



ARCHITECTURAL ENGINEERING GRADUATION STUDIO
2022-2023

P5 FINAL PRESENTATION

Faculty of Architecture & the Built Environment
Delft University of Technology

First Tutor: Anne Snijders
Second Tutor: Engbert van der Zaag
Third Tutor: Nico Tillie
Delegate External Examiner: Marjolein van Esch

Anneke Groeninx van Zoelen
4445929
04-07-2023

Exploring Opportunities for Rewilding the Built Environment through Nature-Inclusive Design

Case study Boerhaavewijk, post-war residential neighbourhood in Haarlem, the Netherlands

Introduction to Rewilding

Research: Rewilding Strategies

Case study: Boerhaavewijk

Architectural Design

Conclusion

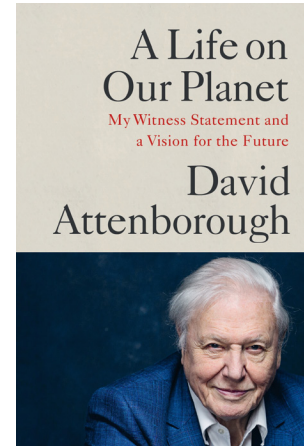


“Over the years, we lost our balance.
We moved from being a part of nature to
being apart from nature.”

(Attenborough & Hughes, 2022)

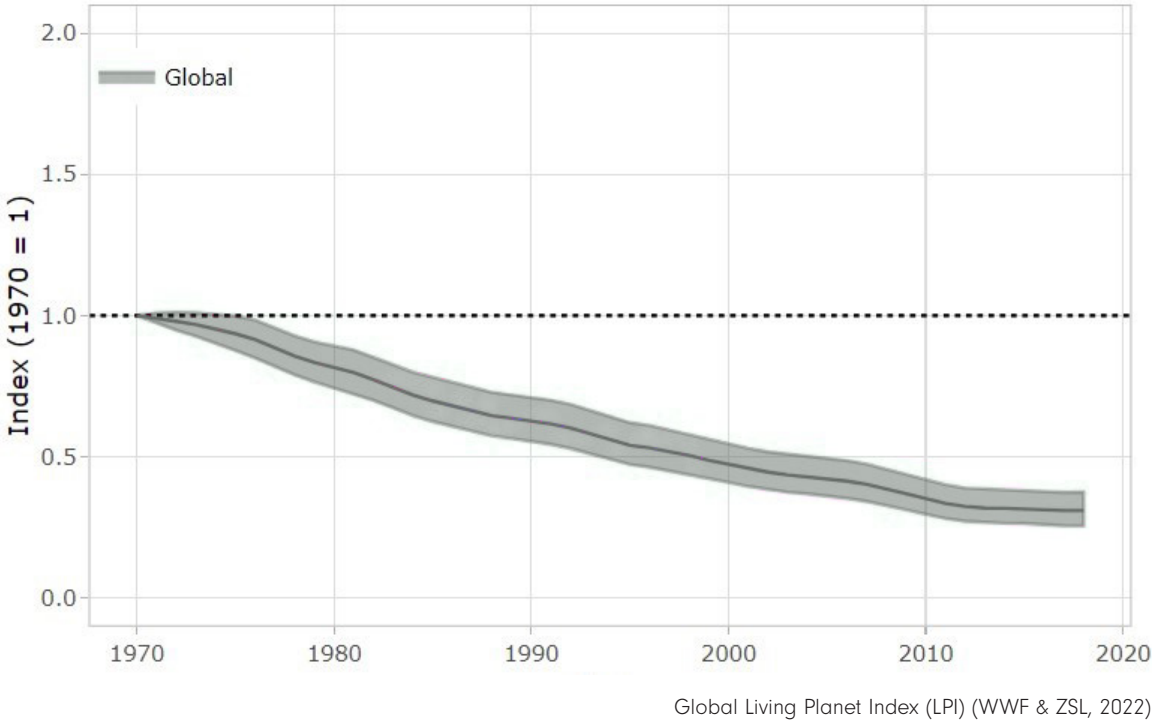
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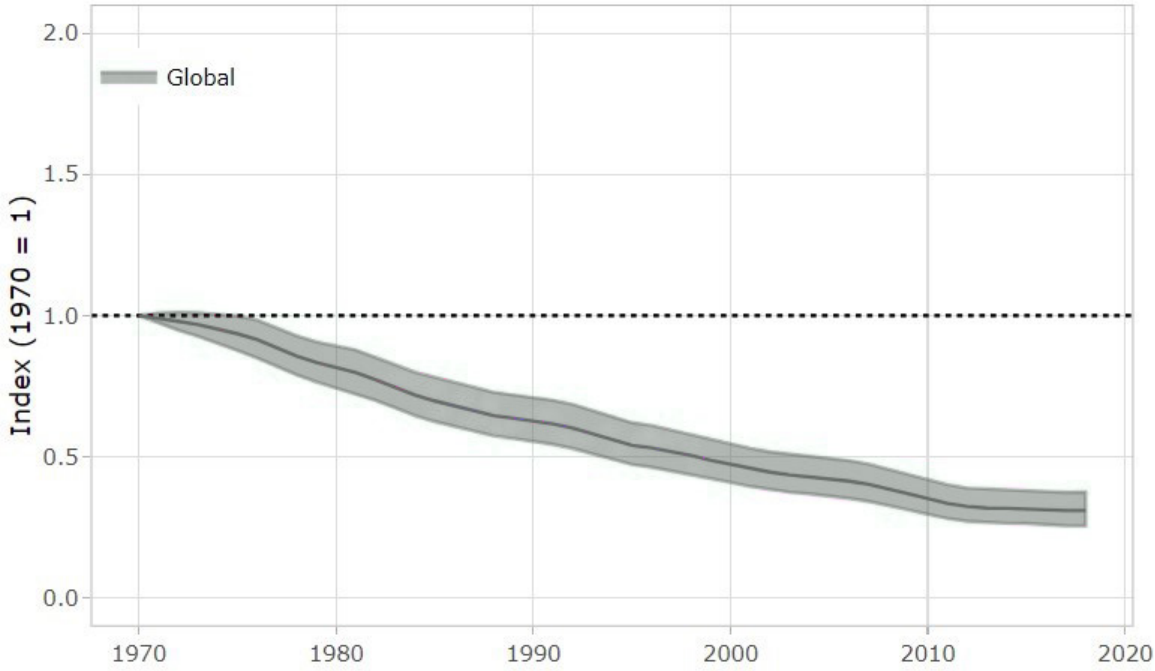
GLOBAL BIODIVERSITY LOSS

INTRODUCTION



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Global Living Planet Index (LPI) (WWF & ZSL, 2022)

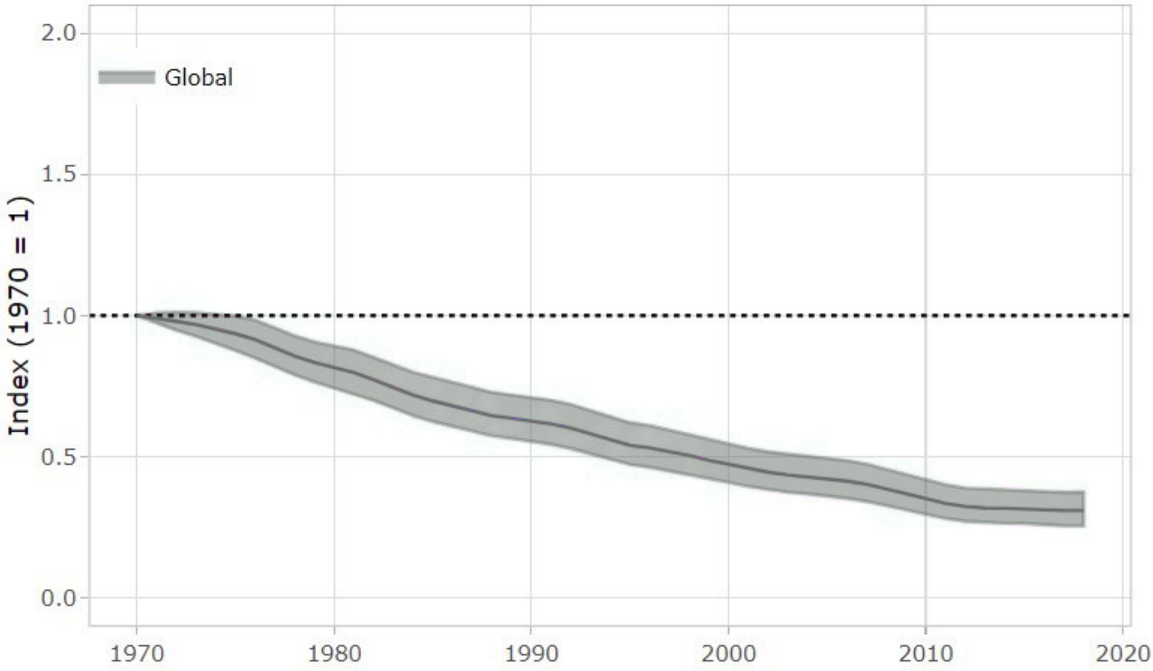


Also in cities



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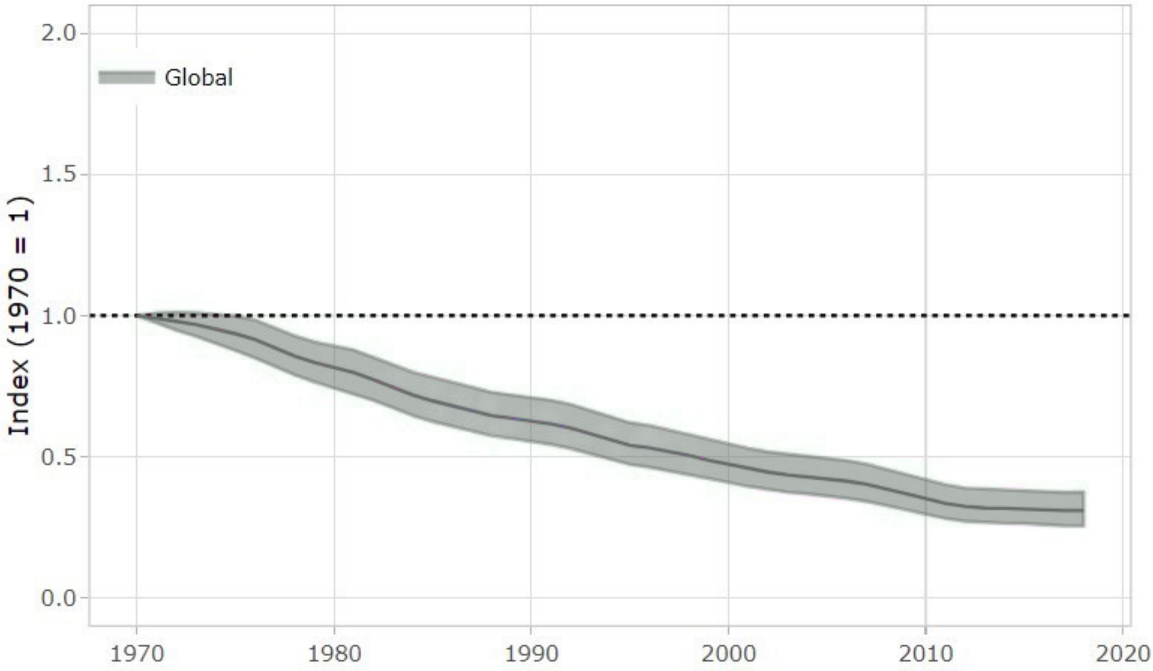


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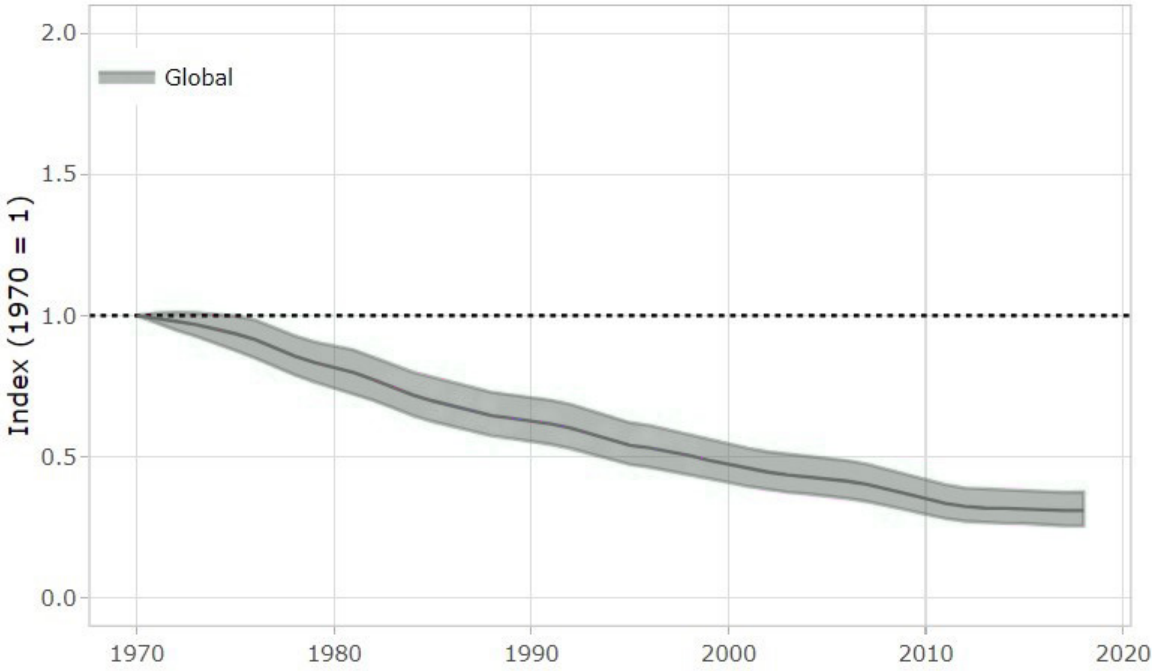


Also in cities



GLOBAL BIODIVERSITY LOSS

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Global Living Planet Index (LPI) (WWF & ZSL, 2022)



Also in cities



RESTORING BIODIVERSITY

More natural
areas



Increasing
biodiversity



RESTORING BIODIVERSITY

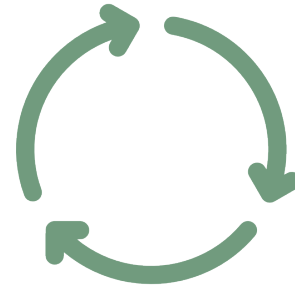
More natural areas



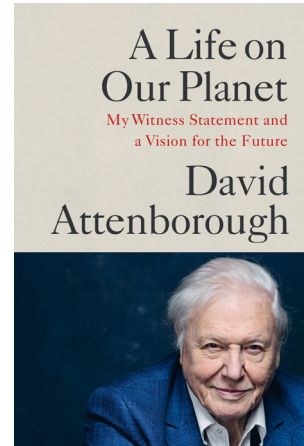
Increasing biodiversity

=

Increasing liveability, circularity, and climate-adaptation



Rewilding




Rewilding

Reintroduction of nature
Allowing it to take the lead
Minimal human intervention

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Reintroduction of nature
Allowing it to take the lead
Minimal human intervention



Ecological rewilding
biophysical nature:
rewilding of water, land
and wildlife

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Ecological rewilding
biophysical nature:
rewilding of water, land
and wildlife

Human rewilding
personal/social/cultural:
urban rewilding

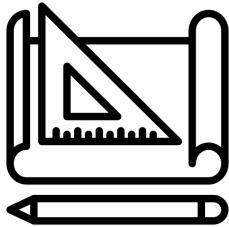
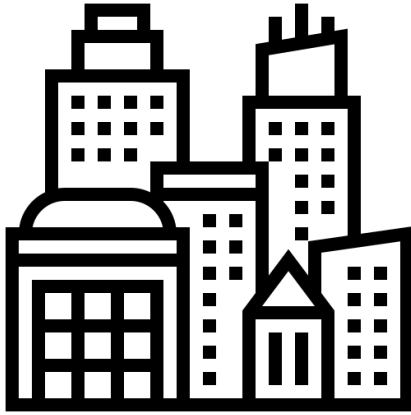
FILLING THE KNOWLEDGE GAP

RESEARCH



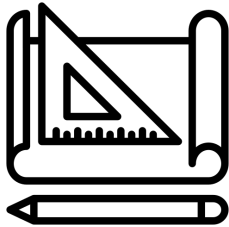
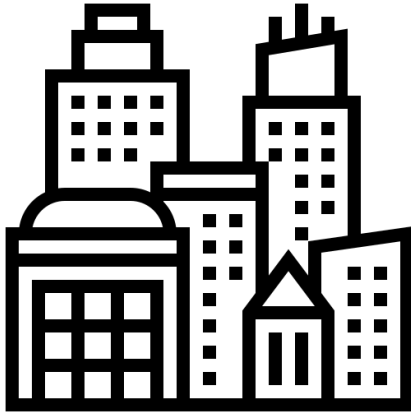
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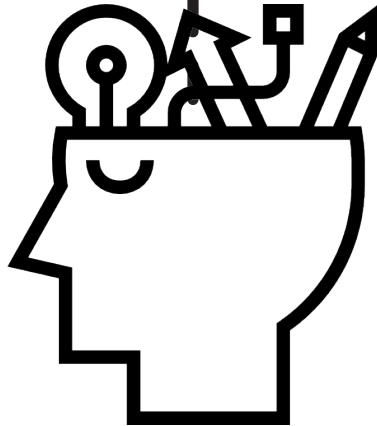
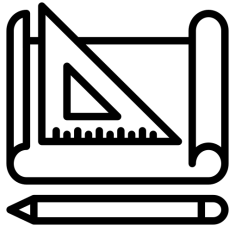
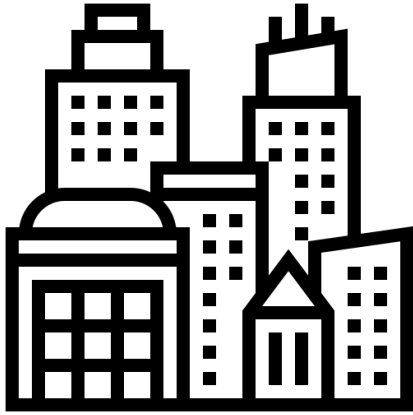
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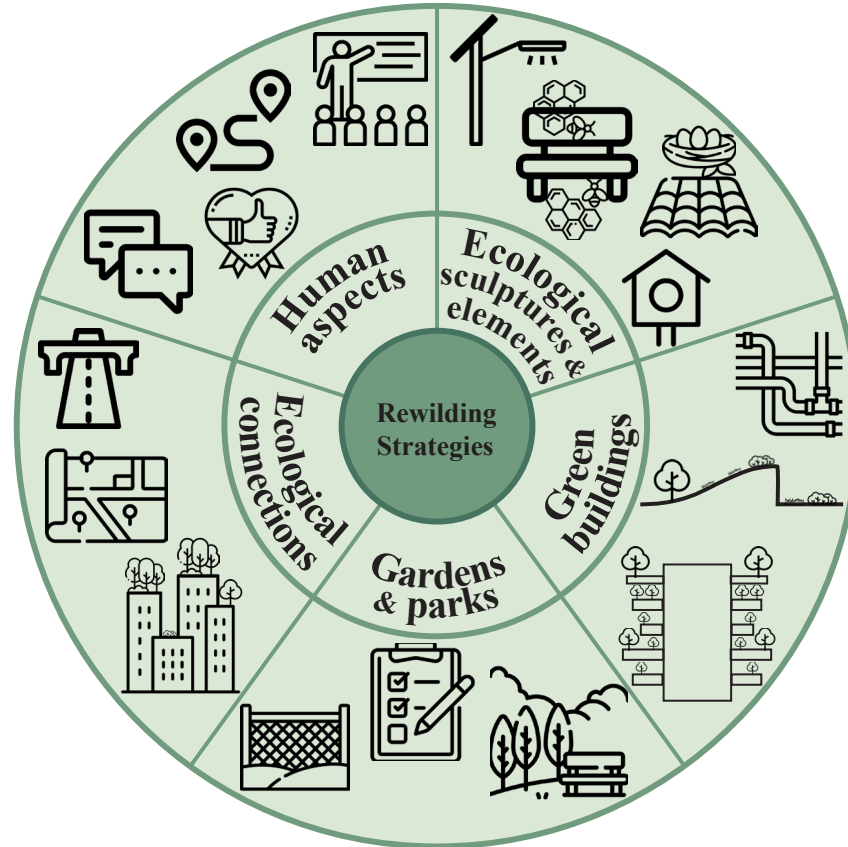


