

Permanently in the polder

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MSc 3-4 Dwelling





Table of contents

1 – Introduction

2 – Floor plans

3 – Structure

4 – Facades

Background

- Facination for traditional architecture
- Master to go deeper into what this means
- First MSc year dedicated to heritage
- Identity, perception, experience, language
- Traditional architecture not only from the past
- Graduation: a new and relevant assignment

Bachelor graduation project



MSc 1 Heritage & Architecture project



MSc 2 Heritage & Architecture project



Dwelling MSc 3-4



-Midden-Delfland

-Agricultural peat polder in between 3 cities

Currently unsustainable in its use



Water management, pumping water out causes several problems

New plan



Studio: how do we still inhabit this place?

Urban zone



Polder zone



Main idea: stop pumping the water out of the peat

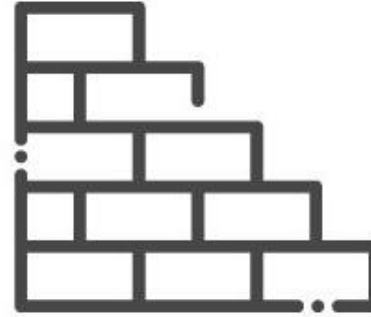
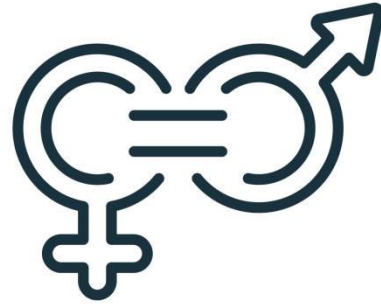
- Can it serve as a drain for the cities?
- Storing the water for dry periods and stop shrinking
- Preserving the area as green lung



Water storage zone



Forest zone

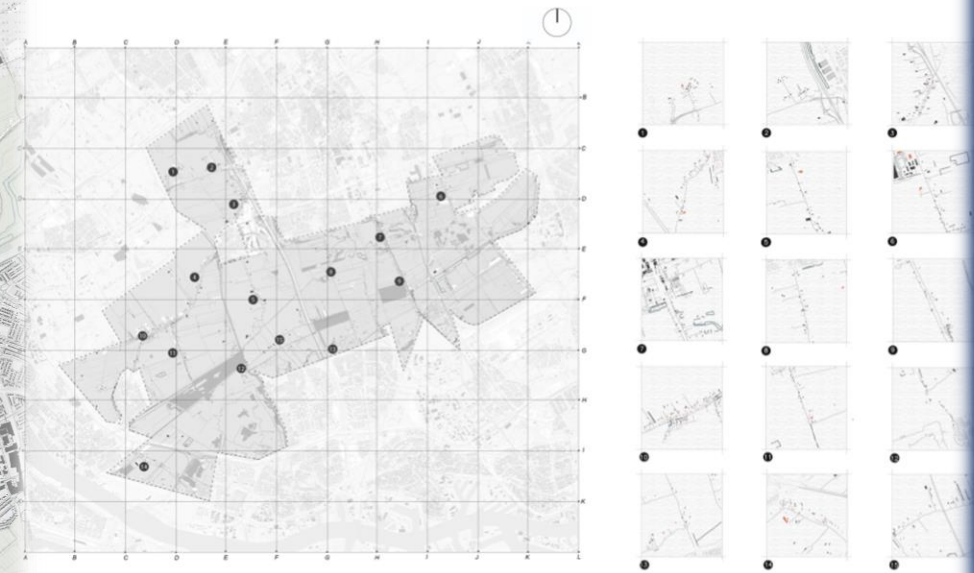


5 main studio ambitions

- Group affordability, choose this group since this is a really relevant issue in The Netherlands
- Main goal: affordable housing development in Midden Delfland
- Other included themes in this project: inclusivity & sustainability

Group research

- Group research to the location, searching for a place to build affordable housing in the area
- ZUS did not think of preserving the characteristic villages and hamlets in the area
- What could be a prototype location to design affordable, sustainable housing in this area



Site investigation

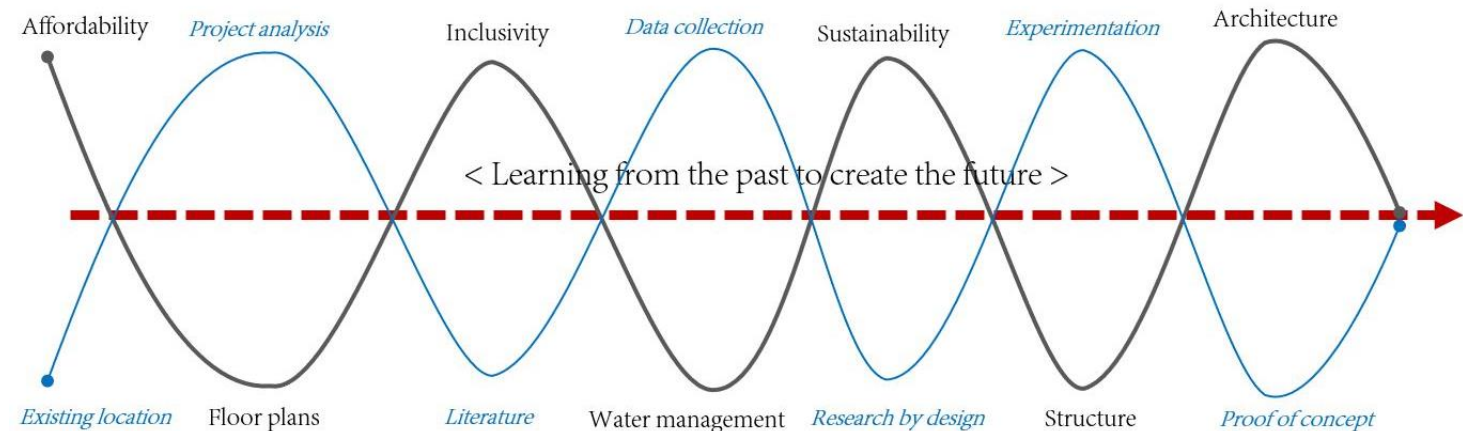
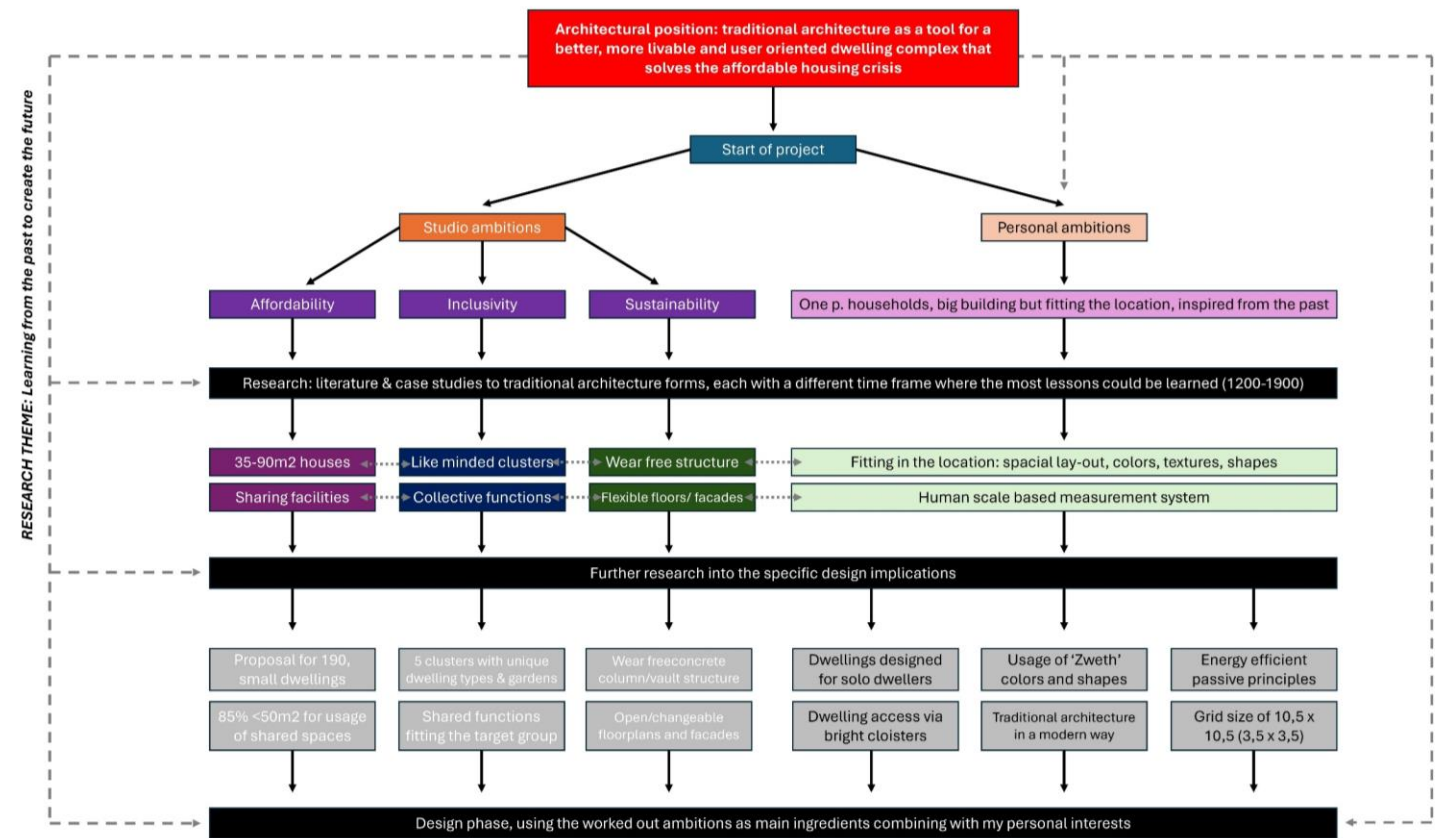
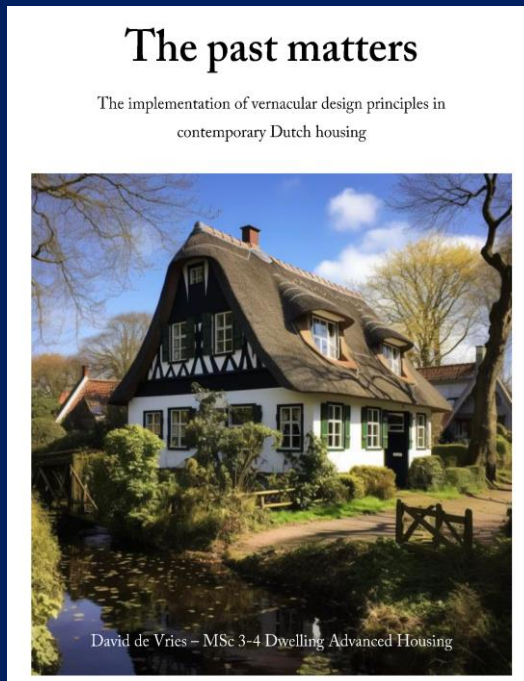
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- Chosen location after 6 weeks research, De Zweth, one of these villages
- Main reason: accessibility and the biking/bus connection to Delft-Rotterdam
- Close to the cities but more affordable ground

Research theme

- Can we take lessons from the past regarding the studio themes and other concepts?
- Connecting the fascination of traditional architecture to a more scientific approach
- Traditional: architecture that is an evolution instead of a revolution
- Not limited to only a certain time period

*Learning from the past
to create the future: a
red line across the
project*



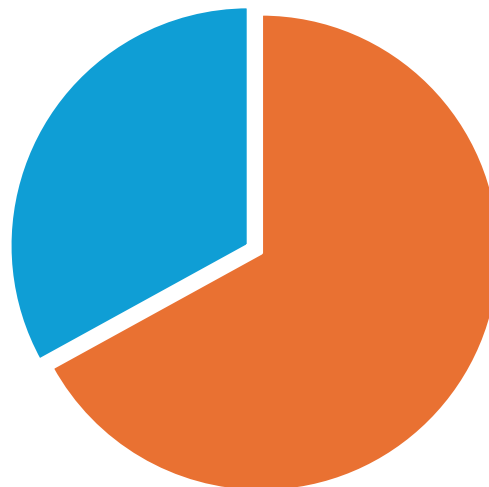
Mismatch in housing supply and demand, for whom is affordable housing the most relevant?

