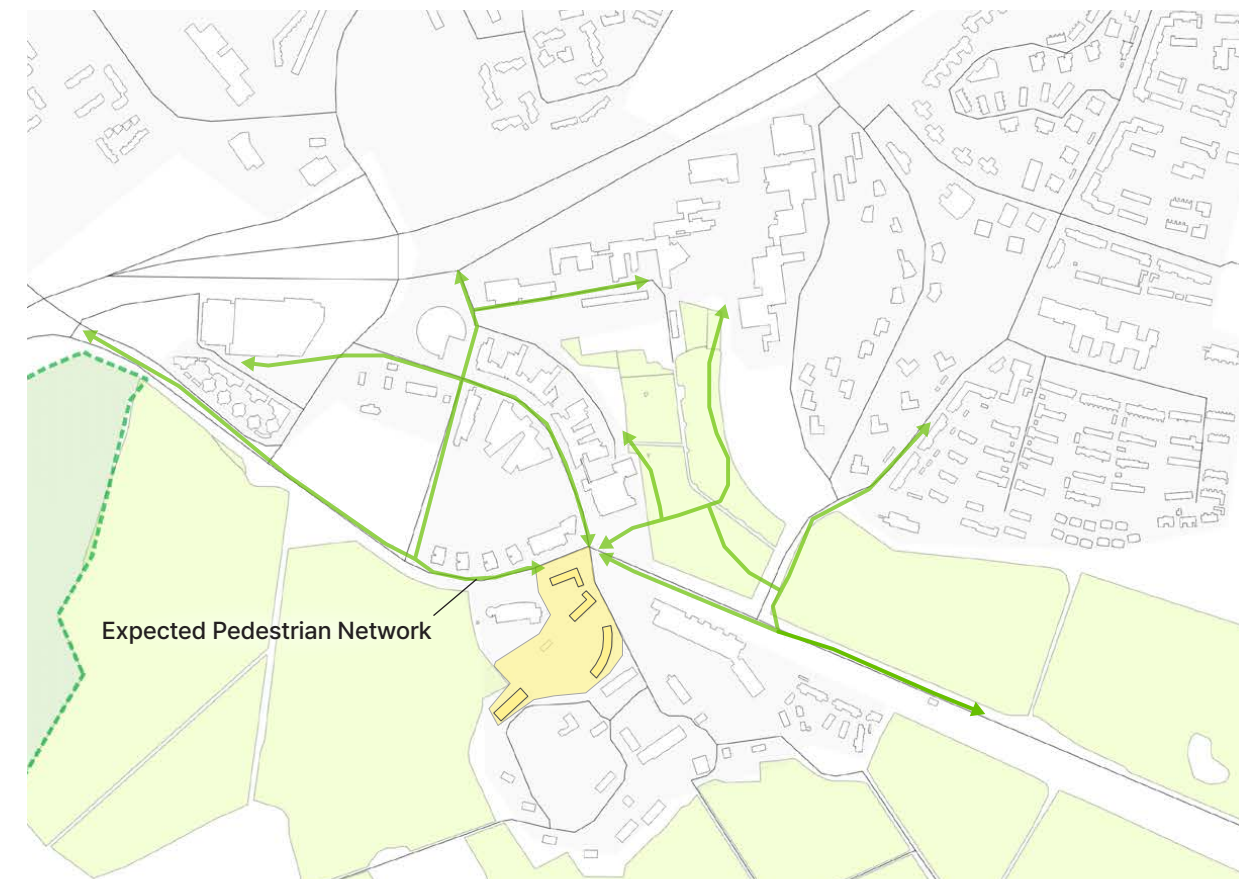
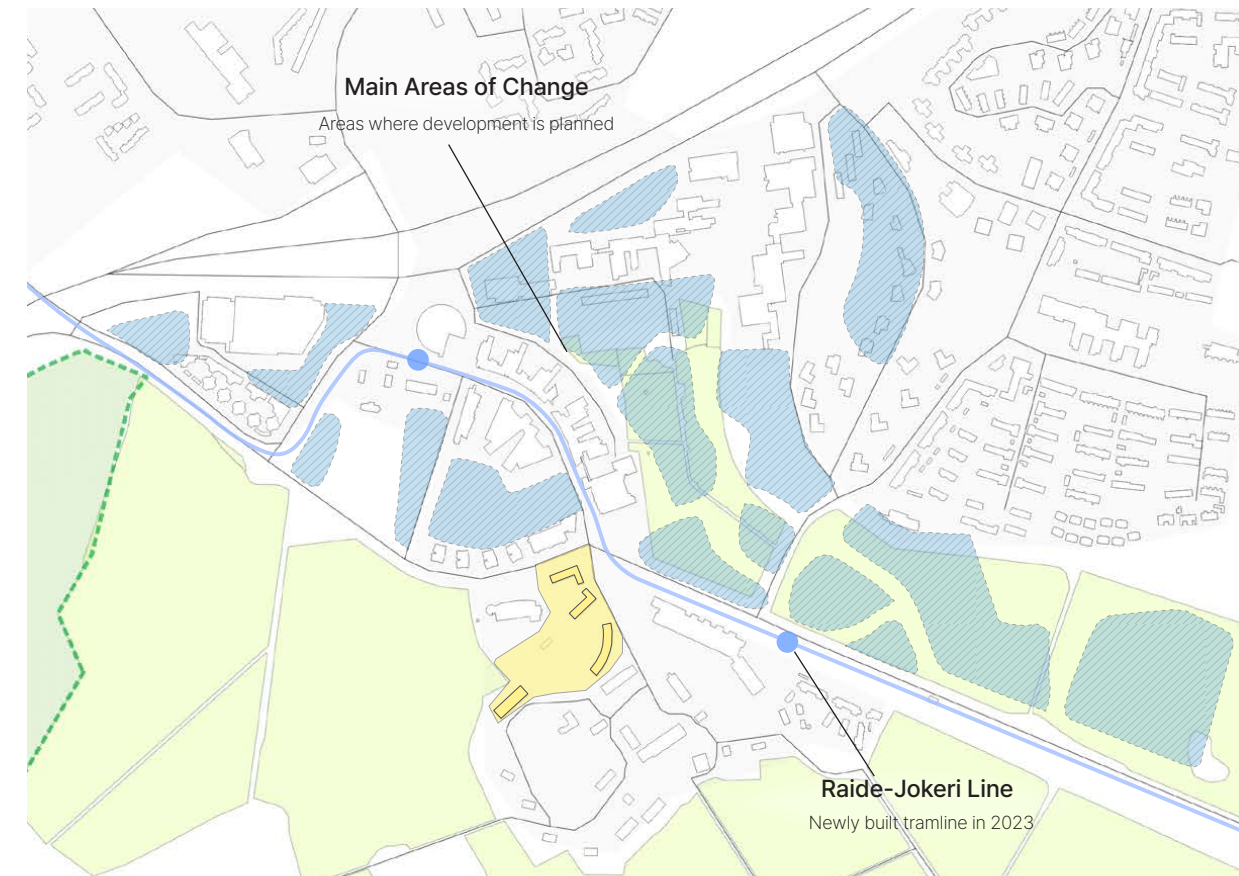
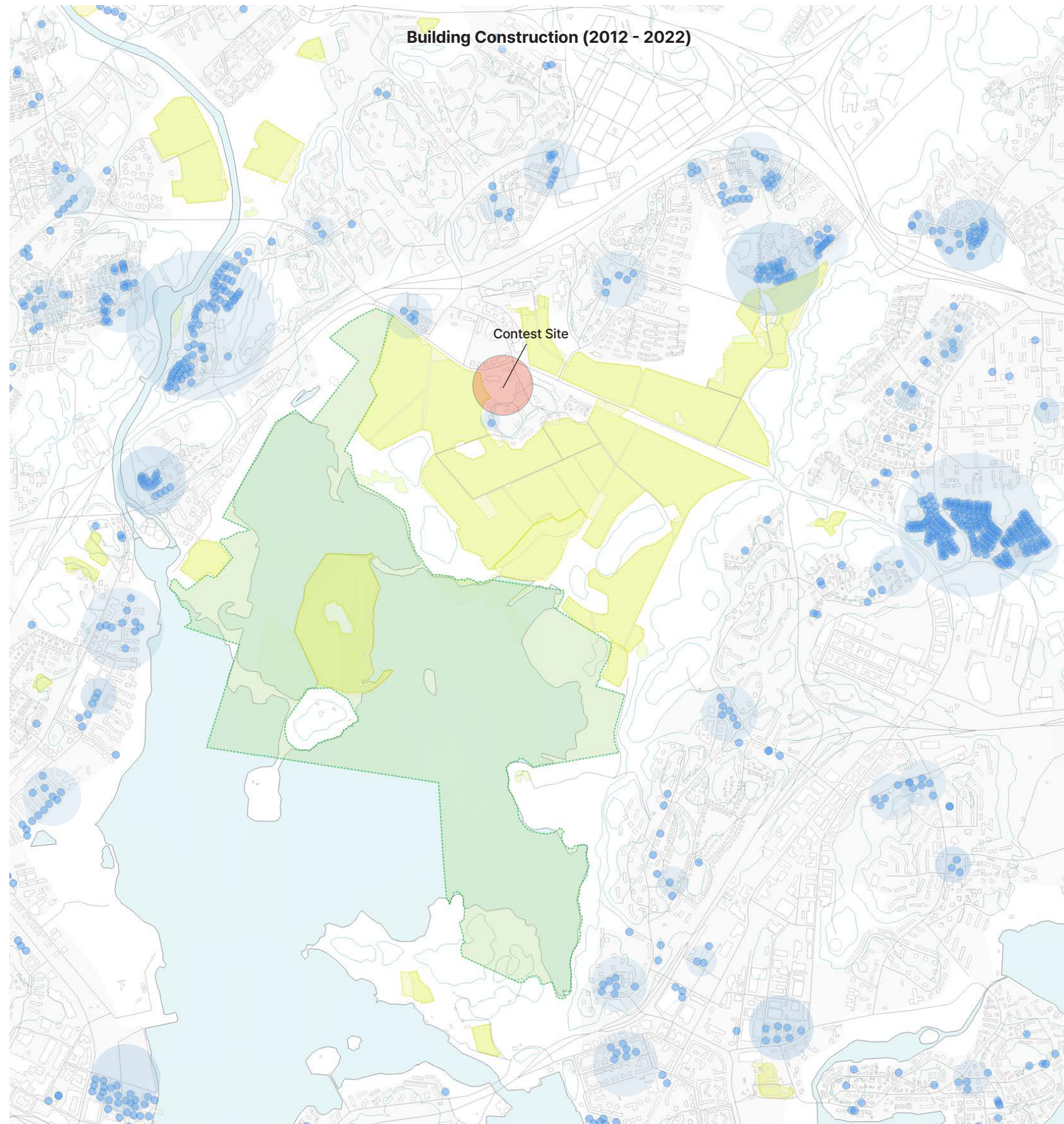
Iris pseudacorus

19 Marsh marigold

Caitha palustris

20 Cuckoo flower

Cardamine pratensis



Development : Threat or Opportunity

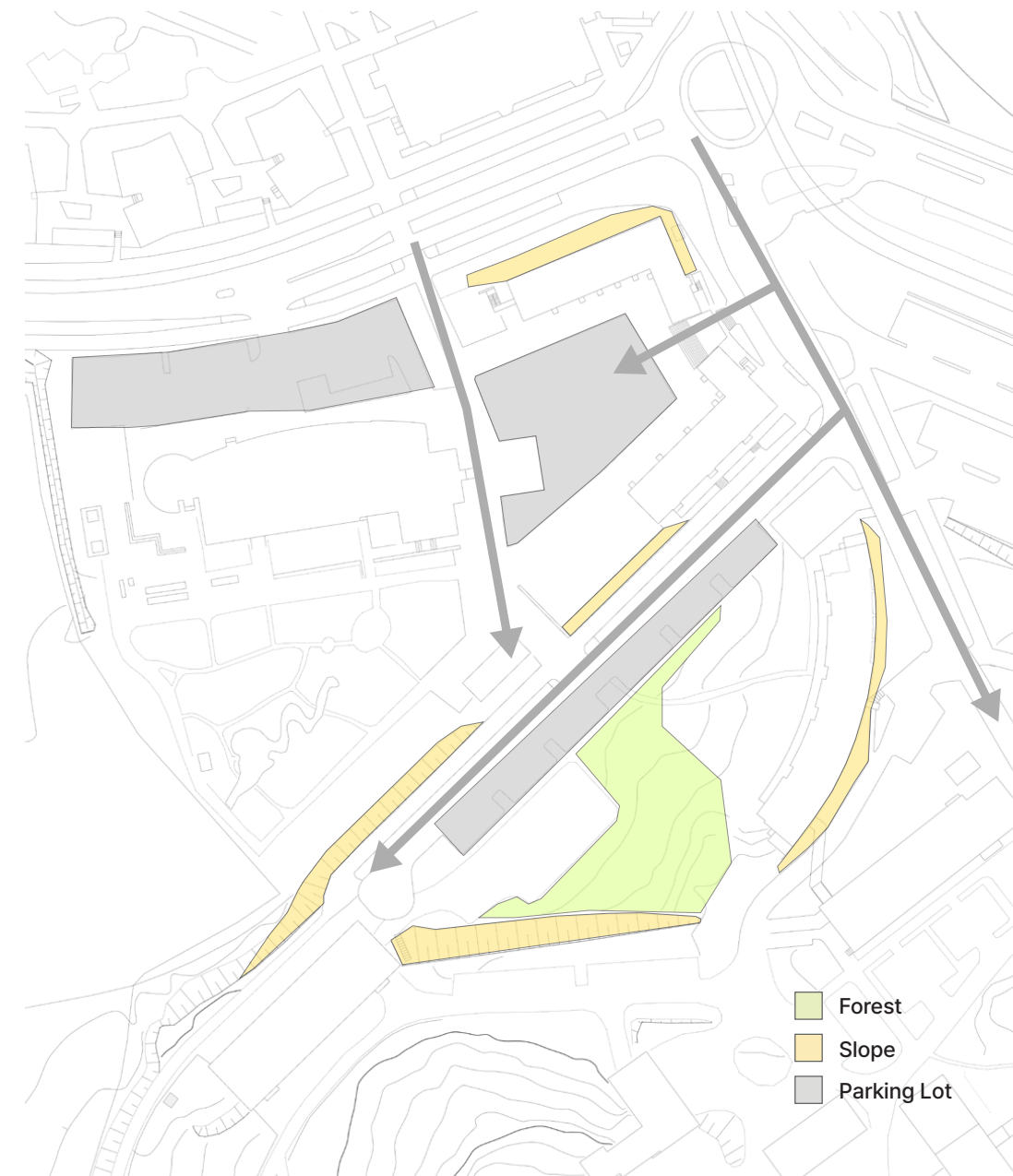
Housing development is ongoing, including in the vicinity of the site, and the new tramline, which opened in 2023, is expected to accelerate this development. Helsinki's population is expected to grow steadily, with many people not owning a car and relying heavily on public transportation such as trams and trains, so the new public transportation near the site will likely increase the number of people visiting the site.

While this development could pose a threat to the natural environment of the area, it also has the opportunity to provide a beautiful natural setting and a sustainable lifestyle for many citizens.

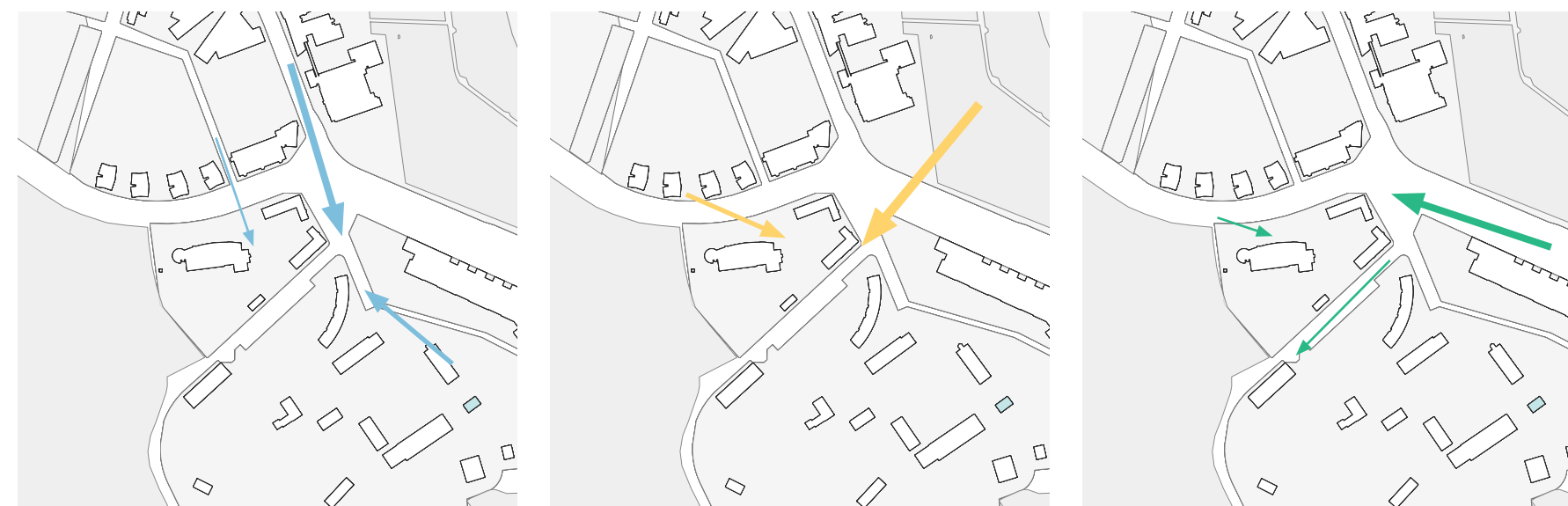
■ Programs in the area near the contest site



■ Barriers within a site that restrict circulation



■ User's Circulation



Campus Members

Local Residents

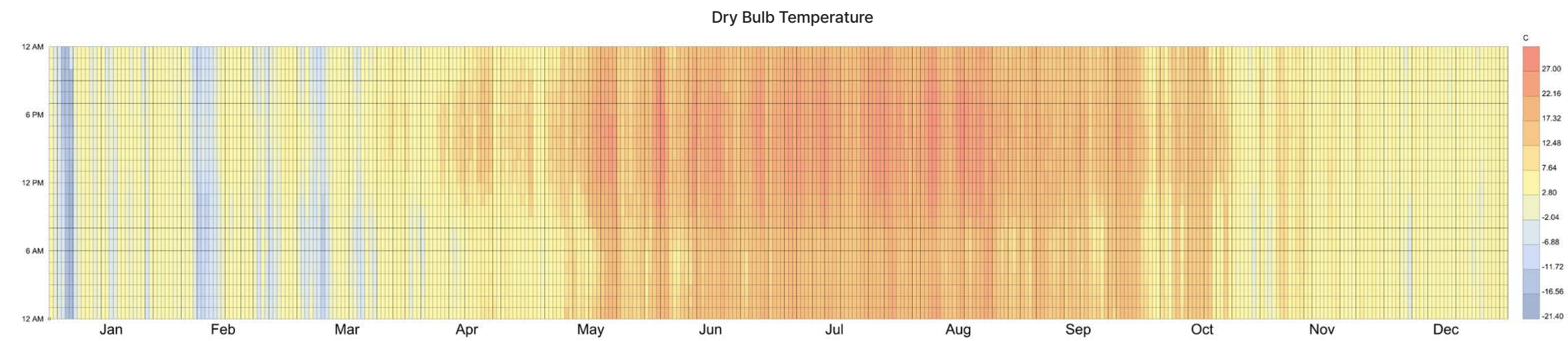
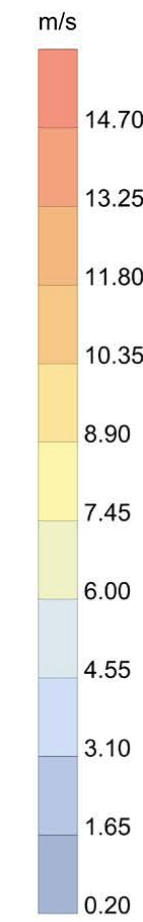
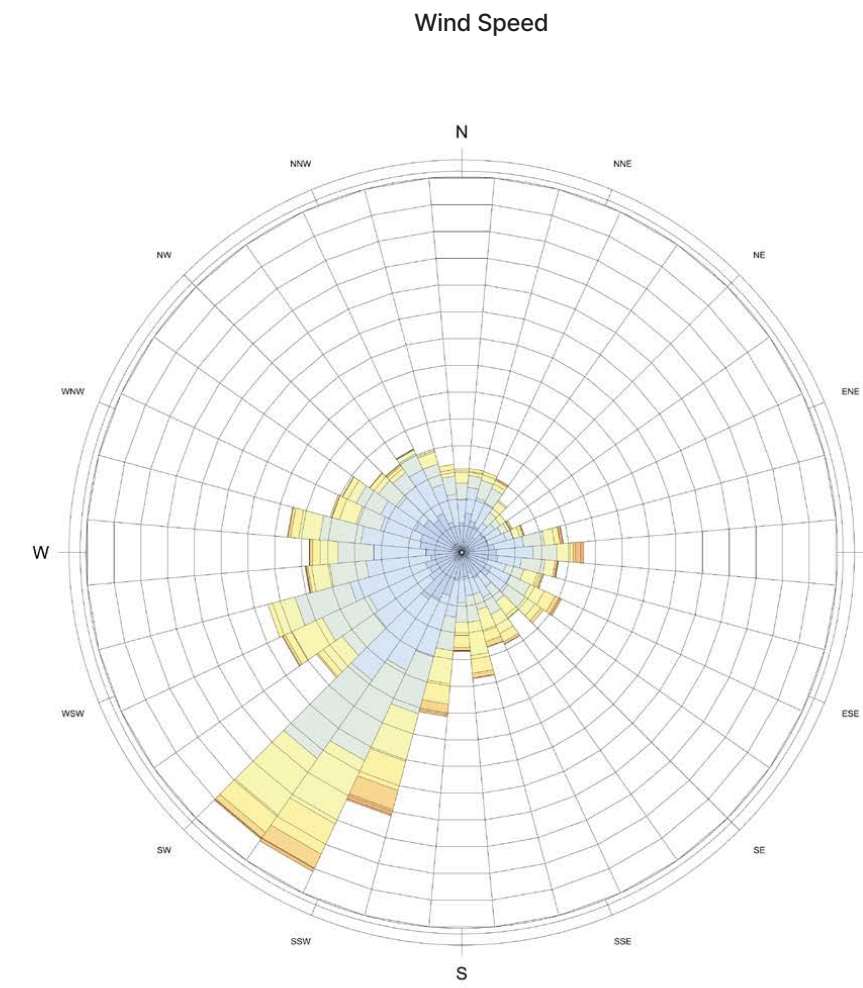
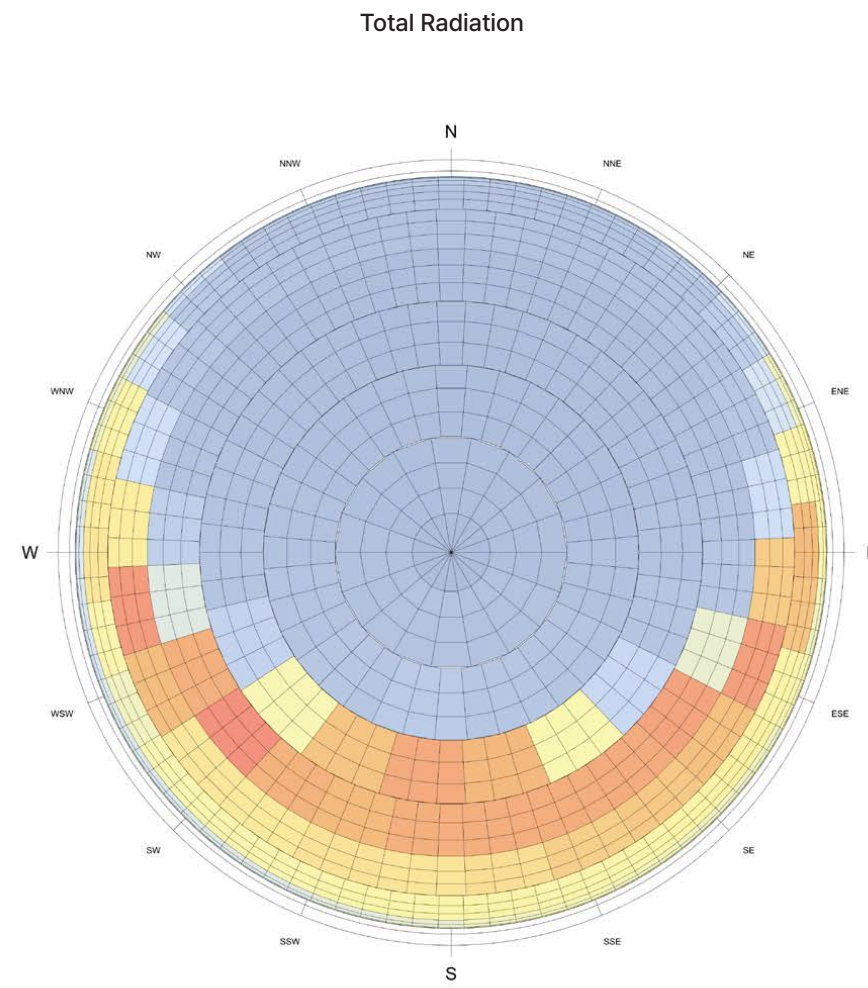
Visitors

Neighborhoods and Circulations

To the north and south of the site is the University of Helsinki's Viikki Campus, which is divided by the site, so it is expected that campus members will be passing through from the north and south. On the other hand, residents of the existing and planned residential complexes in the neighborhood, as well as visitors to the area via tram and bus, meet at the north of the site. In other words, the site appears to be an entrance to a natural recreational space for citizens and campus members.

