

>1:1

2050

References: World Economic Forum. (2016).
The New Plastics Economy: Rethinking the future of plastics. T. W. E. Forum.



Waste



Resources

ReCoNet

a recycling community network for living

CONTENT

Structure of the presentation

1

Introduction
Plastic crisis

2

Thematic research
Use of recycled plastic

3

Site
Analysis of Merwedeterrein

4

Vision
Reconnect in 3 different scales

5

Macro
Reconnect the site

6

Meso
Reconnect the neighbour

7

Micro
Reconnect the nature

8

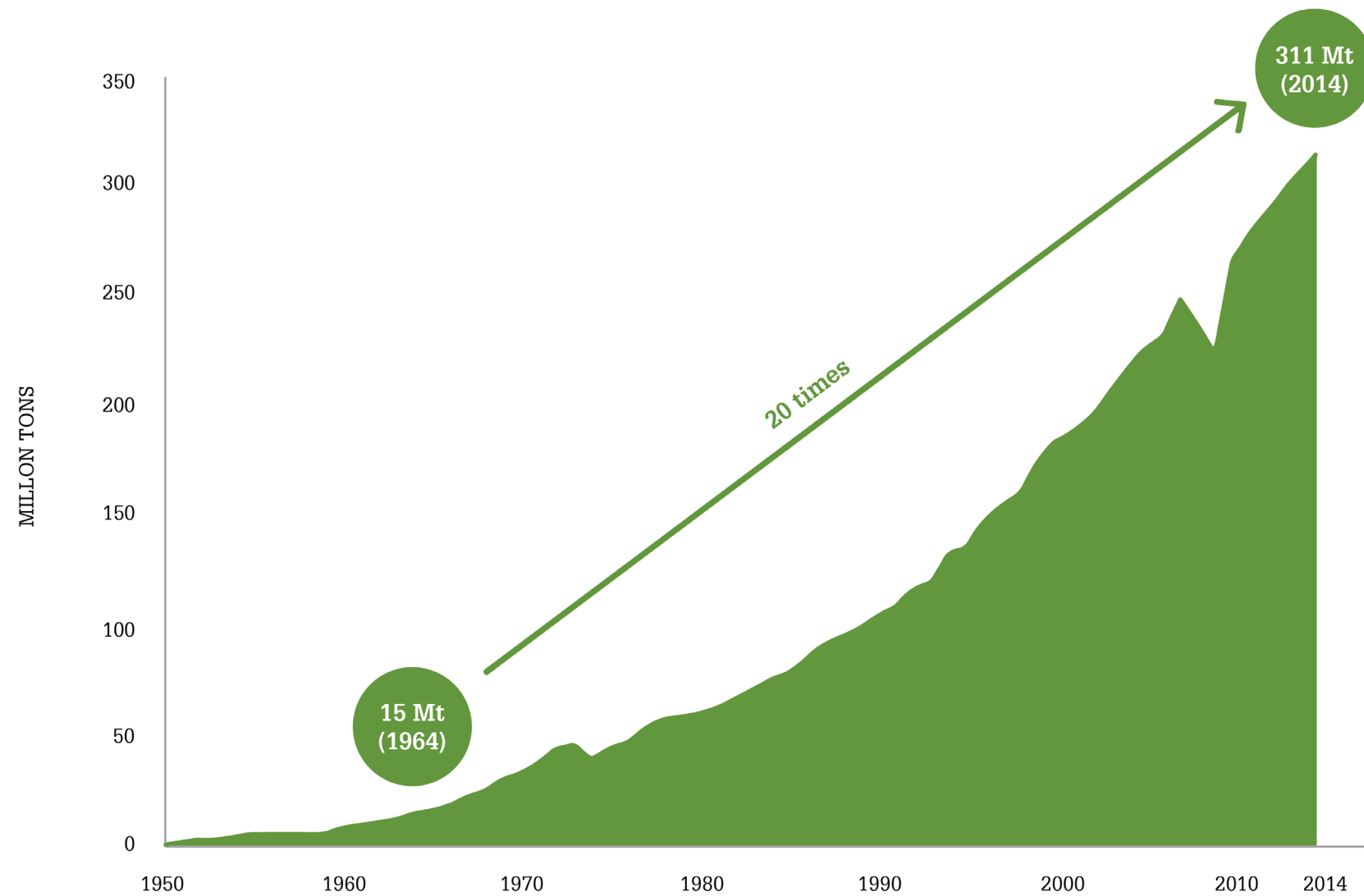
**Future
development**
Future-proof ReCoNet

INTRODUCTION

Plastic crisis

PLASTIC CRISIS

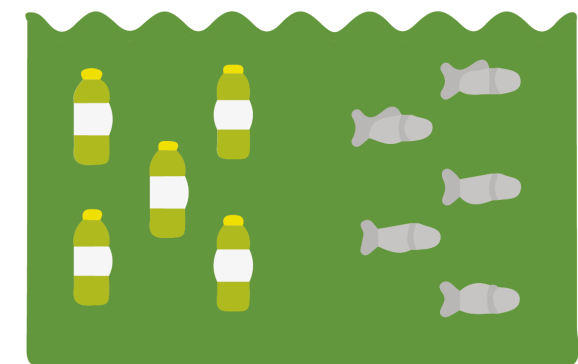
Growth in plastic production



2050



1,124 M tons

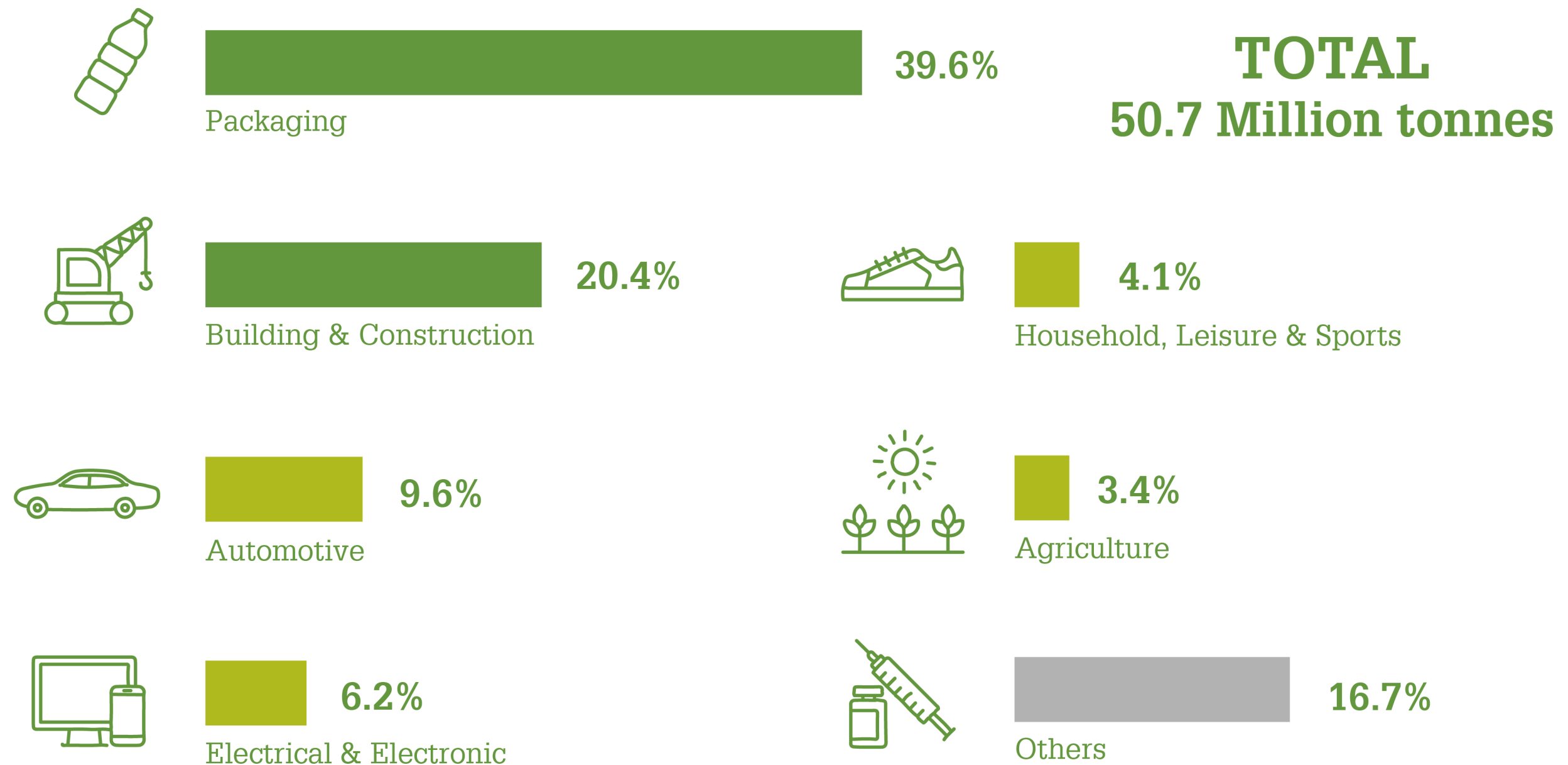


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Note: World Economic Forum. (2016). *The New Plastics Economy: Rethinking the future of plastics*. T. W. E. Forum.

PLASTIC CRISIS

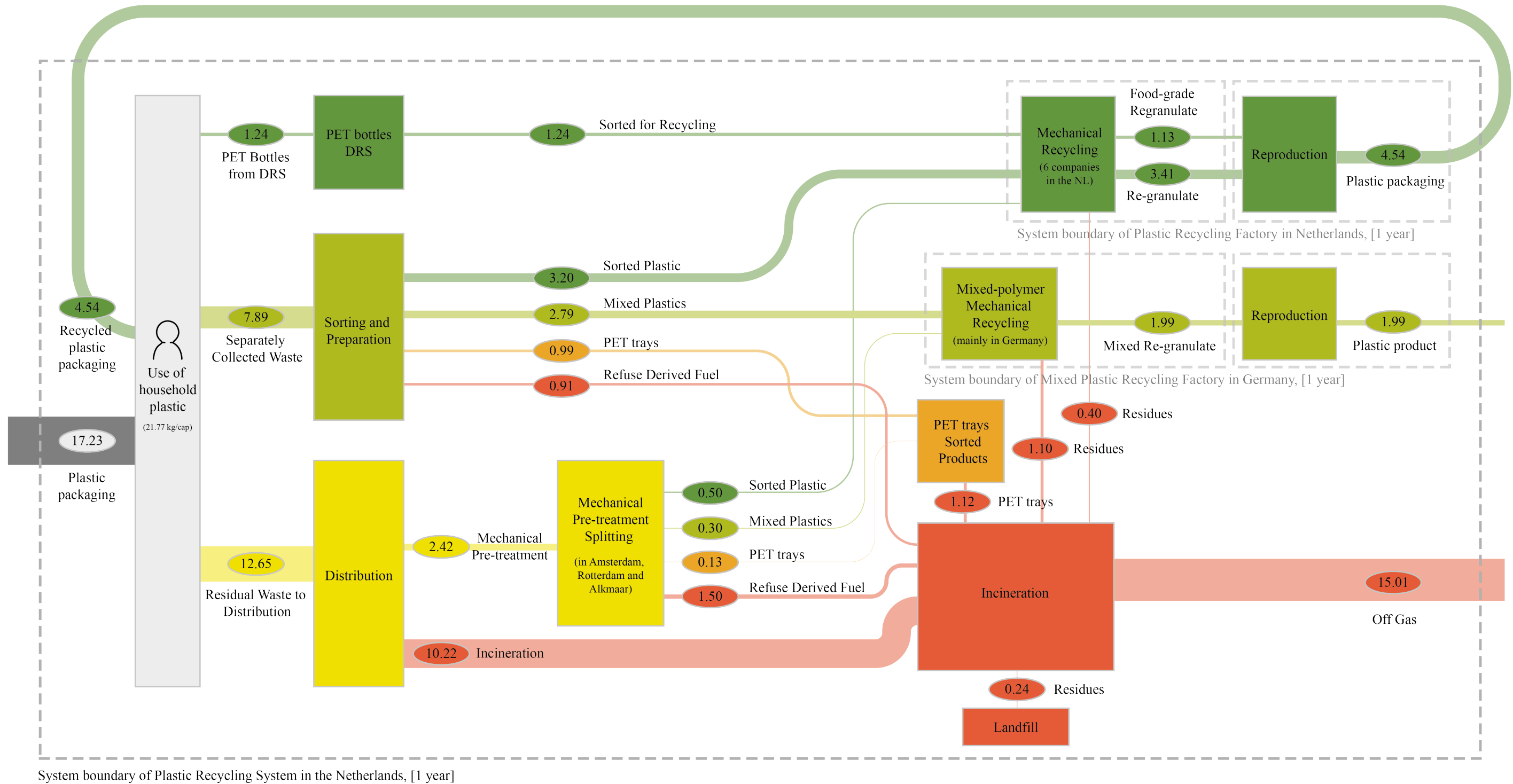
Plastics demand by segment in Europe in 2019



Plastics Europe. (2012).

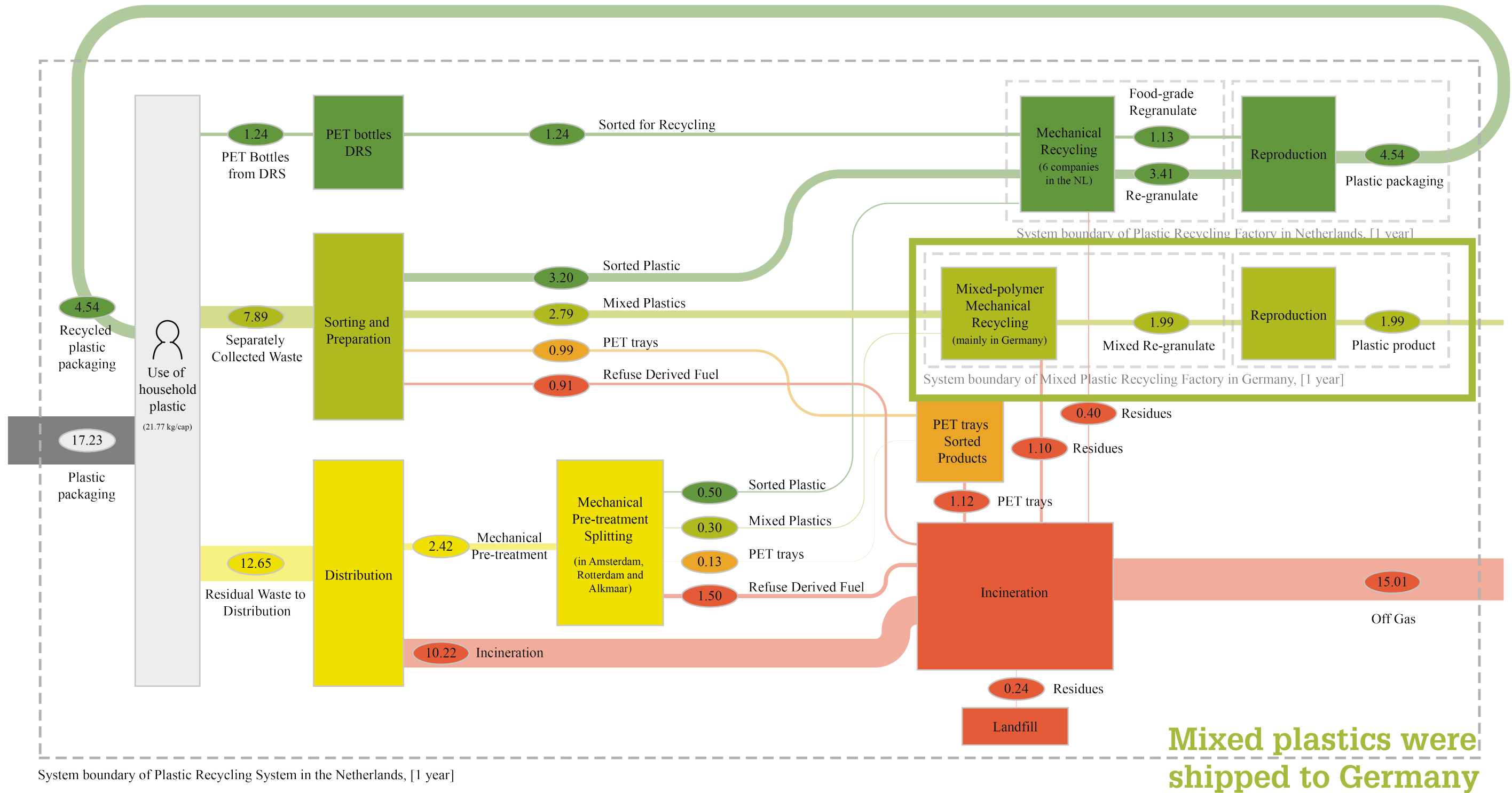
Plastics: Architects of modern and sustainable buildings. P. AISBL. https://plasticseurope.org/wp-content/uploads/2021/10/Final_BC_brochure_111212_web_version_UPD2018.pdf

PLASTIC FLOW IN THE NETHERLANDS



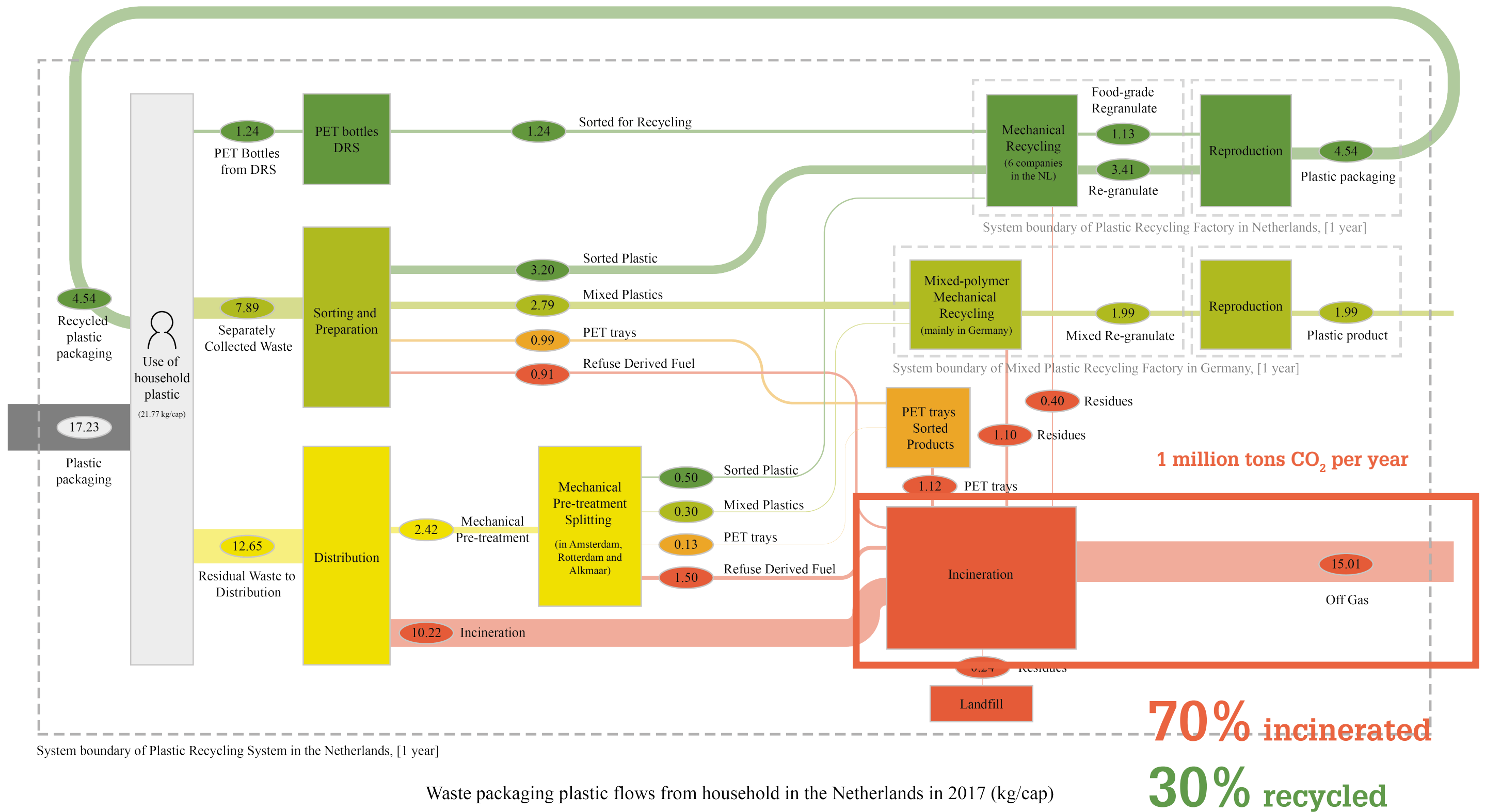
Waste packaging plastic flows from household in the Netherlands in 2017 (kg/cap)

PLASTIC FLOW IN THE NETHERLANDS



Waste packaging plastic flows from household in the Netherlands in 2017 (kg/cap)

PLASTIC FLOW IN THE NETHERLANDS



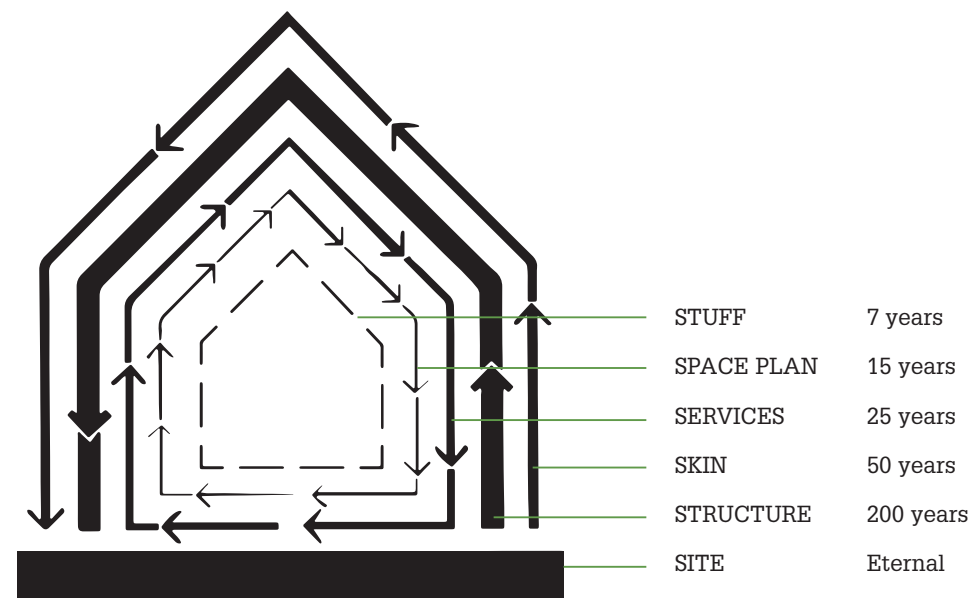
THEMATIC RESEARCH

Use of recycled plastics

RESEARCH QUESTION

The use of recycled plastic in shearing layers

How can **recycled plastic household waste** be applied within the **shearing layers** of Stewart Brand's model?



