LUONNONKOTI

Viikki, Finland

ARCHITECTURE STUDENT CONTEST

Natural Home

Luonnonkoti **harmoniously blends** with nature and is held in Viikki's natural environment. The project is based on the respect and appreciation of Finland's culture, therefore, the proposal is a building that properly **integrates** with the sites physical conditions.

Sustainability is achieved through the correct selection of Saint-Gobain materials, a conscious design, and the integration of innovative and eco-friendly technologies. The proposal centers on the renovation of an existing office building and the creation of a **new residential building** striving to integrate both. It offers a range of versatile spaces, including lounges multipurpose areas, study modules nestled amidst nature, and apartments for students, researchers, and visitors.

Furthermore, the design was developed based on bio-architecture principles, applying passive and active strategies to ensure a comfortable living experience under Viikki's specific climatic conditions.

By redefining the architectural landscape and effecting a substantial change in the district, Luonnonkoti offers a high-quality public space that respects and **dignifies the surrounding nature**, thereby unfolding as a significant urban node.

60°13'26" N 25°00'58" E

Concept

Luonnonrauha
"luonto": nature
"rauha": peace or tranquillity

Connection with nature is a vital part of Finland's lifestyle and identity.

The synergy with the existing environment is valued with the aim of leaving nature in its natural state, at peace, without any alterations or human interactions. The projects intention is to respect, while simultaneously elevating the context and natural essence of the site. The objective is for architecture to blend harmoniously with the environment, adapting and coexisting with the landscape.

The essence lies in its ability to seamlessly merge with the surroundings. The architecture is conceived as an echo of the landscape, with the reflection and integration with the context.

Luonnonkoti employs the analogy of a nest, serving as a quiet and peaceful shelter, adapted to nature while coexisting with it.

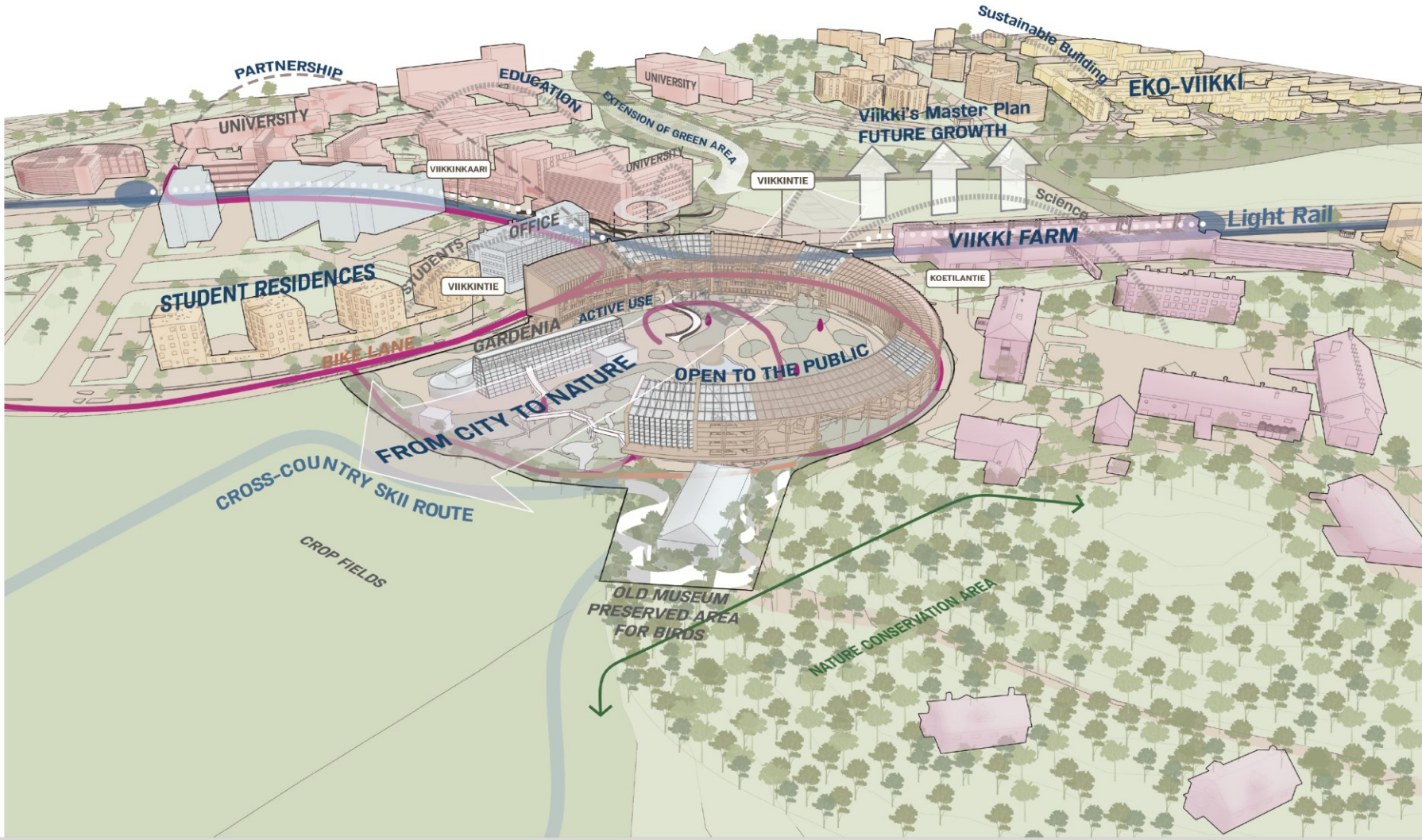
NEST

Masterplan

Luonnonkoti seamlessly blends into Viikki's Masterplan by establishing a centre that connects with the key urban areas of the district, with the aim of enriching both the project and the essence of the surrounding environment.

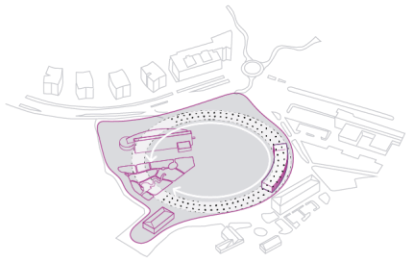
It proposes an elevated bridge over the existing roundabout to strengthen pedestrian and bike access to the project, as well as the direct linkage with the two new light-rail stations proposed by the district and the extension of green areas.

The project serves as a public space that provides dignified areas and residencies, fostering community among its inhabitants.



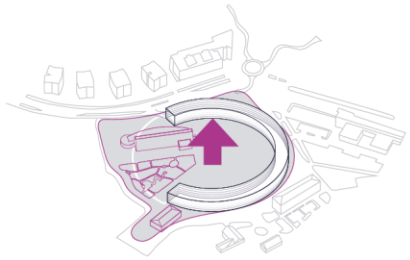
Design process

1



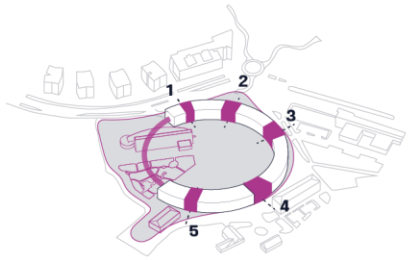
Structural rhythm
The existing building columns delineate the structural module, tracing thorugh their arrangement a circular pattern.

2



Preserve
By preserving significant elements such as vegetation and urban connections, the extruded volume is defined.

3

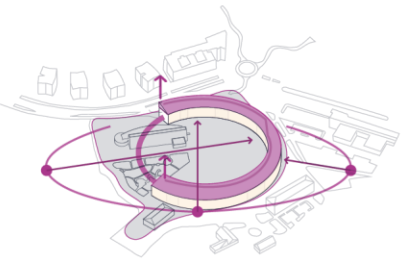


Connect
A relationship with the urban context is made by linking its orientation with the projects accesses and vertical circulations.

4

Coexist
Consolidation between existing vegetation and architectural programme.

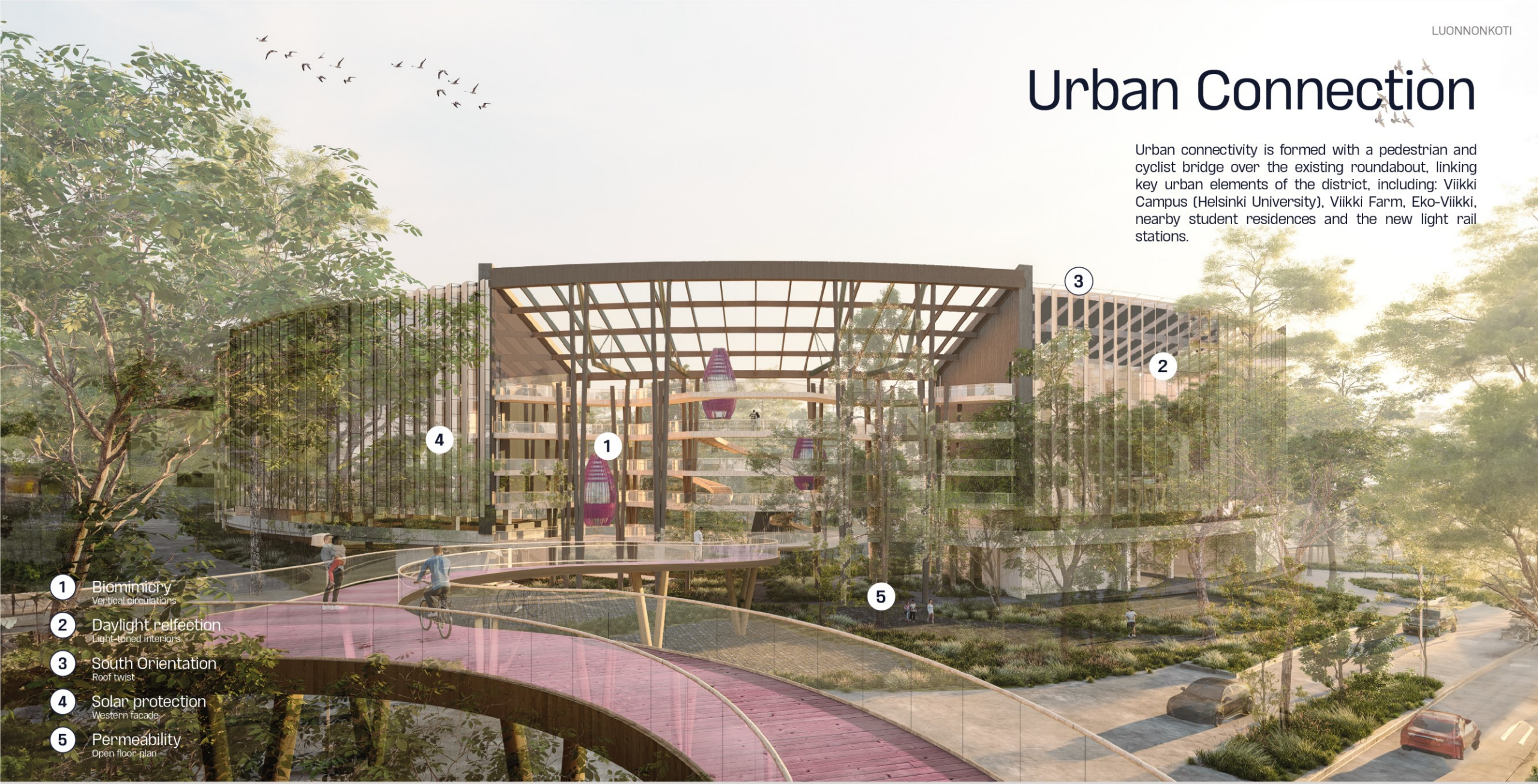
5



Climate response
Hallways located to the north as thermal buffers and roof twist to maximize solar radiation.

