ROOTED

Future-Proof Biophilic Design for Dutch Resettlement Housing

MSc 4 - P5 - 16/01/2025 - Pien Adank - 4842286

Problem statement

Architectural challenges

Research

Concept

Design

Conclusion

Problem statement | *Suzans story*

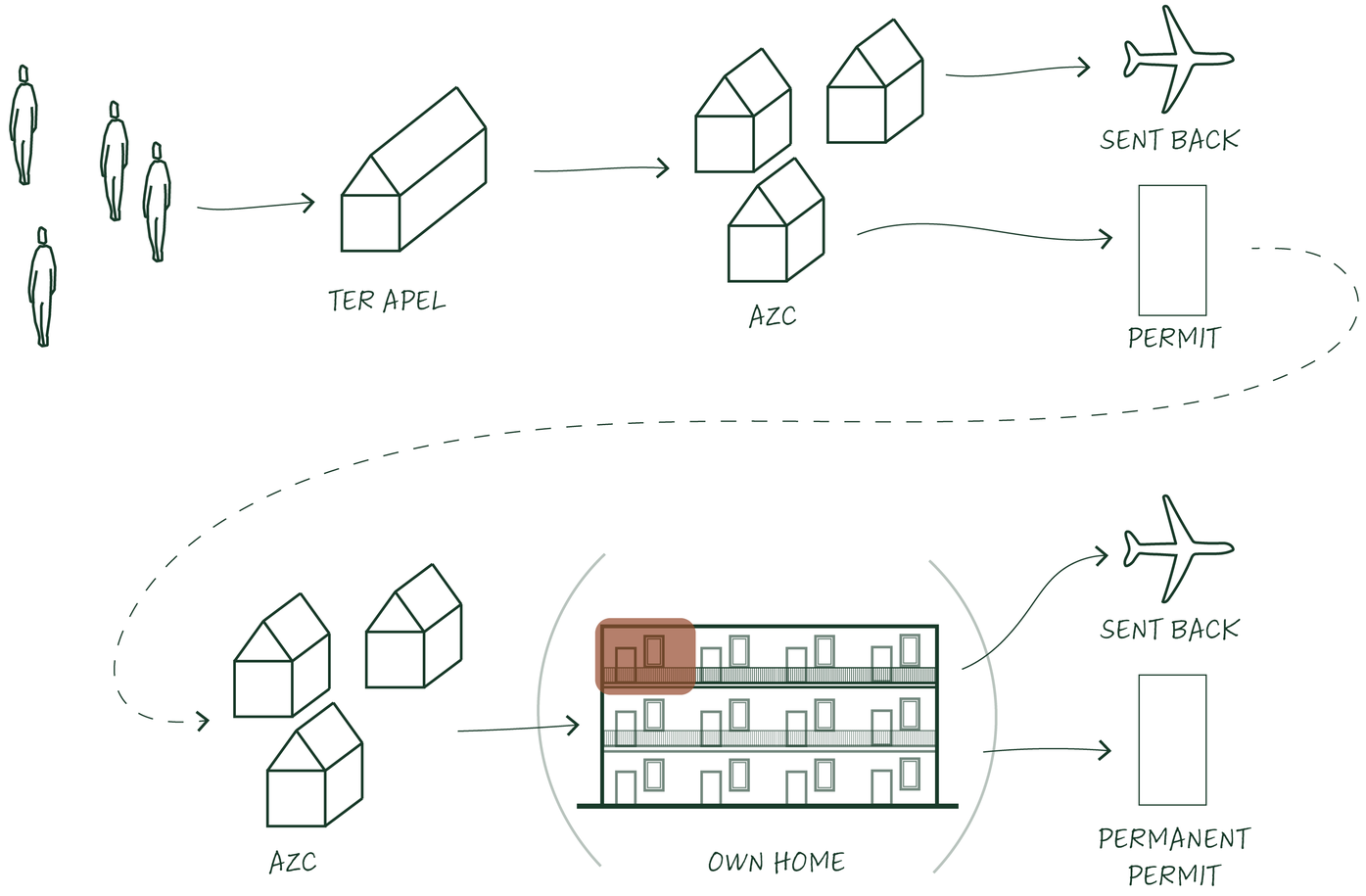
(Vluchtelingenwerk Nederland, 2024)

Problem statement | *Refugee crisis*

114 million people are forcebly displaced every year

(WHO, 2023)

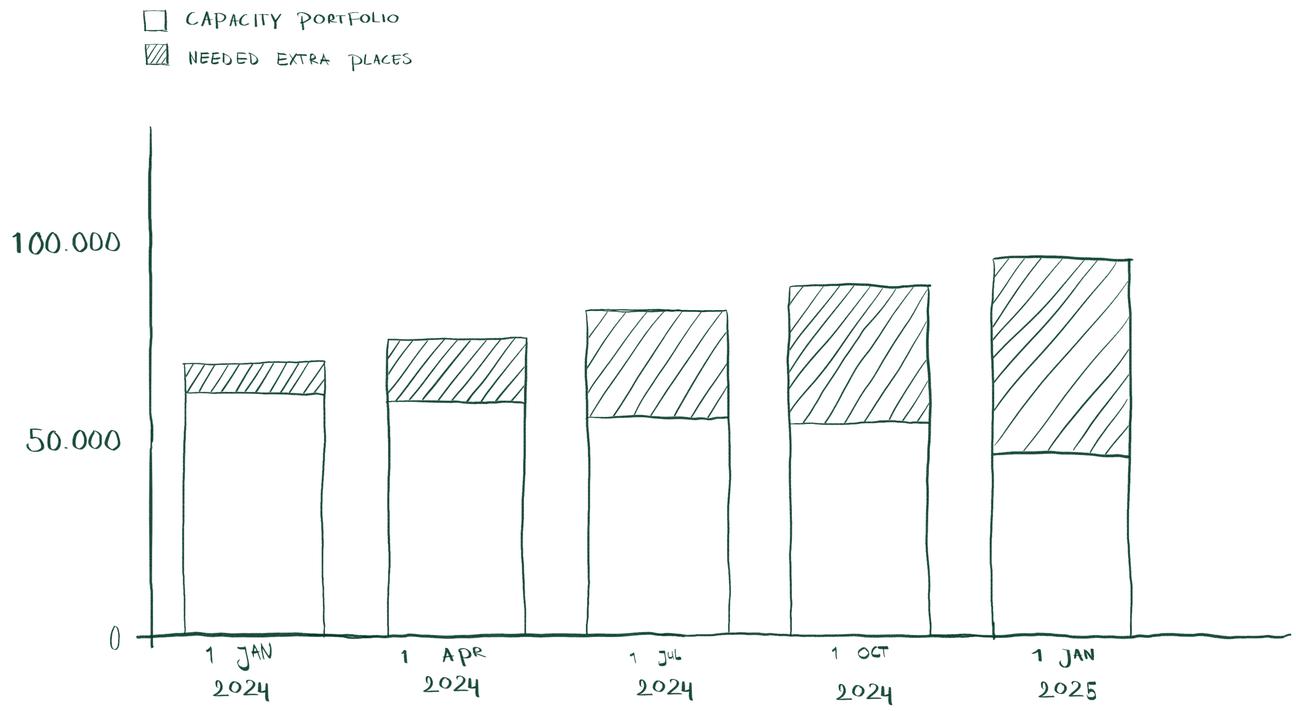
Problem statement | *The Netherlands*



Housing route in the Netherlands by COA

(COA, n.d.)

Problem statement | *Capacity*



Needed capacity and stock

(COA, 2024)

Problem statement | *Cause and architectural problem*

Shortage

\+

Short contract durations or limited resources

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Emergency shelter
Low quality housing

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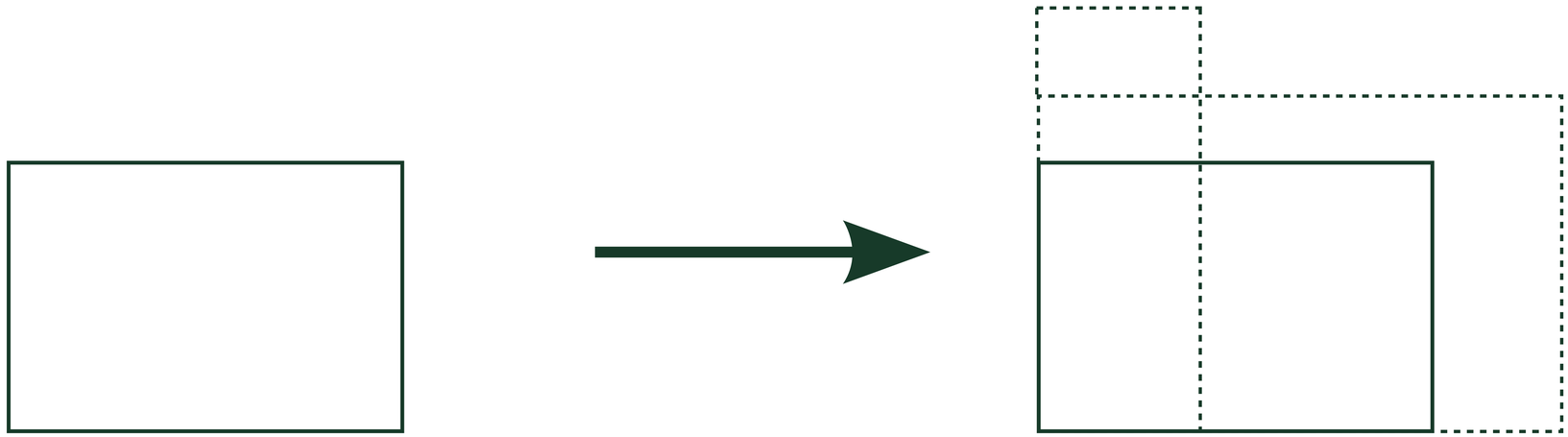
Architectural challenges | *[1] Creating future proof and flexible housing*



Now

Future

Changed needs

Changed locations

Changed use

Architectural challenges | *[2] Creating maximised lived space*

Living space refugee

Including collective, functional and healthcare space

Living space per person Netherlands

(CBS, 2018)
(COA, 2020)

Wellbeing
Noun

Wellbeing is a ***positive state*** experienced by individuals and societies. Similar to health, it is a resource for daily life and is determined by social, economic and ***environmental conditions***. Wellbeing encompasses ***quality of life*** and the ability of people and societies to contribute to the world with a sense of meaning and purpose. (….) A society's wellbeing can be determined by the extent to which it is resilient, builds capacity for action, and is prepared to transcend challenges.

(WHO, 2023)

Architectural challenges | *[3] Make wellbeing core of design*

Resettlement housing falls short on supporting wellbeing

(Kinderombudsman and Nationale ombudsman, 2023)

Architectural challenges | *Wellbeing*

Anxiety and depression

Trauma related problems

↓

Lower chance of asylum

Suicide attempts

(Pharos, 2018)

Architectural challenges | *Salutogenic approach*

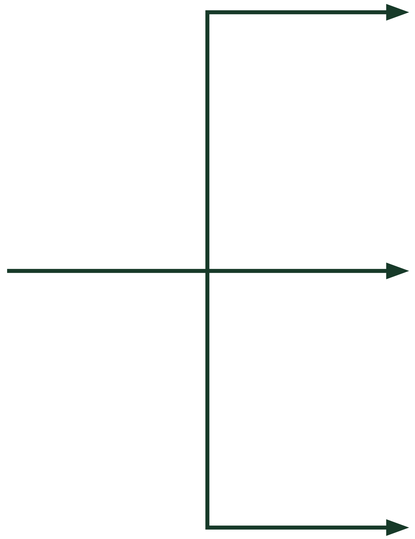
Healing environments

Health promotive building design

Biophilic design

Healthy / healing offices

Sick building syndrome



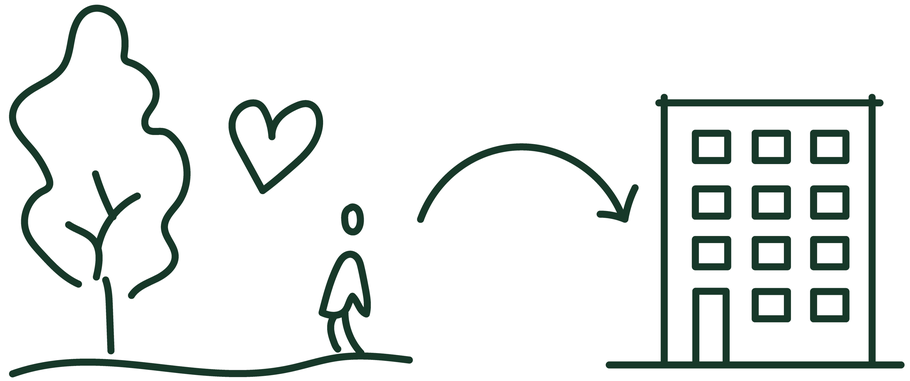
Salutogenic

Scale

Function

(Van der Voordt, 2021)

Architectural challenges | *Biophilic design*



Biophilia - Biophilc design - Promoting wellbeing

(Wilson, 1984)
(Kellert, 2008)
(Browning and Ryan, 2014)

How can we design a resettlement on the *TU Campus* within *the framework of the COA* with a focus on *wellbeing* through *biophilic design*, that *maximises the lived space* for its occupants as well as takes *flexible use* for the future in mind?

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How can *biophilic design* elements be translated into practical design *principles and tools* to be used to increase the overall *wellbeing* of residents in *resettlement housing* in the Netherlands within *the framework of the COA*?

Research | *Overview tools*

General principles

1. Set clear ambitions for each space and scale level, both for current and futue use
2. Biophilic design has to be applied integrally to ensure the effectiveness of the patterns
3. Create a calm environment for wellbeing
4. Distinctions have to be made between buildings with the same function to enhance wayfinding

Pattern principles

1. Visual connection

All spaces in which an user resides in for more than 10 minutes a visual connection must be offered

2. Non visual connection

Multiple sensory experiences must be implemented in spaces in which a user resides for more than 10 minutes

3. Thermal variability

Variability should be deployed at the early phases of the design at the building and dwelling scale

4. Presence of water

Water mystbemadeaccessible through at least one sense

5. Natural systems

Connection to natural systems must be implementes on the context and building scale

6. Biomorphic forms

Biomorphic forms and patterns must be applied integrally throuhg all scales

7. Material

Material choices must be based on their connection to nature and the context

8. Complexity and order

Complexity has to be implemented on the context scale. Order must be implemented on dwelling scale

9. Prospect and refuge

The building scale focuses on prospect, the dwelling scale focuses on refuge

10. Risk/peril

Consideration prior is need for the intended target group

11. Mystery

Mystery must be applied based on function and be distinct from risk/peril

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Tools

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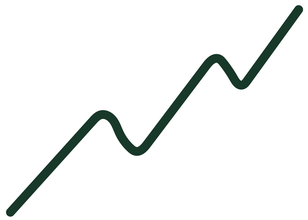
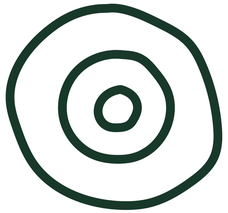
Research | *General principles*



Set clear ambitions for each type of space and each scale level you design for both current use as well as future use

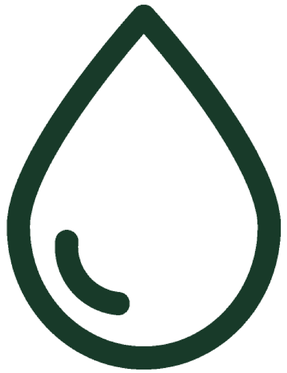
Create a calm environment for wellbeing



Biophilic design has to be applied integrally through all scales to ensure the effectiveness of the patterns

The multisensory experience of biophilic design should have distinctions even within buildings with the same ambitions to enhance wayfinding