Shearing layers of change by Stewart Brand (1994)

RESEARCH RESULT

Shearing layers of change



STUFF
SPACE PLAN
SERVICES
SKIN
STRUCTURE
SITE

7 years
15 years
25 years
50 years
200 years
Eternal

Upper layers
↑
Bottom layers

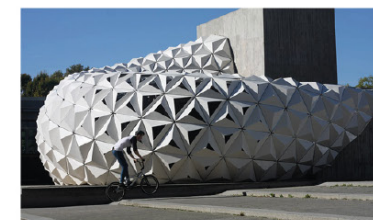
SPACE PLAN



SERVICES



SKIN



STRUCTURE



RESEARCH RESULT

Shearing layers of change

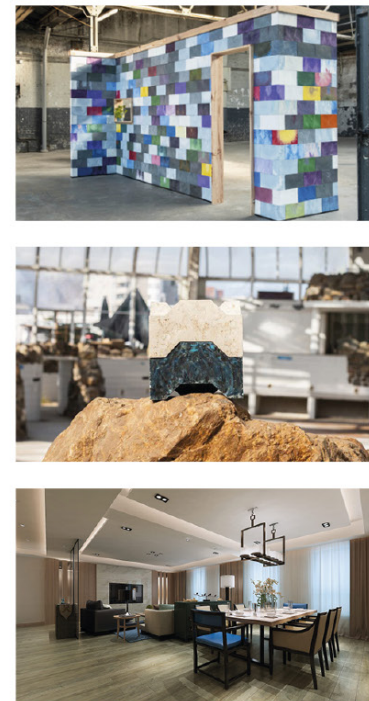


STUFF
SPACE PLAN
SERVICES
SKIN
STRUCTURE
SITE

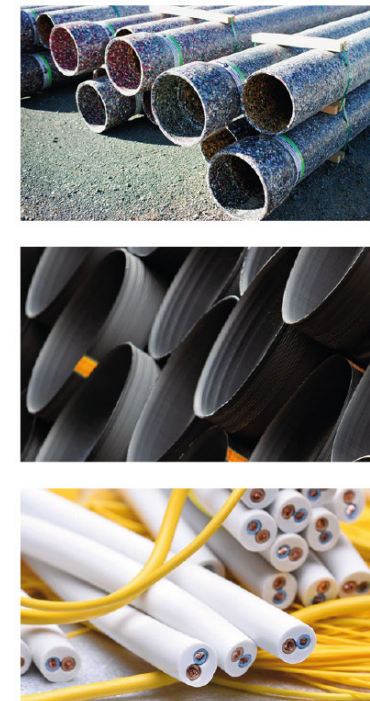
7 years
15 years
25 years
50 years
200 years
Eternal

Upper layers
↑
Bottom layers

SPACE PLAN



SERVICES



SKIN



STRUCTURE



Possible

Best

Only for
small scale

Introduction | Thematic Research | Site | Vision | Macro | Meso | Micro | Future development

RESEARCH RESULT

Characteristics of recycled plastics

Visual



Various of colours



Easy to mould

Weather-proof



Water resistance

Insulation



Better than conventional insulation (U-value:0.18)¹



As good as acoustic tiles²
($\alpha = 0.5$)

Fire resistance



Class B in fire resistance³

¹ JD Composites. (2019). Homeowner information sheet.

² Biskupičová, A., Ledererová, M., Unčík, S., Glorieux, C., & Rychtáriková, M. (2021). Sound absorption properties of materials based on recycled plastic granule mixtures. *Slovak Journal of Civil Engineering*, 29(1), 15-19.

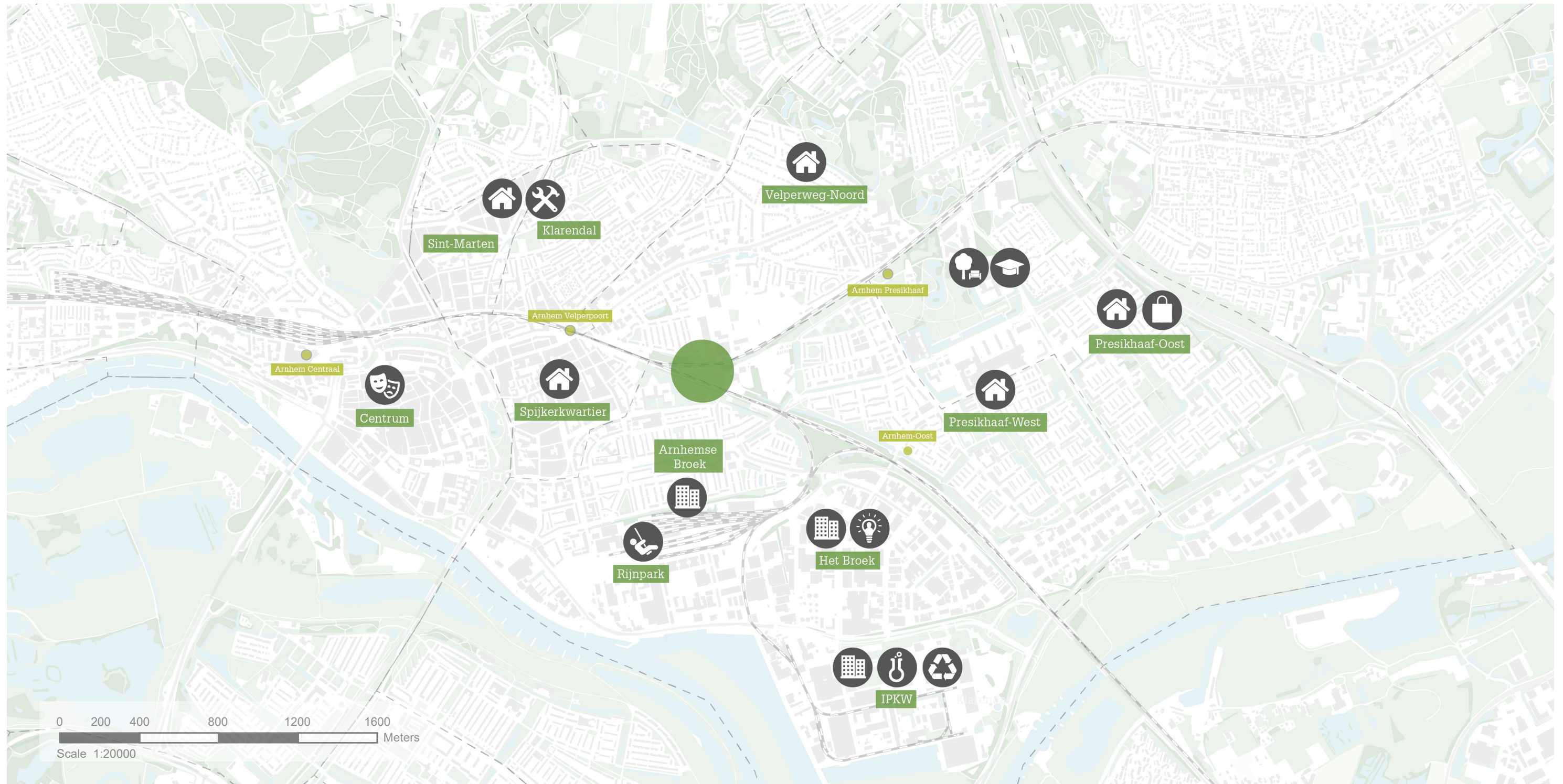
³ Pretty Plastic. (2021). Product information. Pretty Plastic. Retrieved 04 January 2022 from <https://www.prettyplastic.nl/tile/#product-information>

SITE

Analysis of Merwedeterrein

HEART OF THE CITY

North Arnhem in the Presikhaaf region



LACK OF CONNECTION

Program in Merwedeterrein



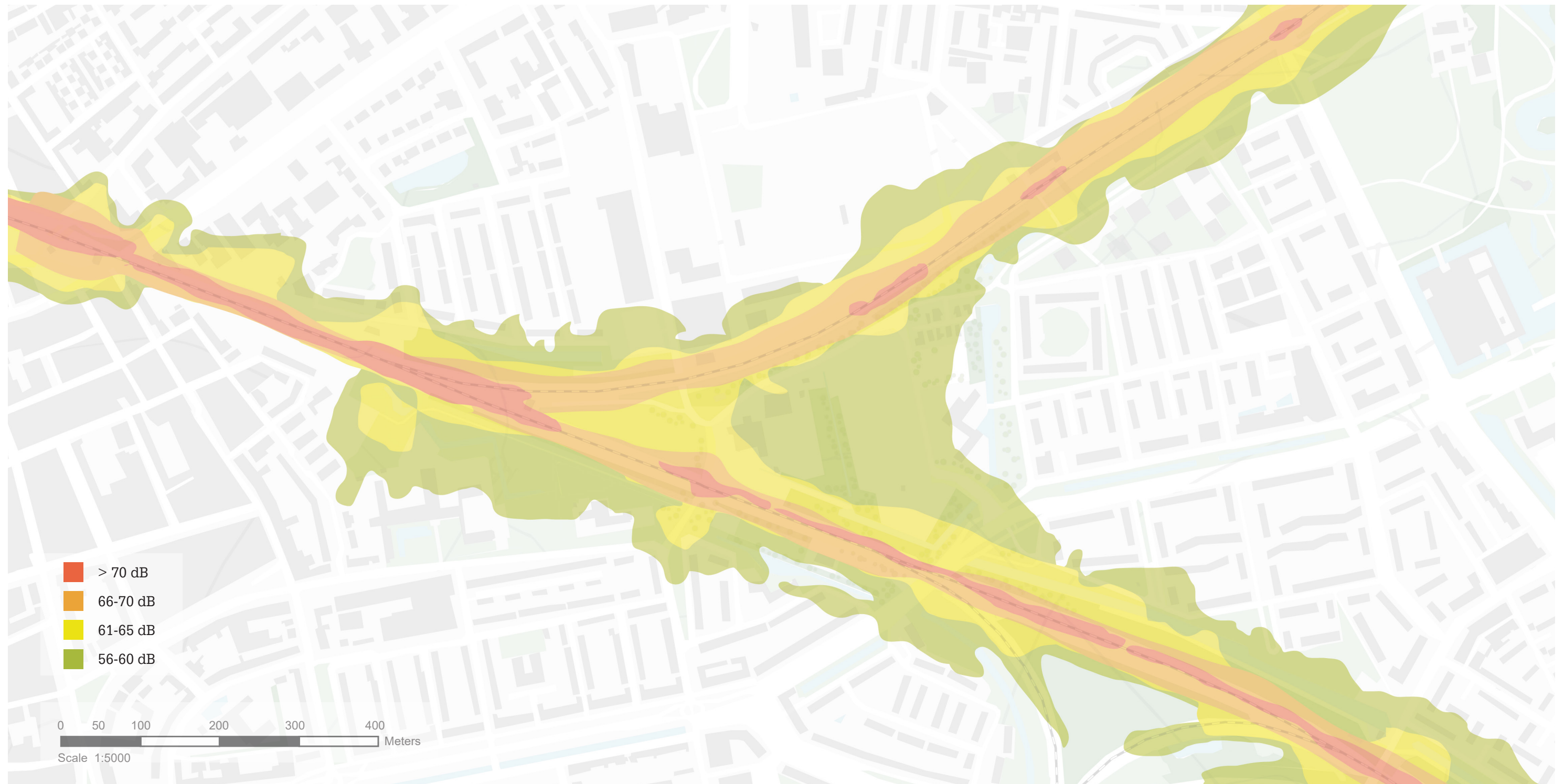
LACK OF CONNECTION

Circulation in Merwedeterrein



NOISY

Noise diagram in Merwedeterrein

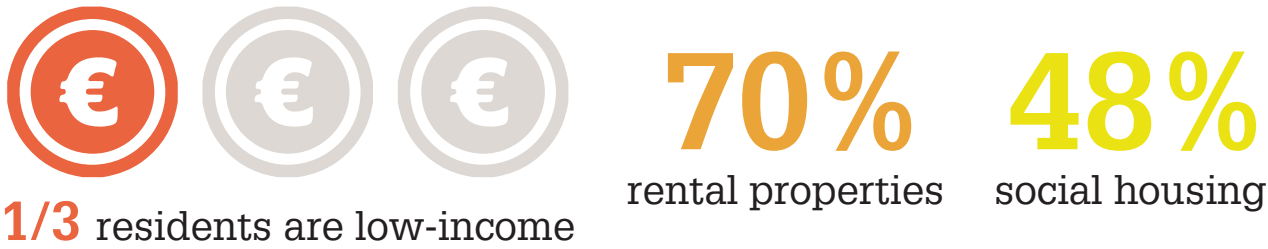
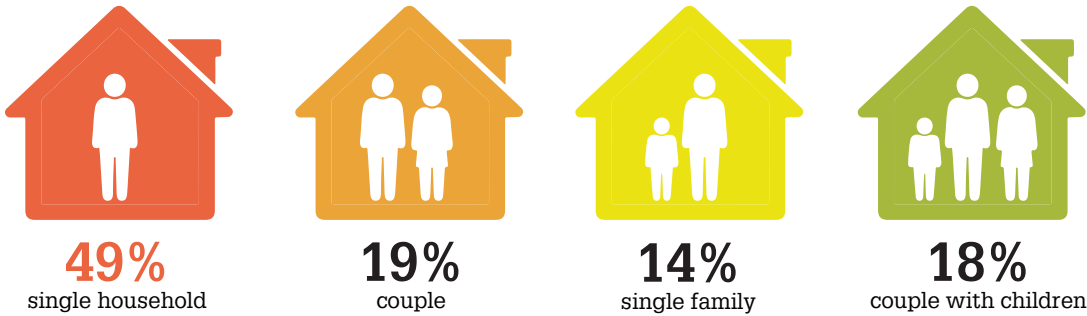
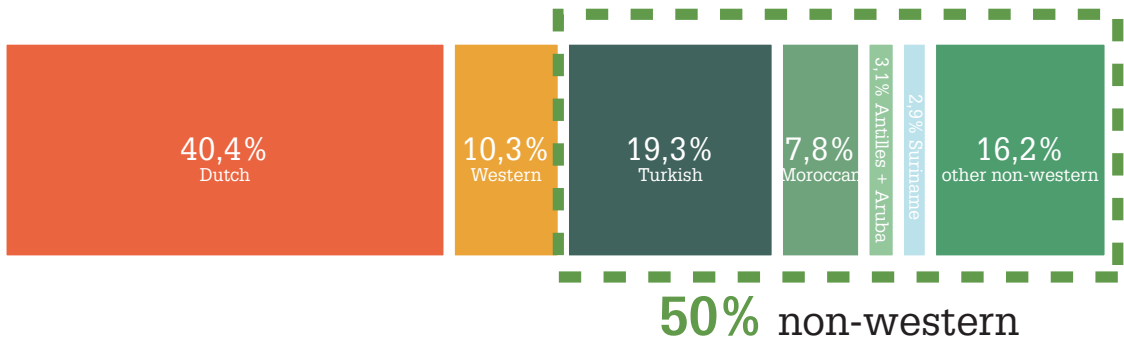


MIXED USERS

Demographics in Presikhaaf-West



16.000 residents
(8.800 households | 1,5 km²)



Arnhem - Presikhaaf-West

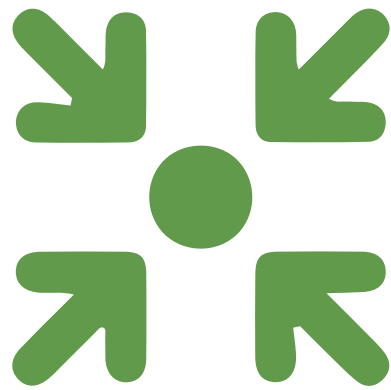
VISION

ReCoNet in 3 different scales

VISION

ReCoNet - Reconnect in 3 different scales

MACRO



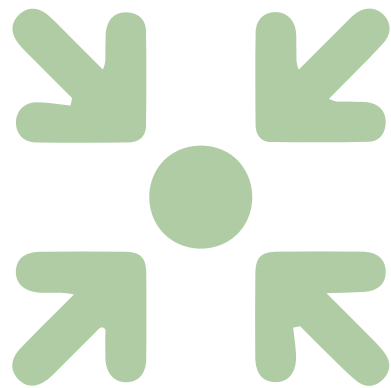
Site

reconnect the site
to form a new recycling centre

VISION

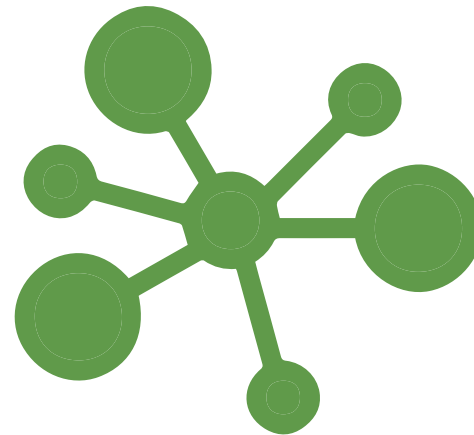
ReCoNet - Reconnect in 3 different scales

MACRO



Site
reconnect the site
to form a new recycling centre

MESO

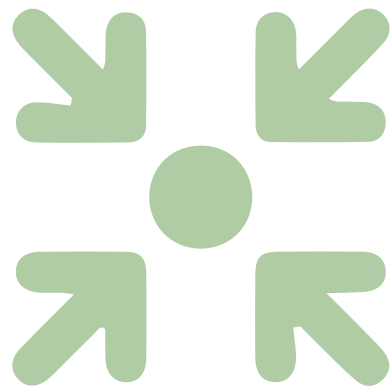


Neighbourhood
reconnect the neighbourhood
to form a recycling plastic community

VISION

ReCoNet - Reconnect in 3 different scales

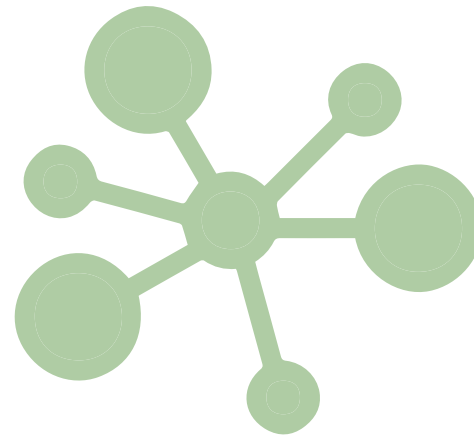
MACRO



Site

reconnect the site
to form a new recycling centre

MESO



Neighbourhood

reconnect the neighbourhood
to form a recycling plastic community

MICRO



Nature

reconnect the nature
to use recycled plastic in a circular and
sustainable way

MACRO

reconnect the site

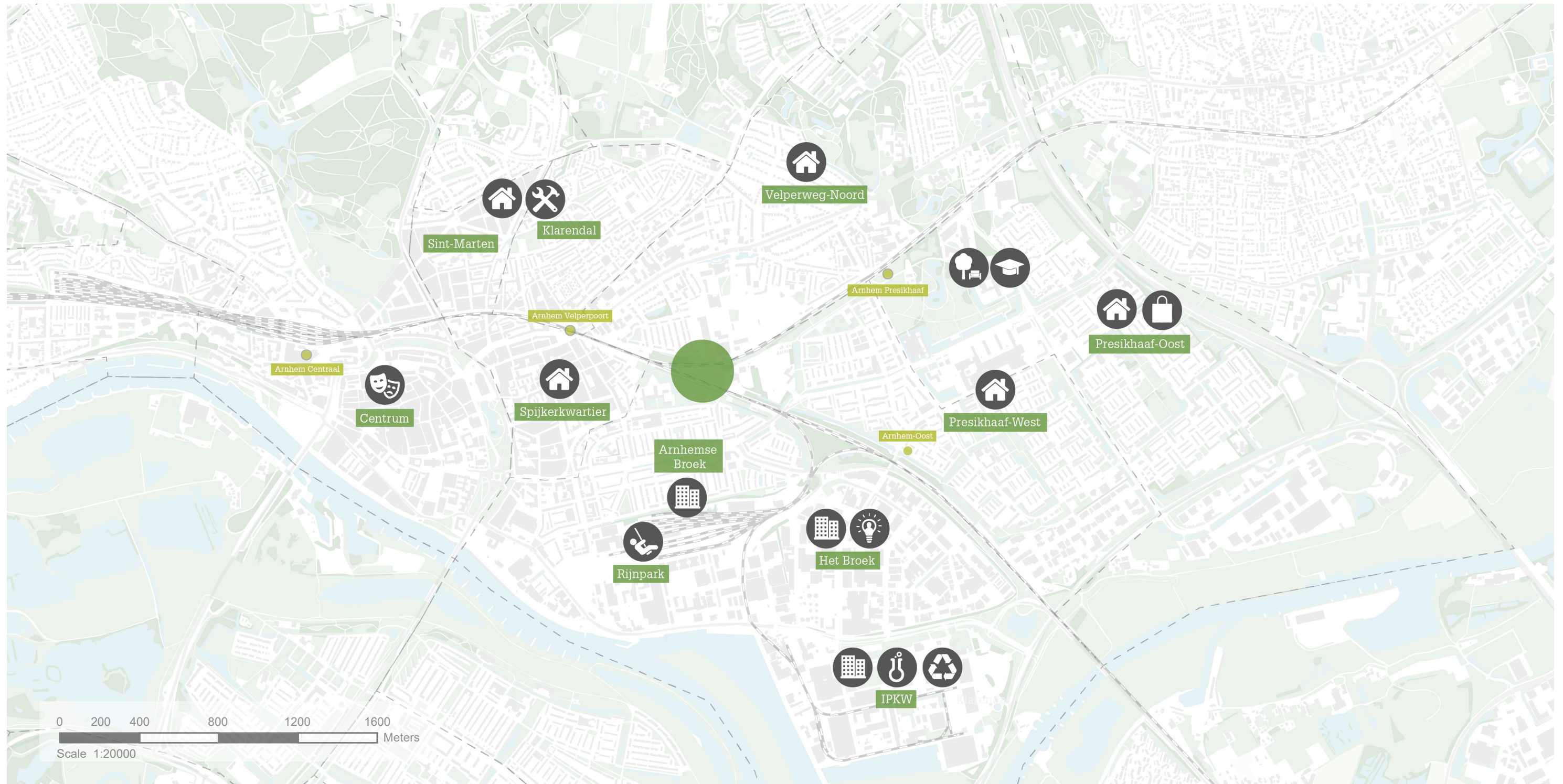
to form a New recycling centre in Arnhem