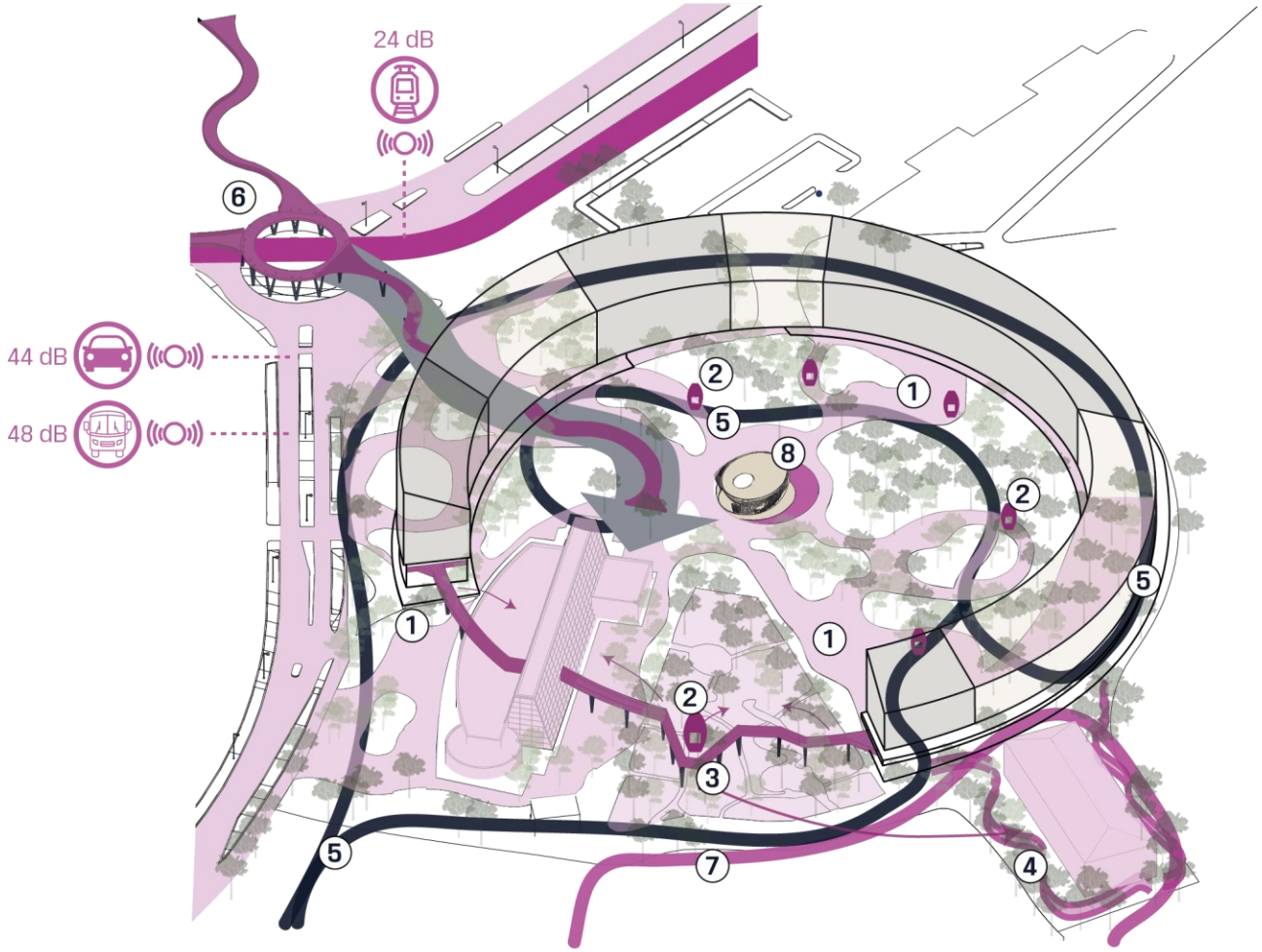
Urban Connection

Urban connectivity is formed with a pedestrian and cyclist bridge over the existing roundabout, linking key urban elements of the district, including: Viikki Campus (Helsinki University), Viikki Farm, Eko-Viikki, nearby student residences and the new light rail stations.



1. **Biomimicry**
   Vertical circulations
2. **Daylight reflection**
   Light-toned interiors
3. **South Orientation**
   Roof twist
4. **Solar protection**
   Western facade
5. **Permeability**
   Open floor plan

Exterior program

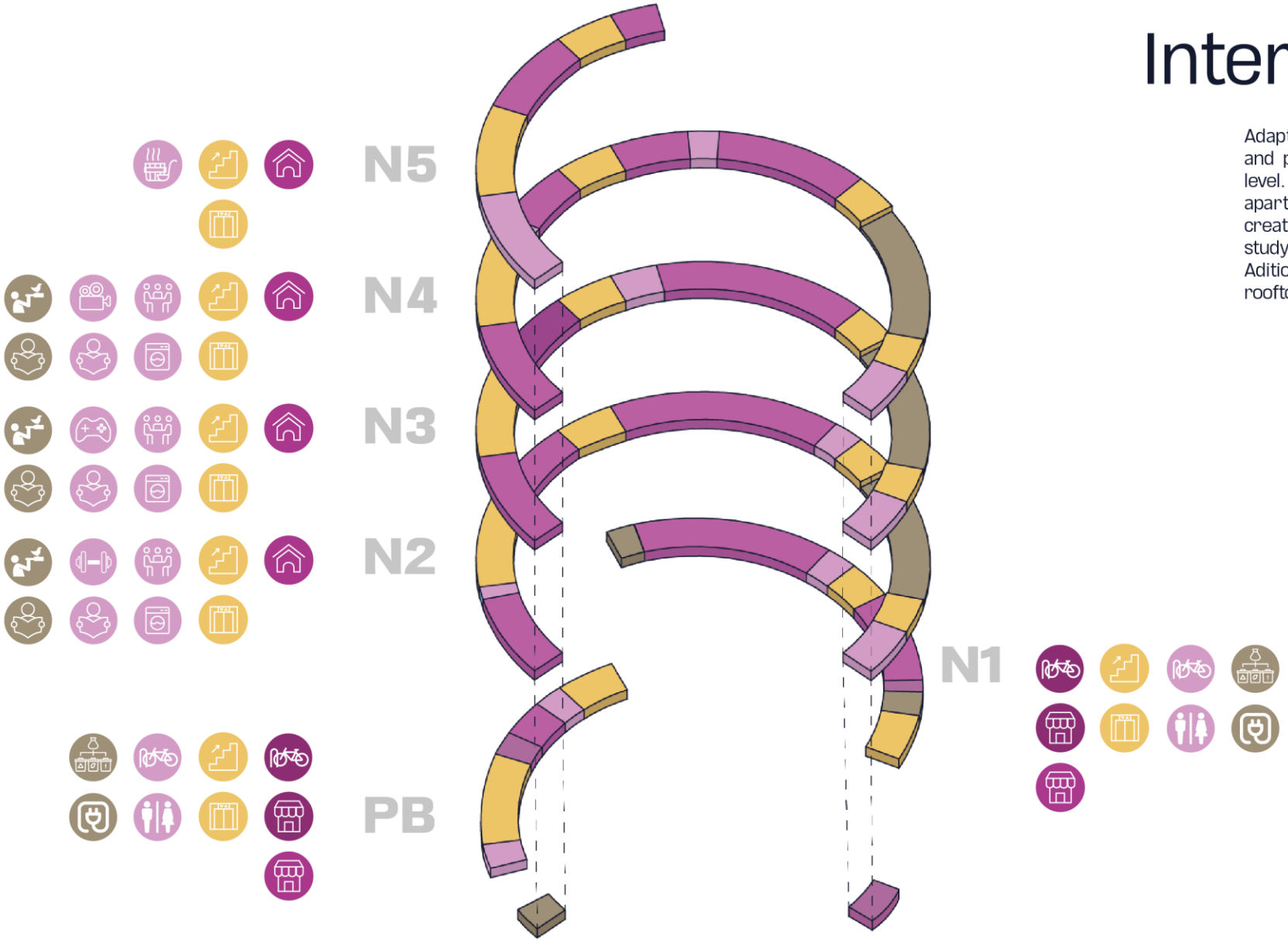


1. Paths
2. Multipurpose nests
3. Gardenia bridge
4. Sculptural wall
5. Bike lane
6. Urban bridge
7. Cross-country skii route
8. Sauna and swimming pond


1
2
3
4
5
6
7
1 Heat gains
Darke-toned wood cladding
2 Biomimicry
Vertical circulations
3 Daylight reflection
Light-toned interiors
4 South orientation
Roof twist
5 Solar protection
Western facade
6 Permeability
Open floor plan
7 Shelter
Home

Interior program

Adapting to the natural topography, commercial areas and public spaces are on the groundfloor and first level. From the 2nd to the 5th floor, there are apartments and nest cabins hanging from the roof, creating spaces for relaxation, gatherings for studying, or chilling in connection with nature. Aditionally, it has an underground parking lot and rooftop garden.