Pattern 4
Presence of water



Water must be made accessible
through at least one sense

Research | *Tools [examples]*

Flowing bodies of water

Sight
Sound
Smell

Temporality/seasonality of water

Absorption
Directing water
Collecting

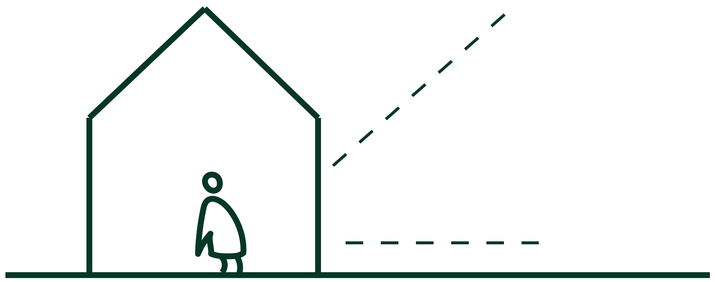
Research | *Ethnographic research*

Hallway of residents

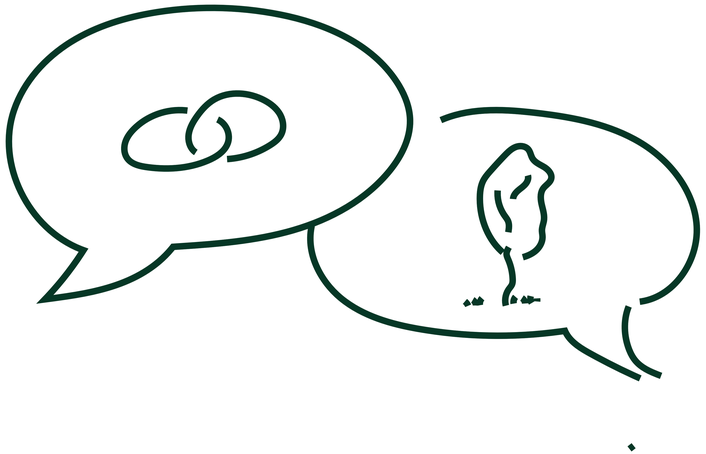
Use of outdoor space

Shared kitchen

Research | *Ethnographic lessons*



Privacy



Connection

Feeling at home

Problem statement

Architectural challenges

Research

Concept

Design

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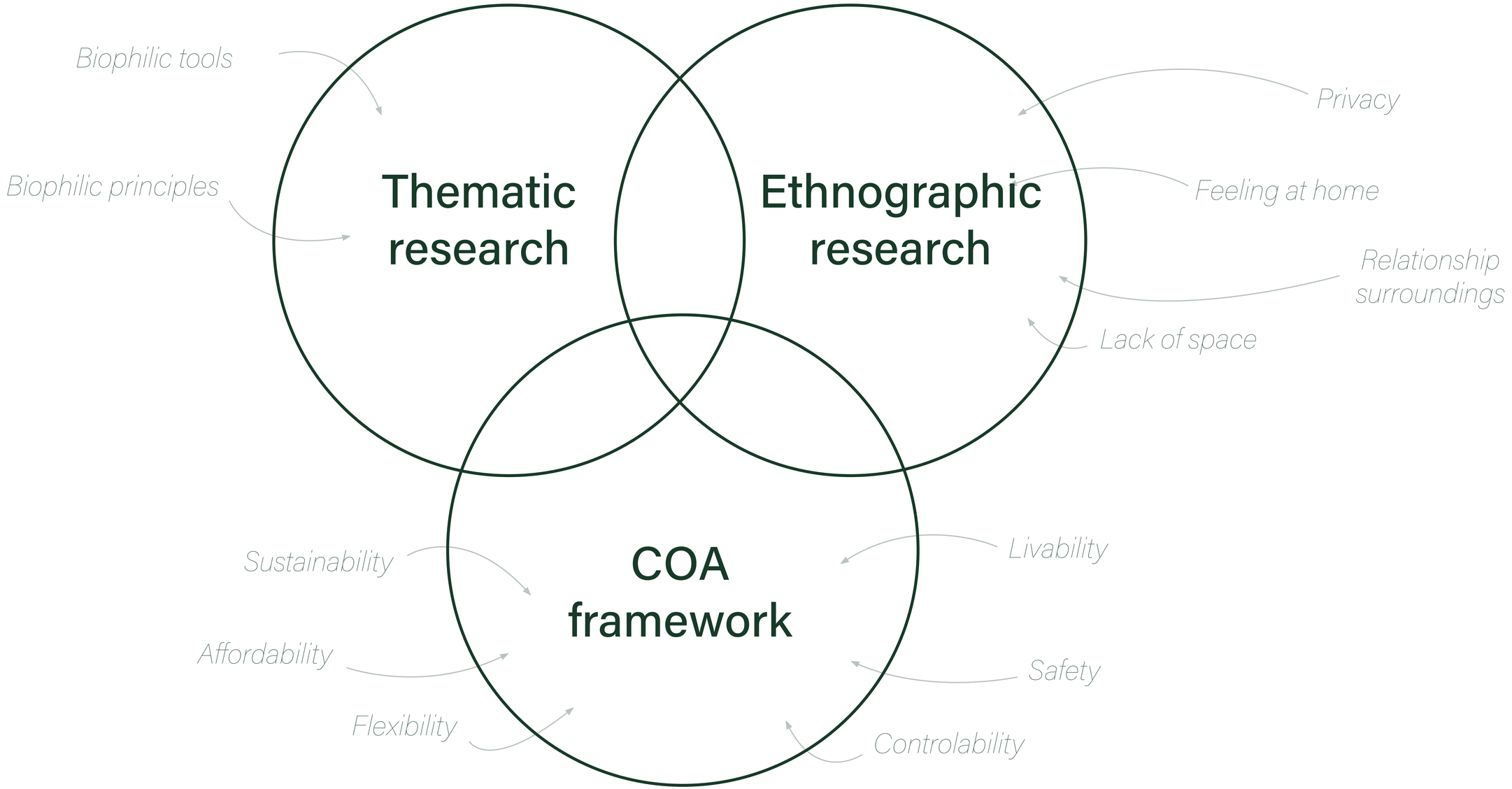
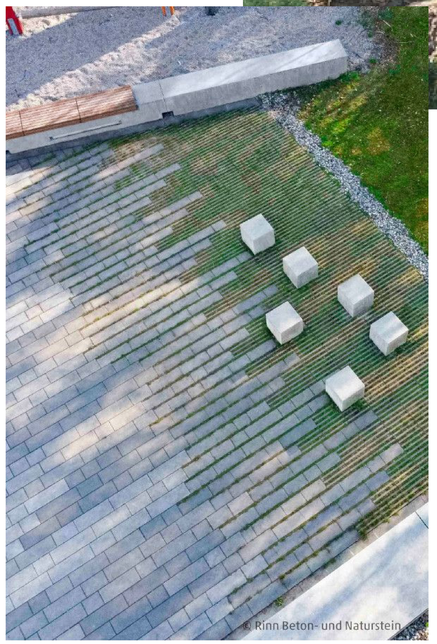
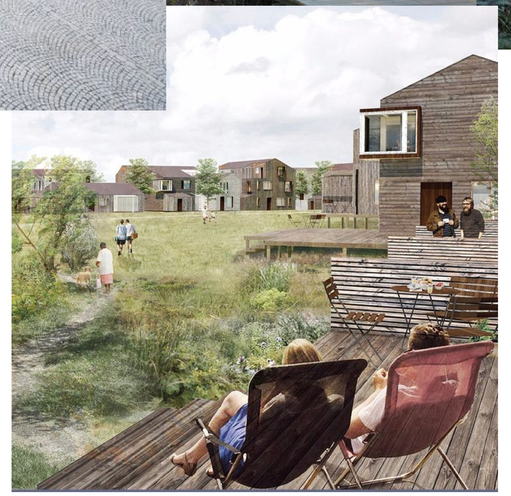
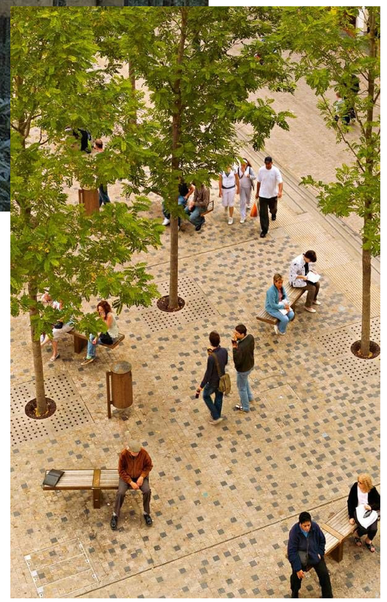
Concept | *Preconditions*



Concept | *Overview*







Problem statement

Architectural challenges

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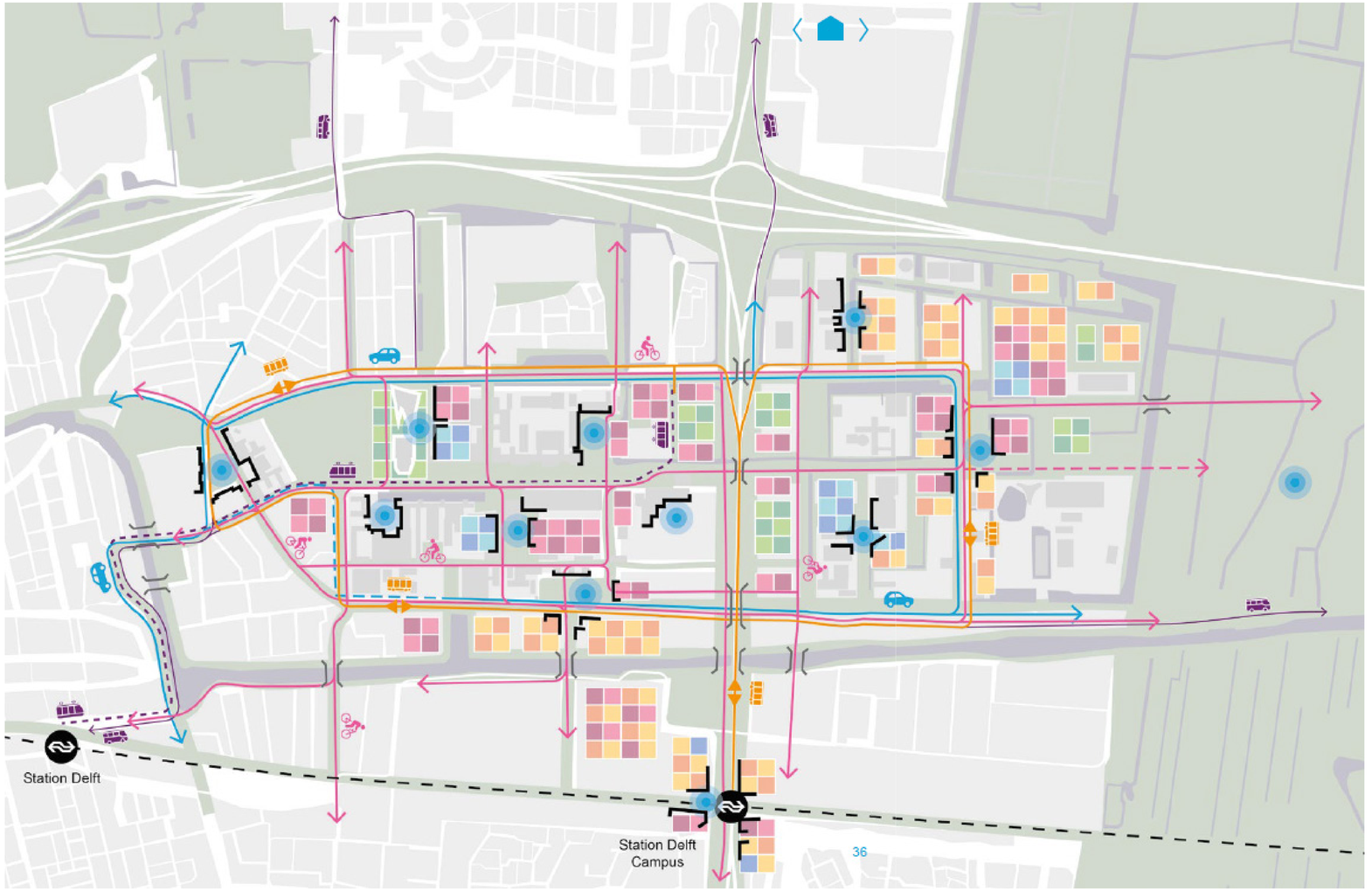
Design | *AZC Delft, TU Campus*

Design | *TU Campus vision 2040*

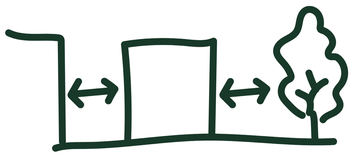


Elaboration of function distribution and infrastructure

Scale 1:10.000

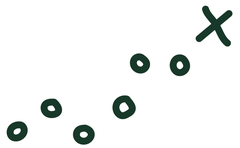
(Van Dorst et al., 2023)