FILLING THE KNOWLEDGE GAP

RESEARCH



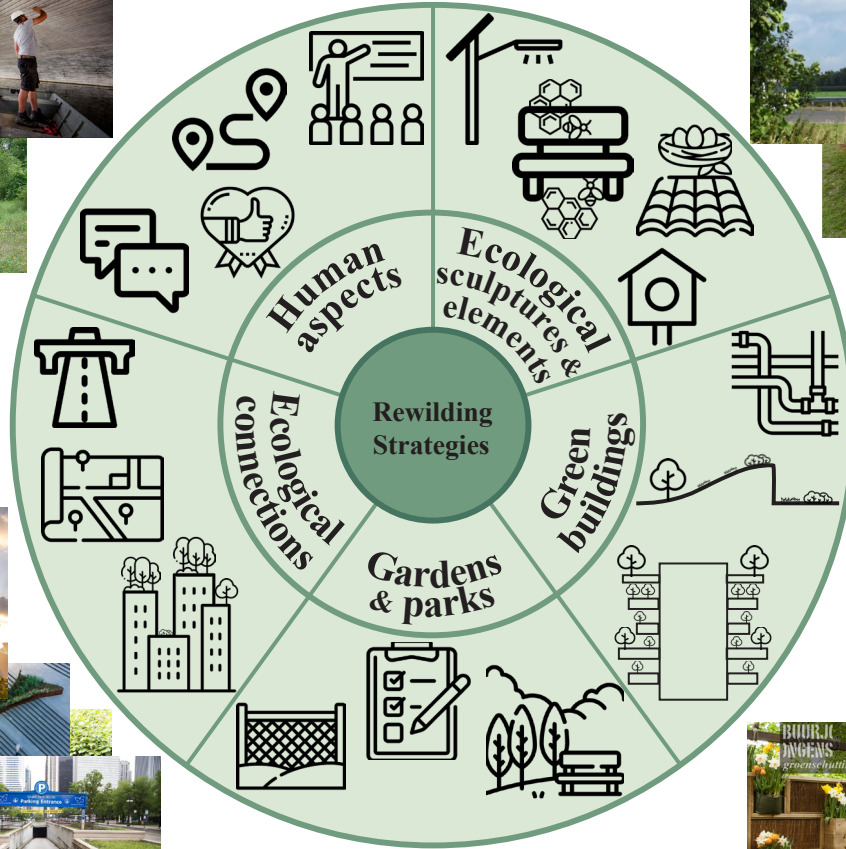
NATURE-INCLUSIVE DESIGN TOOLBOX



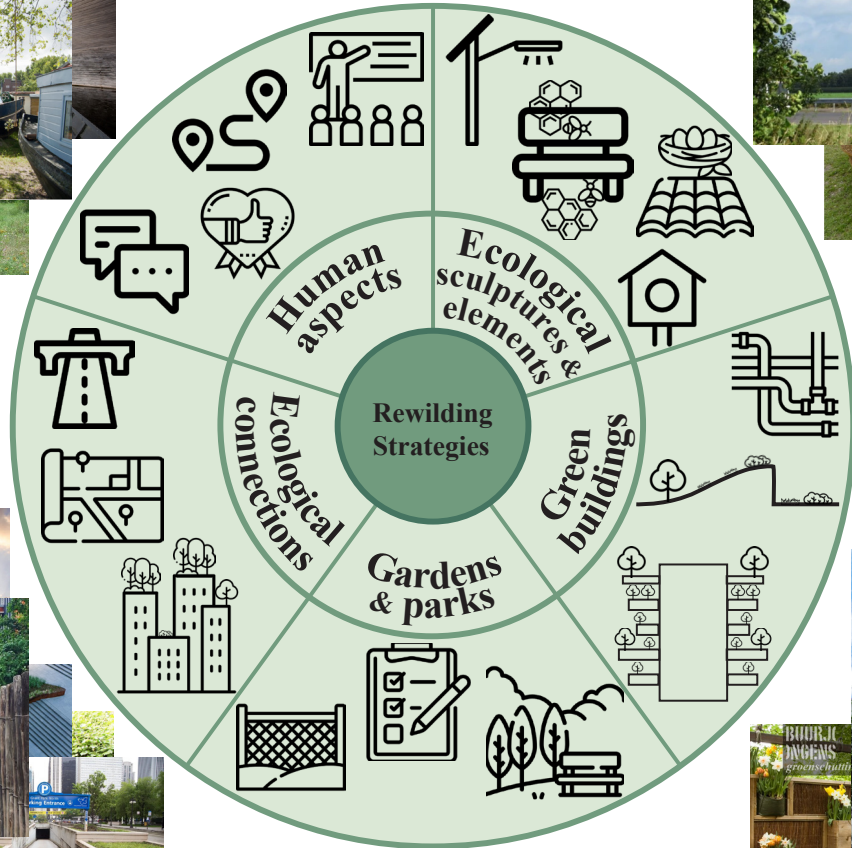
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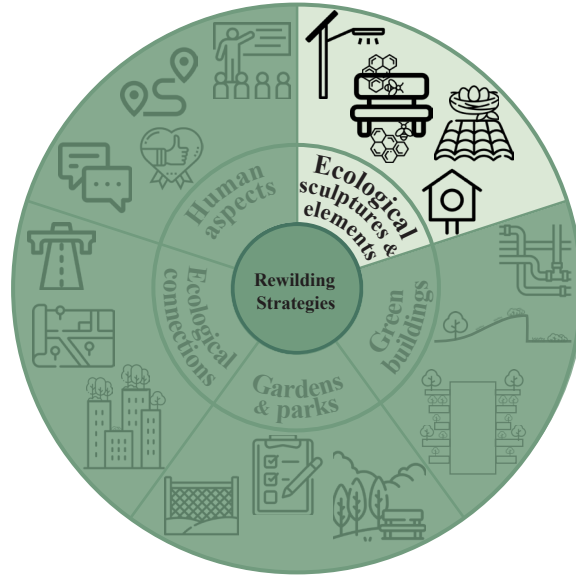


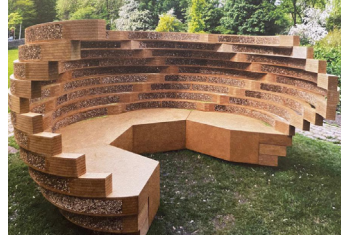
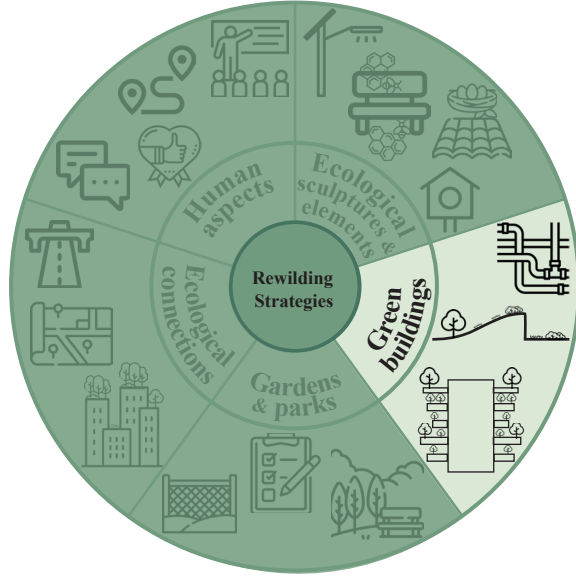
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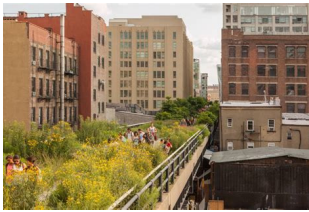
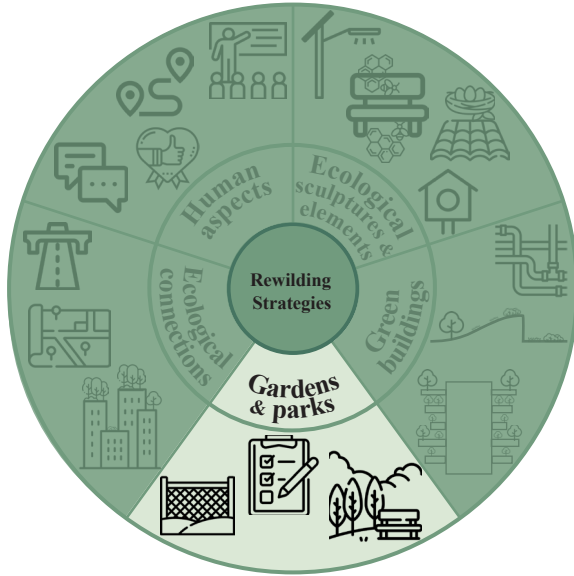
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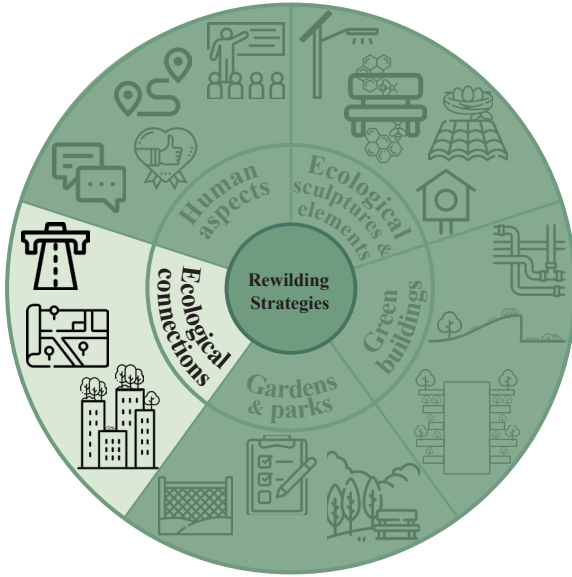
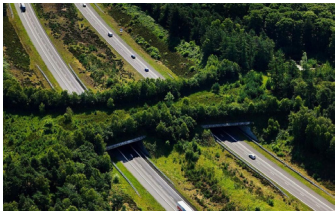




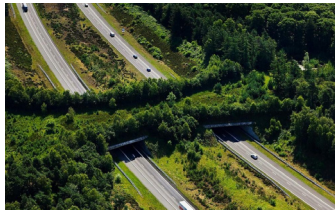
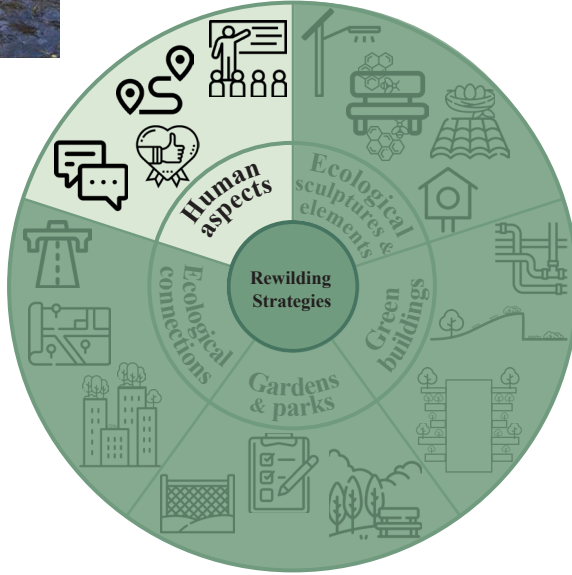
RESEARCH



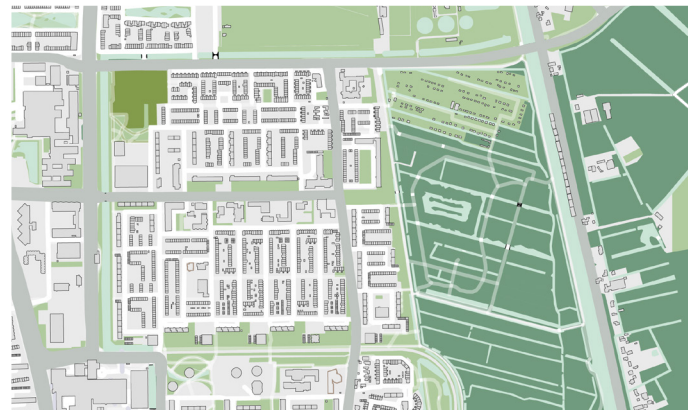
RESEARCH



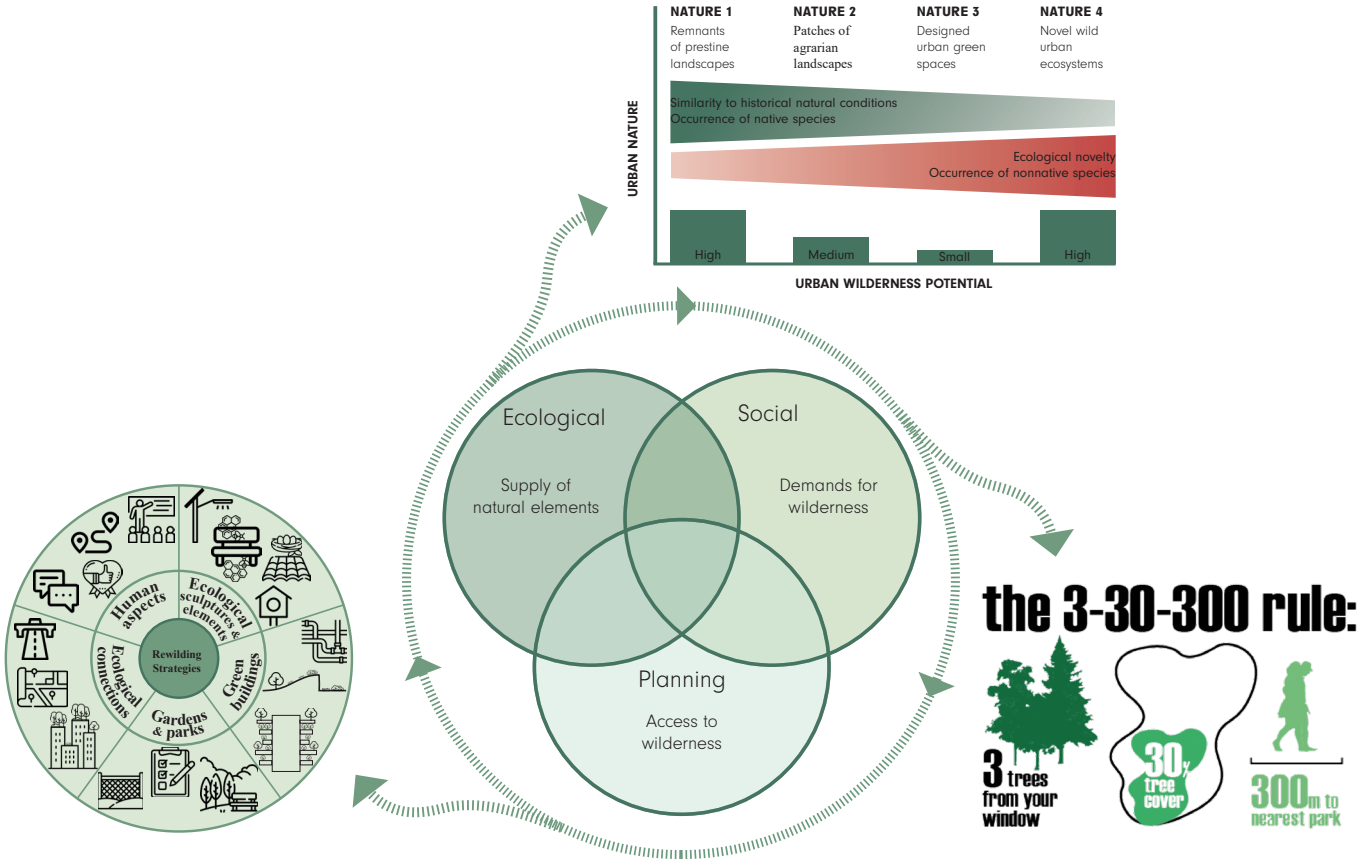
RESEARCH



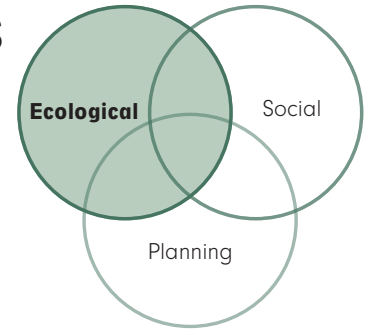
REWILDING A NEIGHBOURHOOD: BOERHAAVEWIJK



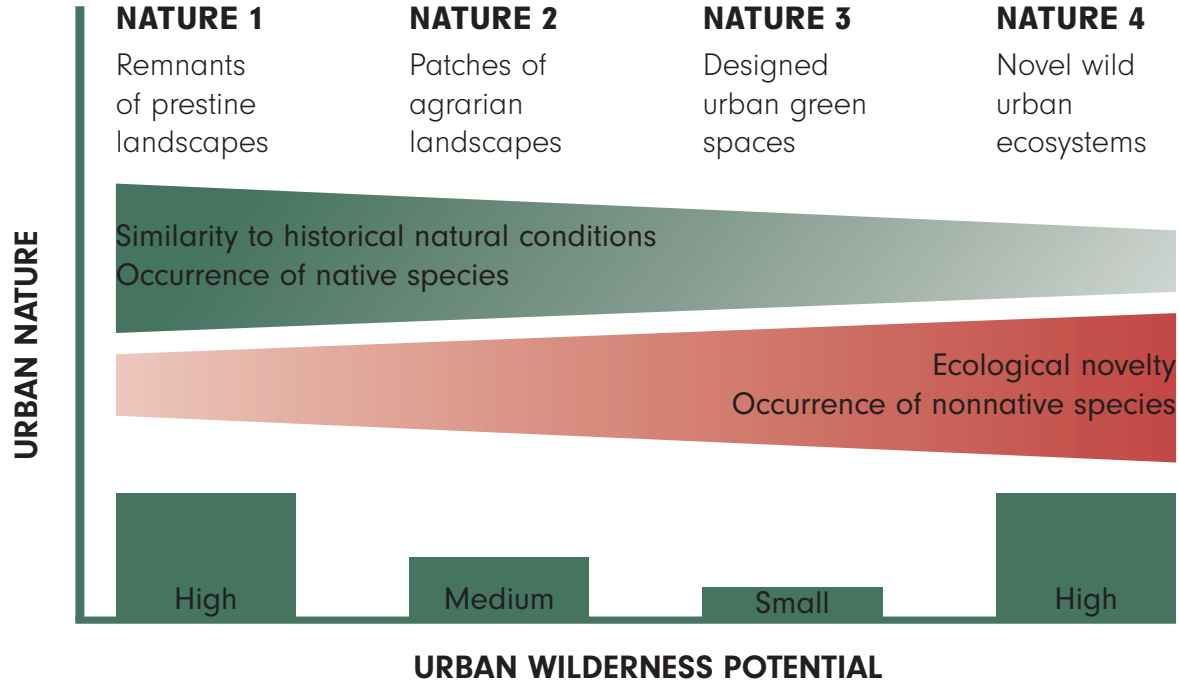
LARGE-SCALE STRATEGY: Urban Wilderness as Social-Ecological System



ECOLOGICAL: SUPPLY OF NATURAL ELEMENTS 'Four Natures Approach'



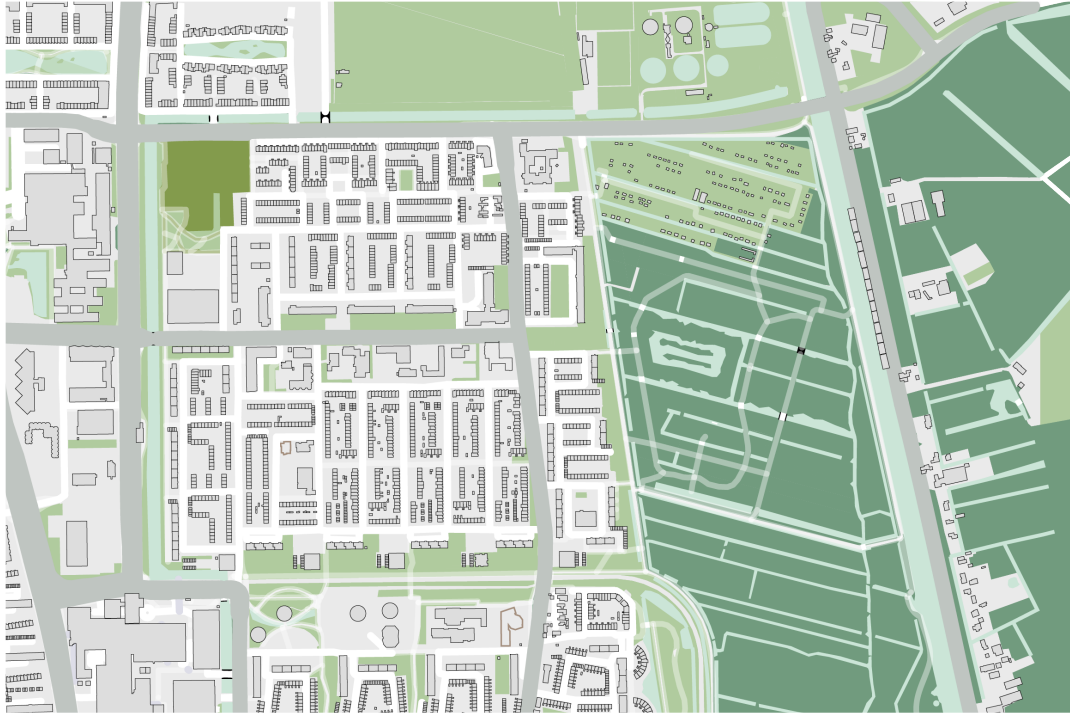
RESEARCH








'Four Natures Approach' (Kowarik, 2018)

ECOLOGICAL: SUPPLY OF NATURAL ELEMENTS

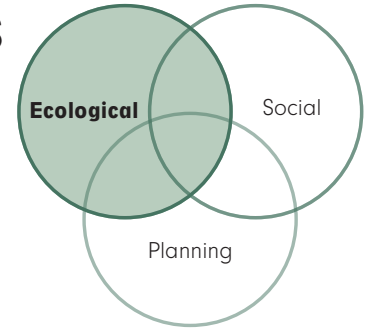
'Four Natures Approach' Boerhaavewijk



-  Nature 1: Remnants of pristine landscapes
-  Nature 2: Patches of agrarian landscapes
-  Nature 3: Designed urban green spaces
-  Nature 4: Novel wild urban ecosystems
-  Water