Nevertheless, circulation within the site is constrained by the slope, parking lot, and forest, and it feels more like a corridor without any experience rather than an entrance to a beautiful space.

Climate Data Analysis



A topographic map of a city area, showing building footprints, streets, and terrain contours. The map is rendered in shades of green and yellow, with white outlines for buildings and roads. A central white box contains text.

Project Goal

"From Boundary to Gateway"

From the analysis of the site, we can assume that the area has great ecological importance and potential, and that many developments, including the Contest site, will make it accessible to more citizens than now. On the other hand, the current site structure does not respect this access to nature, so we need to help users better access to nature.

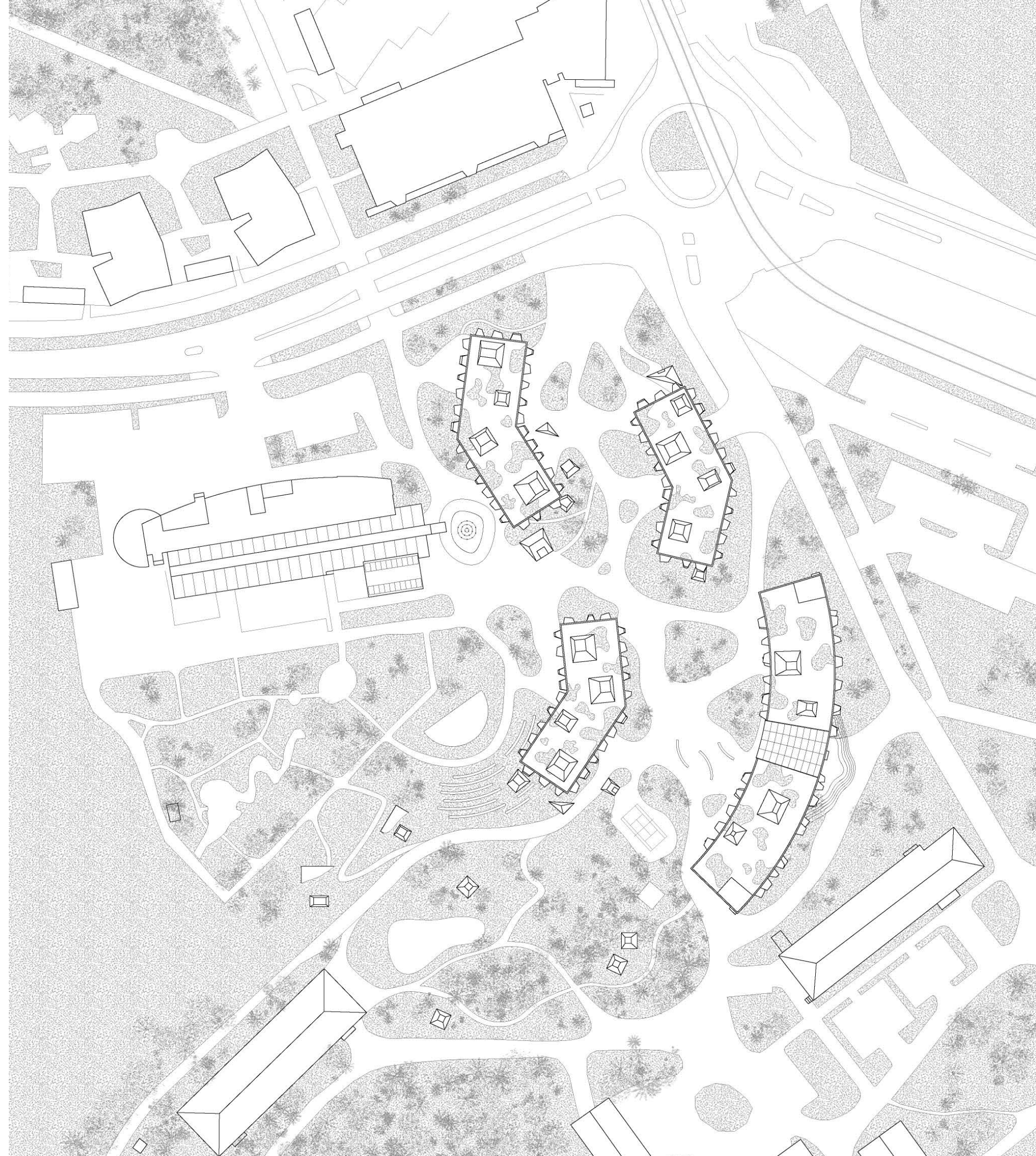
At this point, it should not just be about improving user access, but also about bringing green spaces, which were once confined to protected areas, closer to the city, which is a common Finnish development pattern. Therefore, "From Boundary to Gateway" is the goal of this project.

02

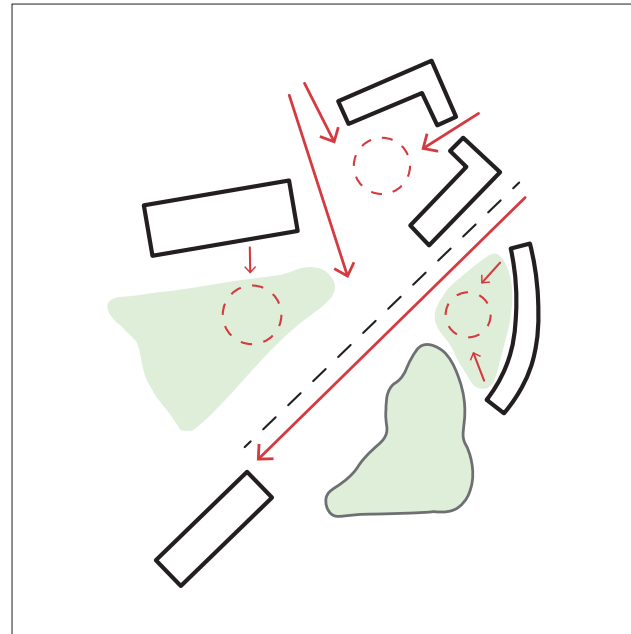
Strategies

Site Strategies

Building Strategies

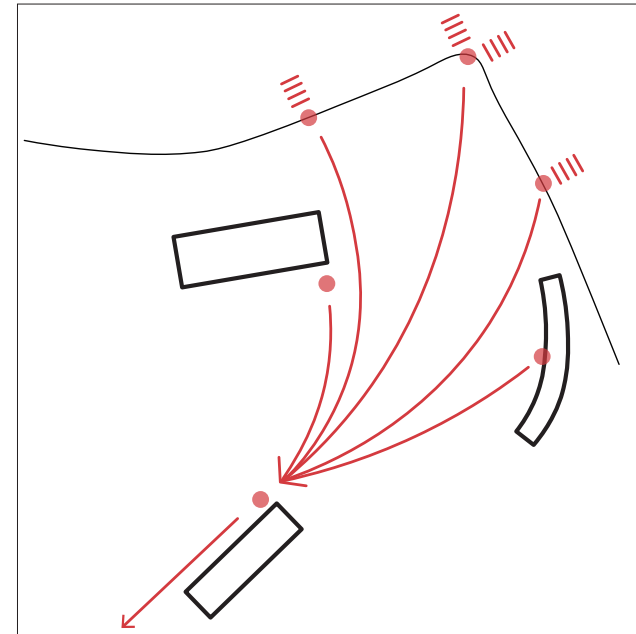


Site Strategies



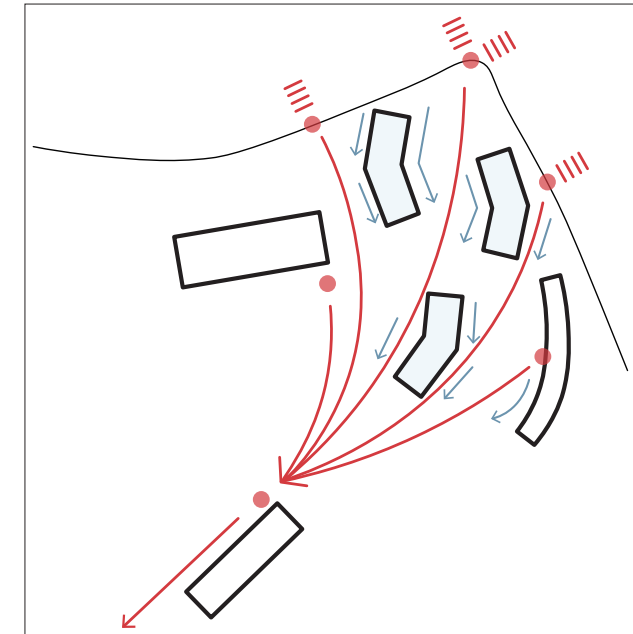
1. Fragmented pathways and greenery

The current site is divided into small sections by steps, parking lots, and driveways, separating users from nature.



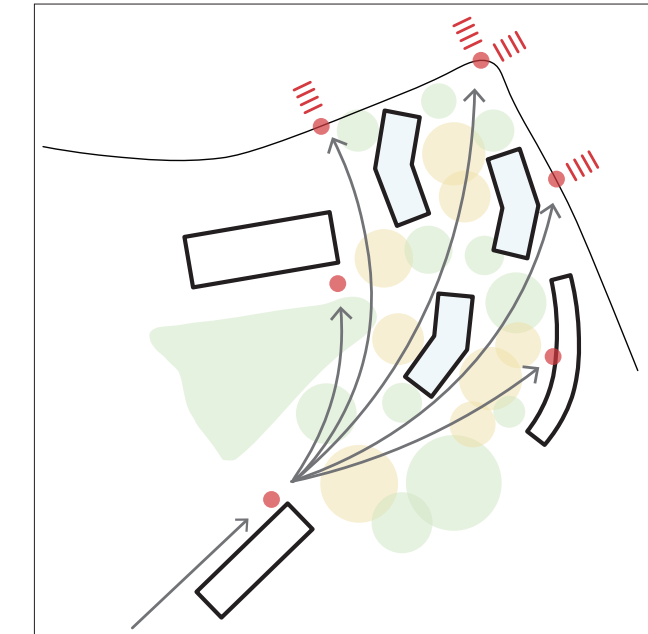
2. Restoring the path to nature

Remove steps to restore the original moderate incline and plan a pathway that connects key access points to the preserve's trails.



3. Enhanced flow and joyful exploration

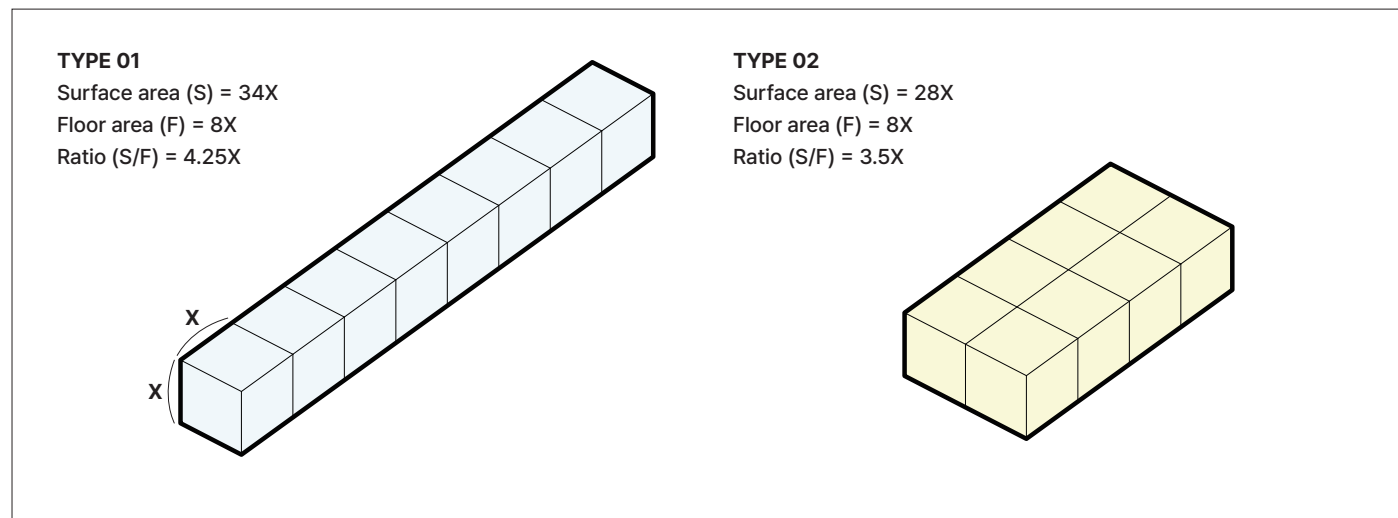
The buildings are placed so that they don't interfere with the flow of traffic, while their shapes reinforce the flow and create trail-like spaces.



4. Spreading greenery and activities

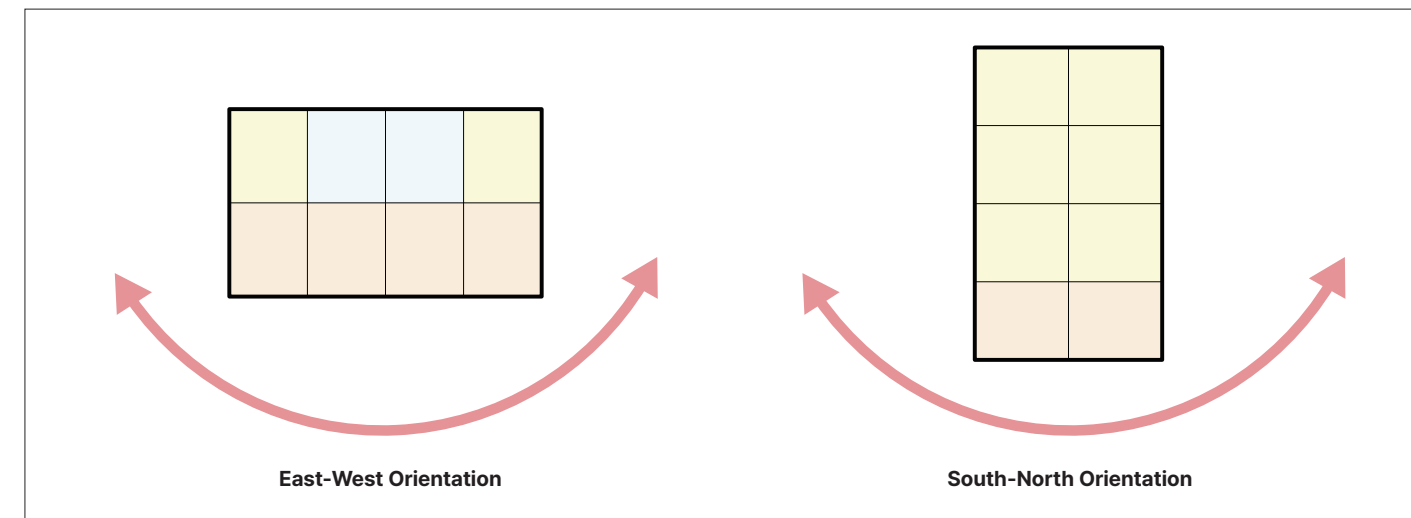
Along the restored paths, the greenery of the reserve's trails spreads out, and a variety of activities take place in between.

Shape and Orientation



Ratio of surface area to floor area

In a typical Finnish apartment, units are often arranged in two rows rather than in a row. The reasoning behind this is that for the same floor area, a two-row layout with less surface area is more thermally efficient because it has less contact with the outside. For the same floor area and volume, the two-row arrangement has a lower surface area to floor area ratio, resulting in better thermal efficiency. Therefore, in this project, the units were arranged in two rows.



Benefits of north-south orientation

As mentioned in the previous paragraph, for a two-row layout, an east-west orientation concentrates light on the southern units and places a large heating load on the northern units. In contrast, a north-south orientation ensures that no unit is left without light and that all units can receive light relatively evenly. This north-south orientation is found in many Finnish apartments, so this project utilizes the north-south orientation.

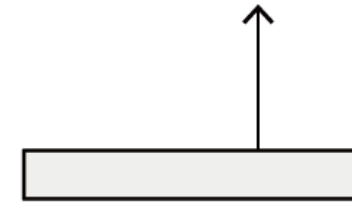
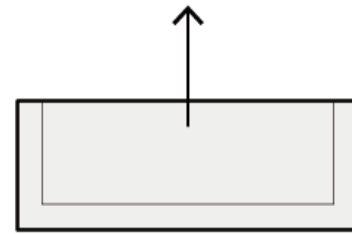
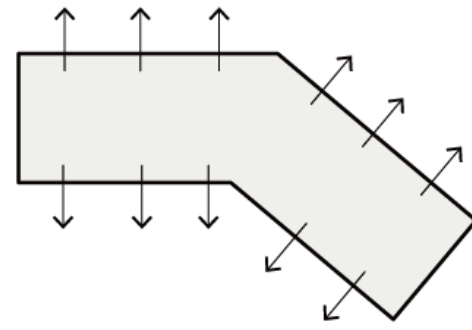
Building Strategies



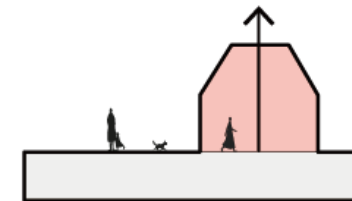
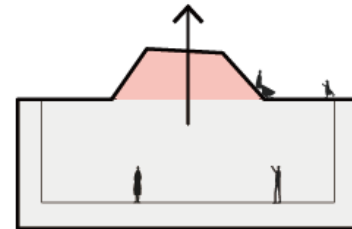
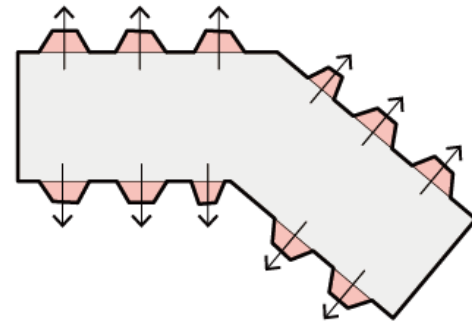
Regional Context : "Valo ja Lunto (Light and Nature)"

The project sought to reflect the regional context of Finland in architecture. We focus on the environmental regionality of Finland and the way Finns relate to nature. Within the harsh climate, Finns have a strong connection to nature, and this connection is expressed in architecture through the various natural landscapes and the light that is featured in them. This project likewise follows the Finnish approach to nature and light ; a space at the gateway to nature, where light and nature become part of everyday life.

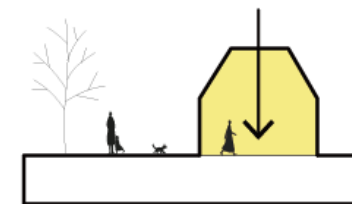
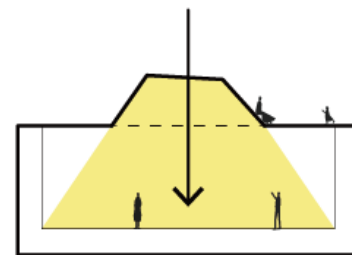
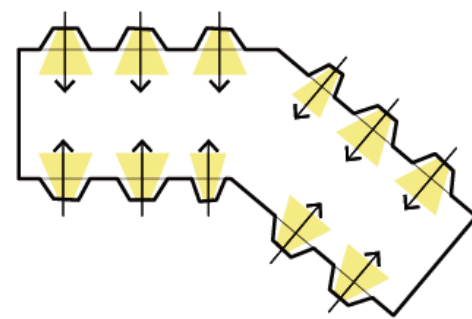
1
Plain Surface



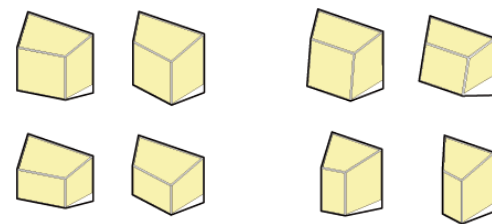
2
Towards
Nature and Light



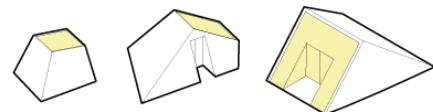
3
Light and Nature
in Every life



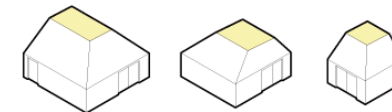
4
Variation
of Barnacles



Balcony

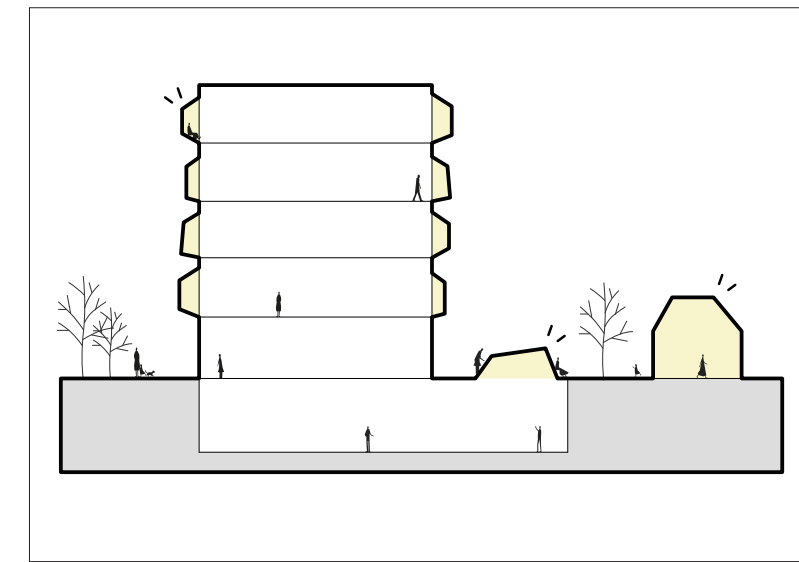


Skylight & Entrance



Pavilion

"Barnacles" for Light and Nature



"Barnacles" are the medium that makes "light and nature" an everyday presence in this project. We believe that the project should have a sense of place based on the culture and lifestyle of the region. In this project, we wanted to reflect the local Finnish ethos of living closer to nature and seeking light in the architectural design. Here, nature and light should be everyday things, not something special.