Design | *Ambitions on context scale*



Connect to surroundings
Nature + society

Thematic research
Design



Safe exploration

COA

Inspire by nature

Biophilic

Design | *TU Campus*

Overview of campus

Scale 1:7500

Design | *Location*

Hightlighted chosen site

Scale 1:7500

Design | *Connection to surrounding*

Ground source heat storage

Scale 1:7500

Design | *Connection to surrounding*

Parking

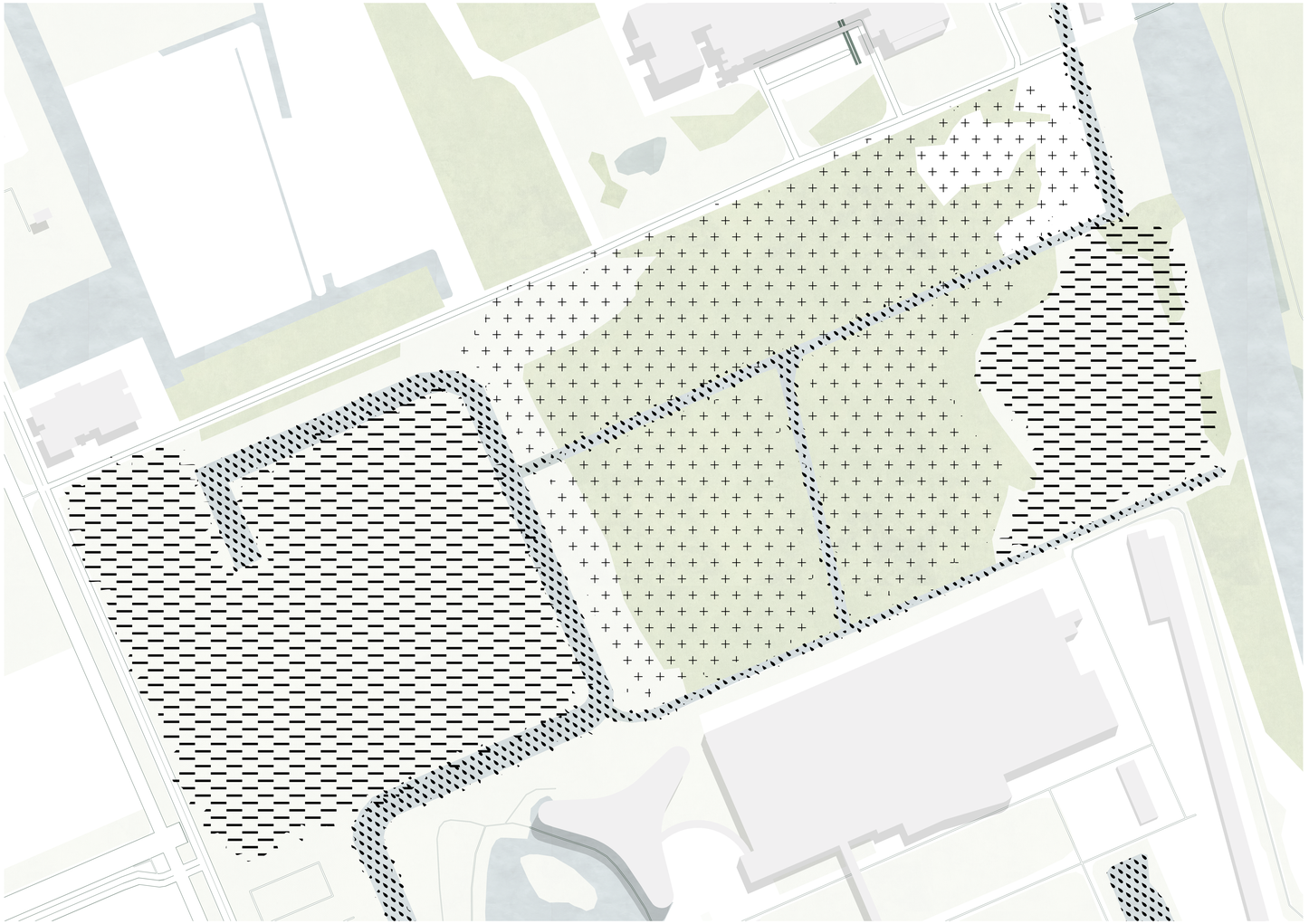
Scale 1:7500

Design | *Connection to surrounding*

Biodiversity campus

Scale 1:7500

Design | *Current habitats*



Rough woods

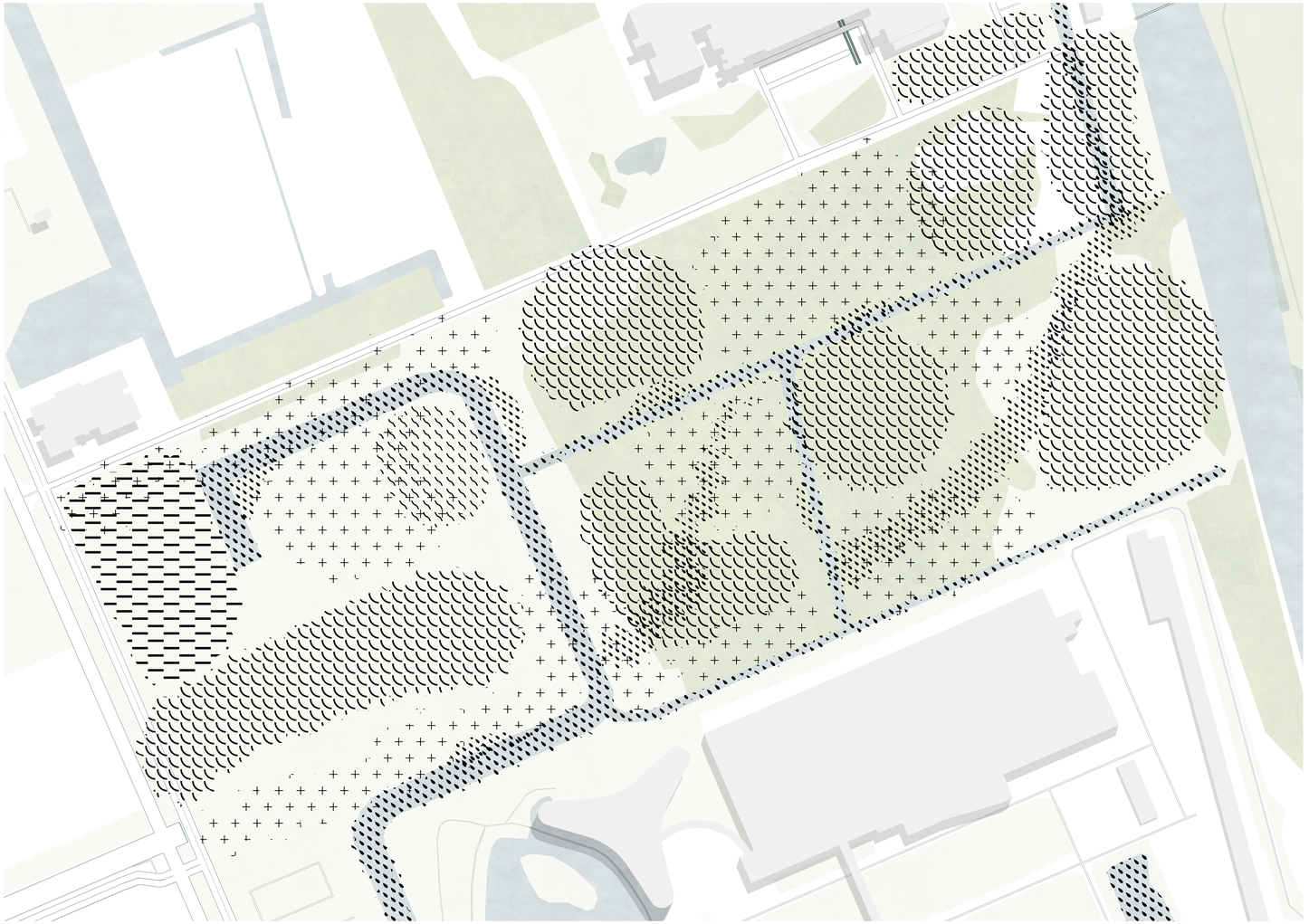
Mono culture

Shore

Habitats on site

Scale 1:1000

Design | *Introduction of new habitats*

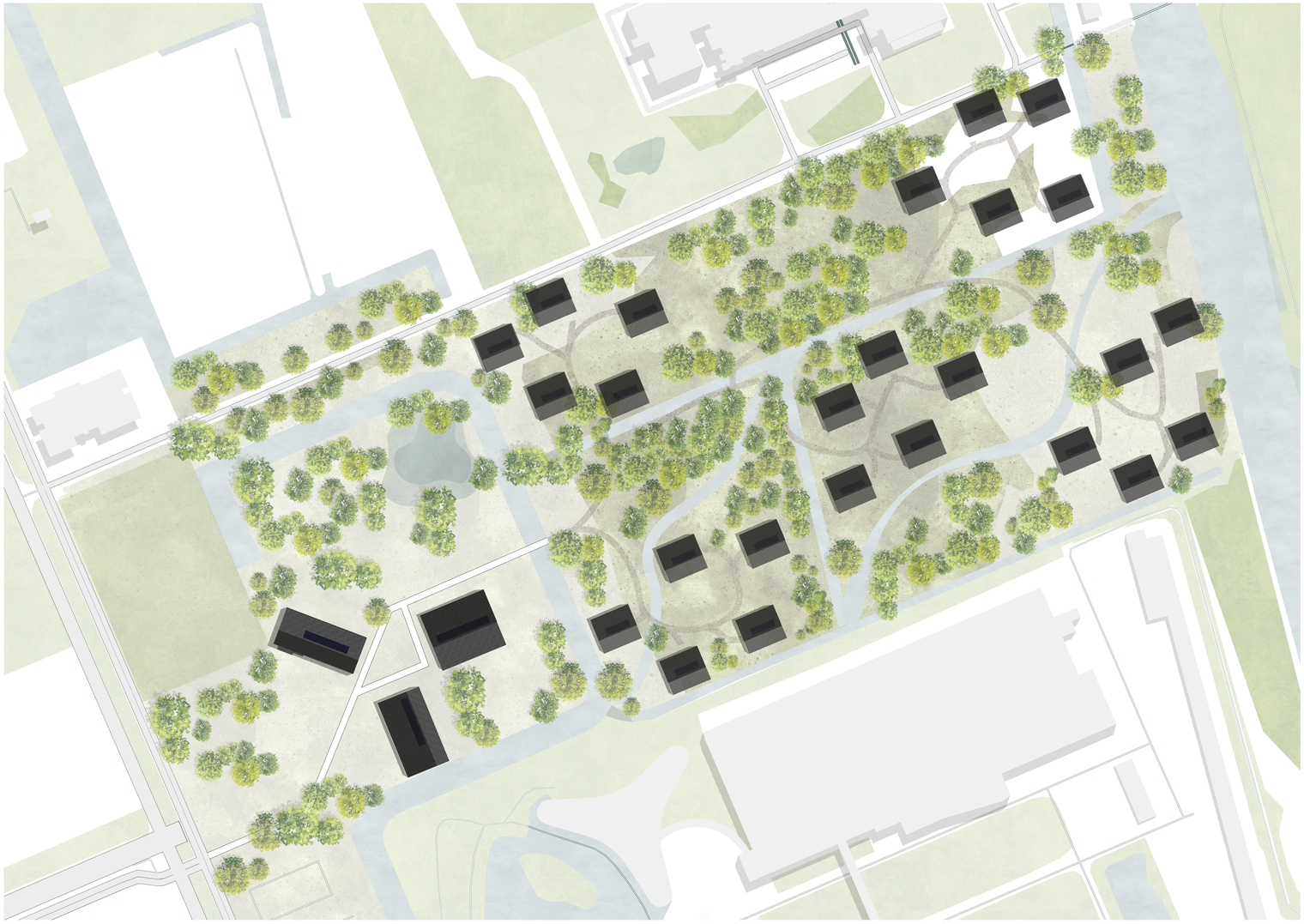


- Rough woods
- Mono culture
- Shore
- Bushes
- Protected waters

Adding habitats

Scale 1:1000

Design | *Seeking space for building*



Scale 1:1000

Design | *Ambitions on building scale*

Multisensory experiences

Thematic research

Active climate system

Thematic research
COA

Balanced prospect and refuge

Thematic research
Ethnograpic
COA

Connect

Nature + eachother

Thematic research
Design

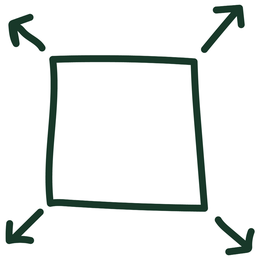
Design | *Ambitions on dwelling scale*

Feeling at home

Ethnographic research

Calm, warm, welcome with natural elements

Thematic research
COA



Optimised feeling of space

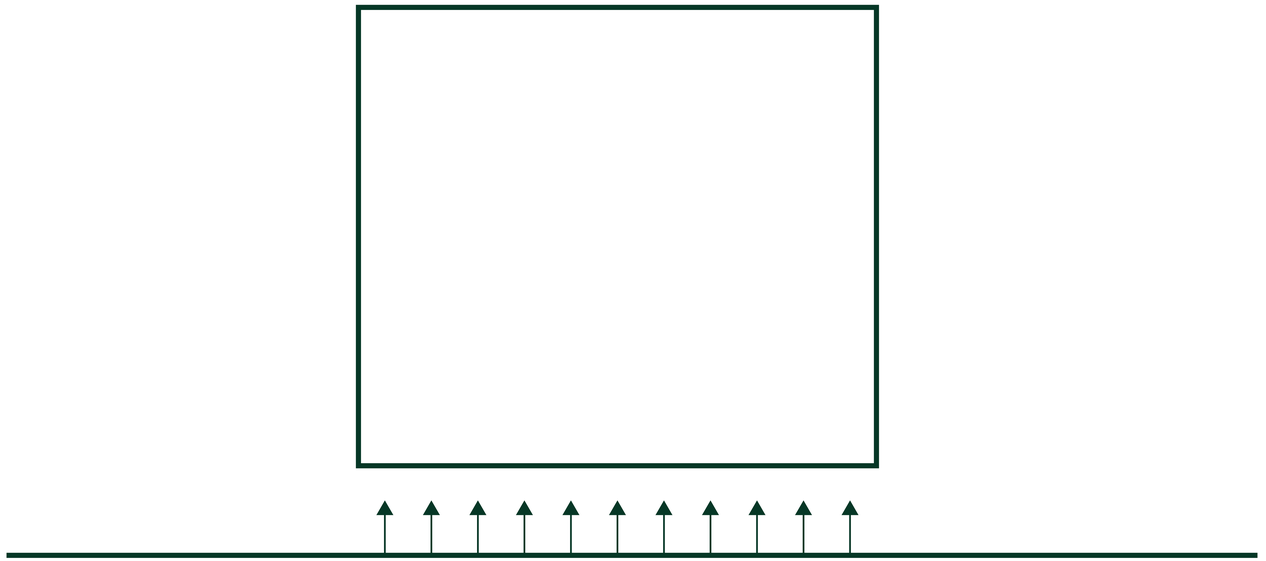
Ethnograpic

Refuge and privacy

Thematic research
Ethnographic
COA

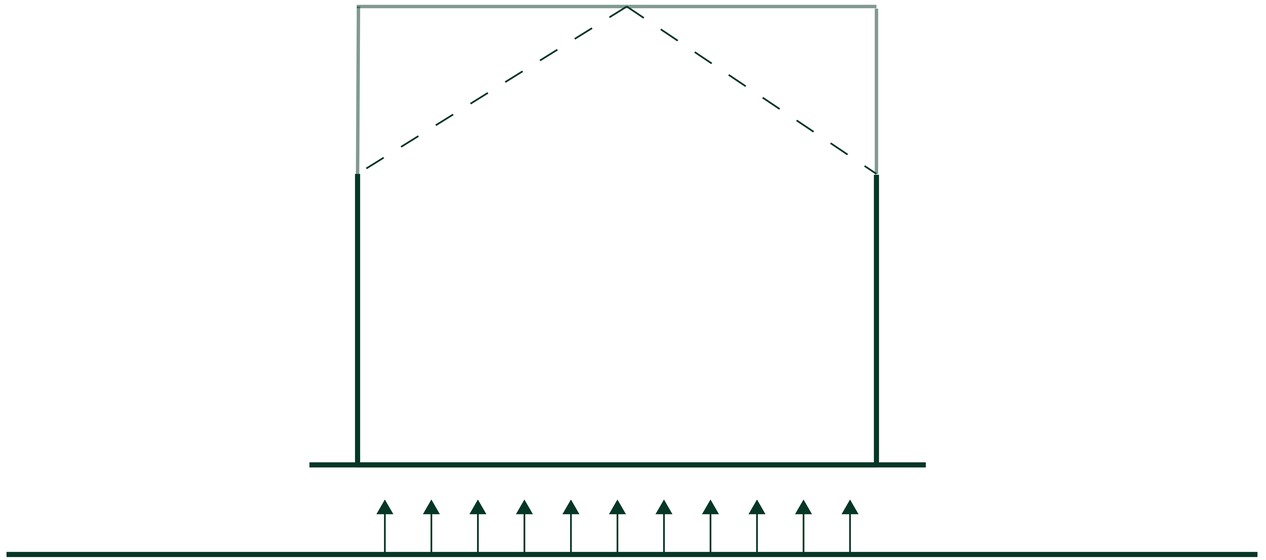
Design | *COA dwelling anatomy*

Square metres of spatial plan of requirements