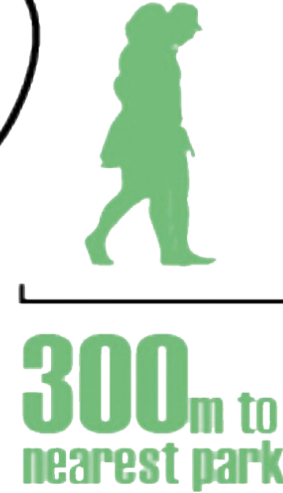
ECOLOGICAL: SUPPLY OF NATURAL ELEMENTS

Connecting Nature



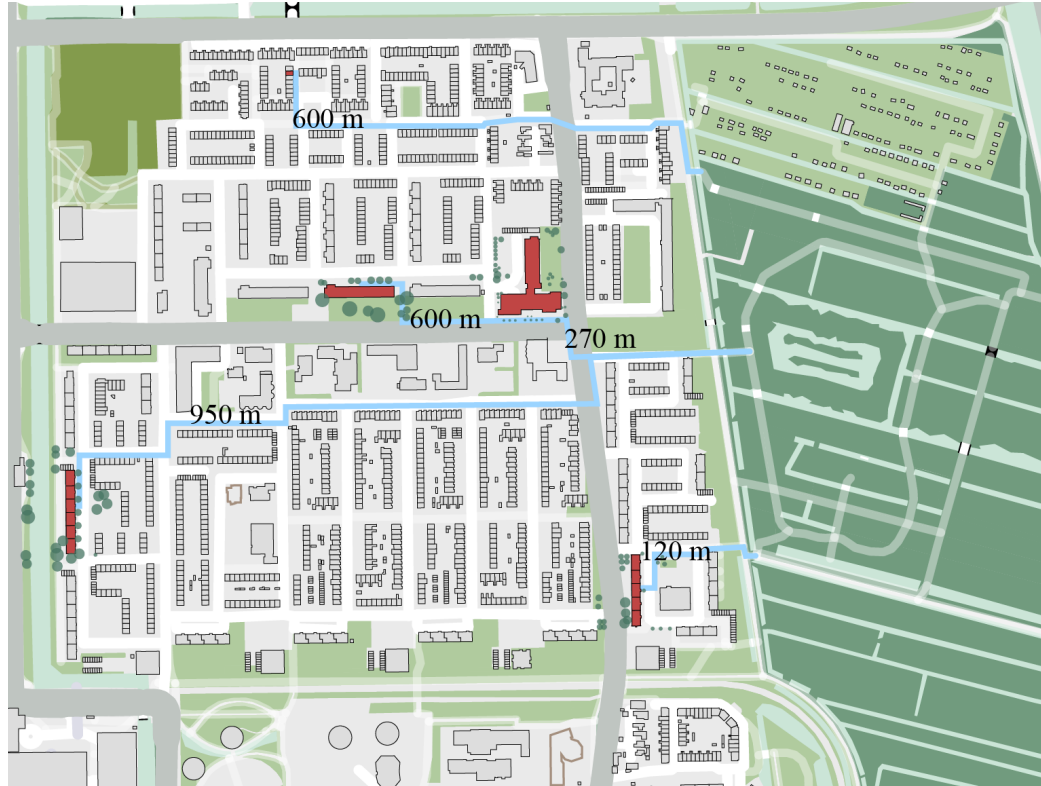
SOCIAL: DEMANDS FOR WILDERNESS

3-30-300 Rule

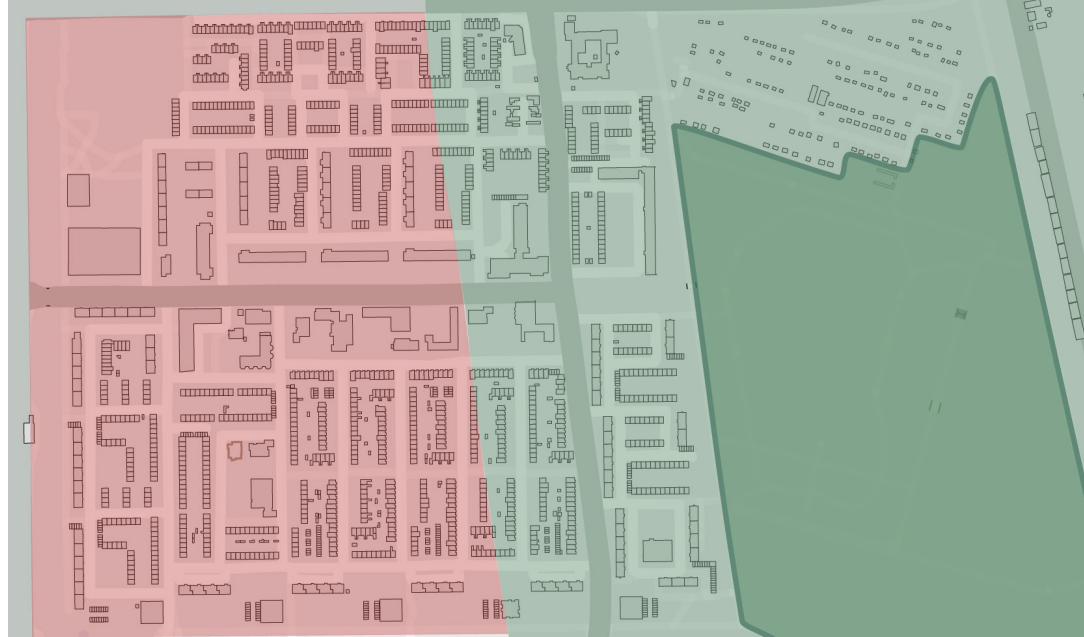


SOCIAL: DEMANDS FOR WILDERNESS

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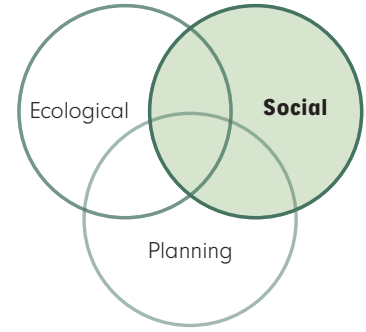
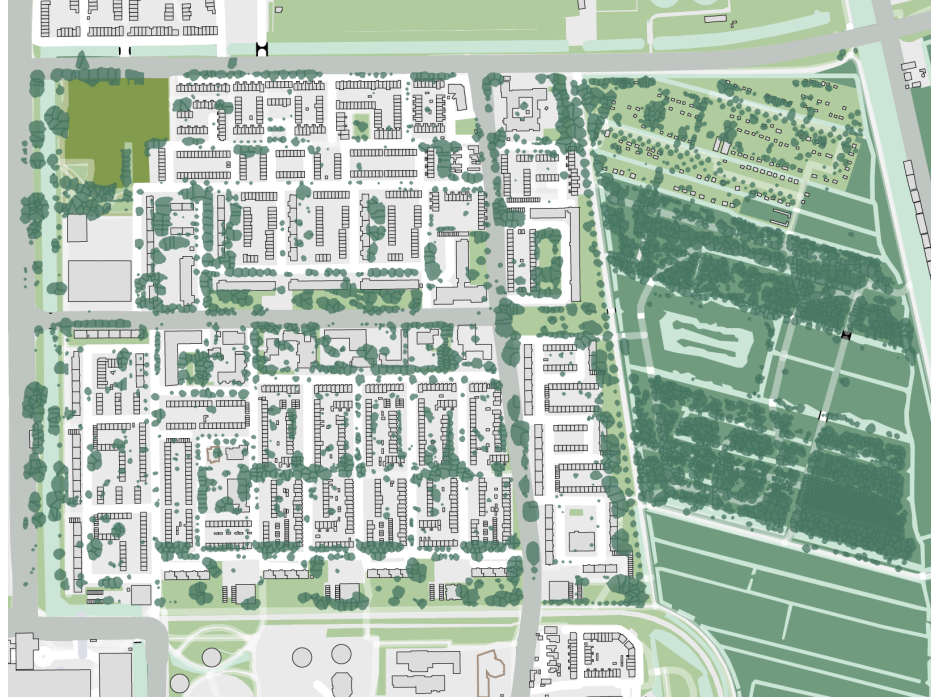


SOCIAL: DEMANDS FOR WILDERNESS 300M to Poelpolder

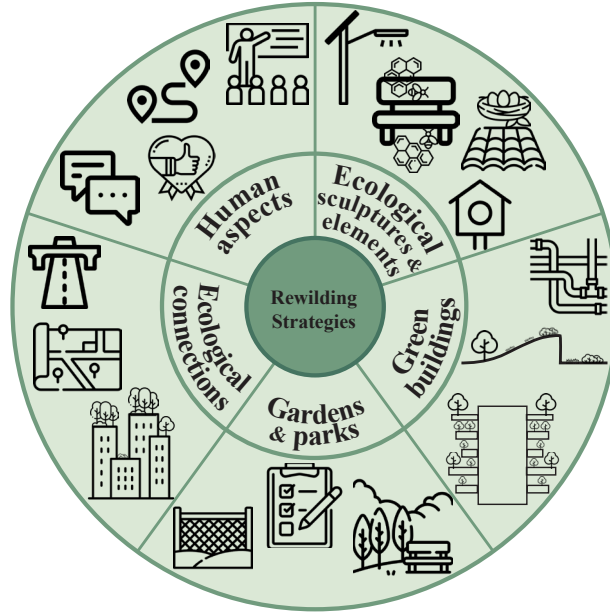
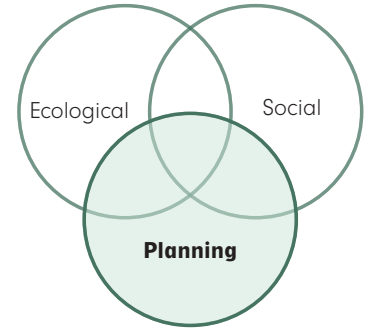


SOCIAL: DEMANDS FOR WILDERNESS

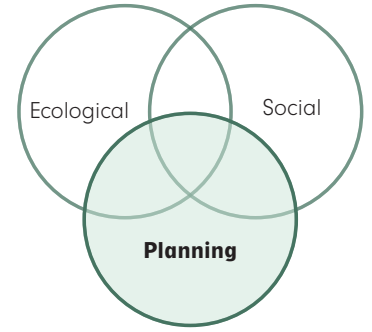
Tree Canopy Cover: 27%



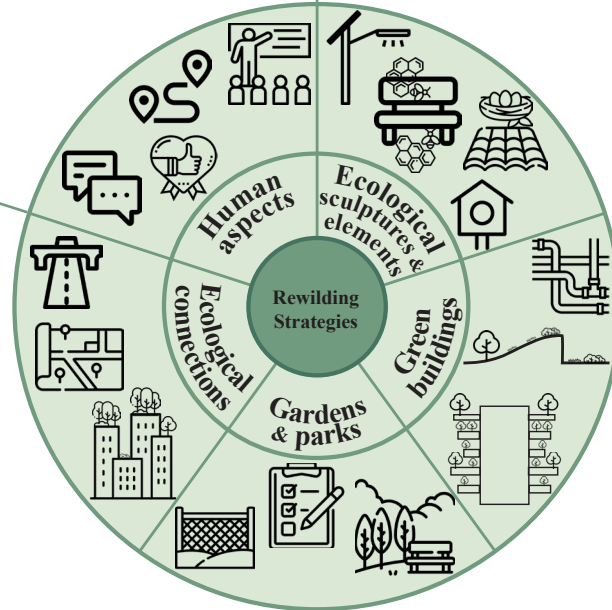
PLANNING: ACCESS TO WILDERNESS



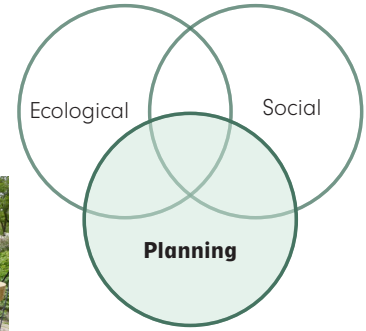
PLANNING: ACCESS TO WILDERNESS



Mental access



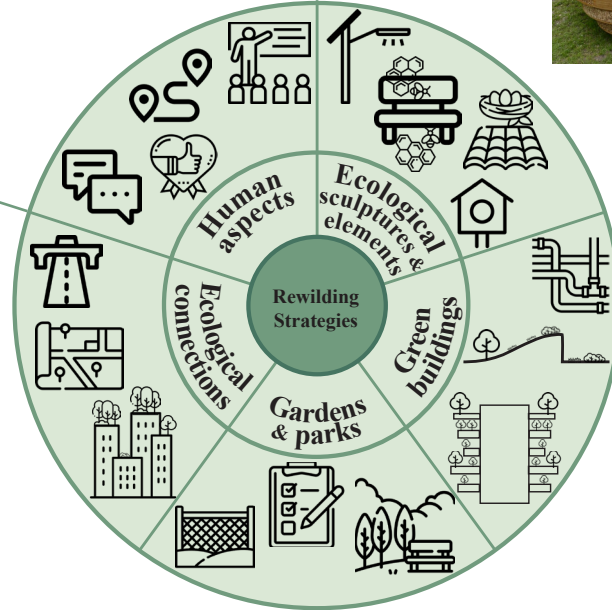
PLANNING: ACCESS TO WILDERNESS



Mental access



Physical access





**ECOCITY
WORLD SUMMIT
LONDON
6-8 JUNE 23**



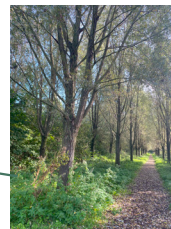
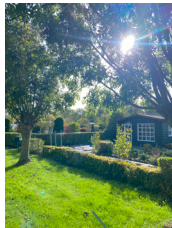
BOERHAAVEWIJK, SCHALKWIJK, HAARLEM

CASE STUDY



- Forest
- Park
- Green
- Water
- Sports

SITE VISITS



DEFICIENCIES IN BOERHAAVEWIJK

- Monofunctional neighbourhood
- Few public buildings & meeting spaces
- Paving, 'kijkgroen' & 'grasfalt'



- Enclosed private gardens
- No green roofs
- Poor rainwater management
- No green corridors with surroundings

ECOLOGICAL ROUTES



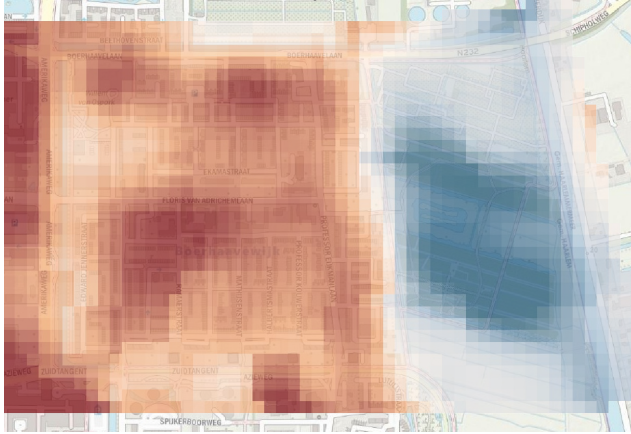
CONNECTING NATURE



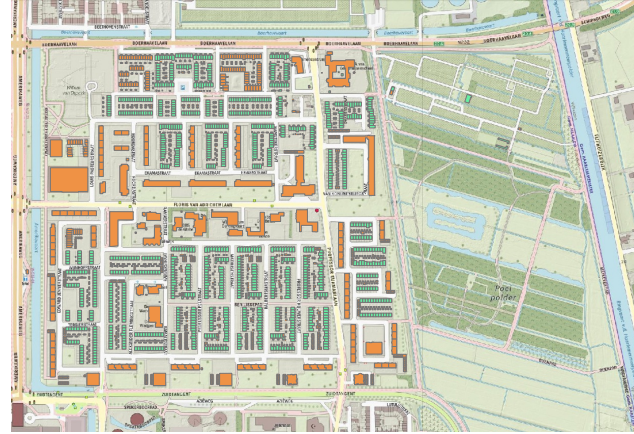
Urban Heat Map



Urban Heat Map

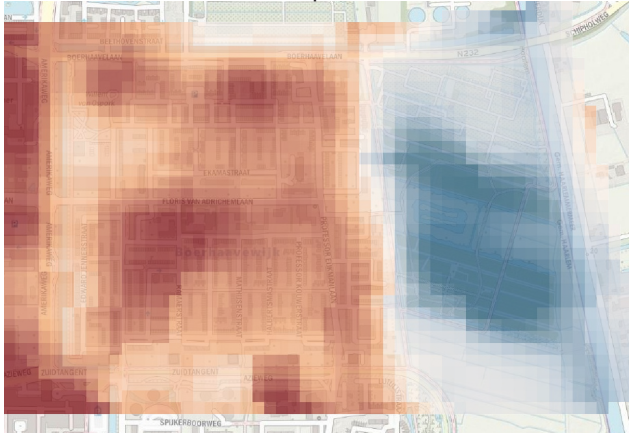


Flat roof vs Non-flat roof

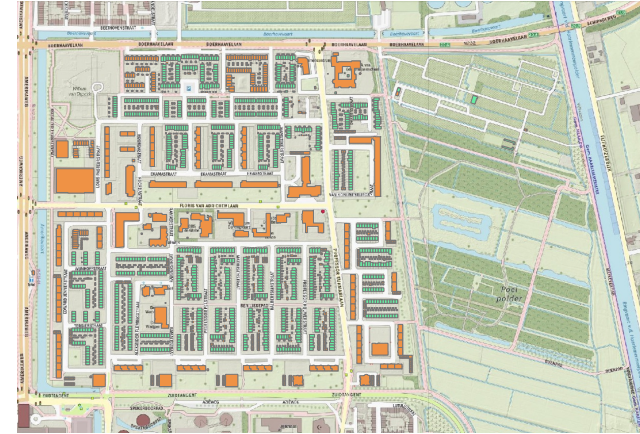


- Flat roof
- Non-flat roof

Urban Heat Map

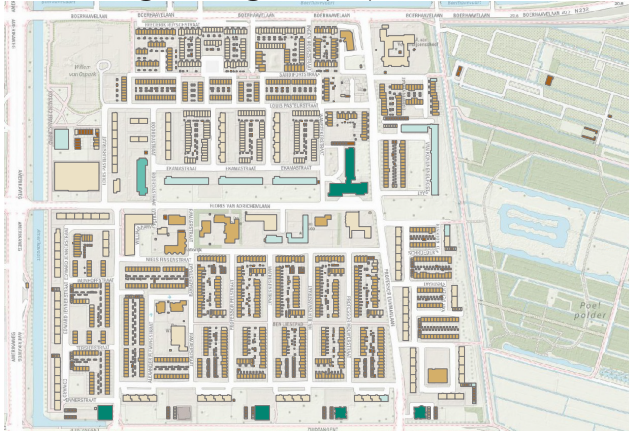


Flat roof vs Non-flat roof



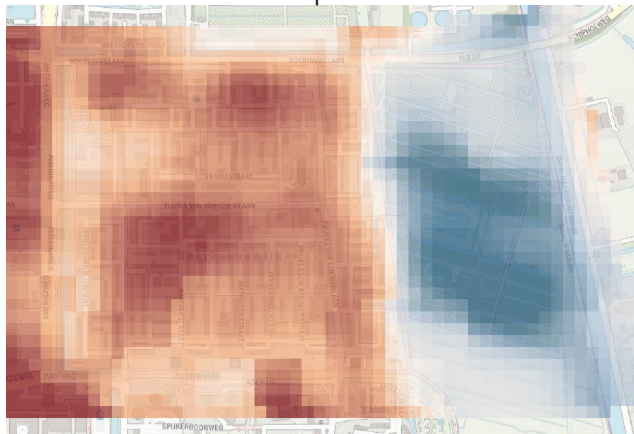
- Flat roof
- Non-flat roof

Building Height (m)

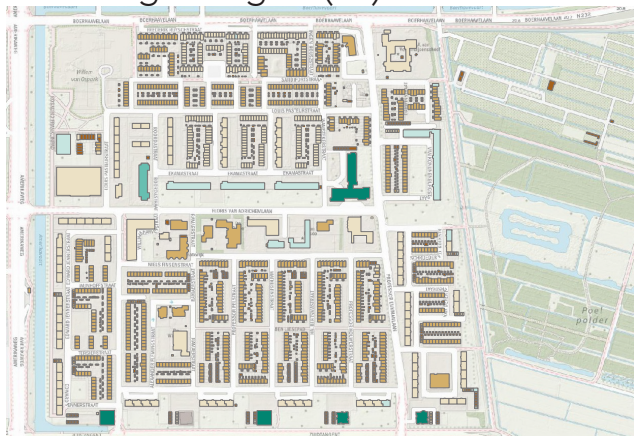


- 0 - 5
- 5 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50

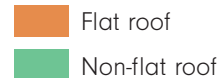
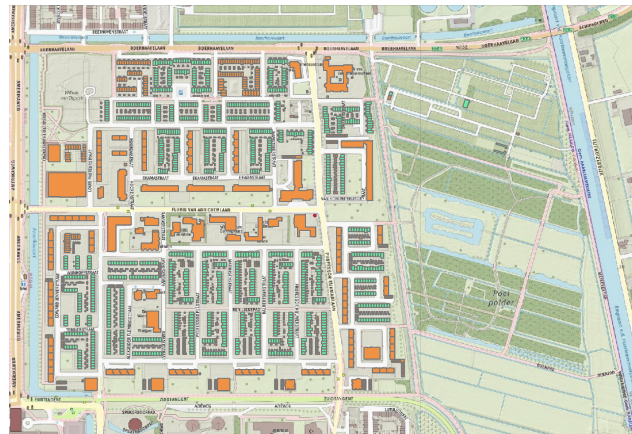
Urban Heat Map



Building Height (m)



Flat roof vs Non-flat roof



Local Species



SWIFT



SMALL NEWT



DRAGONFLY



LONGHORN BEETLE



MARTEN



HOUSE SPARROW

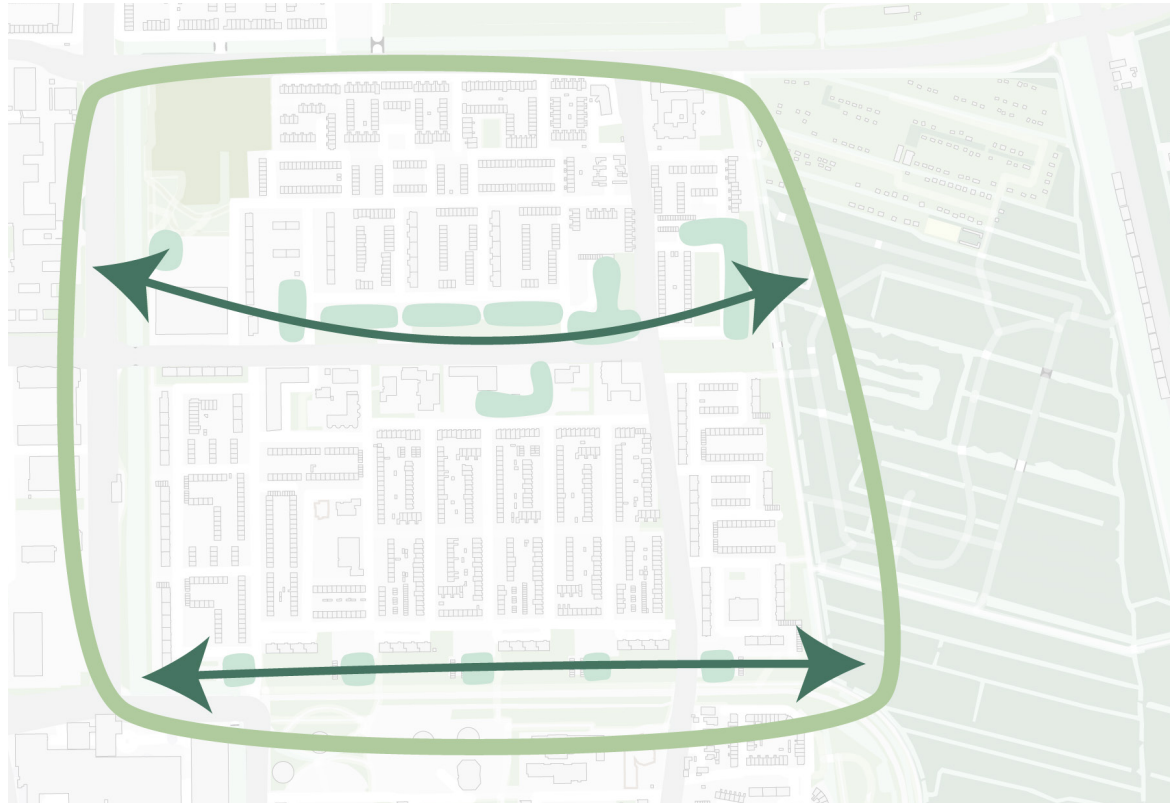





HEDGEHOG



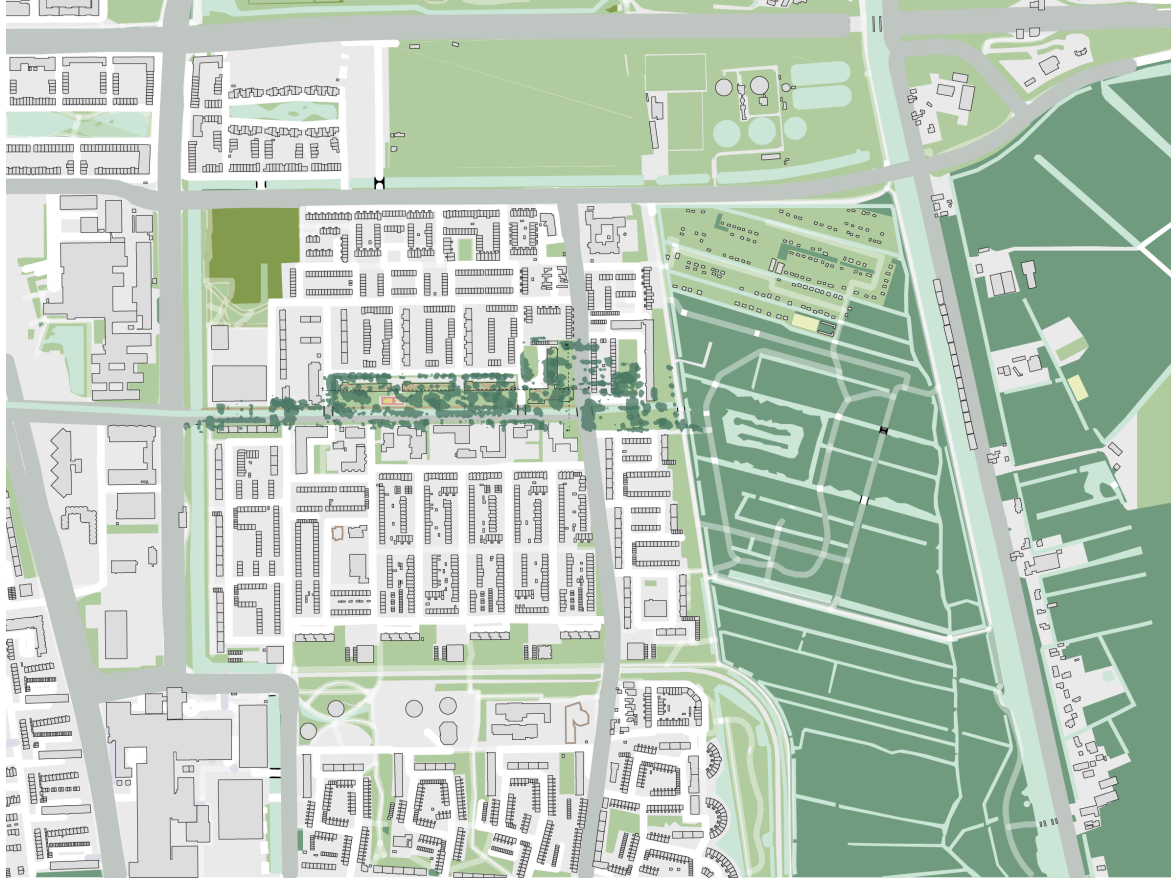
SAND BEE

PATCH-CORRIDOR-MATRIX



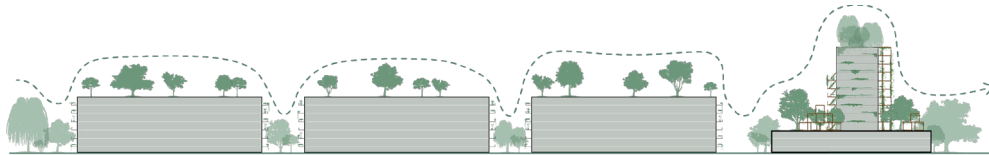
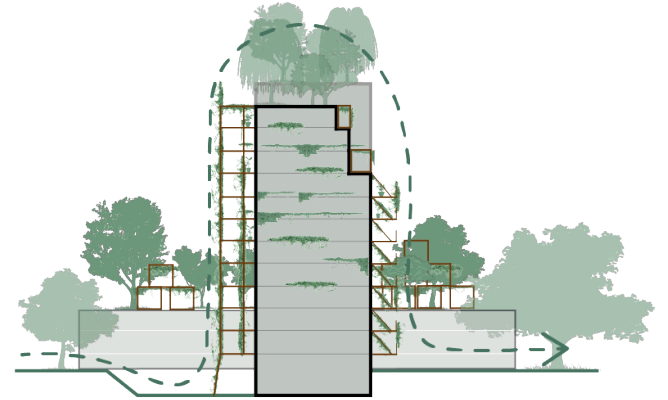
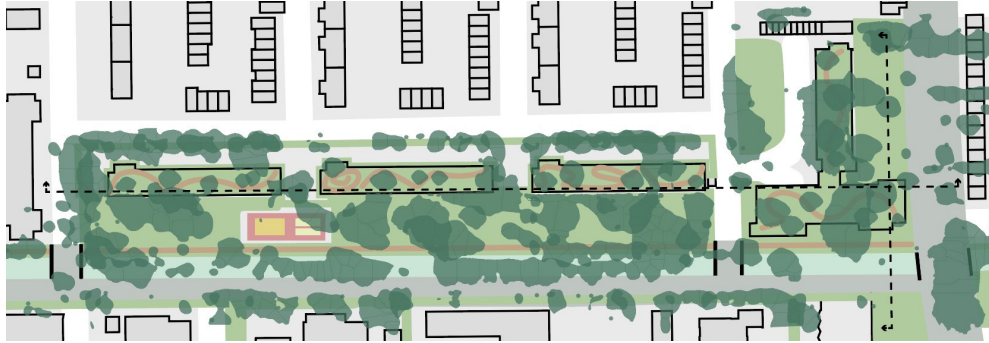
-  Patch
-  Corridor
-  Matrix