It starts with the usual plain surfaces, and extends to the interior protruding outward to bring light and nature into rooms, basements, and pavilions. They let in more light and blur the boundaries between the interior space and the nature outside. It is expressed in the form of protruding windows in the rooms, skylights and entrances for the basement, and pavilions in the exterior spaces.

03

Project Details

Masterplan

Newly Built Part (Area B)

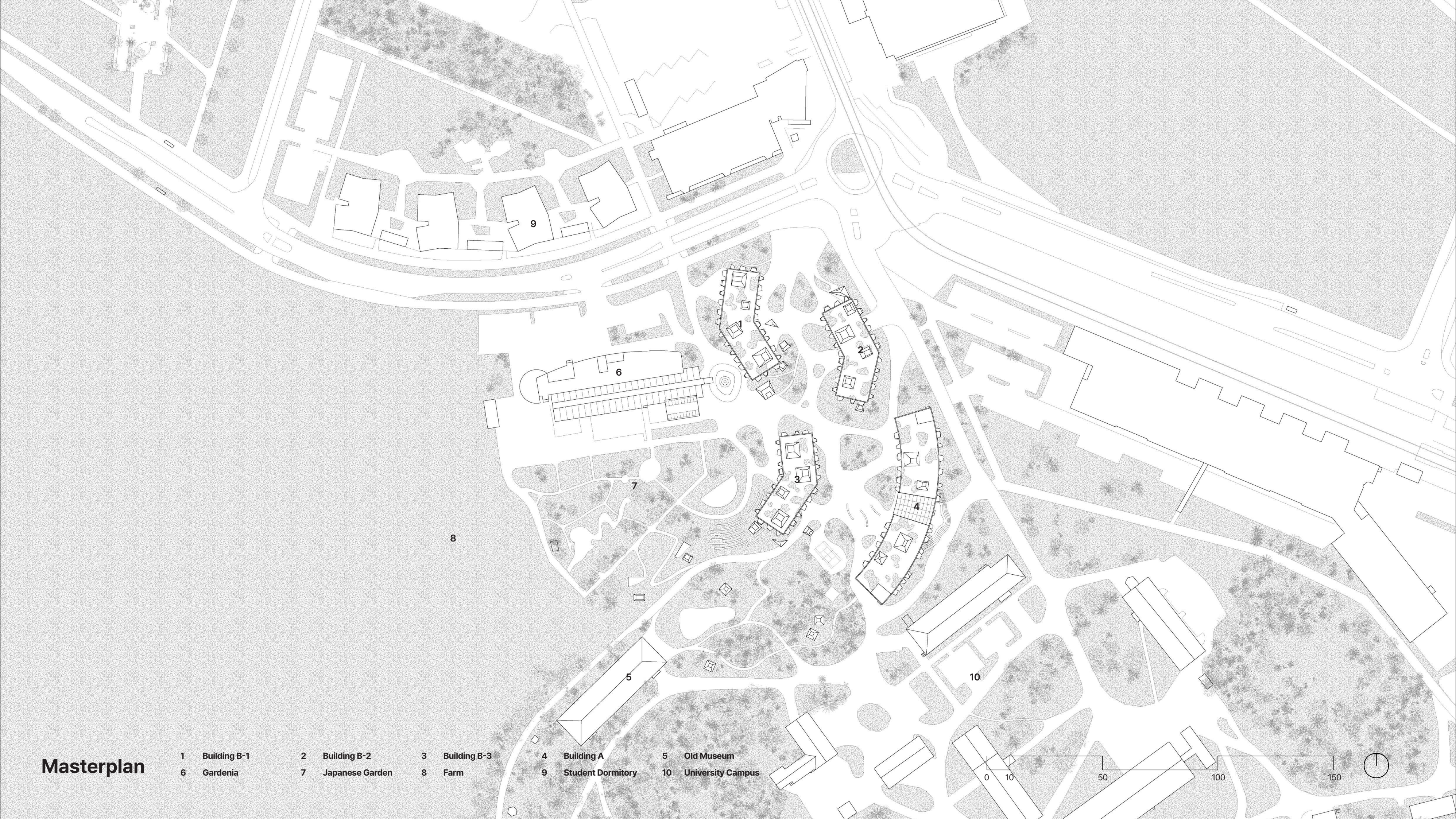
Renovated Part (Area A)

Area C & Landscape



Masterplan

- | | | | | | | | | | |
|---|--------------|---|-----------------|---|--------------|---|-------------------|----|-------------------|
| 1 | Building B-1 | 2 | Building B-2 | 3 | Building B-3 | 4 | Building A | 5 | Old Museum |
| 6 | Gardenia | 7 | Japanese Garden | 8 | Farm | 9 | Student Dormitory | 10 | University Campus |



Newly Built Part (Area B)

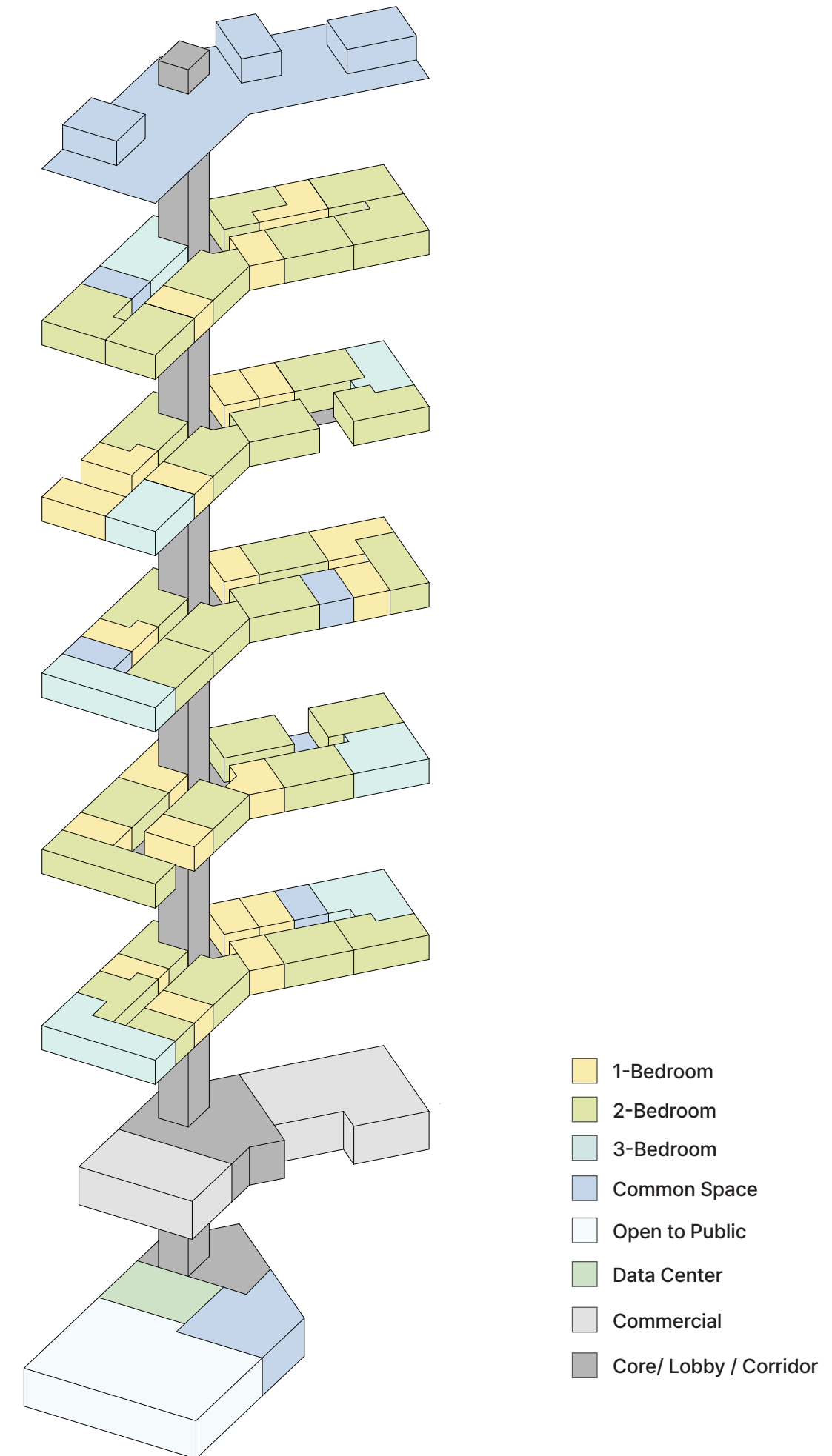
Newly Built Part (Area B)



Diverse Unit Types and Community Spaces

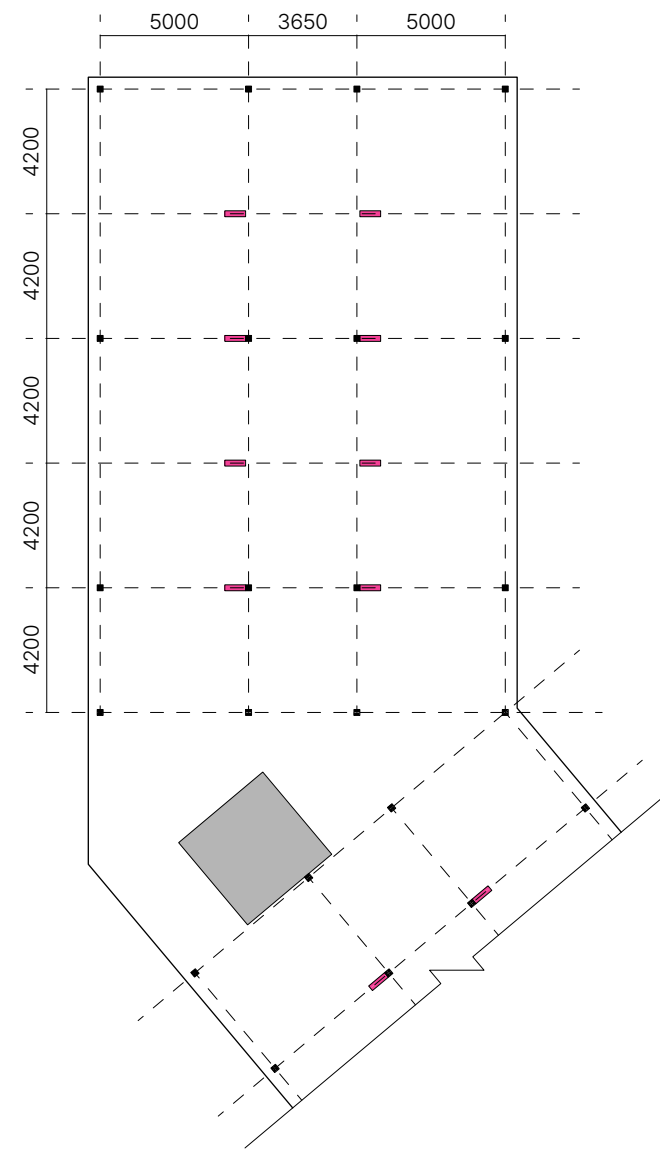
Our lives are as diverse as the ecosystems in this region. We need housing not only for students, but also for the families of visiting professors and local people, so we need housing types with one to three beds to accommodate these different family types. We organized the apartments into units that vary in size and number of rooms. 80% of the floor area was used for individual living spaces, of which 30% were distributed as three-bedroom, 50% as two-bedroom, and 20% as one-bedroom.

Each floor has a common multi-purpose lounge area and laundry facilities for residents to use. There are also common facilities such as a greenhouse and sauna on the rooftop with a garden, and a swimming pool and meeting room on the basement level. On the ground floor, there is a lobby area for residents, as well as commercial spaces such as a gym, recycling retail, and a café.



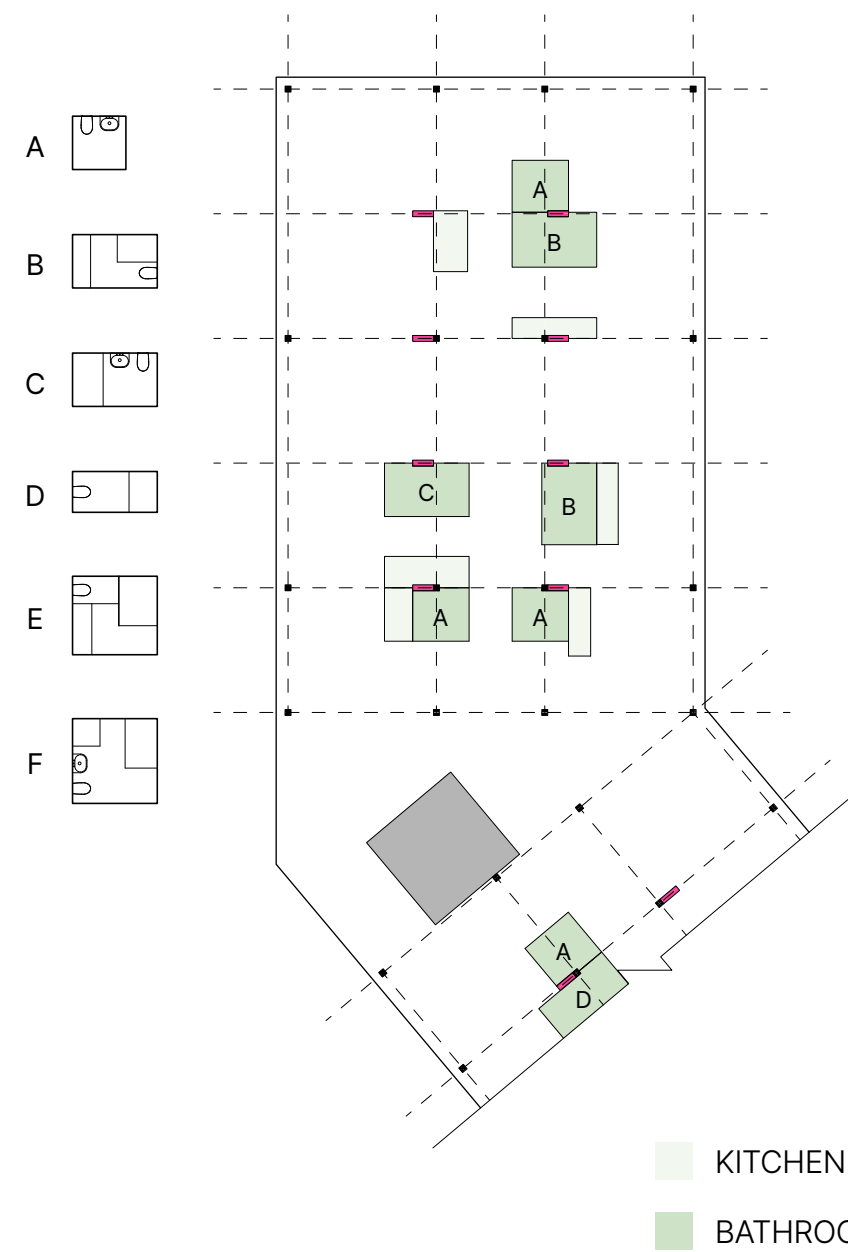
Flexible and Adaptable Planning for Longevity: Utility Core

For a sustainable building, it is essential that the building is flexible from a life cycle perspective and can be transformed to meet the needs of the users. In this project, a utility core with electricity, water, and other facilities is placed at regular intervals, and various types of changeable bathrooms and kitchens are installed in this core while dividing the units. This accommodates different family types and different scale needs for kitchens, bathrooms, and rooms, and minimizes the constraints of transformation even when the units are changed to non-residential uses.



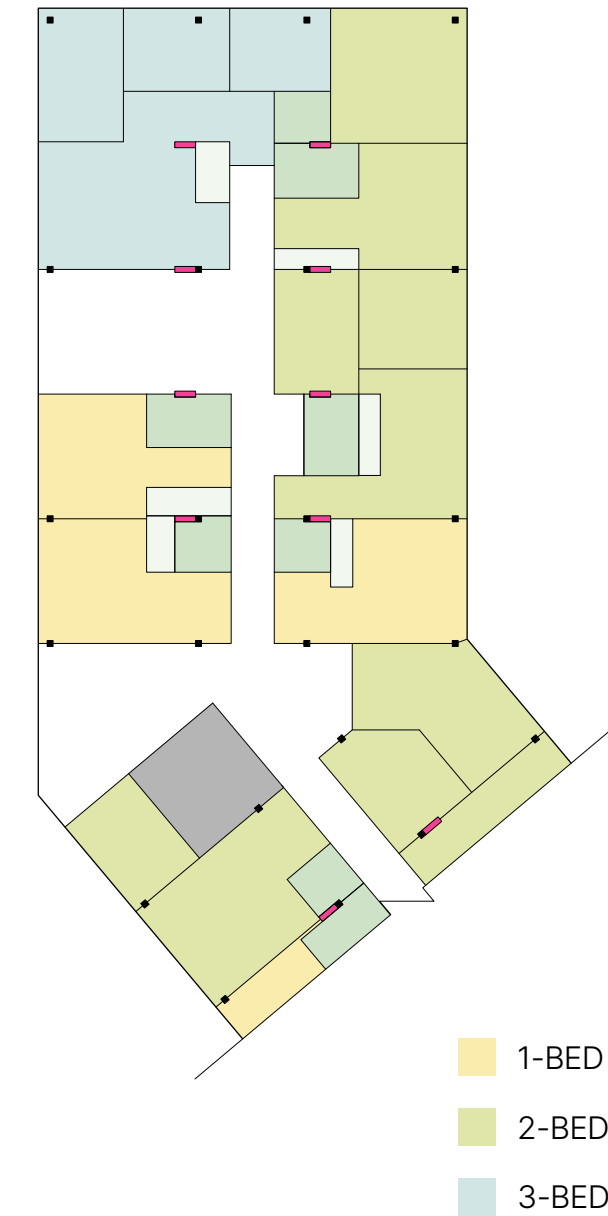
1. Columns and utility core

Columnar construction for flexibility.
Installed Utility core, a collection of utilities.



2. Bathroom and kitchen installation

Unit bathrooms and kitchens are organized around the Utility Core, based on the needs of each room.



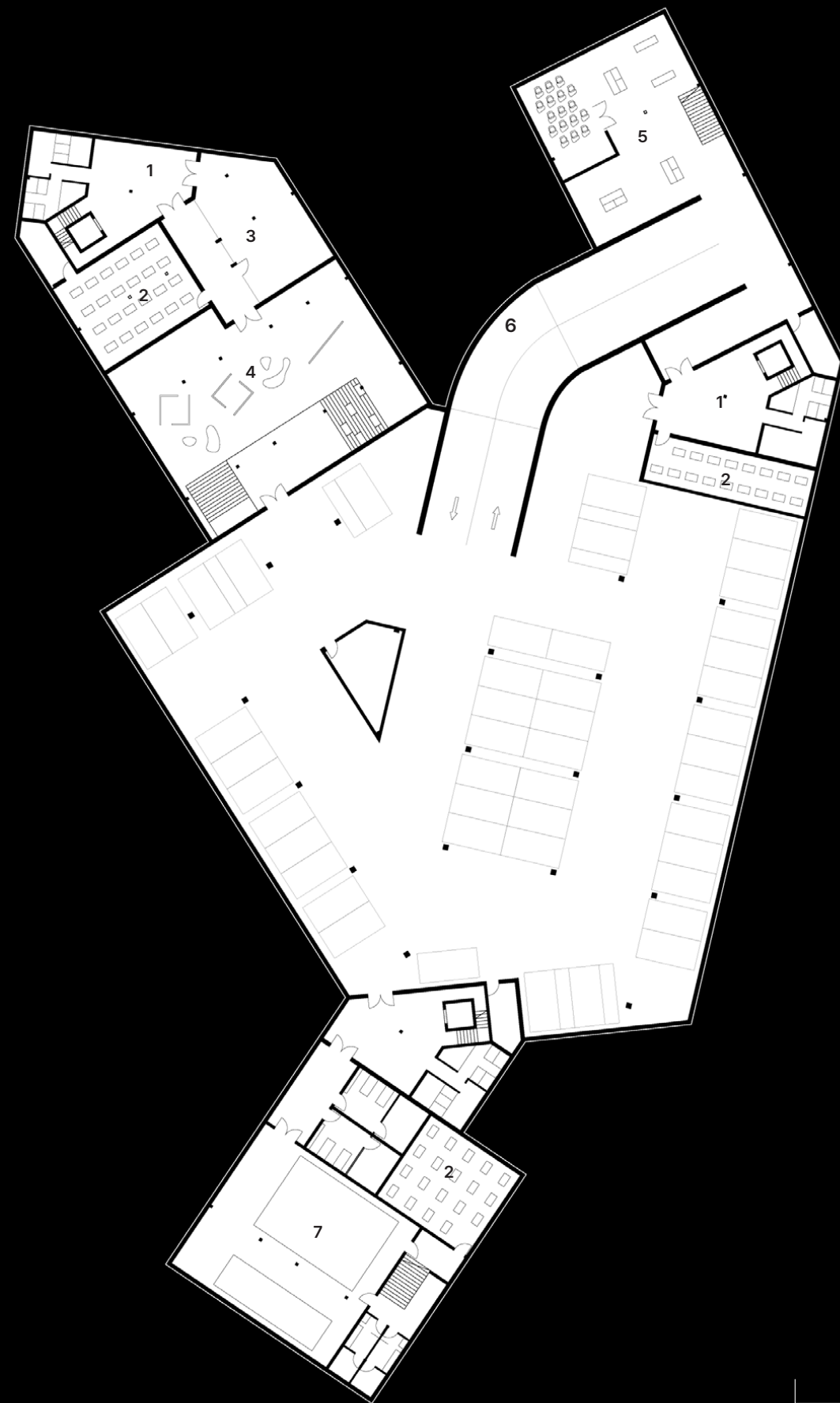
3. Split into different unit types

Split into appropriate unit types with 1-3 bedrooms using non-load-bearing walls.