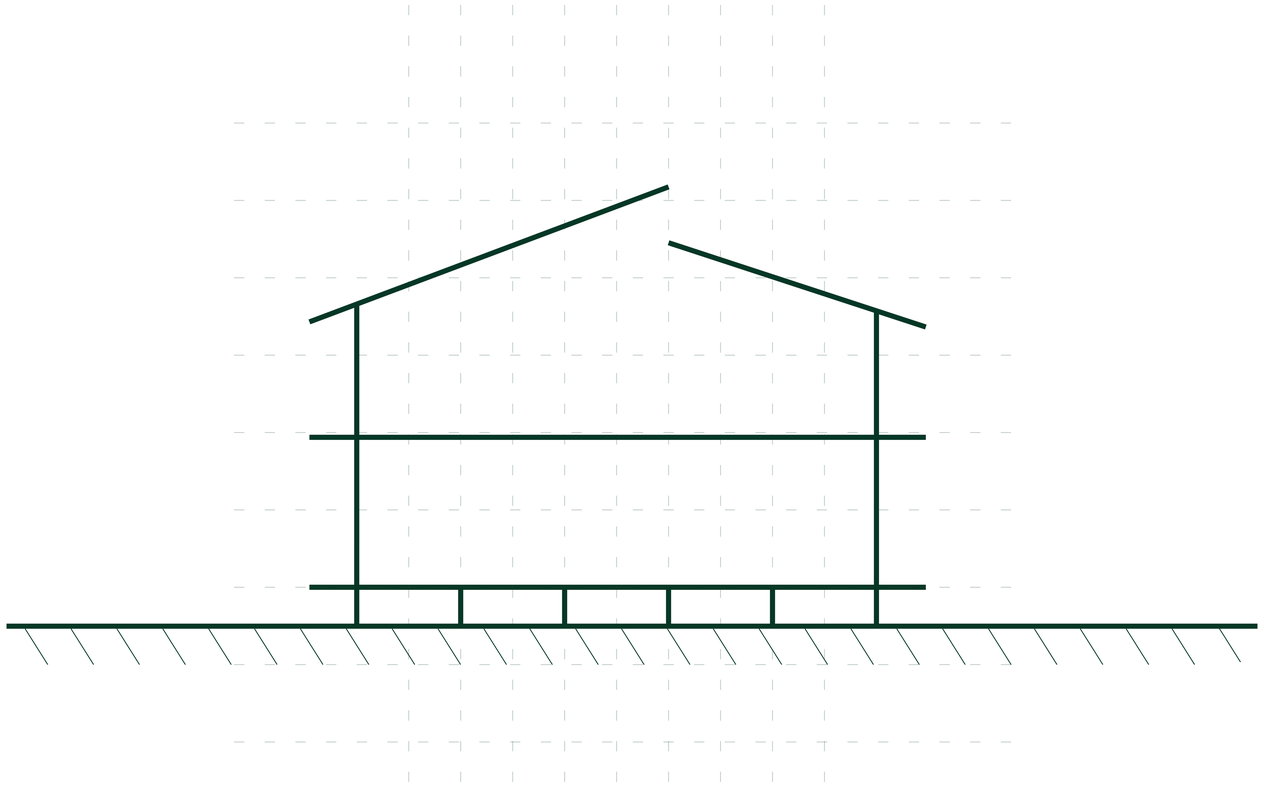
Lift

Design | *Taking shape*



Shaping

Design | *Taking shape*



Size

Design | *Floorplan south oriented dwelling*

Floorplan - Focal lenghts
Prospect and refuge

Biodiversity-Animals-Vegetation
Visual connection

Weather refuge
Prospect and refuge

Ground Floor

Scale 1:100

Design | *Floorplan south oriented dwelling*

Auditory
Complexity and order

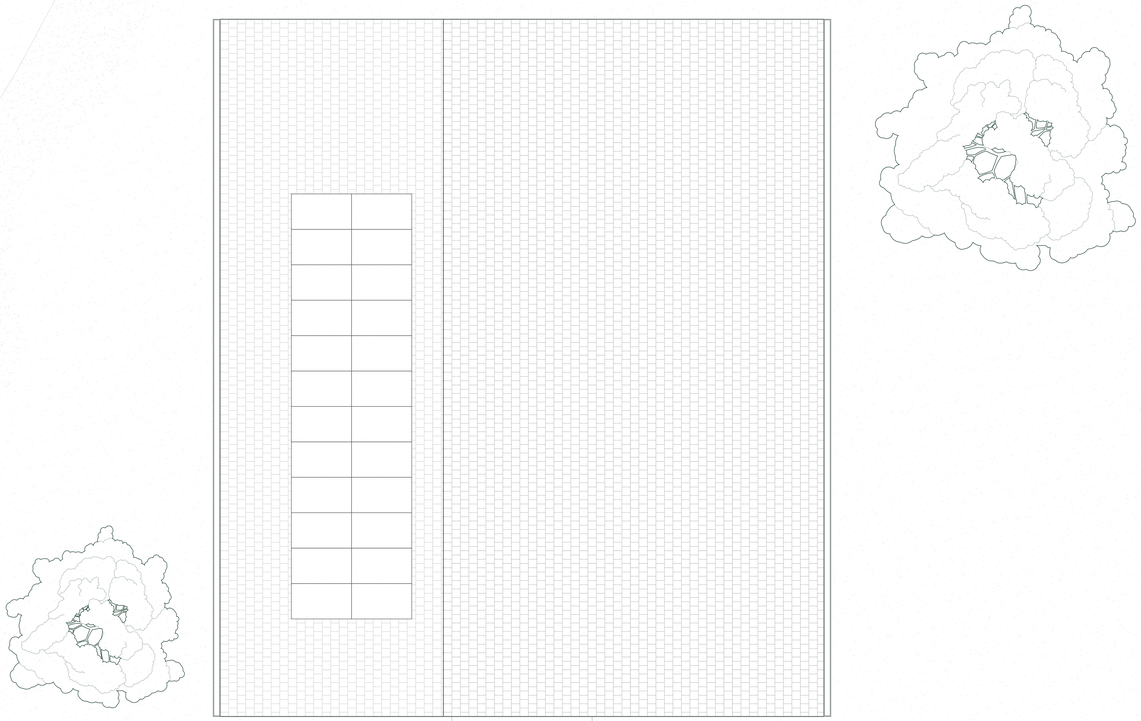
Imperceptible
Mystery

Heights
Risk

First floor

Scale 1:100

Design | *Floorplan south oriented dwelling*



Weather
Connection to natural system

Seasonality
Presence of water

Roof

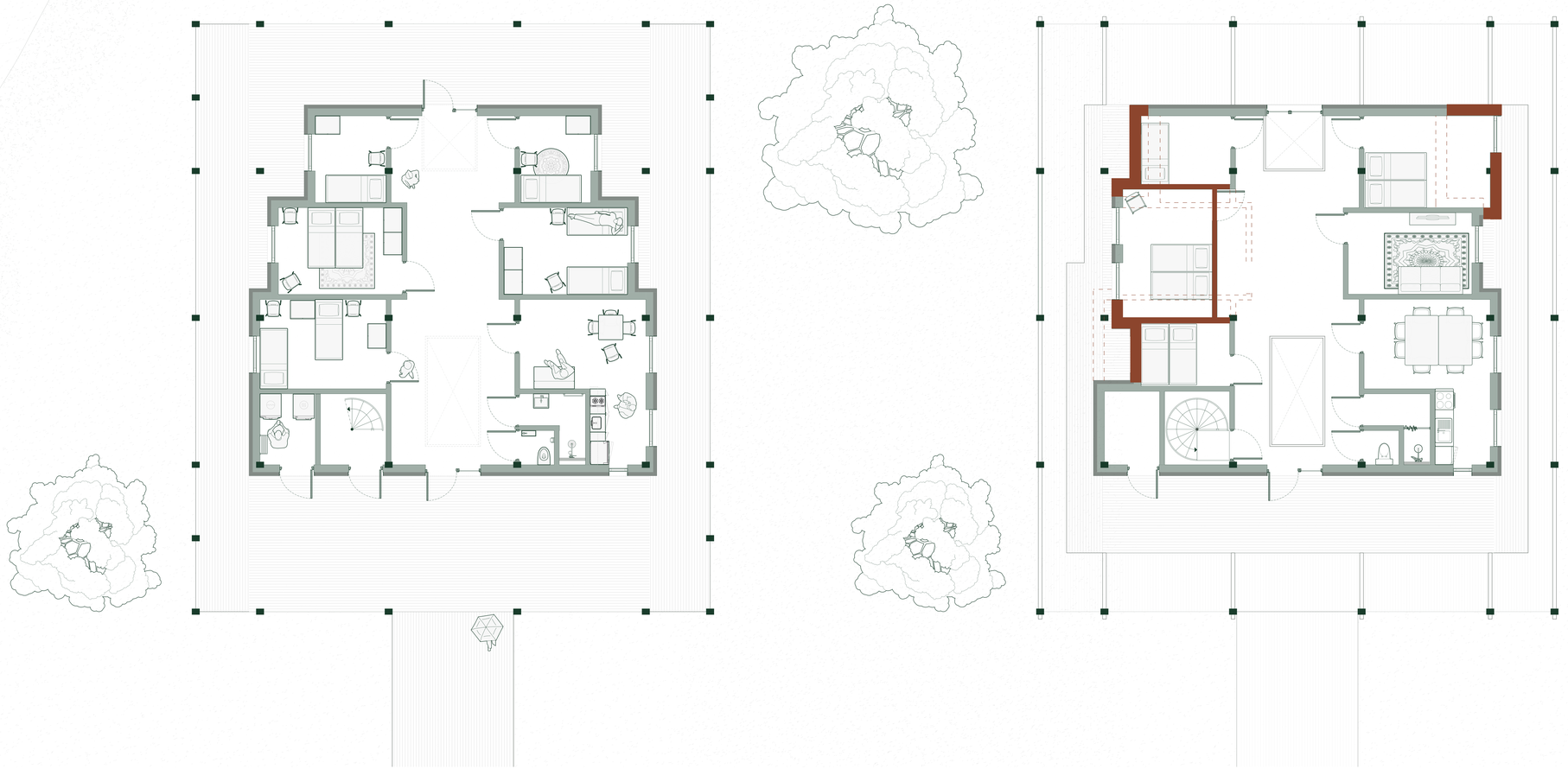
Scale 1:100

Design | *Alternative floorplan - youth*

Example AMV

Scale 1:100

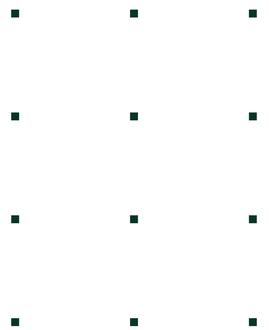
Design | *Alternative floorplan - family*



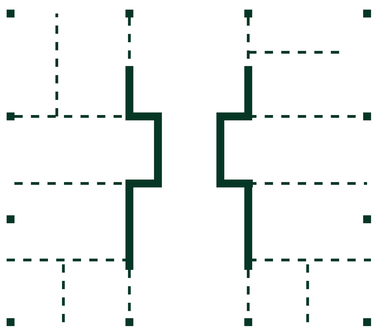
Example GLO

Scale 1:100

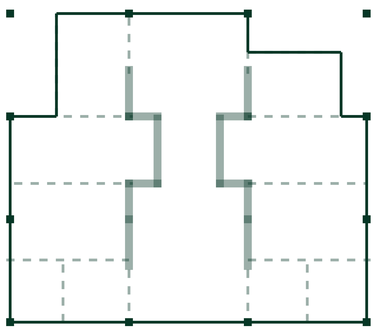
Design | *Materialisation - concept*



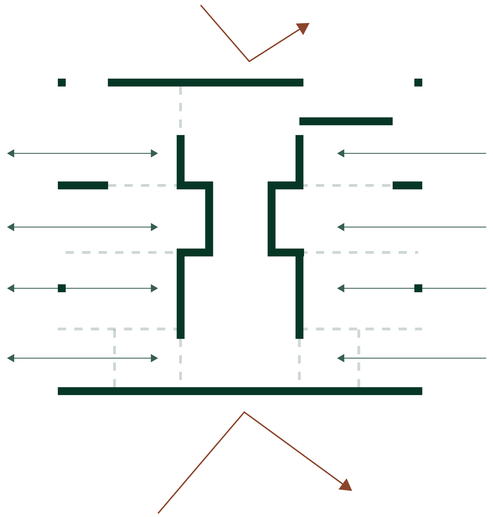
1. Grid



2. Core met rooms attached

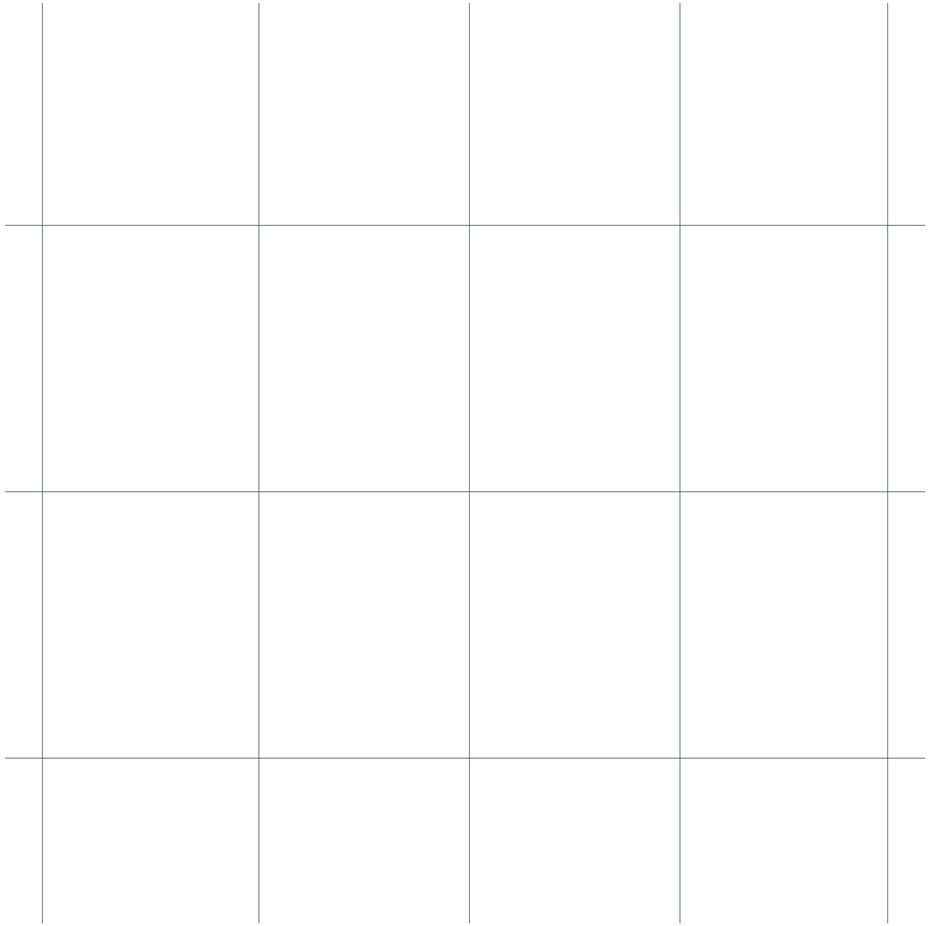


3. Wrapped by facade



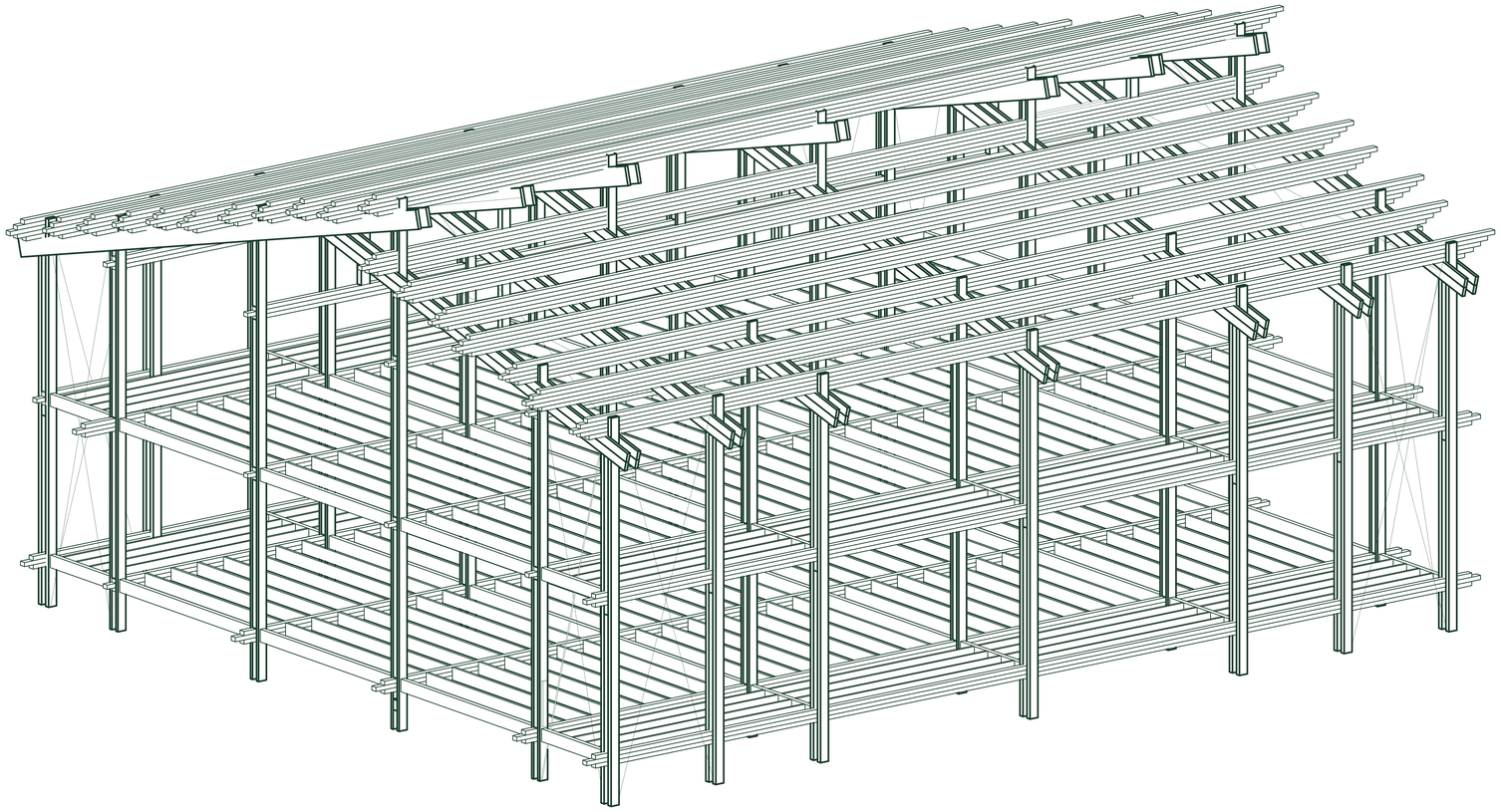
4. Private and mass
vs.
Flexible and nature

Design | *The grid*



600 x 600

Design | *3D stucture*



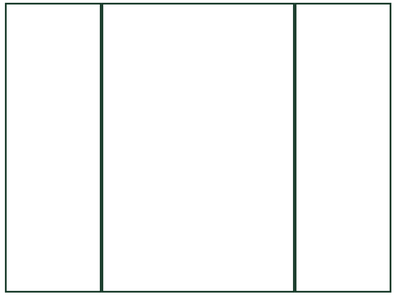
Axonometric view of structure

Design | *Construction elements*

Ash wood - Construction
Fraxinus excelsior

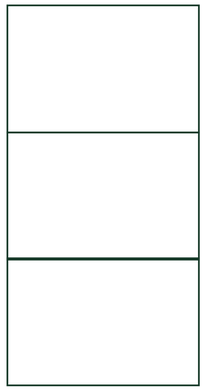
Birch plywood - Plywood
Fagus sylvatica

Larch - Facade cladding
Larix decidua (European Larch)