Dutch households

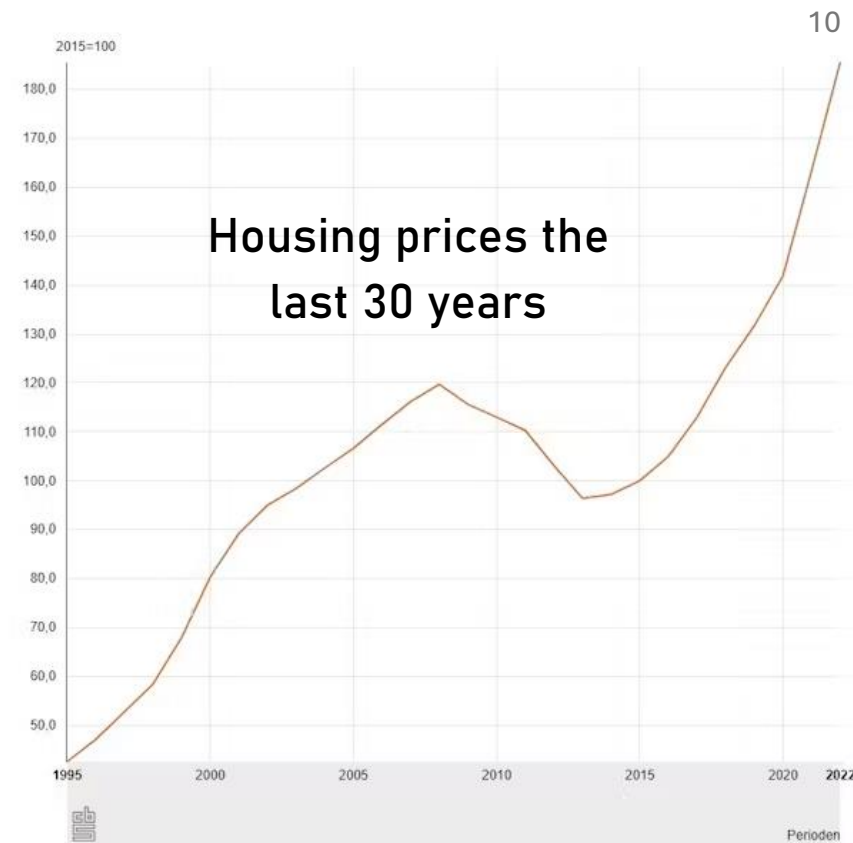


Source: CBS

Housing distribution



Source: CBS



Source: CBS

- Which target group needs affordable houses the most?
- We build houses that are too large for what we actually need
- Building for solo dwellers

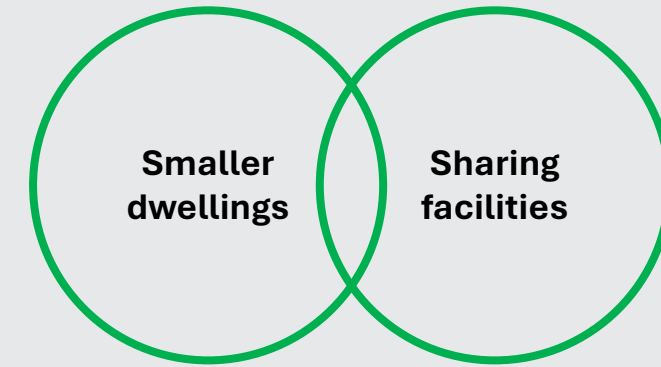
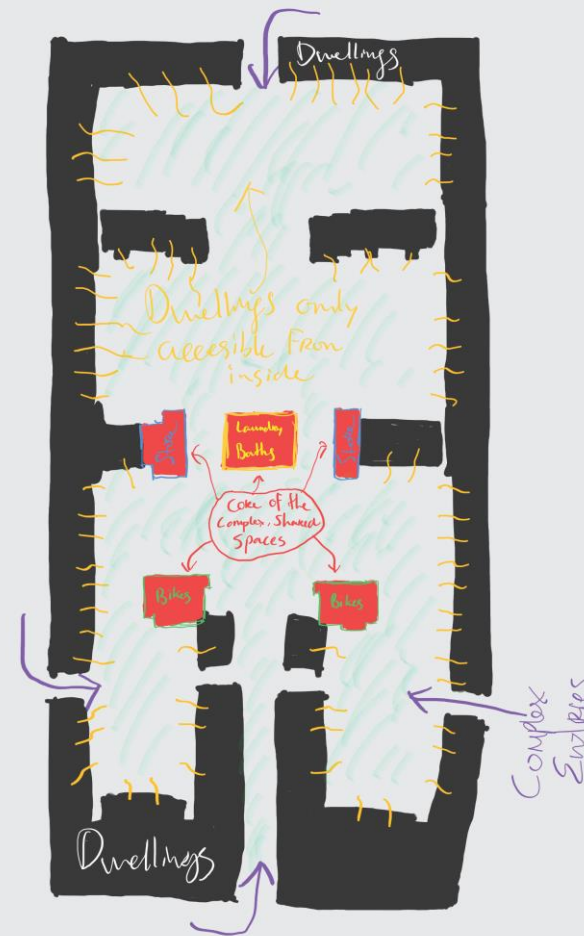


Affordable & inclusive one person households

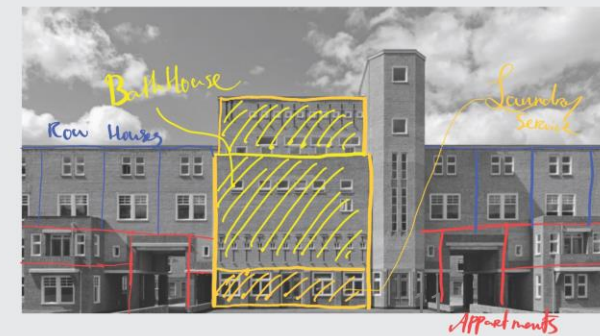
What means affordability?

Defined by two main elements:

- Prices often linked to square meter prices
Smaller dwellings for what solos actually need
- Sharing facilities to make individuals dwellings smaller
Houses below 50m² to make sharing possible

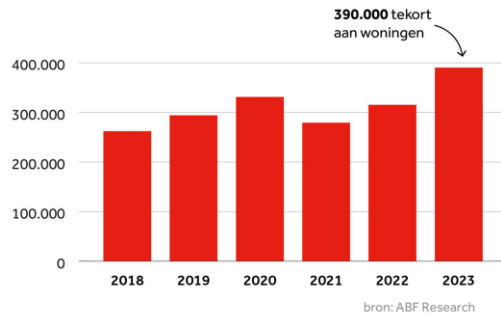


Group research



Woningtekort fors gestegen

Aantal woningen tekort



Concept

- What do we need? Houses, a lot of them, how to do this in Midden-Delfland?
- Conflicting ideas: needing much more houses, but also preserving nature

Bijna 400.000 huizen te weinig

Te weinig nieuwe huizen, te veel mensen: woningtekort loopt op



Door RTL Z
12 juli 2023 07:10 • Aangepast 13 juli 2023 19:04

NOS Nieuws • Woensdag 12 juli 2023, 07:35 •
Aangepast woensdag 12 juli 2023, 08:17

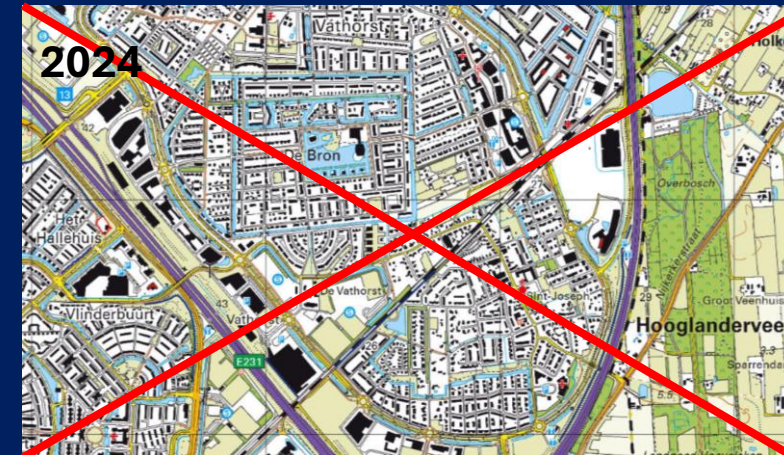
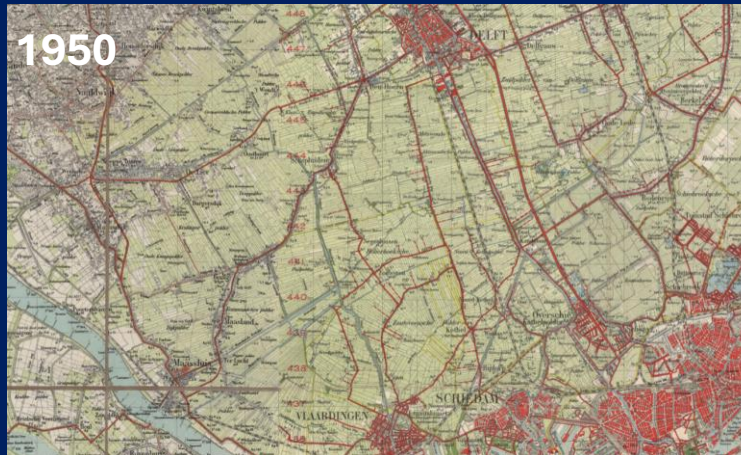
Woningtekort stijgt fors naar 390.000, pas vanaf 2028 minder krapte

NOS Nieuws • Zaterdag 11 november, 06:35

Schreeuwend tekort aan woningen en hoge huizenprijzen: hoe is het zo gekomen?

'Woningtekort wordt komende jaren alleen erger'

10 feb. 2022 in GELD



Preserving nature



By creating one big complex...