VISION: "VOORZIENINGENSTROOK"



VISION: "VOORZIENINGENSTROOK"

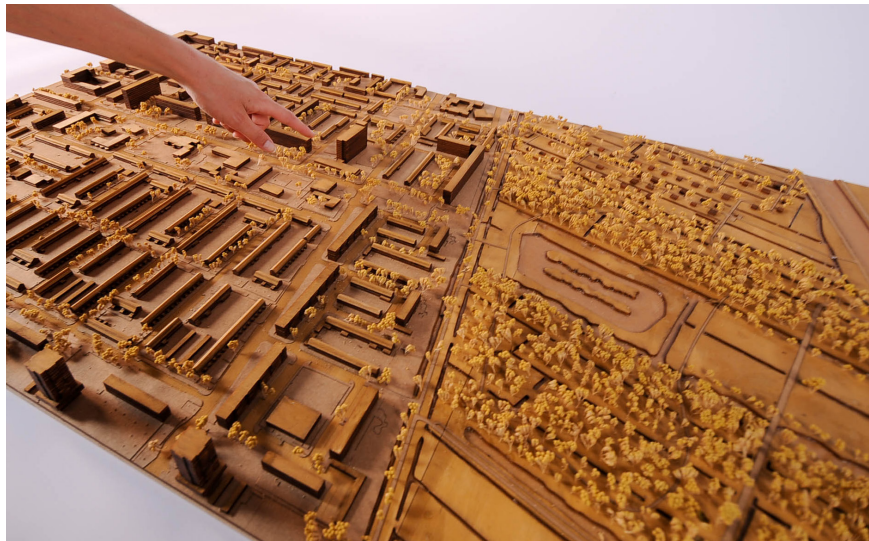
CASE STUDY



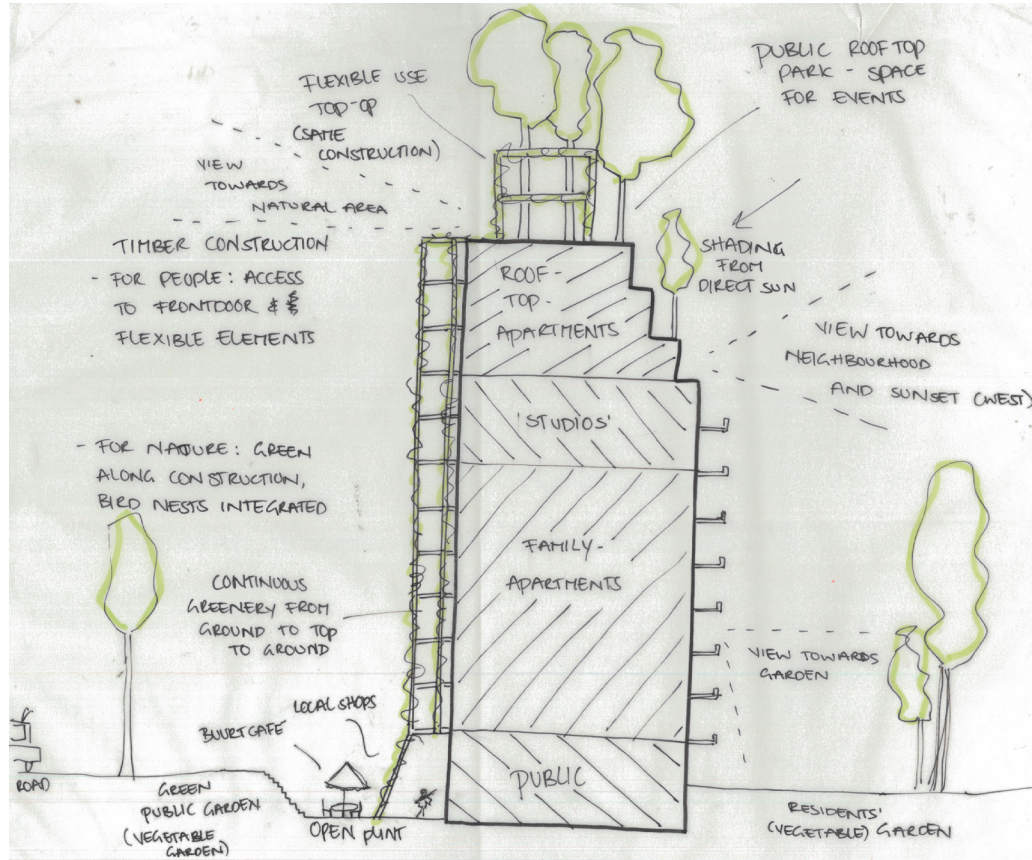
STICHTING SINT JACOB - WOONZORGCENTRUM SCHALKWEIDE

Current Situation

DESIGN



INTEGRATION OF NATURE IN BUILDING

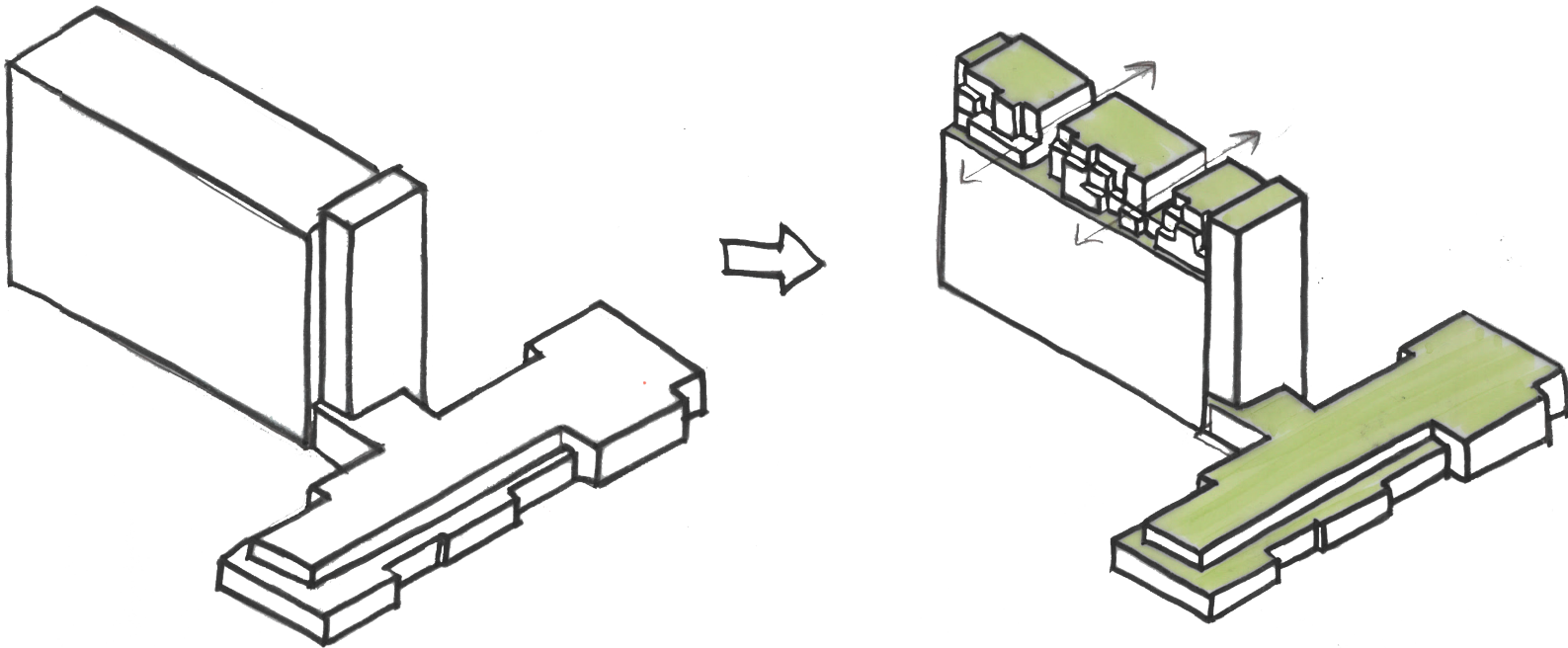


Valuing all forms of nature:

- Considering fauna
- Use of materials
- Impact of building

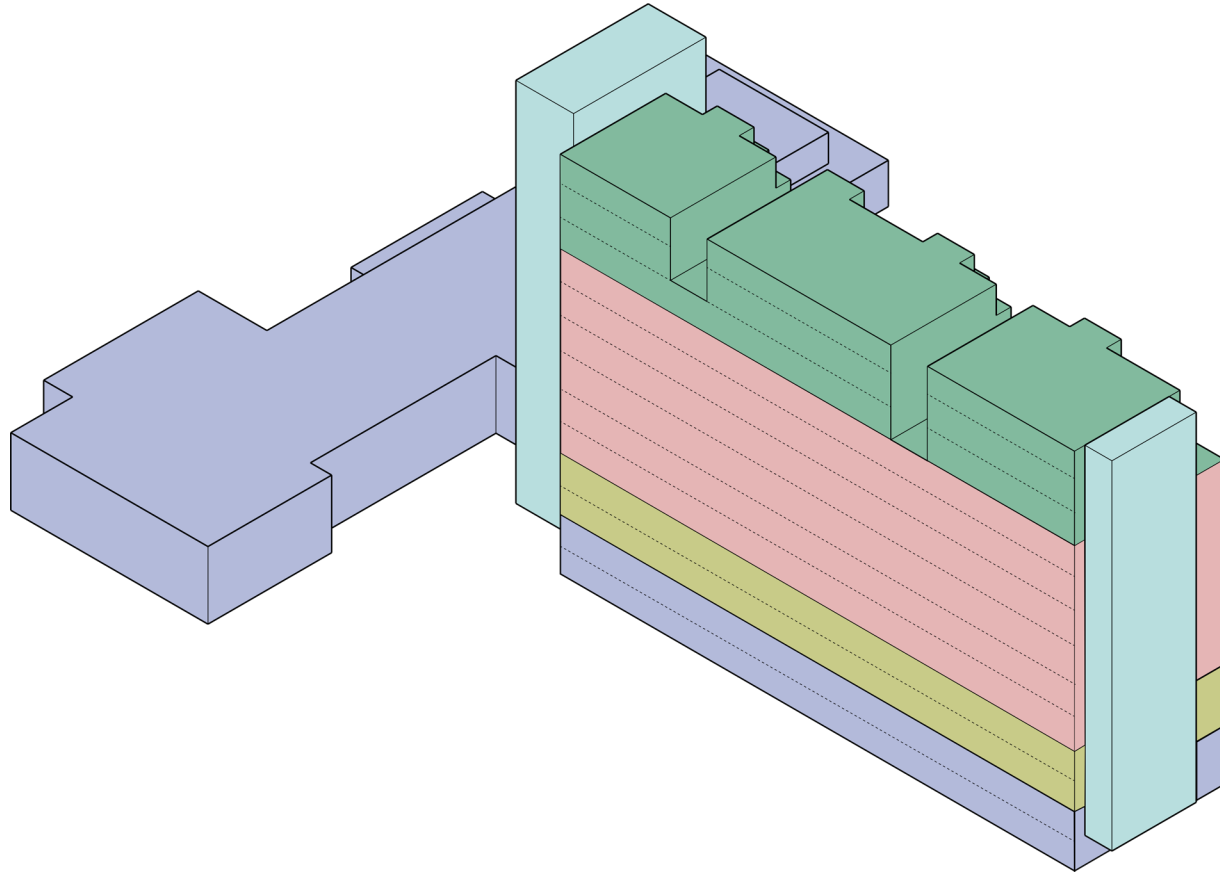
CREATING SPACE FOR NATURE

DESIGN



PROGRAMME

DESIGN



Public area

Stairwell

Studios

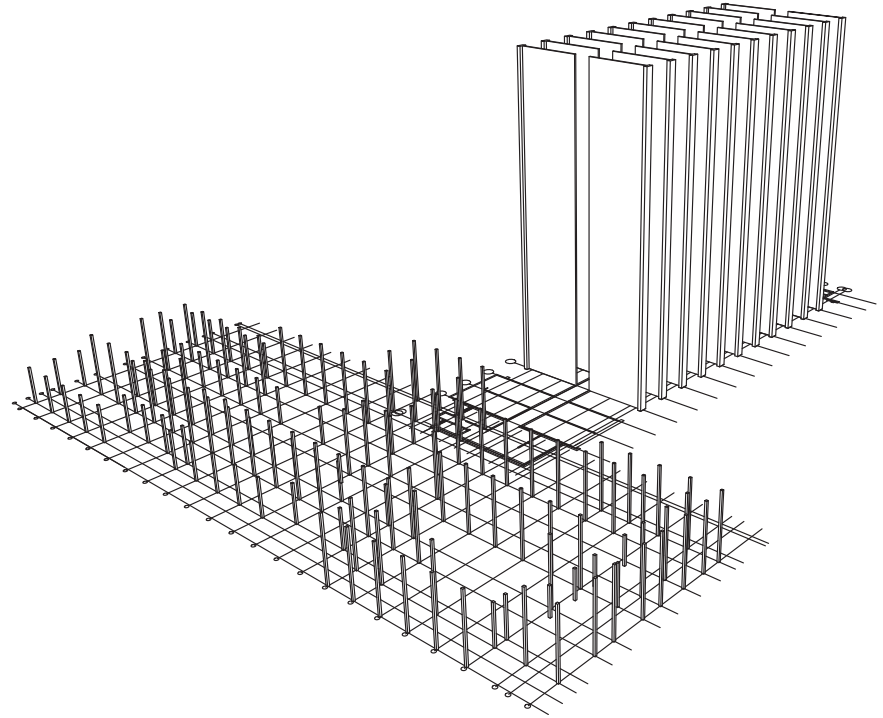
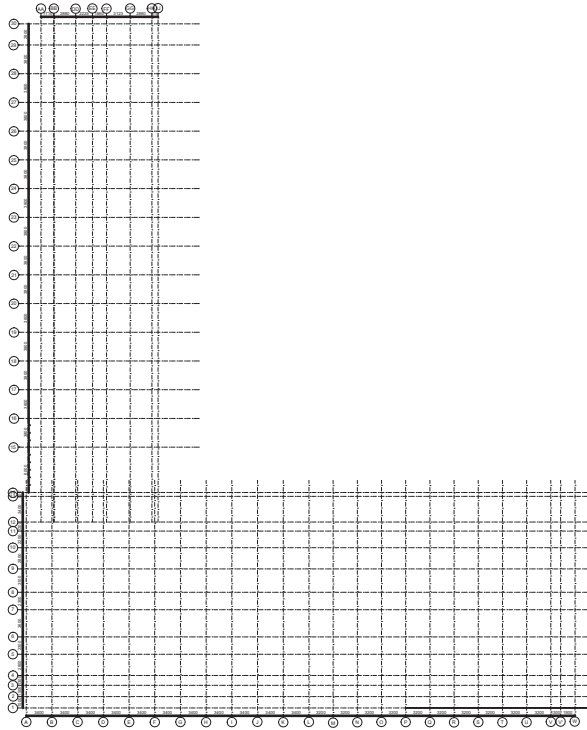
Family apartments