Top view

Columns
60+120+80x180



Elevation view

Beams
80+80+80x120

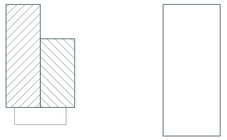
Design | *What is local?*

Material

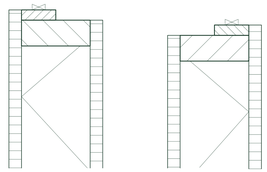
Product

Design | *Wall elements*

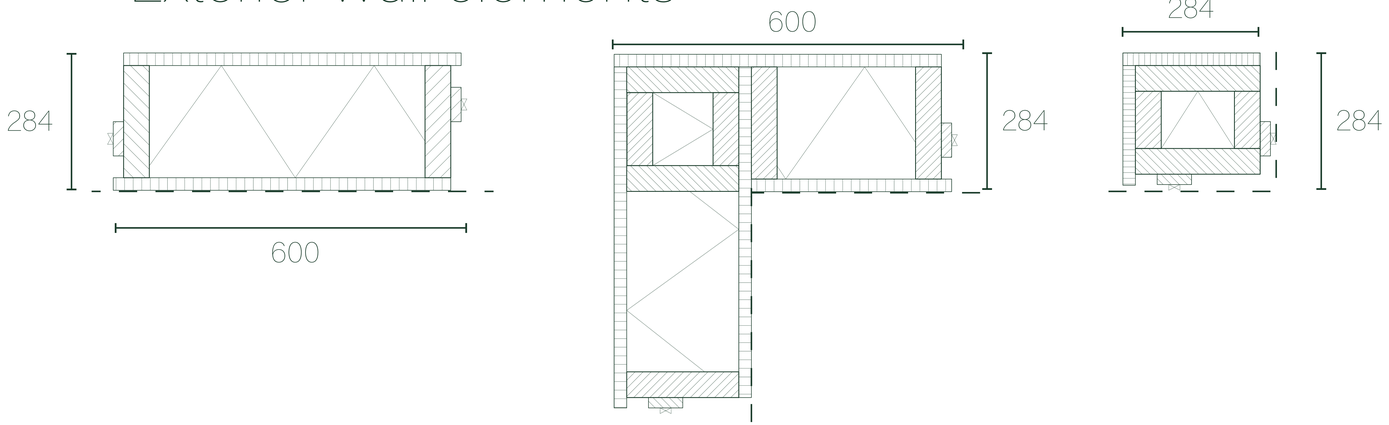
Facade



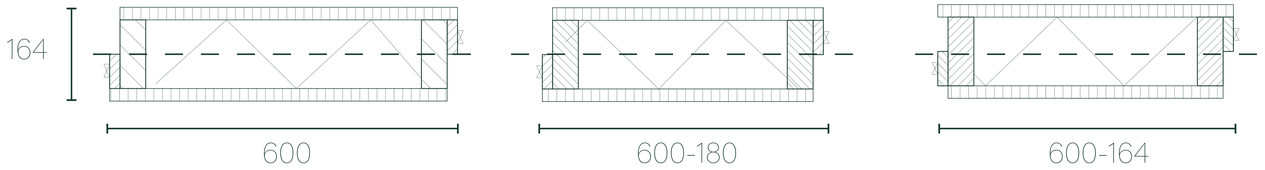
Male/Female end



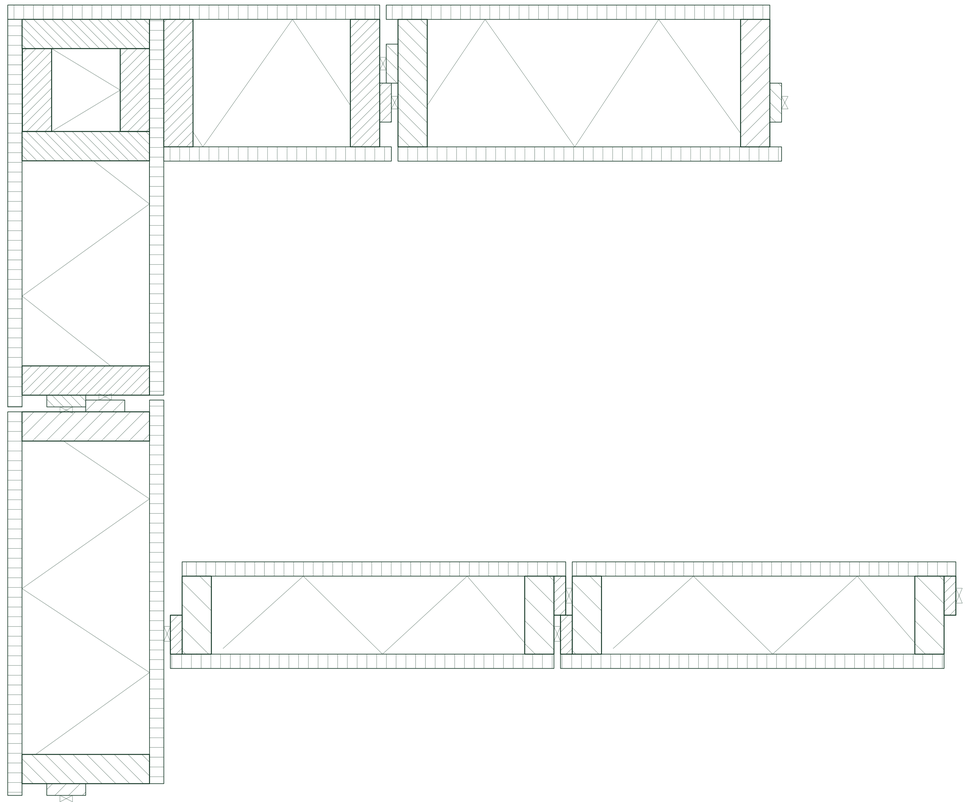
Exterior wall elements



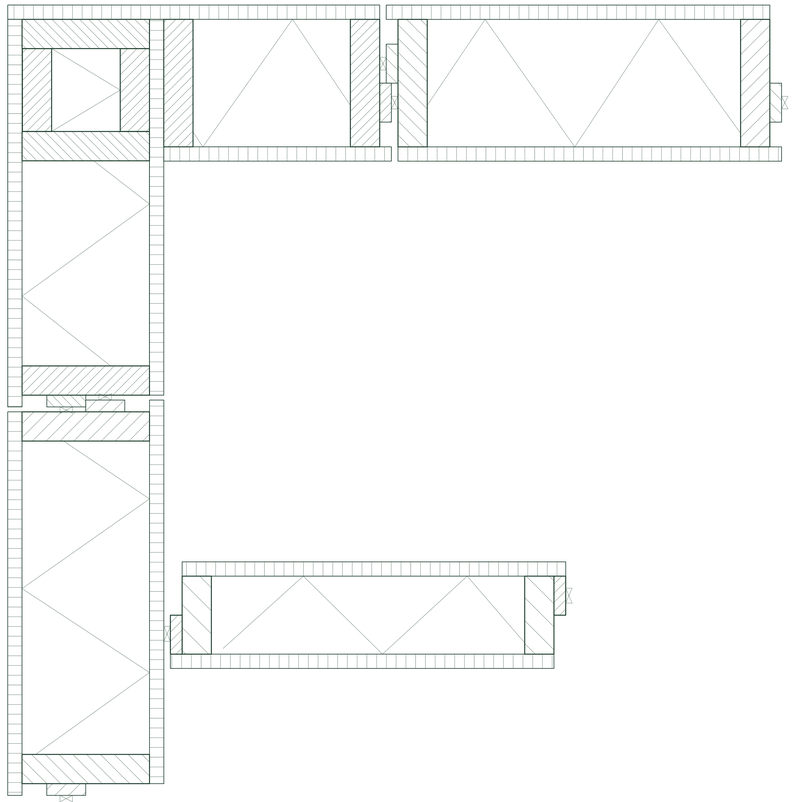
Interior wall elements



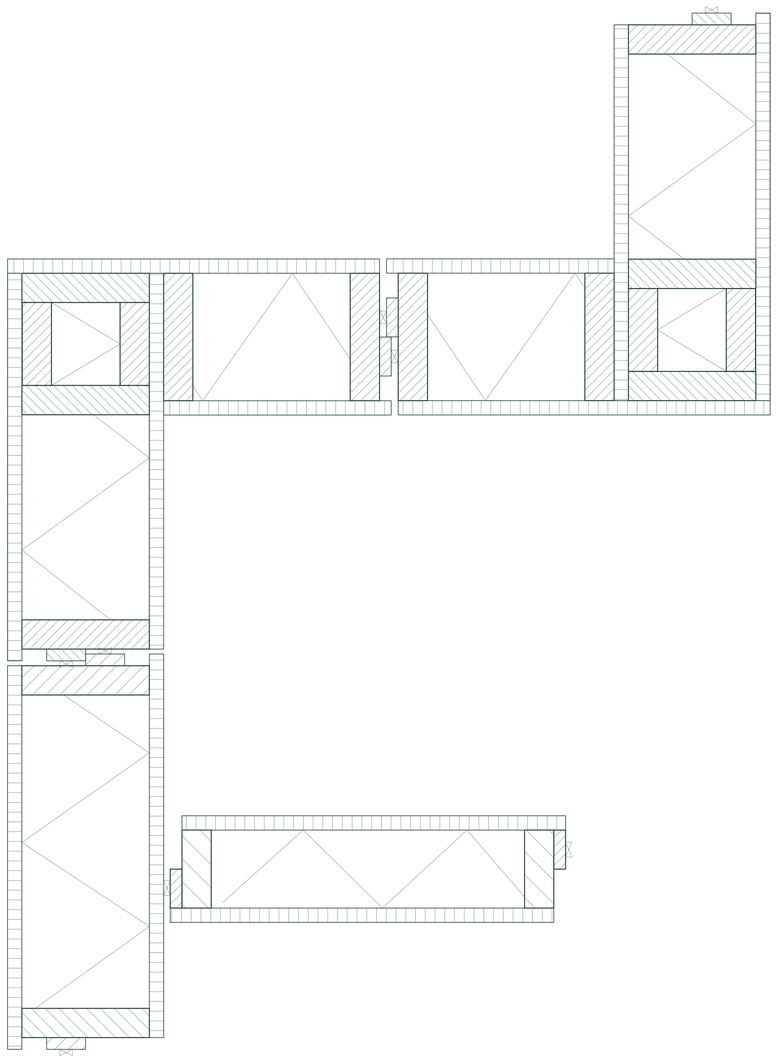
Design | *Flexibility*



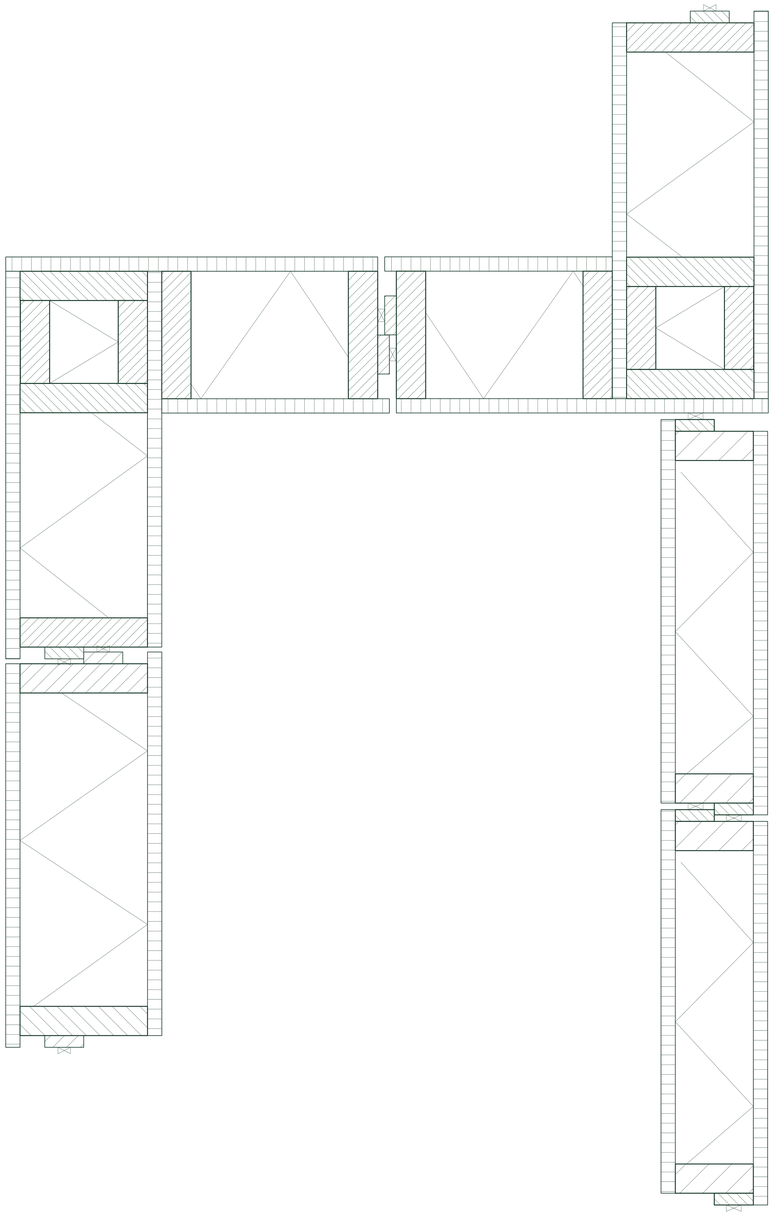
Design | *Flexibility*



Design | *Flexibility*

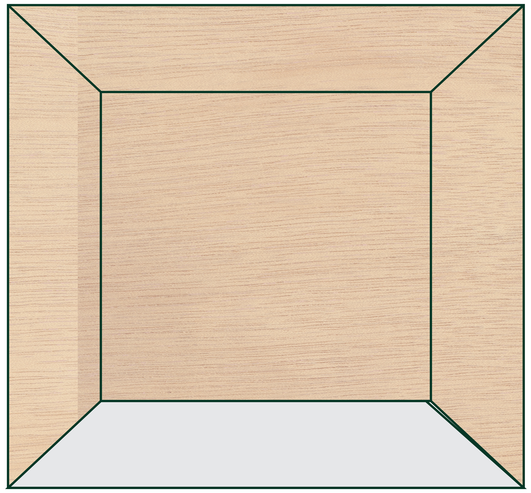


Design | *Flexibility*

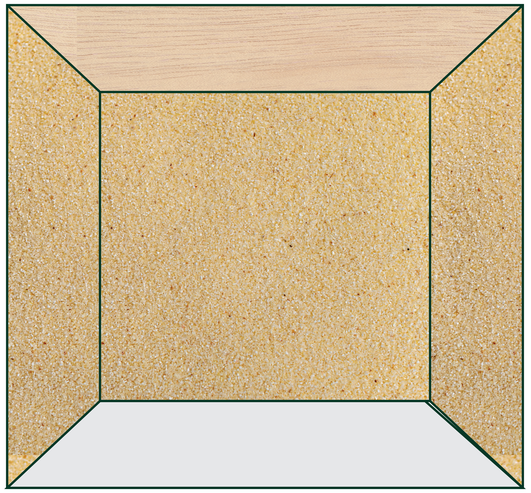