Site

N

0 10 20 30 40 50 m

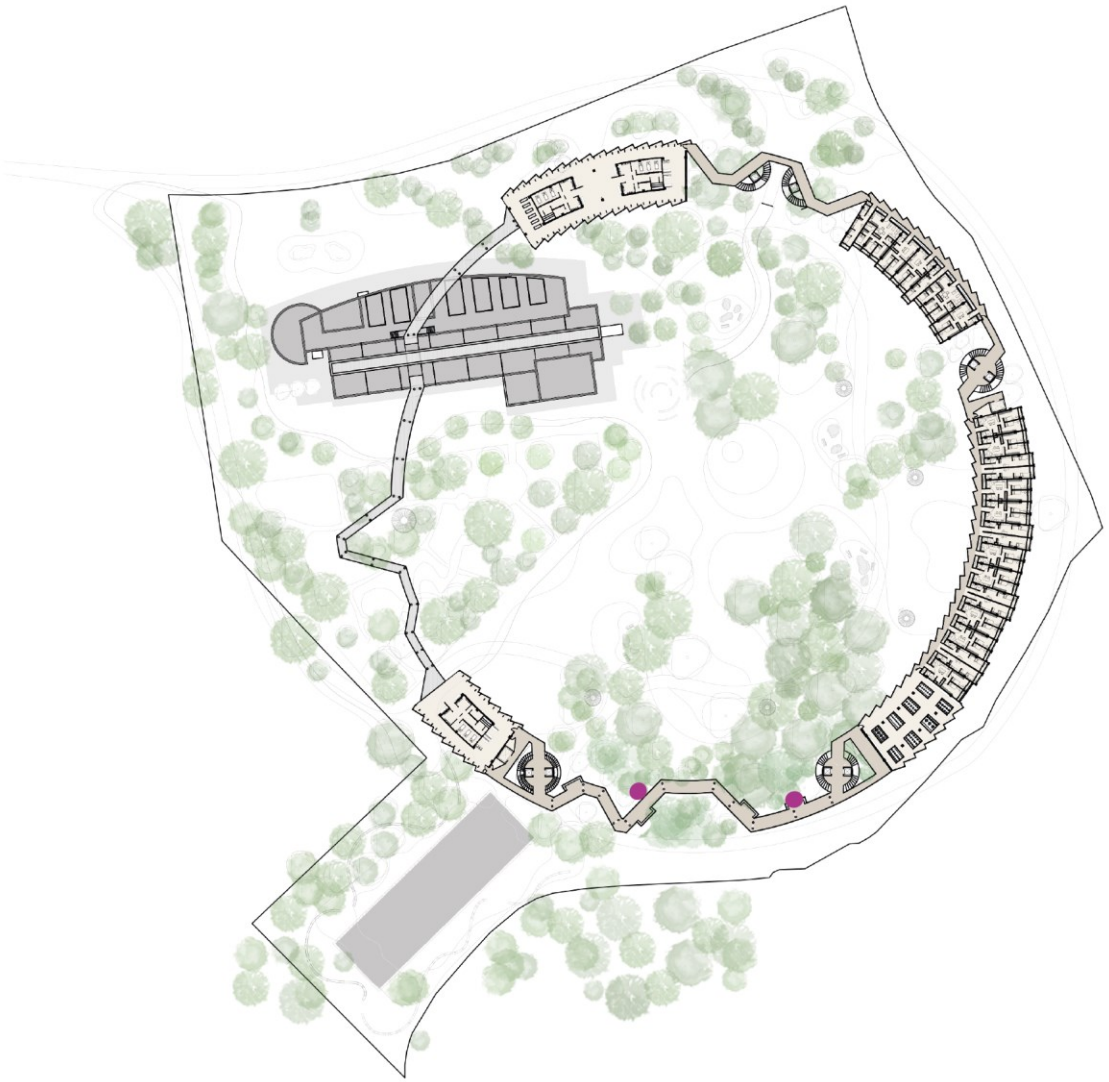
Groundfloor / 1st Floor

N

0 10 20 30 40 50 m

Apartments type floor

5th Floor



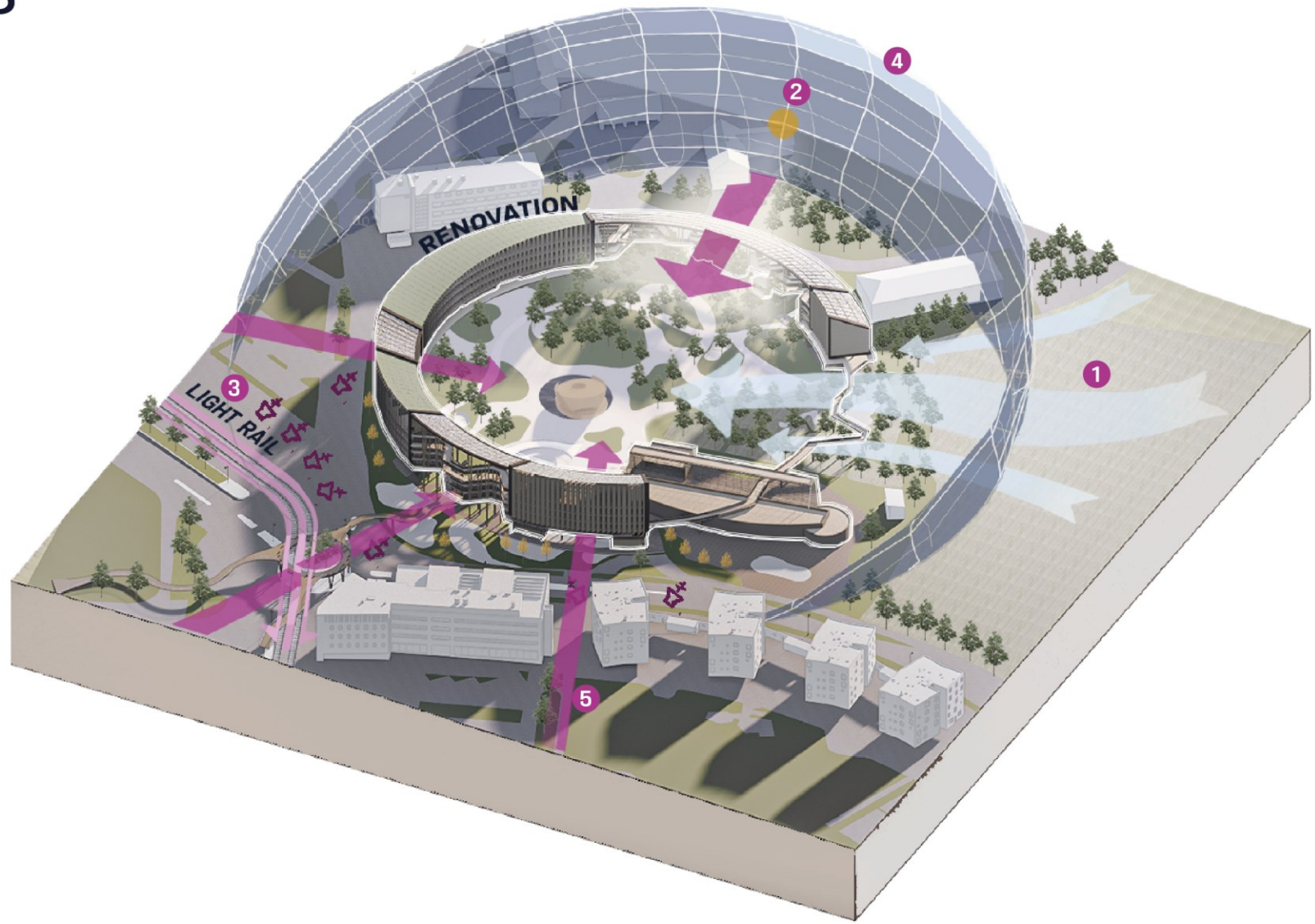
Harmonious blend with nature / Bridges with multipurpose nests

Climatic analysis

The project was design based on an analysis of the **site's conditions**, such as wind, solar incidence, noise disturbance, temperatures, and urban connections.

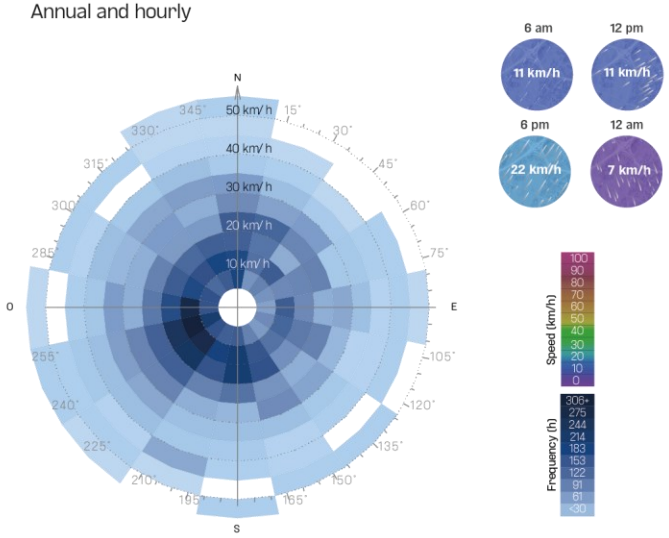
Therefore, seeking efficiency and sustainability, bioclimatic strategies were applied while designing the interior and exterior spaces.

1. Wind
2. Solar incidence
3. Noise disturbance
4. Temperatures
5. Urban connections



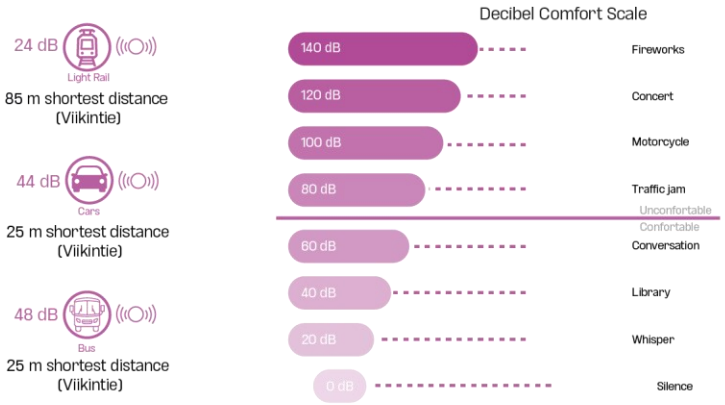
1 Wind

WIND ROSE
Annual and hourly



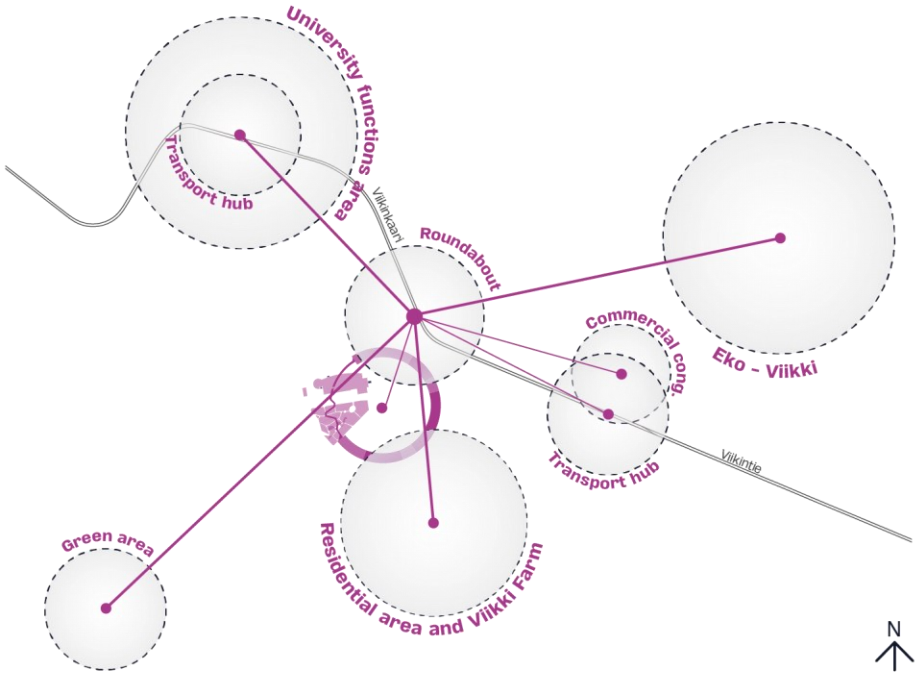
3 Noise disturbance

NOISE POLLUTION ANALYSIS
Decibel and distance from the project



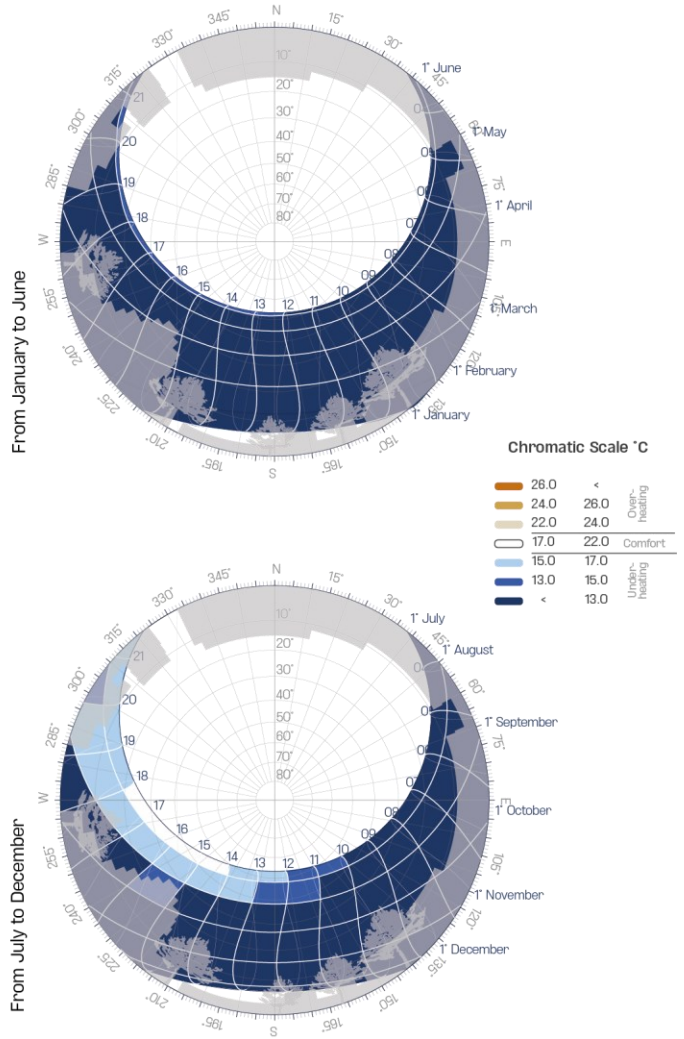
5 Urban connections

CONTEXT CONNECTIONS
According to the vision for Viikki´s future



2 Solar incidence

STEREOGRAPHIC SUN-PATH
Hourly temperatures and site obstructions



Bioclimatic strategies

Psychrometric chart:

Bioclimatic strategies based con the climatic conditions of the site to ensure thermal comfort.