Rooftop Apartments



GRID & STRUCTURE

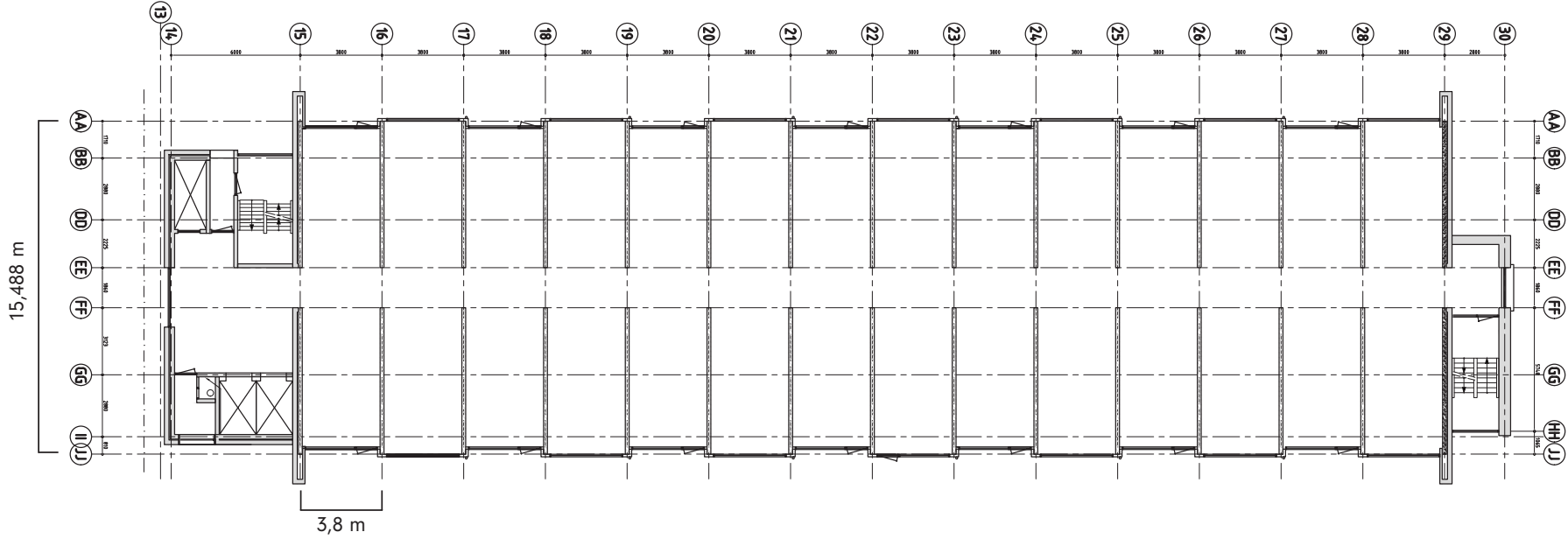
DESIGN



Existing structure: columns & load-bearing walls 

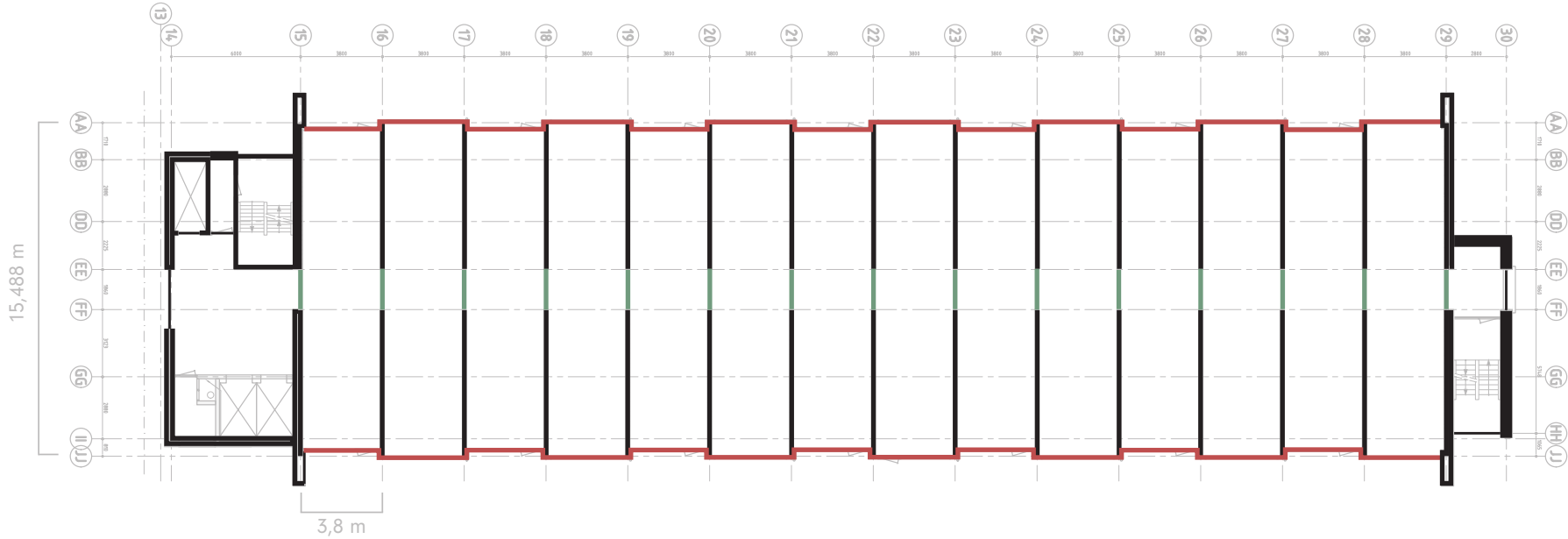
FLOORPLAN ON GRID

DESIGN



STRATEGY FOR HOUSING: STUDIOS & FAMILY APARTMENTS

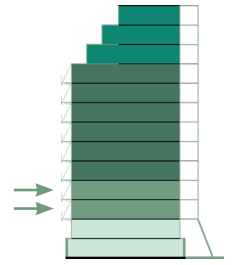
DESIGN



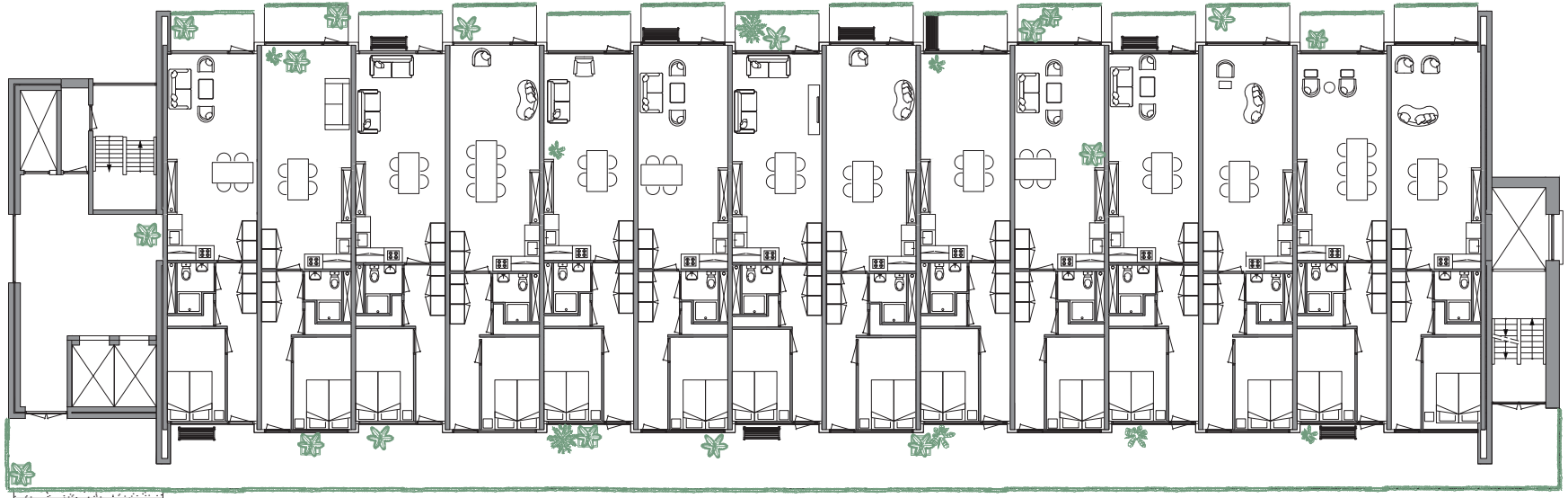
- Old
- New
- Remains



FLOORPLAN STUDIOS



DESIGN

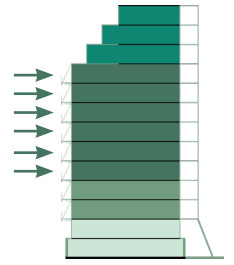


First & second floor

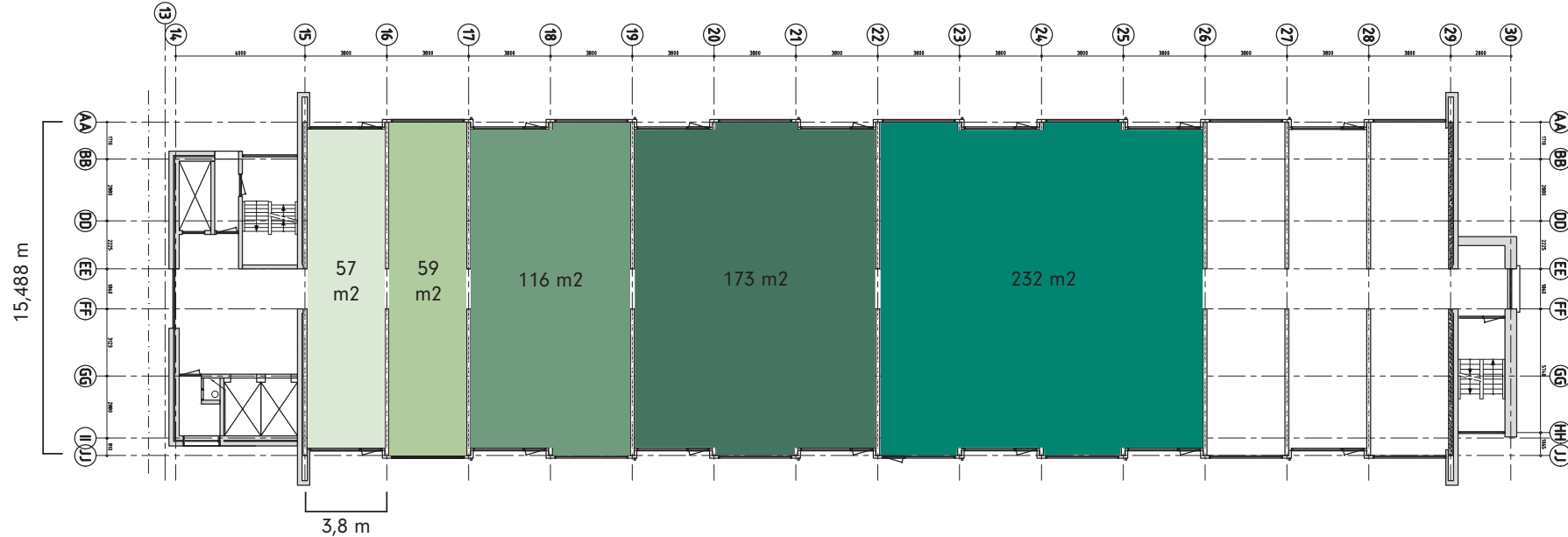
0 5 10 15 20 m



STRATEGY FOR HOUSING: FAMILY APARTMENTS

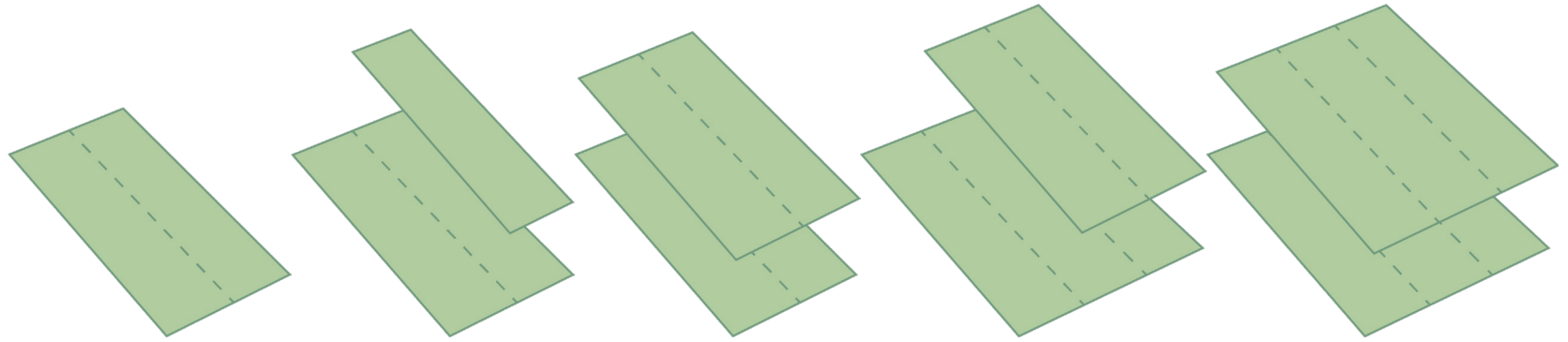


DESIGN



STRATEGY FOR HOUSING: SMALL, MEDIUM & LARGE DWELLINGS

DESIGN



A

2 strips
1 floor

1-3 pers.

B

3
2 floors

2-4 pers.

C

4
2 floors

3-5 pers.

D

5
2 floors

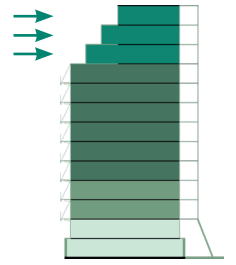
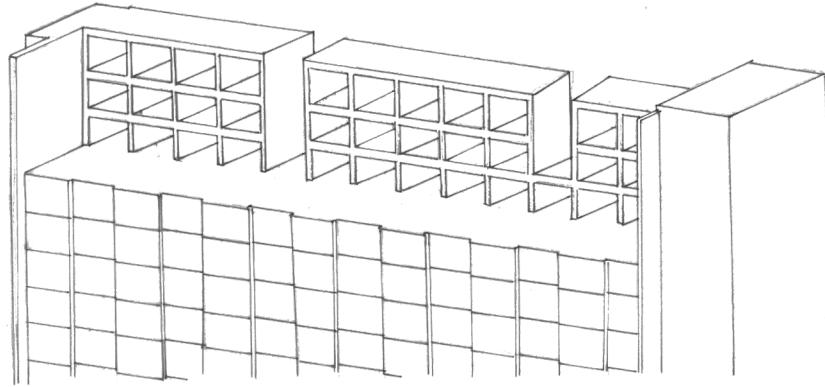
4-6 pers.

E

6
2 floors

5-8 pers.

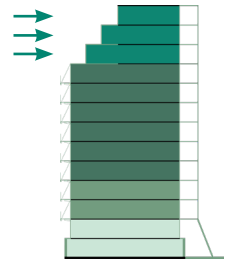
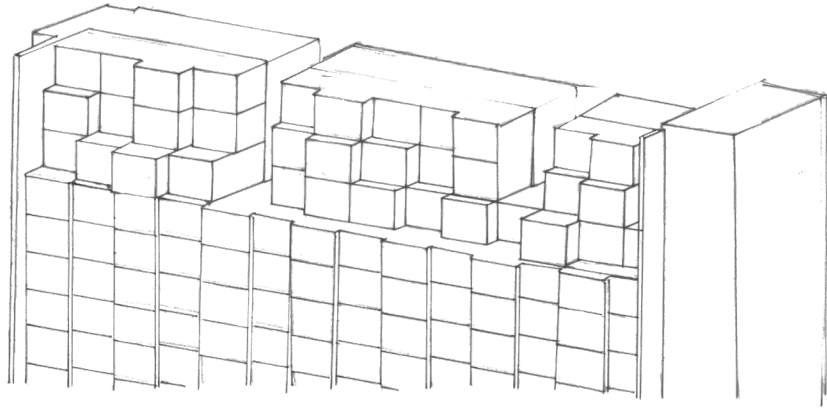
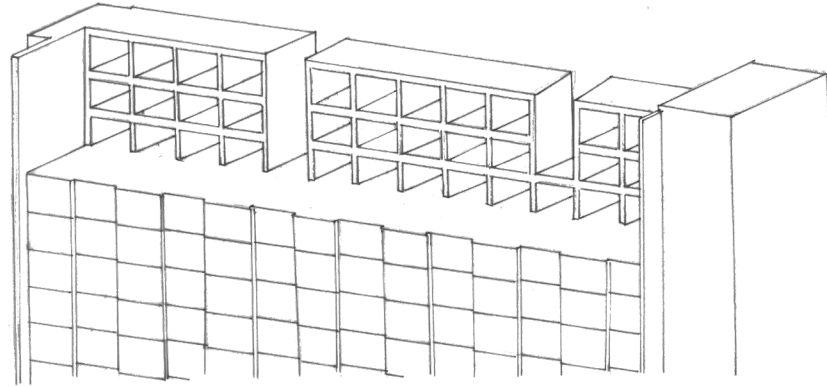
STRATEGY FOR HOUSING: ROOFTOP APARTMENTS



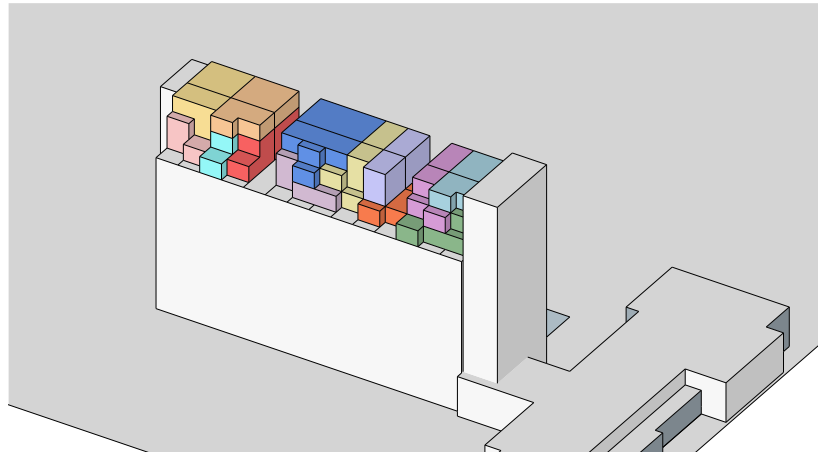
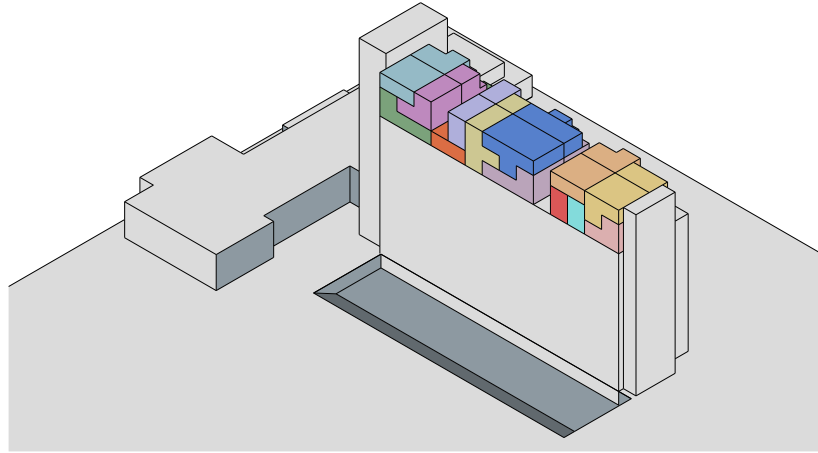
DESIGN

STRATEGY FOR HOUSING: ROOFTOP APARTMENTS

DESIGN

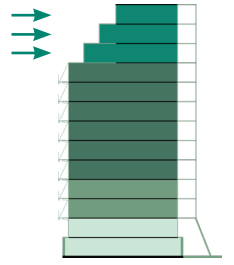


CONFIGURATION ROOFTOP APARTMENTS

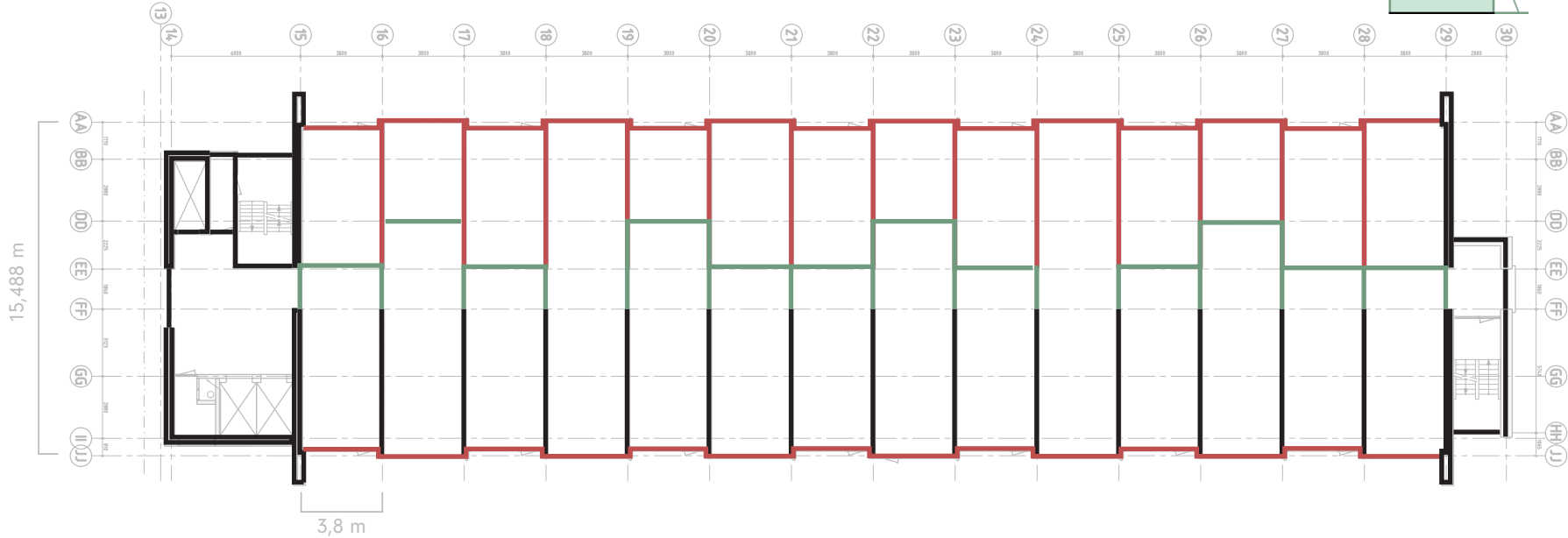


- Pink: 3 bedrooms, 2 bathrooms
2 floors
- Yellow: 3 bedrooms, 1 bathroom (+ wc)
2 floors
- Blue: 2 bedrooms, 1 bathroom (+ wc)
2 floors
- Red: 2 bedrooms, 1 bathroom (+ wc)
2 floors
- Orange: 1 bedroom, 1 bathroom
1 floor
- Lilac: 4 bedrooms, 2 bathrooms (+ wc)
2 floors
- Purple-blue: 5 bedrooms, 2 bathrooms (+ wc)
2 floors
- Yellow: 5 bedrooms, 3 bathrooms (+ wc)
3 floors (incl. masterbedroom)
- Orange: 2 bedrooms, 2 bathrooms
1 floor
- Lilac: 2 bedrooms, 1 bathroom (+ wc)
2 floors
- Green: 5 bedrooms, 4 bathrooms
2 floors
- Purple-pink: 3 bedrooms, 2 bathrooms
2 floors
- Blue: 1 bedroom, 1 bathroom
1 floor