...but not by destroying the characteristic landscape

“In the same way that you would not wear the same clothes to a wedding and a funeral, architecture should respond to its context and purpose” - Bjarke Ingels

Architecture in De Zweth - recognisable dwellings



‘Learning from the past to create the future’



-Look into historical precedents on how to fit one big building in an existing, traditional context

-‘Big friendly giant’; a big but gentle addition to De Zweth



Coherent ensemble of castle, church, city and farms – Castle De Haar, Haarzuilens



Similar in: color schemes, material textures, shapes & forms, landscape design. Connected to a forest park, like De Zweth in the new ZUS plan



Gradual entry from outside to inside

Public/ private study

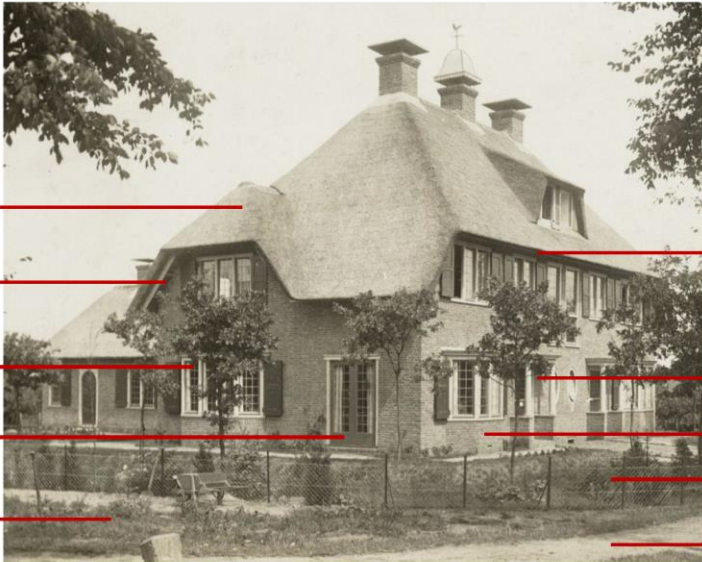
Natural colored/
materialised roof

Large roof
overhangs

Bay window
reaching into
garden

Double doors to
garden

Grass between
path and garden
fence



Natural colored/
materialised roof

Roofed front porch
before entering the
house

Glass bay window

Garden

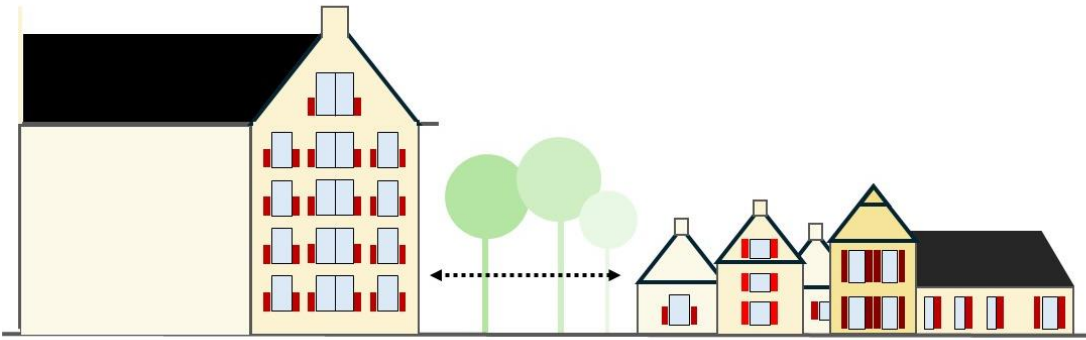
Path surrounded
by greenery

Monastery 'Achelse Kluis', in a similar landscape

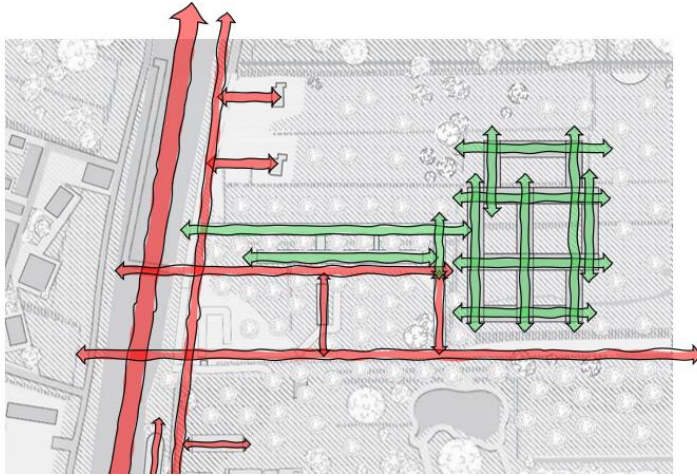


Building follows the borders of the landscape and the tree lines and has a similar color scheme, creating coherence between building and nature

Coherent with the town like a castle

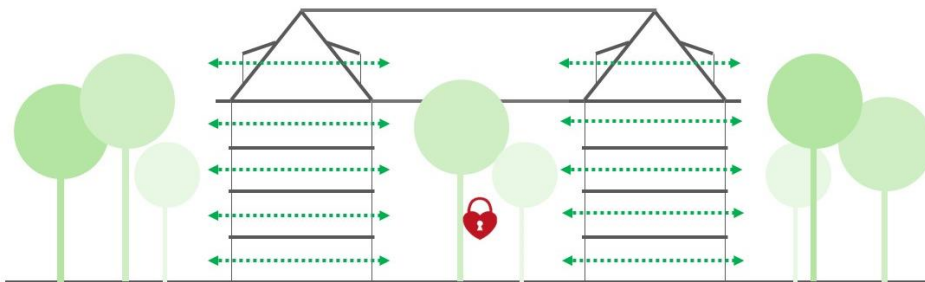


Architecture in coherence with the village



Embedded in the landscape

Connected to nature like a country house



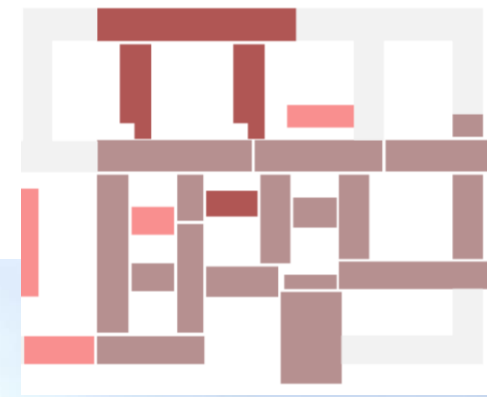
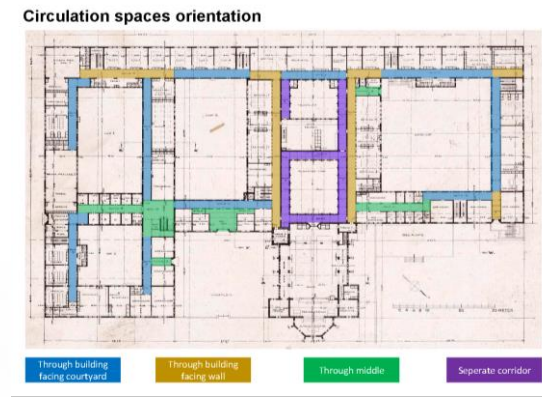
Connection from outside to inside

Floor plans



Living together

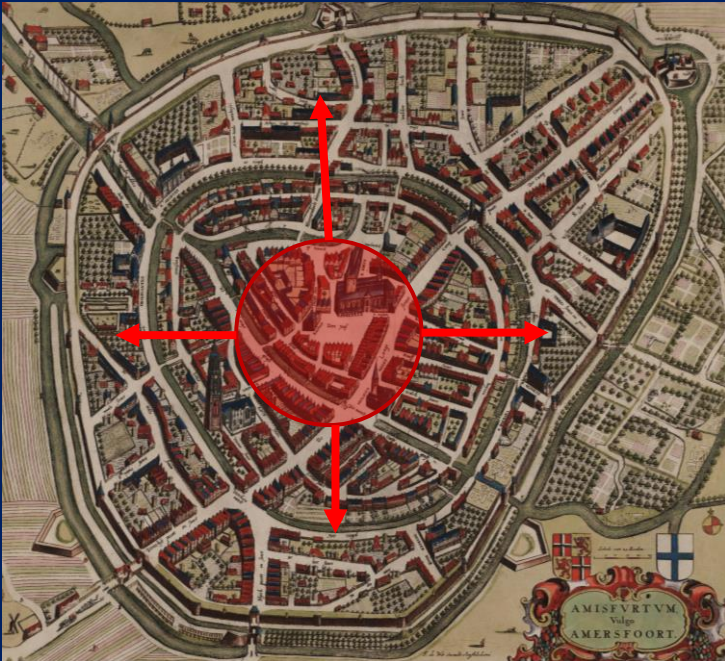
- If we live solo, how is it still inclusive?
- Very broad group: 20-90 years old
- Not a new problem, but centuries old
- Analysis on monasteries and there qualities
- Building like a micro city



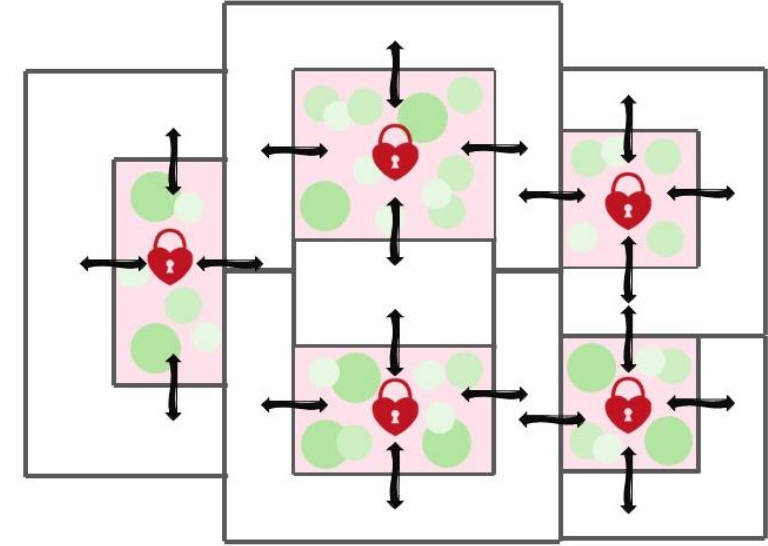
What means living inclusive?

Defined by two main elements:

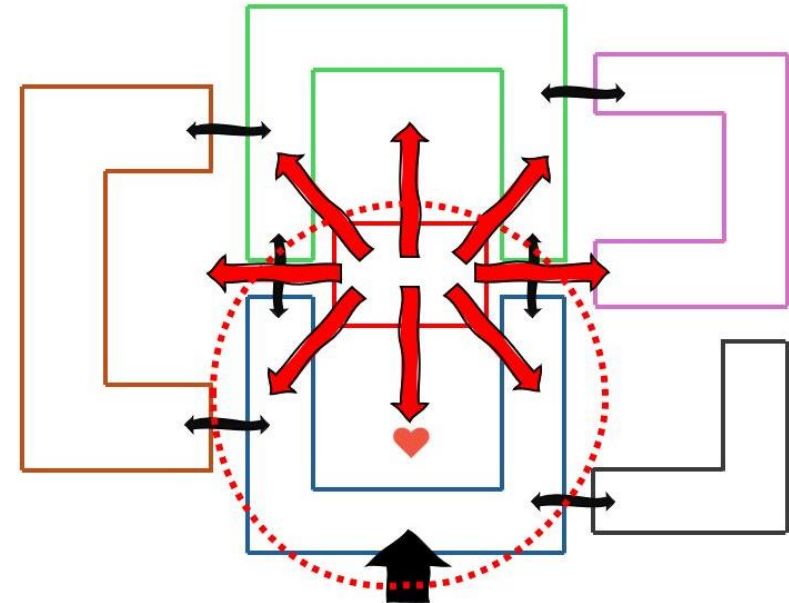
- Public familiarity where people recognise and meet
Creating like minded clusters and not mix every group
- Shared & collective spaces in the building
Looked at a historical town and its main inclusive function