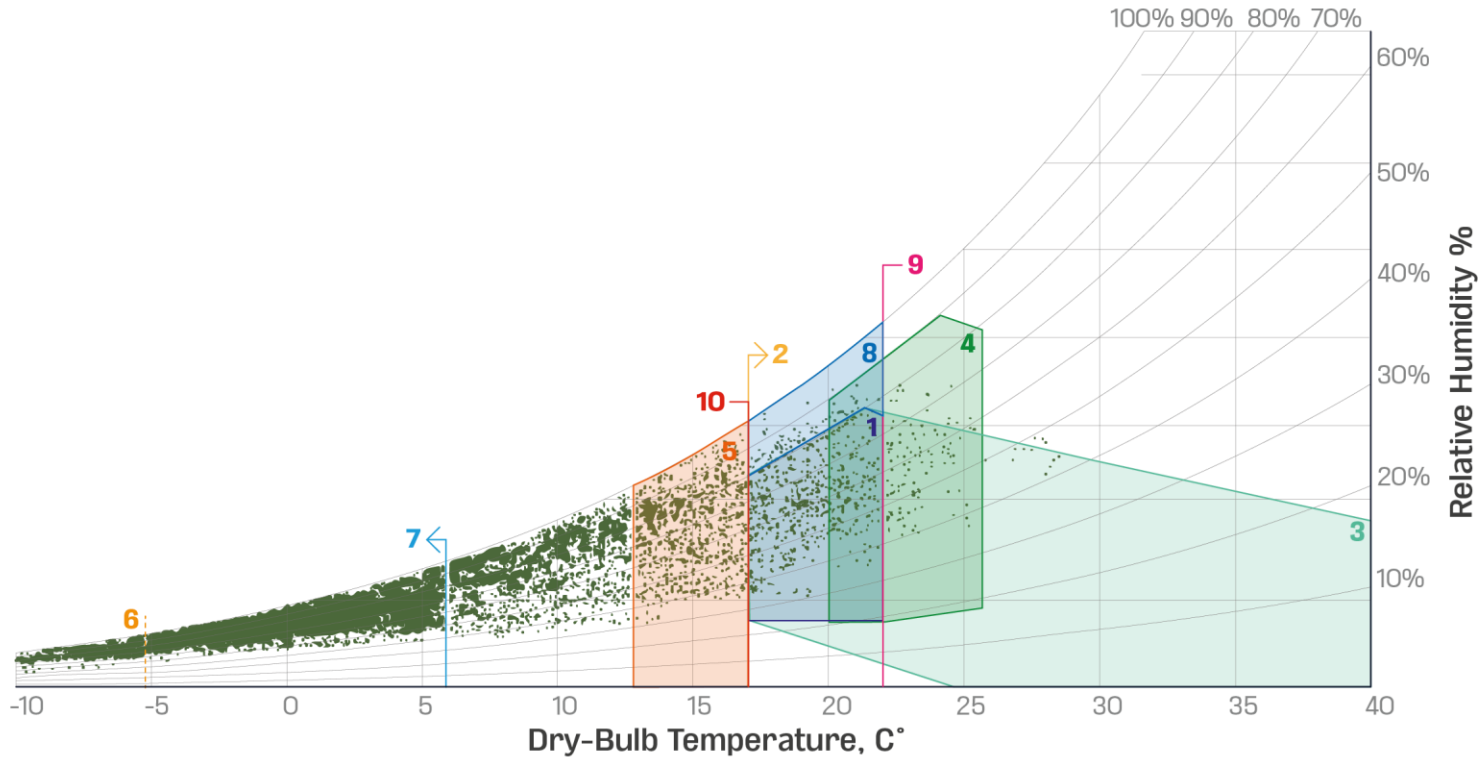
Generic main strategies:

1. Comfort 9.8% (858 h)
2. Sun shading of windows 6.4% (563 h)
3. Two-stage evaporative cooling 1.7% (149 h)
4. Natural ventilation cooling 3.5% (310 h)
5. Internal heat gain 14.1% (1,237 h)
6. Passive solar direct gain high mass 13.9% (1,214 h)
7. Wind protection of outdoor spaces 1.2% (108 h)
8. Dehumidification only 2.0% (171 h)
9. Cooling (HVAC) 0.2% (17 h)
10. Heating (HVAC) 63.4% (5,550 h)

Climate Consultant

Luonnonkoti's strategies:

1. Greenhouse
2. Greenhouse
3. Orientations and natural obstructions
4. Heating through ventilation systems, geothermal and water supply.



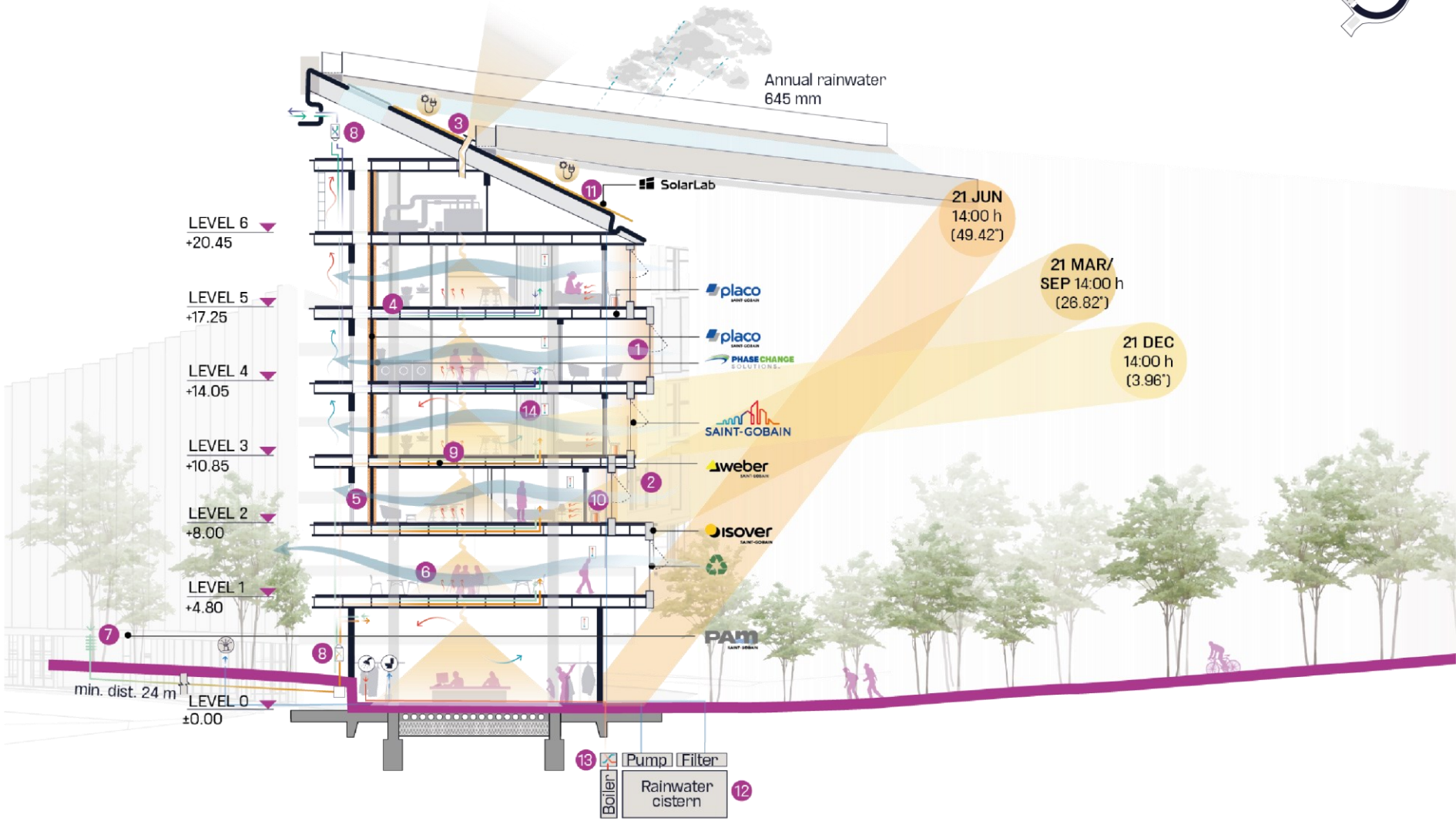
ANNUAL PSICROMETRIC CHART
Design strategies from January through December

Bioclimatic strategies

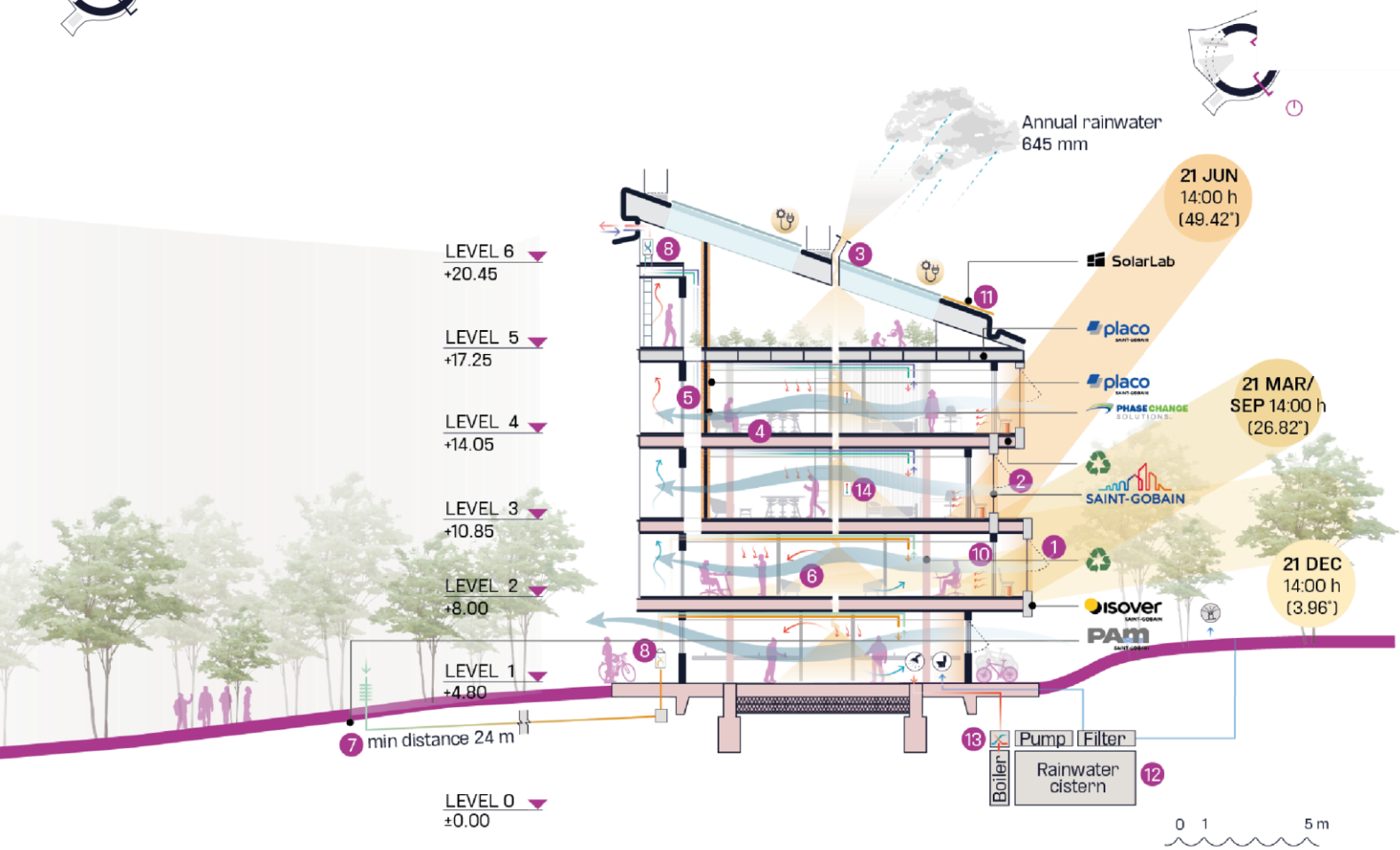
Bioclimatic section
Building B (new building)

1. Natural lightning and ventilation
2. Solar gains
3. Solar tube
4. Maximization of thermal mass
5. Thermoacoustic insulation
6. Strategic spatial orientation
7. Elixair Geothermal Air System
8. Ventilation system (DOAS)
9. Underfloor heating system
10. Heat pumps
11. Photovoltaic panels
12. Rainwater capture, filtration and distribution
13. Heat recovery from wastewater
14. Control devices (thermal, lighti

Cold air
Hot air
Air supply
Air extraction
Treated water supply
Hydronic heat recovery
Preservation of existing building



Bioclimatic strategies



Bioclimatic section
Building A (renovation)