STRATEGY FOR HOUSING: ROOFTOP APARTMENTS



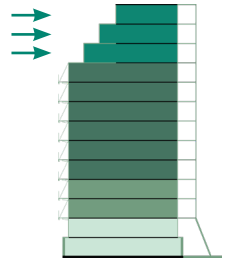
DESIGN



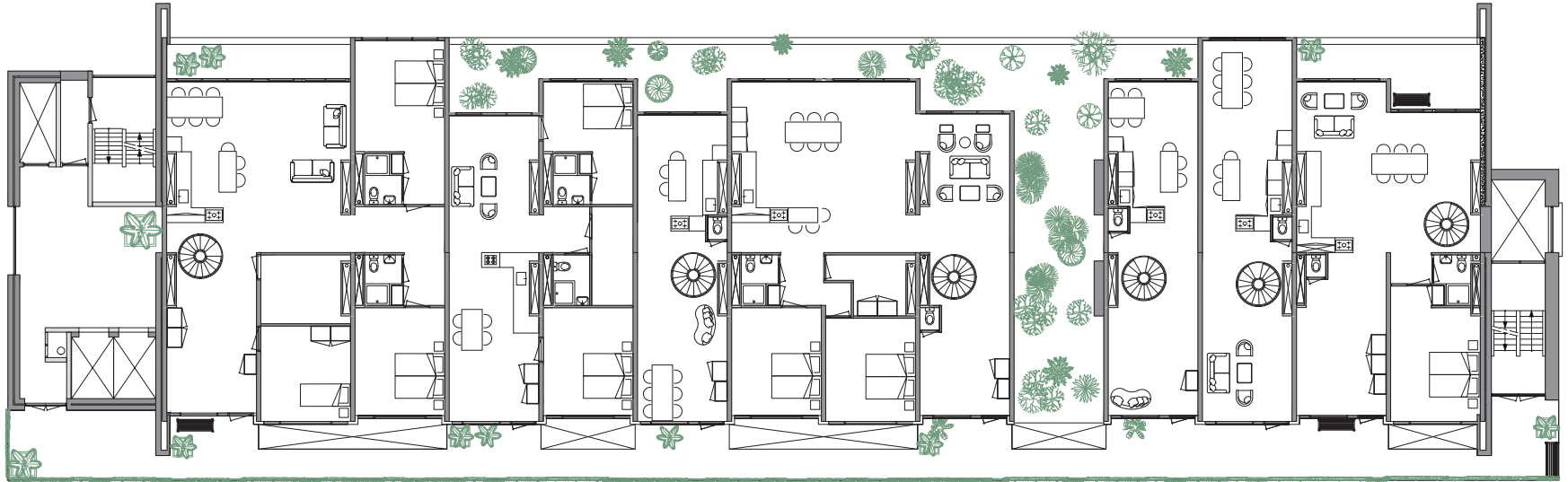
- Old
- New
- Remains



FLOORPLAN ROOFTOP APARTMENTS



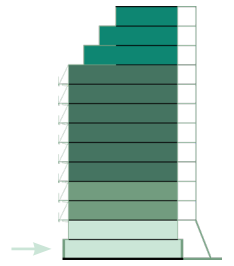
DESIGN



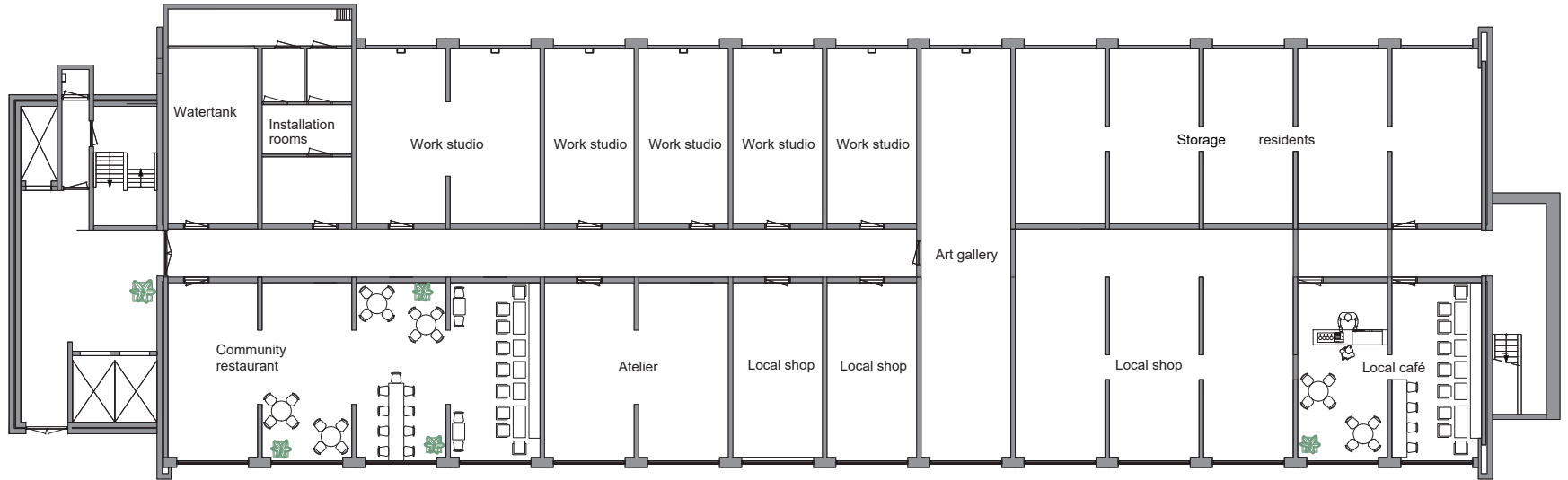
9th floor



FLOORPLAN BASEMENT: PUBLIC SPACES

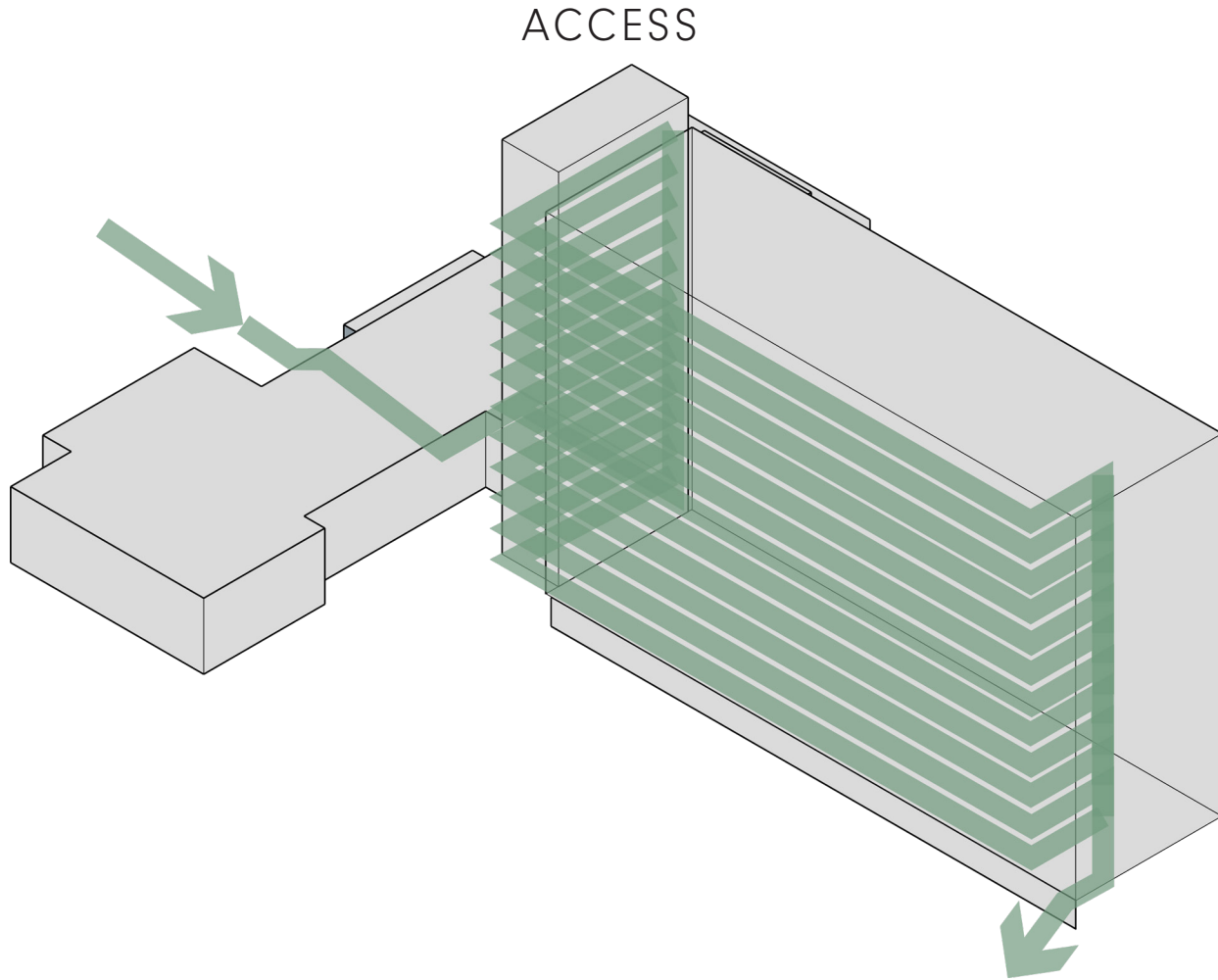


DESIGN



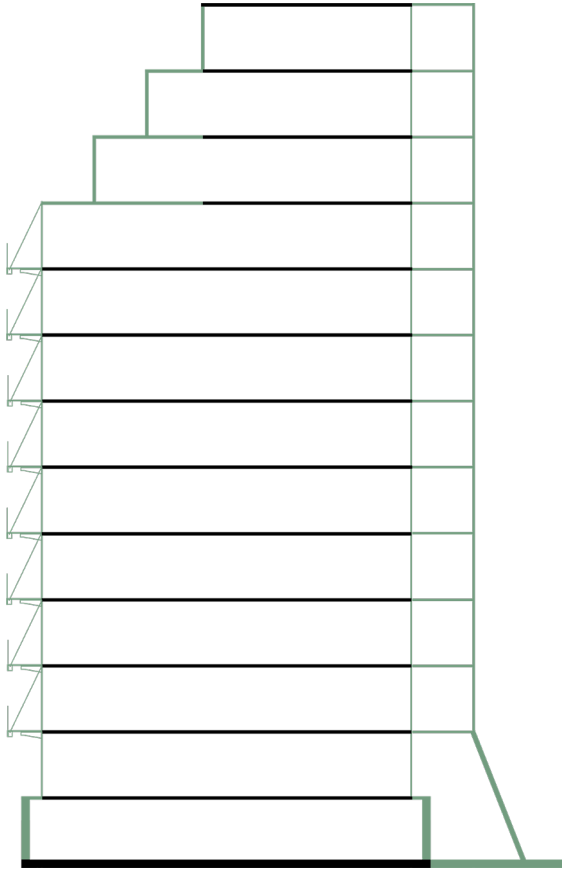
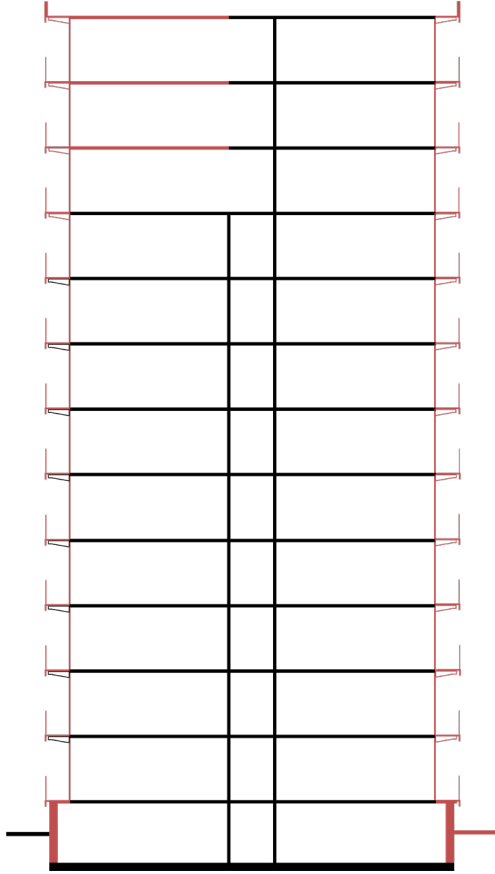
Basement





TRANSFORMATION

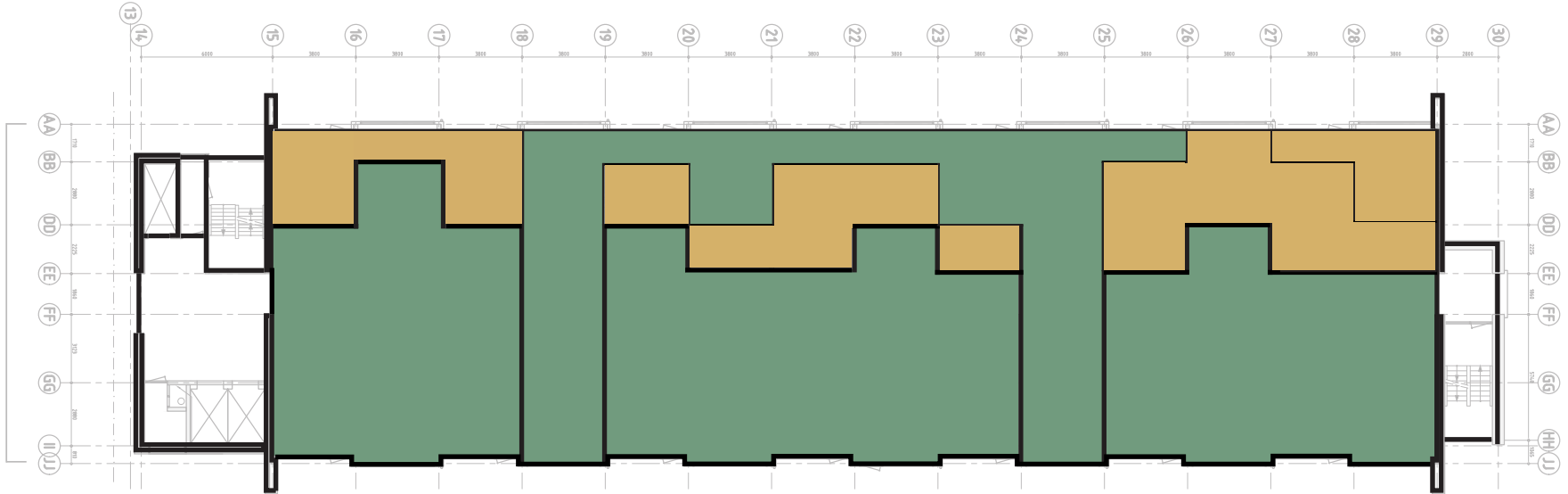
DESIGN



- Old
- New
- Remains

ZONING

DESIGN



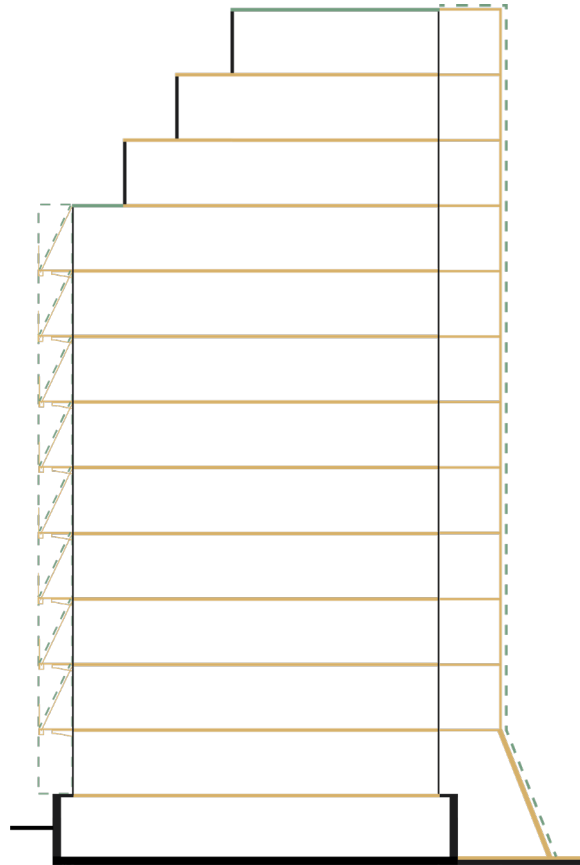
Topview



-  Humans
-  Nature

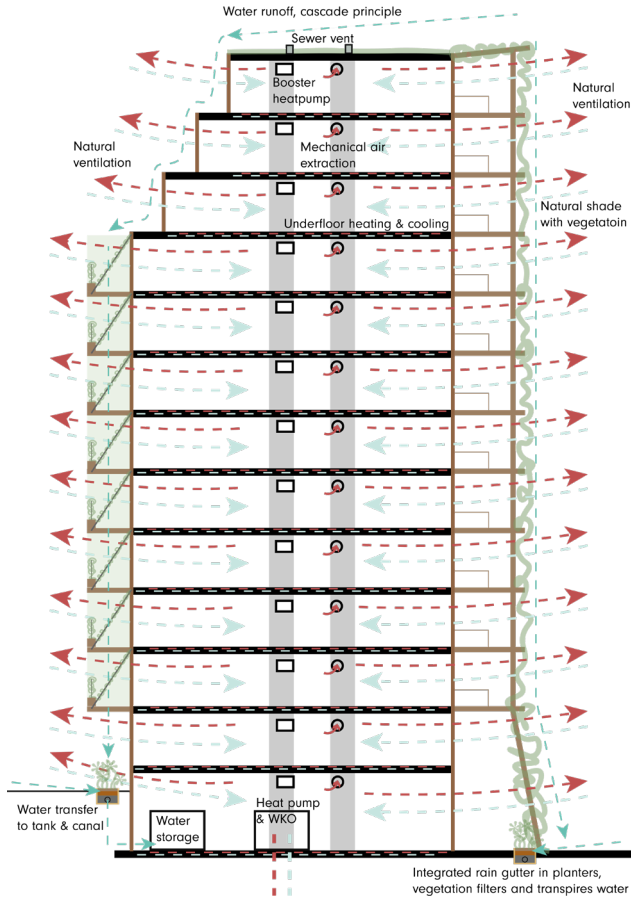
DESIGN

ZONING



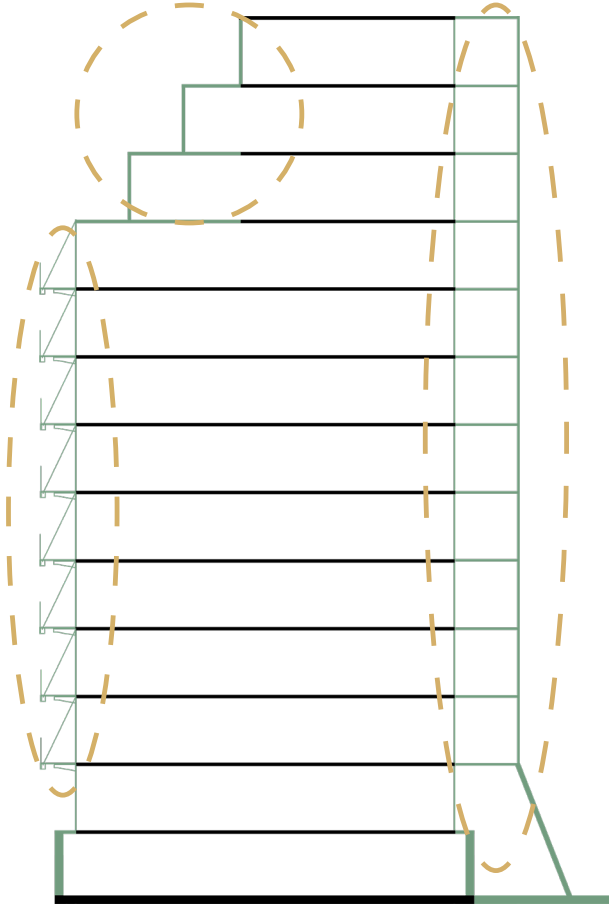
- Humans
- Nature

CLIMATE DESIGN



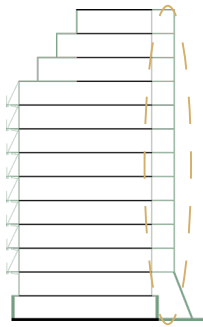
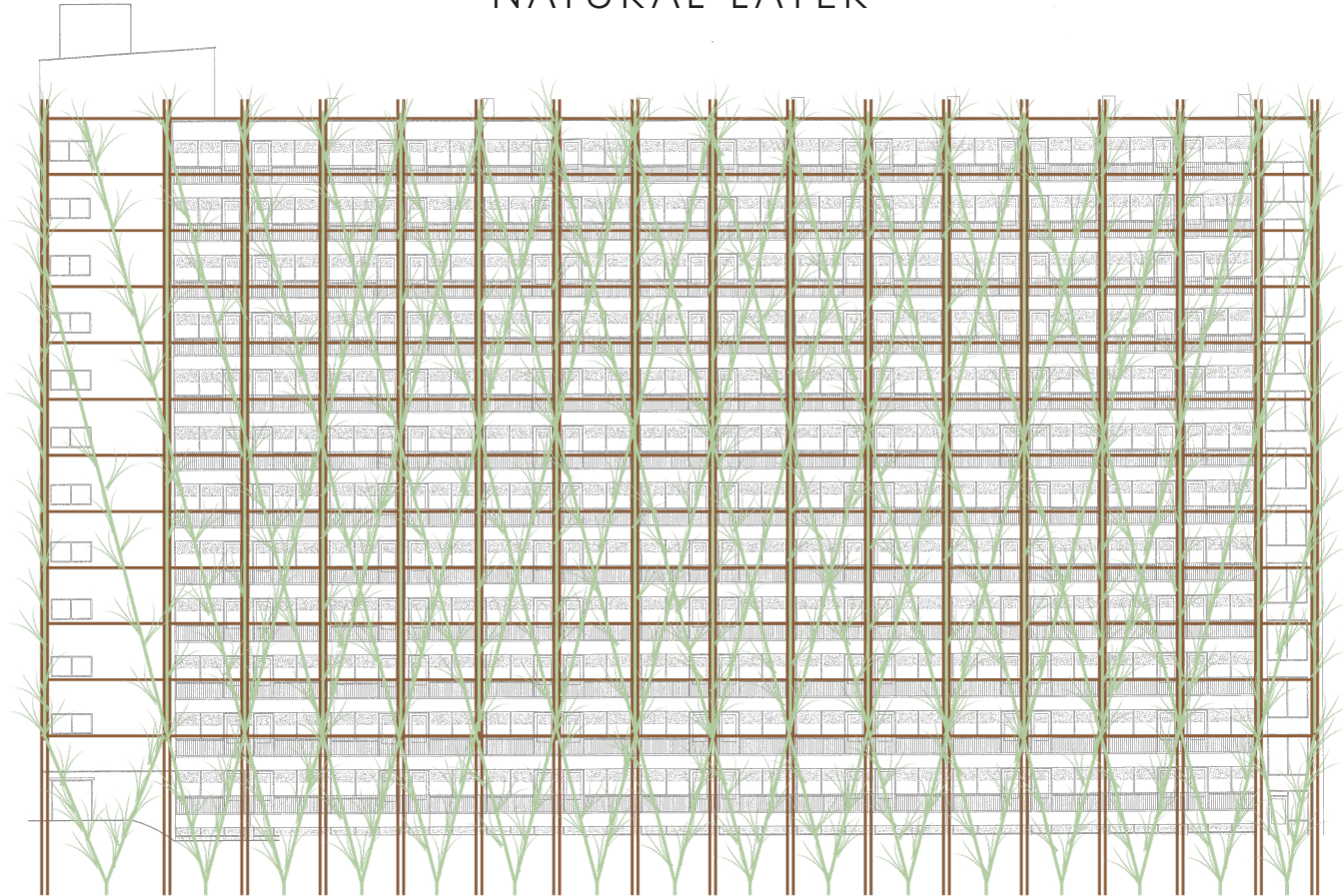
ARCHITECTURAL COMPONENTS

DESIGN



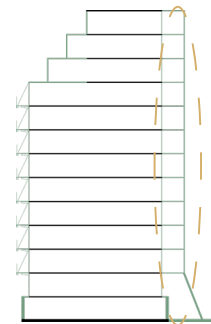
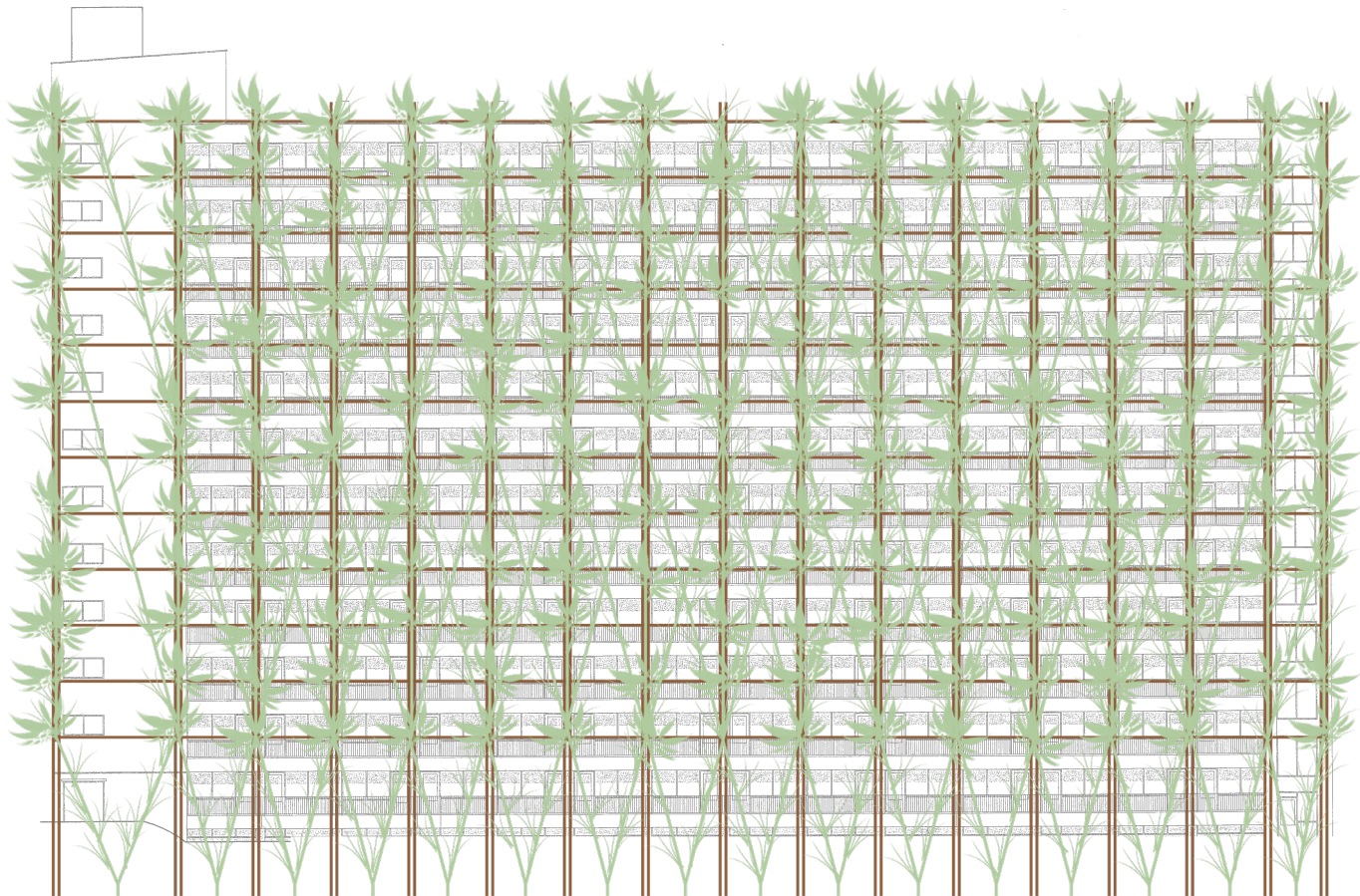
EAST FAÇADE: GALLERY CONSTRUCTION NATURAL LAYER