Design | *Internal materialisation*

Plywood
Plywood
Linoleum



Rooms

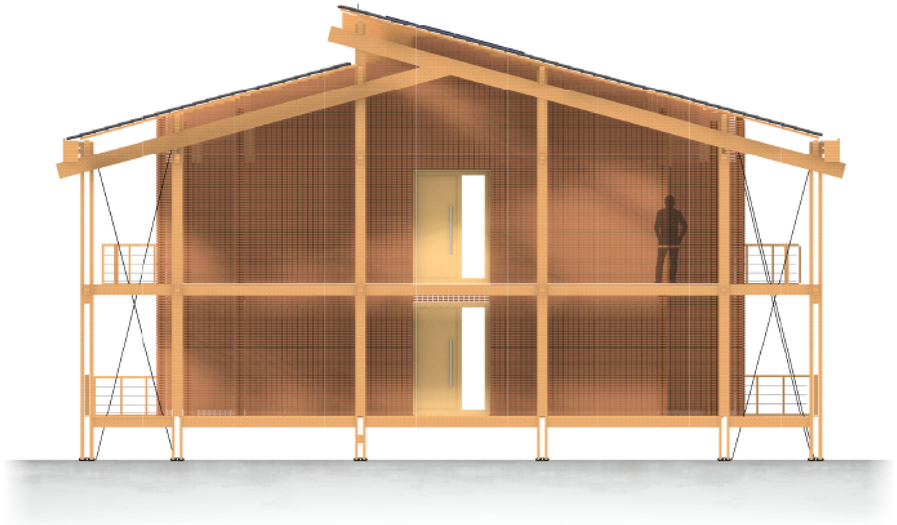


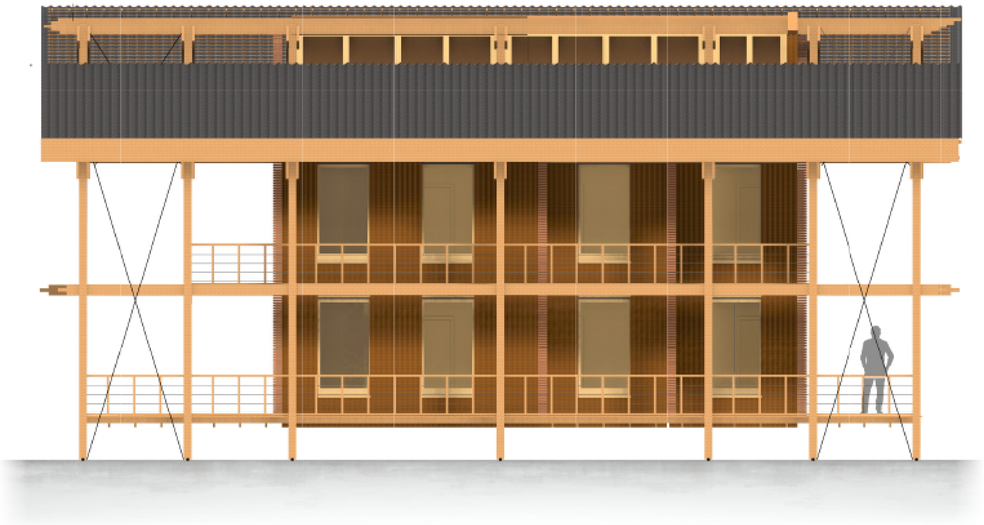
Hallways

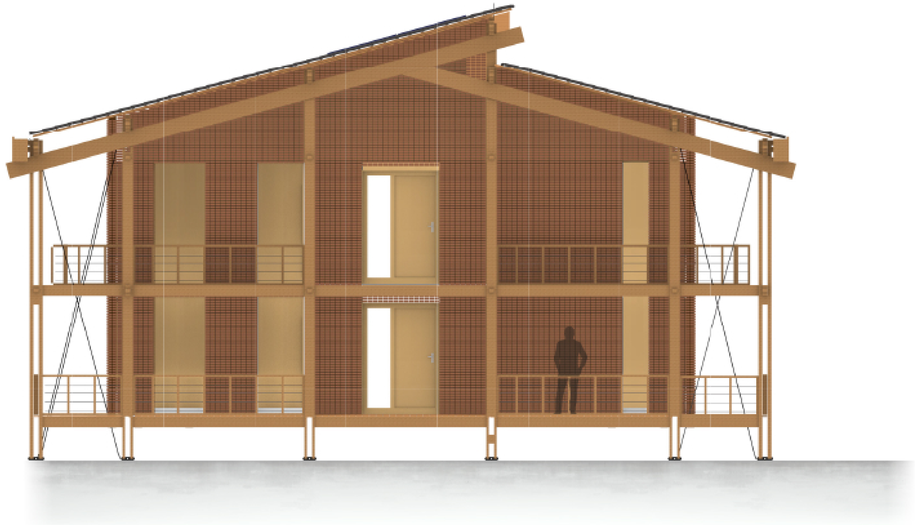
Plywood
Corntiles
Linoleum

Design | *Local materials*

Design | *Elevations*





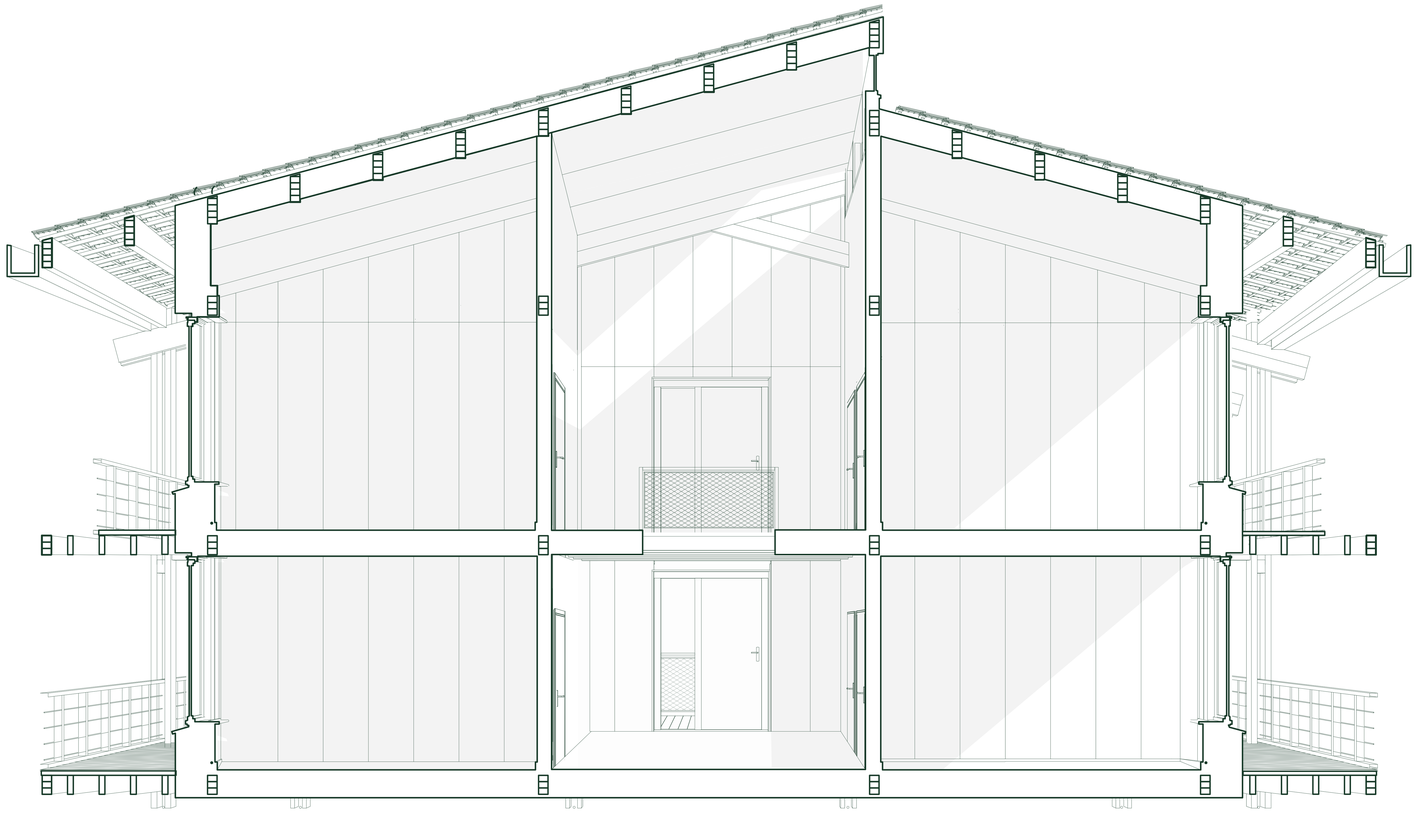


Scale 1:100

Design | *Elevation on plot*

Scale 1:100

Design | *Section*



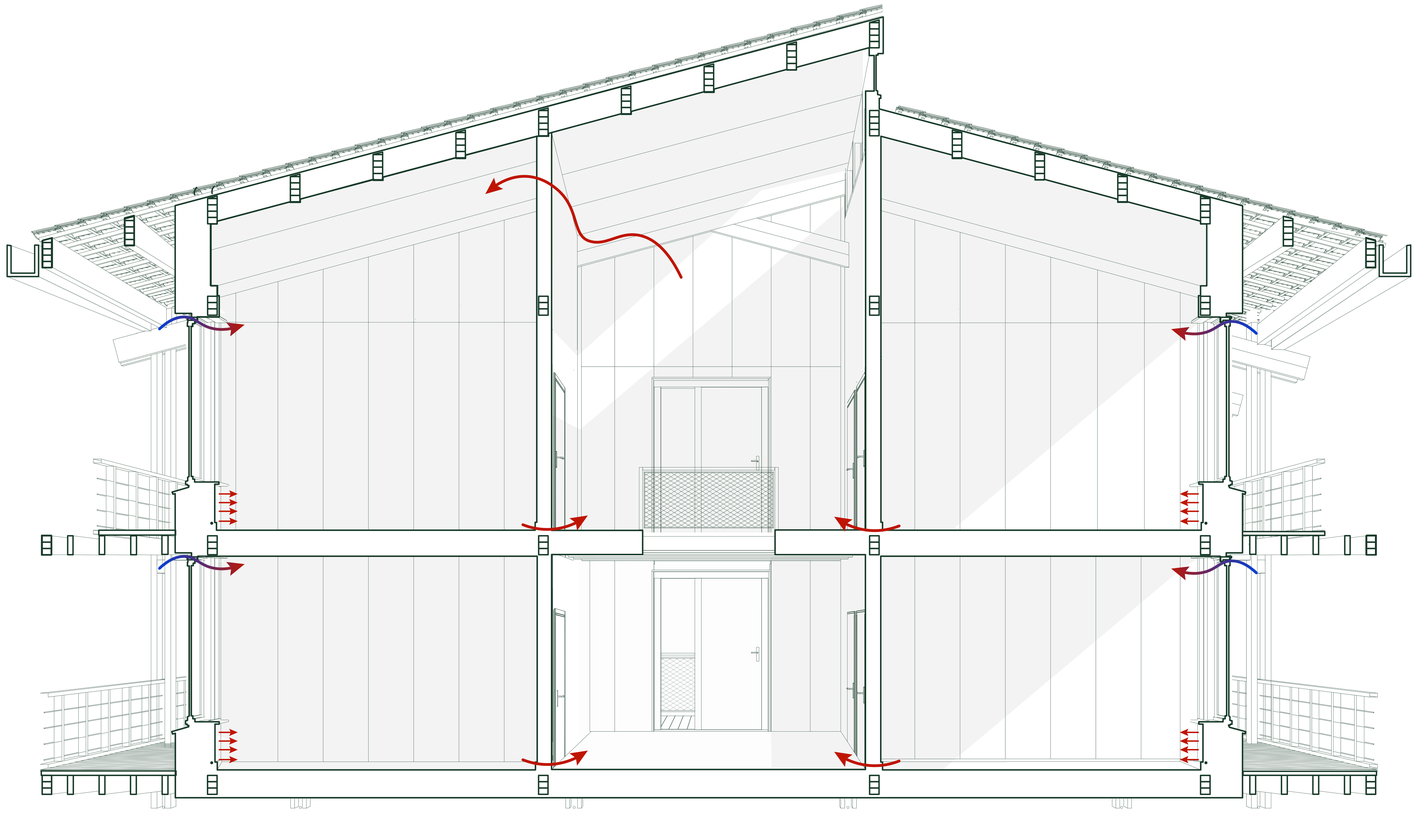
Sound
Non visual connection

Fragrance - Wind
Non-visual connection

Construction
Complexity and order

Scale 1:50

Design | *Climate*



Climatisation
Thermal and airflow variability

Ventilation
Thermal and airflow variability

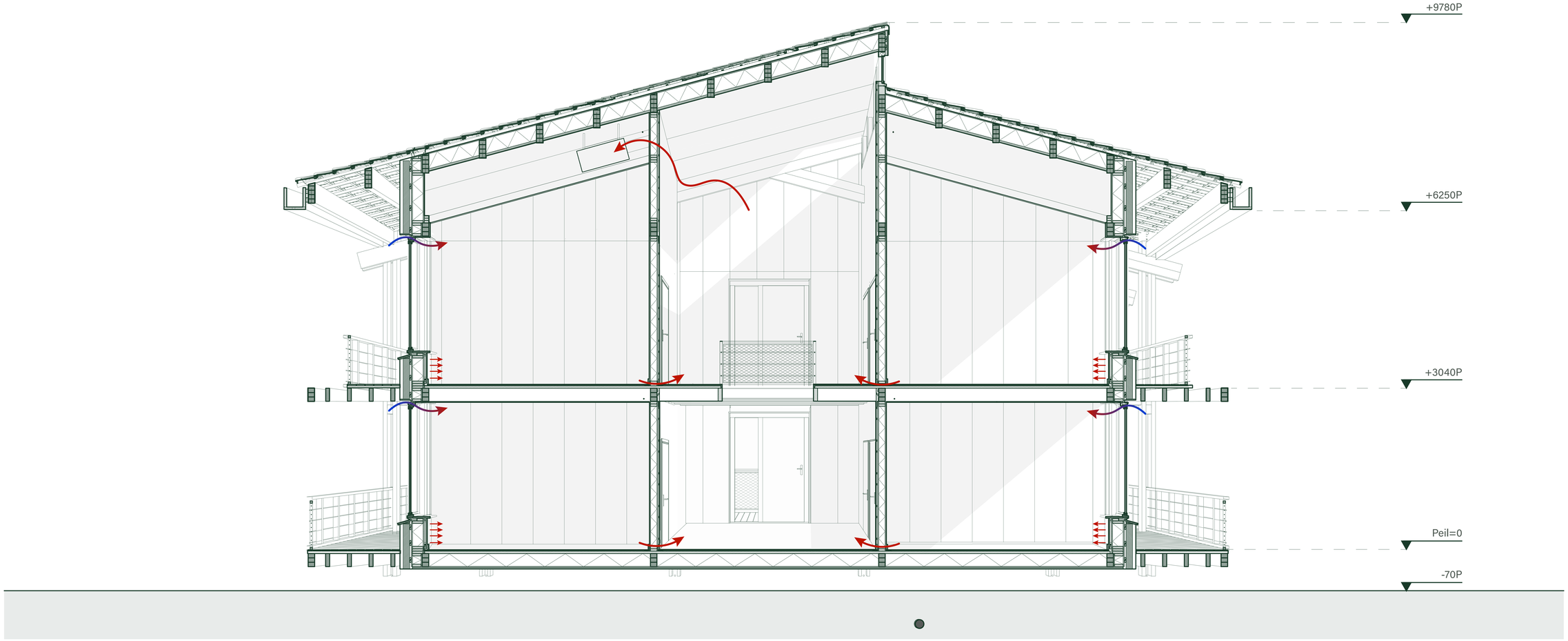
Solar heat
Thermal and airflow variability