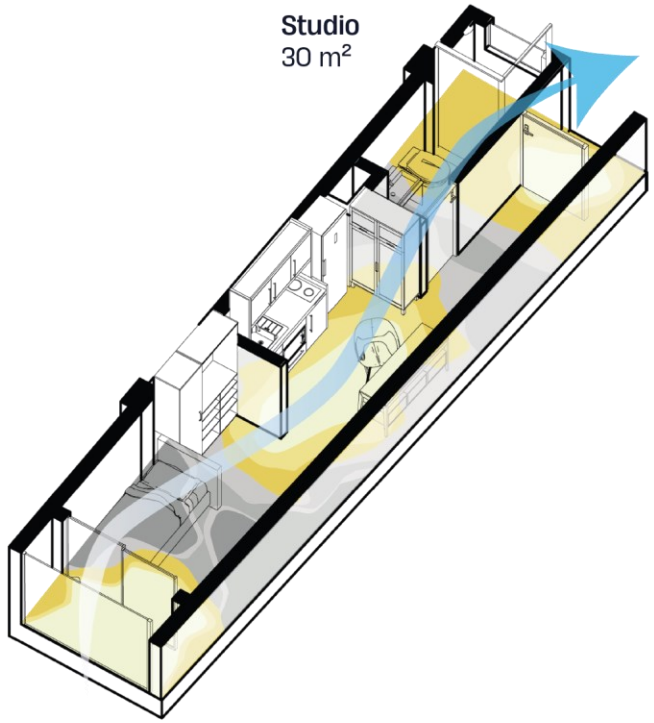
1. Natural lightning and ventilation
2. Solar gains
3. Solar tube
4. Maximization of thermal mass
5. Thermoacoustic insulation
6. Strategic spatial orientation
7. Elixair Geothermal Air System
8. Ventilation system (DOAS)
9. Underfloor heating system
10. Heat pumps
11. Photovoltaic panels
12. Rainwater capture, filtration and distribution
13. Heat recovery from wastewater
14. Control devices (thermal, lighti

- Cold air
- Hot air
- Air supply
- Air extraction
- Treated water supply
- Hydronic heat recovery
- Preservation of existing building

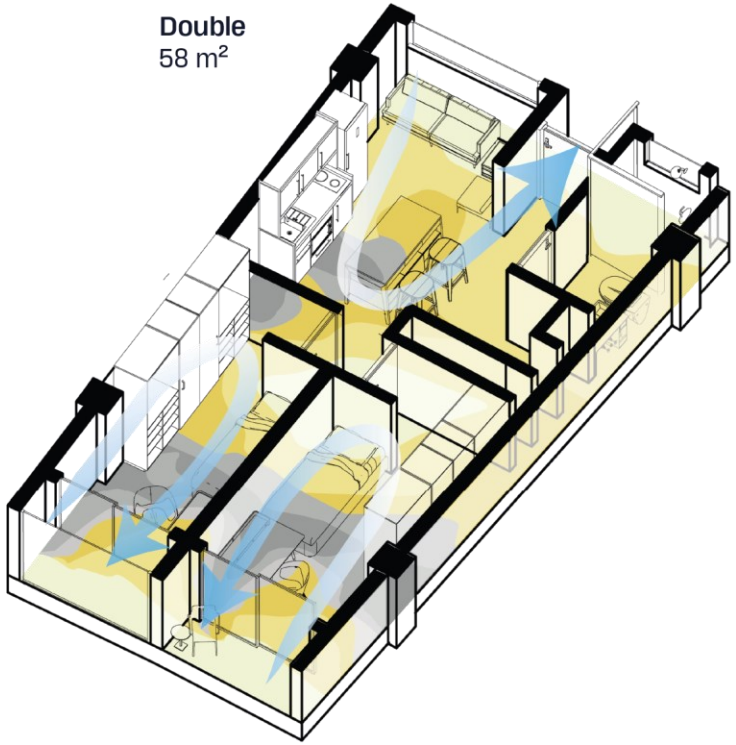
Apartments

Every apartment fulfills the needed 30 air changes per hour and a minimum of 60% of daylight autonomy.

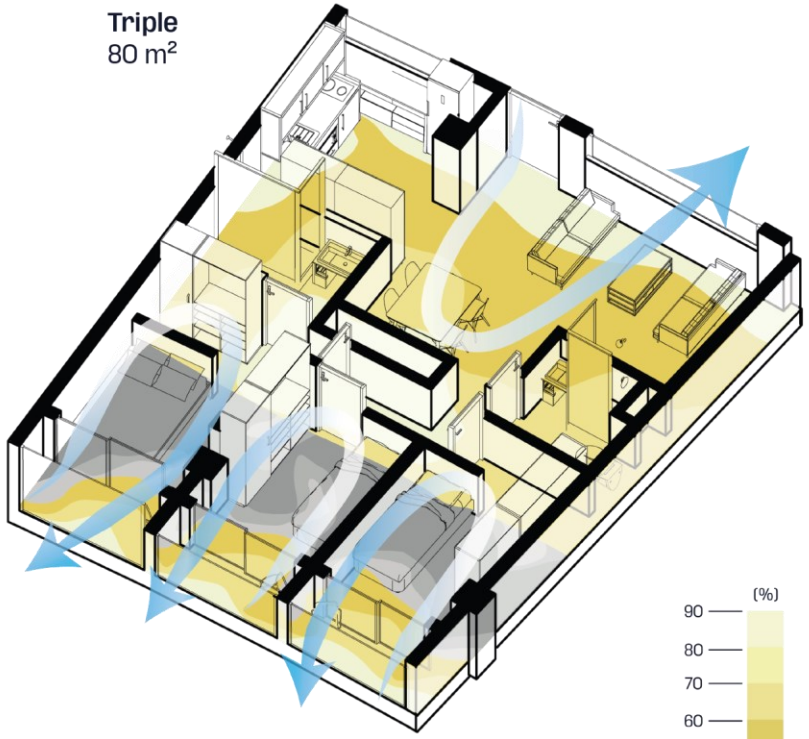
Studio
30 m²



Double
58 m²



Triple
80 m²



SAINT-GOBAIN 1
ORAÉ
PLANICLEAR

placo 2
SAINT-GOBAIN
PLASTER LUTÉCE
AIRPUR

isover 3
SAINT-GOBAIN
ISOCOTON

PHASECHANGE SOLUTIONS 4
PCM

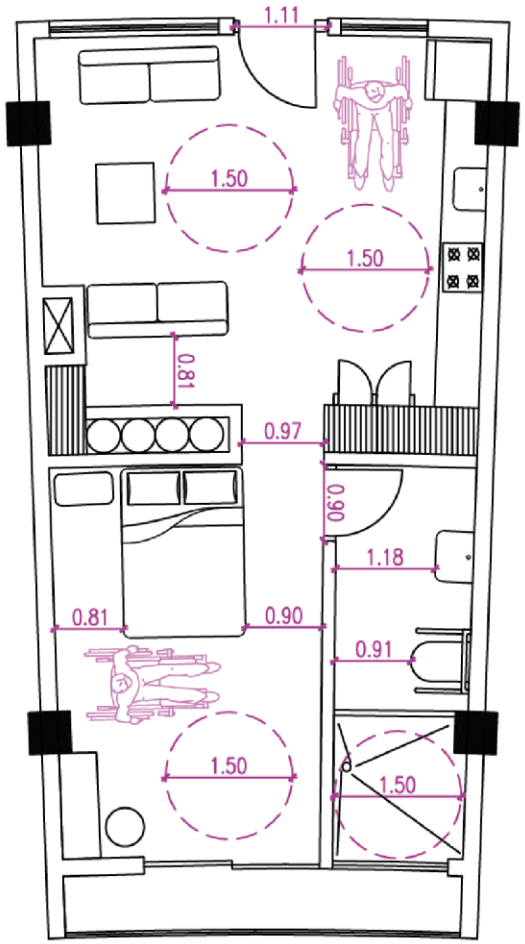
Double apartment bedroom interior

Accessibility

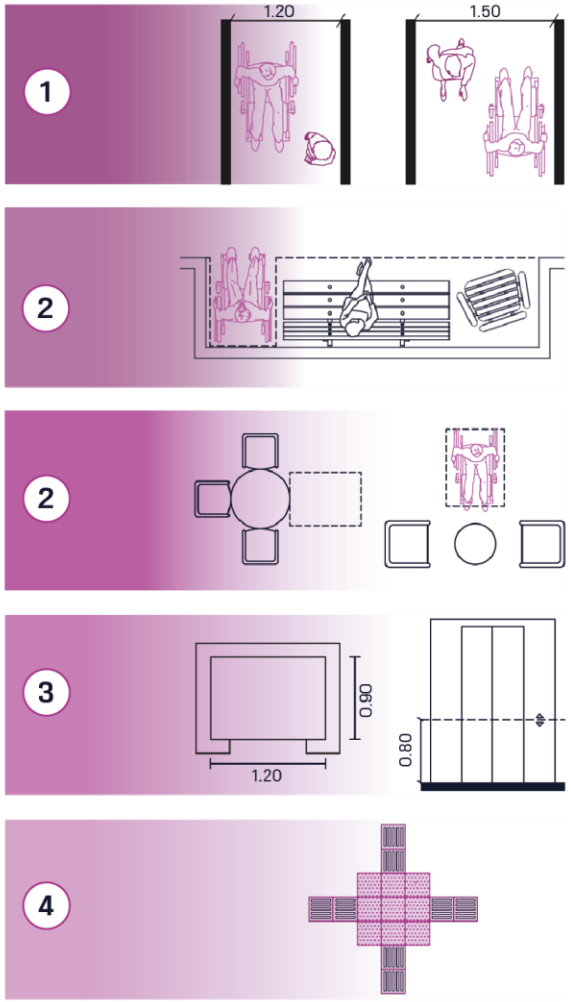
The interior design becomes flexible as it permits walls to be modified based on the structural modulation of the building. The apartment may be adjusted to an open concept interior in order to guarantee an adequate circulation and turning radius in case a resident uses a wheelchair or any other disability that requires it.

Additionally, all public areas are considered inclusive, taking into account that every area is able to comfortably welcome people of all backgrounds and abilities.

1. Hallways
2. Public areas
3. Reachable height
4. Podotactile pavement

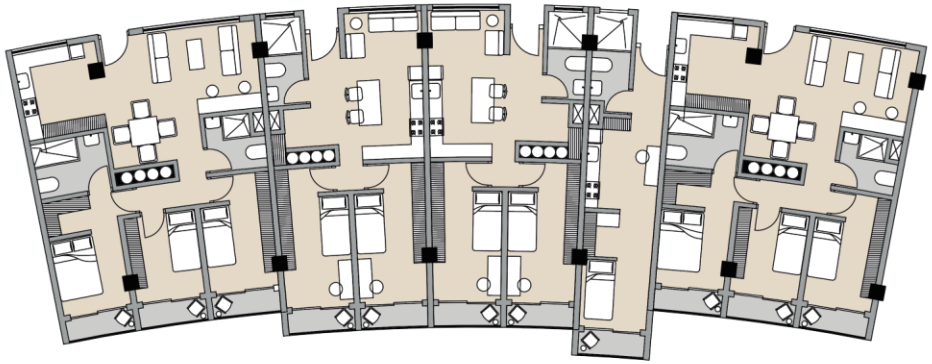


Adapted accesible apartment

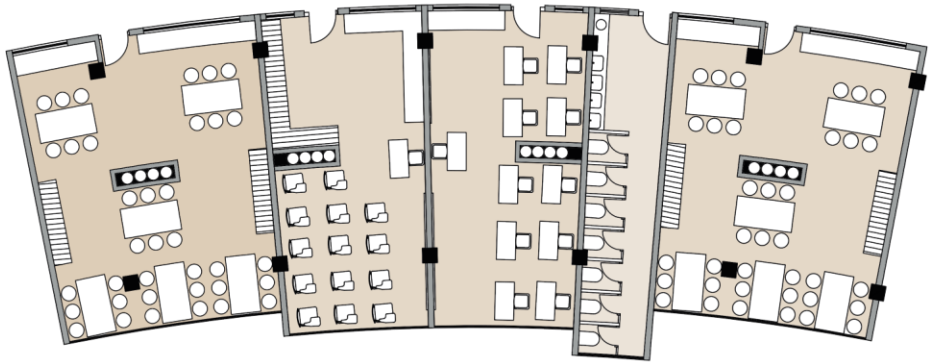


Adaptability

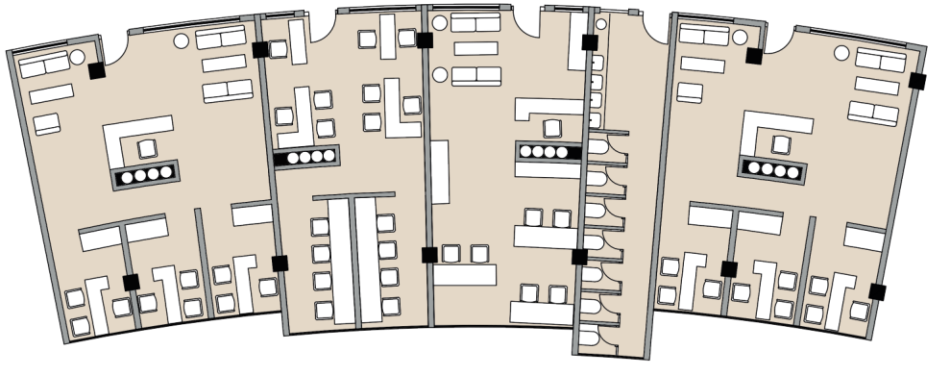
The structural modulation allows the interior to be completely adjusted tailored to the needs and preferences of each resident, therefore, prolonging the building's lifespan.