Sustainable Future Scenarios : What if you need other than housing?

Spatial organization with such a utility core can respond to future spatial needs that cannot be predicted at this time, and this promotes sustainability by extending the life of the building. The fact that the kitchen and restrooms are not fixed and can be removed and installed maximizes this advantage. The diagram below assumes a future scenario; what if the demand for housing decreases and more workspace is needed alongside living space?





B1 Plan

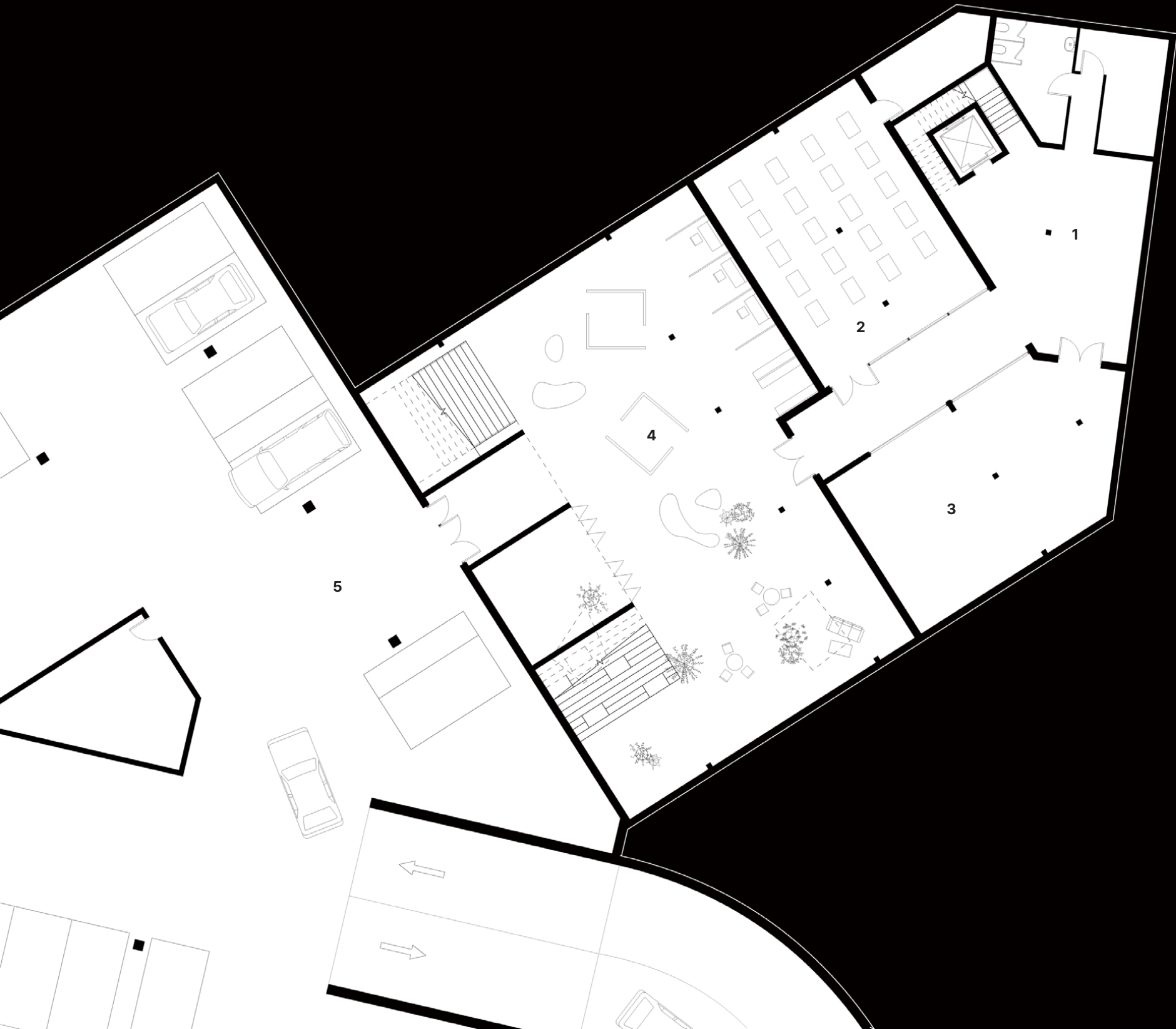
- 1 Lobby
- 2 Data Center
- 3 Meeting Room
- 4 Entertainment Space
- 5 Exhibition Hall
- 6 Underground Parking
- 7 Swimming Pool





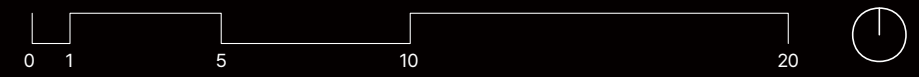
1F Plan

- 1 Commercial
- 2 Lobby
- 3 Bicycle Parking
- 4 Sports Gym
- 5 Daycare Center
- 6 Underground Gate
- 7 Recycling Center



Building B-1
B1 Plan

- 1 Lobby
- 2 Data Center
- 3 Meeting Room
- 4 Entertainment Space
- 5 Parking Lot





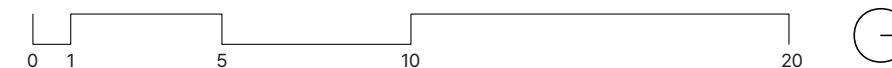
Building B-1
1F Plan

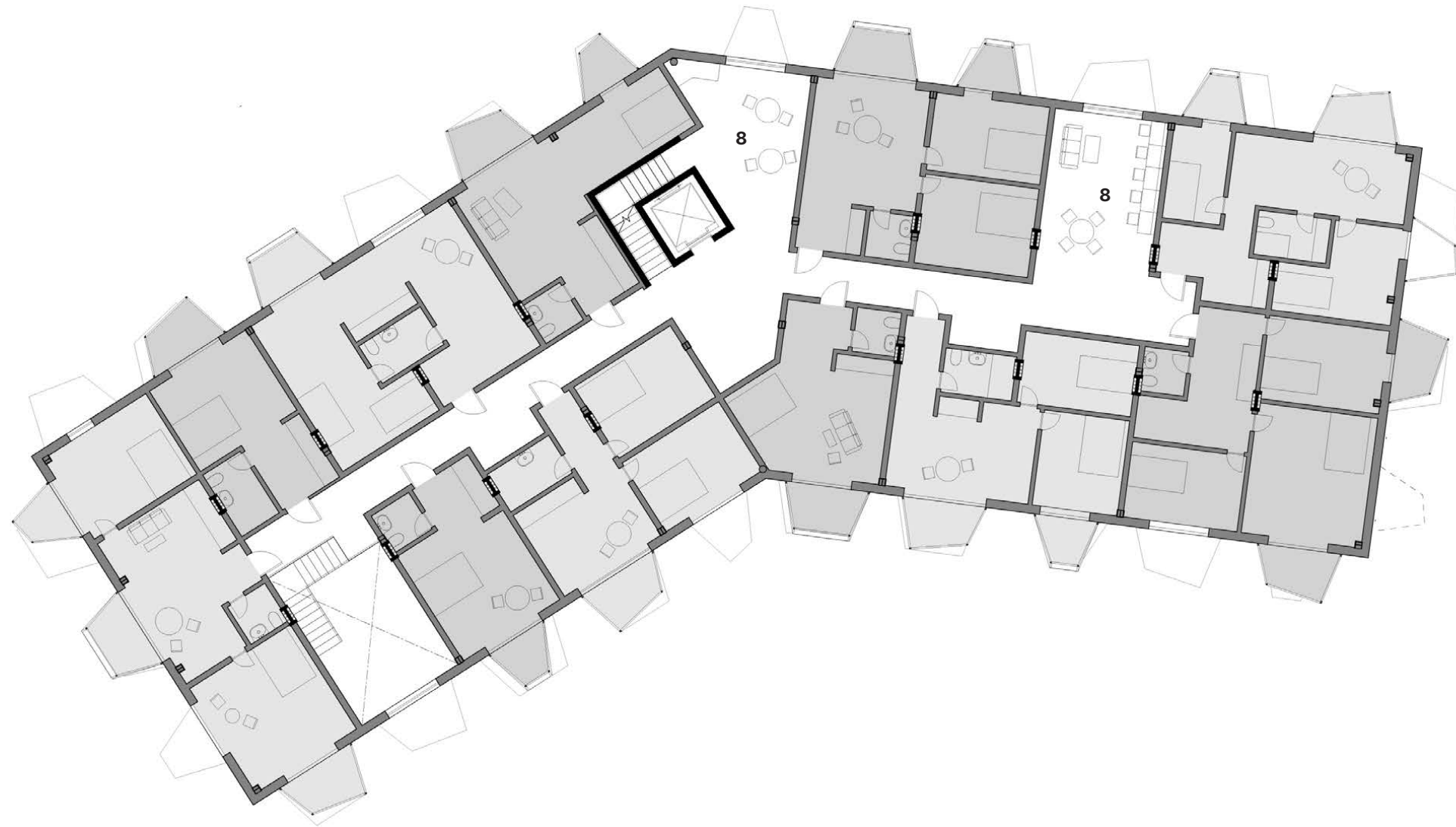
- 1 Lobby
- 2 Deposit Archive Room
- 3 Bicycle Parking Lot
- 4 Bakery & Cafe
- 5 Recycling Center
- 6 Shops
- 7 Plant Shop
- 8 Common Space
- 9 Greenhouse
- 10 Sauna



Building B-1
2F Plan

- 1 Lobby
- 2 Deposit Archive Room
- 3 Bicycle Parking Lot
- 4 Bakery & Cafe
- 5 Recycling Center
- 6 Shops
- 7 Plant Shop
- 8 Common Space
- 9 Greenhouse
- 10 Sauna

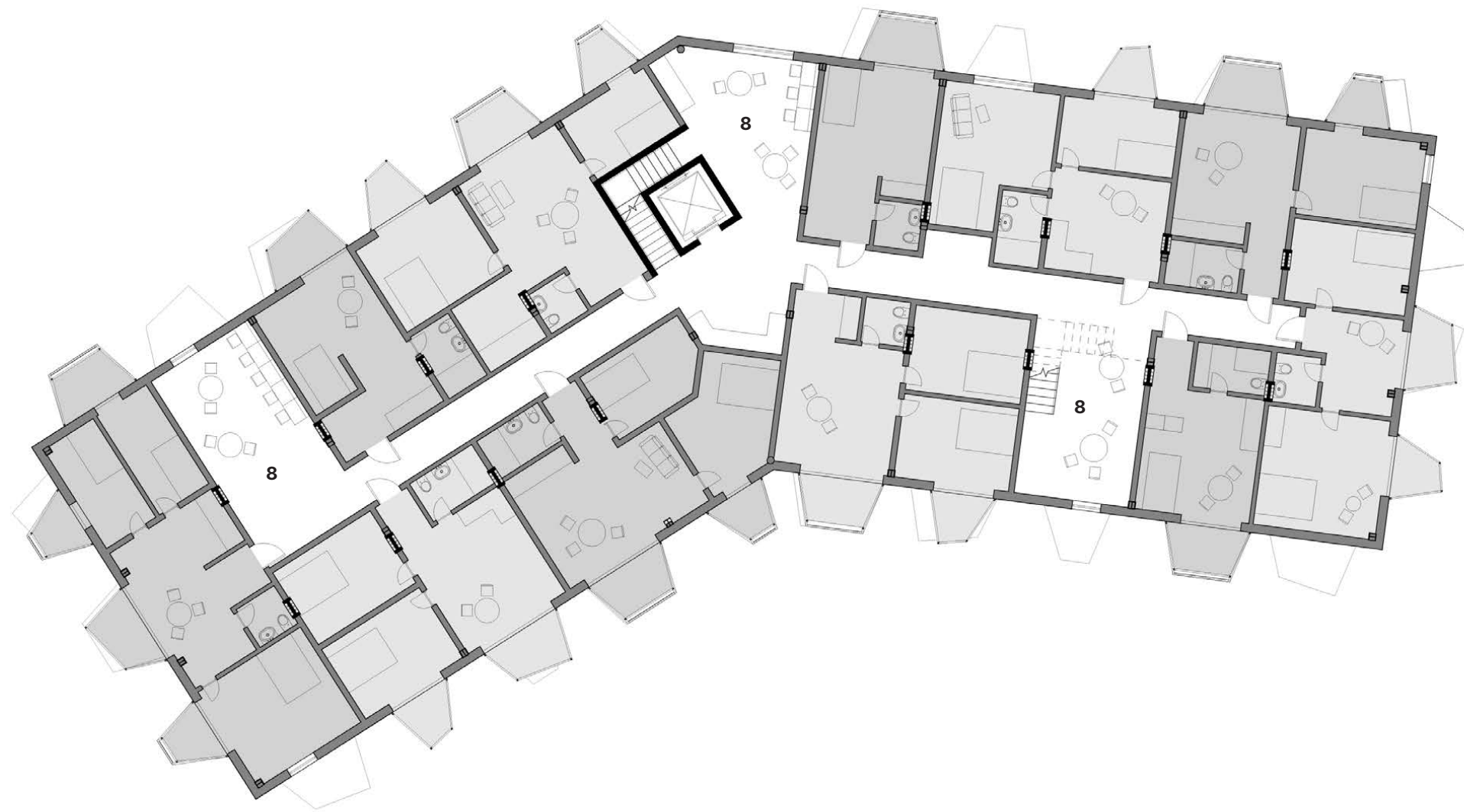




Building B-1
3F Plan

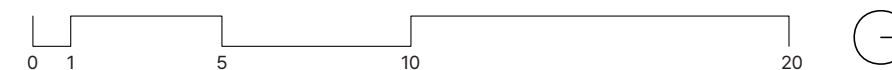
- 1 Lobby
- 2 Deposit Archive Room
- 3 Bicycle Parking Lot
- 4 Bakery & Cafe
- 5 Recycling Center
- 6 Shops
- 7 Plant Shop
- 8 Common Space
- 9 Greenhouse
- 10 Sauna

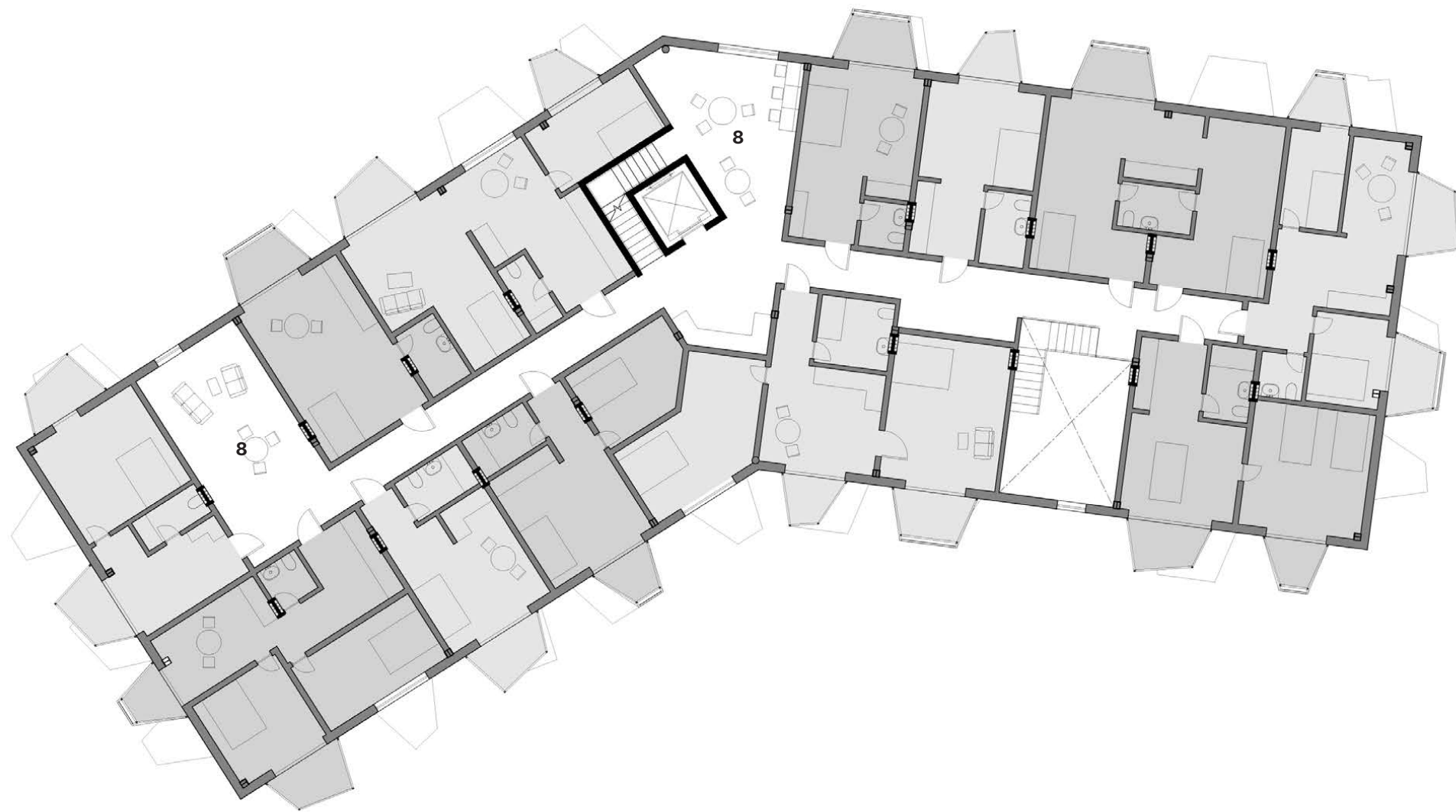




Building B-1
4F Plan

- 1 Lobby
- 2 Deposit Archive Room
- 3 Bicycle Parking Lot
- 4 Bakery & Cafe
- 5 Recycling Center
- 6 Shops
- 7 Plant Shop
- 8 Common Space
- 9 Greenhouse
- 10 Sauna

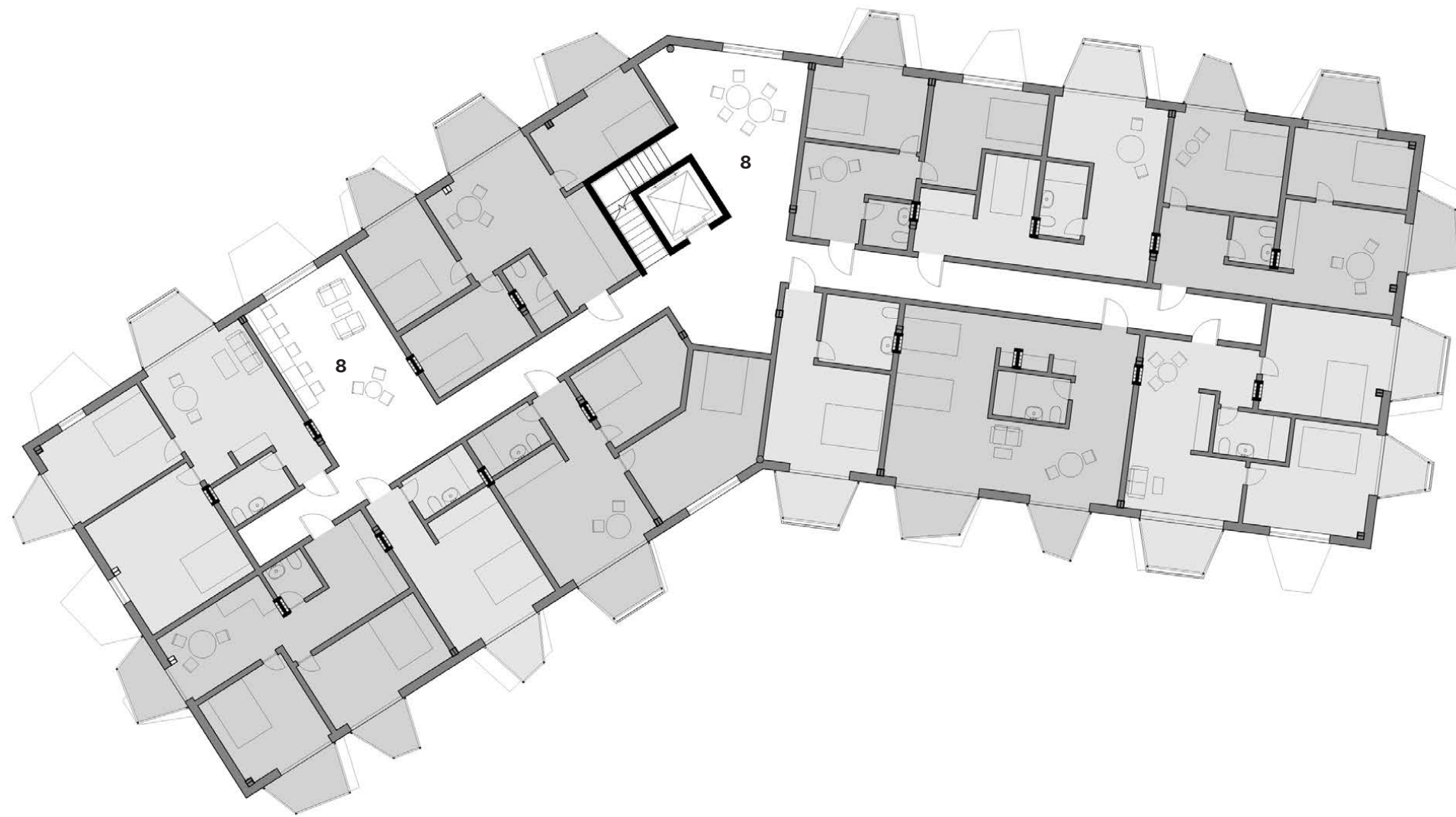




Building B-1
5F Plan

- 1 Lobby
- 2 Deposit Archive Room
- 3 Bicycle Parking Lot
- 4 Bakery & Cafe
- 5 Recycling Center
- 6 Shops
- 7 Plant Shop
- 8 Common Space
- 9 Greenhouse
- 10 Sauna