1. Plastic recycling factory
2. Treatment of existing users
3. Recycled park

keywords: connection

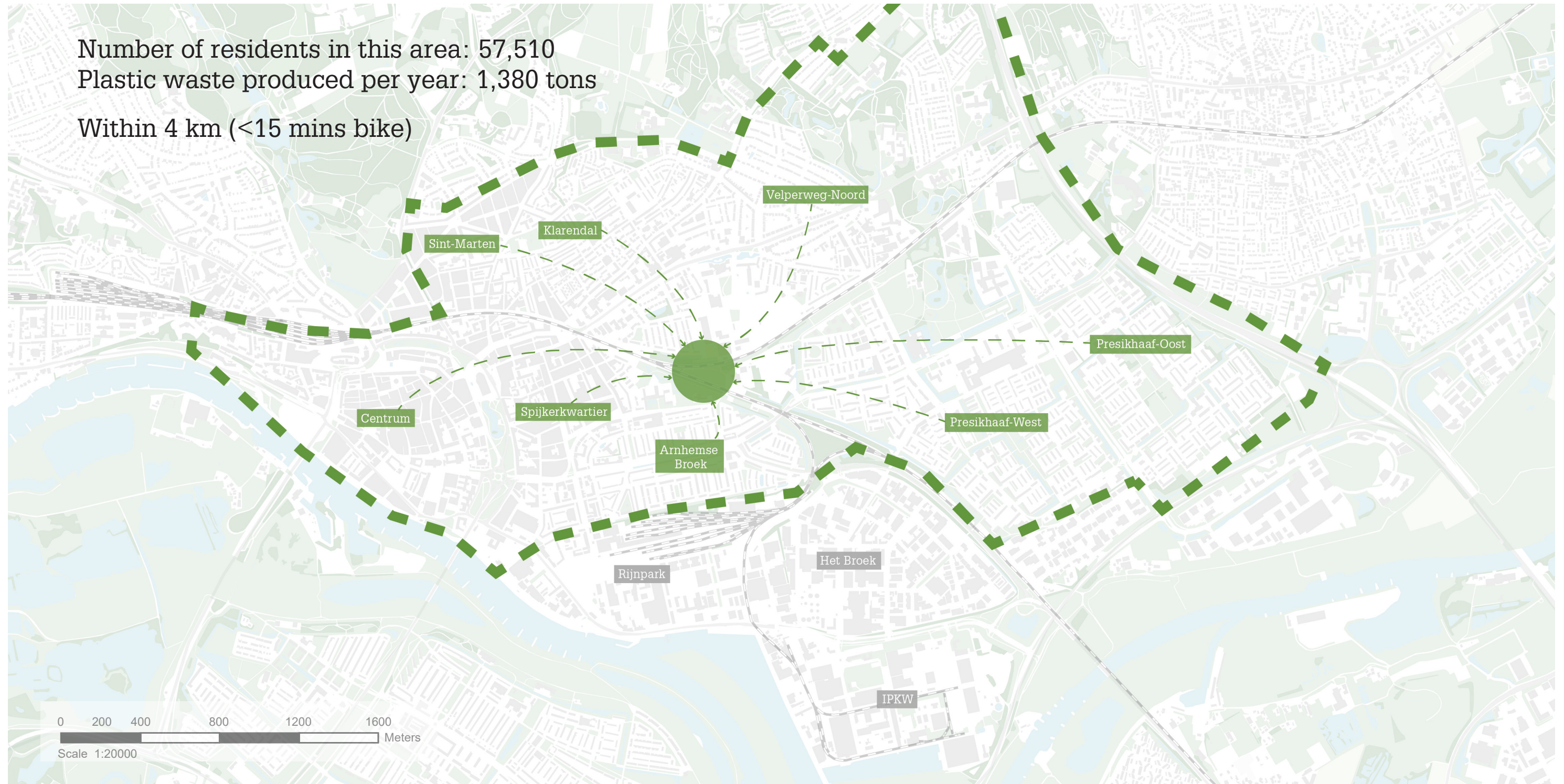
PLASTIC FACTORY

New recycling centre

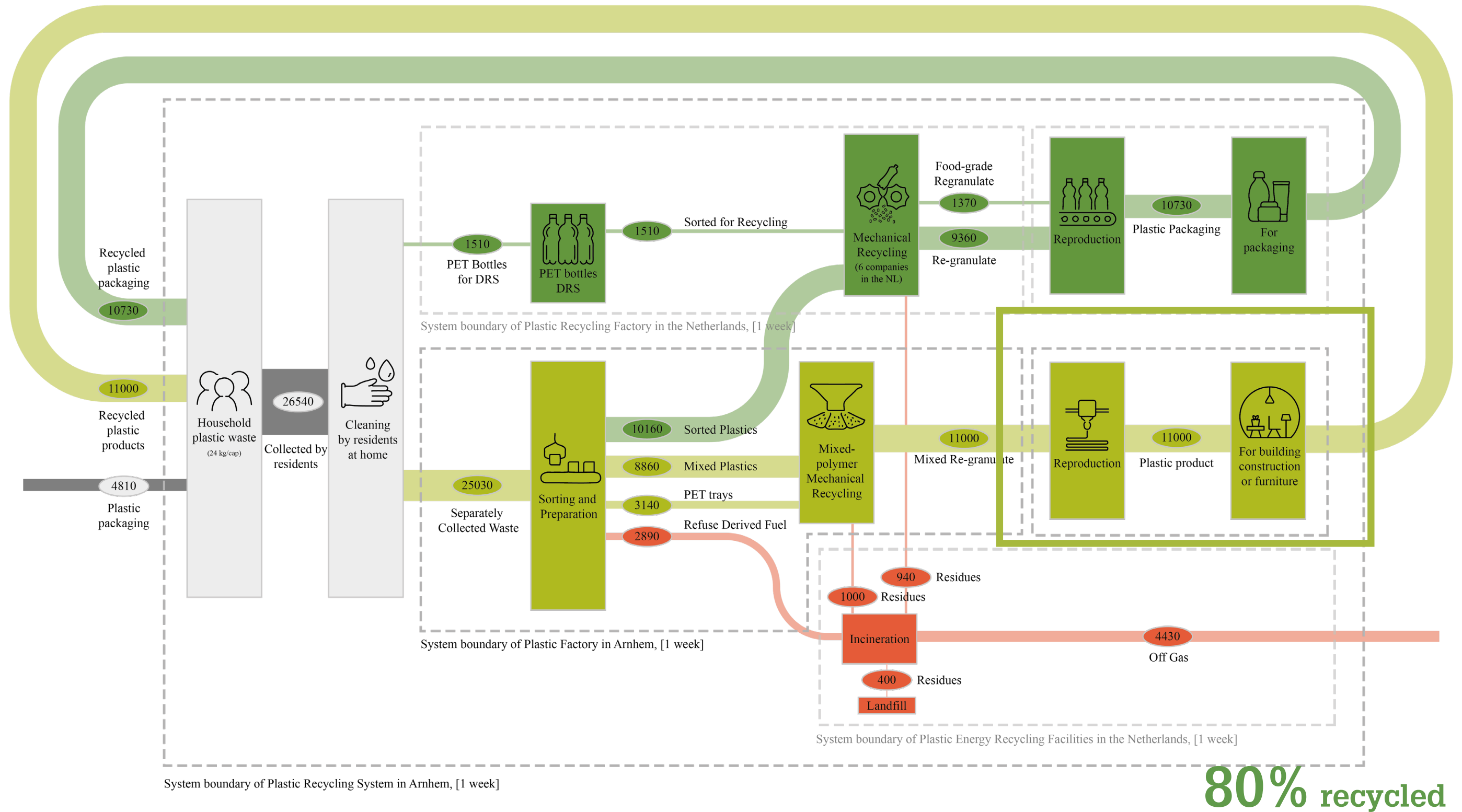


PLASTIC FACTORY

15-minutes city



PLASTIC FACTORY



Waste packaging plastic flow for the all 58.000 residents in the North Arnhem in 2030 (kg/week)

3.2 kg CO₂-eq./ kg plastic

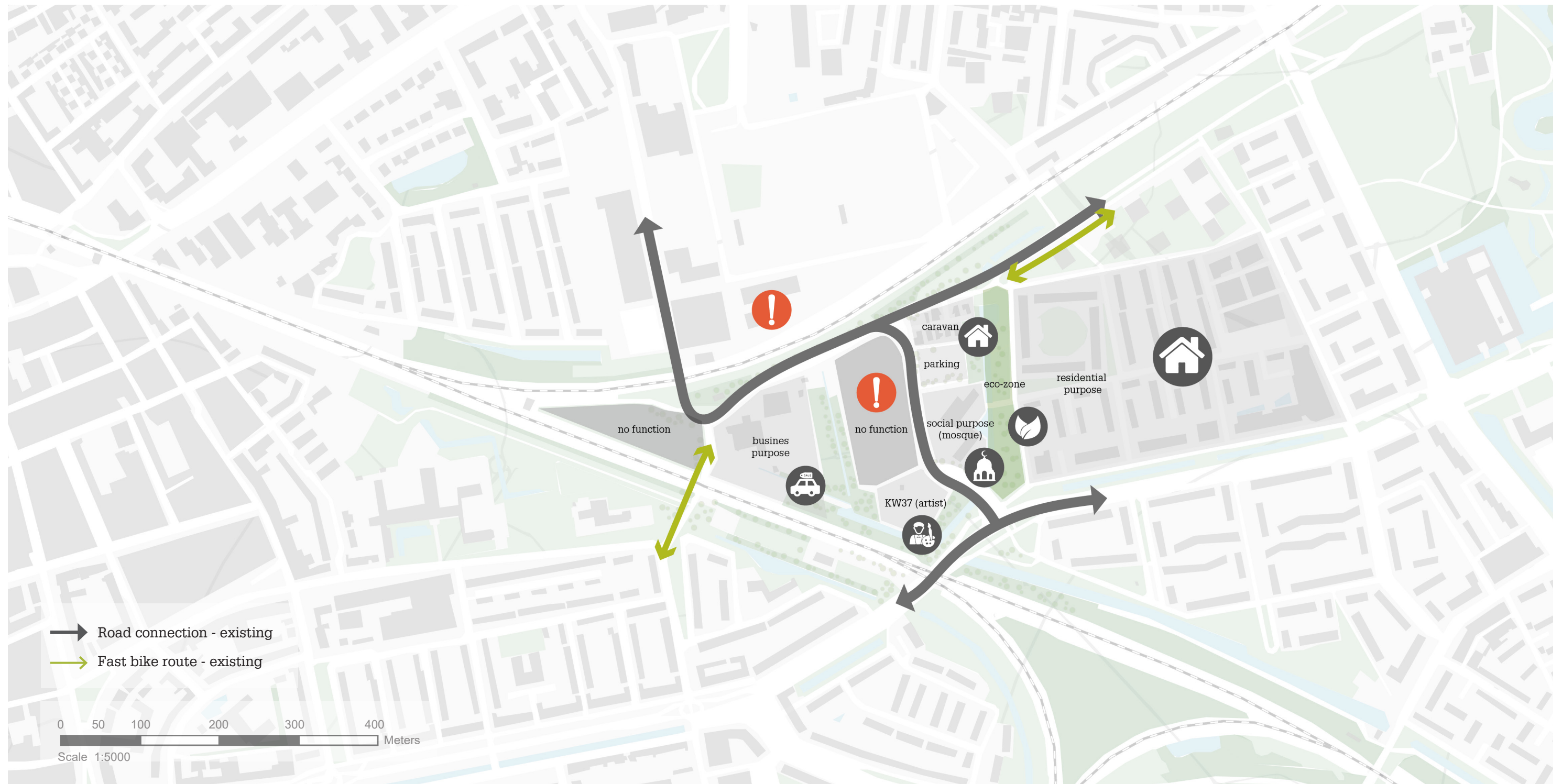
-70%
(saving 300 t CO₂ per year)

1 kg CO₂ -eq./ kg plastic

80% recycled

TREATMENT OF EXISTING USERS

Type of users



TREATMENT OF EXISTING USERS

Type of users



TREATMENT OF EXISTING USERS

Type of users



Living van



Car company



Mosque



Artists in KW37

TREATMENT OF EXISTING USERS

Living van



Keep

have their own community
for future extension



TREATMENT OF EXISTING USERS

Car company



Relocate

Intergrat with the new parking



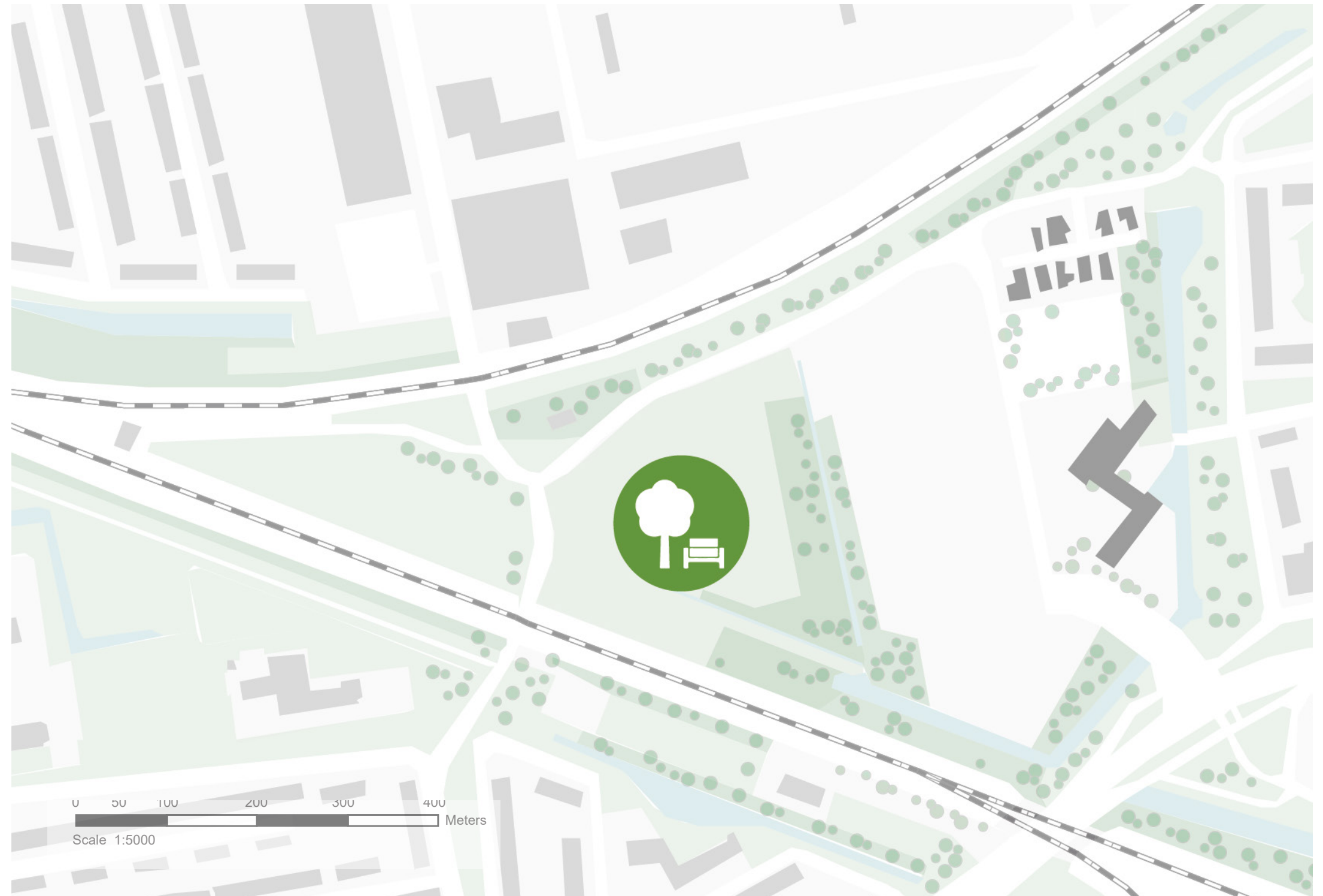
TREATMENT OF EXISTING USERS

Car company



Transform

Recycled park to promote recycling and provide a leisure area for residents



TREATMENT OF EXISTING USERS

Mosque



Rebuild

was a school with poor experience



TREATMENT OF EXISTING USERS

Mosque



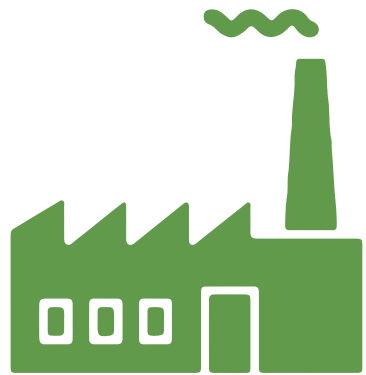
Rebuild

better connection
better quality



TREATMENT OF EXISTING USERS

Plastic factory



Build

plastic factory to collect household plastic waste in the North Arnhem



TREATMENT OF EXISTING USERS

Artists in KW37



Integrate

better working and living space
Light green: artist park



TREATMENT OF EXISTING USERS

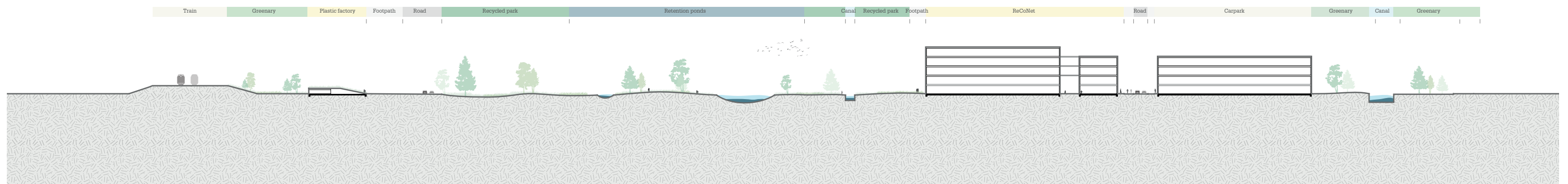
Overall scheme



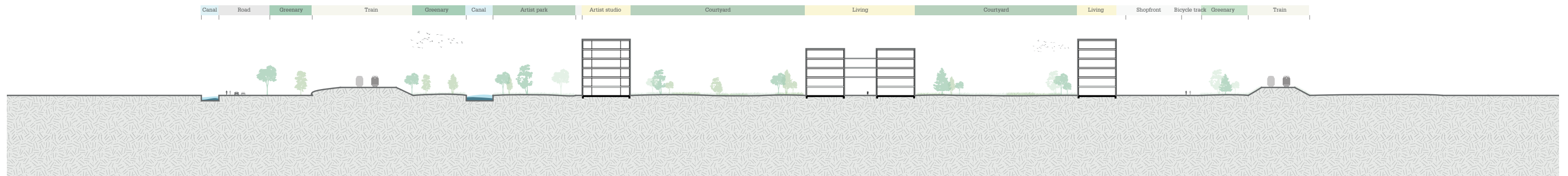
Introduction | Thematic Research | Site | Vision | Macro | Meso | Micro | Future development

SITE SECTION

Relationship with the train track and enviroment



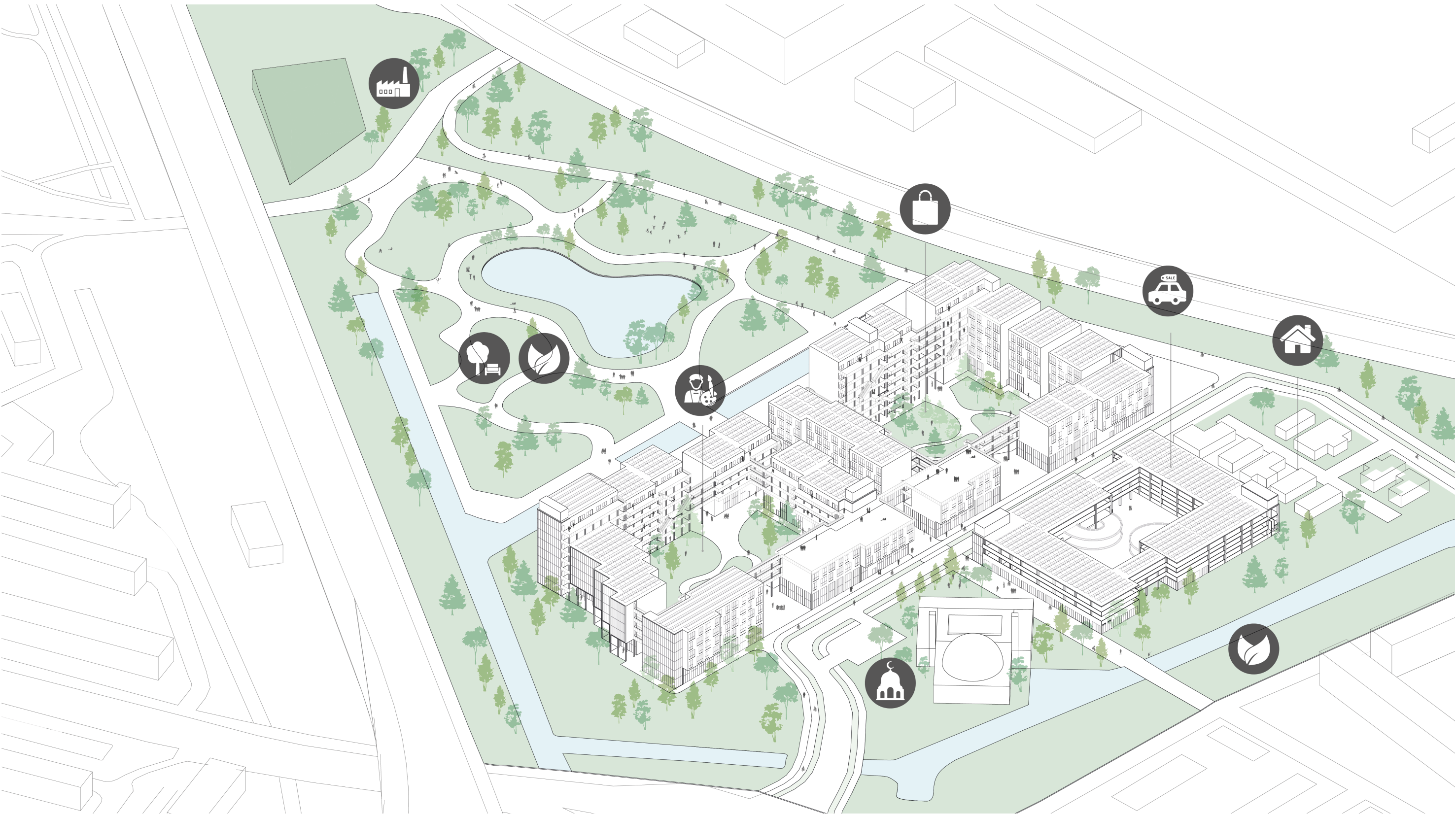
reduce urban heat island effect





MACRO

reconnect the site to form a new recycling centre



MESO

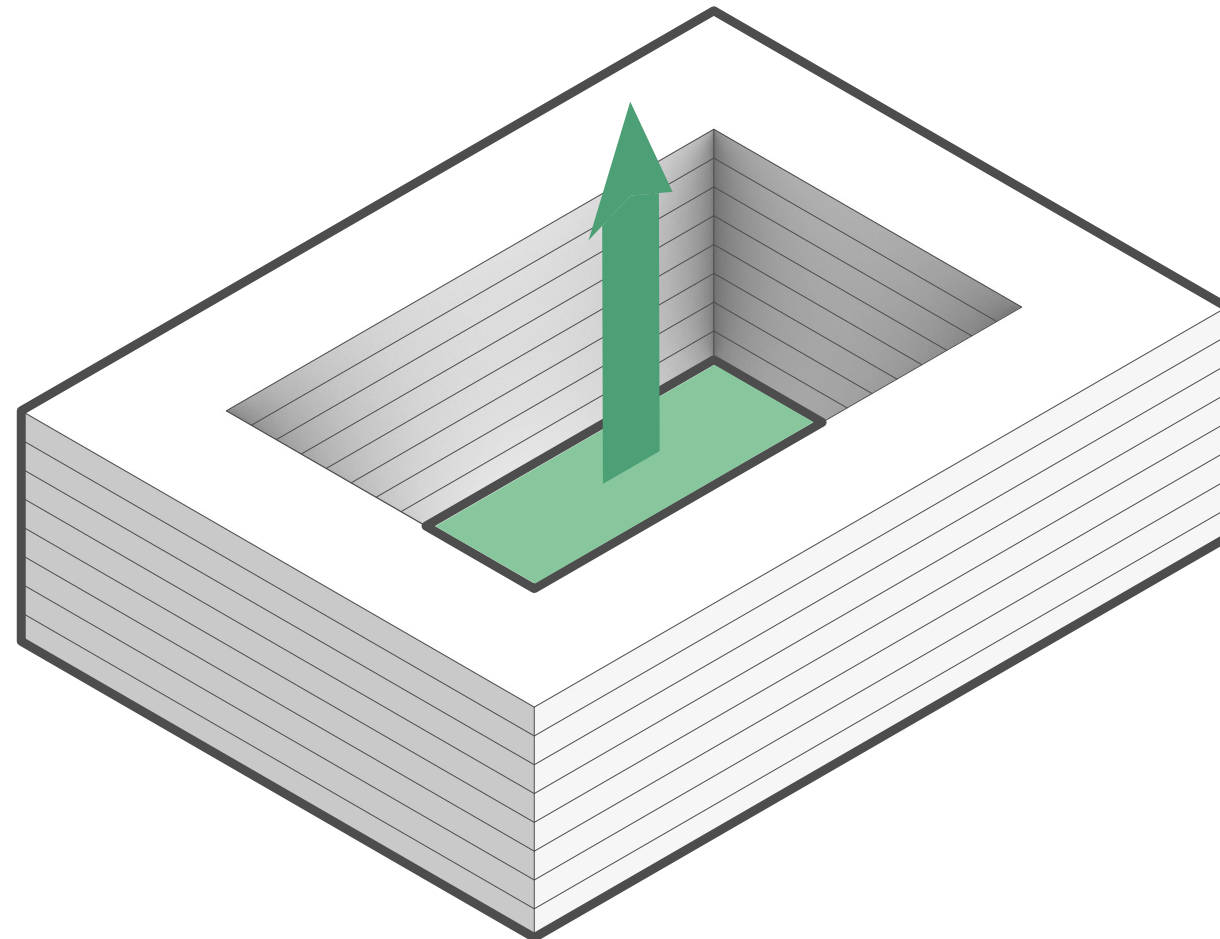
reconnect the neighbour
to form a recycling plastic community