Apartments



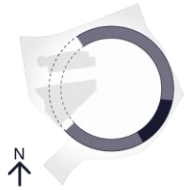
Classrooms

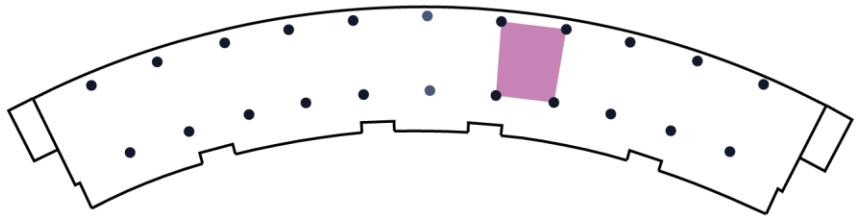


Offices

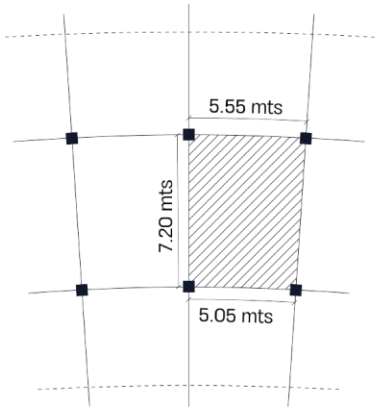
Structure

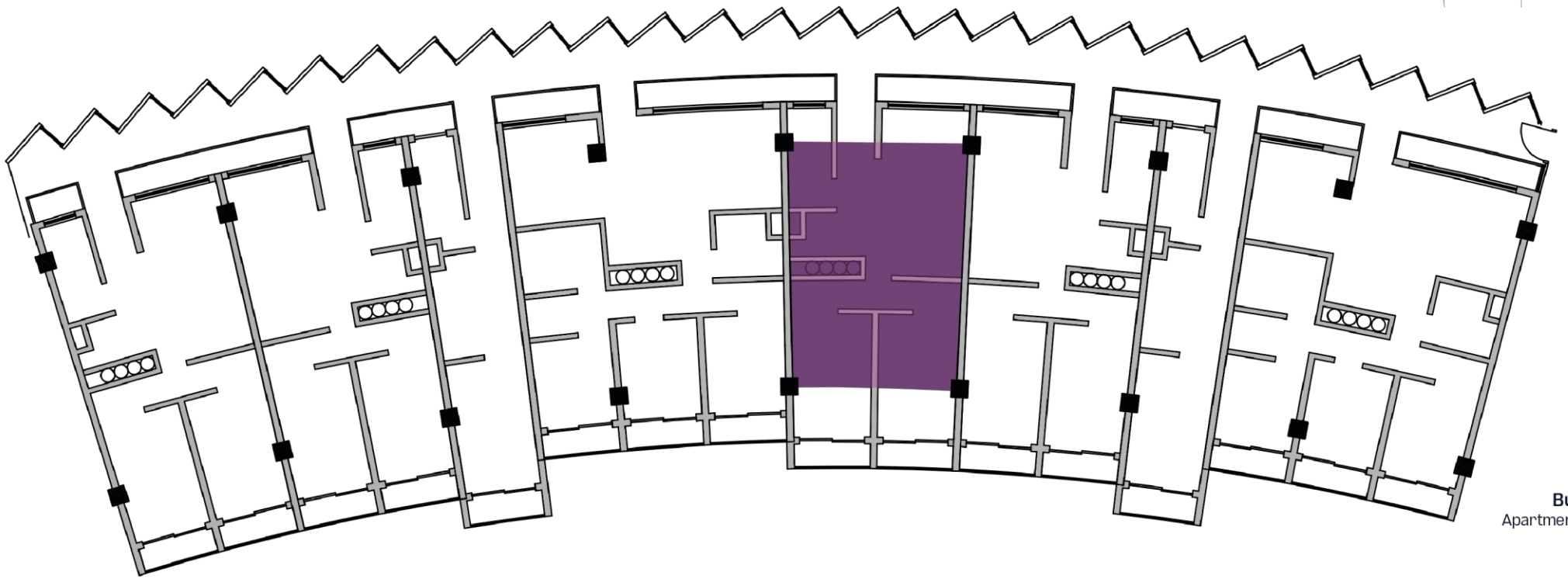
Based on building's A structural module, the existing column rhythm was extended to define the project's structure.