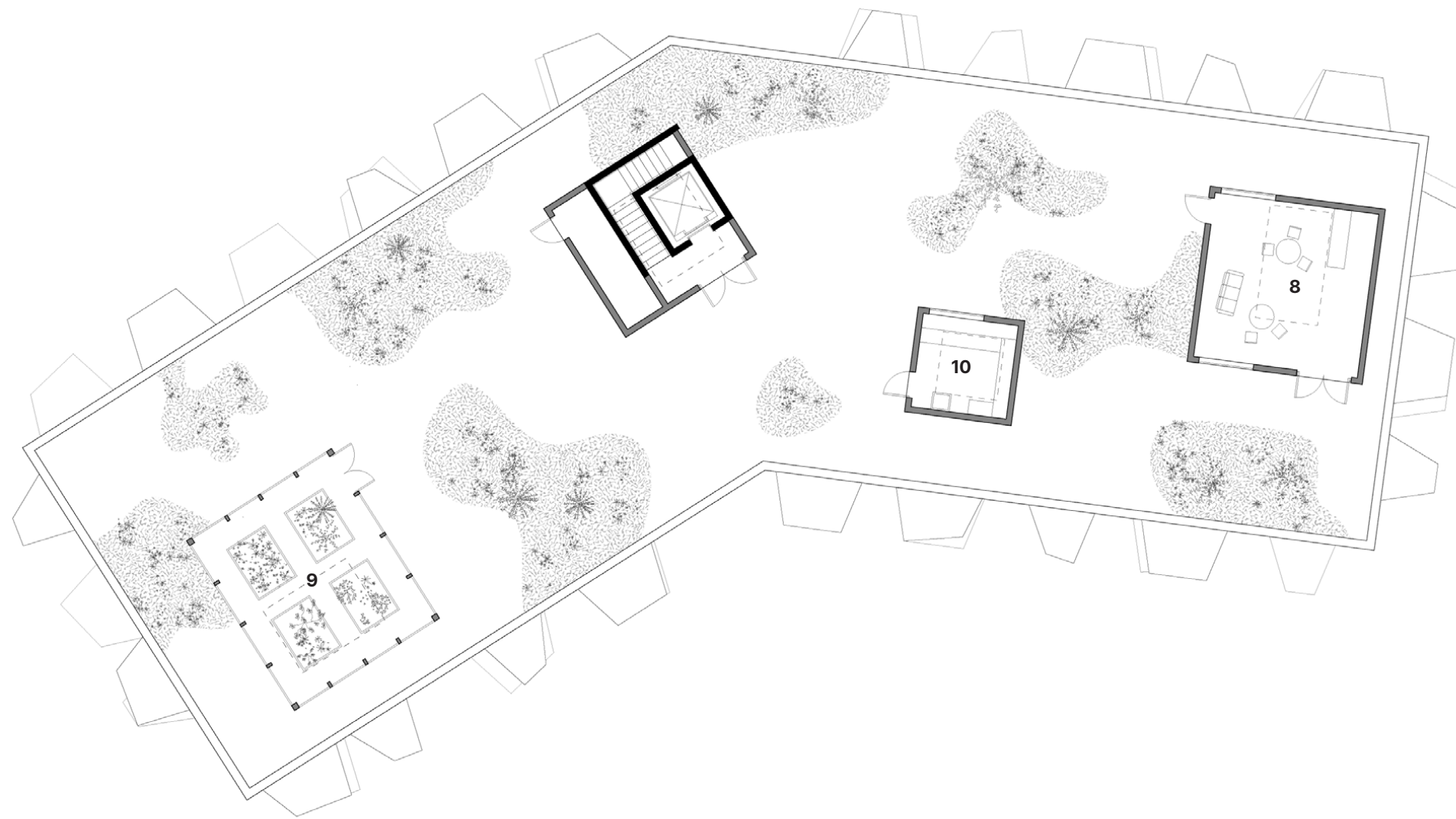




Building B-1
6F Plan

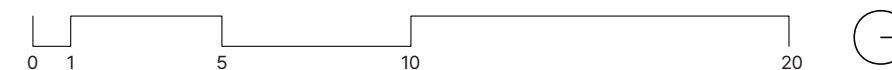
- 1 Lobby
- 2 Deposit Archive Room
- 3 Bicycle Parking Lot
- 4 Bakery & Cafe
- 5 Recycling Center
- 6 Shops
- 7 Plant Shop
- 8 Common Space
- 9 Greenhouse
- 10 Sauna





Building B-1
7F Plan

- 1 Lobby
- 2 Deposit Archive Room
- 3 Bicycle Parking Lot
- 4 Bakery & Cafe
- 5 Recycling Center
- 6 Shops
- 7 Plant Shop
- 8 Common Space
- 9 Greenhouse
- 10 Sauna

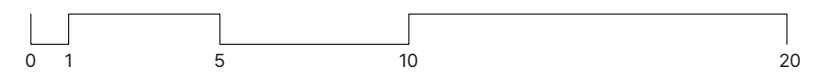


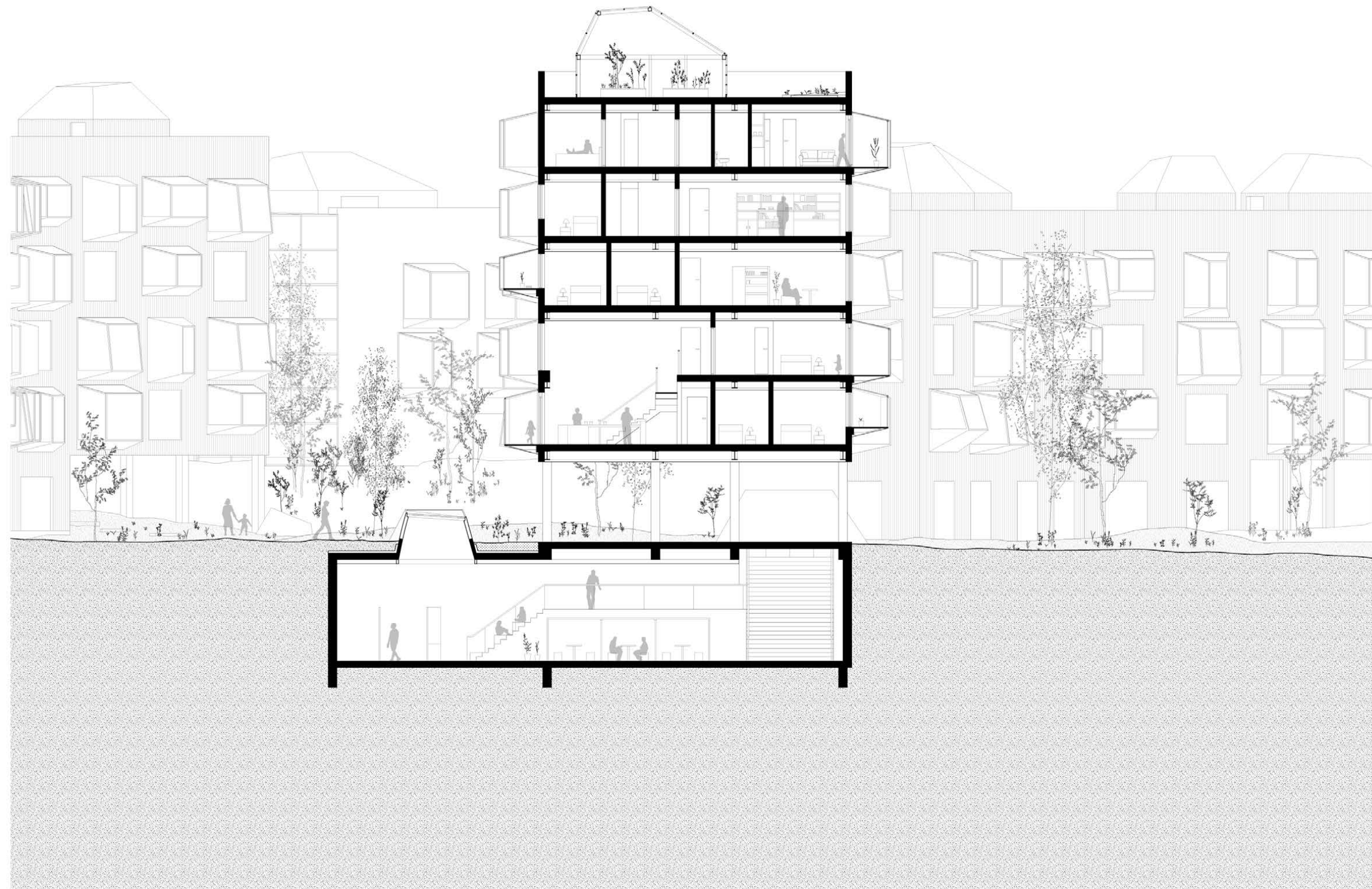






Elevation
Building B-1





A-A' Section
Building B-1



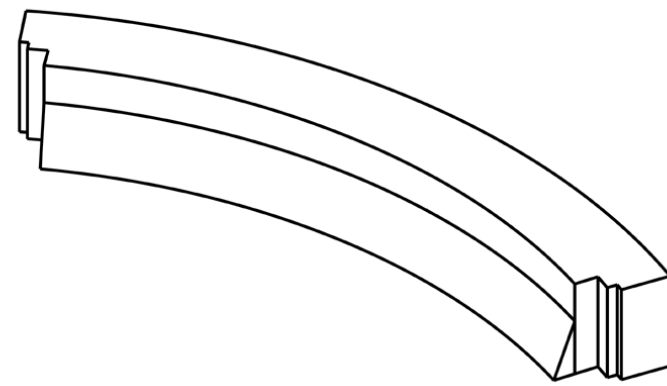


Common Space (2F)

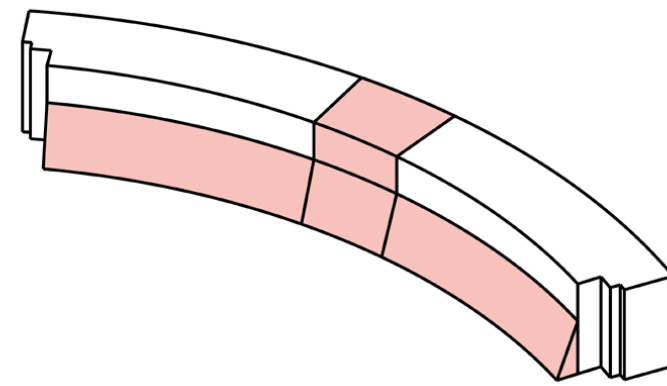


Entertainment Space (B1)

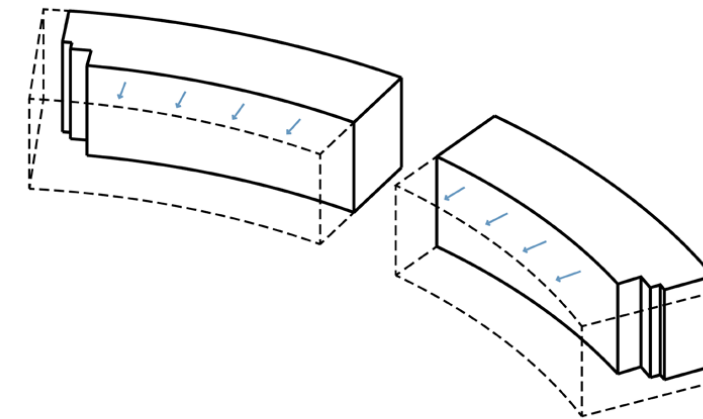
Renovated Part (Area A)



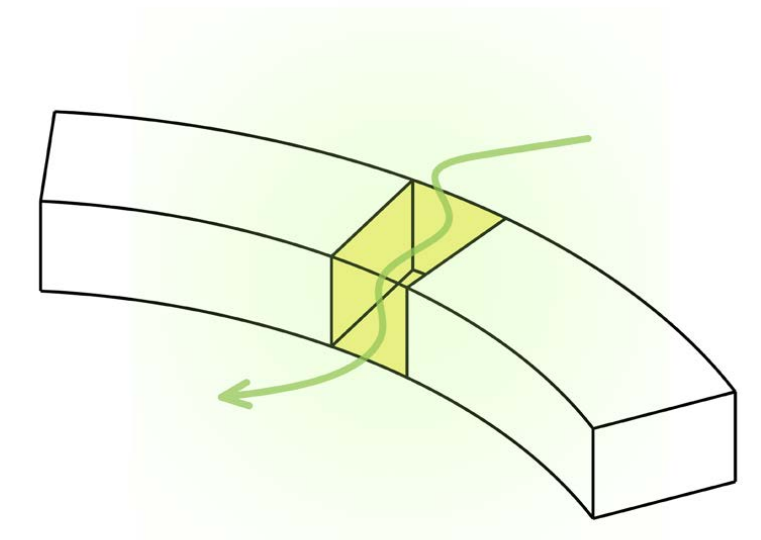
1. Original building



2. Demolition of parts of existing building



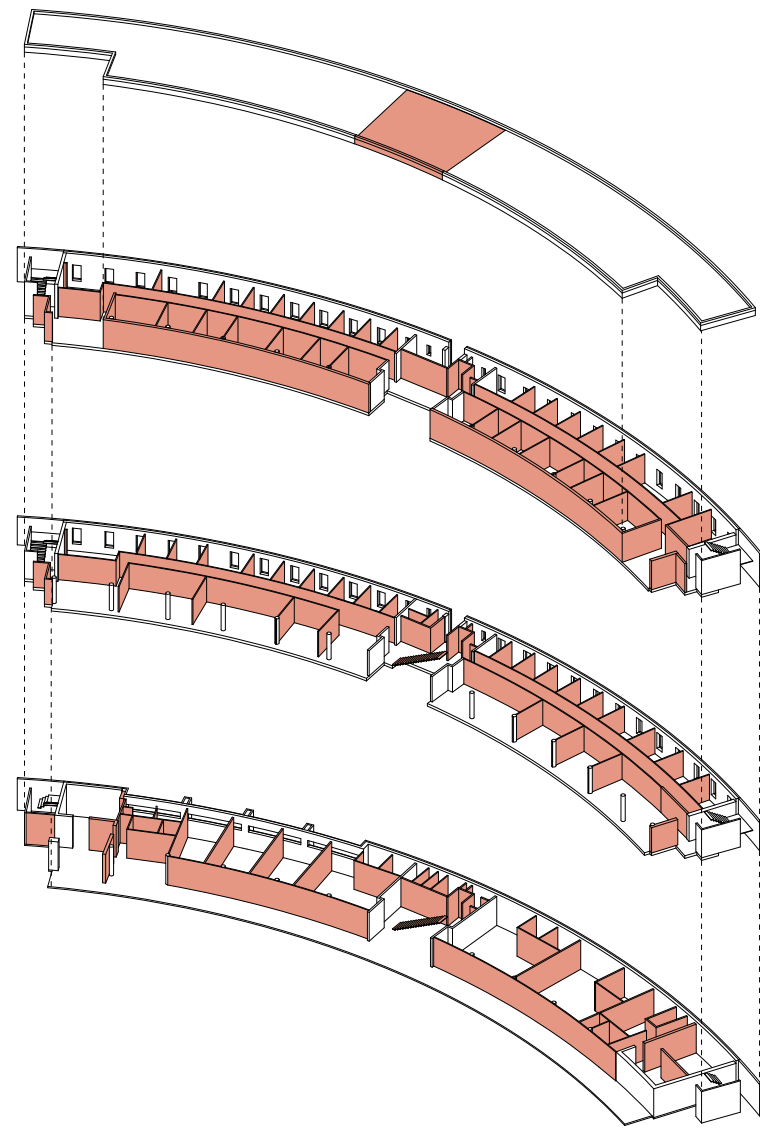
3. Extension for more residential space



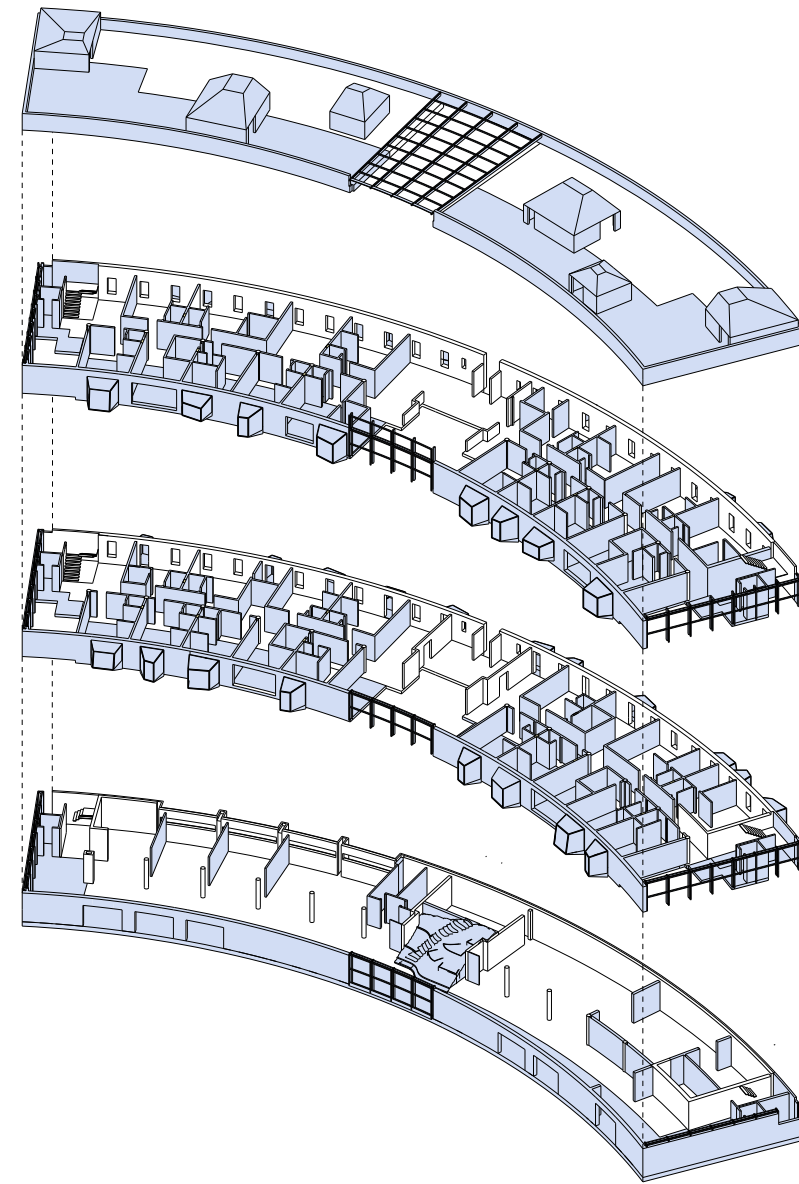
4. Recovery of nature with greenhouse

Renovation Strategy : from Office to Living Space

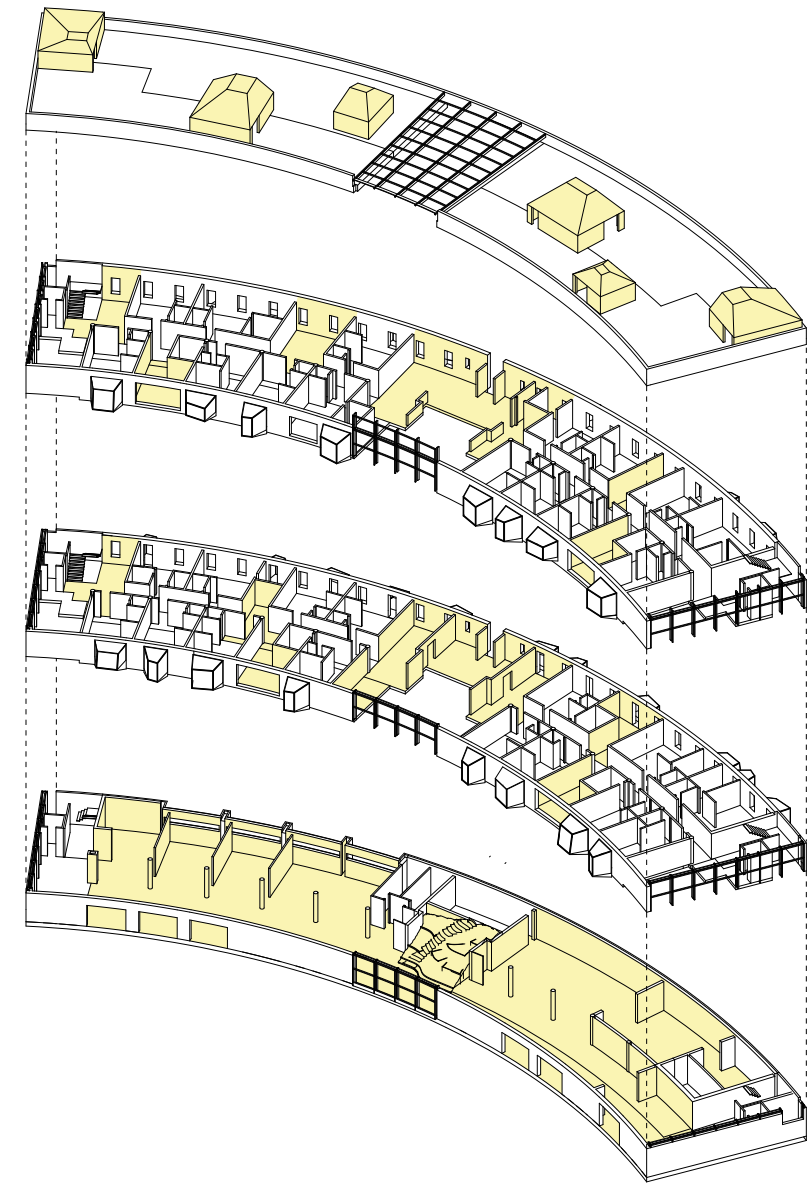
Existing Building A was originally office space, but will be renovated for short- or long-term residential use for researchers and professors. The west side will be partially demolished and extended to create more space for housing and to break away from the monotonous office floor plan. At the same time, the right-sized common spaces, which are difficult to secure in the existing office plan, are evenly distributed on each floor to support the limited function of each small private units.