1. Massing
2. Recycling plastic community
3. Community collaboration

keywords: community & collaboration

MASSING

Concept

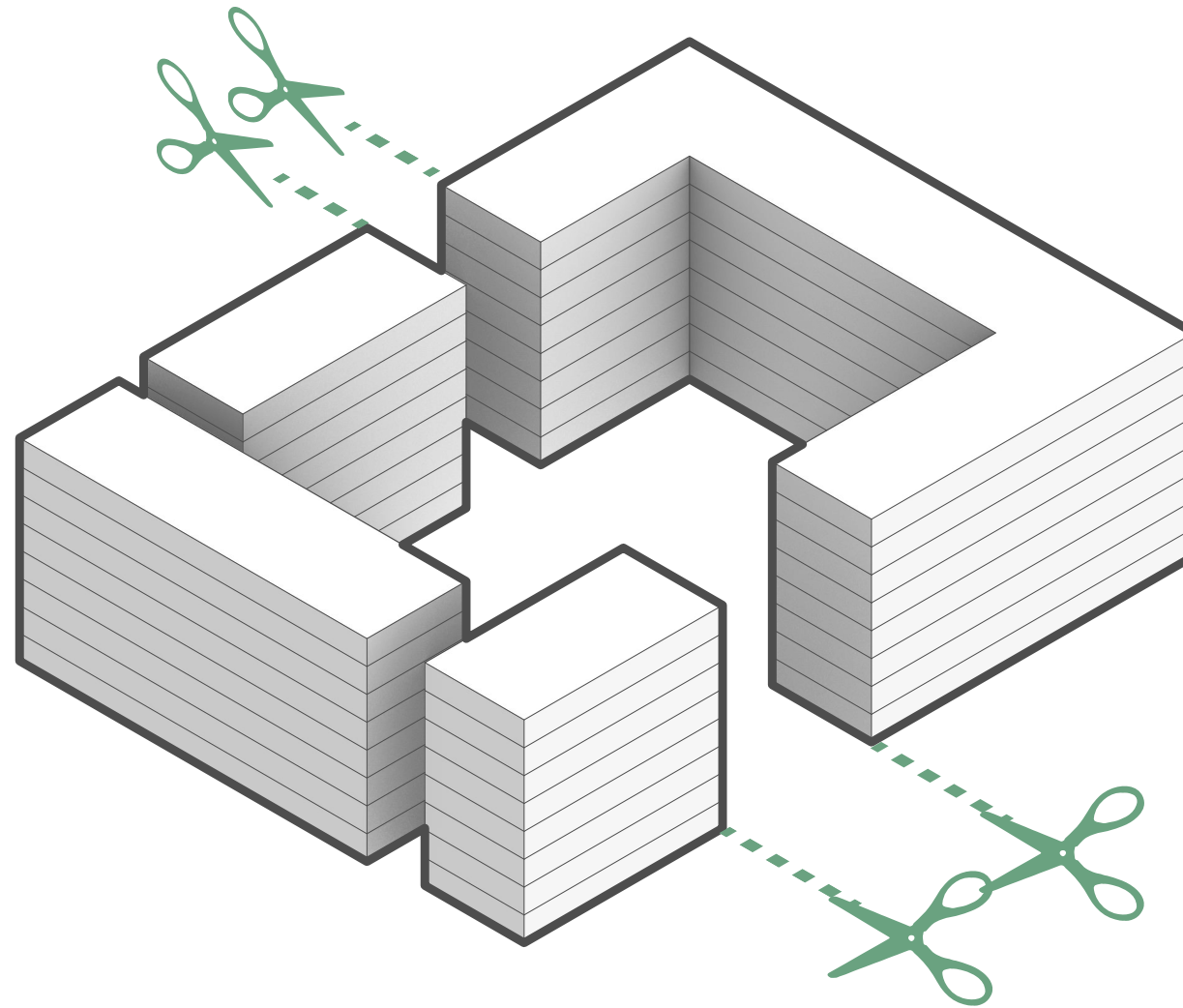


Extrude

Compacted form to create a warmer courtyard

MASSING

Concept

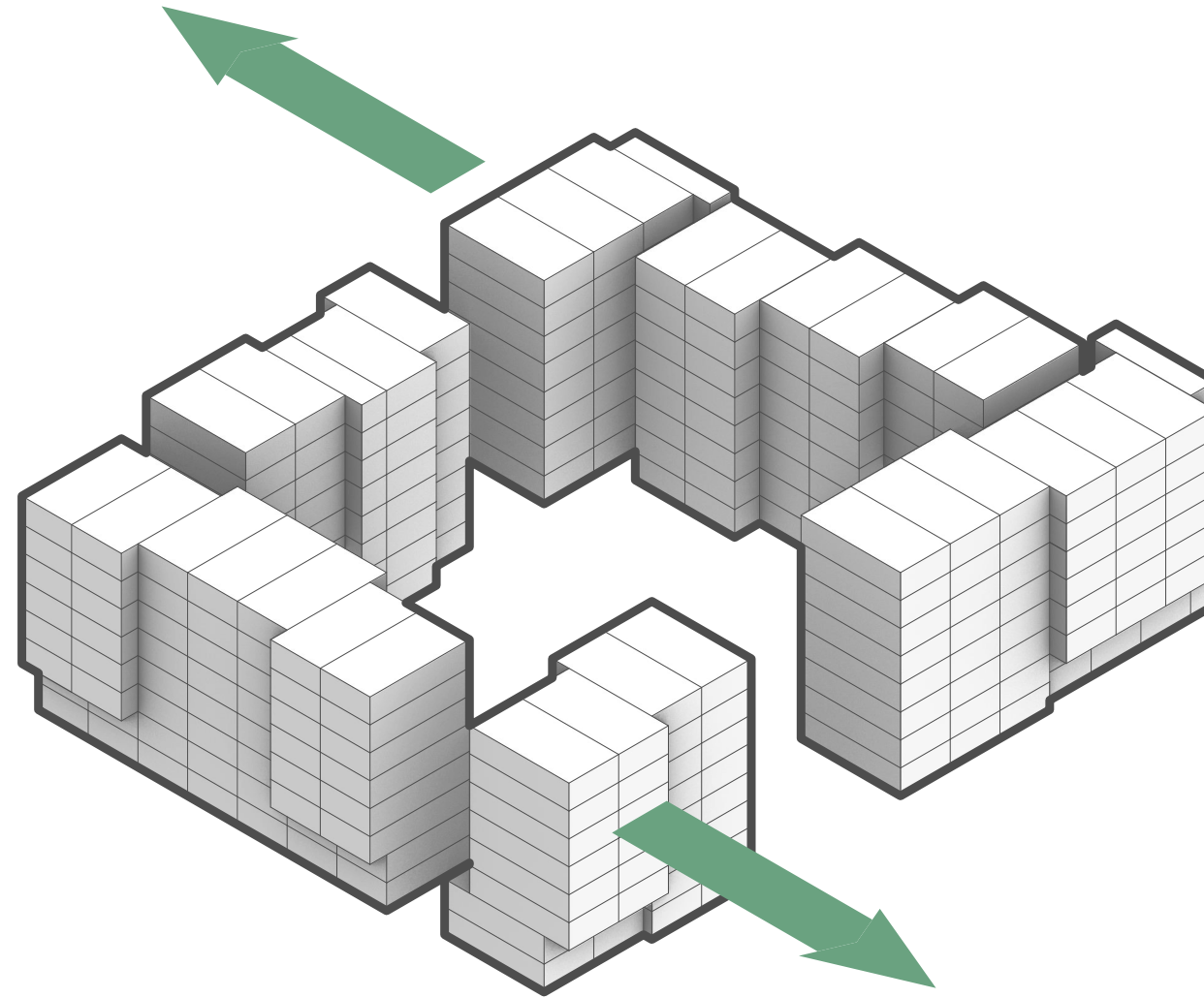


Subtract

Openings to create more welcoming semi-public spaces

MASSING

Concept

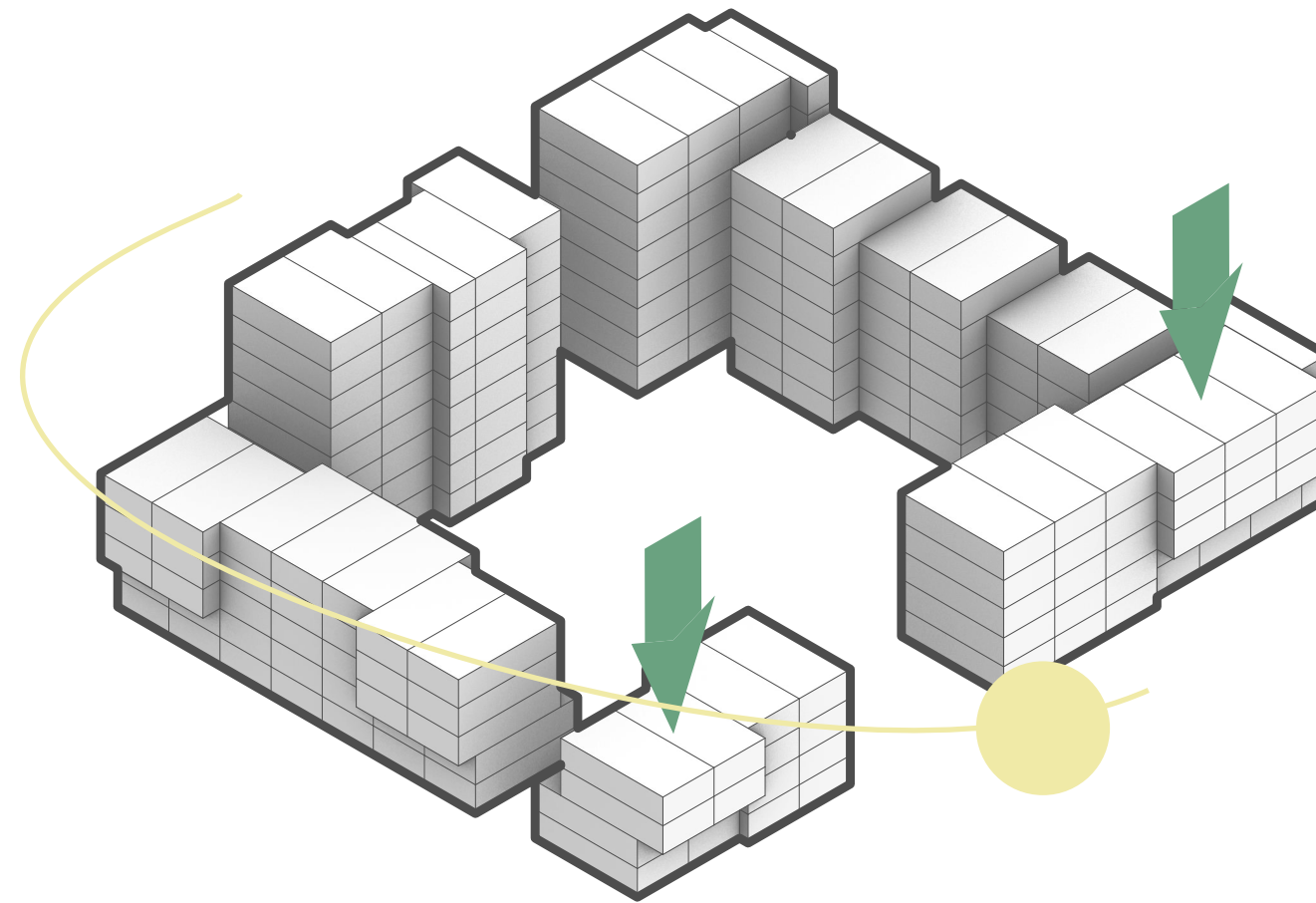


Divide and Shift

Apply modular construction and diffuse noise by shifting

MASSING

Concept

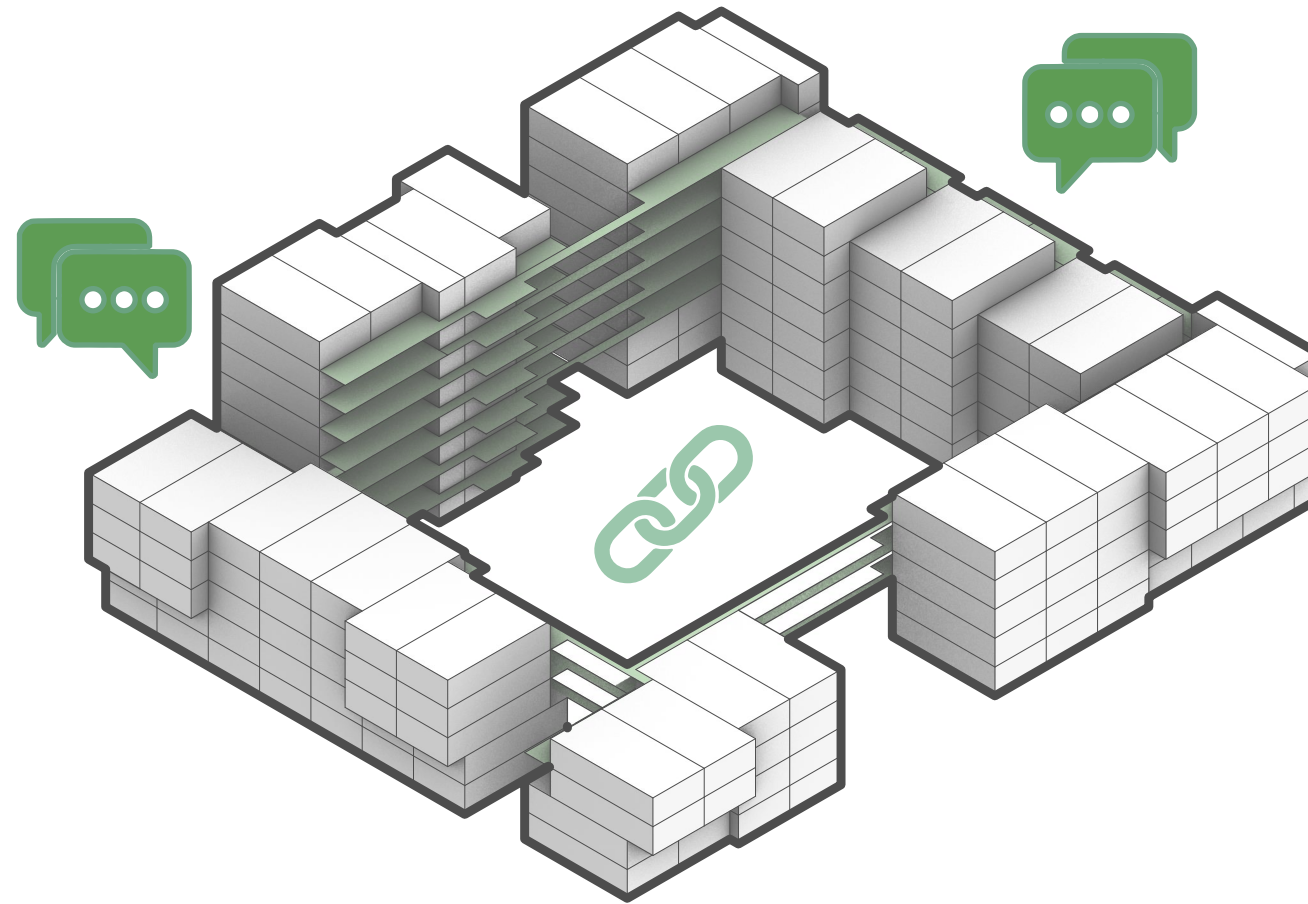


Compress

Lower down the block on the South and West for better sunlight in the courtyard

MASSING

Concept

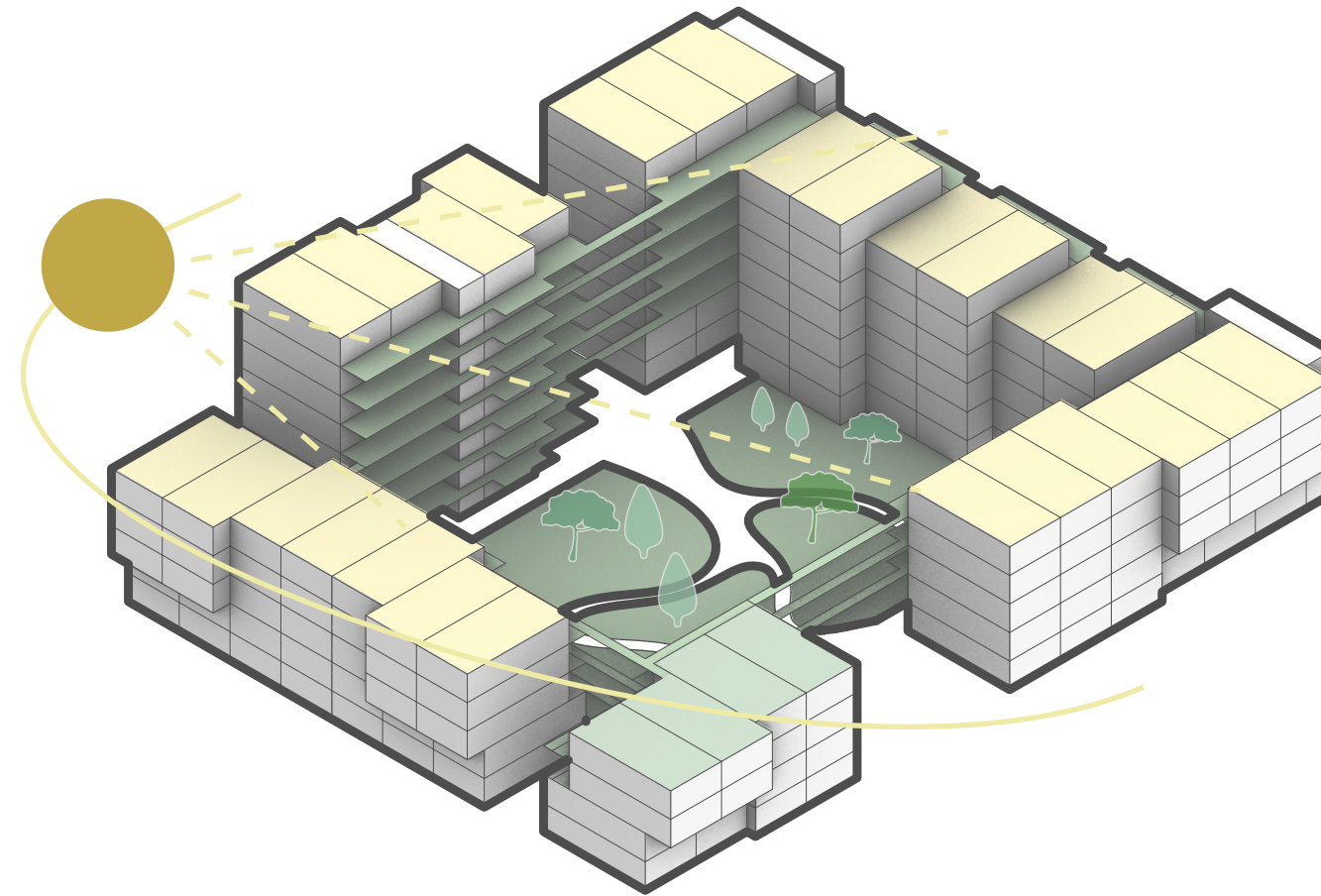


Add-on gallery

creates social gathering space in the gallery

MASSING

Concept

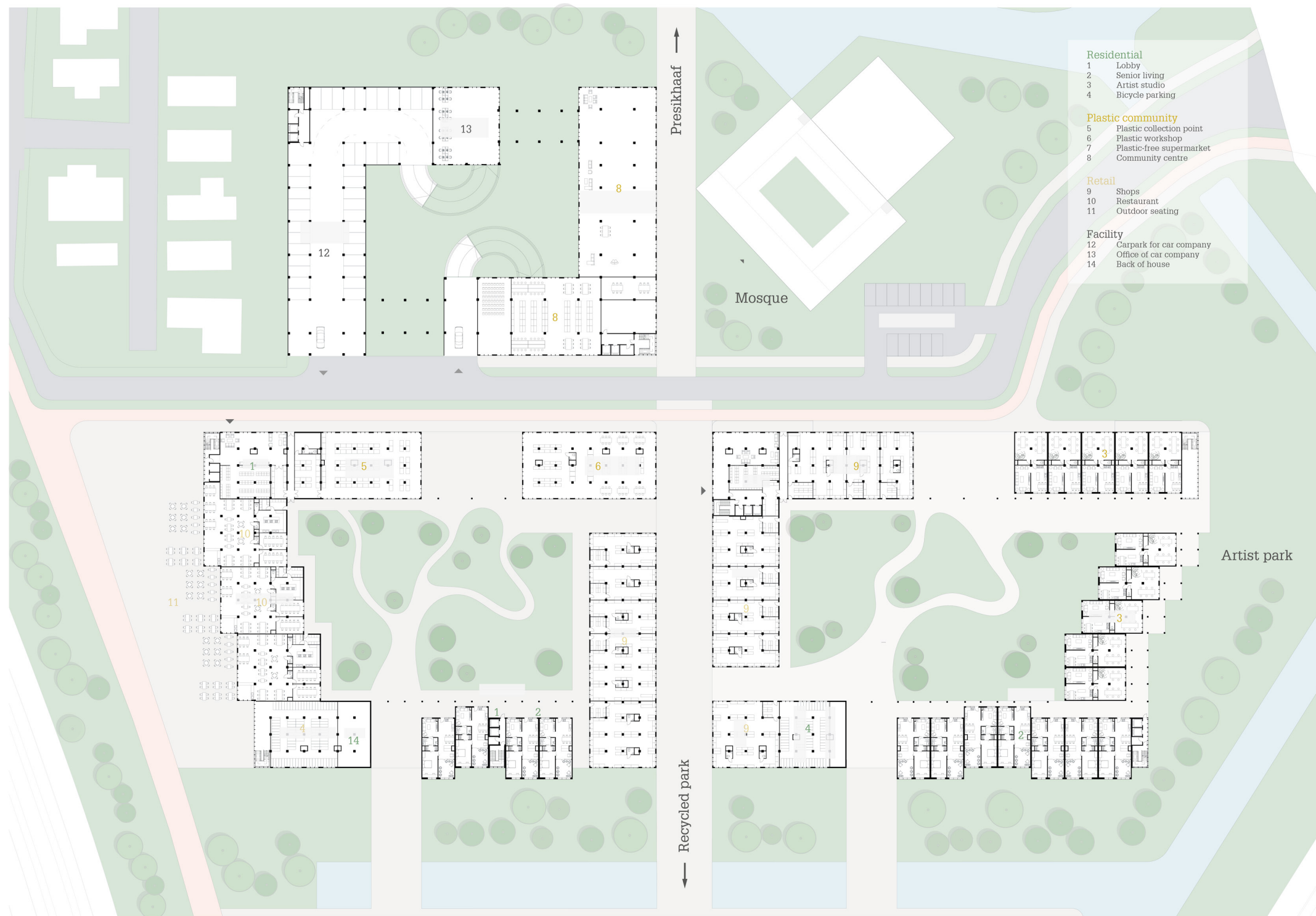


Green roof and courtyard

put solar panels on the roof
community gardening space on the ground and roof

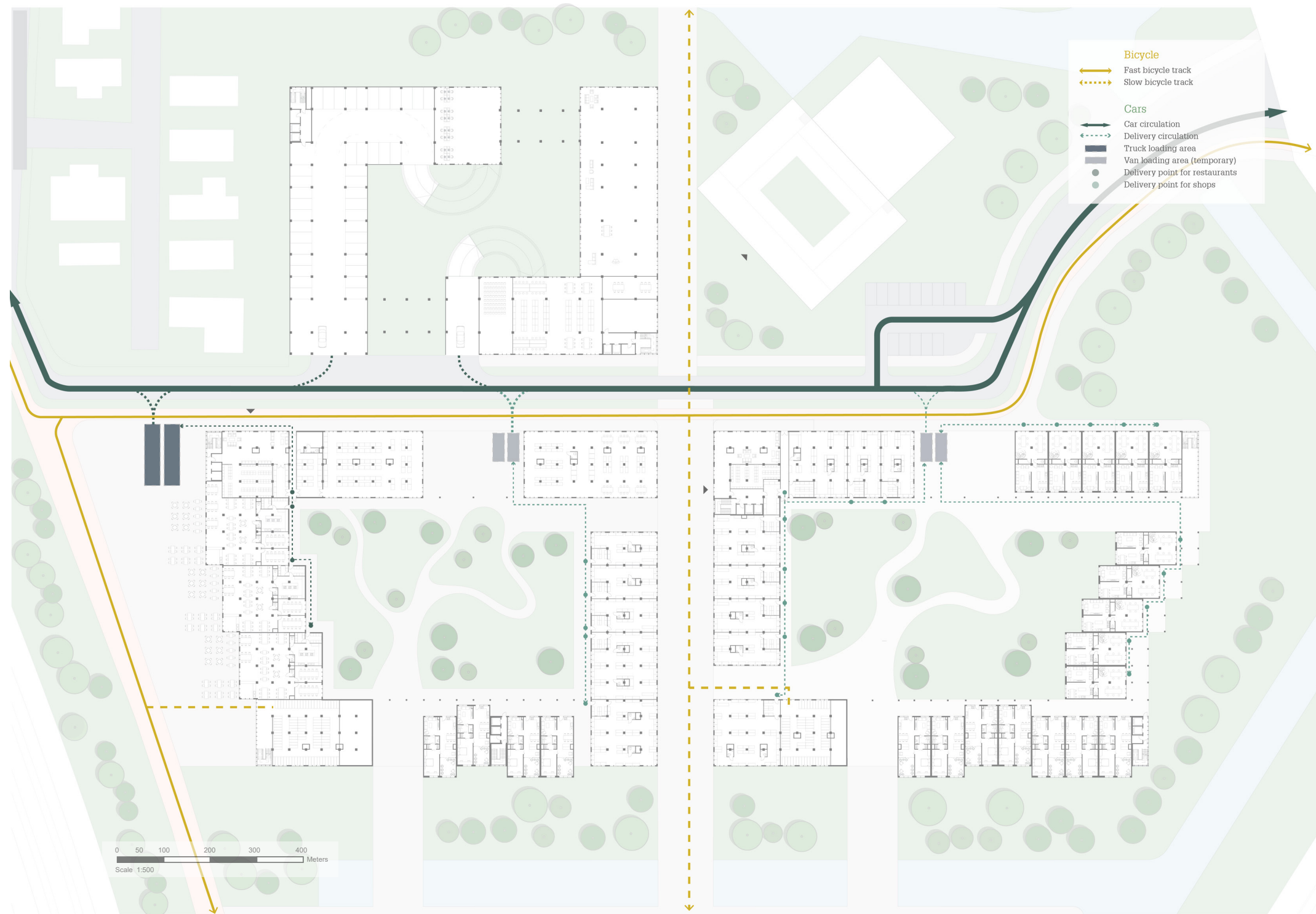
RECYCLING PLASTIC COMMUNITY

a various range of programs on the GF



RECYCLING PLASTIC COMMUNITY

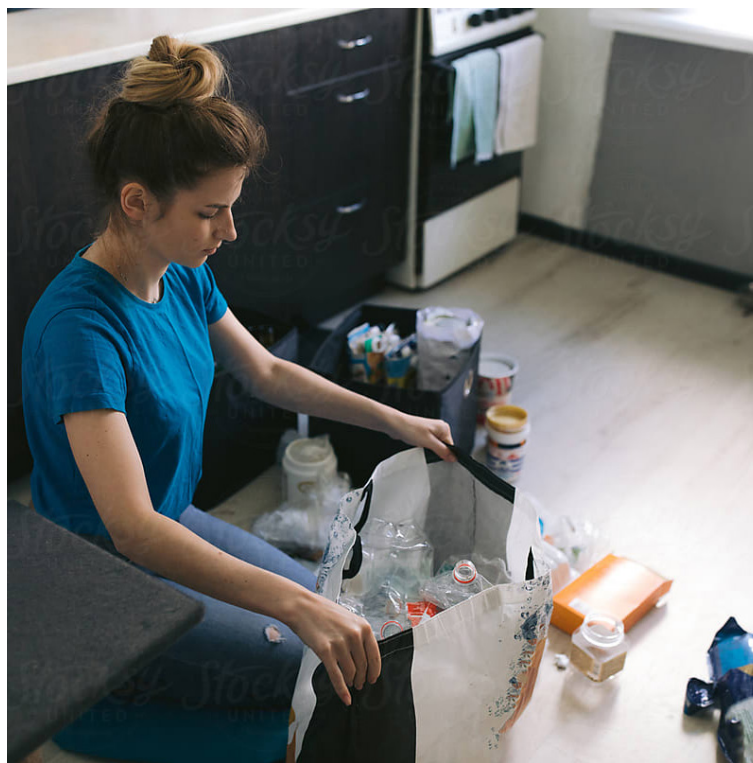