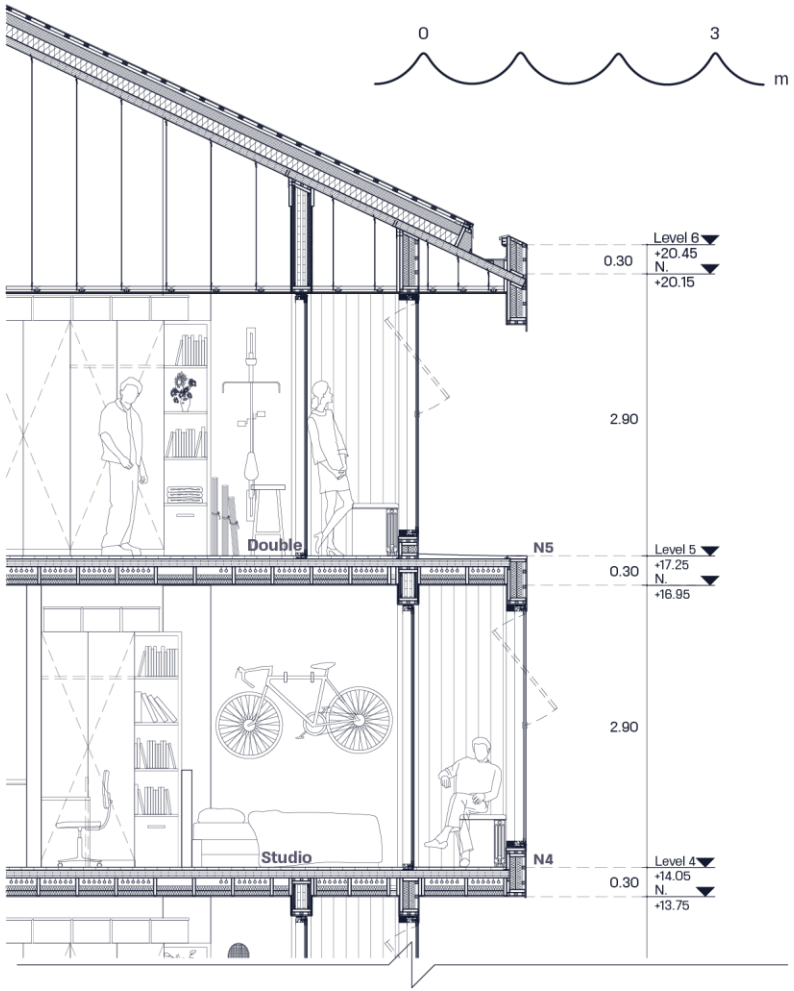
Building A
Offices

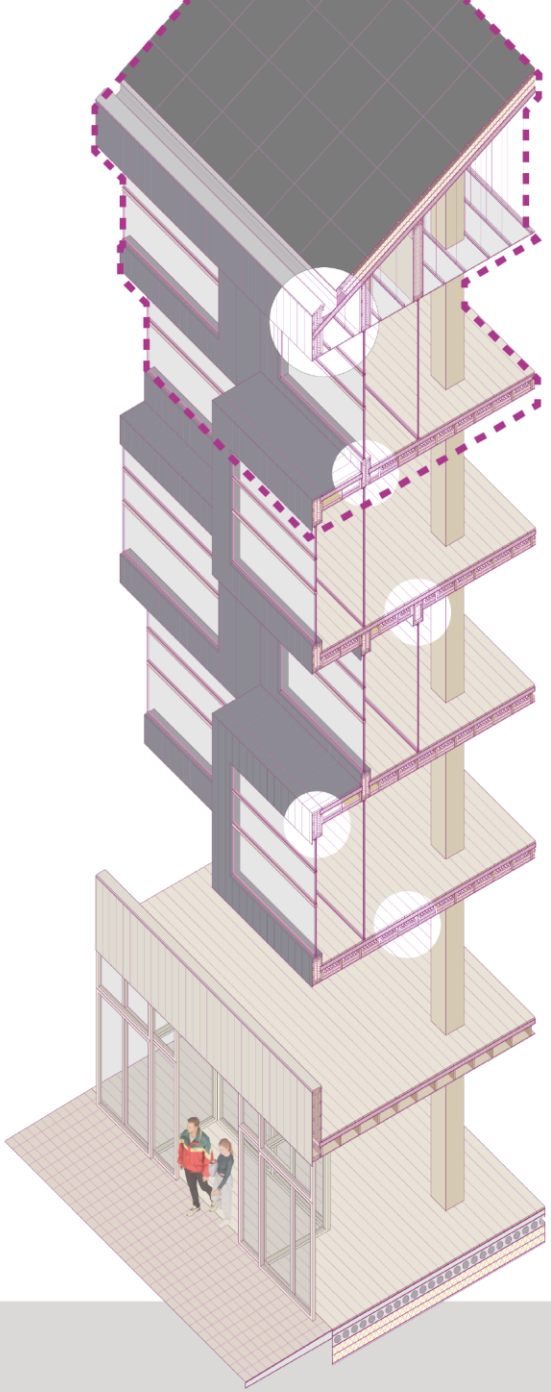




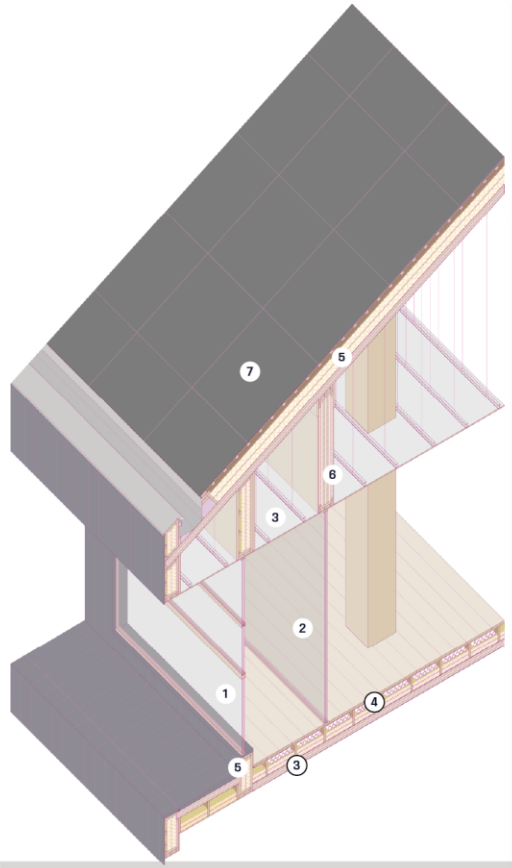
Building A
Apartments design

Construction system





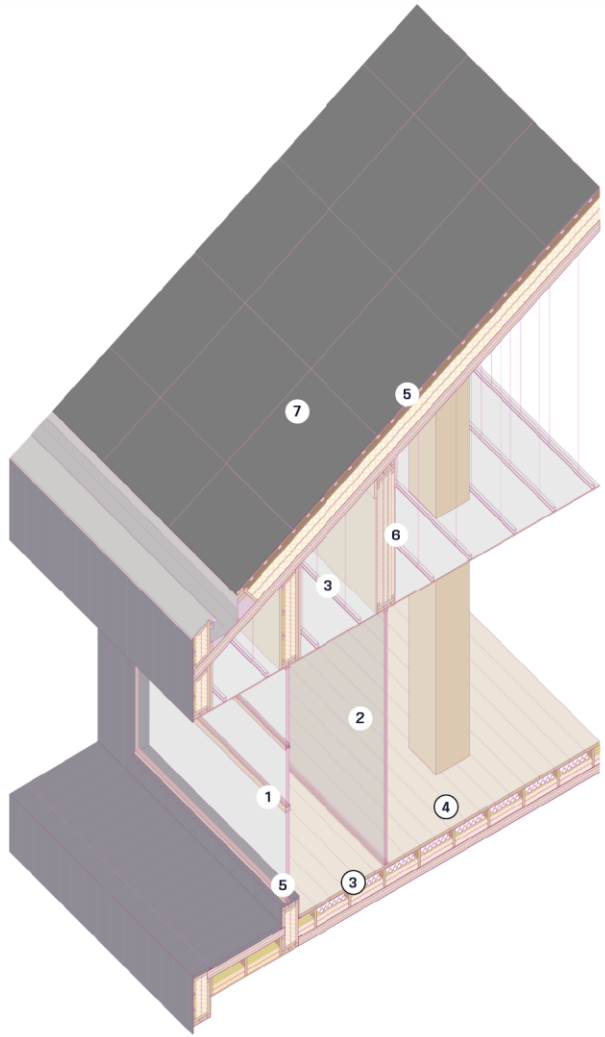
The project's structural system consists of prefabricated cross-laminated timber panels (CLT) based on the existing building`s modulation. The facade consists of recycled triple low-e glazing and prefabricated dark-toned wood cladding. Both slabs and walls are CLT with thermoacoustic insulation made of recycled clothes. The walls also have a layer of Phase-change Materials to stabilize indoor temperature. Finally, the solid photovoltaic panel roof produces a large amount of energy.



1. SAINT-GOBAIN PLANICLEAR
2. SAINT-GOBAIN ORAÉ
3. placo SAINT-GOBAIN ACTIVE'AIR
4. weber SAINT-GOBAIN UNDERFLOOR HEATING SYSTEM
5. isover SAINT-GOBAIN ISOCOTON
6. PHASE CHANGE SOLUTIONS PCM
7. SolarLab PV ROOF CLADDING

Construction details

Units in millimetres



1 SAINT-GOBAIN PLANICLEAR

2 SAINT-GOBAIN ORAÉ

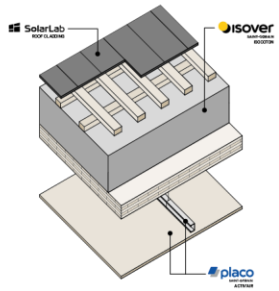
3 placo SAINT-GOBAIN ACTIV'AIR

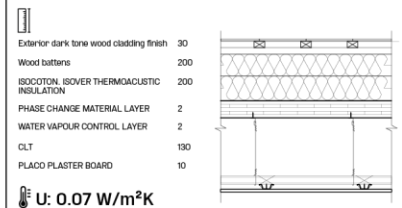
4 weber SAINT-GOBAIN RADIANT FLOOR

5 isover SAINT-GOBAIN ISOCOTON

6 PHASE CHANGE SOLUTIONS PCM

7 SolarLab PV Roof cladding

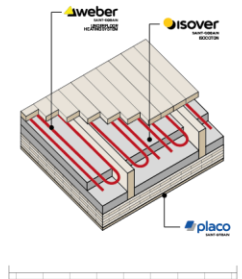


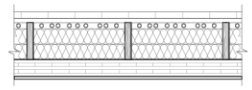


Exterior dark tone wood cladding finish	30
Wood battens	200
ISOCOTON, ISOVER THERMOACOUSTIC INSULATION	200
PHASE CHANGE MATERIAL LAYER	2
WATER VAPOUR CONTROL LAYER	2
CLT	130
PLACO PLASTER BOARD	10

U: 0.07 W/m²K

ROOF

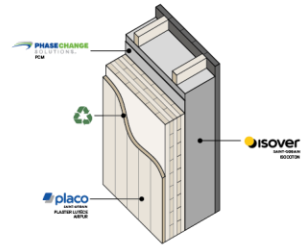




Floating floor wood planks	30
Floor decking	20
LVL REINFORCEMENT	180
WEBER UNDERFLOOR EAT SYSTEM	30
ISOCOTON, ISOVER THERMOACOUSTIC INSULATION	150
CLT	80
PLACO PLASTER BOARD CEILING	10

U: 0.07 W/m²K

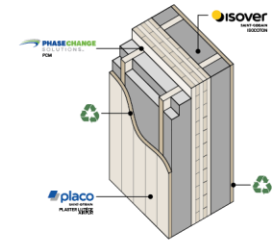
SLABS



Exterior dark tone wood cladding finish	30
Wood battens	200
ISOCOTON, ISOVER THERMOACOUSTIC INSULATION	200
PHASE CHANGE MATERIAL LAYER	2
WATER VAPOUR CONTROL LAYER	2
CLT	130
PLACO PLASTER BOARD	10

U: 0.13 W/m²K

EXTERIOR WALL

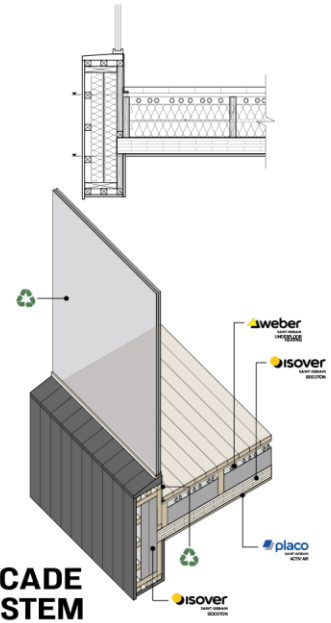


PLACO PLASTER BOARD	10
WOOD BATTENS	130
ISOCOTON, ISOVER THERMOACOUSTIC INSULATION	130
PHASE CHANGE MATERIAL LAYER	2
CLT	130
PHASE CHANGE MATERIAL LAYER	2
ISOCOTON, ISOVER THERMOACOUSTIC INSULATION	130
WOOD BATTENS	130
PLACO PLASTER BOARD	10

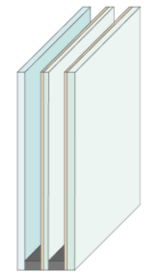
Air tightness: 60

U: 0.13 W/m²K

INTERIOR WALL 1



FACADE SYSTEM



PANE 1	PLANICLEAR	6
CAVITY 1	ARGON (90%) / AIR (10%	12
PANE 2	ECLAZ II PLANICLEAR	4
CAVITY 2	ARGON (90%) / AIR (10%)	12
PANE 3	ECLAZ II PLANICLEAR	6

TL: 75.3%

SHGC: 0.54

U - winter: 0.73 W/m²K
U - summer: 0.76 W/m²K

FACADE GLAZING

PANE 1	ORAÉ	6

TL: 90%

SHGC: 0.87

U - winter: 5.80 W/m²K
U - summer: 5.24 W/m²K

DOUBLE FACADE INTERIOR GLAZING

PLACO PLASTER BOARD	10
WOOD BATTENS	30
ISOCOTON, ISOVER THERMOACOUSTIC INSULATION	30
PHASE CHANGE MATERIAL LAYER	2
CLT	130
PHASE CHANGE MATERIAL LAYER	2
ISOCOTON, ISOVER THERMOACOUSTIC INSULATION	30
WOOD BATTENS	30
PLACO PLASTER BOARD	10

Air tightness: 60

INTERIOR WALL 2

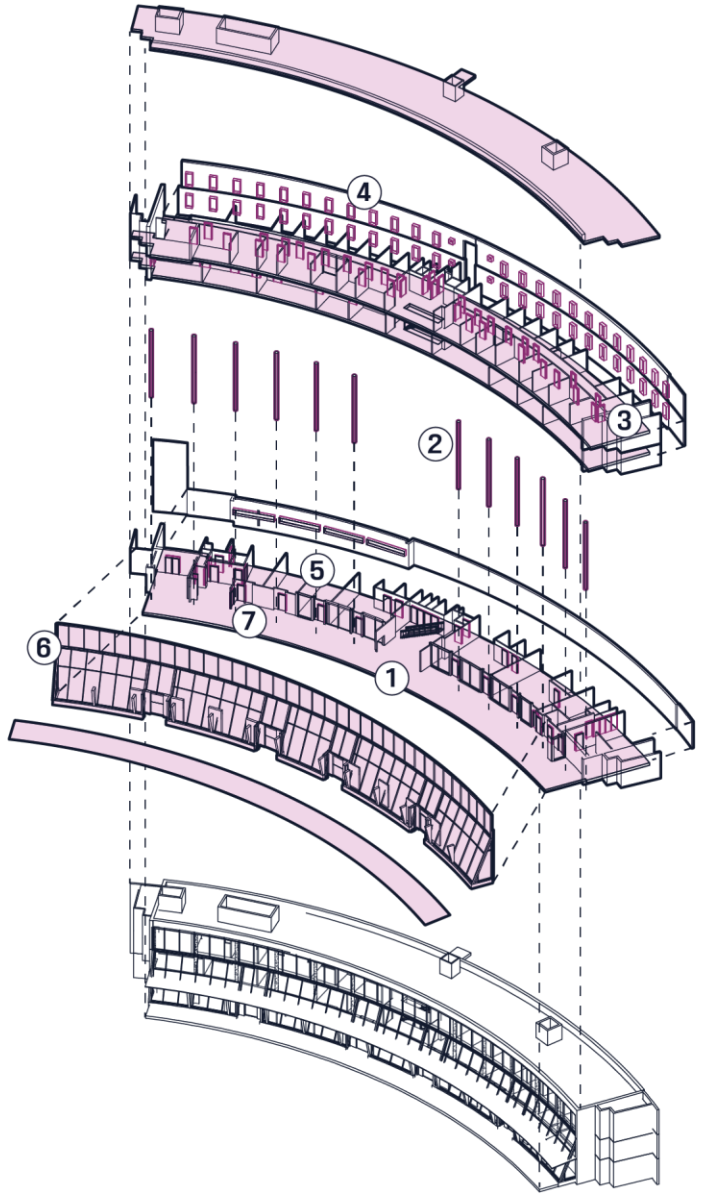
Resources and circularity

A crucial step in the project involved leveraging the materials and structure of the existing buildings for reused elements. Strategies employed in the renovation of building A and the demolition of building B included relocating doors, windows, wall cladding, and sanitary fixtures. Additionally, through Saint Gobain's recycling system, glass and gypsum board were recovered

1. Slabs
2. Columns
3. Doors
4. Windows
5. Interior walls
6. Exterior glazing
7. Sanitary fixtures

Reused

Recycled

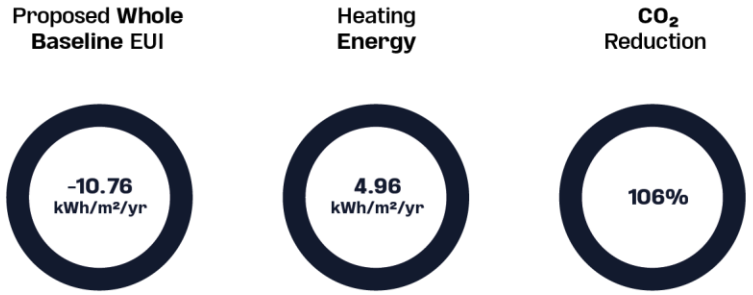


Carbon and energy

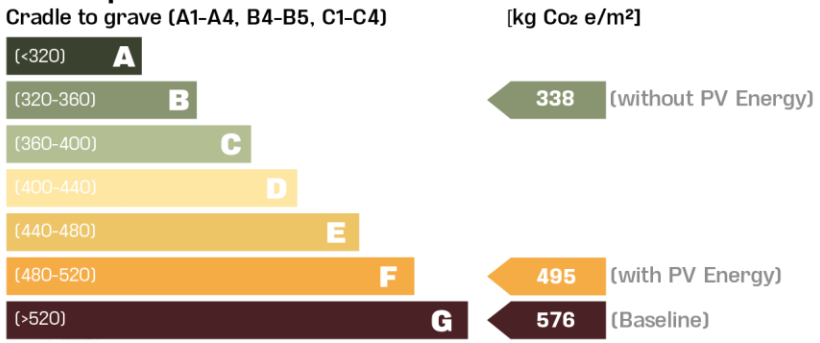
Using an energy modeling analysis, Luonnonkoti demonstrated to be a Net Zero project with a lower carbon footprint than a conventional building.