Scale 1:50

Design | *Part of natural system*

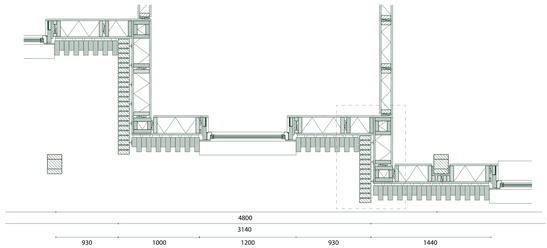
Scale 1:50

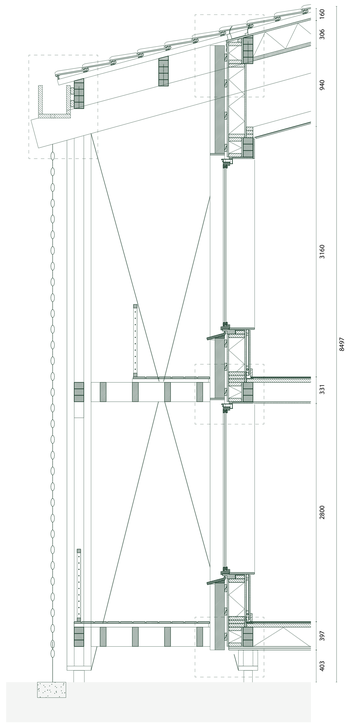
Design | *Materialisation 1.50*



Scale 1:50

Design | *Facade section*





Texture
Non-visual connection with nature

Colour
Material connection to nature

Material
Material connection to nature

Scale 1:20

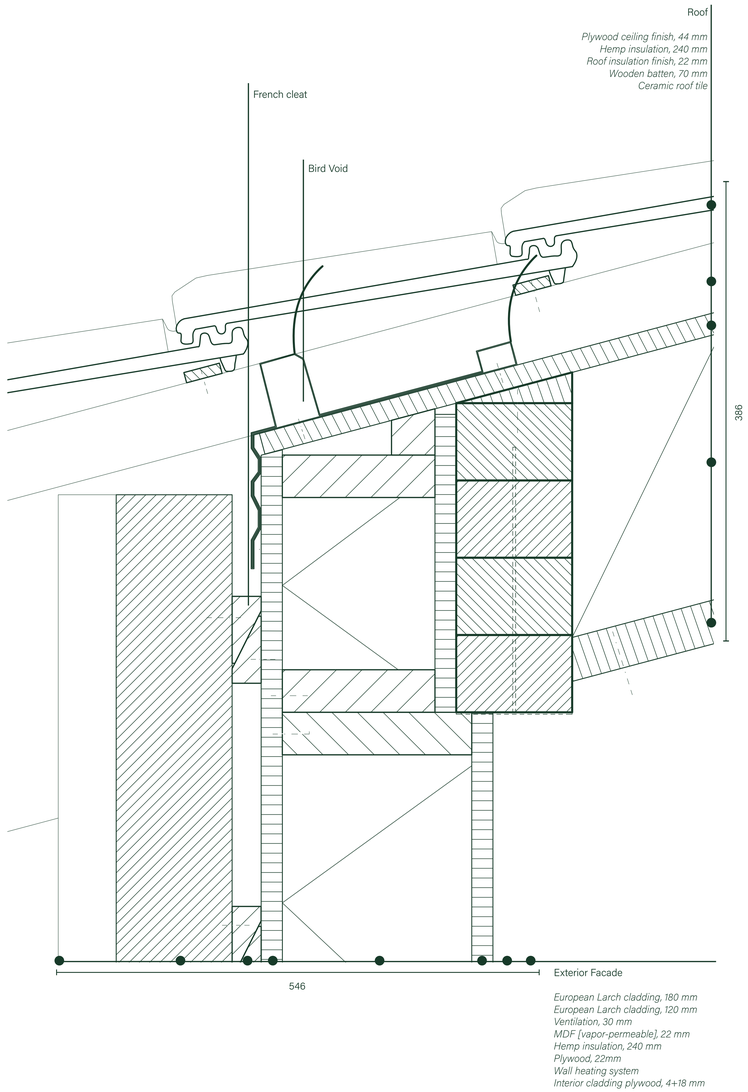
Design | *Biophilic materialisation*

Local materials
Material connection with nature

Variability in daylight
Non visual connection

Construction
Complexity and order

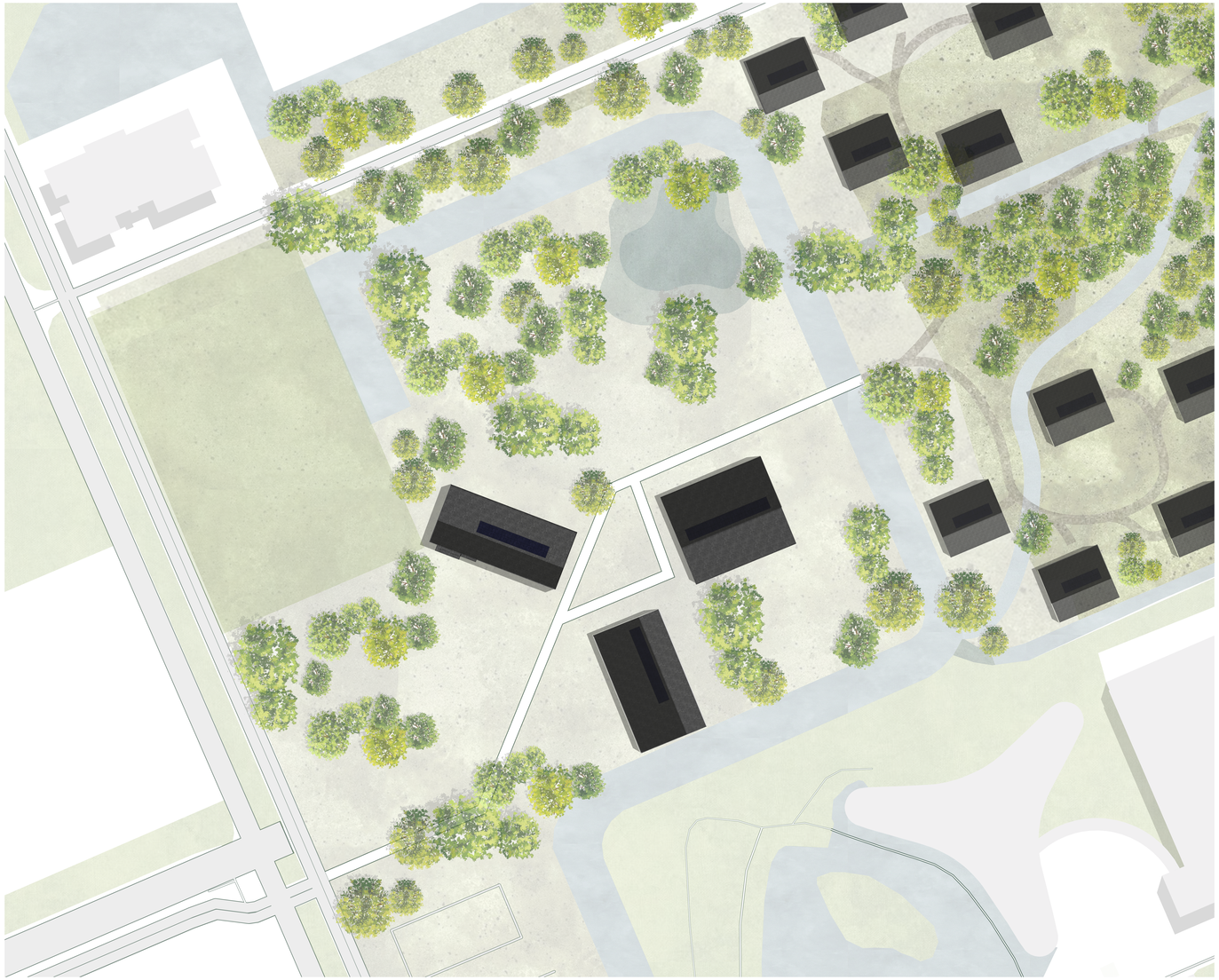
Design | *Detailing- Bird void*



Scale 1:5

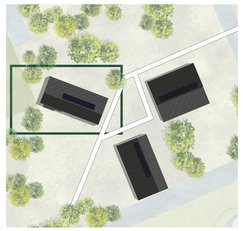
Design | *Impression of outside coffee*

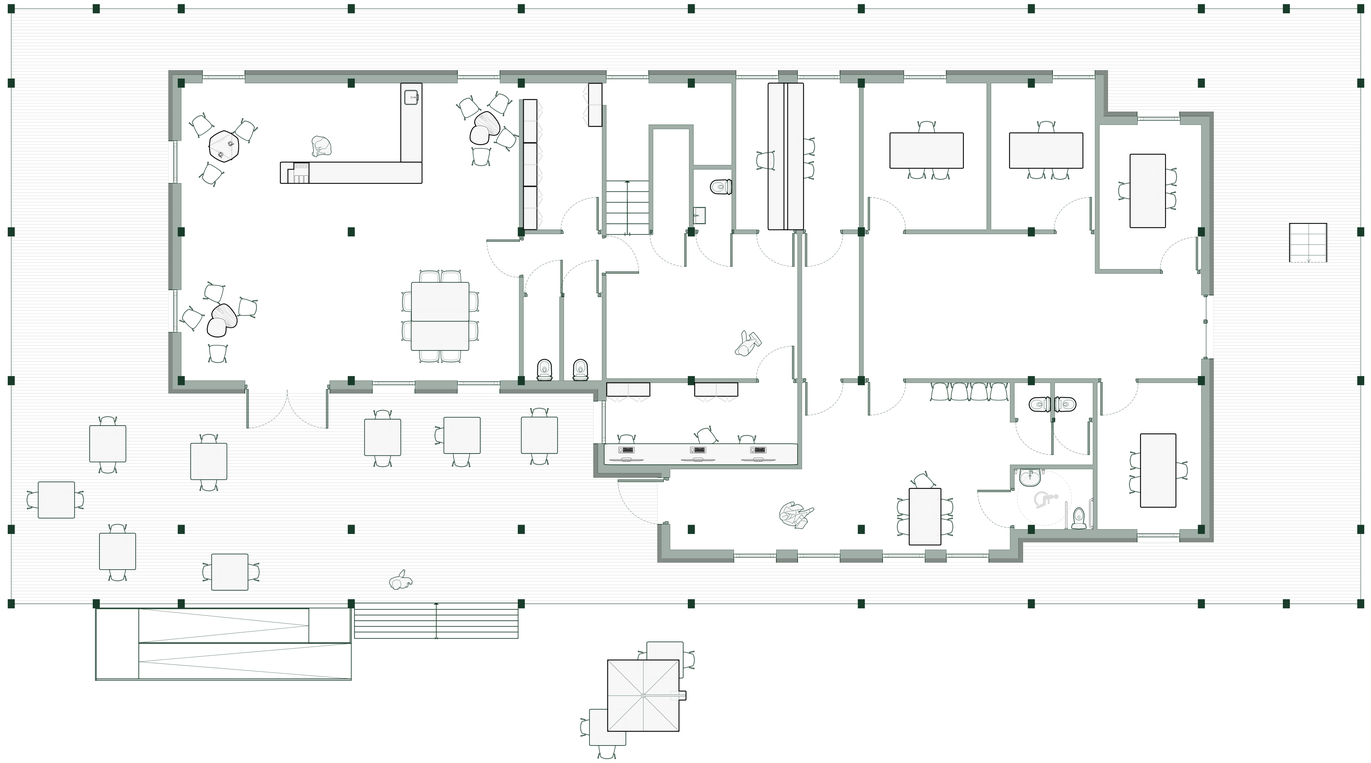
Design | *Public square - placement*



Scale 1:500

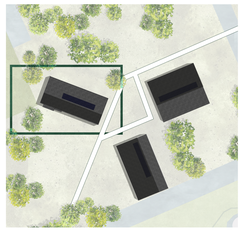
Design | *Ground floor public building 1*

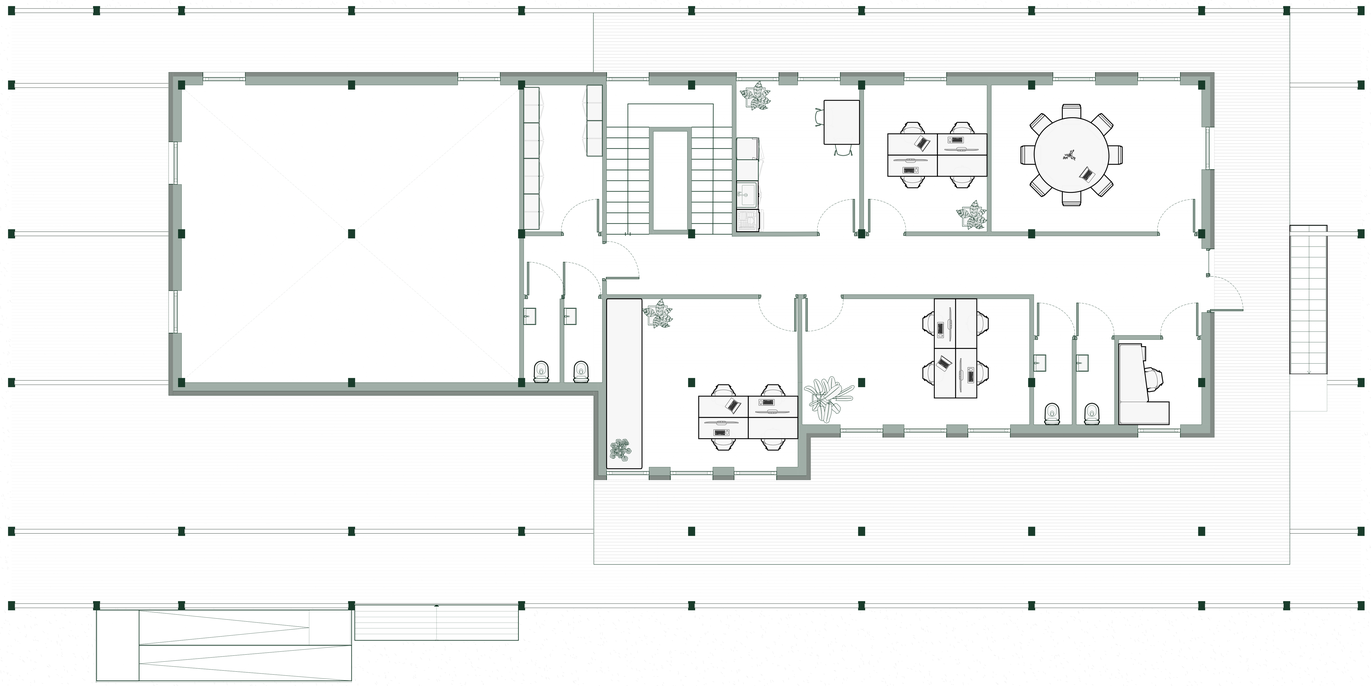




Scale 1:200

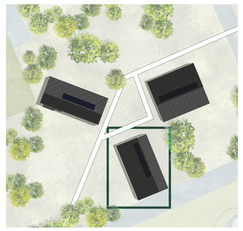
Design | *First floor public building 1*

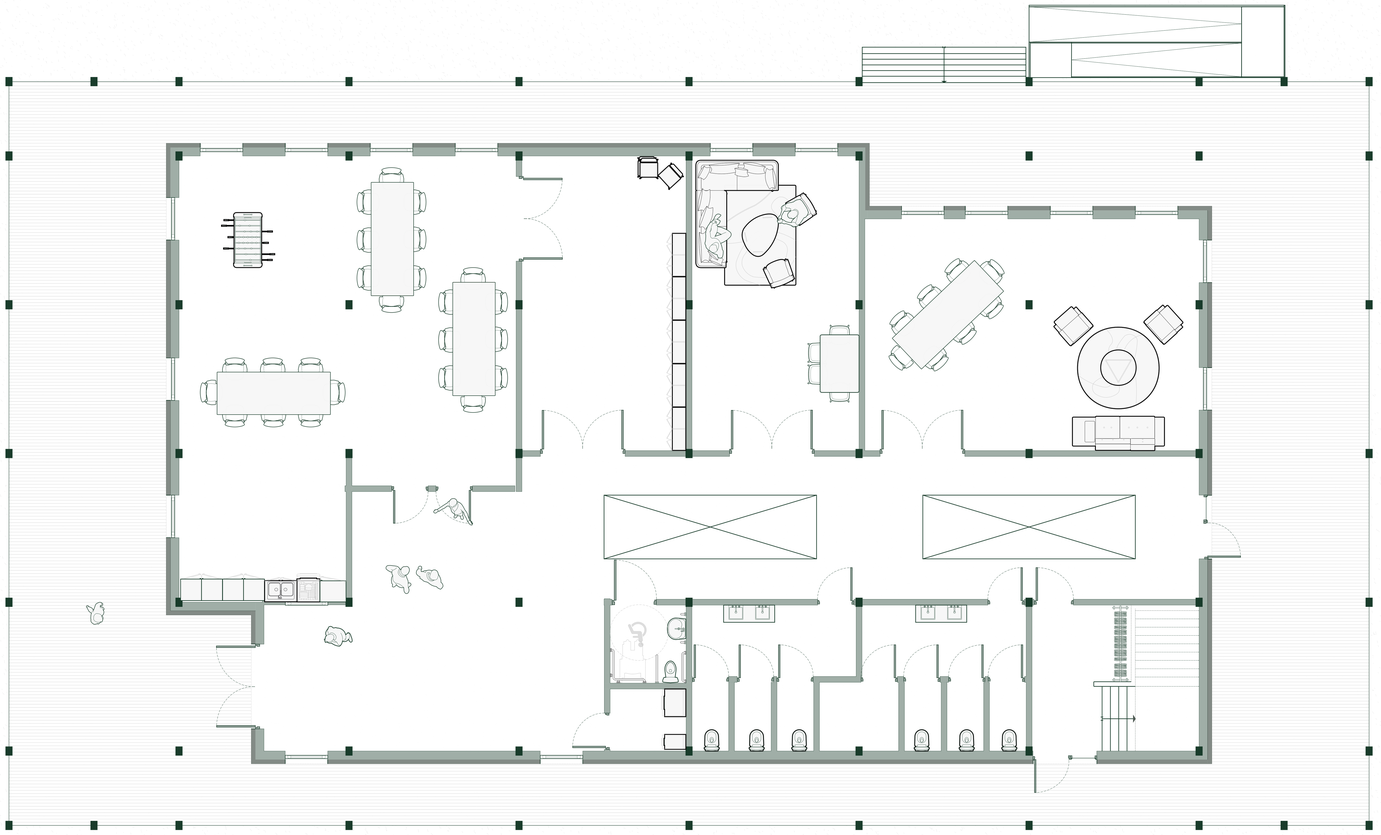




Scale 1:200

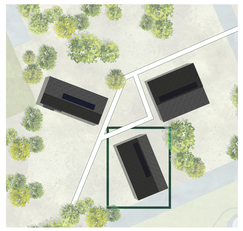
Design | *Ground floor public building 2*

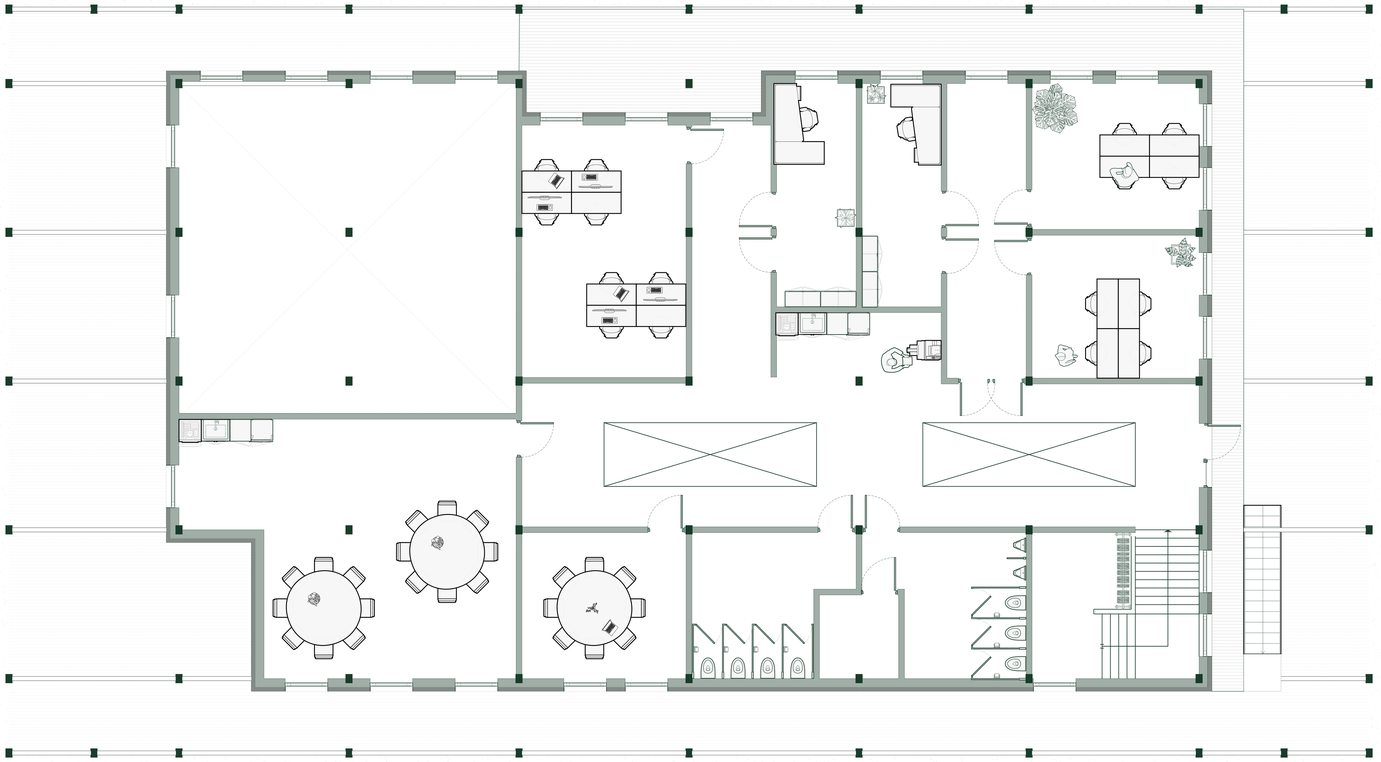




Scale 1:200

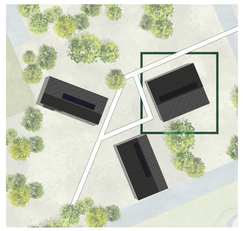
Design | *First floor public building 2*