Proposed circulation





RECYCLING PLASTIC COMMUNITY

Plastic waste collection point



Collect waste at home



Bring the waste to the collection point and get stamps

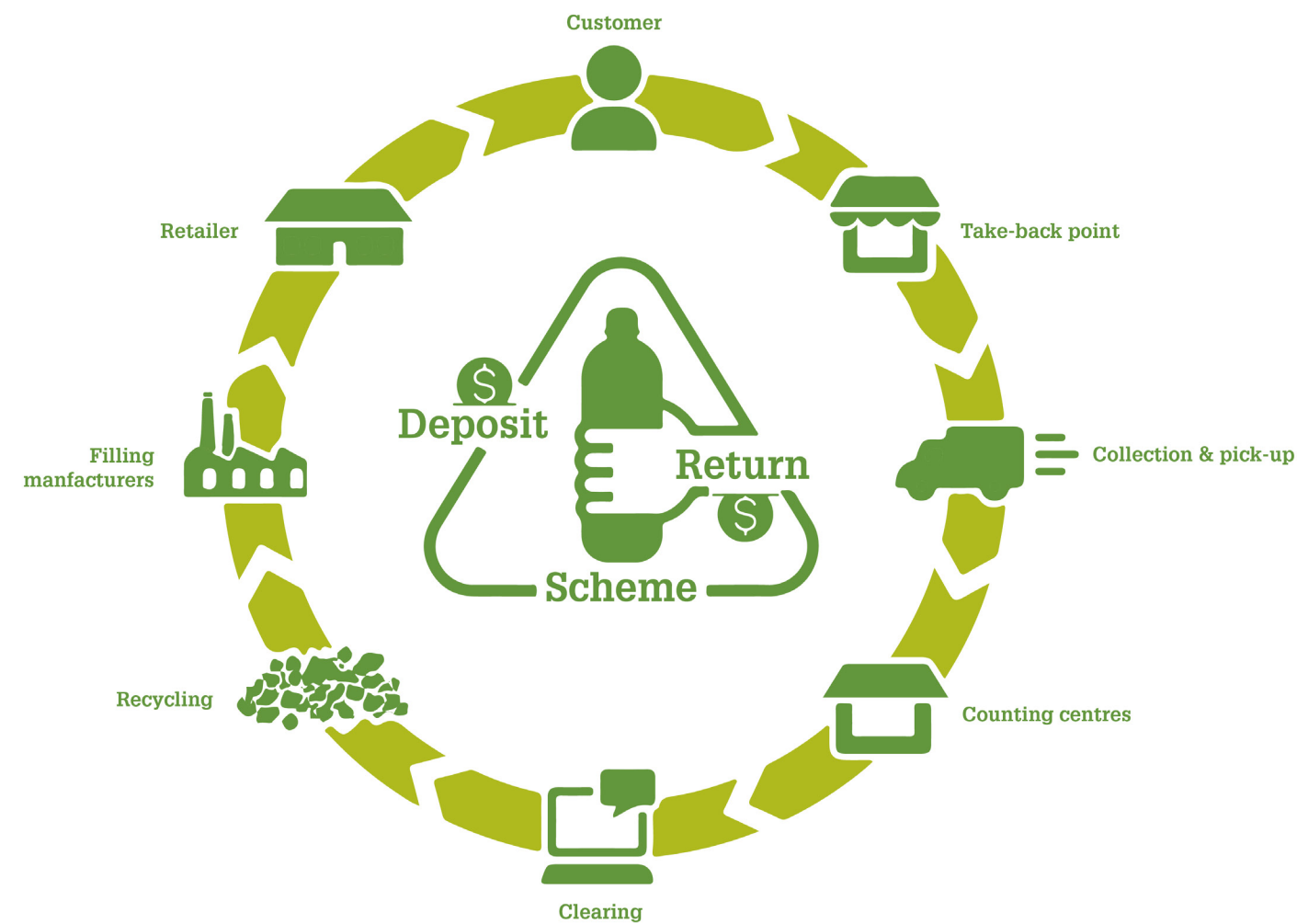


Redeem stamps in the local community

Reference: Zero Waste Lab in Amsterdam

RECYCLING PLASTIC COMMUNITY

Plastic waste collection point



RECYCLING PLASTIC COMMUNITY

Plastic-free supermarket



Reference: YES FUTURE in Barcelona

Introduction | Thematic Research | Site | Vision | Macro | **Meso** | Micro | Future development

RECYCLING PLASTIC COMMUNITY

exhibition, demonstration, workshop

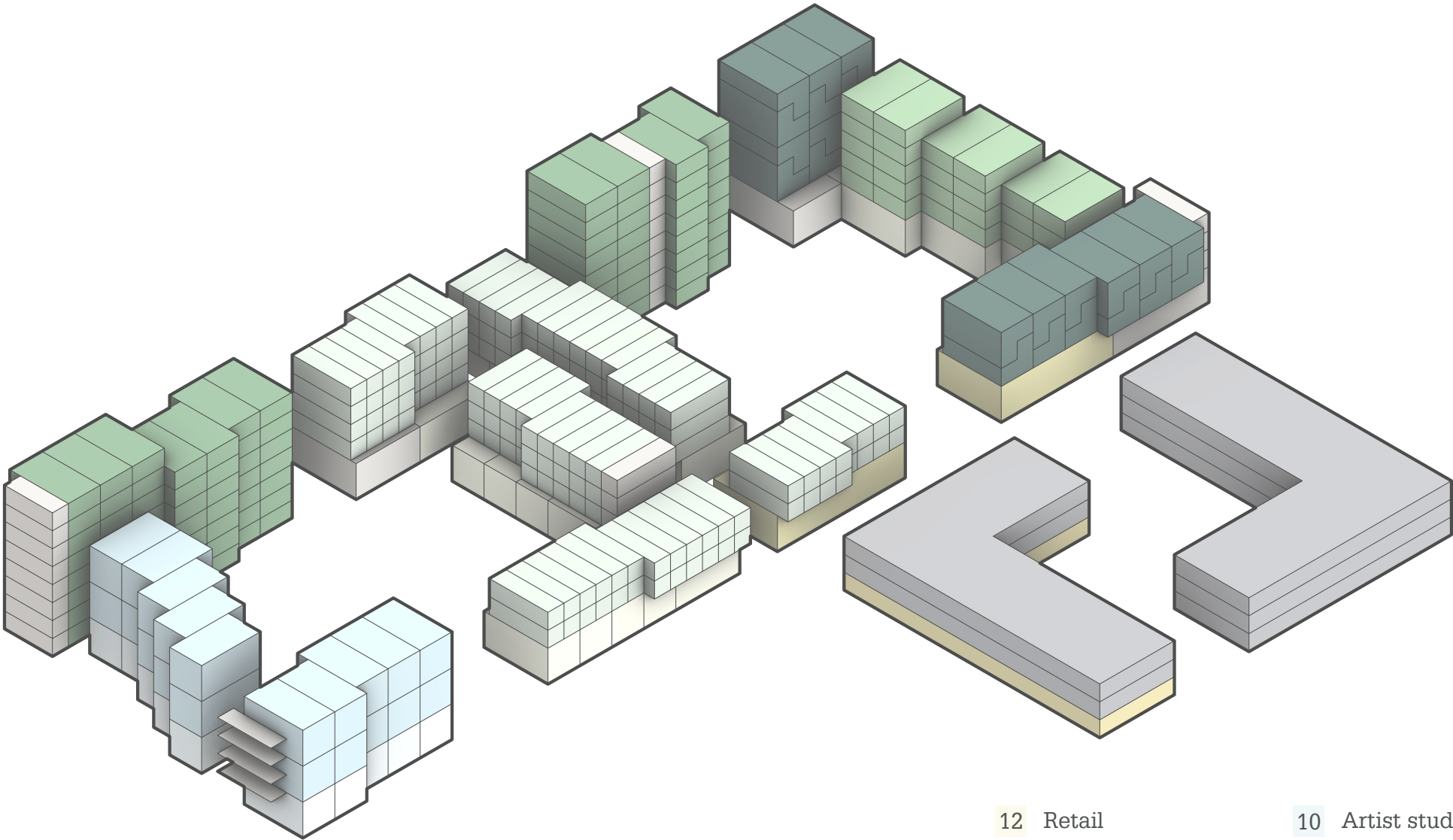






COMMUNITY

Program arrangement

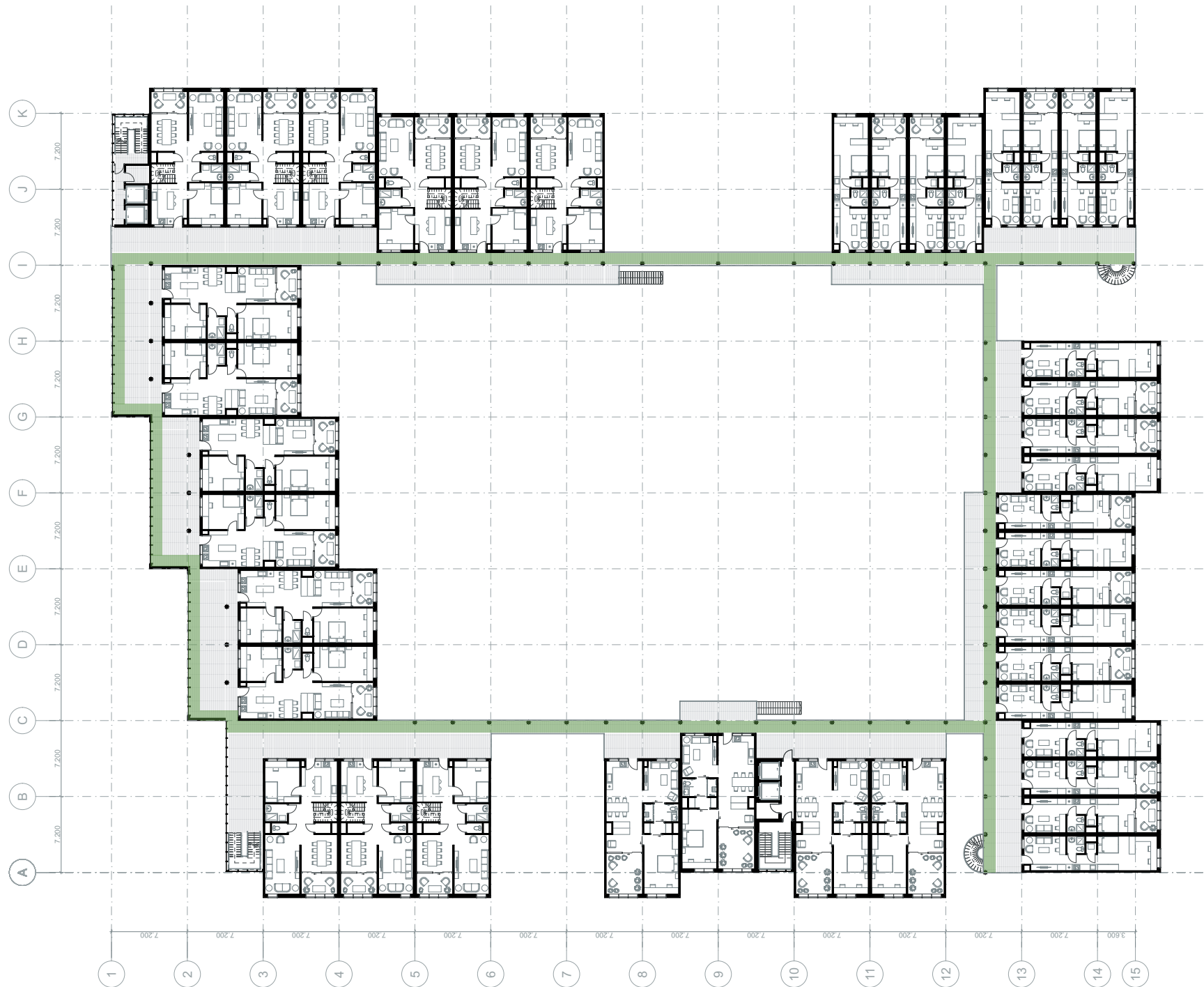


300 units
600 residents
350 car rental and parking

- | | | | |
|-----|----------------------|-----|------------------|
| 12 | Retail | 10 | Artist studio |
| 2 | Plastic-related | 20 | Artist co-living |
| 1 | Community centre | 141 | Single studio |
| 4 | Lobby | 24 | Family |
| 350 | Car rental + Parking | 84 | Senior |
| | | 24 | Family loft |