Demolished parts of existing building



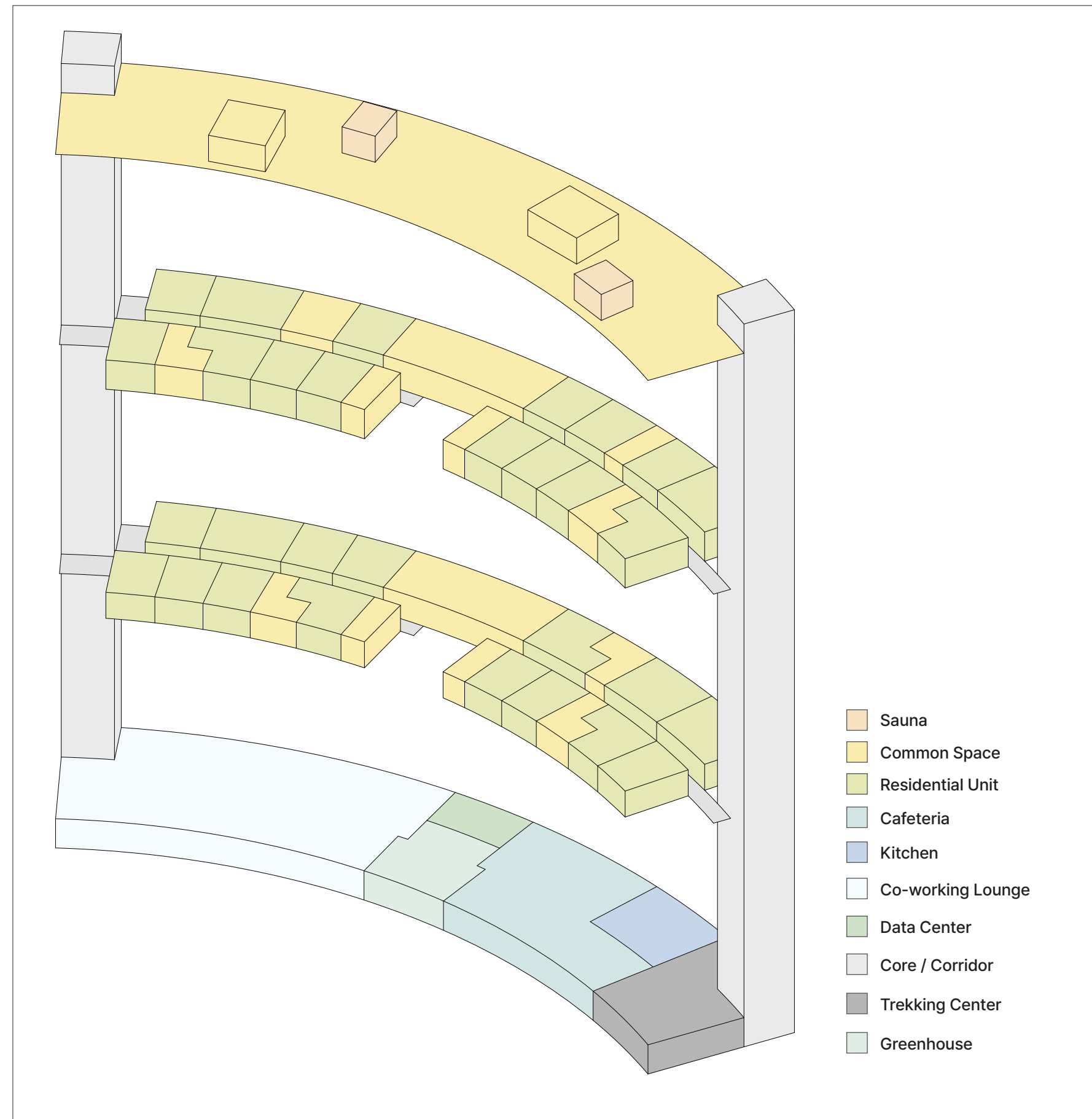
Extended parts and housing planning

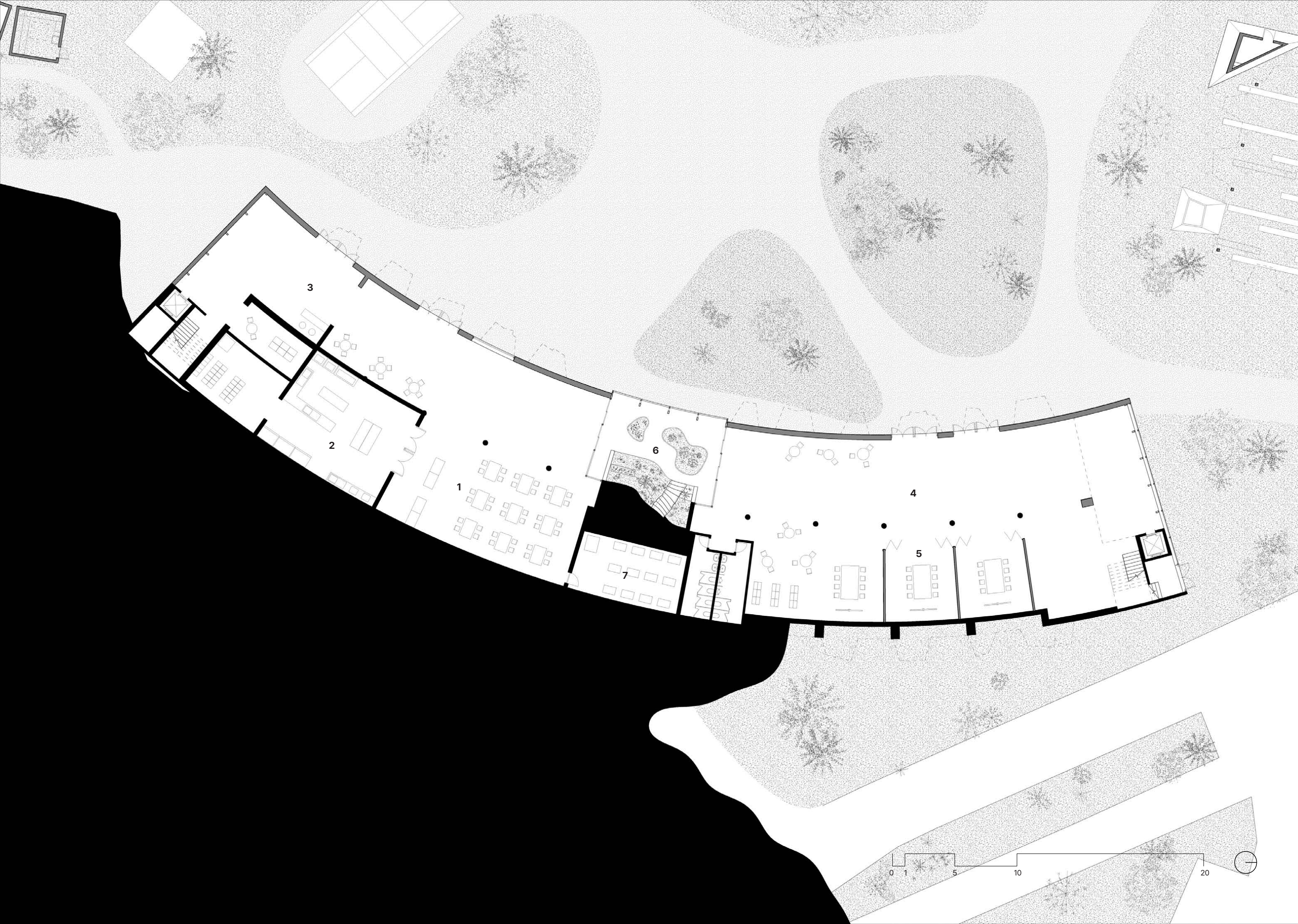


Common space planning for residents

In order to improve the previous situation where the front and back of the building were blocked by retaining walls due to the steps in the front and back that prevented east-west traffic, a greenhouse was created in the center with a natural slope down to the ground, allowing anyone to enter. This allowed easy access to the contest site from the south side of the site while restoring some of the natural topography. In addition to the greenhouse, the ground floor consists of a trekking center that guides visitors on trails and rents equipment, a data center that uses waste heat to maintain the greenhouse, a shared kitchen, and a co-working lounge.

On the other hand, like the new building described above, the utility cores were installed at regular intervals, and non-load-bearing walls were utilized to facilitate future changes to the floor plan, allowing for flexibility and adaptability.





Building A
1F Plan

- 1 Cafeteria
- 2 Kitchen
- 3 Trekking Center
- 4 Co-working Lounge
- 5 Meeting Room
- 6 Greenhouse
- 7 Data Center
- 8 Common Space
- 9 Common Balcony
- 10 Sauna



Building A
2F Plan

- 1 Cafeteria
- 2 Kitchen
- 3 Trekking Center
- 4 Co-working Lounge
- 5 Meeting Room
- 6 Greenhouse
- 7 Data Center
- 8 Common Space
- 9 Common Balcony
- 10 Sauna

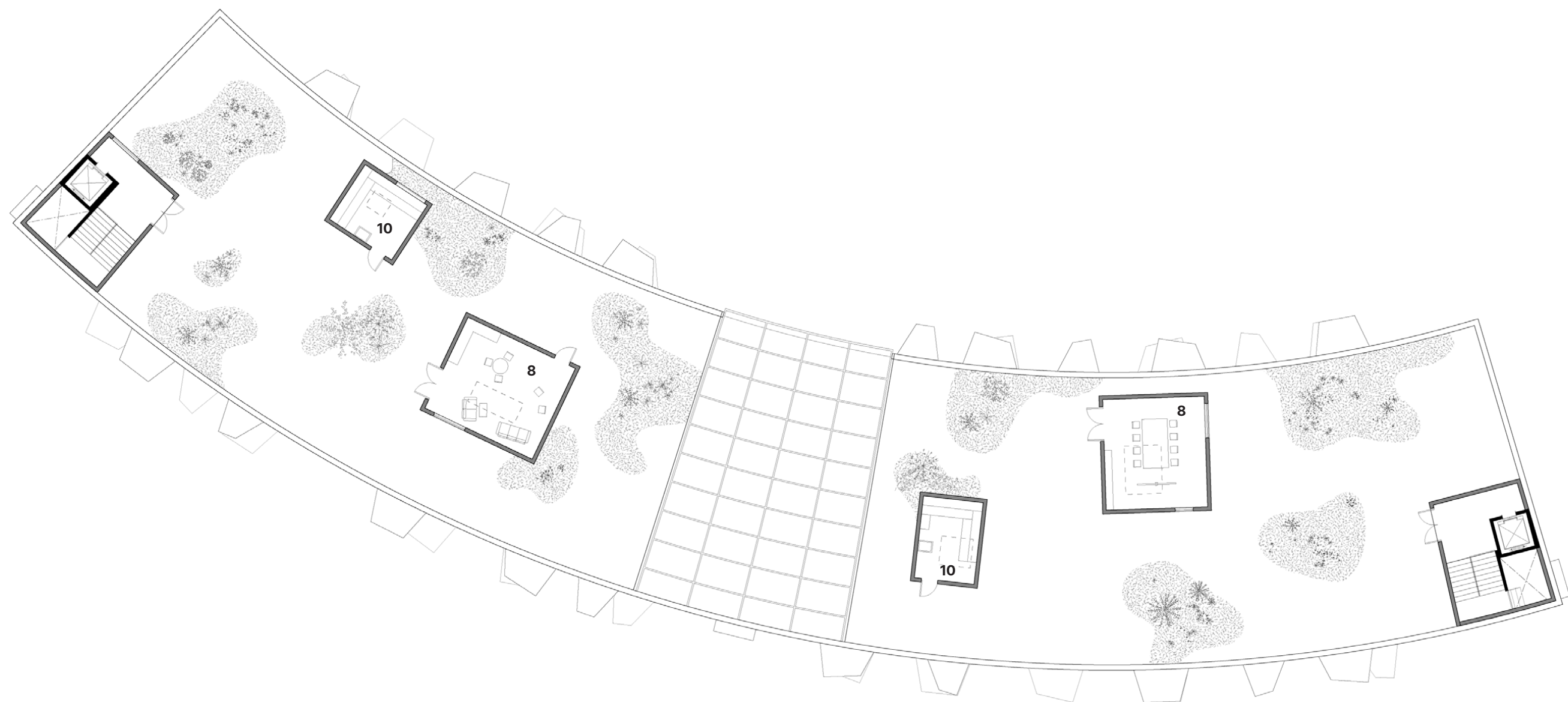




Building A
3F Plan

- 1 Cafeteria
- 2 Kitchen
- 3 Trekking Center
- 4 Co-working Lounge
- 5 Meeting Room
- 6 Greenhouse
- 7 Data Center
- 8 Common Space
- 9 Common Balcony
- 10 Sauna





Building A
4F Plan

- 1 Cafeteria
- 2 Kitchen
- 3 Trekking Center
- 4 Co-working Lounge
- 5 Meeting Room
- 6 Greenhouse
- 7 Data Center
- 8 Common Space
- 9 Common Balcony
- 10 Sauna





Living Room and Barnacle

Common Area of the Renovated Building



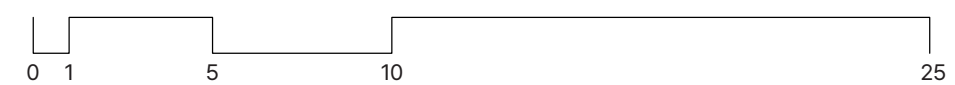


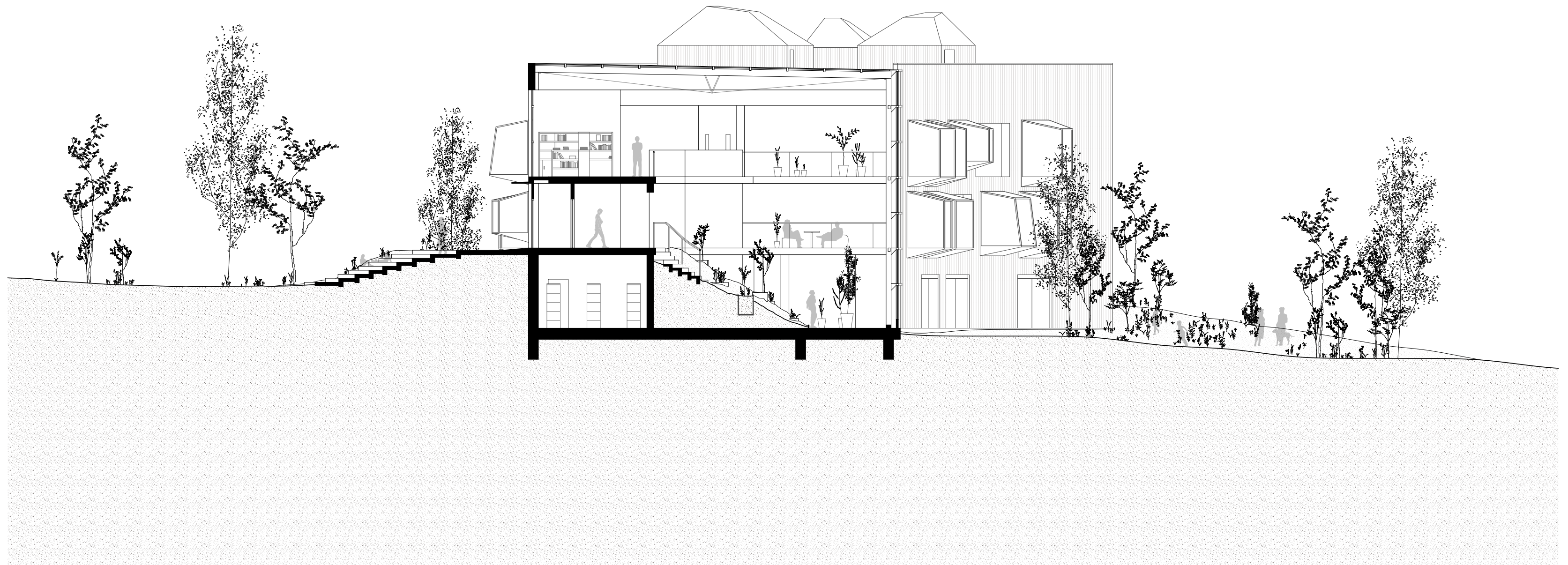
Elevation (West)



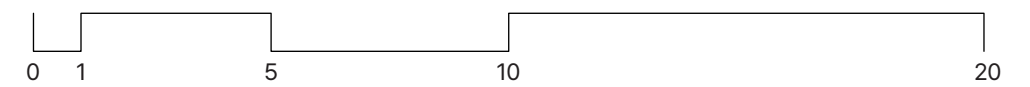


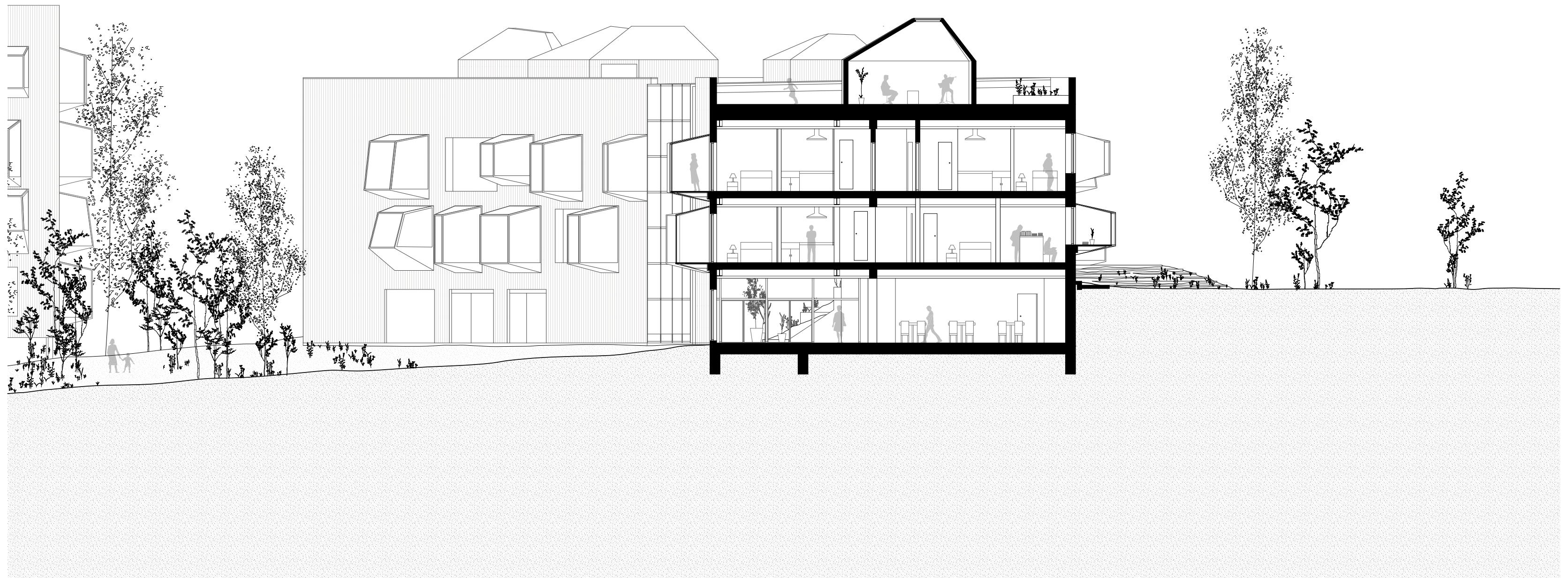
Elevation (East)



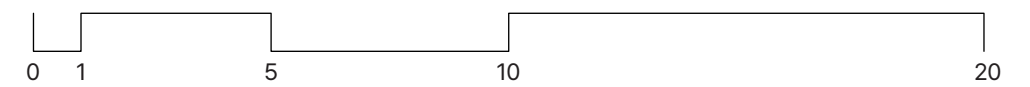


A-A' Section





B-B' Section





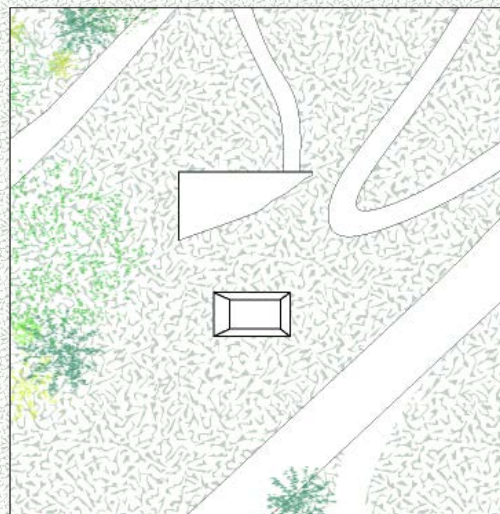
Greenhouse Atrium

Area C & Landscape



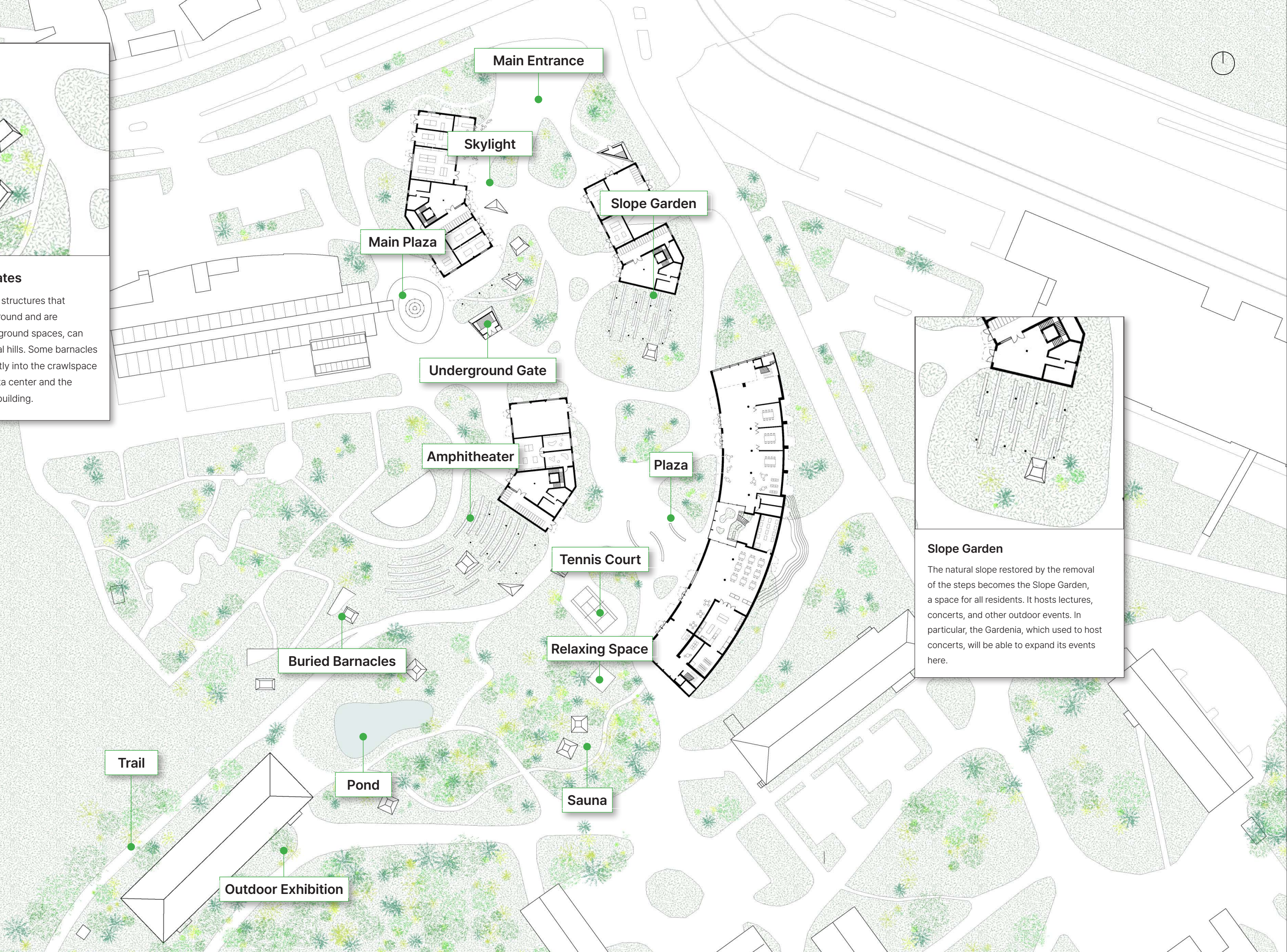
Skylights & Gates

Skylights, which are structures that protrude from the ground and are connected to underground spaces, can also become artificial hills. Some barnacles become gates directly into the crawlspace from the outside, data center and the heating load of the building.



Pavilions

Some of the barnacle pavilions (in front of the Japanese garden) are partially buried in the ground, respecting the slope of the existing landscape. The relaxing space created in the original forest on the south side has a sauna pavilion.