Enclosed courtyard organisation like a monastery



Inclusive micro city with a chapel of a medieval town





Gardens



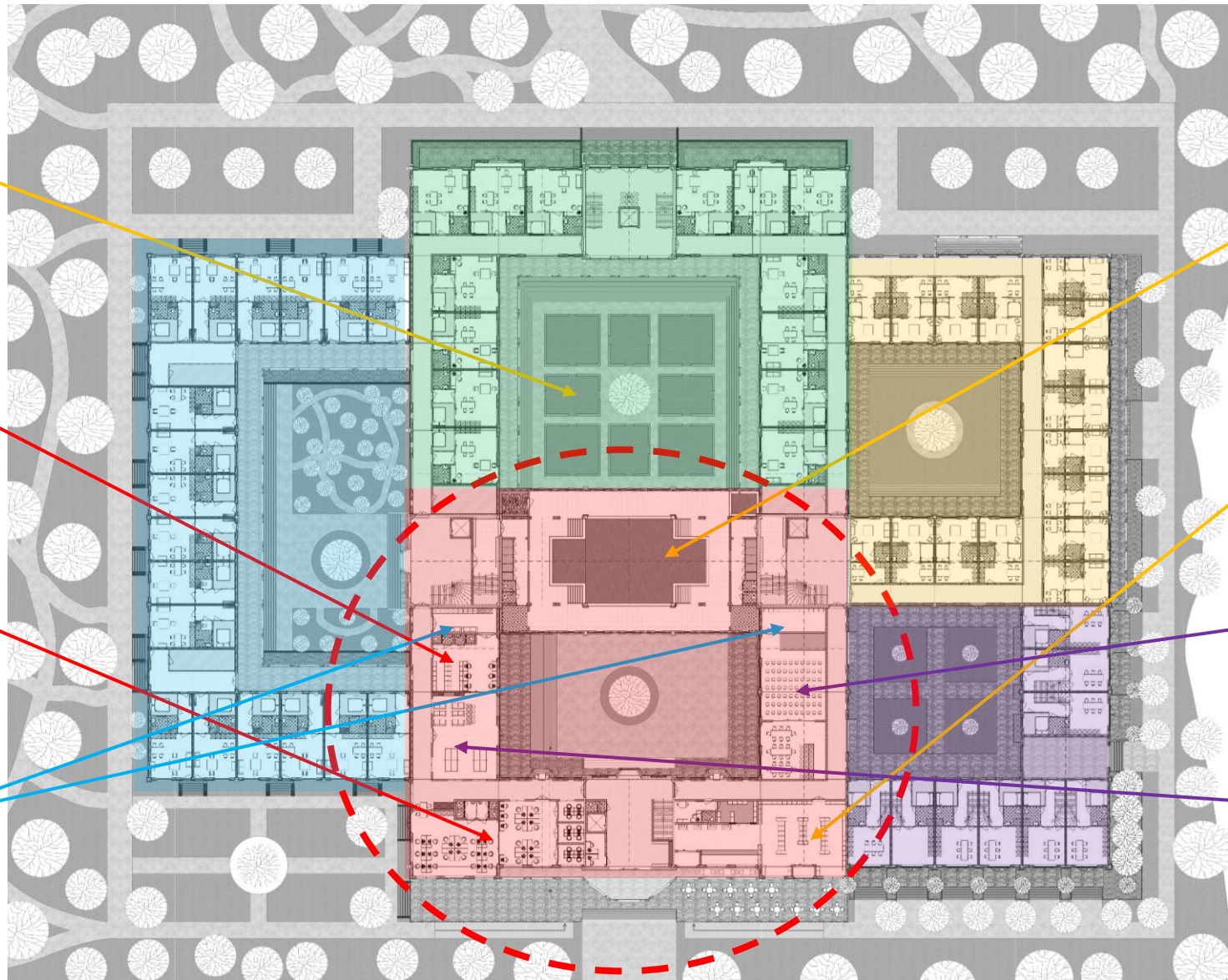
Library



Work space



Laundry bar



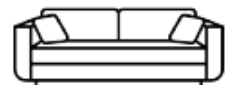
Bath house & gym



Local store & café



Auditorium



Parlor

Ground floor 21

- Each cluster its on courtyard
- Each cluster its own specific dwelling
- Bright cloisters instead of dark corridors
- Dwelling sizes: 85% <50m²
- One main entrance, each cluster as well



First floor

22

- Each cluster its own unique dwelling
- Dwelling sizes: 85% <50m²
- Connection to courtyards: balconies etc.
- Four vertical stair towers



Shared spaces



Shared work space

- Environment suitable for remote working
- No need for extra rooms in houses
- Meeting point for like minded people
- Three reservable quiet rooms



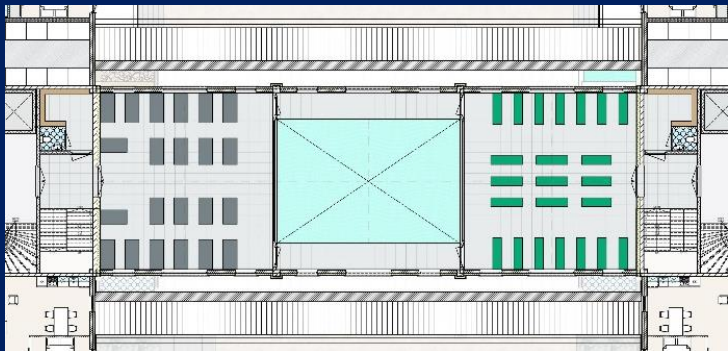
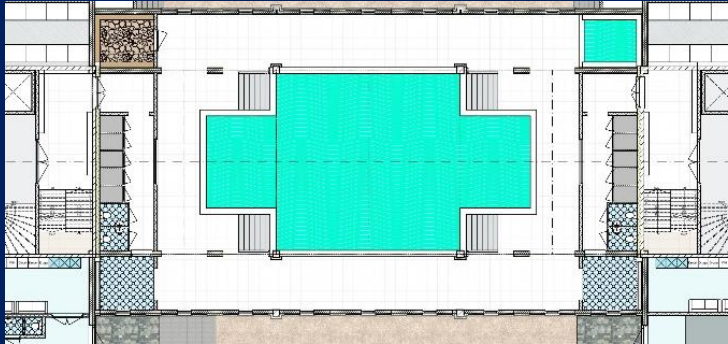
Shared living room

- Living room as a central meeting point
- Shared complex library: public familiarity
- Connected to shared laundry room



The chapel

- Shared bath house & gymnasium
- Unique function adding a lot of quality
- Also breathing new life to the Zweth
- Used in the past both for an inclusive, healthy and affordability function



Dwelling types

- Dwellings aimed at solos
- 3 sizes, 6 types
- 85% below 50m² to share functions
- Sliding doors for flexibility
- User oriented for different sub-groups



Alcove studio 35m²
48 dwellings



Small apartment 48m²
42 dwellings



Attic apartment 48m²
36 dwellings



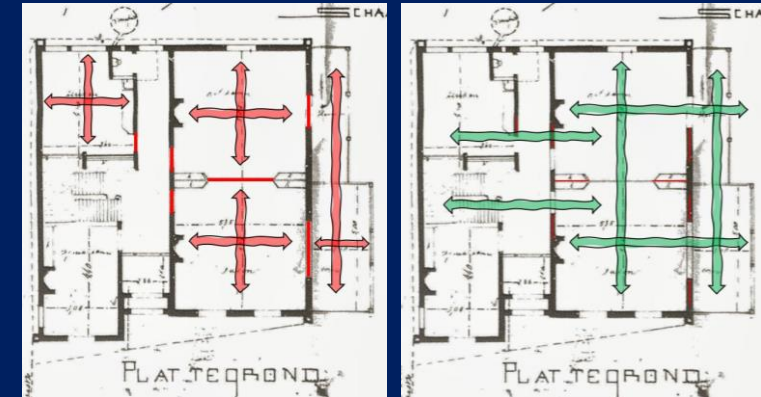
Two bedroom apartment 48m²
36 dwellings



Two bedroom apartment 80m²
16 dwellings



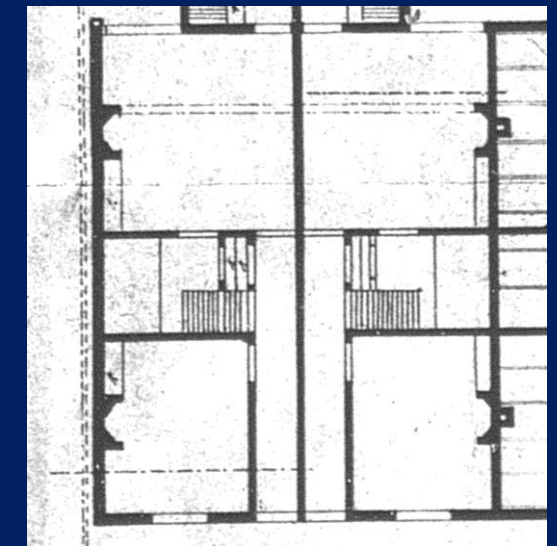
Two story dwelling 90m²
9 dwellings



Traditional flexibility idea

Studio 35m2

- Refreshing interpretation on the standard contemporary studios and traditional alcove dwellings
- Analysis of the dark places in a house
- Two bright rooms and a dark alcove

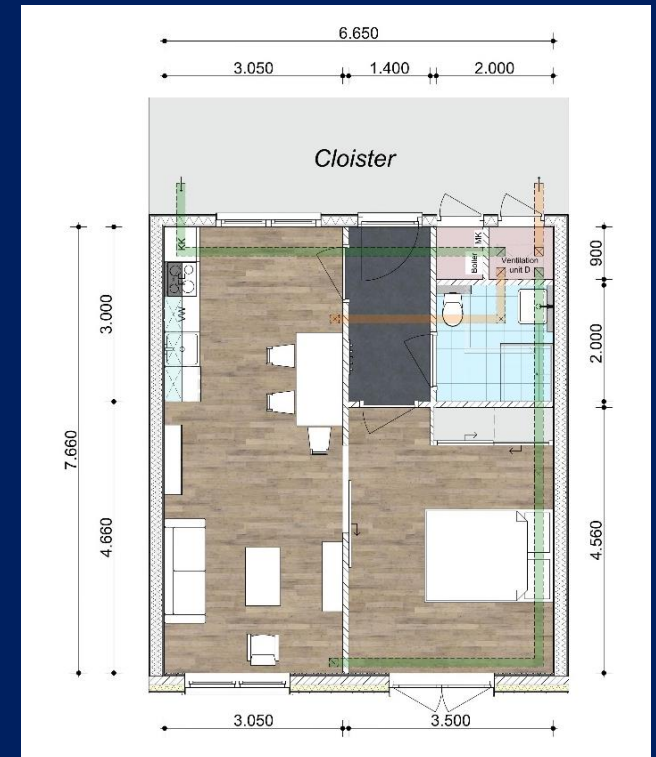


Traditional alcove dwelling



Apartment 48m2

- Multifunctional sliding doors
- Users able to choose how they want to live and how they want to use the space
- Saved space on corridor and bathroom





187

New dwellings



85%

Affordable, <50m2 houses



8

Shared functions



6

Unique dwelling types



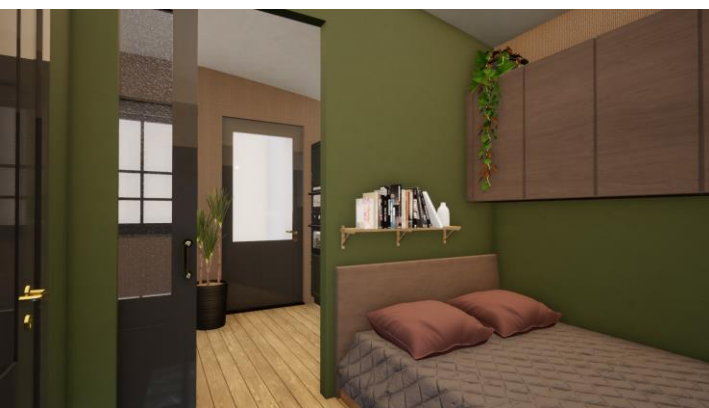
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Like minded clusters