DESIGN



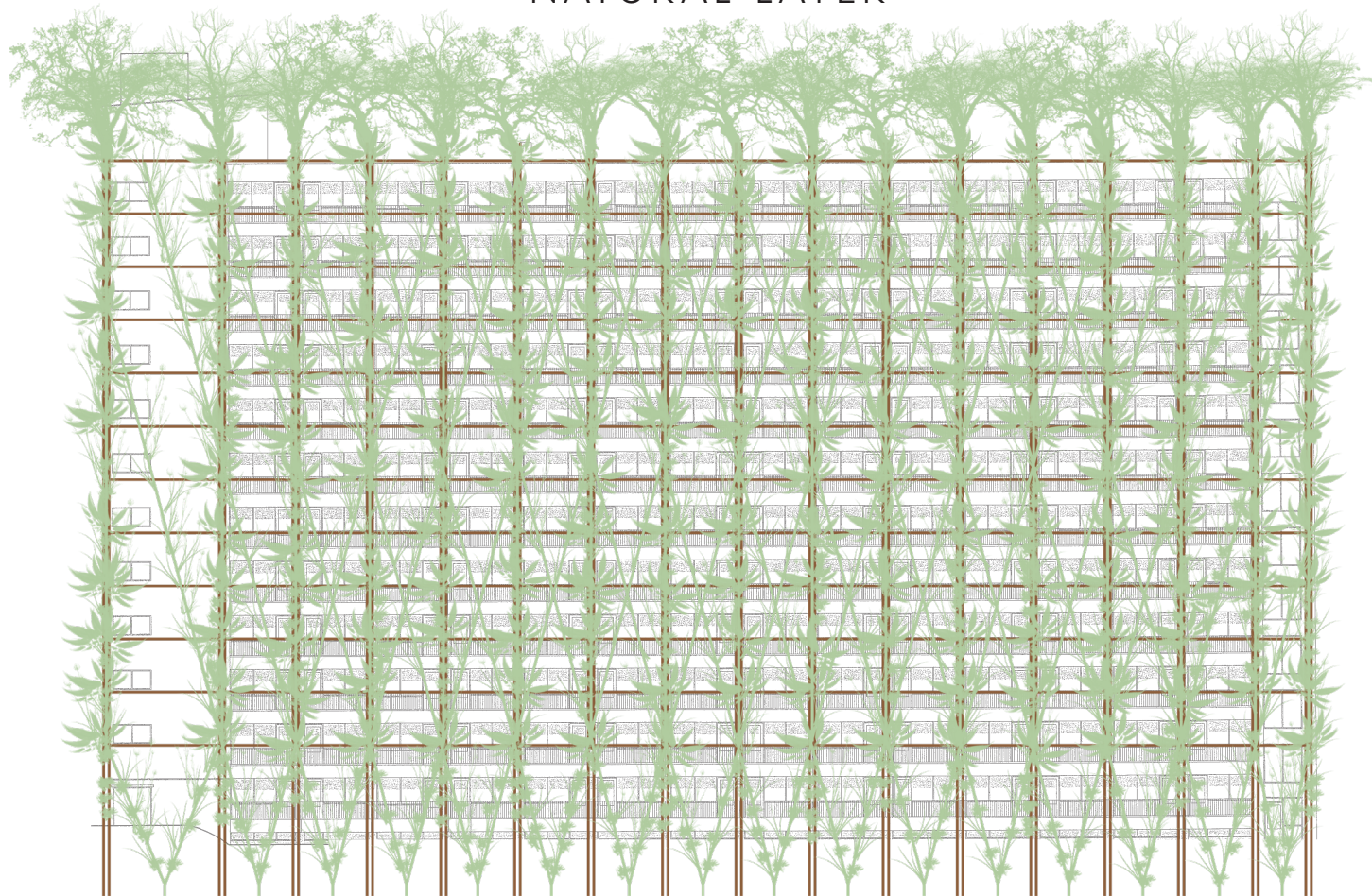
NATURAL LAYER

DESIGN



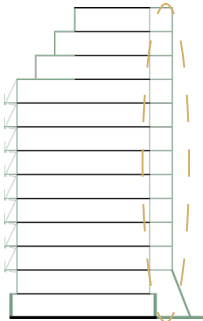
NATURAL LAYER

DESIGN



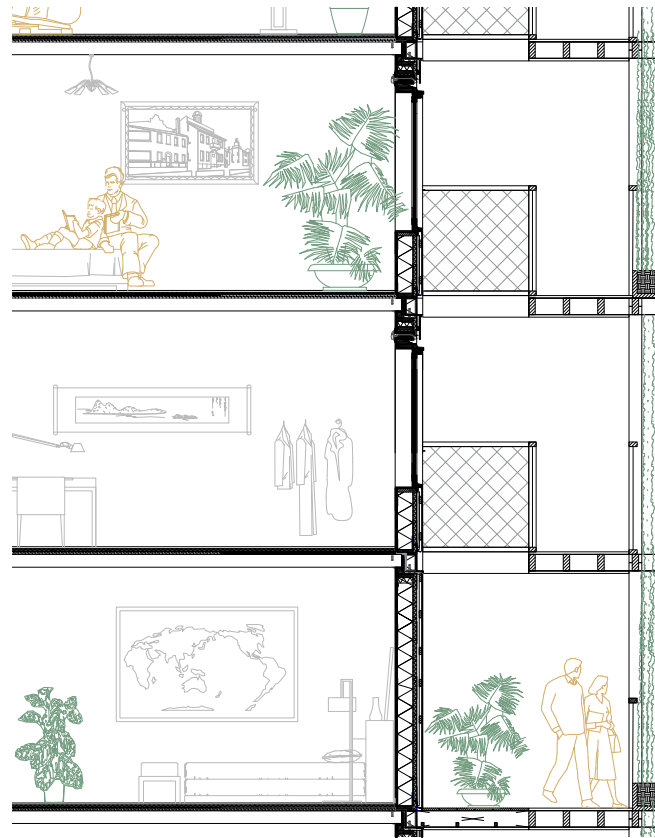
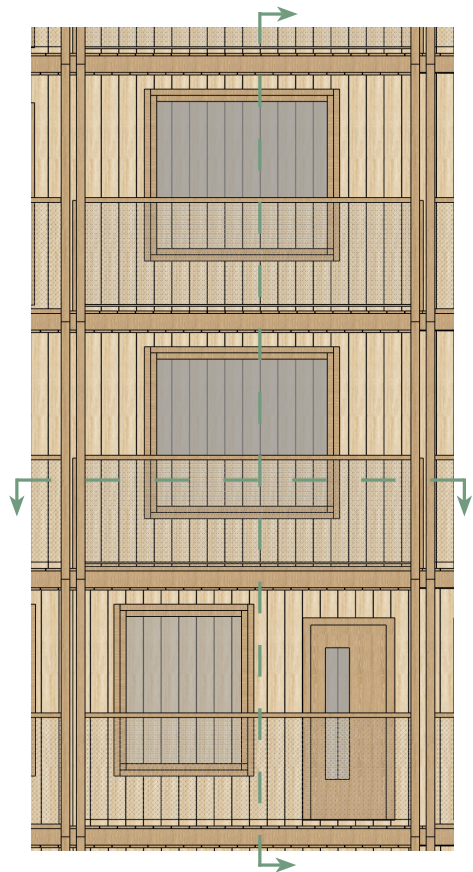
EAST FAÇADE ELEVATION

DESIGN



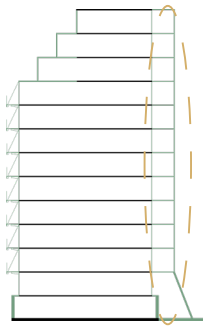
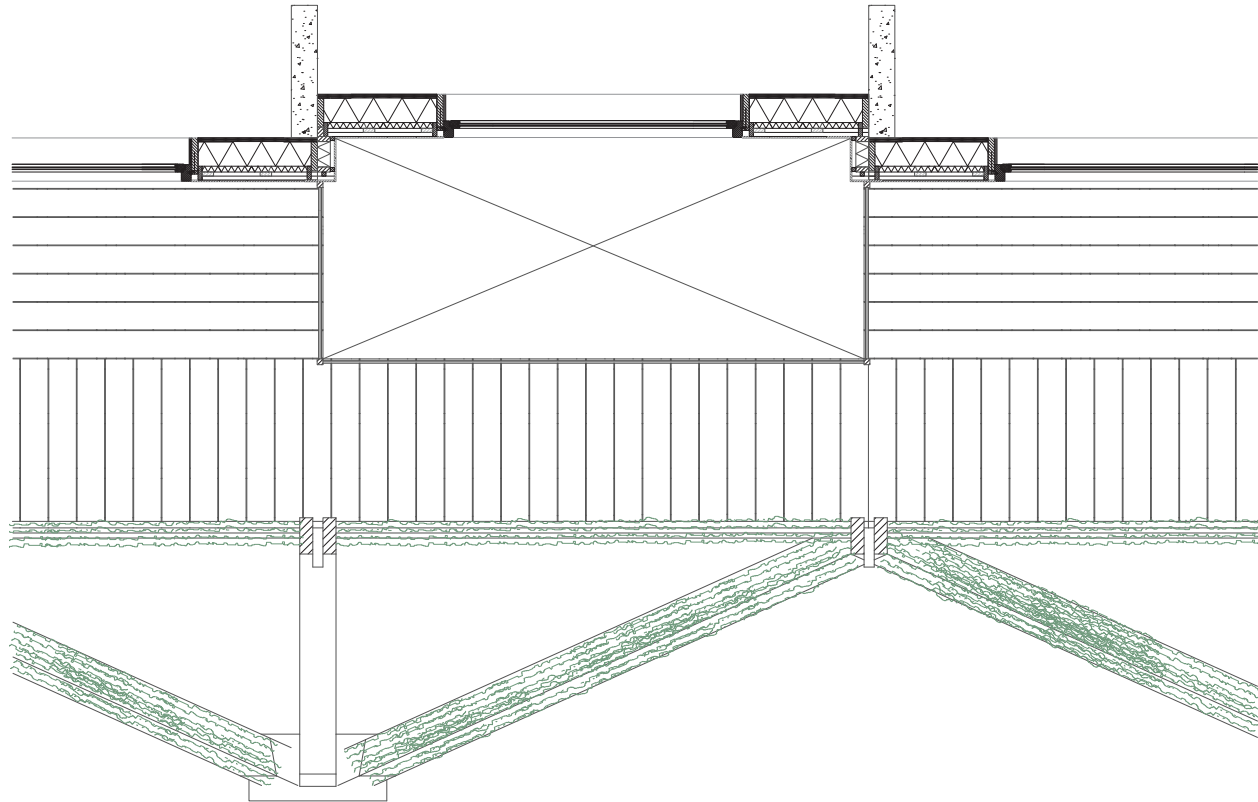
EAST FAÇADE FRAGMENT

DESIGN



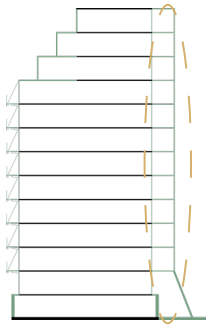
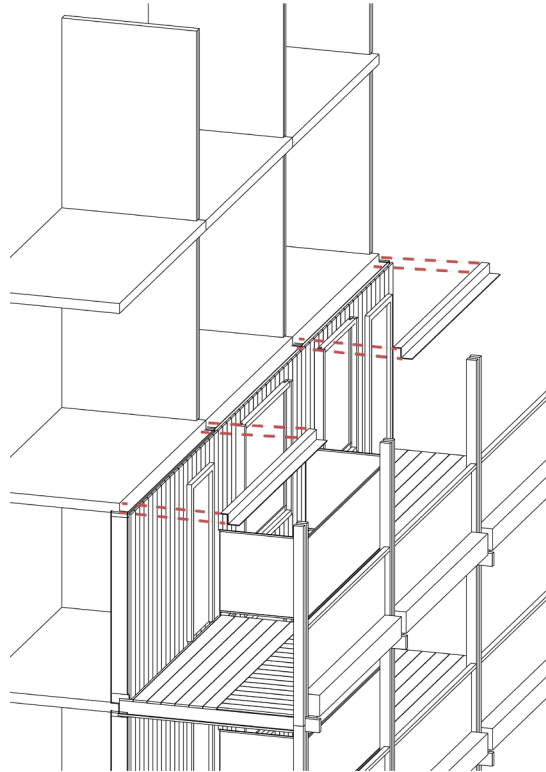
EAST FAÇADE HORIZONTAL SECTION

DESIGN



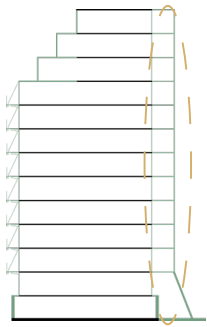
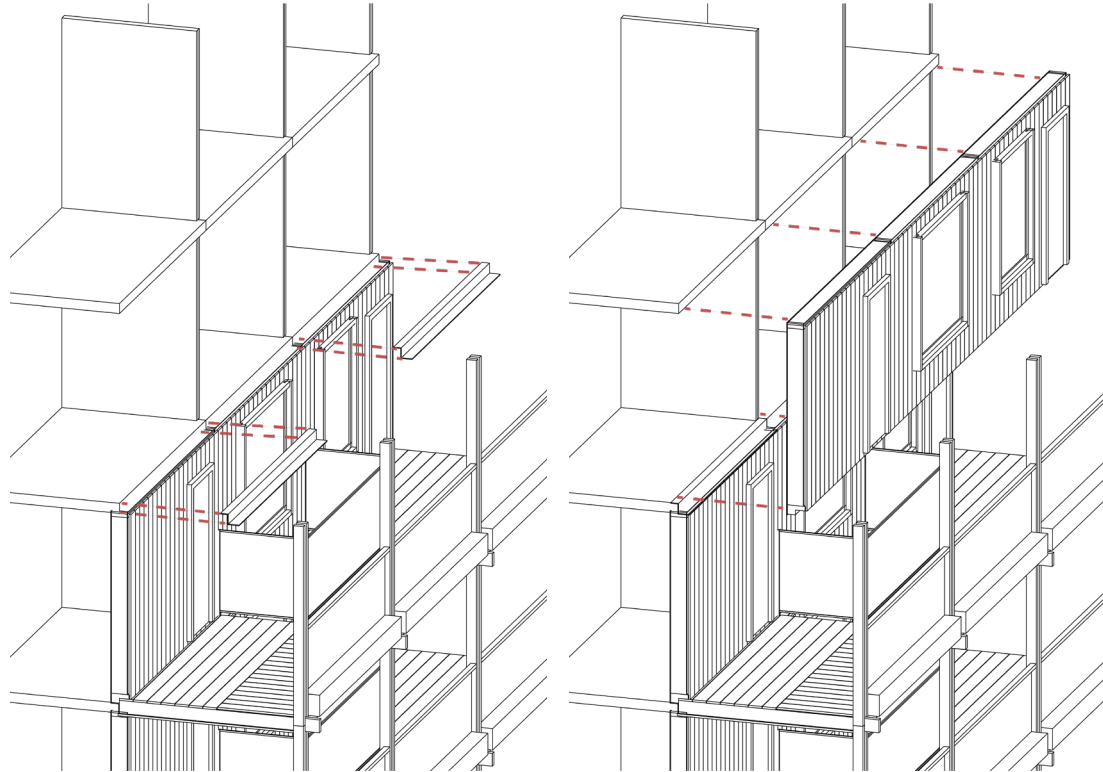
STEP-BY-STEP GALLERY CONSTRUCTION

DESIGN



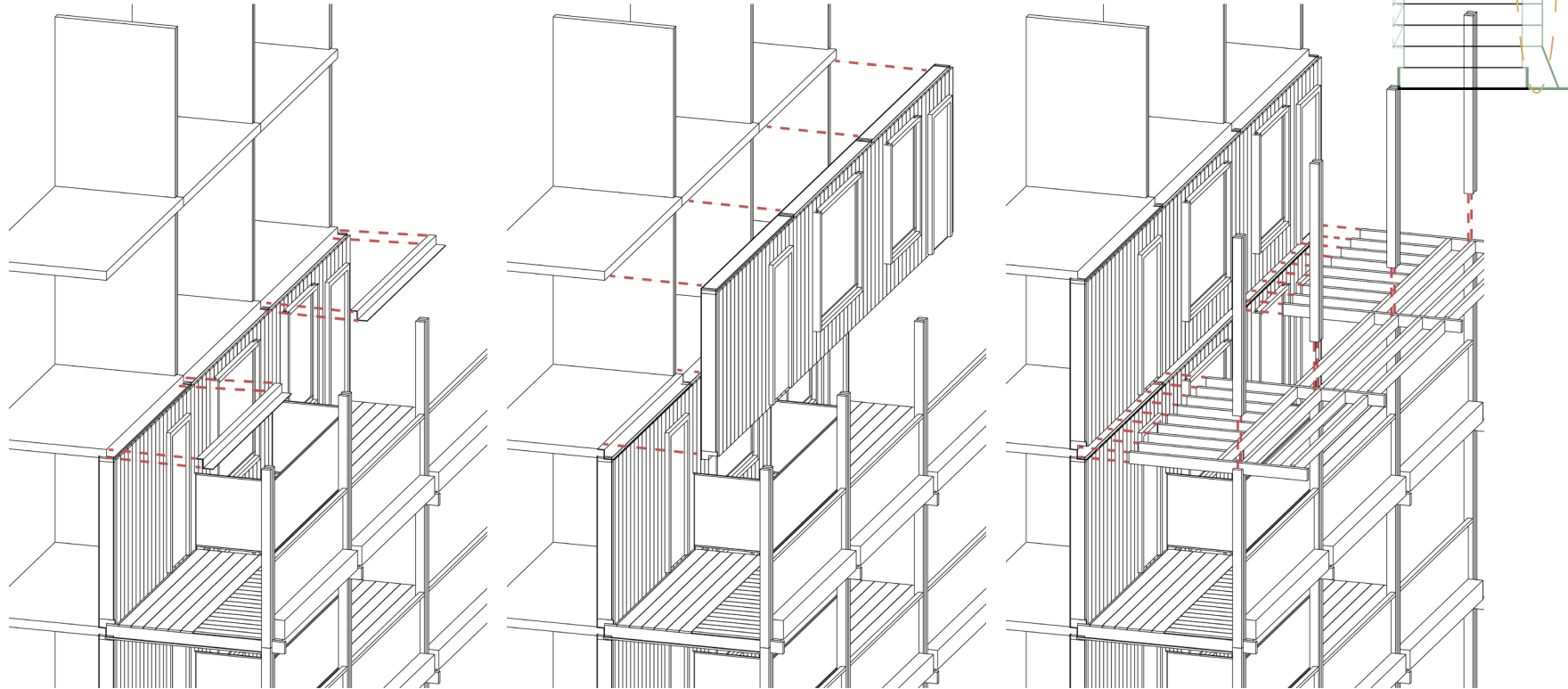
STEP-BY-STEP GALLERY CONSTRUCTION

DESIGN



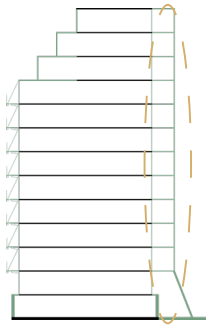
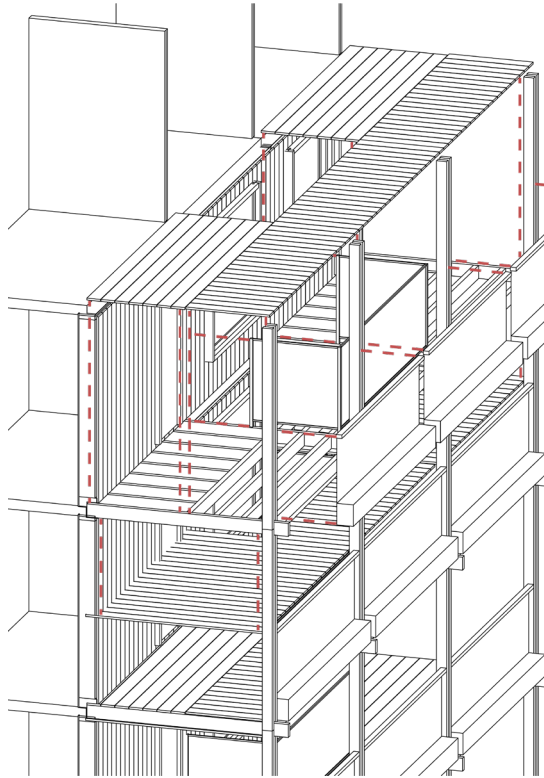
STEP-BY-STEP GALLERY CONSTRUCTION

DESIGN



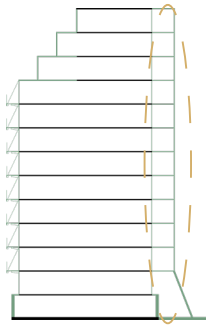
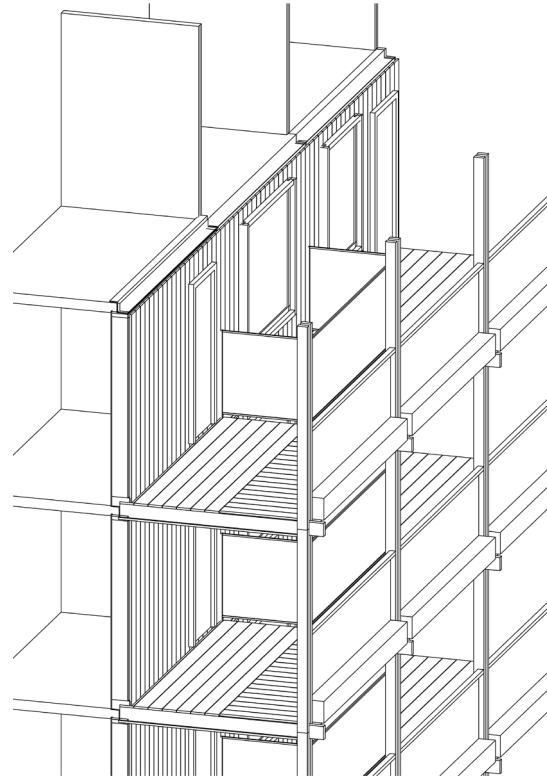
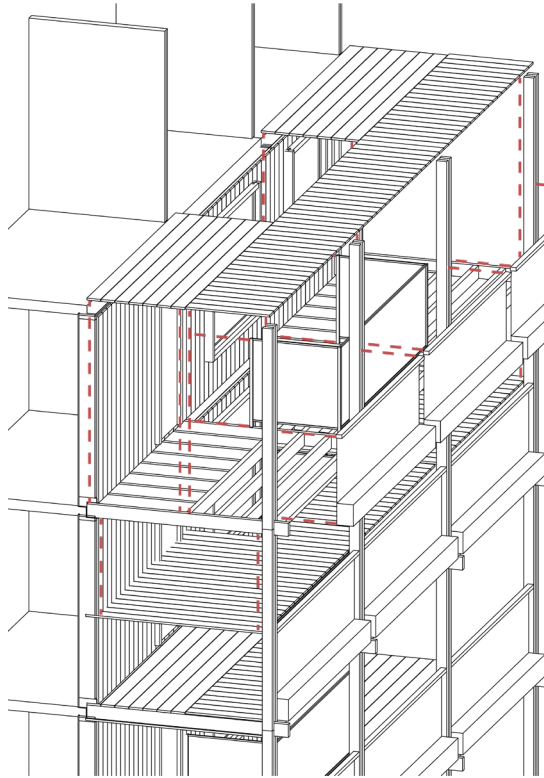
STEP-BY-STEP GALLERY CONSTRUCTION