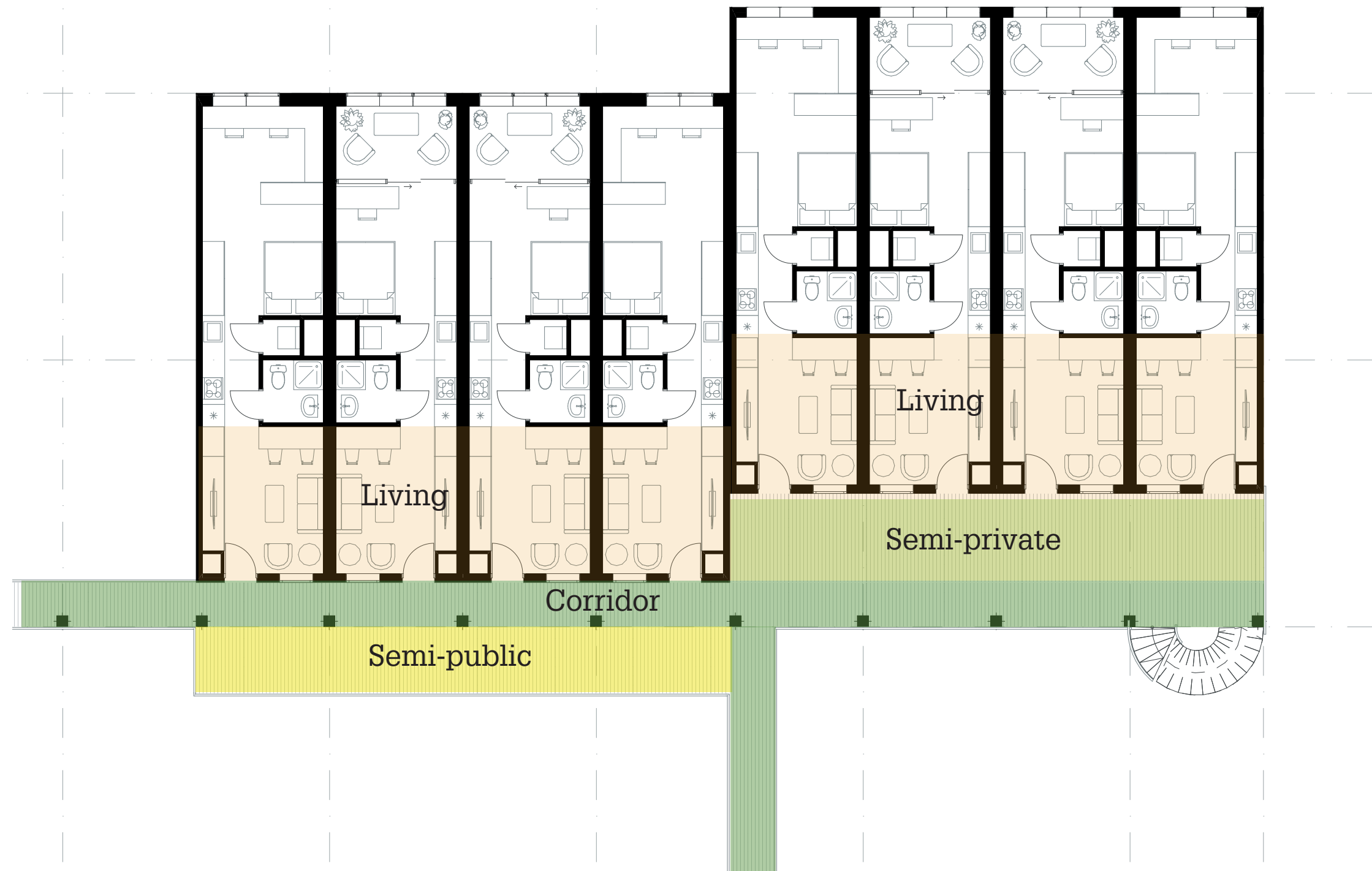
COMMUNITY

Typical floor plan



COMMUNITY

Typical floor plan

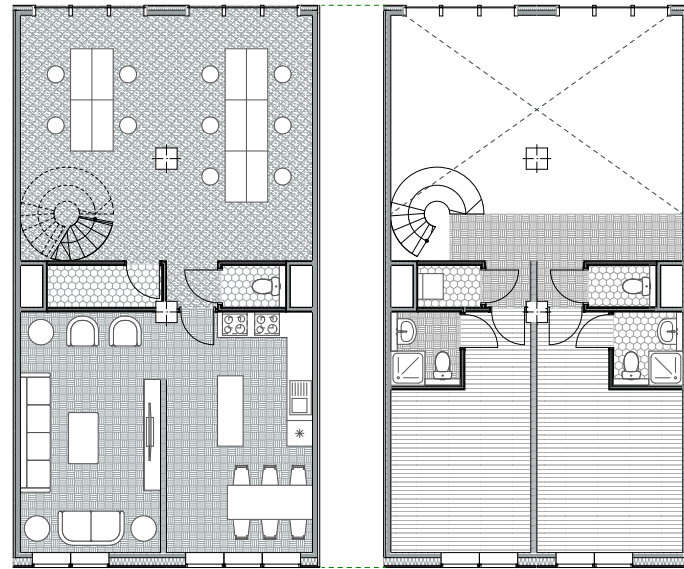




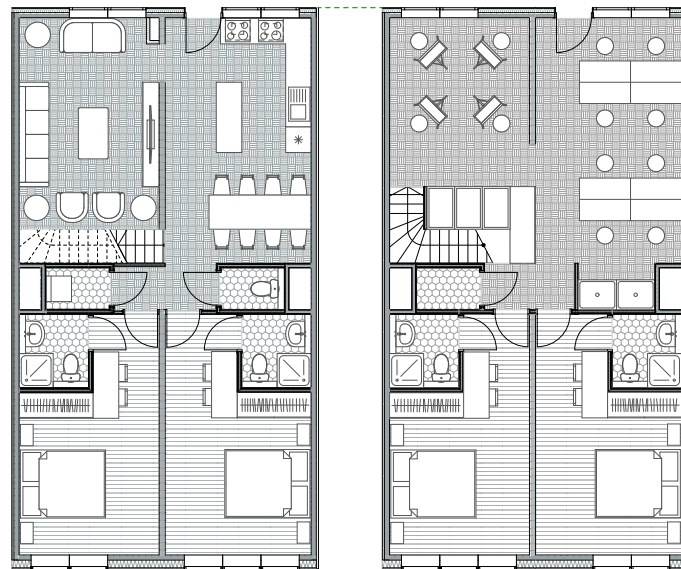


COLLABORATION

Artist collaboration



Artist co-working/ living studio 150 m²
2-4 people

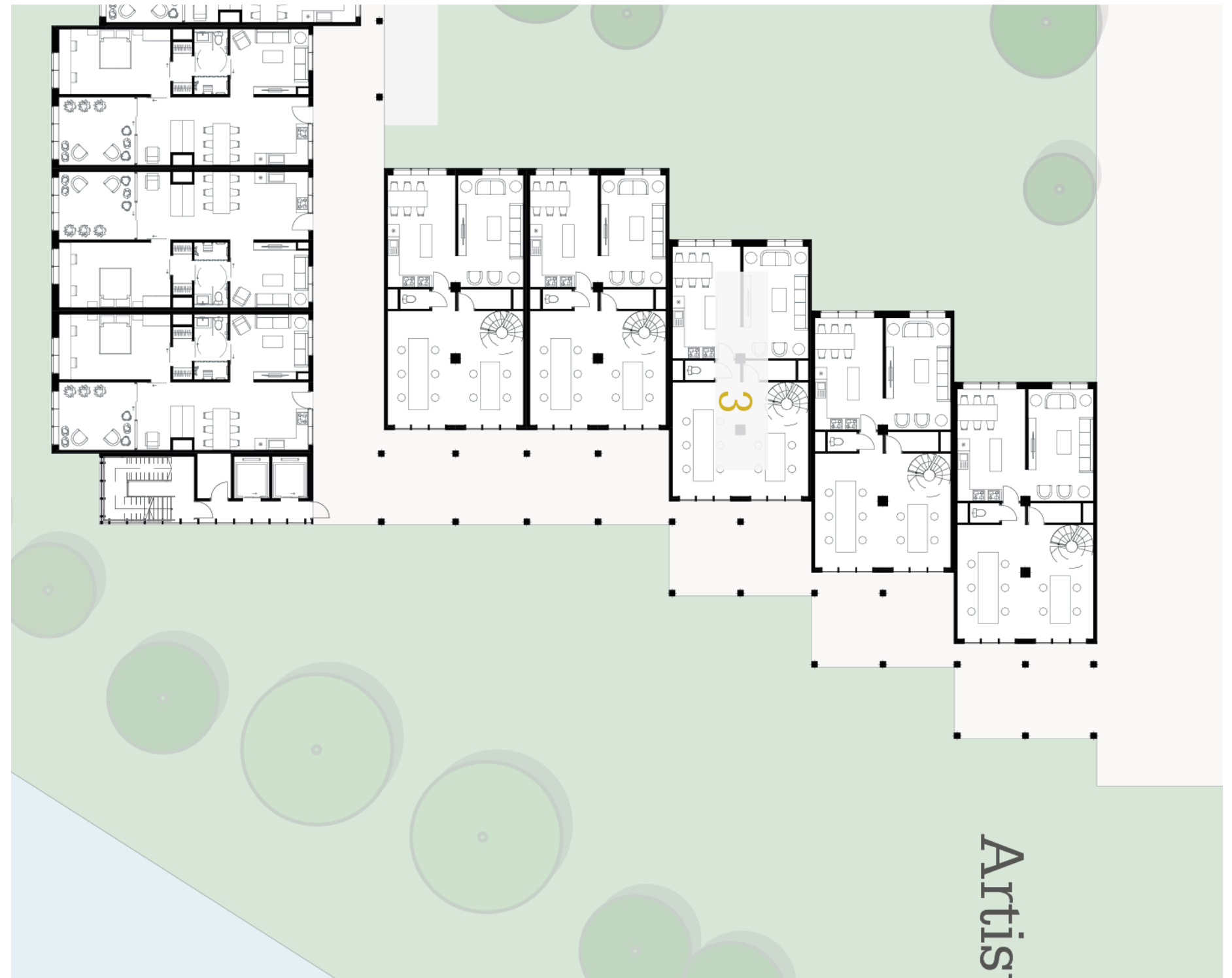
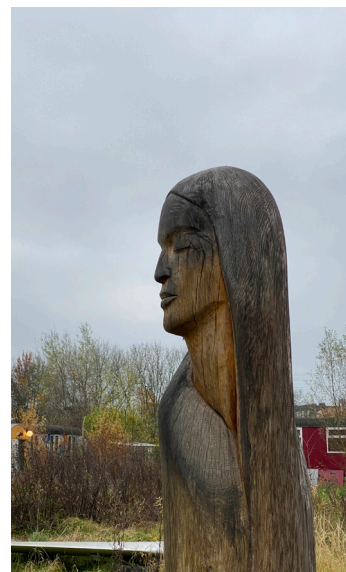
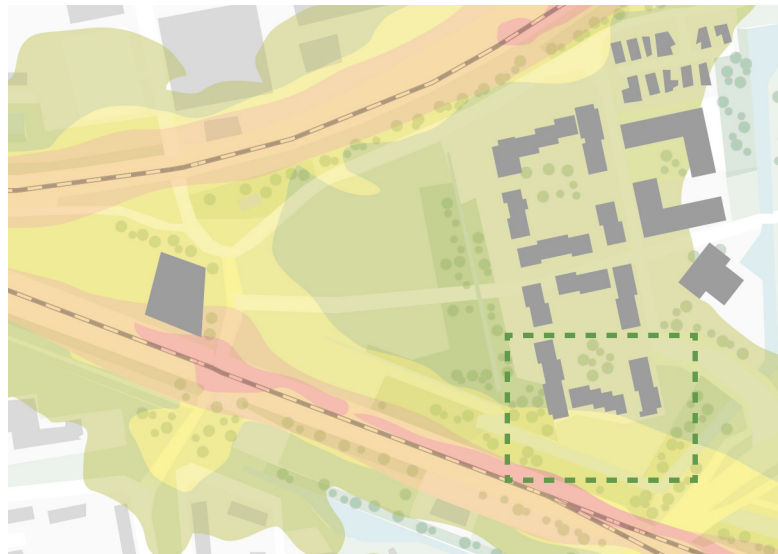


Artist co-living apartment 190 m²
4-8 people



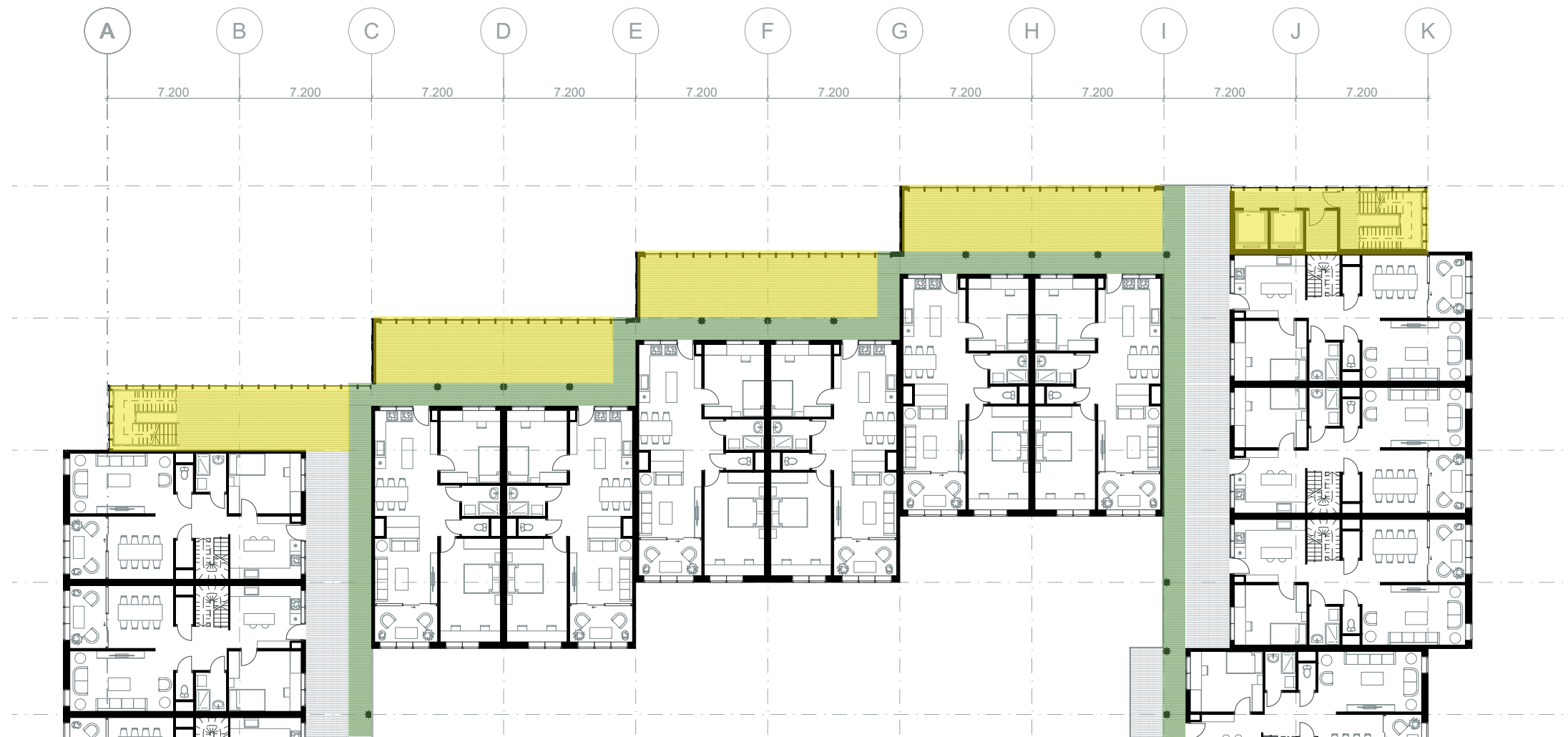
COLLABORATION

Artist park



COMMUNITY

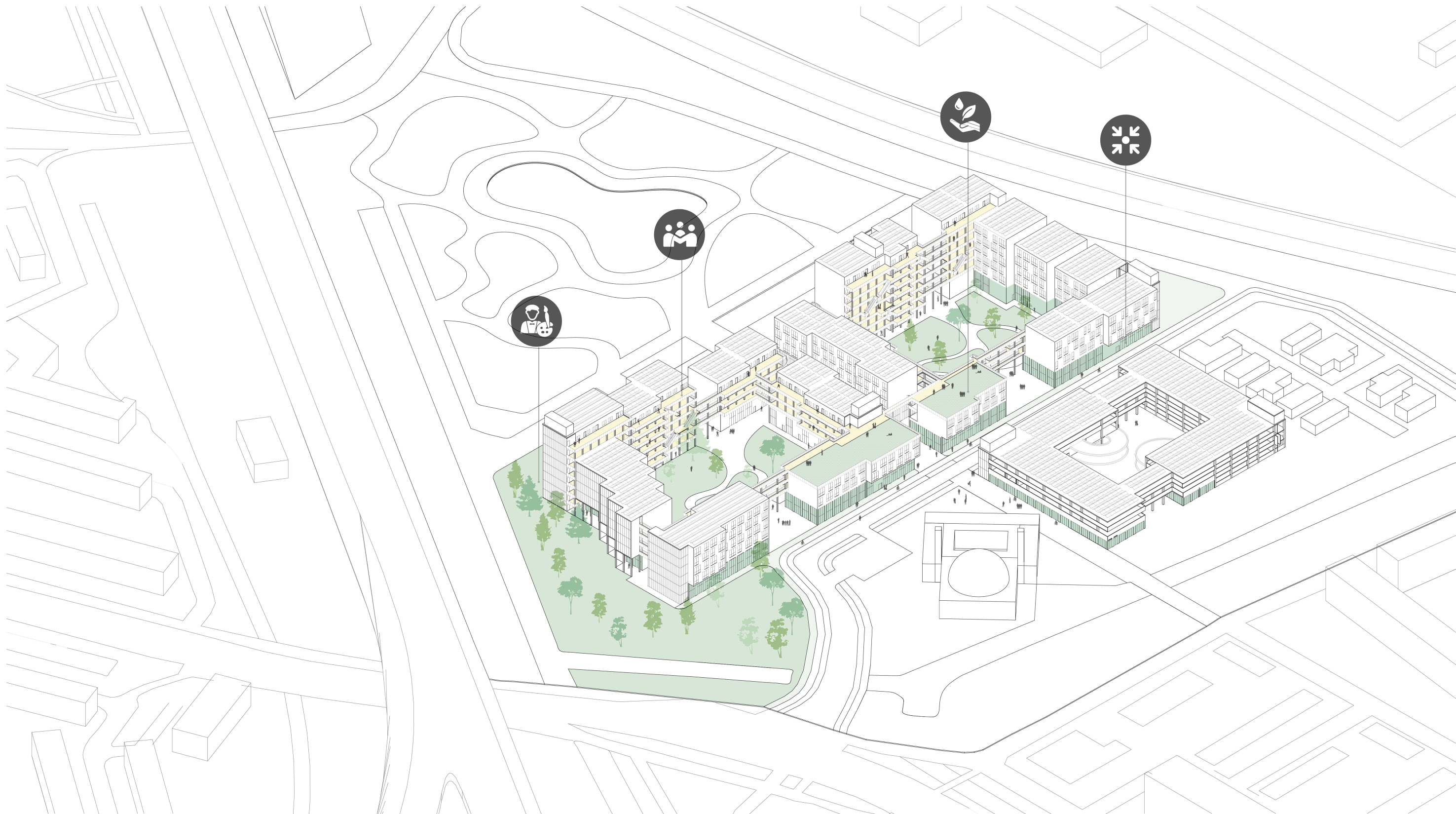
Buffer zone and shifting facing the noisy train track





MESO

reconnect the neighbour to form a recycling plastic community



MICRO

reconnect the nature

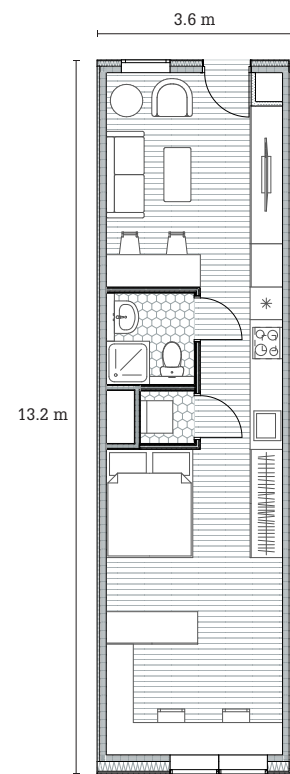
to use recycled plastic in a circular and sustainable way

1. Modular CLT construction
2. Use of recycled plastics
3. RE!facade
4. Circular concept
5. Climate scheme

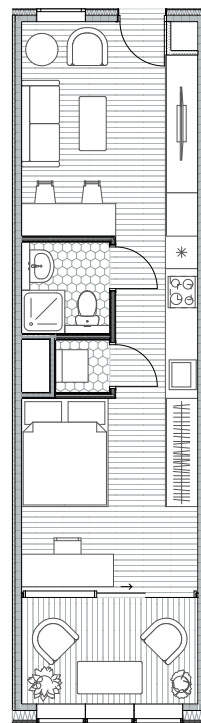
keywords: circularity

MODULAR CLT CONSTRUCTION

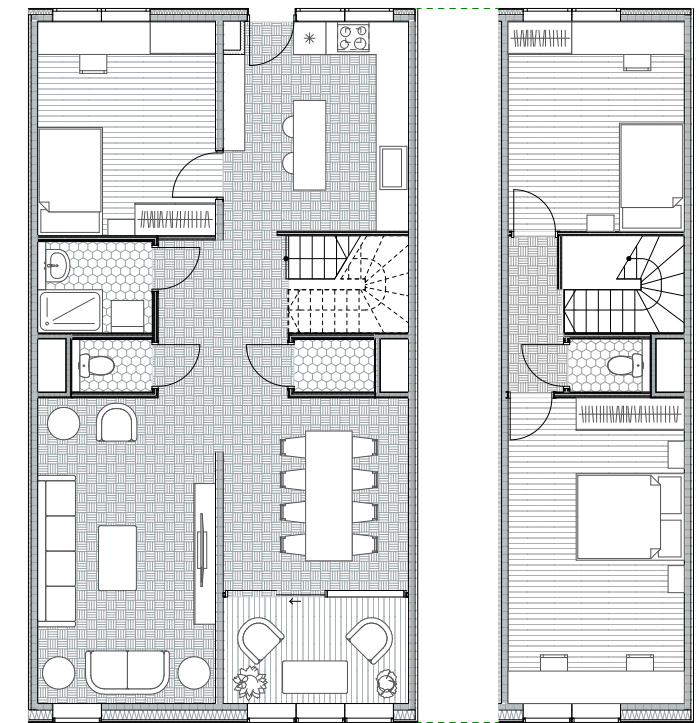
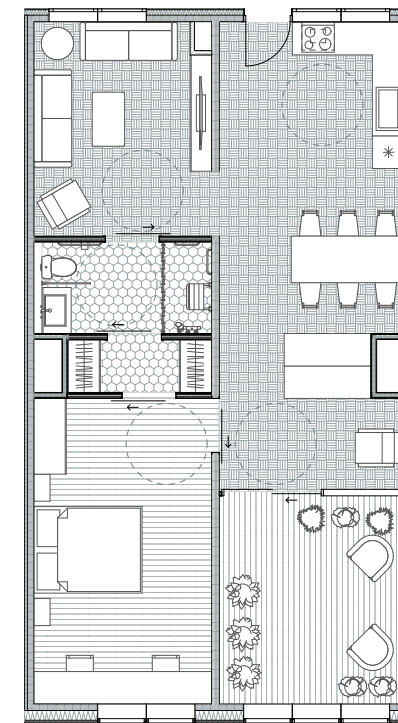
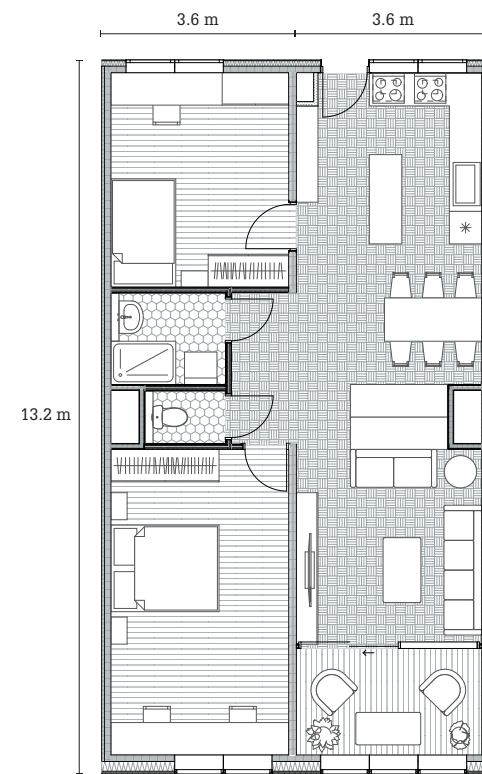
Module unit