Main Entrance

Skylight

Slope Garden

Main Plaza

Underground Gate

Amphitheater

Plaza

Tennis Court

Relaxing Space

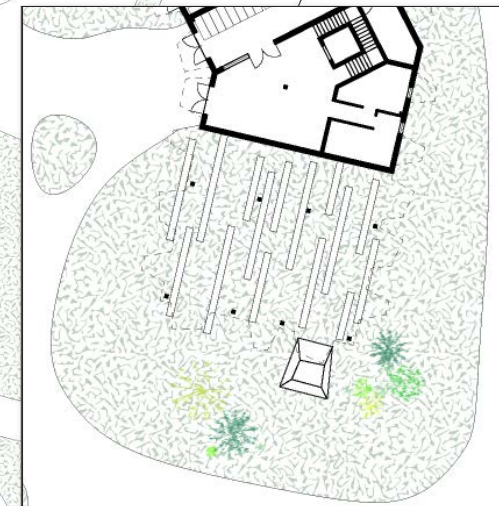
Buried Barnacles

Pond

Sauna

Trail

Outdoor Exhibition



Slope Garden

The natural slope restored by the removal of the steps becomes the Slope Garden, a space for all residents. It hosts lectures, concerts, and other outdoor events. In particular, the Gardenia, which used to host concerts, will be able to expand its events here.





Slope Garden

The previous landscape design was an artificial division of the natural terrain into different levels. The continuity of nature at ground level has been restored by placing the community spaces underground. People will be able to move along the slope and rest on the site. This also increases the accessibility of the green spaces created between the buildings.



Amphitheater

For more active events, the area near the Gardenia will become a place of entertainment. Along the line of the slope, people will be able to sit on the stands and enjoy relaxation and entertainment.



Buried Barnacles

Find Barnacles buried in the ground on the site. In this Project, the partially buried barnacles are used as a community space while restoring the natural topography. This brings the Gardenia together while improving access to the previously underused Japanese garden in front of the Buried Barnacles.

Outdoor Exhibition (Area C)

To the south of the contest site is a building that used to be a museum. This building's outside wall is now used for an outdoor exhibition. Facing the nature of the reserve, it welcomes visitors and conveys a variety of information about the beautiful nearby nature, flora and fauna. At the same time, it respects the atmosphere and history of the building, which was once a museum.



04

Energy & Technics

Detail Section

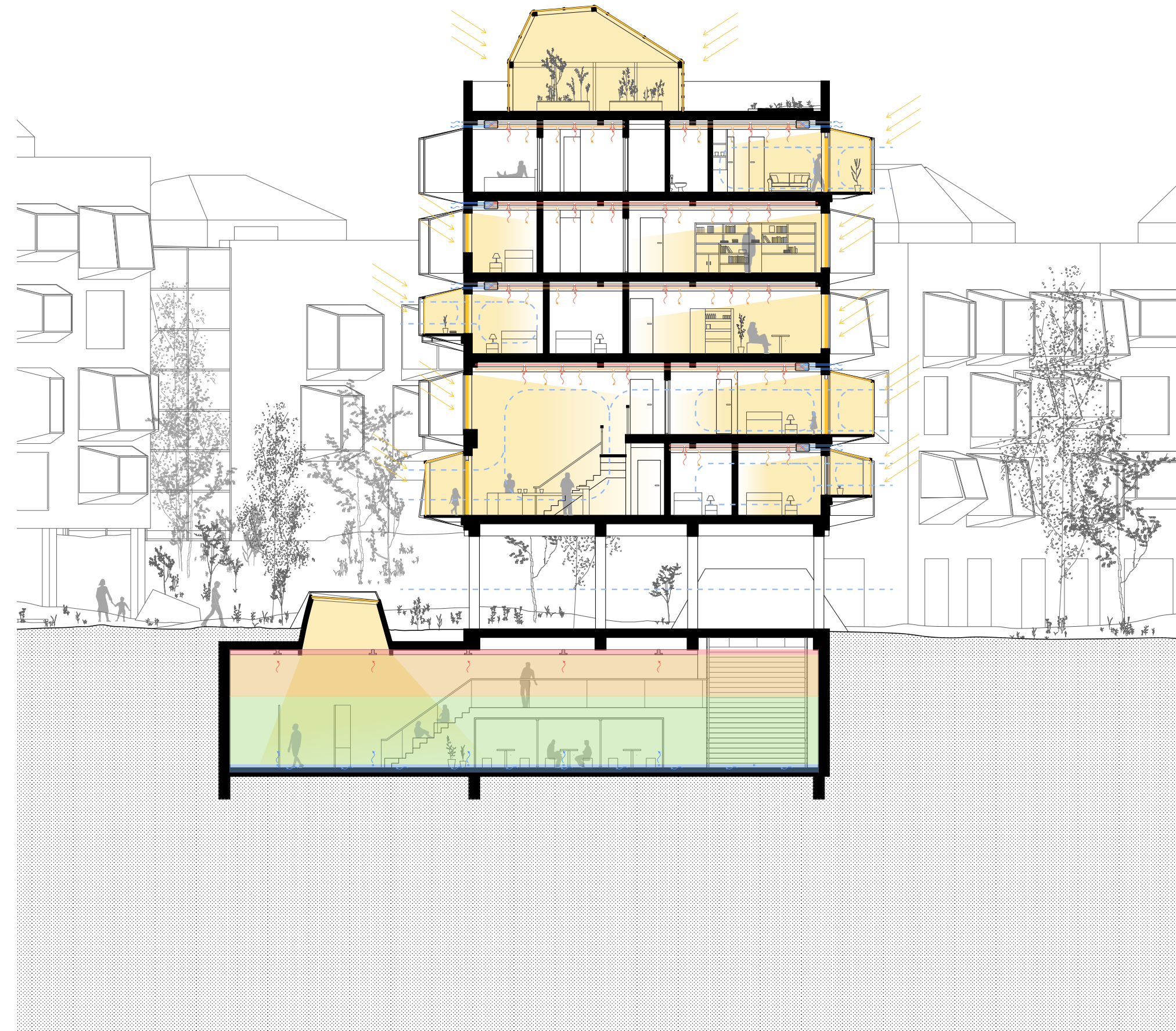
Sustainable Materials

Energy Solutions

Ventilation & Daylight

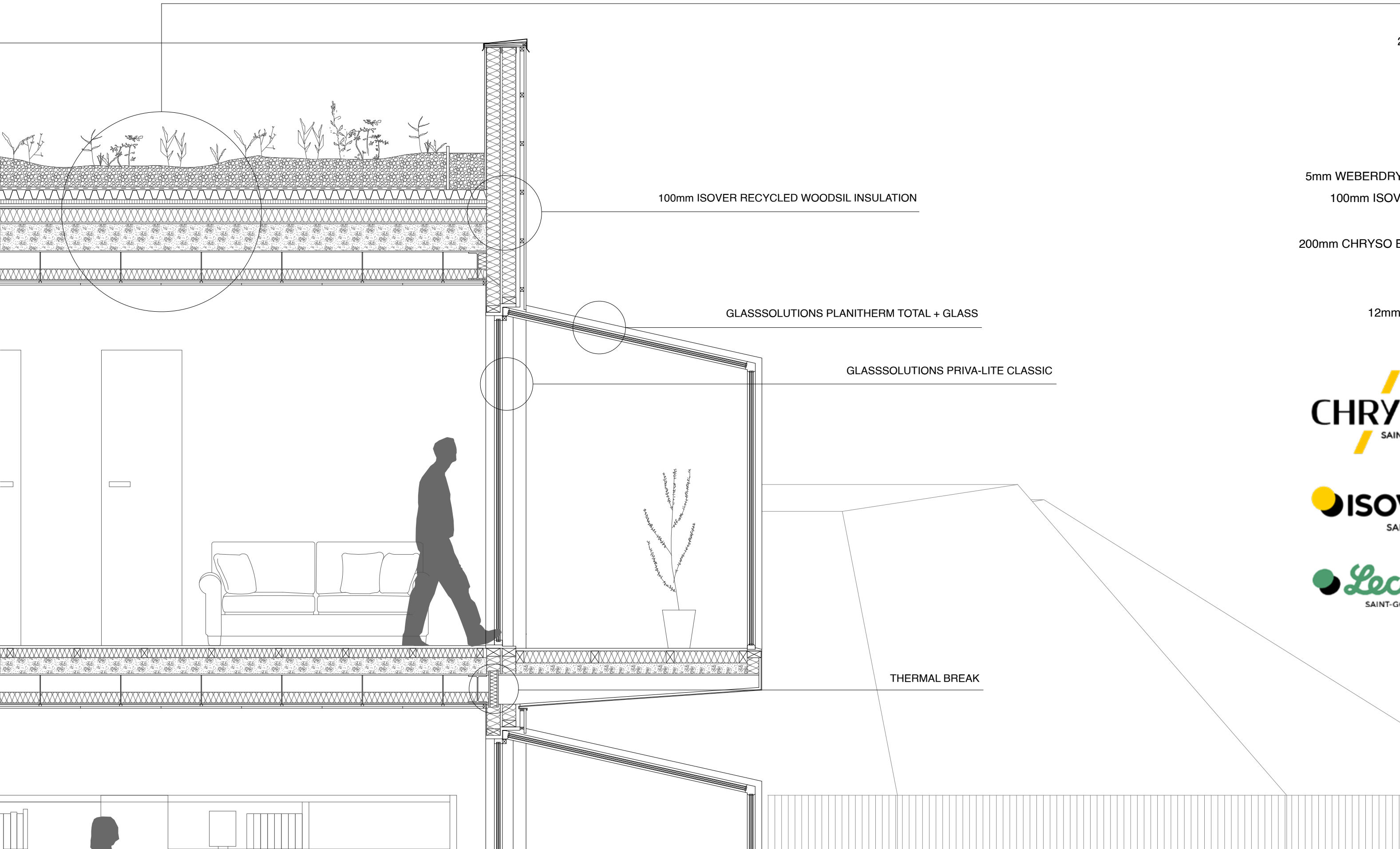
Water Treatment

One Click LCA



Detail Section

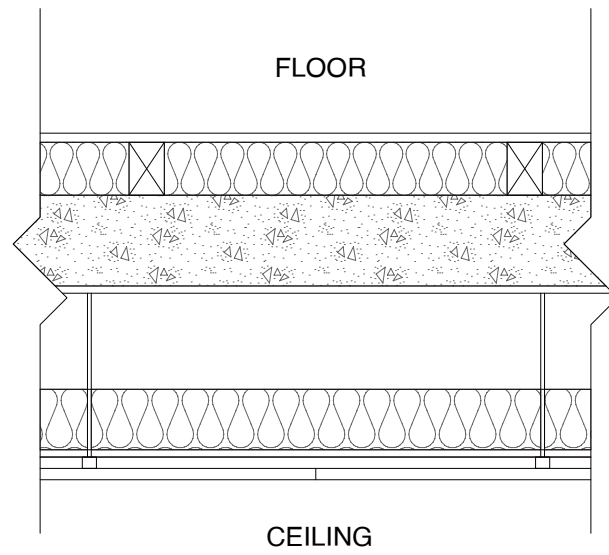
GREEN ROOF DETAIL



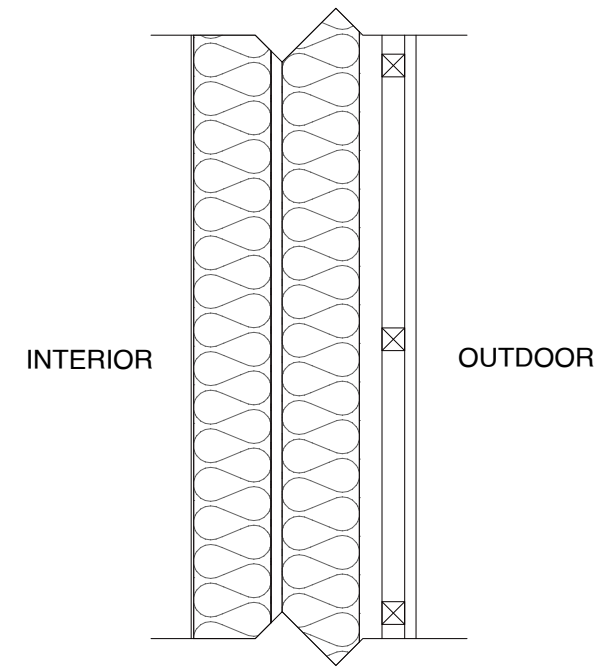
- 200mm EXPLANDED CALY(LECA) FOR PLANTING
- 6mm FILTER FABRIC
- 75mm DRAINAGE AND RESERVIOR BOARD
- MOISTURE RETENTION LAYER
- 20mm ROOT BARRIER
- 12mm MEMBRANE PROTECTION
- 5mm WEBERDRY ROOF NATURA WATER-PROOFING MEMBRANE
- 100mm ISOVER ARENA COVERAGES THERMAL INSULATION
- VAPOUR CONTROL LAYER
- 200mm CHRYSO EnviroMix ULC(ULTRA-LOW CARBON) CONCRETE
- STEEL H BEAM
- 100mm ACOUSTIC INSULATION ARENA PF
- 12mm PROGYP PPF BA - LAMINATED PLASTERBOARD (SUSPENDED CEILING SYSTEM)



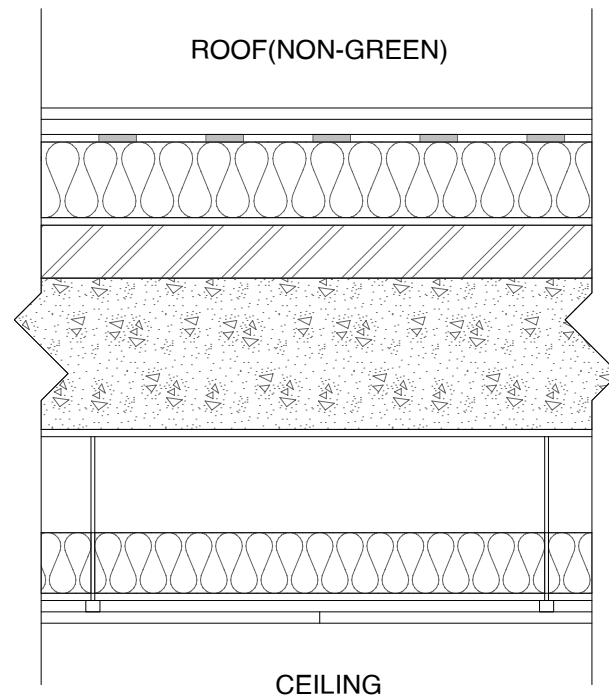
Detail Section



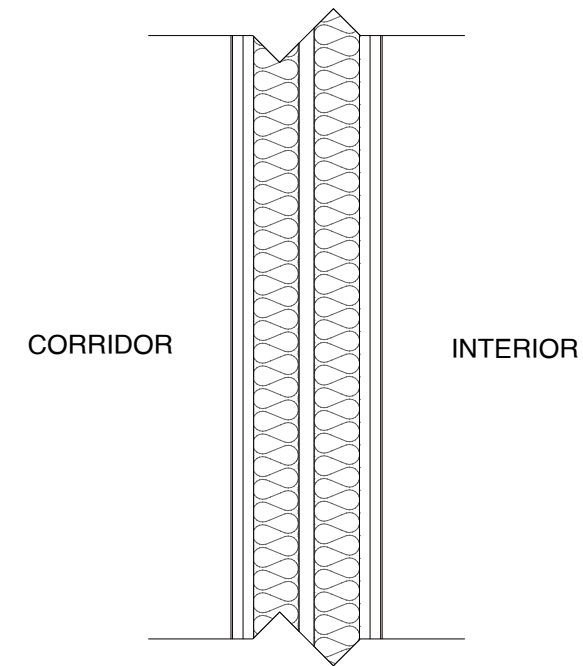
- 10mm TIMBER FINISHING
- 70mm ACOUSTIC INSULATION ARENA PF
- 120mm CHRYSO EnviroMix ULC(ULTRA-LOW CARBON) CONCRETE
- STEEL H BEAM
- 100mm ACOUSTIC INSULATION ARENA PF
- 12mm PROGY PPF BA - LAMINATED PLASTERBOARD



- WALL FINISHING
- METAL STUD WALL WITH:
- 100mm ISOVER RECYCLED WOODSIL INSULATION
- AIR GAP(VAPOUR CONTROL)
- 100mm ISOVER RECYCLED WOODSIL INSULATION
- VERTICAL TIMBER BATTENS
- HORIZONTAL TIMBER BATTENS
- VERTICAL TIMBER CLADDING



- 10mm ROOF FINISHING
- WABERDRY PURE FABRIC 110G
- 15mm WEBERDRY PUR SEAL AQUA POLYURETHANE WATER-PROOFING MEMBRANE
- 100mm ISOVER 175 ROOFING PANEL (THERMOACOUSTIC)
- VAPOUR CONTROL LAYER
- 70mm WEBERFLOOR BASE SCREED
- 200mm CHRYSO EnviroMix ULC(ULTRA-LOW CARBON) CONCRETE
- STEEL H BEAM
- 100mm ACOUSTIC INSULATION ARENA PF
- 12mm PROGY PPF BA - LAMINATED PLASTERBOARD



- WALL FINISHING
- 14mm x 2 PROGY PPF BA (PLACO)
- : LAMINATED-PLASTERBOARD(DOUBLE)
- 70mm ISOVER ACOUSTIC ROLL
- AIR GAP
- 70mm ISOVER APT ARENA
- 14mm x 2 PROGY PPF BA (PLACO)
- : LAMINATED-PLASTERBOARD(DOUBLE)
- WALL FINISHING



Sustainable Materials

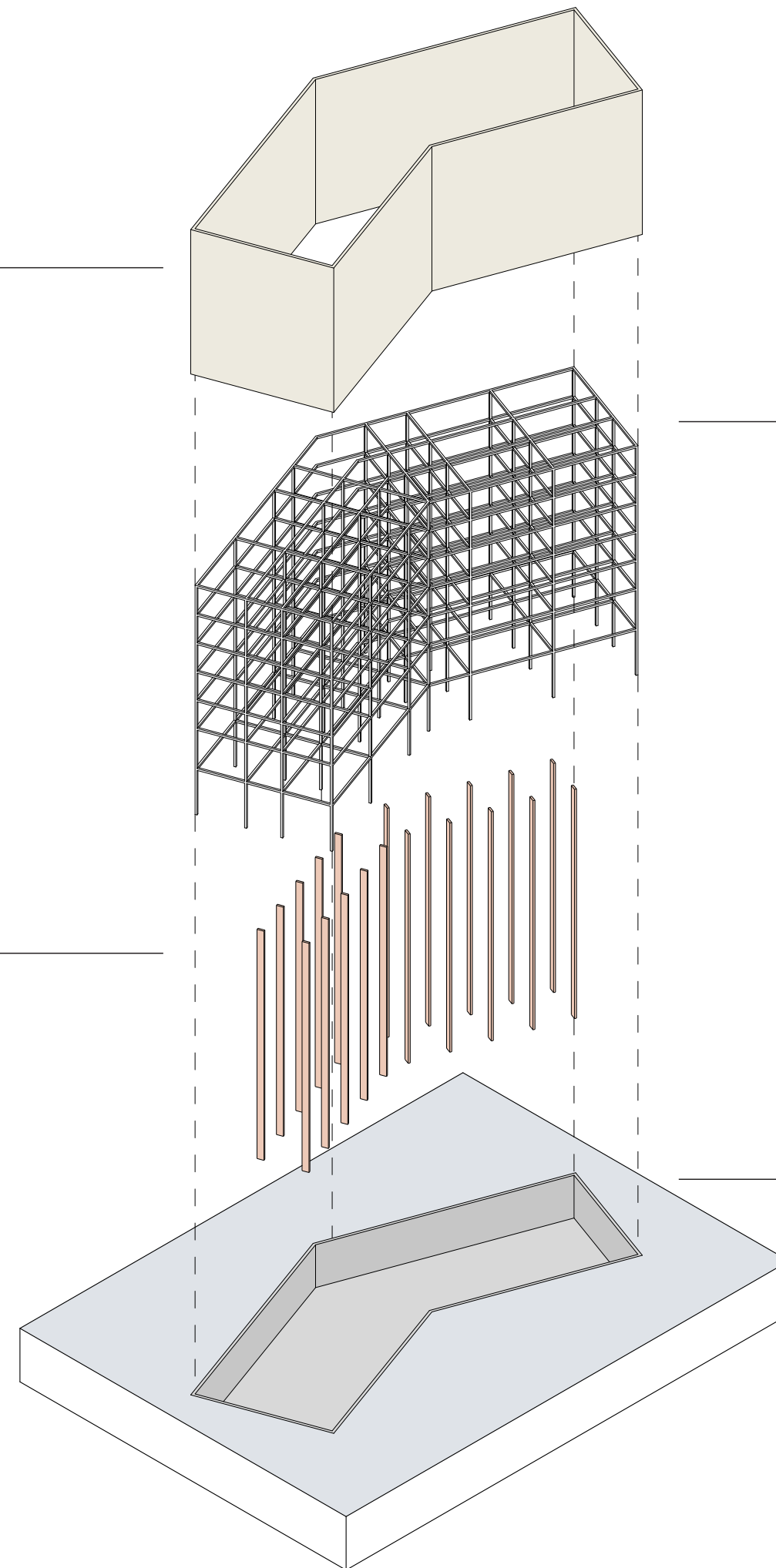
Timber cladding

Reduced Carbon Emission : Timber reduces carbon emissions in the building life cycle.

Ease of Maintenance : It is a local material in Finland and is easy to get and maintain throughout the life cycle of the building.

Utility Core

Flexibility and Adaptability : This building has steel structure and utility core and these features let the building have high flexibility. Various composition can be made around the utility core according to the needs by time and situation. The lifespan of the building increases by this flexibility.



Steel Structure

High recyclability : The recycling rate of timber, which accounts for a significant portion of the building waste generated, is as low as 26% in Finland. On the other hand, steel production shows 56% of a recycling rate. Steel frames are more likely to be circulated during demolition over the life cycle.