DESIGN



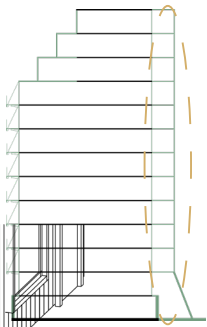
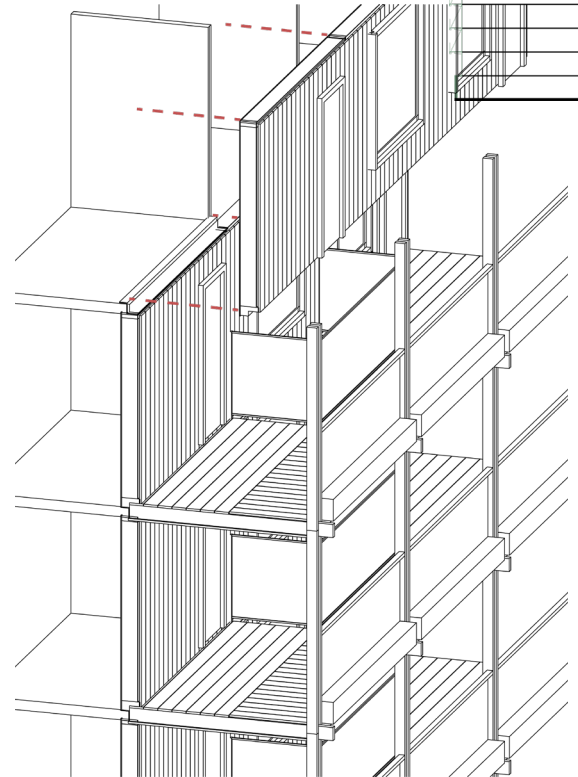
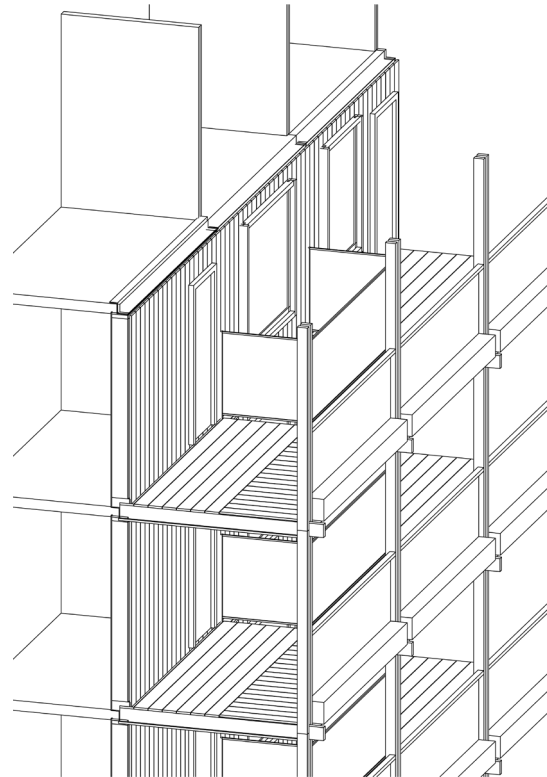
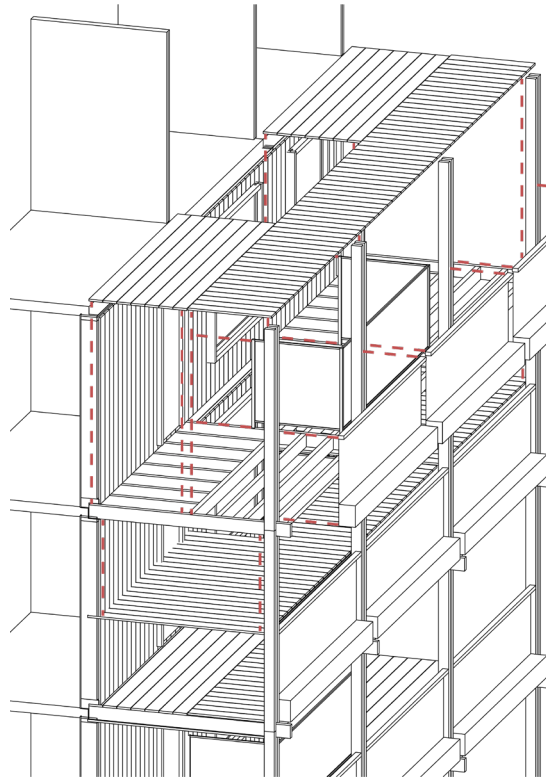
STEP-BY-STEP GALLERY CONSTRUCTION

DESIGN

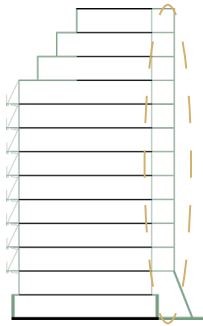
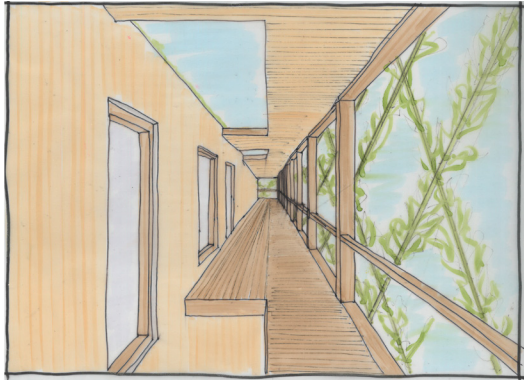


STEP-BY-STEP GALLERY CONSTRUCTION

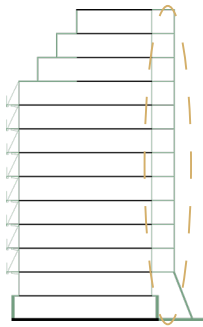
DESIGN



EAST FAÇADE IMPRESSIONS

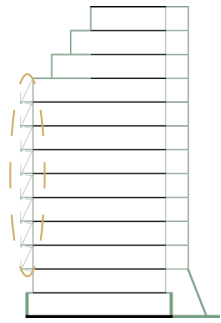


EAST FAÇADE IMPRESSIONS

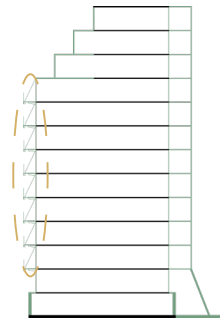
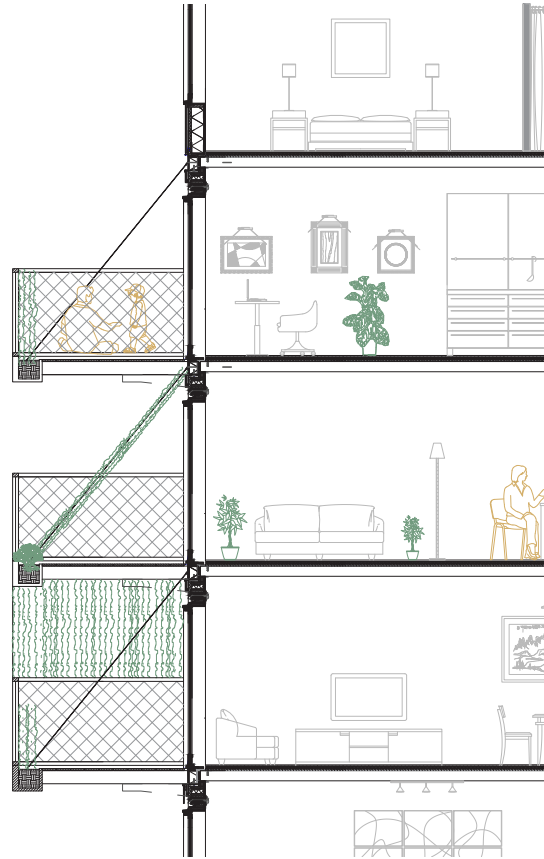


WEST FAÇADE ELEVATION

DESIGN

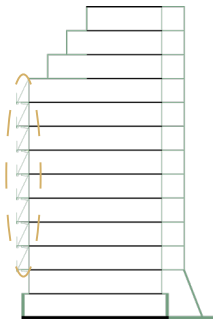


WEST FAÇADE FRAGMENT



WEST FAÇADE IMPRESSIONS

DESIGN



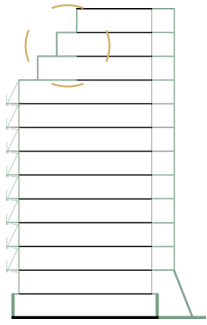
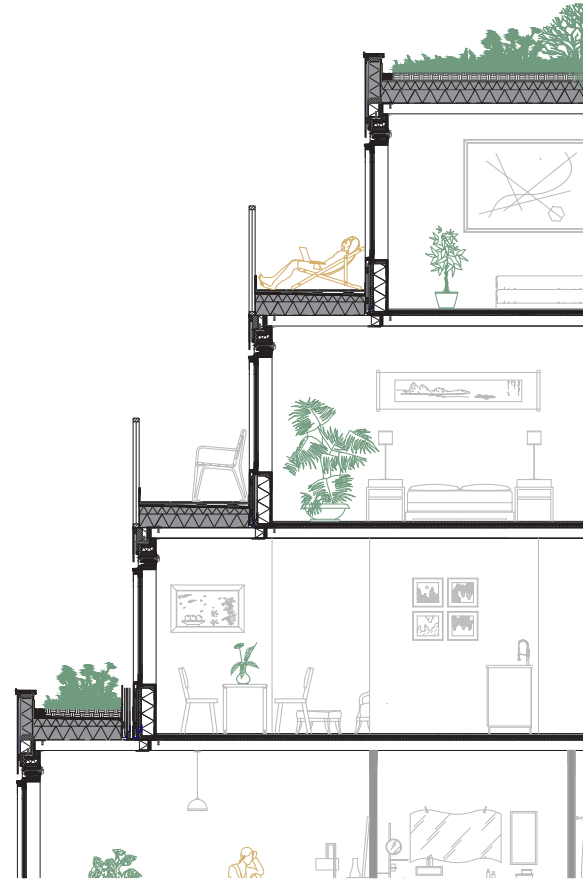
BALCONIES IMPRESSION

DESIGN

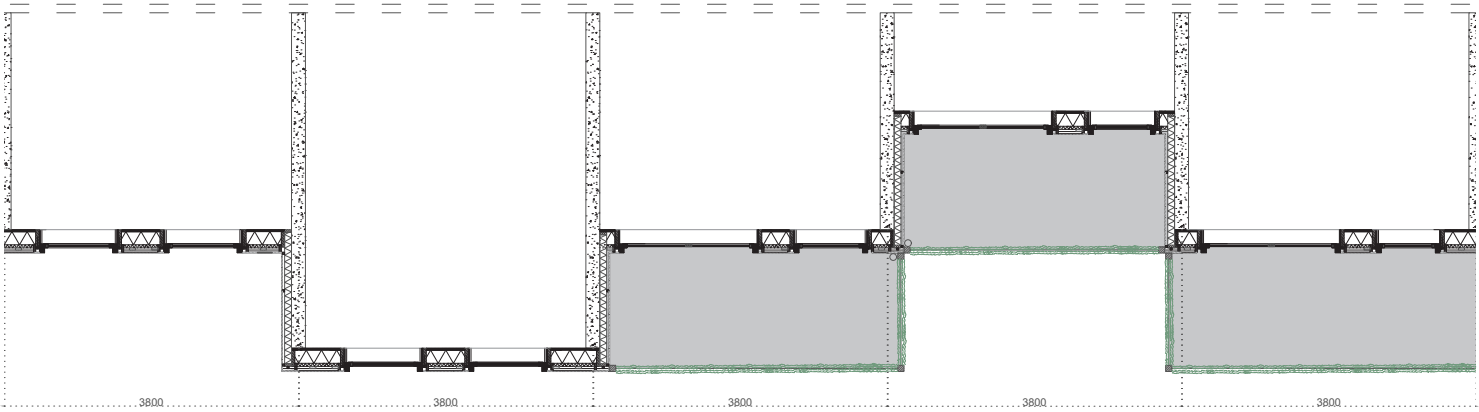
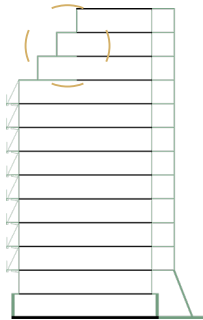


WEST FAÇADE: ROOFTOP FRAGMENT

DESIGN

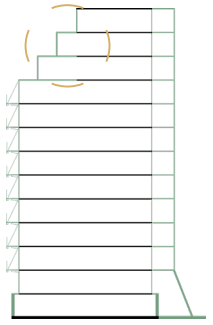


HORIZONTAL SECTION ROOFTOP



DESIGN

ROOFTOP IMPRESSIONS



DESIGN



WEST FAÇADE



COMMUNITY BUILDING

DESIGN

Participatory kitchen

Meeting places

Dining room

Vegetable garden



Educational activities

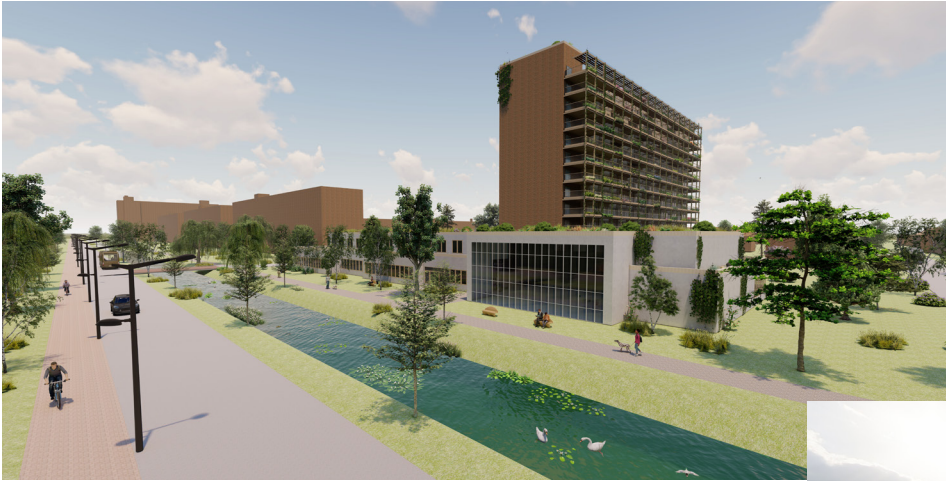
Library

Theater

Art expositions

COMMUNITY BUILDING

DESIGN



ECOLOGY



SWIFT



DRAGONFLY



SMALL NEWT



SAND BEE



HEDGEHOG



SHREW MOUSE



SEROTINE BAT



FAUNA
BOERHAAVEWIJK



COMMON TOAD



HOUSE SPARROW



MASON BEE



MARTEN



ERMINE



NATTERJACK TOAD



LONGHORN BEETLE

HABITAT HEIGHT FAUNA

DESIGN



SWIFT



SEROTINE BAT



HOUSE SPARROW



MASON BEE



MARTEN



ERMINE



NATTERJACK TOAD



LONGHORN BEETLE



DRAGONFLY



COMMON TOAD



SHREW MOUSE



HEDGEHOG

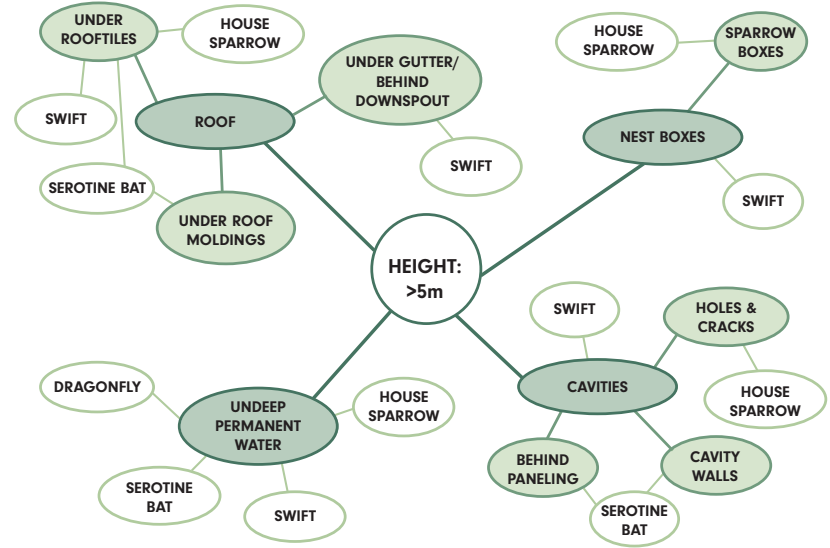
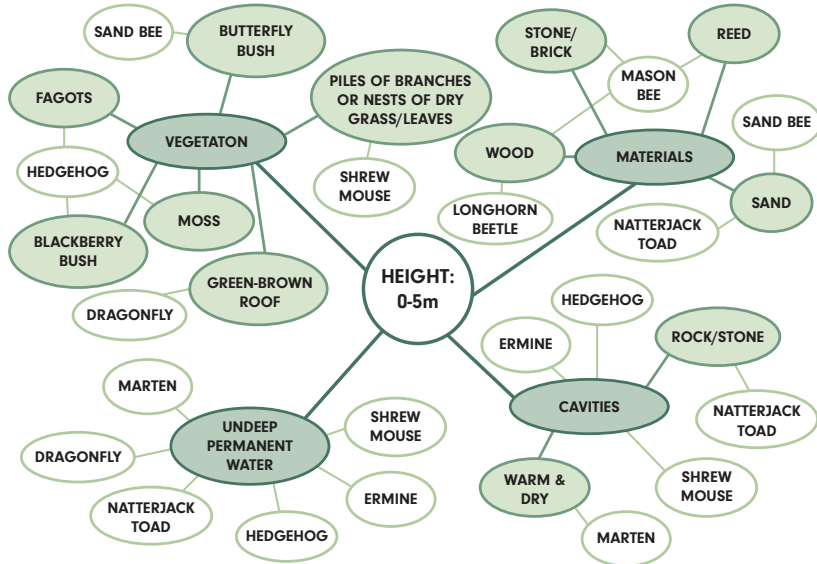


SMALL NEWT



SAND BEE

PREFERENCES LOCAL FAUNA



ECOLOGICAL DESIGN INTERVENTIONS FAÇADES



Cavities, cracks, greenery



SWIFT



SEROTINE BAT



HOUSE SPARROW



MARTEN



ERMINE



NATTERJACK TOAD



HEDGEHOG



SHREW MOUSE

ECOLOGICAL DESIGN INTERVENTIONS ROOF



Different types of vegetation
Green-brown roof, sand, stones & bricks



SWIFT



DRAGONFLY



MASON BEE



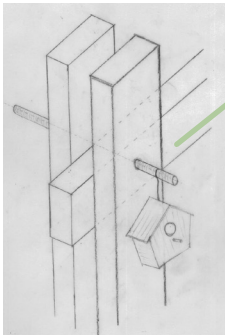
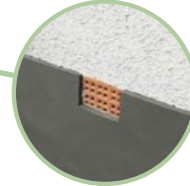
SAND BEE



SHREW MOUSE

ECOLOGICAL DESIGN INTERVENTIONS

Nests on construction



SWIFT



HOUSE SPARROW

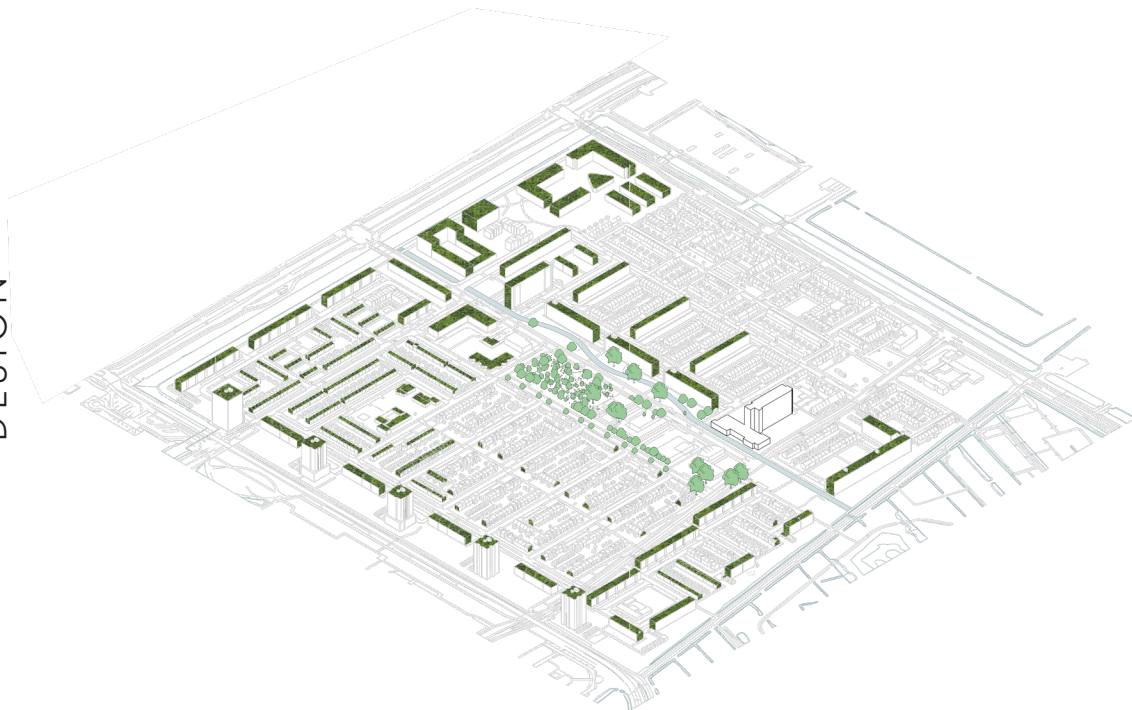
Nests in façade



SEROTINE BAT

IMPLEMENTATION ON SCALE OF NEIGHBOURHOOD

DESIGN



REFLECTION



REWILDING STRATEGIES



REWILDING STRATEGIES

Create opportunities for biodiversity
& make cities greener and more resilient

CONCLUSION



REWILDING STRATEGIES

Create opportunities for biodiversity
& make cities greener and more resilient

- Site-specific & depend on characteristics



REWILDING STRATEGIES

Create opportunities for biodiversity
& make cities greener and more resilient

- Site-specific & depend on characteristics
- Start at smaller scale



REWILDING STRATEGIES

Create opportunities for biodiversity
& make cities greener and more resilient

- Site-specific & depend on characteristics
- Start at smaller scale
- Rewild together



REWILDING STRATEGIES

Create opportunities for biodiversity
& make cities greener and more resilient

- Site-specific & depend on characteristics
- Start at smaller scale
- Rewild together
- Rewild architecture





LET'S REWILD OUR CITIES!