1

Unique bath house



35m2 alcove studio



48m2 two room attic apartment



80m2 three room apartment



48m2 two room apartment



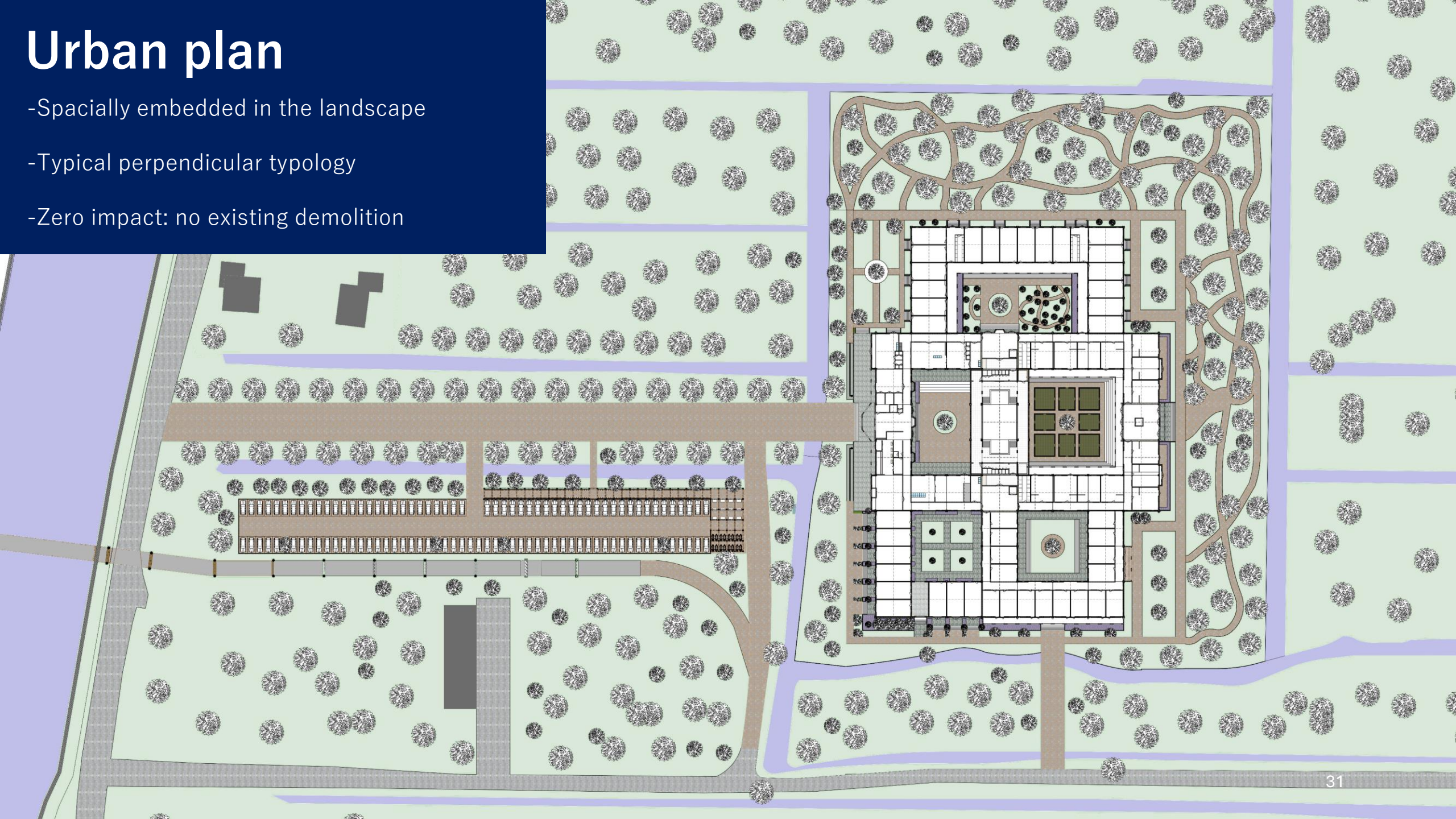
48m2 three room apartment



90m2 two story house

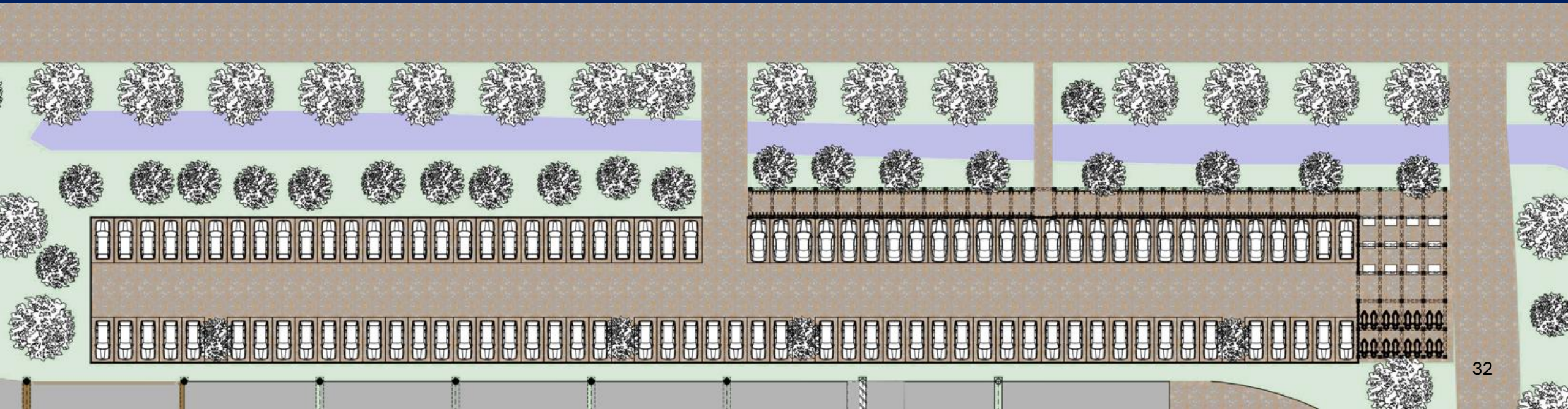
Urban plan

- Spatially embedded in the landscape
- Typical perpendicular typology
- Zero impact: no existing demolition



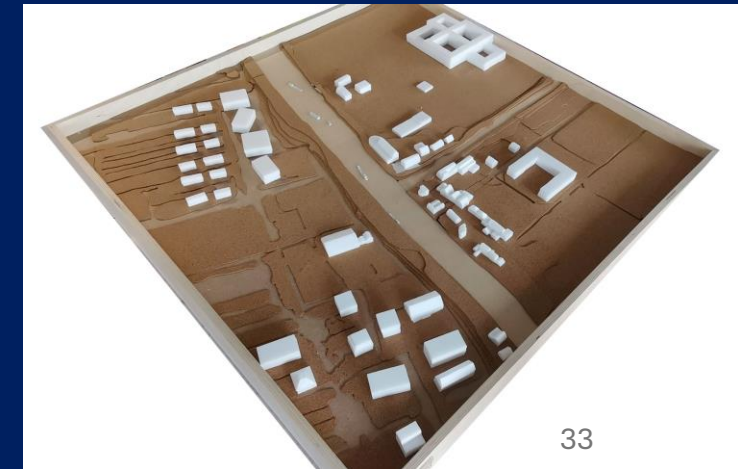
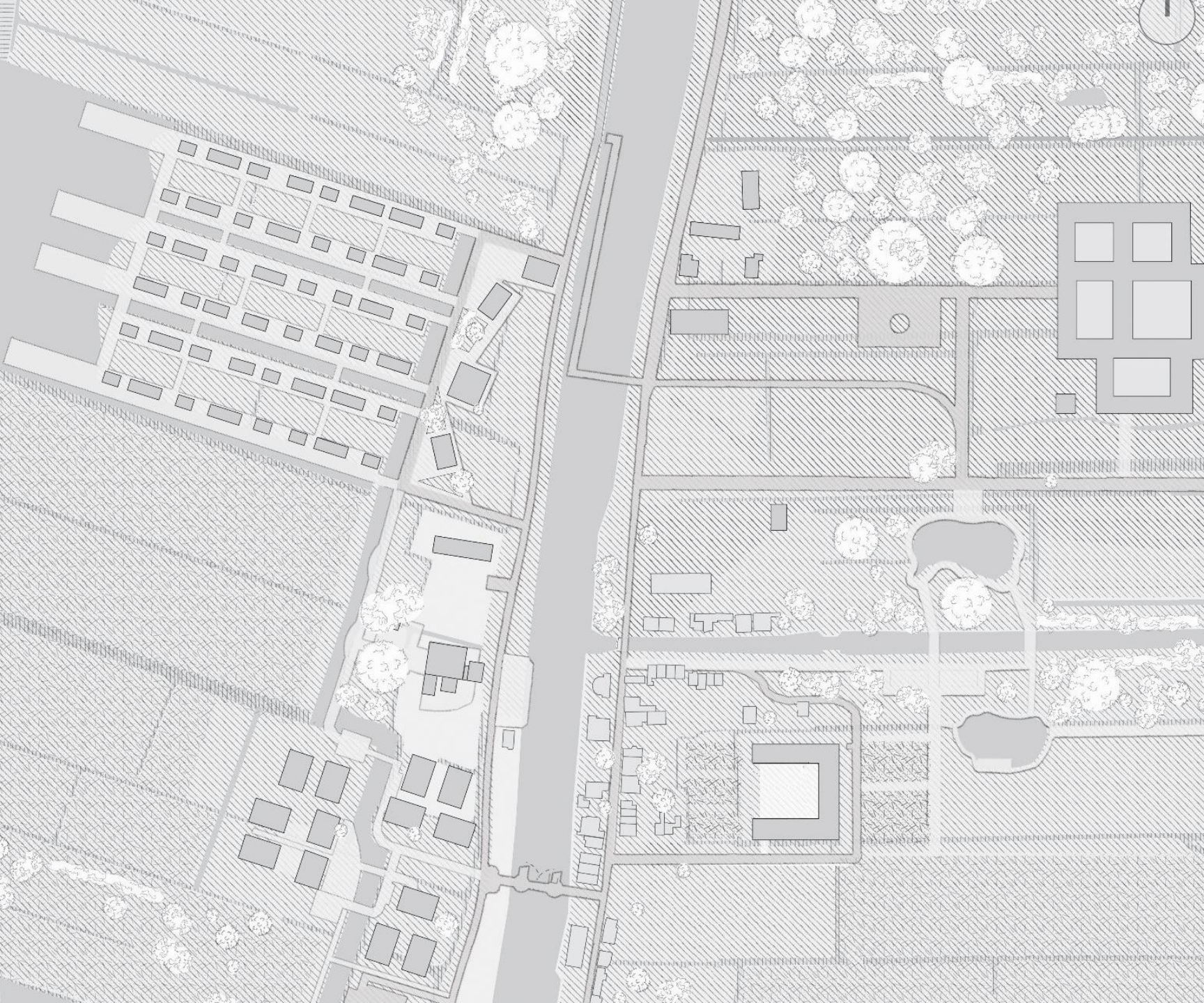
Mobility hub

- Mobility is not a permanent function, changes drastically over time, more shared mobility in the future
- Not a function for inside, but a reversible, low impact addition for now
- Car park with 90 spots, calculated with 25 shared cars and 16 shared e-mopeds according to the parking norm
- Part of the gardens, embedded & reversible



Group plan

- Four students, four prototype affordability strategies
- My role in the plan: add around 200 houses but in a coherent way with the village







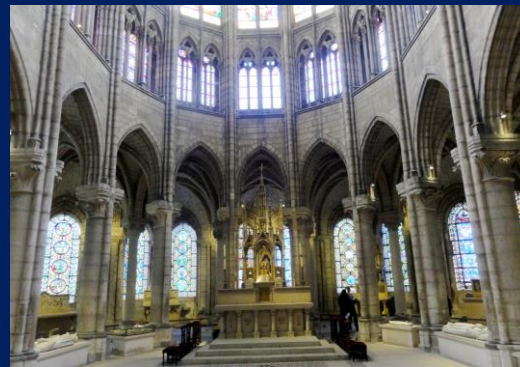
Structure

What means sustainability?