Studio (A&B) 47.5 m²
1-2 people



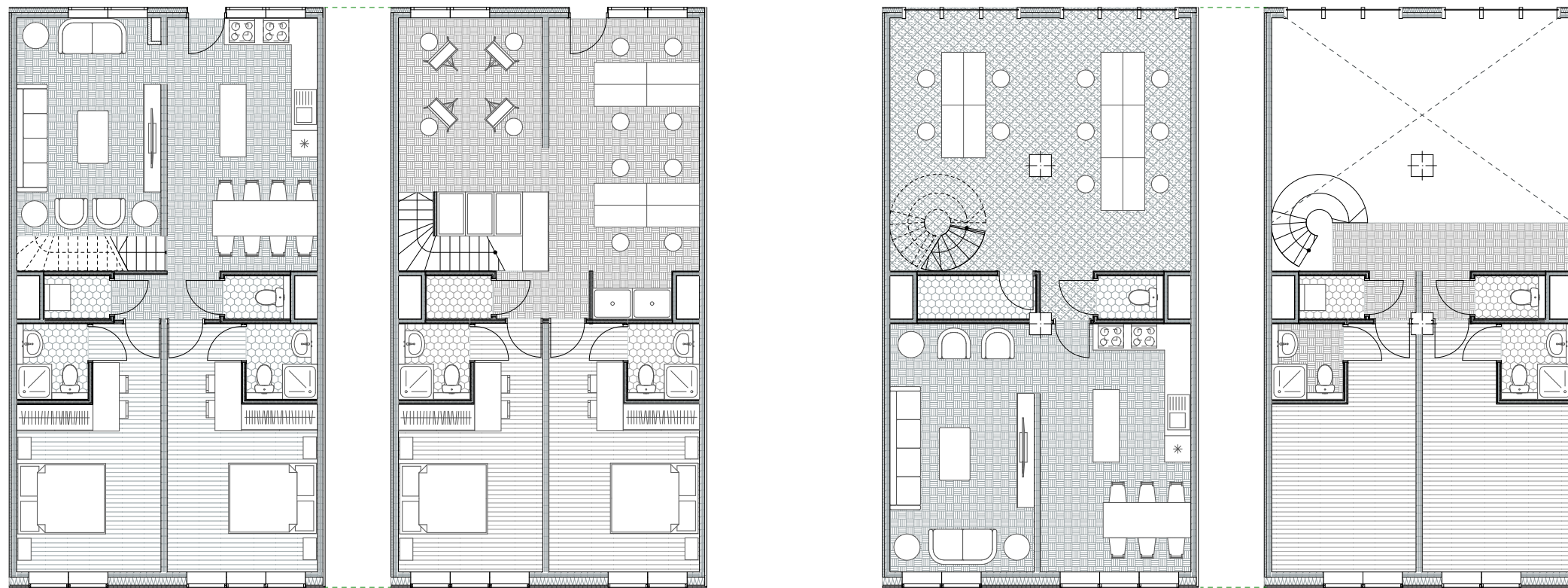
Family 95 m²
2-3 people



Family loft 142.5 m²
4-5 people

MODULAR CLT CONSTRUCTION

Module unit for artists

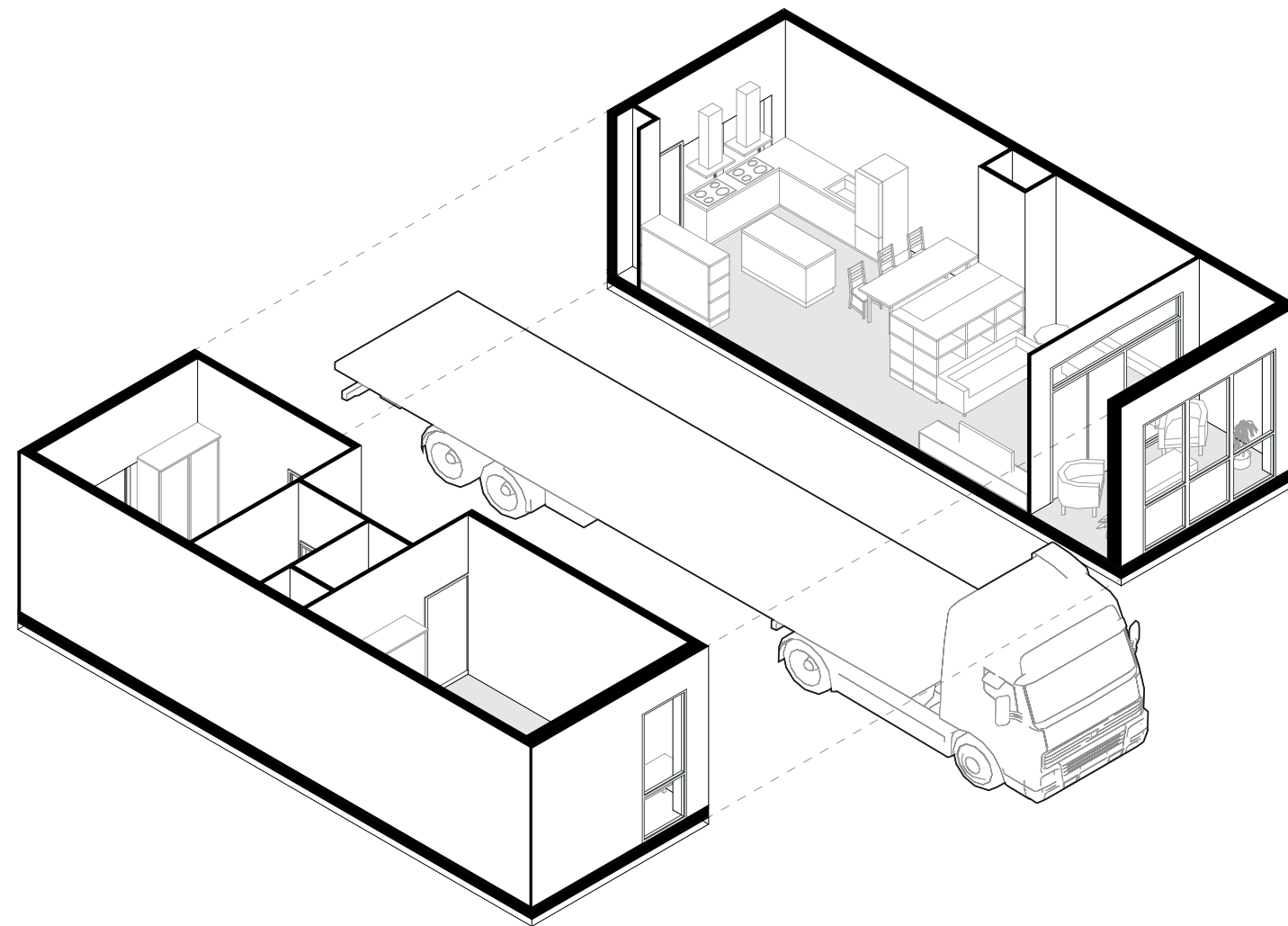


Artist co-living apartment 190 m²
4-8 people

Artist co-working/ living studio 150 m²
2-4 people

MODULAR CLT CONSTRUCTION

Delivery method



MODULAR CLT CONSTRUCTION

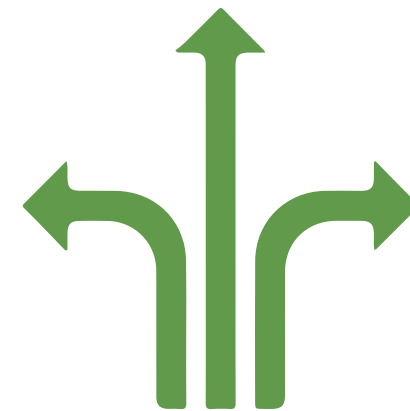
Advantages



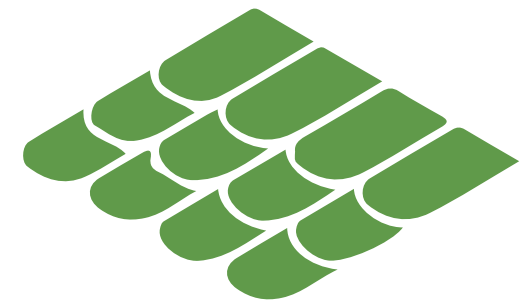
Greener



Cheaper



More flexible



**Easier to apply new
material**

USE OF UPCYCLED PLASTICS

Different shearing layers



STUFF
SPACE PLAN
SERVICES
SKIN
STRUCTURE
SITE

7 years
15 years
25 years
50 years
200 years
Eternal

Upper layers
↑
Bottom layers

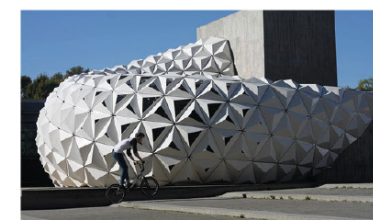
SPACE PLAN



SERVICES



SKIN

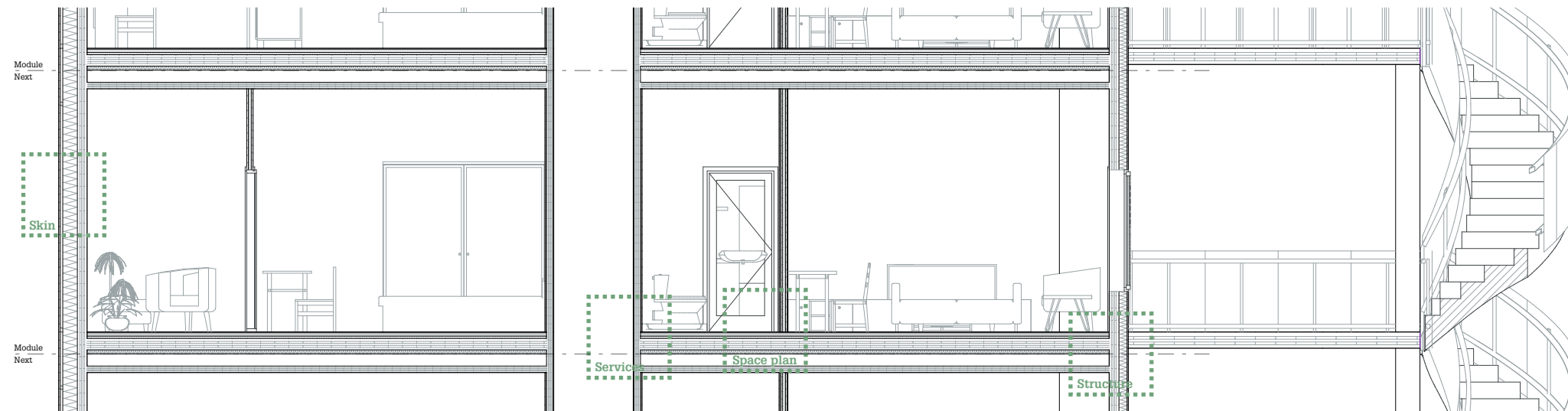


STRUCTURE

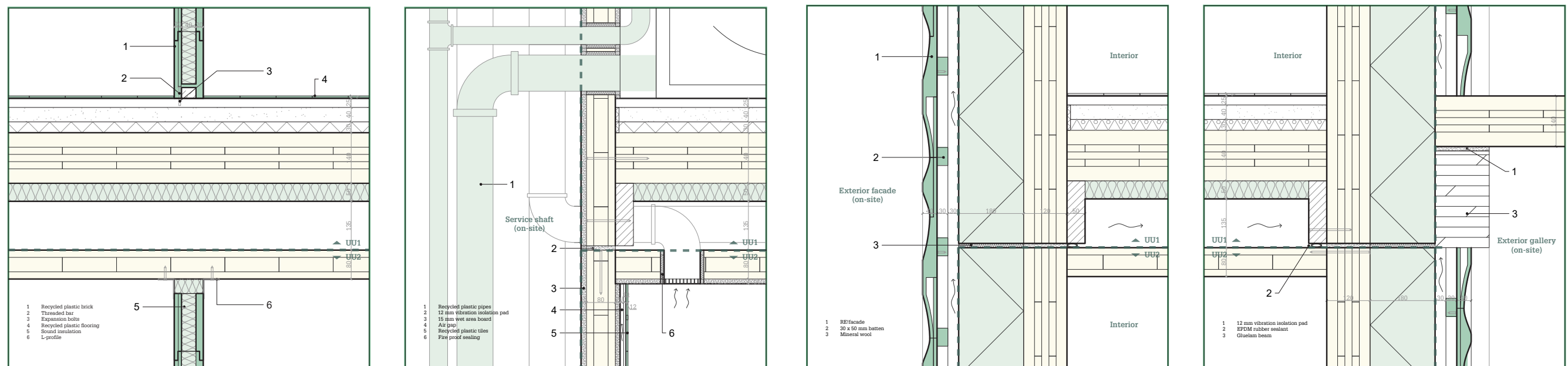


USE OF UPCYCLED PLASTICS

Different shearing layers

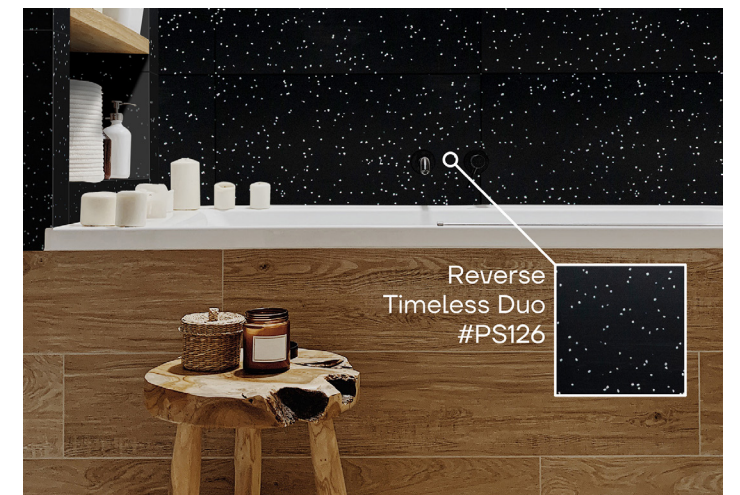
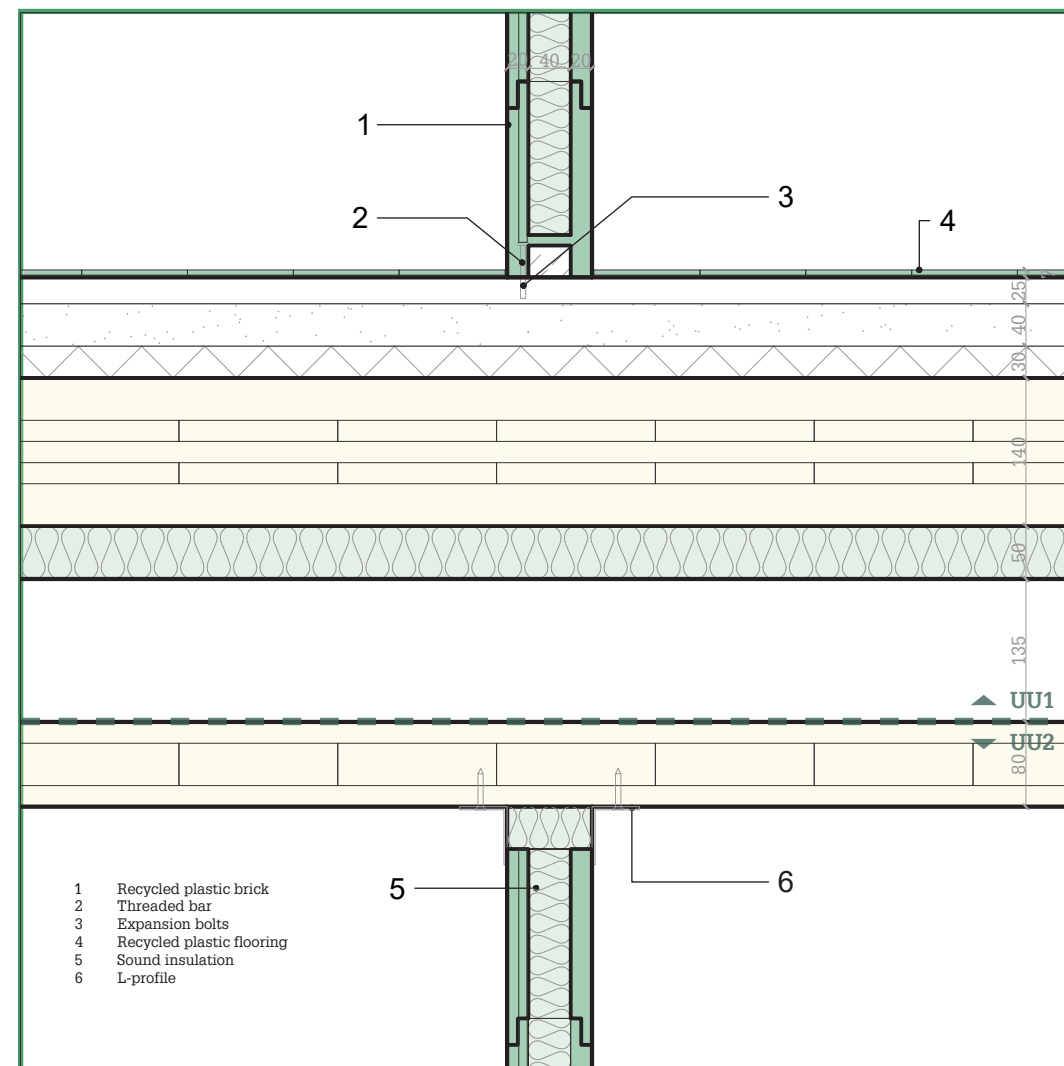


Design for disassemble and reuse



USE OF UPCYCLED PLASTICS

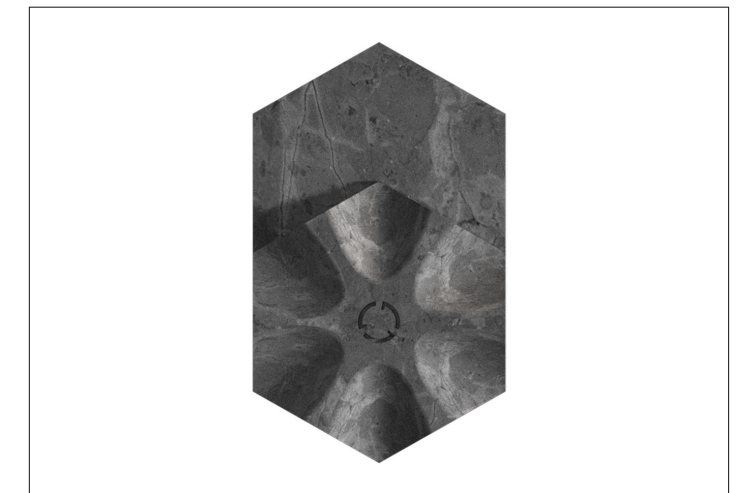
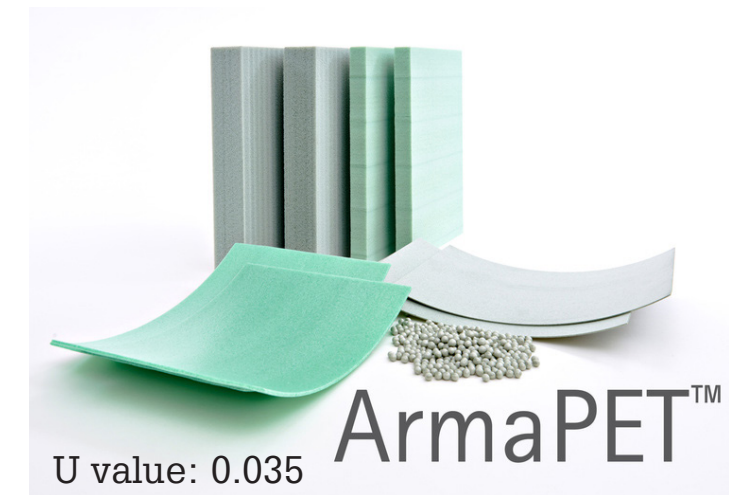
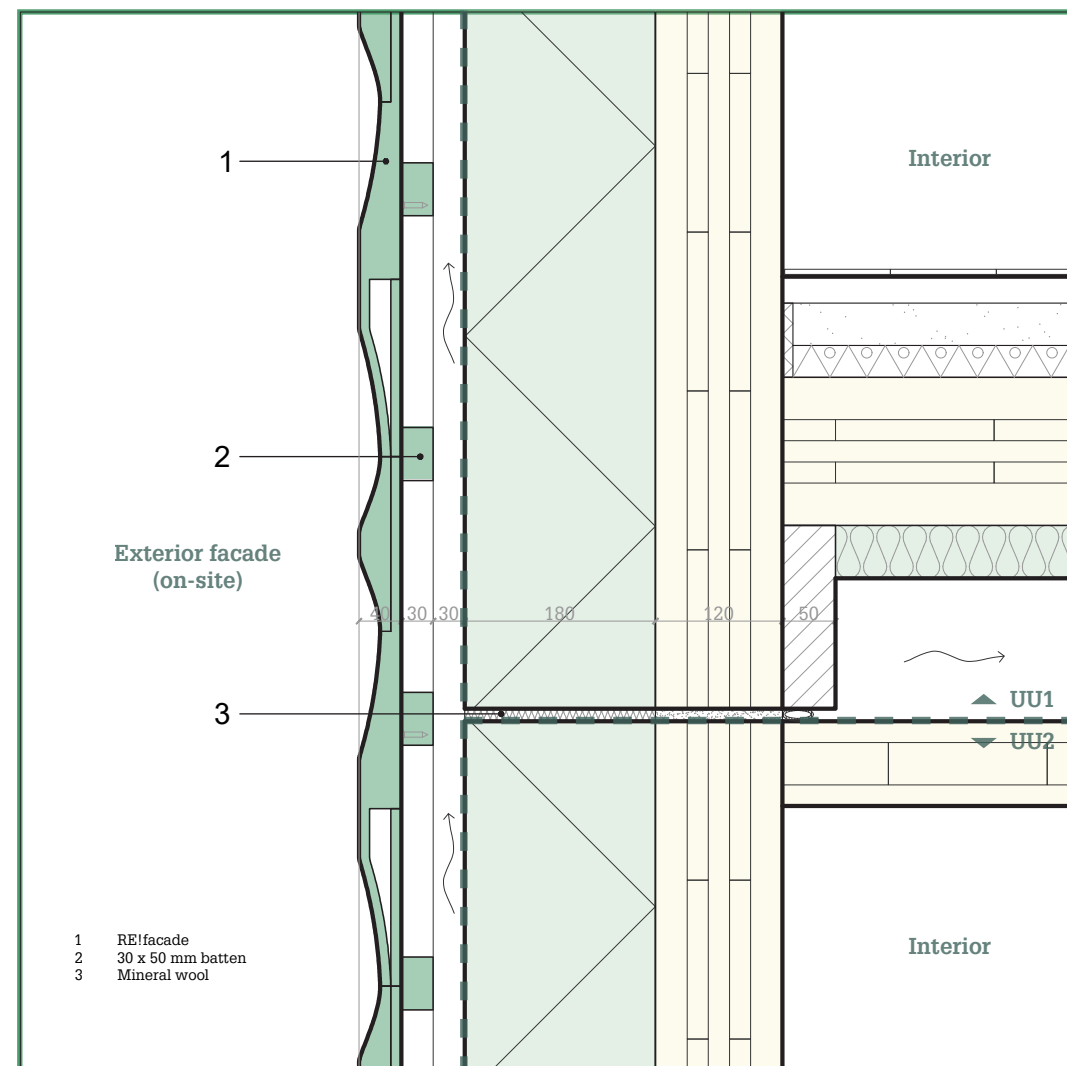
Space plan



Precious Plastic. (2020). Plastic bricks. Retrieved 04 January 2022 from <https://preciousplastic.com/starterkits/buy/bricks>.
 SelectTech. (2019). Flooring by SelechTech.