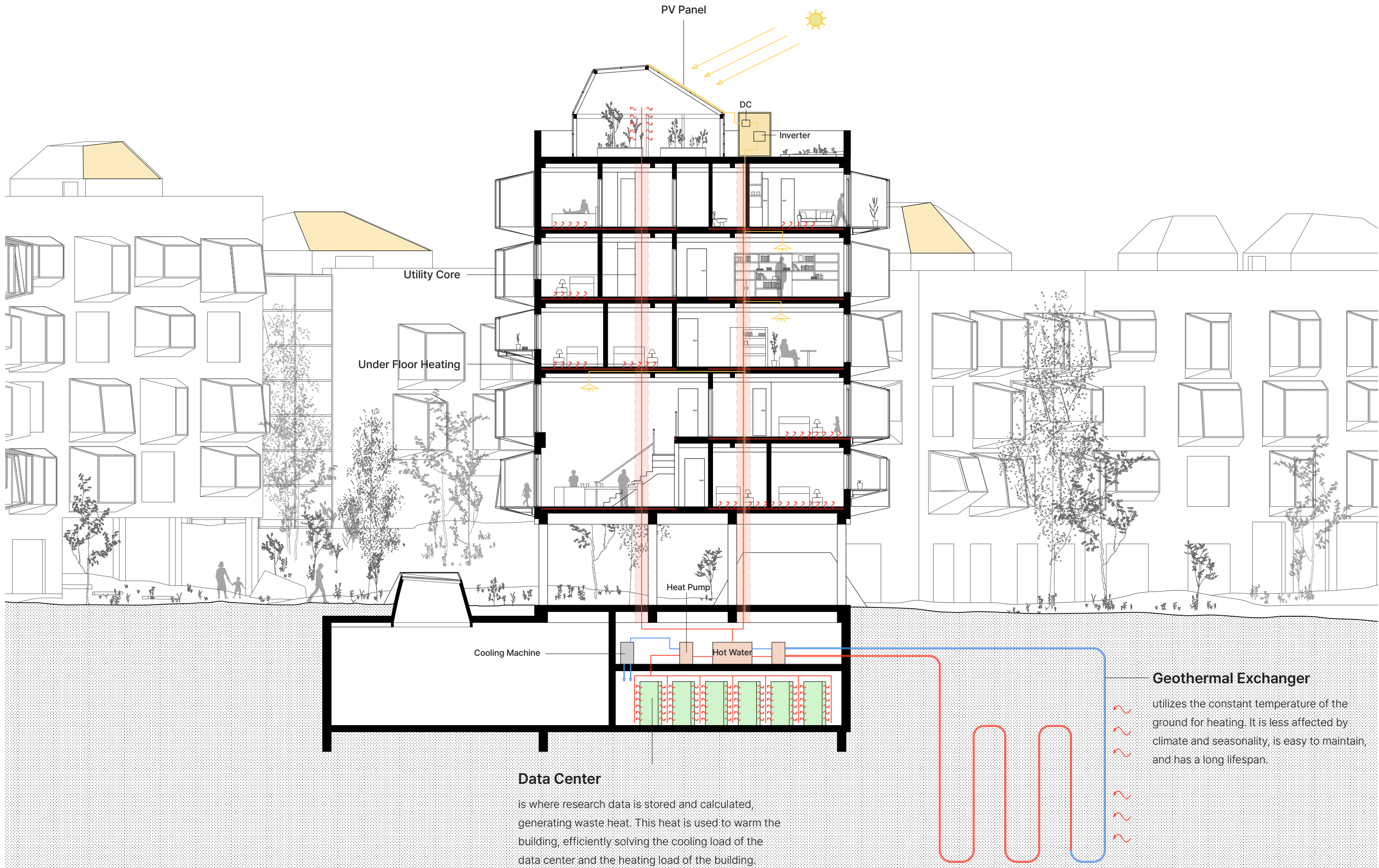
Usage of FFS (Fossil-Free Steel) : Our project uses steel produced using electrical energy, as opposed to traditional methods, producing by burning fossil fuels. Finland has been investing gradually in low-carbon steel industries as well.

Concrete, Brick

Low Carbon Concrete : CHRYSO EnviroMix, which is made with ash, slag, etc, reduces CO2 emission up to 50% during producing.

Recycled Brick Pavement : Pavement over the site is made by recycled bricks and the bricks are composed of construction waste.

Energy Solutions



Utility Core

Under Floor Heating

PV Panel

DC

Inverter

Heat Pump

Cooling Machine

Hot Water

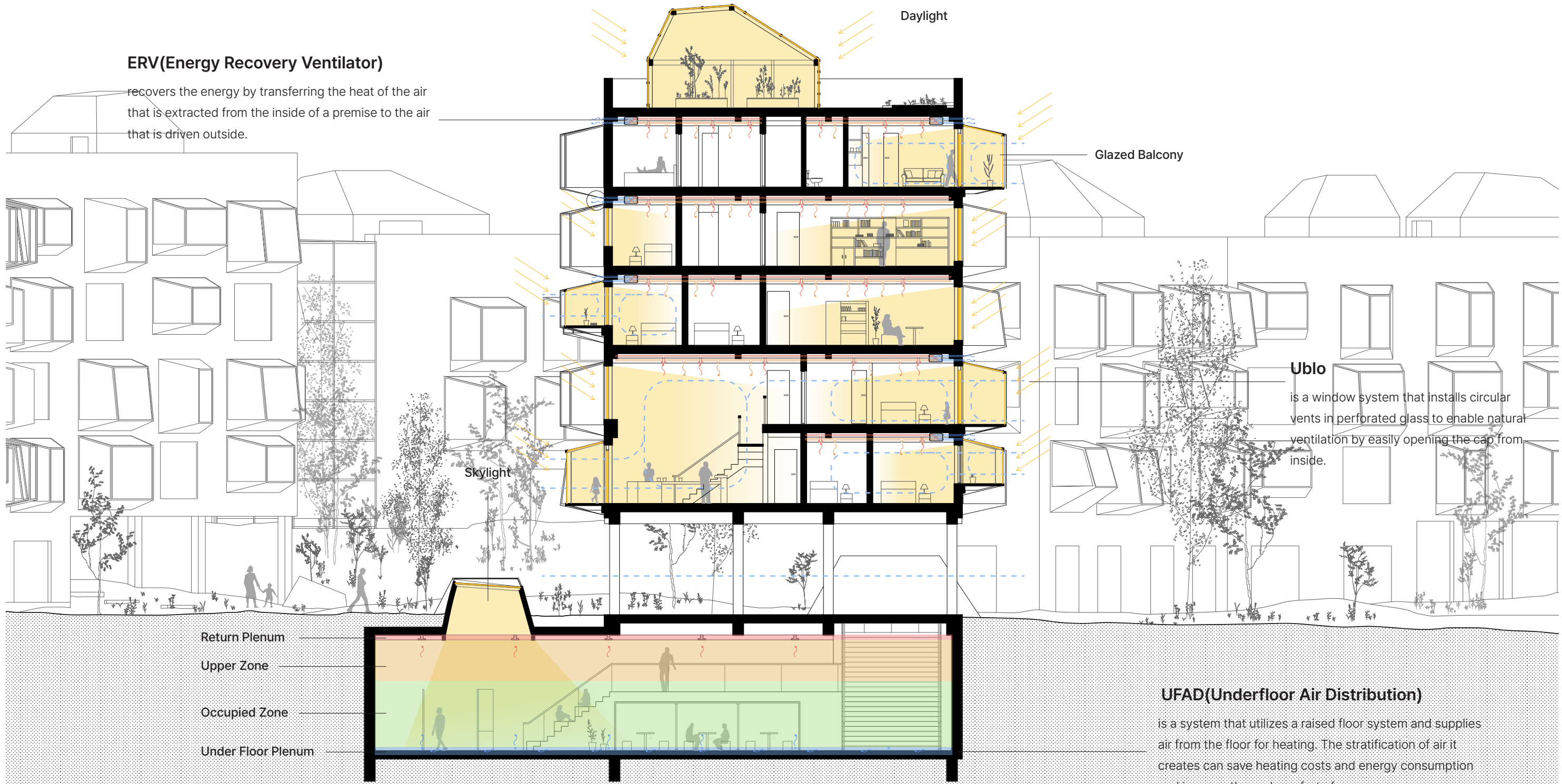
Geothermal Exchanger

utilizes the constant temperature of the ground for heating. It is less affected by climate and seasonality, is easy to maintain, and has a long lifespan.

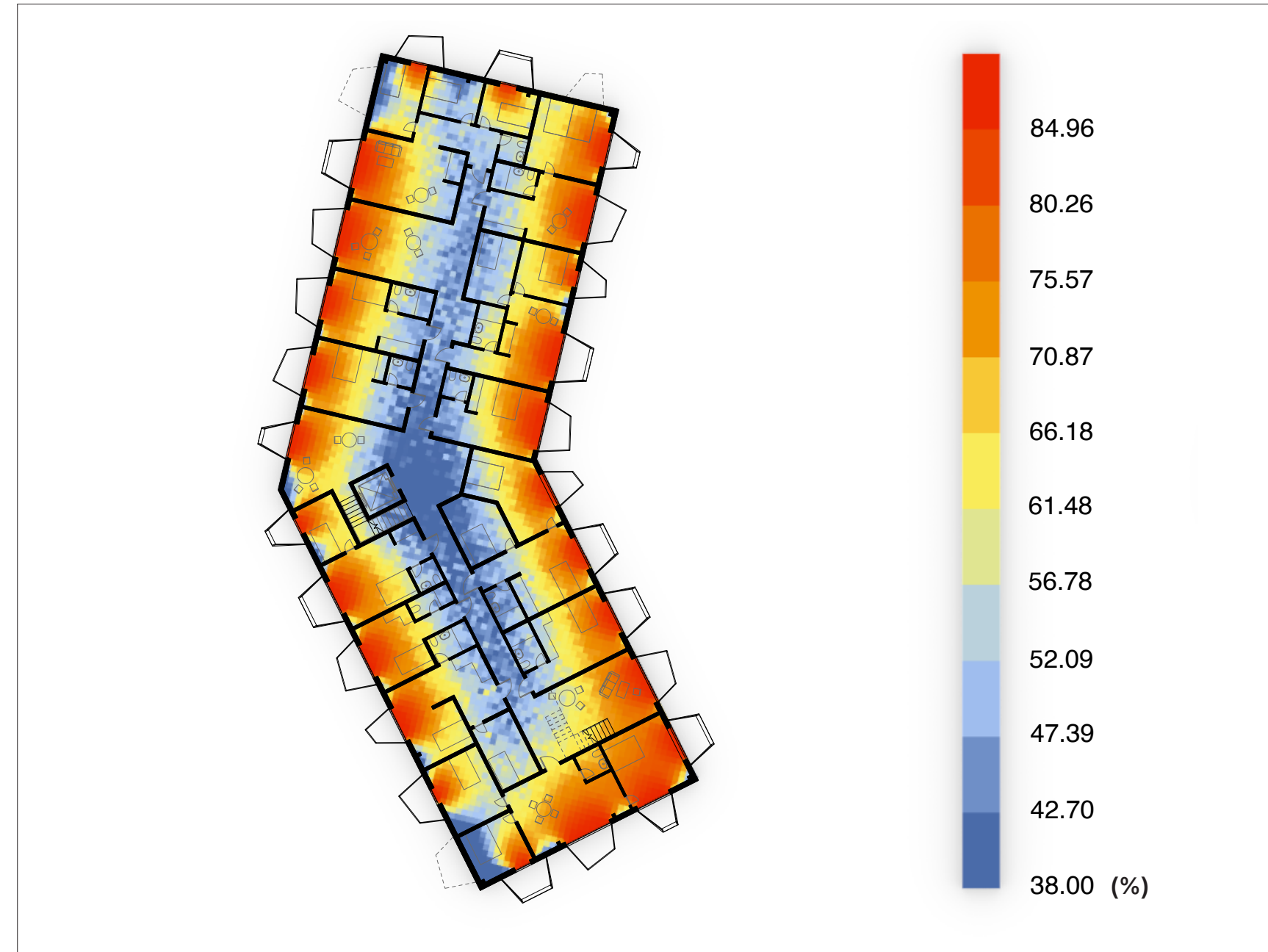
Data Center

is where research data is stored and calculated, generating waste heat. This heat is used to warm the building, efficiently solving the cooling load of the data center and the heating load of the building.

Ventilation & Daylight



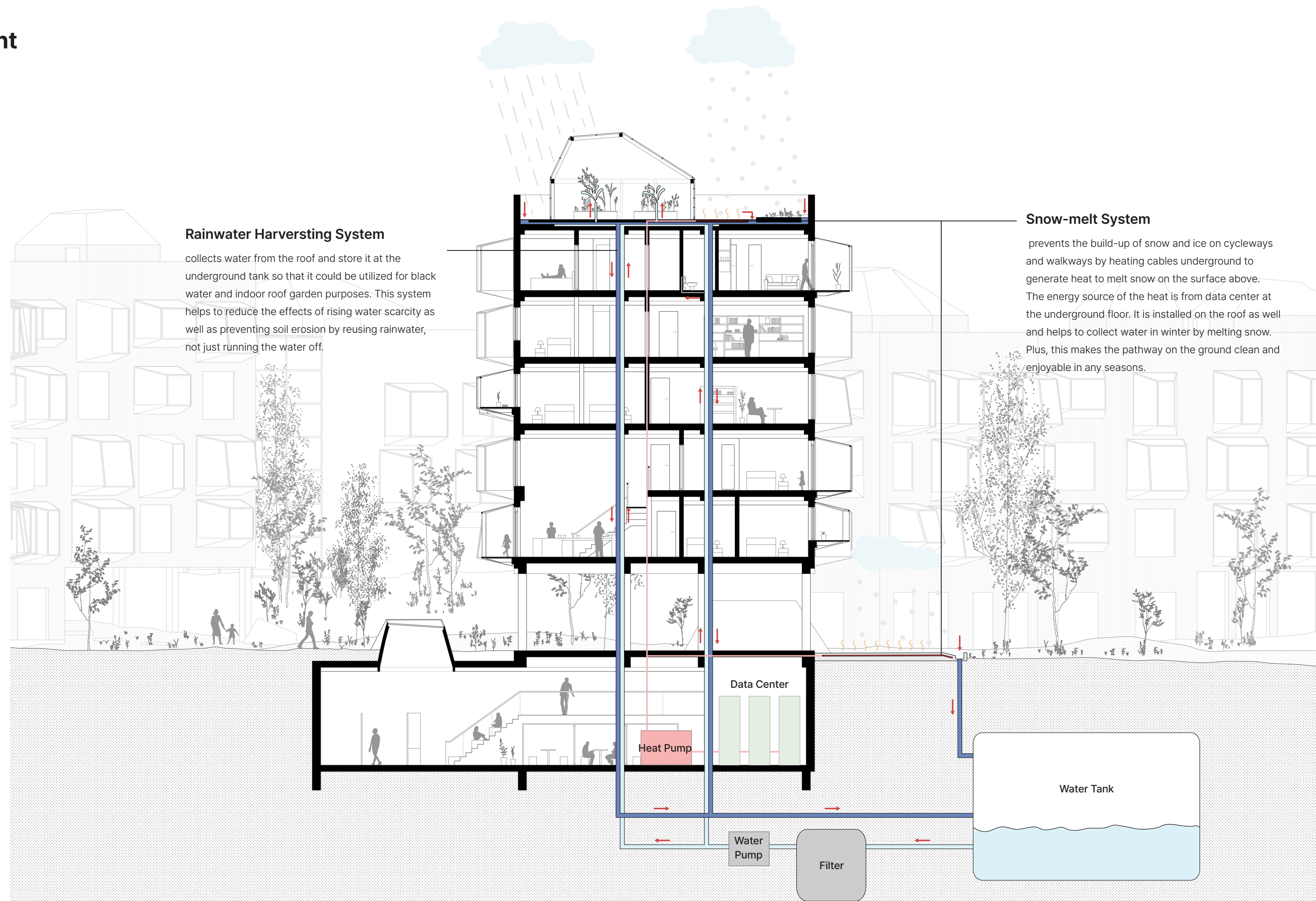
Ventilation & Daylight

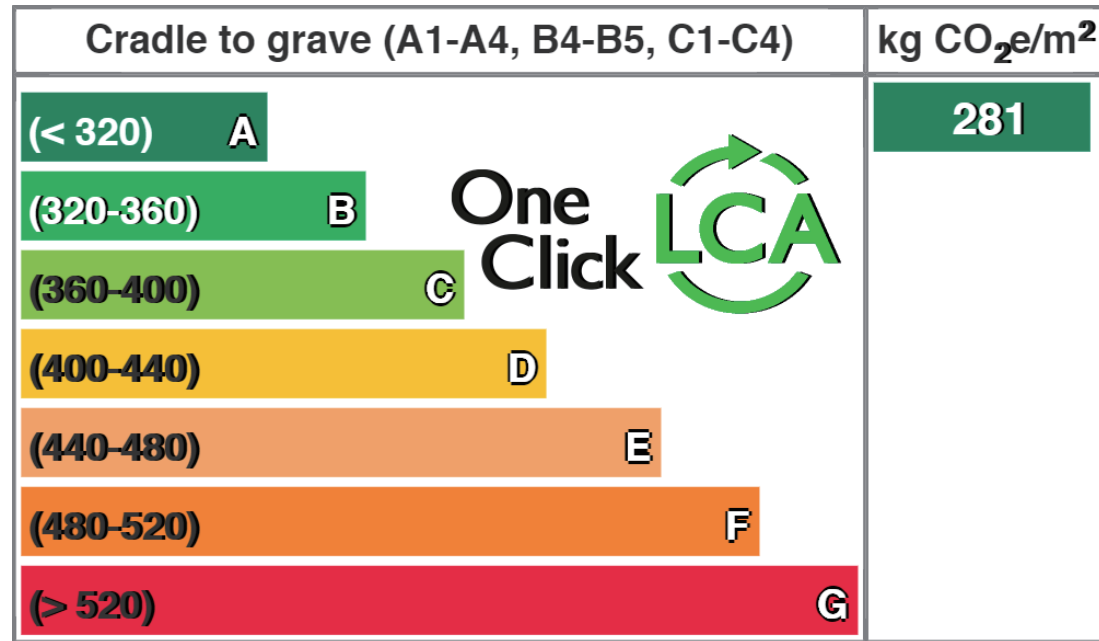


Annual Daylight Analysis

Using Helsinki climate conditions and analyzing the annual daylight for one building, it can be seen that there is an even distribution of daylight across the entire building.

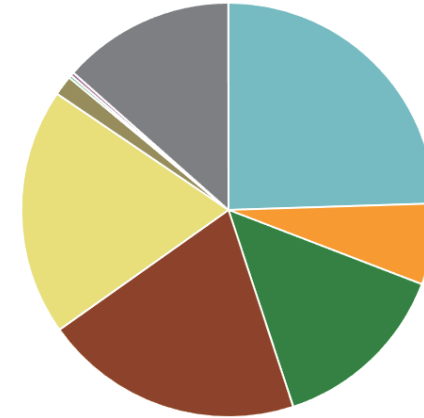
Water Treatment





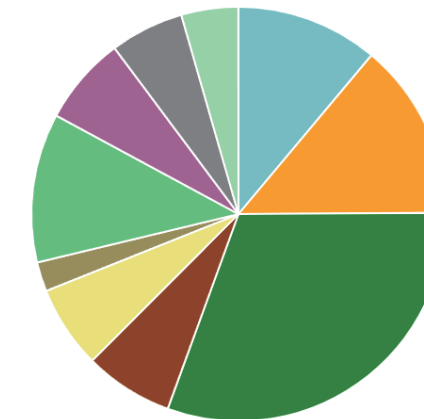
Mass kg - Classifications

- 1.1 Foundations (substructure) - 24.5%
- 1.2 Load bearing structural frame - 6.3%
- 1.2.1 Frame (beams, columns and slabs) - 14.1%
- 1.2.3 External walls - 20.3%
- 1.3.1 Ground floor slab - 19.3%
- 1.3.2 Internal walls, partitions and doors - 1.6%
- 1.4.2 Façade openings - 0.2%
- 2.1.3 Ceilings - 0.3%
- 2.1.5 Floor coverings and finishes - 13.5%

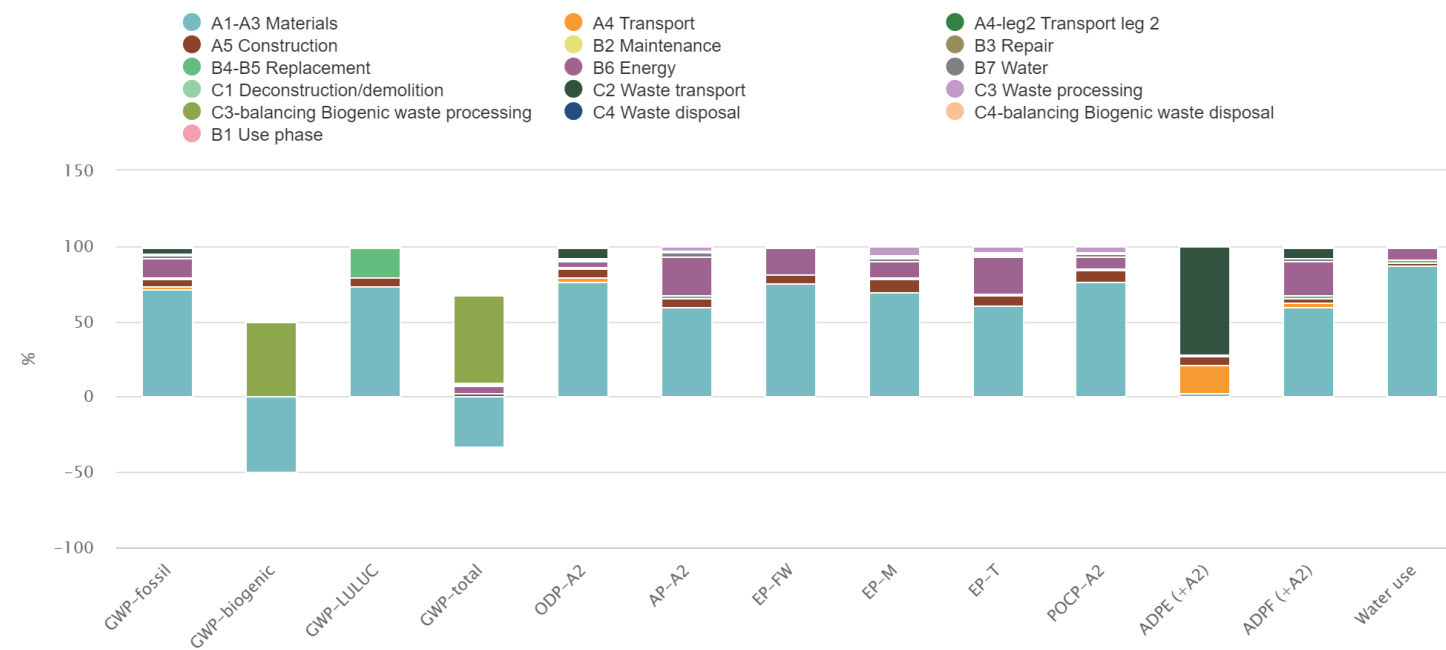


Global Warming Potential total kg CO₂e - Classifications

- 1.1 Foundations (substructure) - 11.1%
- 1.2 Load bearing structural frame - 13.8%
- 1.2.1 Frame (beams, columns and slabs) - 30.7%
- 1.2.3 External walls - 6.9%
- 1.3.1 Ground floor slab - 6.5%
- 1.3.2 Internal walls, partitions and doors - 2.3%
- 2.1.5 Floor coverings and finishes - 11.6%
- Electricity use - 6.9%
- District heat use - 5.8%
- Other classifications - 4.4%



Life-cycle impacts by stage as stacked columns



Global Warming Potential total kg CO₂e - Resource types

This is a drilldown chart. Click on the chart to view details

- Structural steel and steel profiles - 50.6%
- Plain wood/timber (softwood and hardwood) - 18.5%
- Electricity - 6.9%
- Concrete slabs (hollow and solid) - 6.2%
- District heat - 5.8%
- Ready-mix concrete for foundations and internal walls - 5.0%
- Water - 1.9%
- Wood and wood board doors - 1.6%
- Safety glass panes - 1.3%
- Other resource types - 2.3%