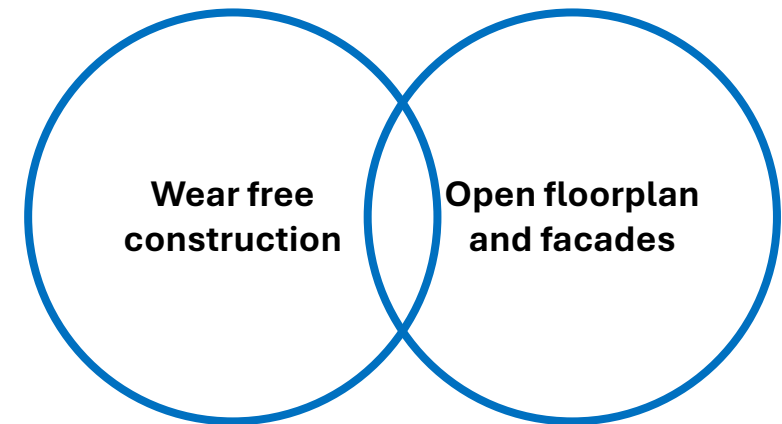
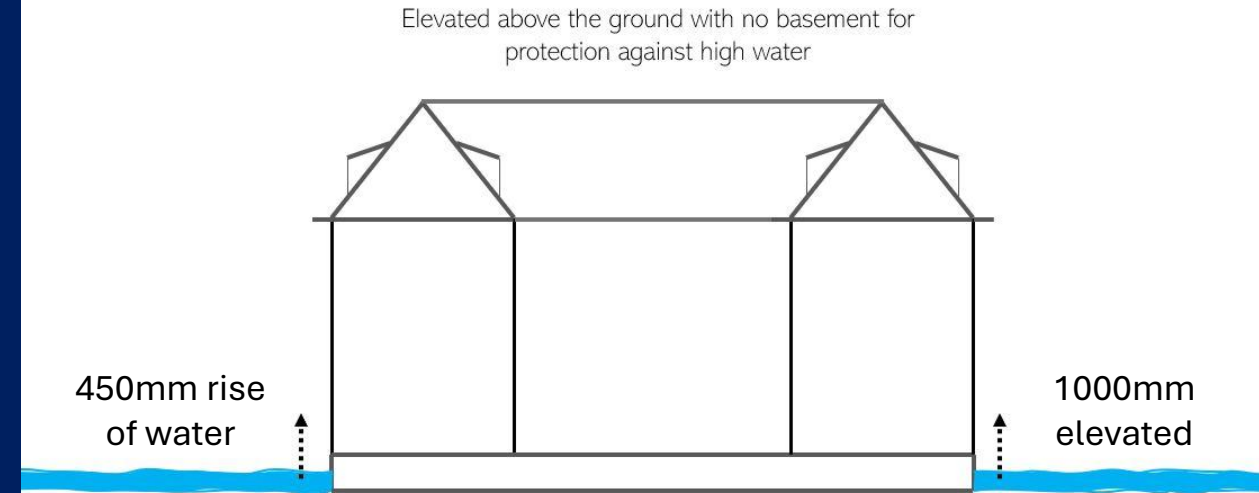
-Two strategies to lower the environmental impact of buildings:
low CO2 impact materials or long lasting structures

-My strategy based on conducted research: long lasting structure, why are buildings demolished? Bad constructions, non-flexible floor plans, wearing out of materials

-Design implications: applying shearing layers, durable & wear free structure, open floorplan for future changes, no basement since the area can flood with 450mm

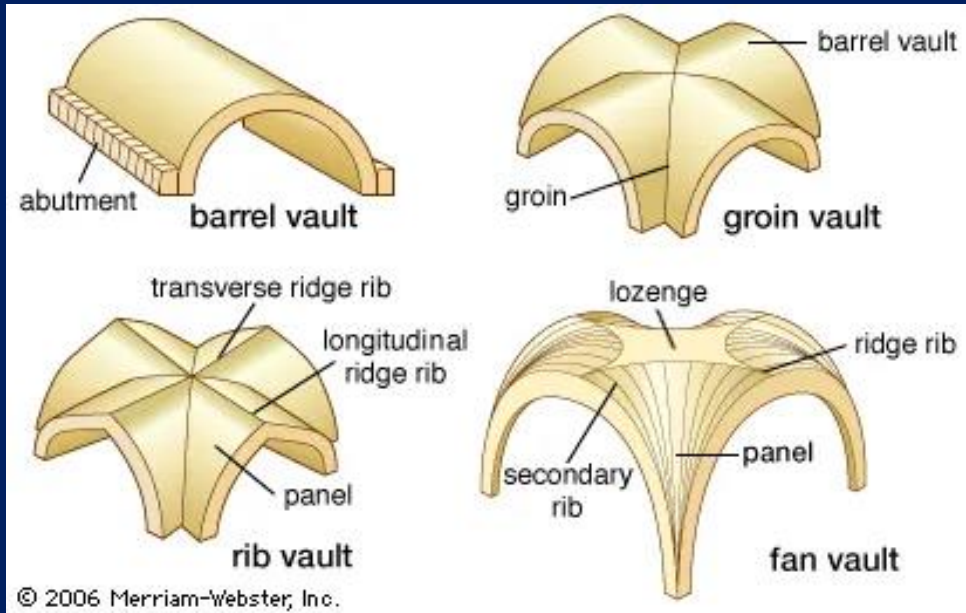


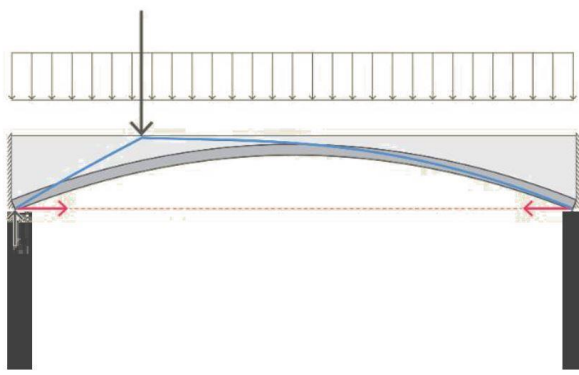
Can we still build in the new wet environment? Yes!



An eternal construction

- Learning from the past: using stone-like materials using their natural pressure based properties
- Gothic vaults main inspiration for the construction: saving weight and material usage to a minimum to have less impact



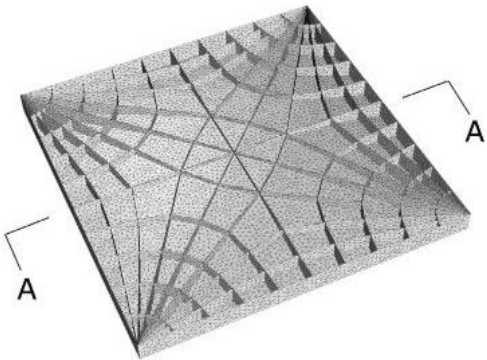


Pressure based, lightweight design

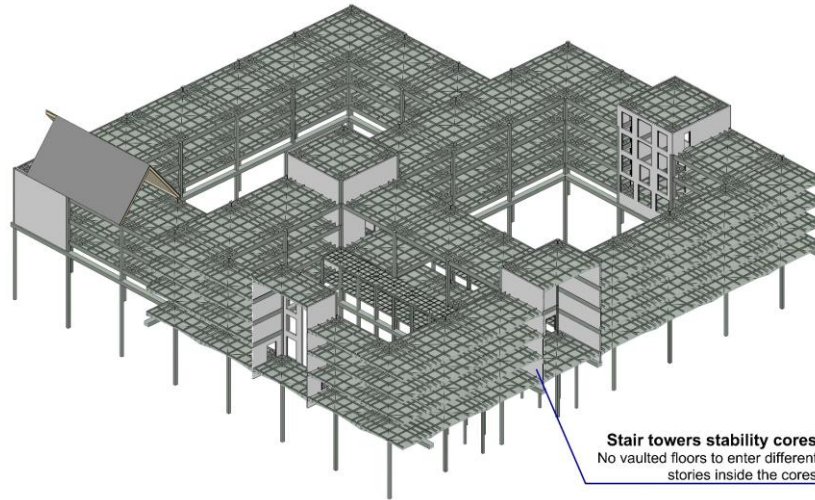
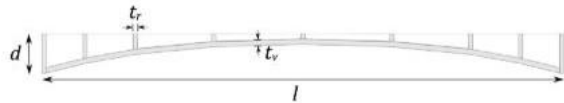
Unreinforced concrete

-Pressure instead of tensile based to save materials and create a mono material structure

-Creating open floor plans and open facades for easily applicable function changes



(a) Discretised mesh model with $l = 5$ m and $l/d = 15$.