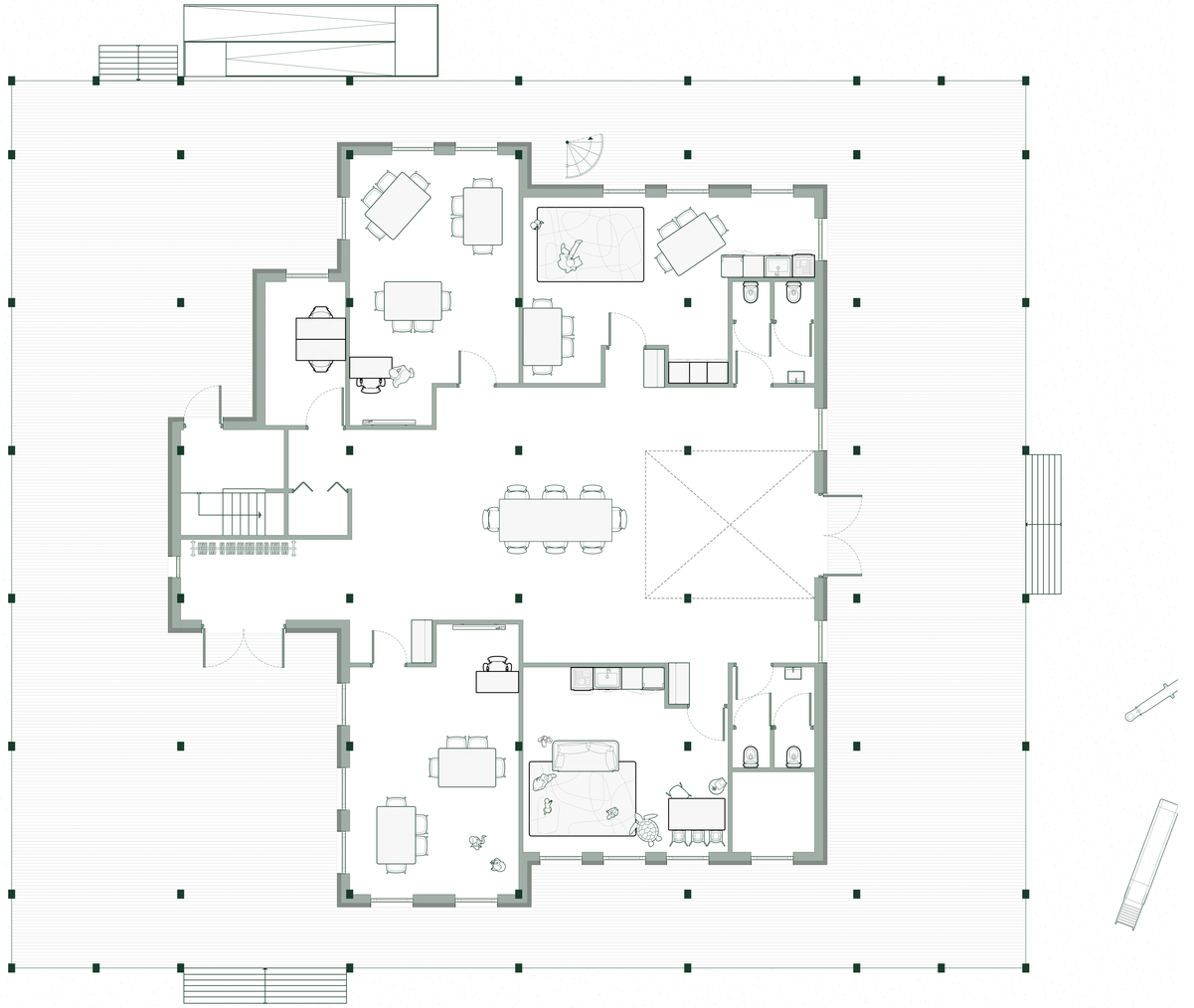




Scale 1:200

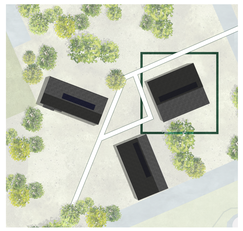
Design | *Ground floor public building 3*

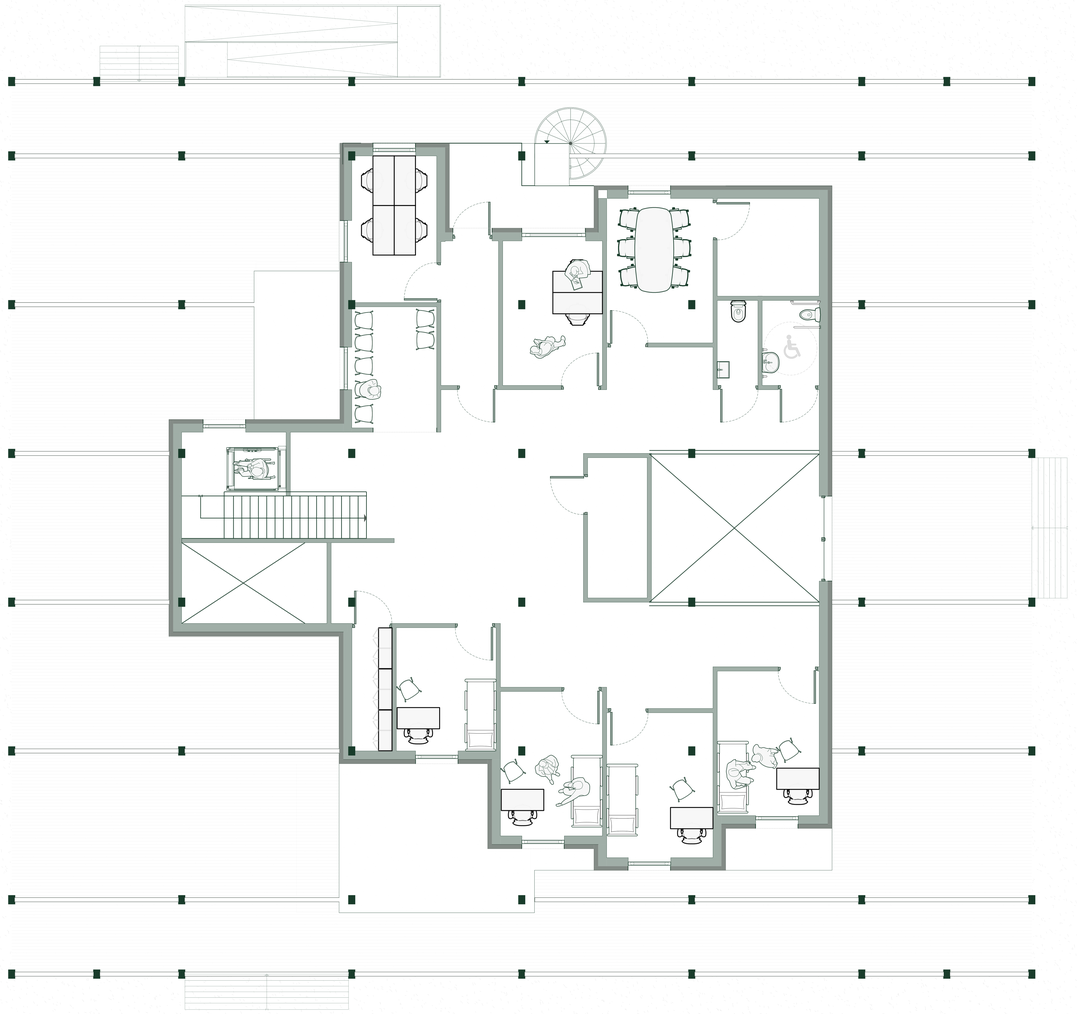




Scale 1:200

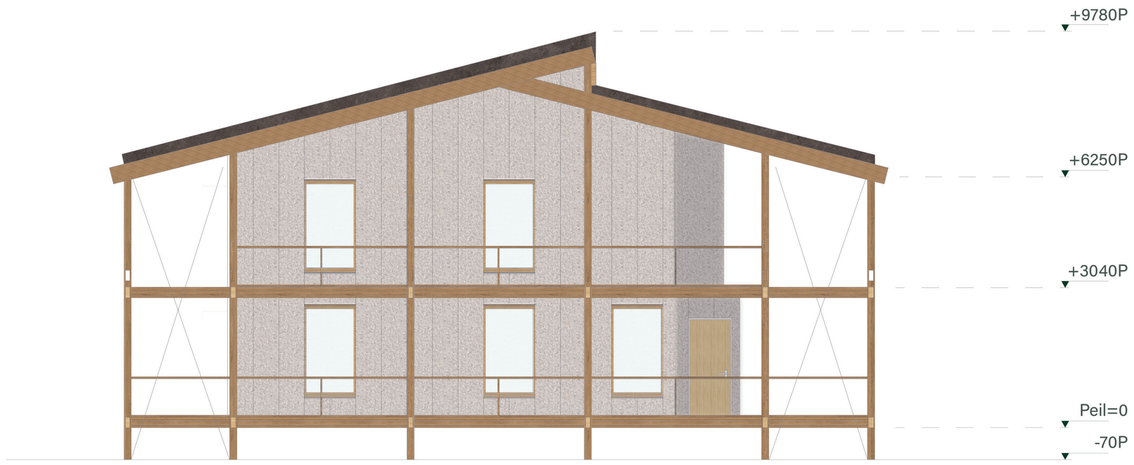
Design | *First floor public building 3*





Scale 1:200

Design | *Elevation public*



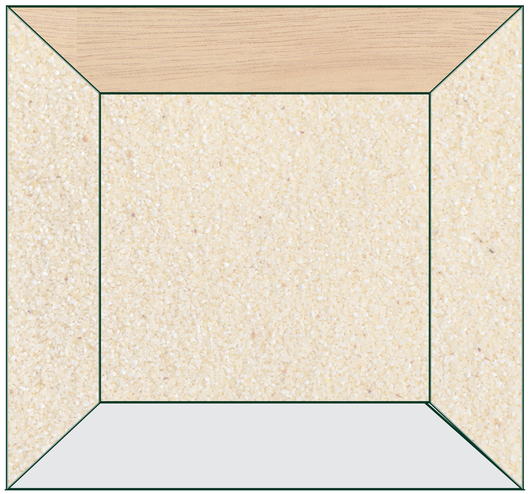
Public building

Dwelling

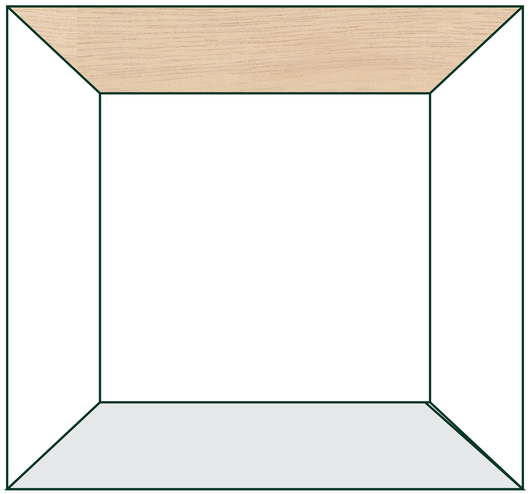
Scale 1:200

Design | *Internal materialisation*

Plywood
Corntiles
Linoleum



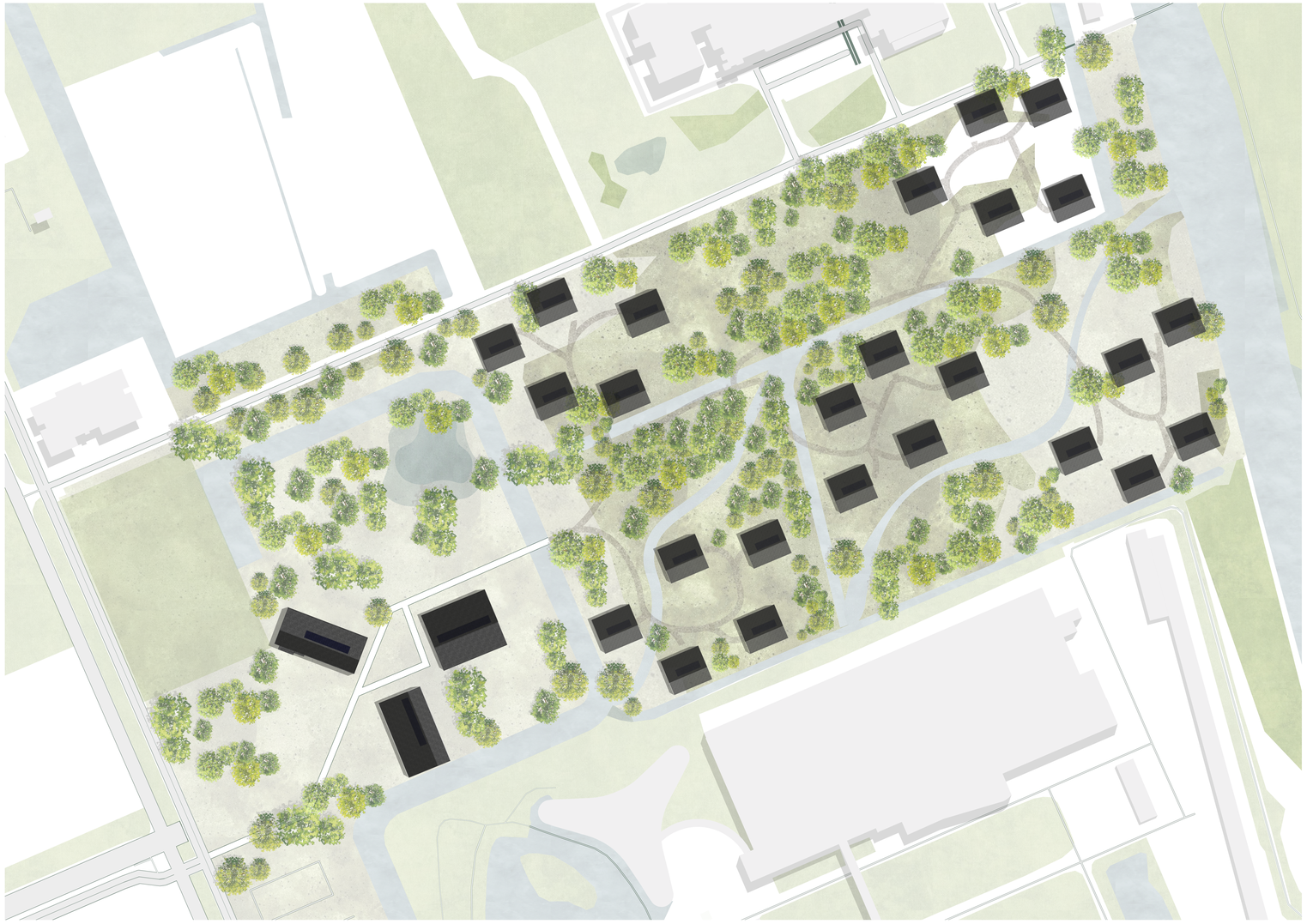
Rooms



Hallways

Plywood
Loam plaster
Linoleum

Design | *Plot overview*



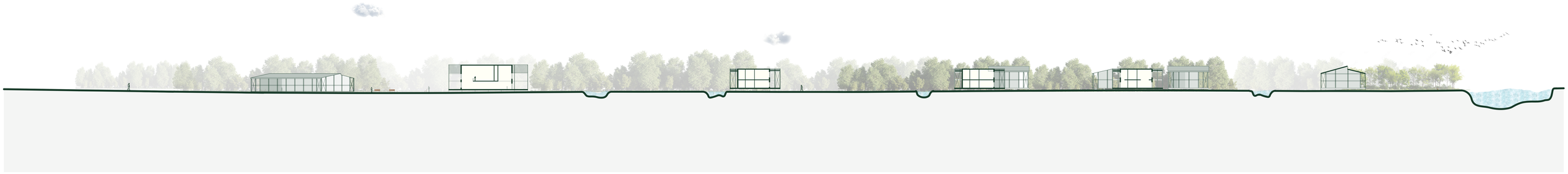
Obscurance
Mystery

Seasonal changes
Non visual connection

Soil/earth
Visual connection

Scale 1:1000

Design | *Plot section*



Scale 1:500

Problem statement

Architectural challenges

Research

Concept

Design

Conclusion

Conclusion | *Answer to design question*

Connect

Biophilia

Home

Conclusion | *Reflection*

Questions?

Thank you for listening