Thanks to bioclimatic design strategies and photovoltaic panels, the building produces more energy than it consumes, offsetting the embodied carbon footprint throughout its life cycle.

Carbon and energy

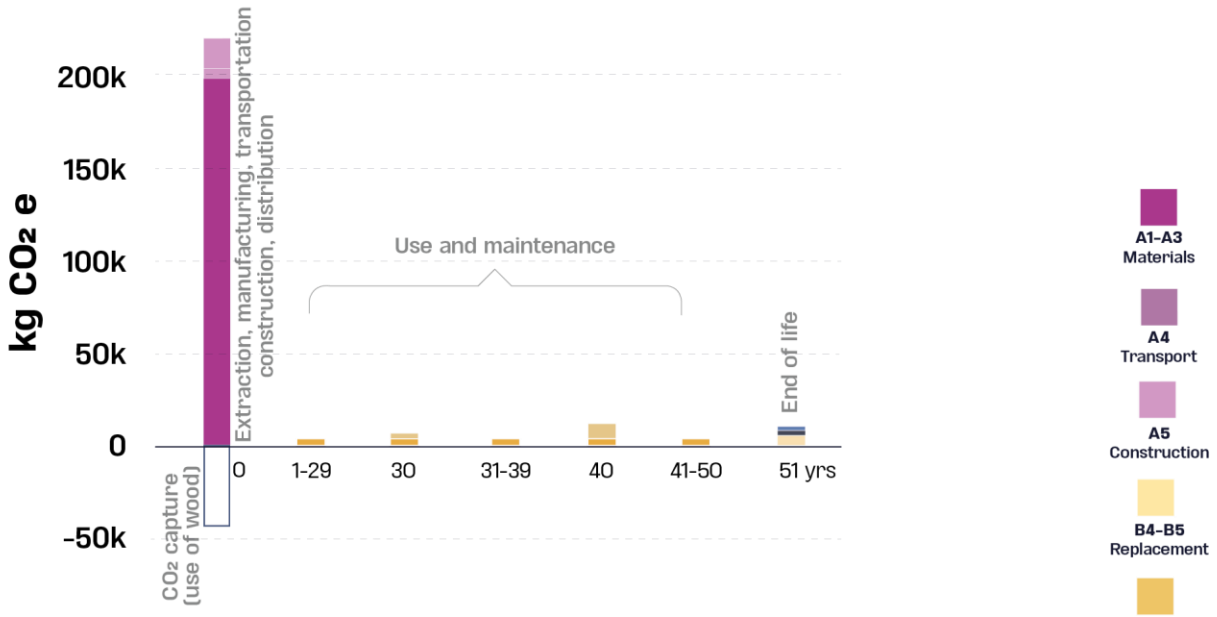


Proposed embodied carbon benchmark

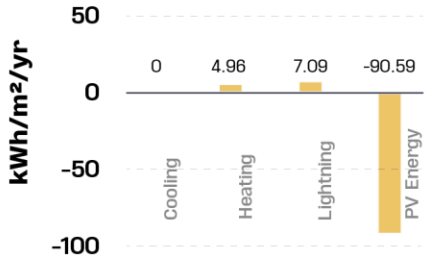


PV: Photovoltaic

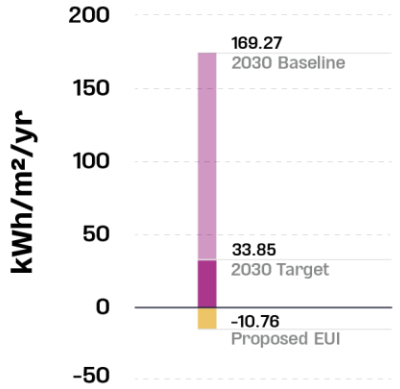
Carbon Footprint Life Cycle



Proposed Whole Baseline EUI Breakdown



Benchmarking Energy



Luonnonkoti is:

FLEXIBLE

REPLACEABLE

REPAIRABLE

DISMANTABLE

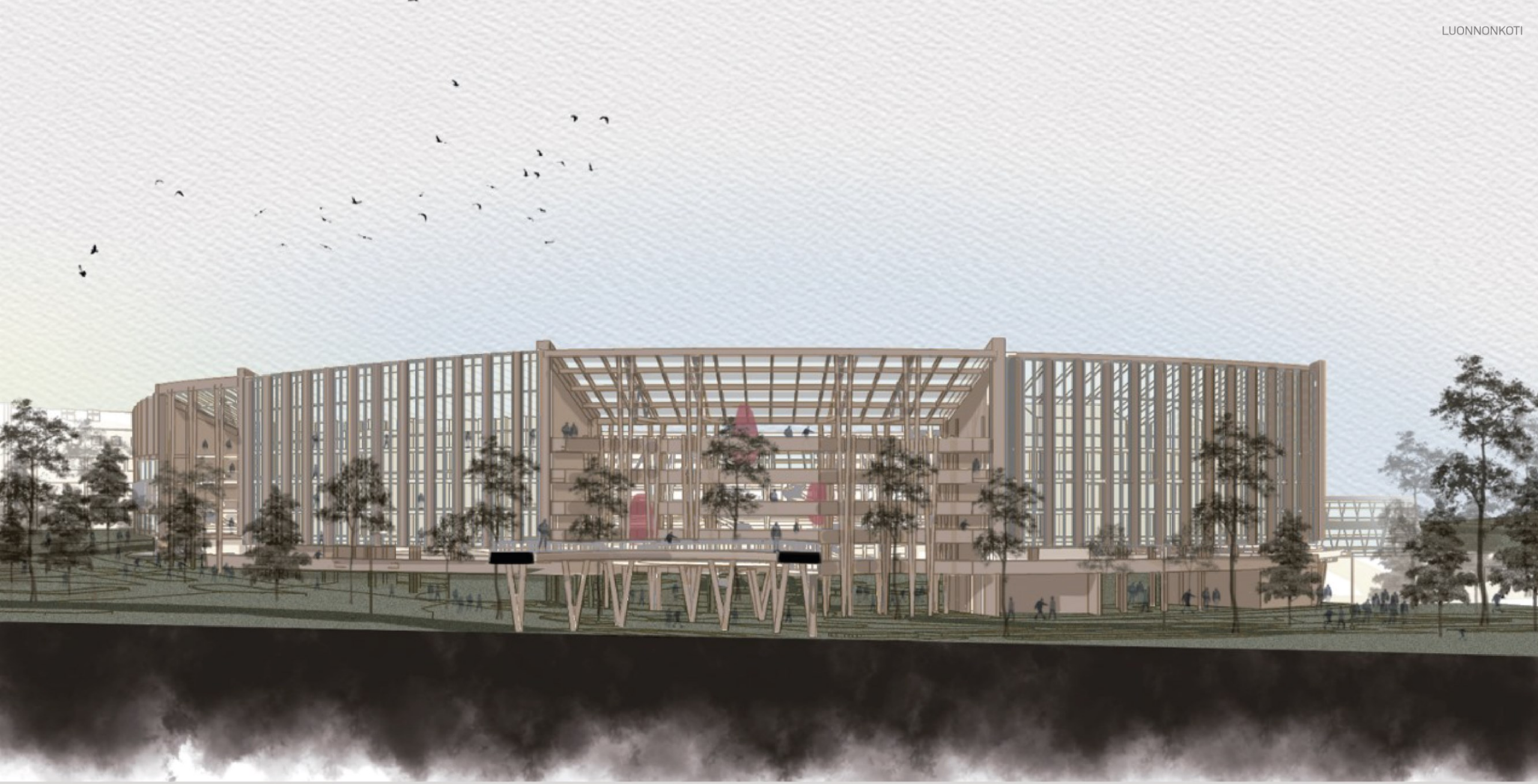
EASILY MAINTAINED

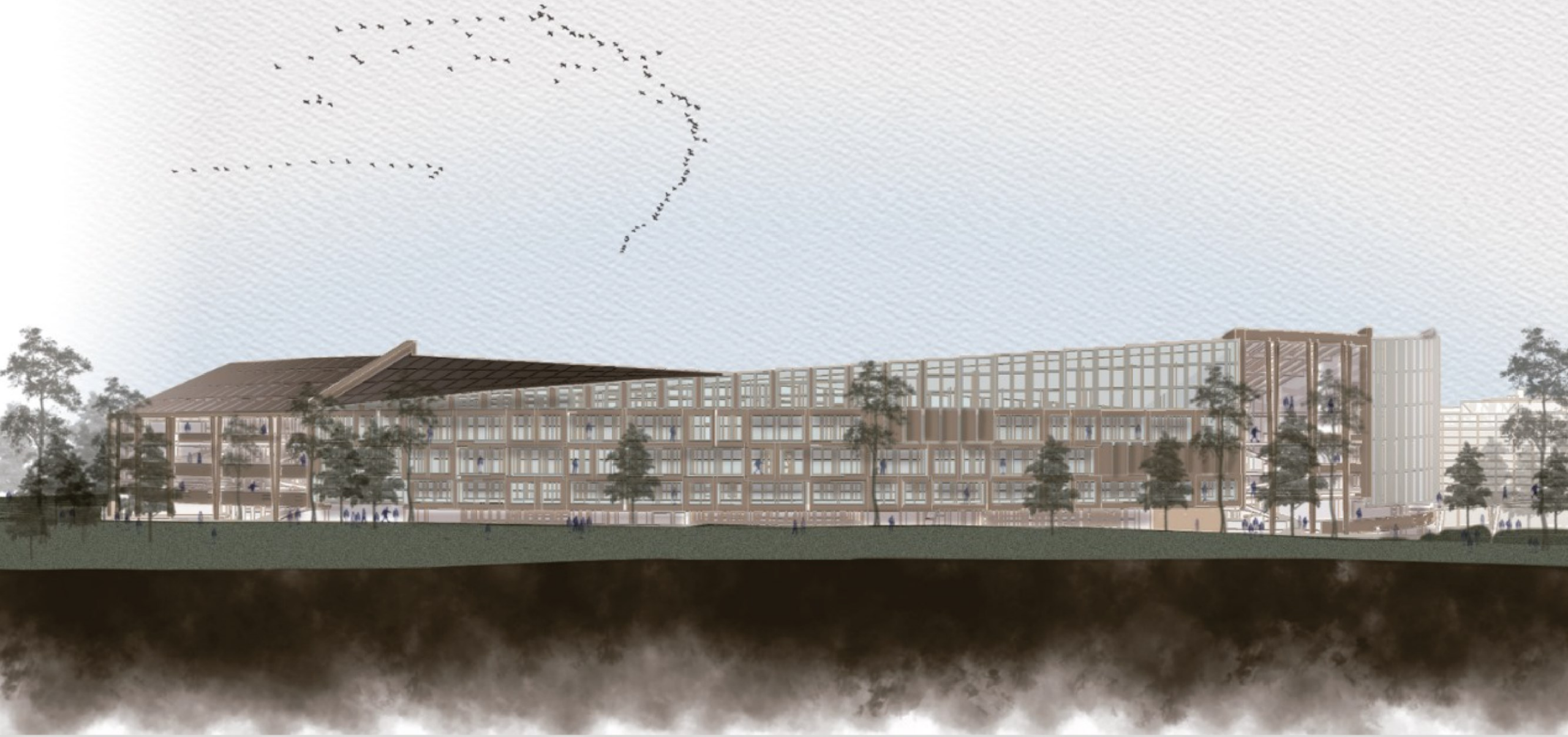

1
3
2
4
5
7
6
Heat gains
Darked-toned wood cladding
1
Biomimicry
Vertical circulations
2
Daylight reflection
Light-toned interiors
3
South orientation
Roof twist
4
Solar protection
Western facade
5
Permeability
Open floor plan
6
Shelter
Home
7

LUONNONKOTI

Aerial view

Winter aerial view





Exterior facade


LUONNONKOTI

Pedestrian access

Sauna night view

Sauna / Swimming pond

Sauna interior

Sculptural wall