-70%

Concrete

-80%

Steel

-65%

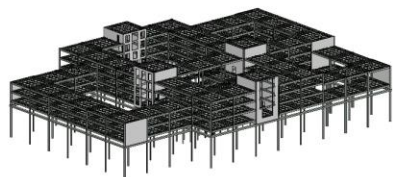
Weight

-80%

Embodied Carbon



A light, but permanent structure



Vaulted unreinforced concrete floor

Span = 10,5m

L/D ratio: 15, thickness $10,5 / 15 = 700\text{mm}$

3,5 meter

3,5 meter

10,5
meter

Stability disc

Sand lime stone CALDURAN

180mm Ø, to be specified by constructor

Concrete column

Column height = 4m

$4 / 12 \geq 333\text{mm } \varnothing$

Foundation

Concrete pillar foundation

Ø to be determined by constructor

Stability core

Sand lime stone CALDURAN

180mm Ø, to be specified by constructor

Double height for 2 story dwellings

Column height = 7,5m

$7 / 12 \geq 625\text{mm } \varnothing$ concrete columns

10,5
meter

Vaulted unreinforced concrete floor

Span = 10,5m

L/D ratio: 15, thickness $10,5 / 15 = 700\text{mm}$

Foundation beams

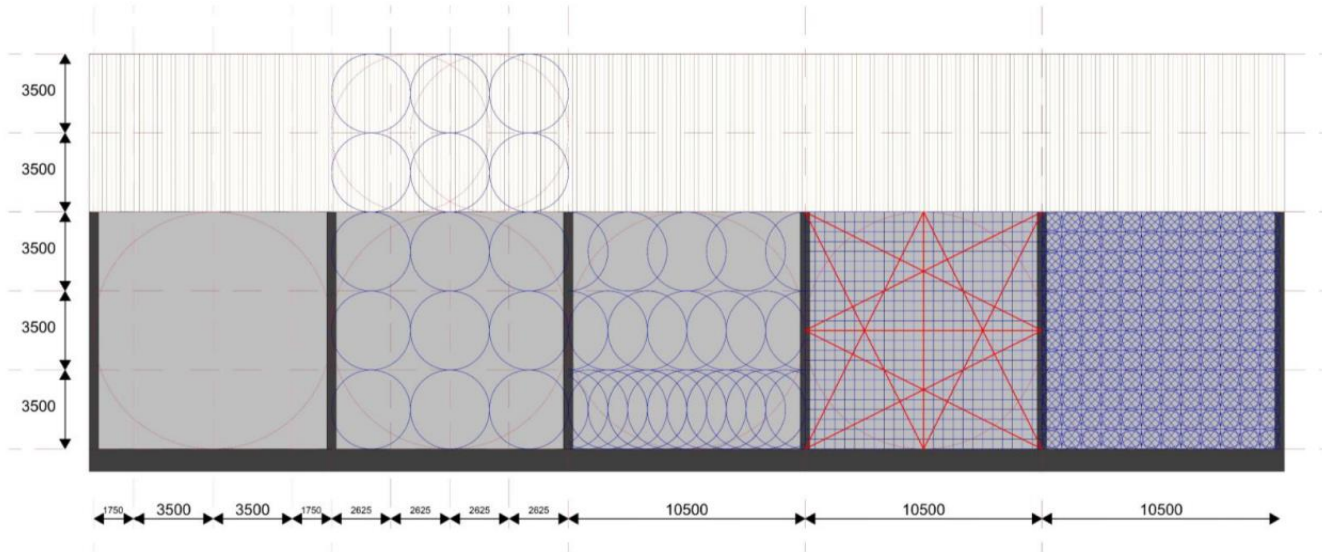
Span = 10,5m, 800mm below ground level

Ø to be determined by constructor

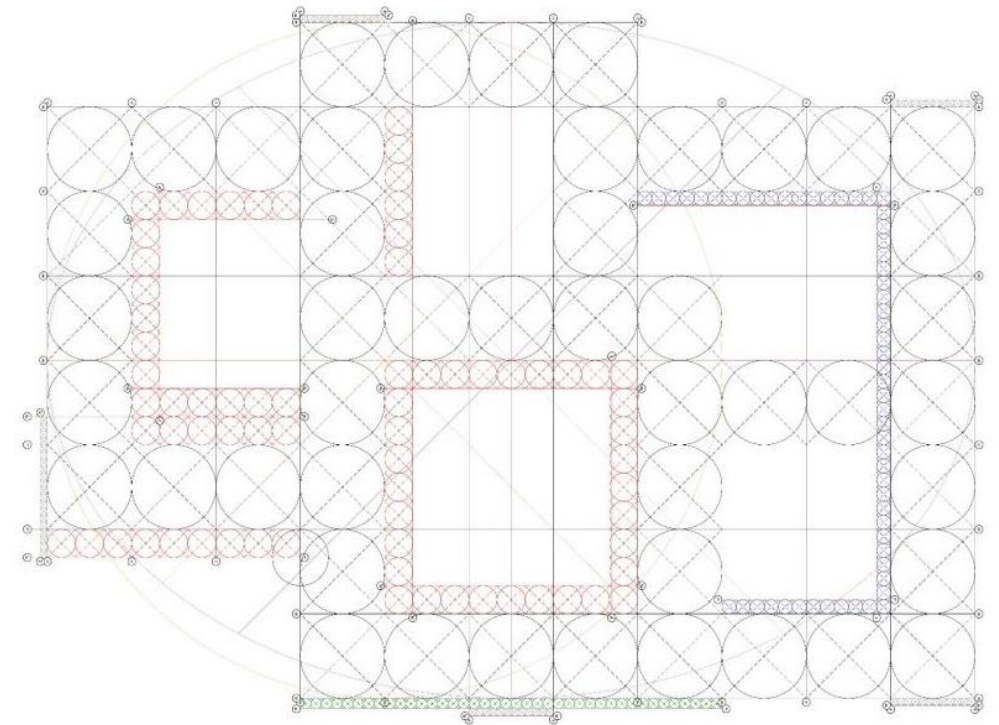
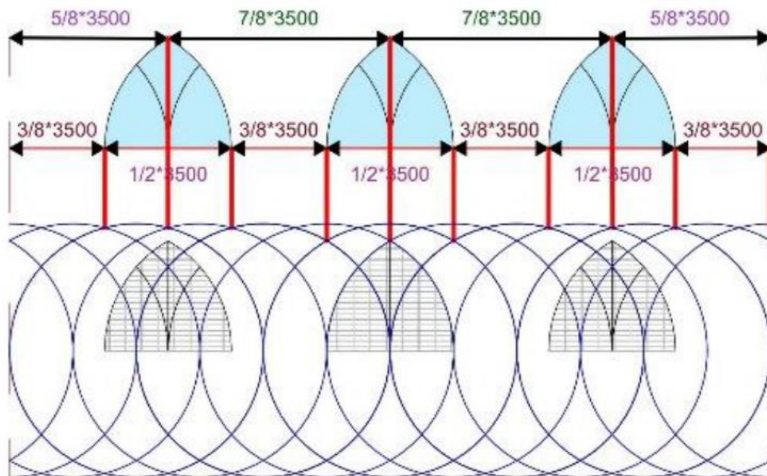
10,5
meter

Grid size based on the human scale

-Base grid size: 10,5 * 10,5, fitting 3 floors of each 3,5 meters high according to the ideal ceiling height as researched



Mathematical system behind the repetitive circles



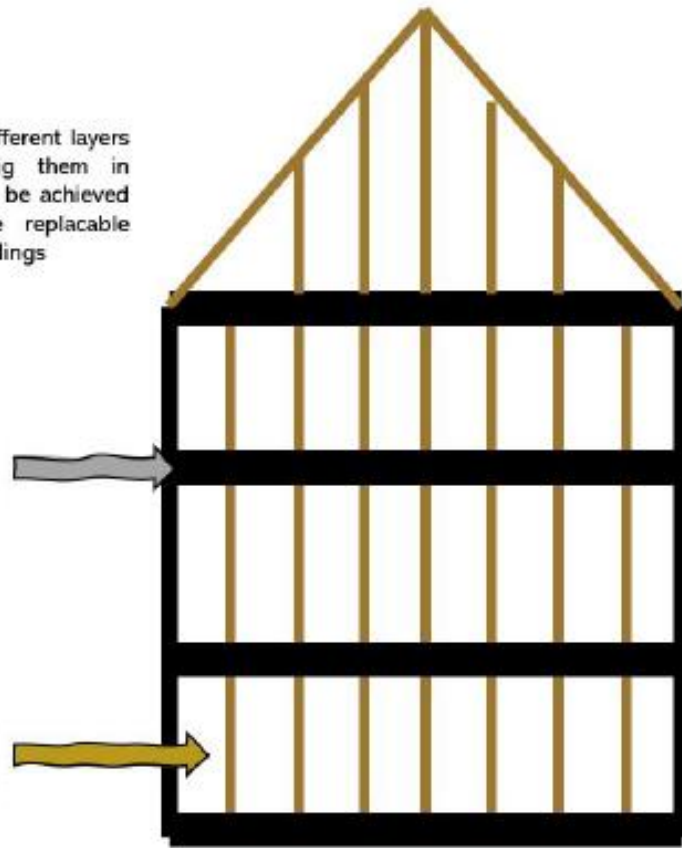
Facades



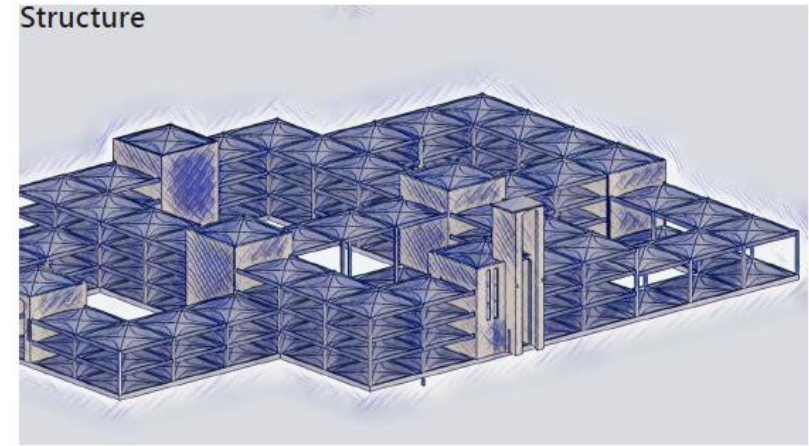
Ambition: visual expression of the two different layers that make up the façade, separating them in permanent and replaceable. This goal can be achieved by only placing windows within the replaceable wooden frames, and giving different claddings

Solid concrete columns and floors that will stay in place over the lifespan of the building

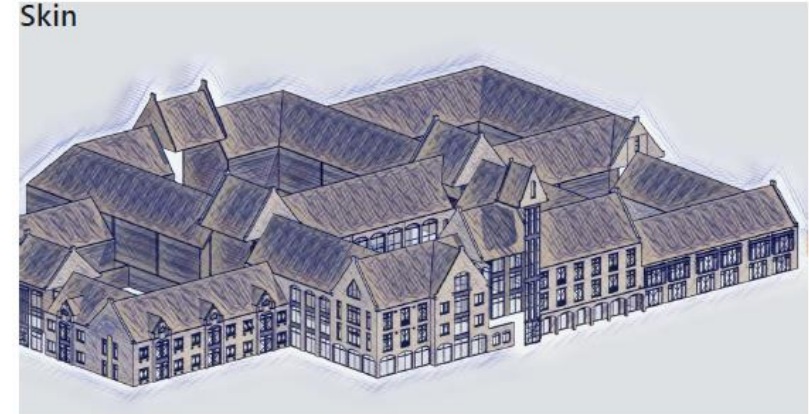
Wooden panels in between the concrete construction which are easily replaceable in the future as taste or requirements change



Structure



Skin



Low impact skin layer

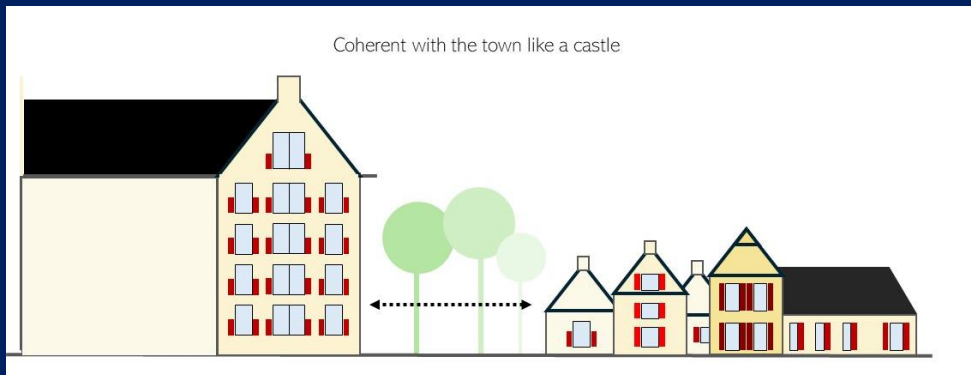
- Main structure separate from the walls, which are non load bearing and replaceable enabling them to be of a low impact wood structure

- Structural layer very free in its usage, liberated from load bearing walls and flexible for future usage

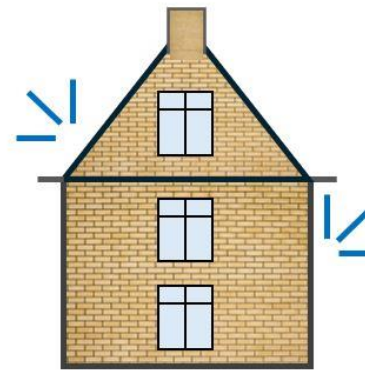
Traditional in a modern way

Key elements:

- Each cluster its own identity
- Local in shapes, colors and textures
- Wear & maintenance free for a long lifespan
- Flexible for small & large changes
- Honest in visual presentation



Architecture in De Zweth - recognisable Dutch dwellings



Recognisable and unique Dutch architecture

Zweth textures

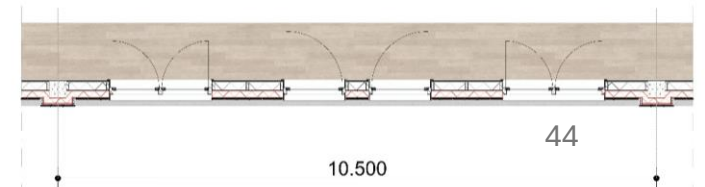


Zweth colors



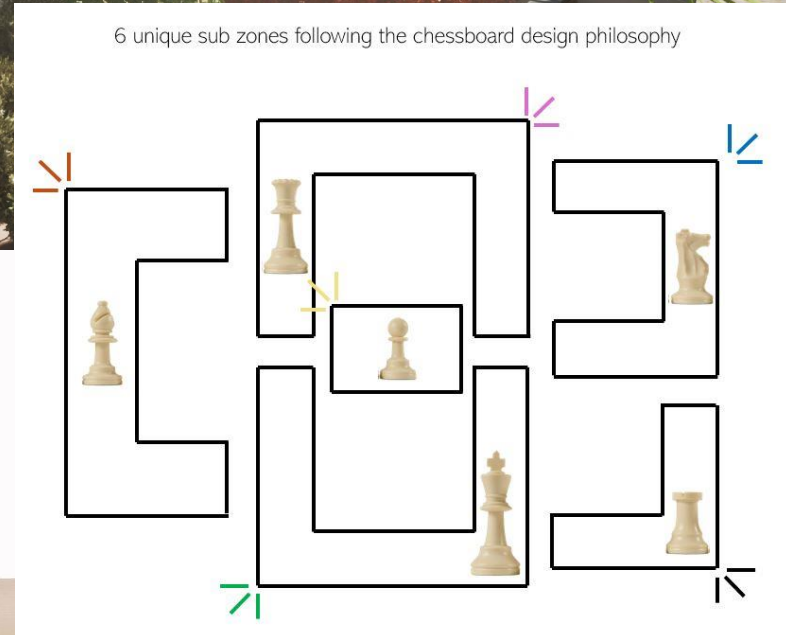
Zweth elements





6 building clusters, 6 identities but part of the same family

45



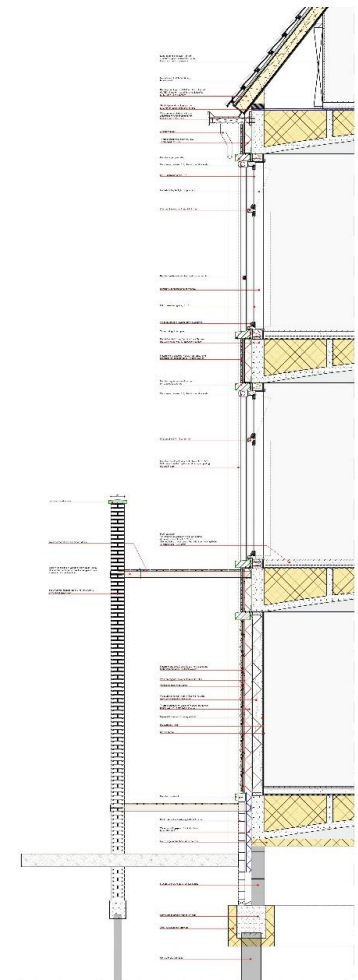
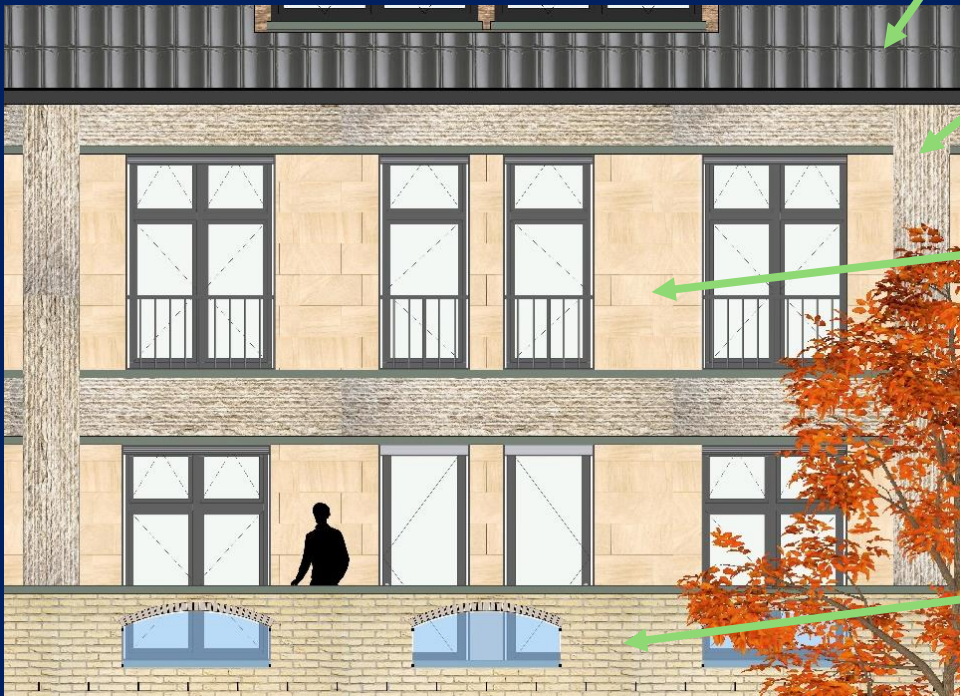
Local in colors and shapes to be coherent with the village



Facade materials

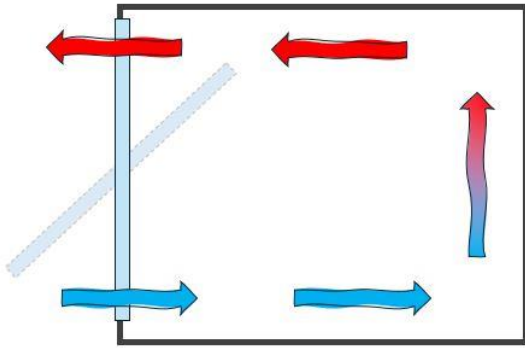
Key elements:

- Visually representing the layers
- Honest usage only, not copying
- Permanent appearance
- Wear free demountable tiles & stones

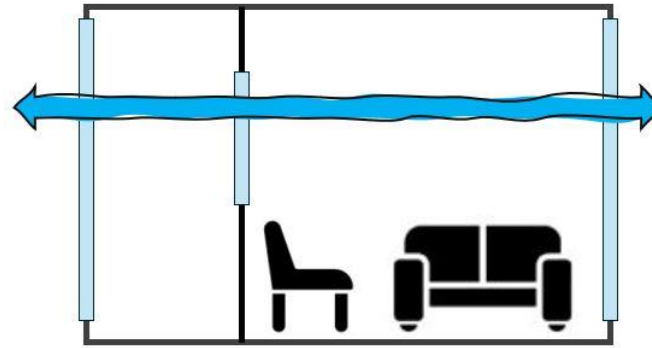


*Demountable system for future changes
in the facade lay out*

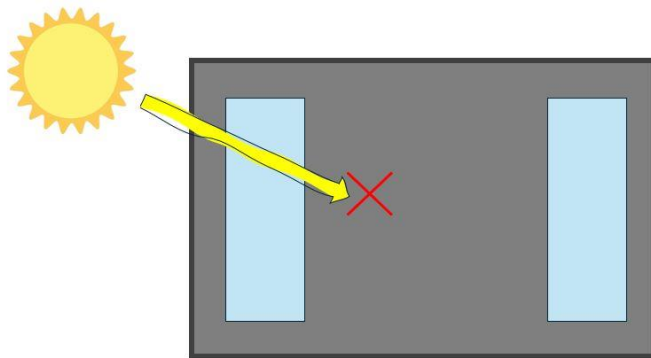
Energy saving



Double openable floor to ceiling windows for passive cooling in summer

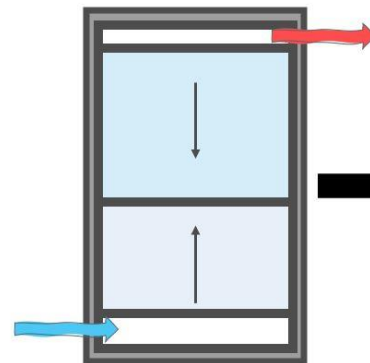


Cross ventilation for passive ventilation in summer

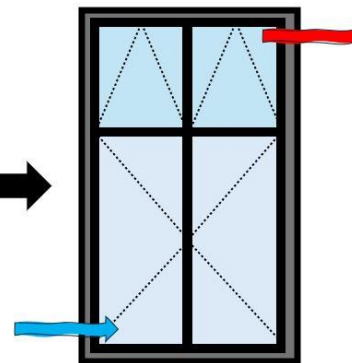


Glass percentage below 60% to prevent overheating in sunny months

Vernacular double sash window



Contemporary interpretation



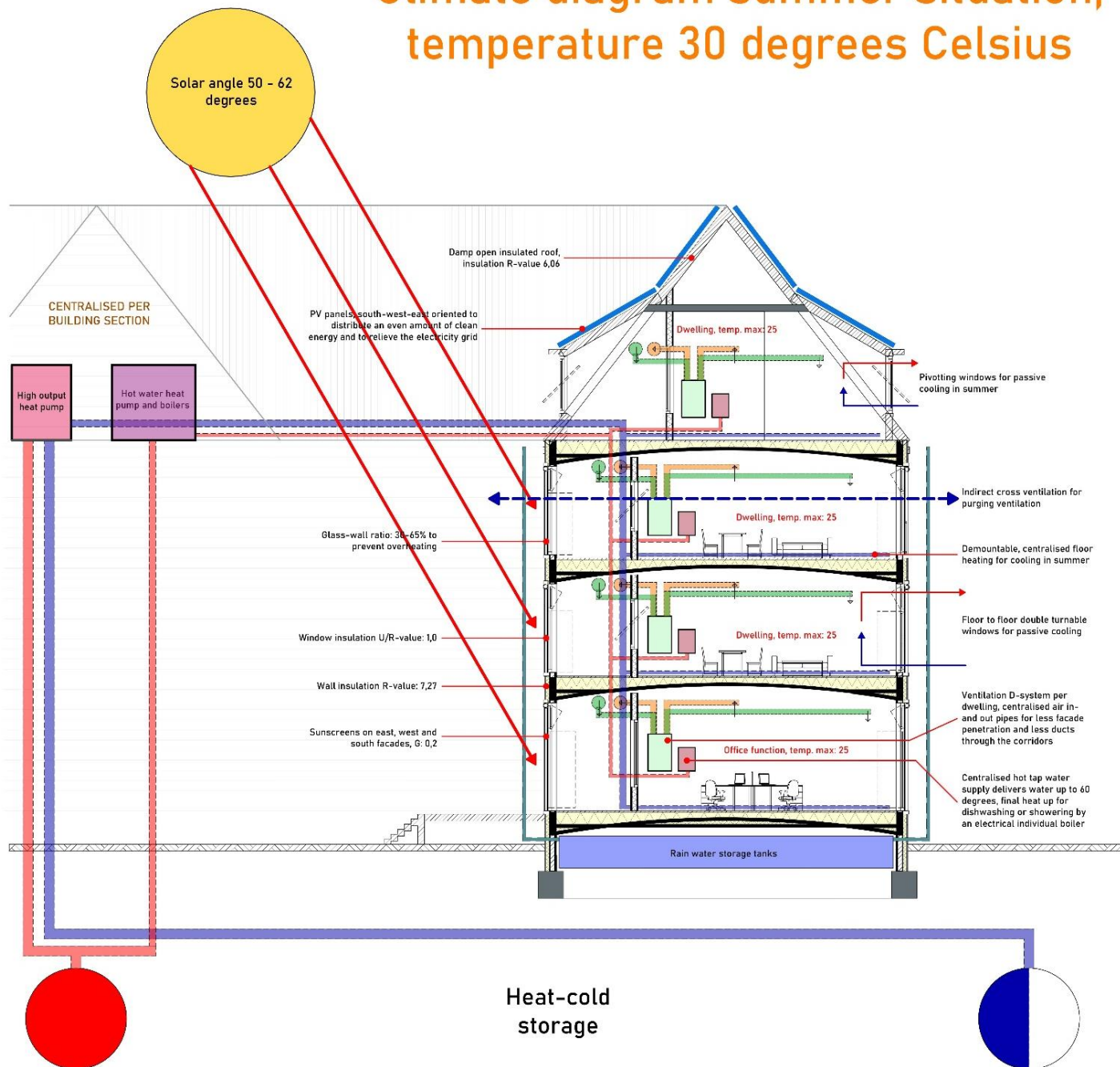
Learning from the past to create the future

- High insulation values with natural and low impact wood fibre insulation
- No glass facades, ideal ratio glass-wall
- Passive cooling and ventilating in summer with double windows



Floor to ceiling double openable windows

Climate diagram summer situation, temperature 30 degrees Celsius



Climate diagram

Highlights:

- Centralised heat/cooling pumps for future developments
- Heat cold storage for affordable and sustainable warming/cooling
- East-South-West solar panels for even green energy distribution instead of only a peak
- Energy efficient heat recovery ventilation units

Cross sections



Courtyard and open cloister



Main entrance & terrace



Main entrance by night



Building in the forest



Allotment courtyard





End of my presentation

Questions?

Forest zone



Now – an unsustainable polder with shrinking ground



Stop pumping the
water out of the peat



Swampy peat soil to
stop the shrinking



A new environment in Midden Delfland

Future – a swampy forest that lets the peat grow back



Plant water resistant
trees



Plant the ground with
peat moss