USE OF UPCYCLED PLASTICS

Skin



JD Composites. (2019). Homeowner information sheet.

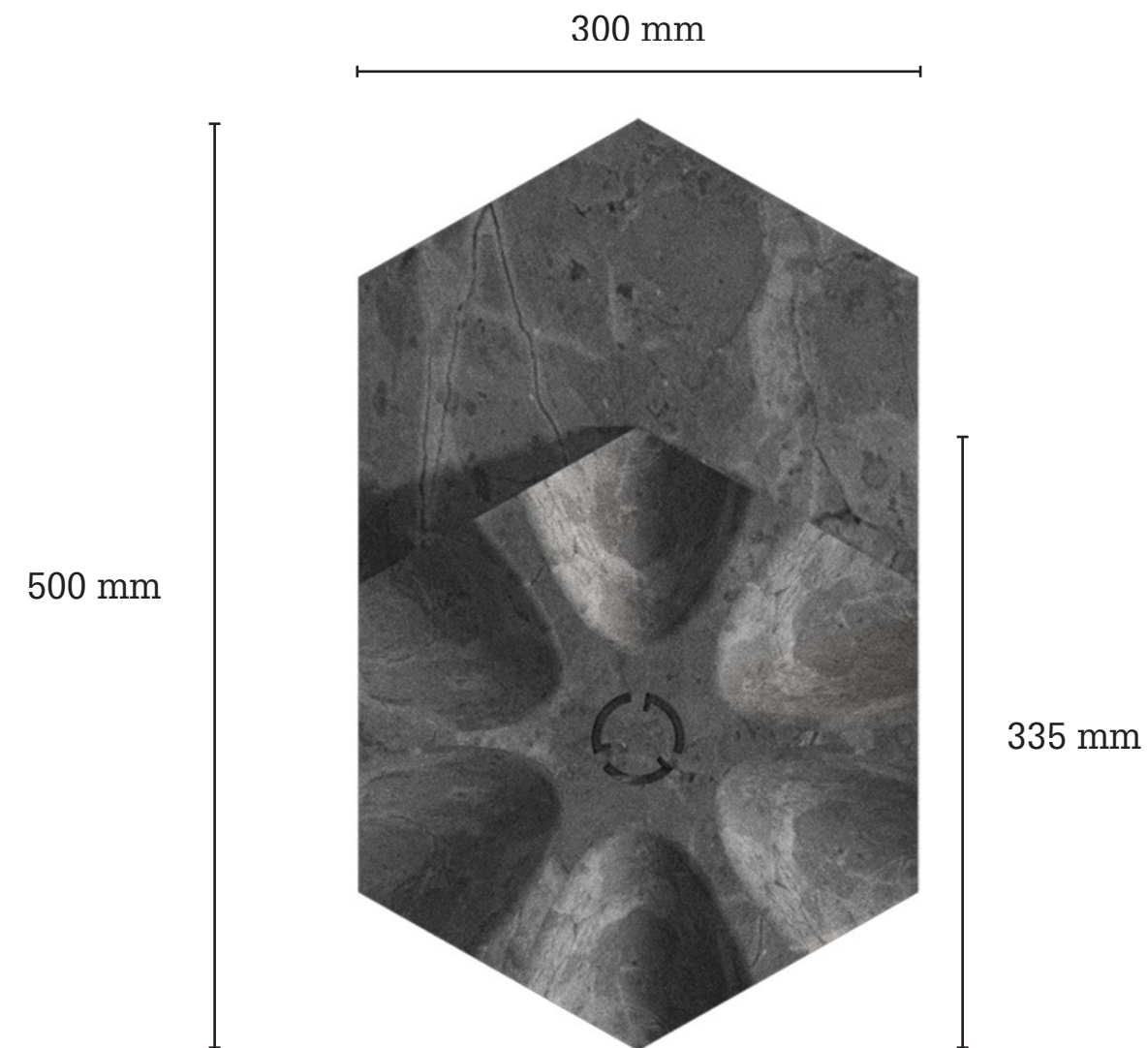
RE!FACADE

Concept



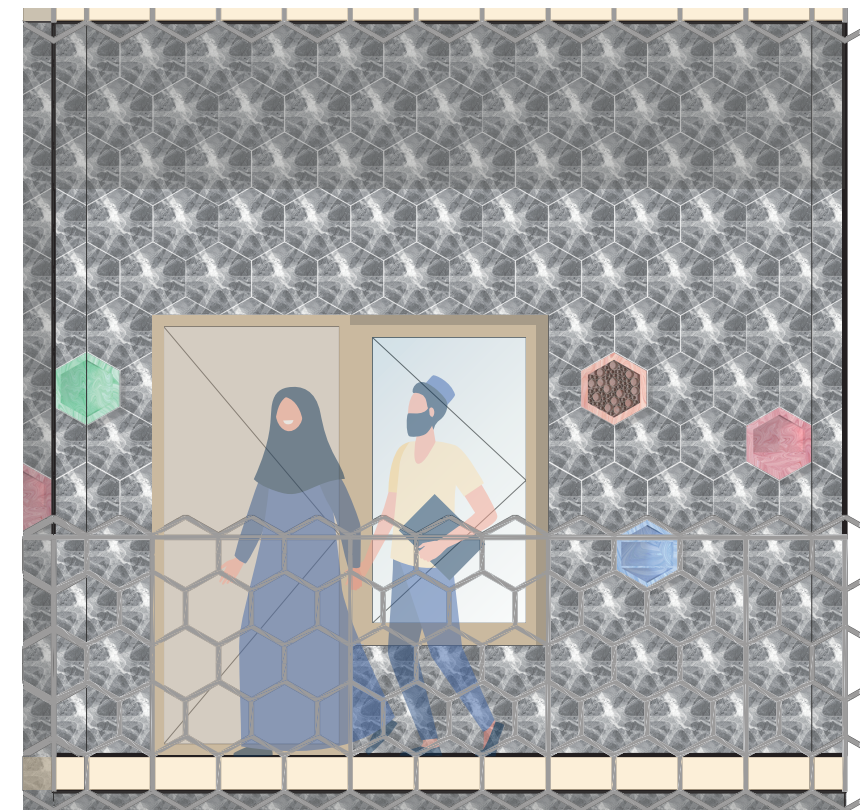
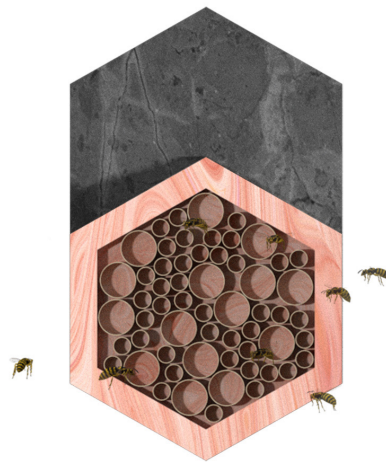
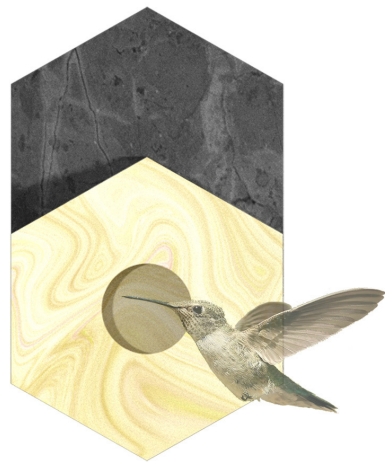
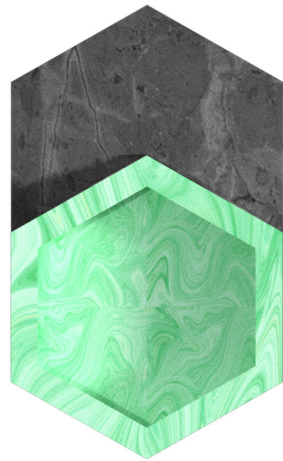
RE!FACADE

Base cladding



RE!FACADE

Plug-in options



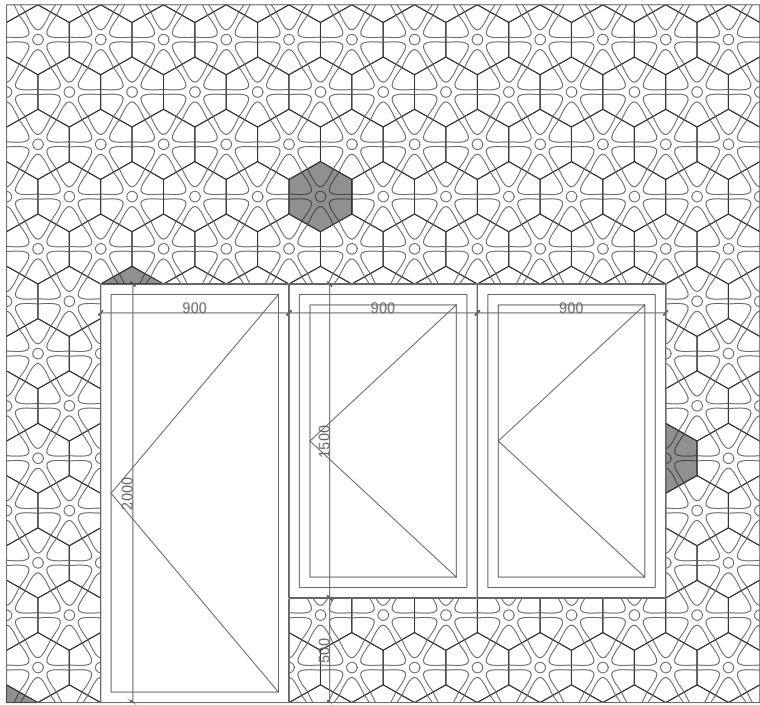
RE!FACADE

Video - Different use of RE!facade

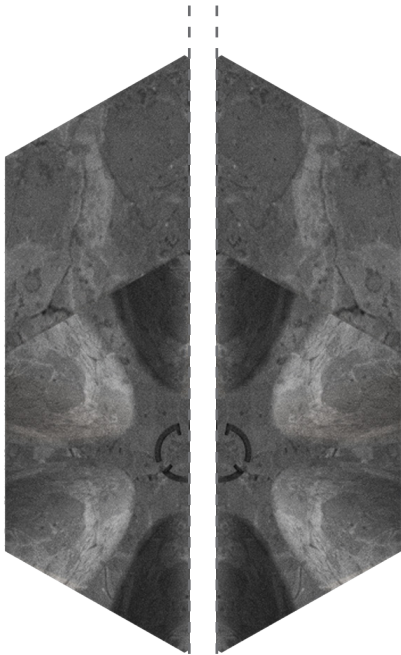


RE!FACADE

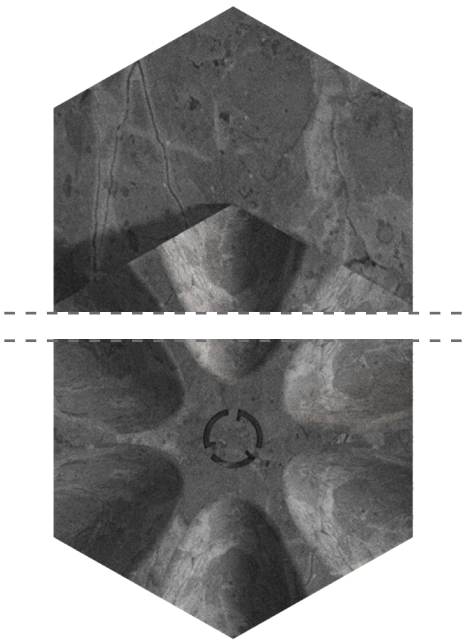
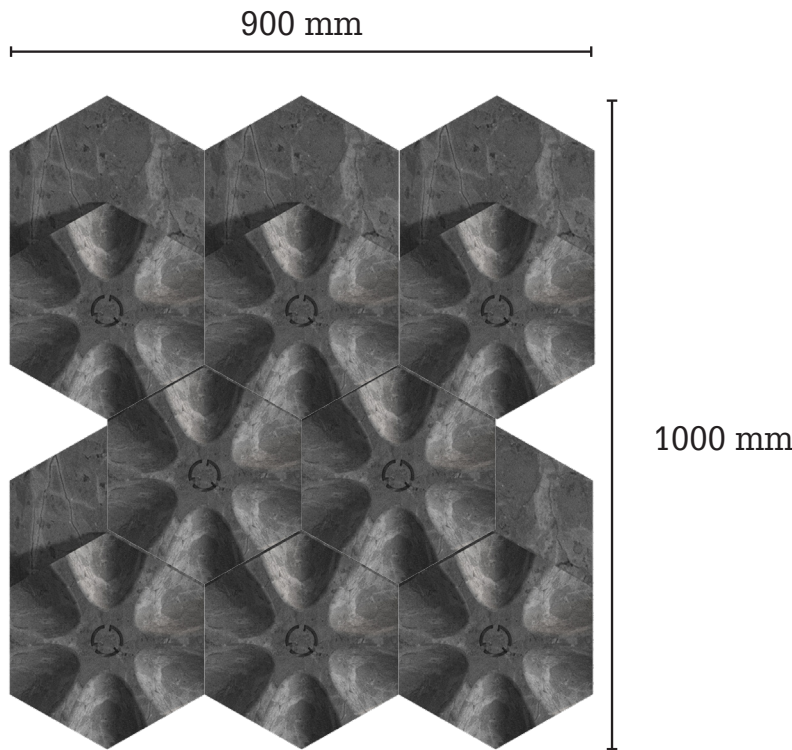
Windows opening



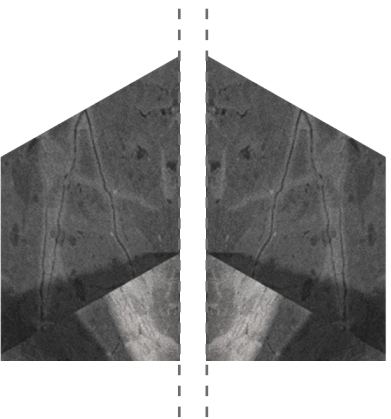
Full cladding



Half cladding
(window)



Quarter cladding
(window)



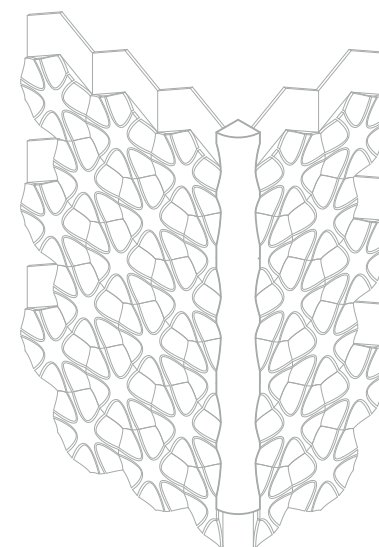
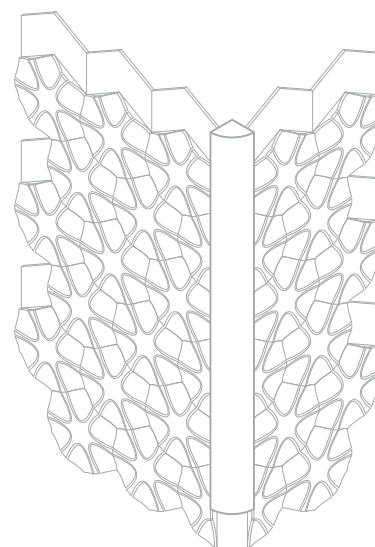
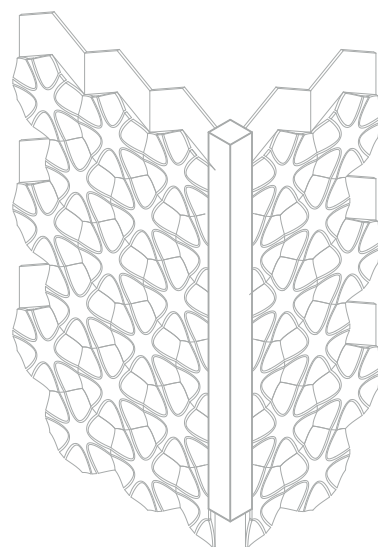
Half quarter cladding
(edges only)

RE!FACADE

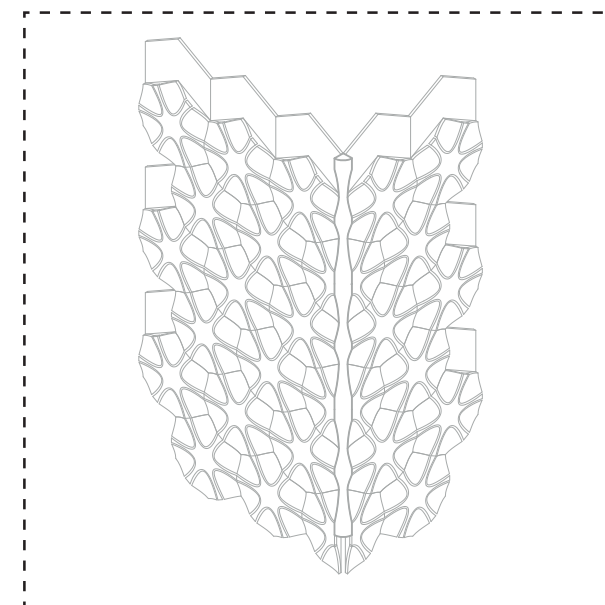
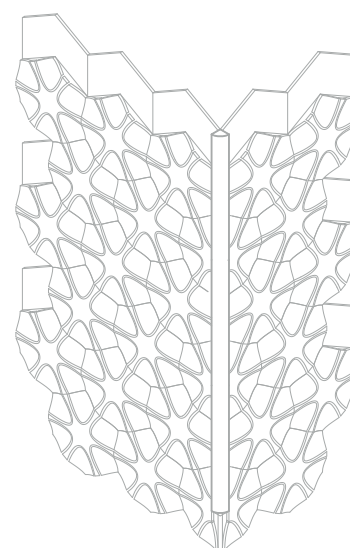
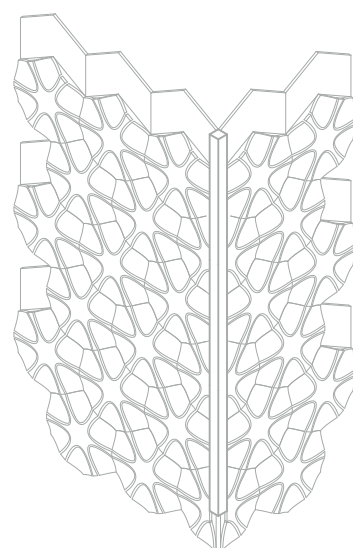
Corner study



100 x 100 mm

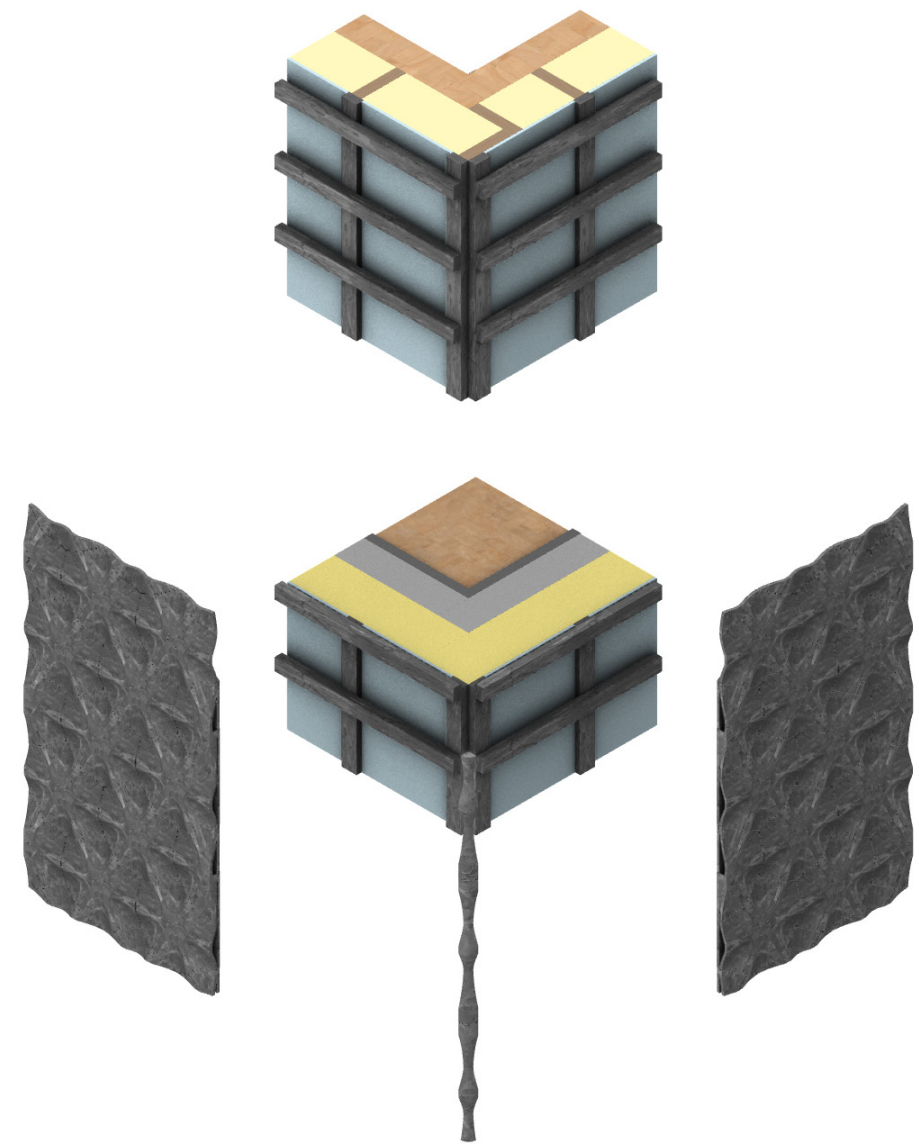
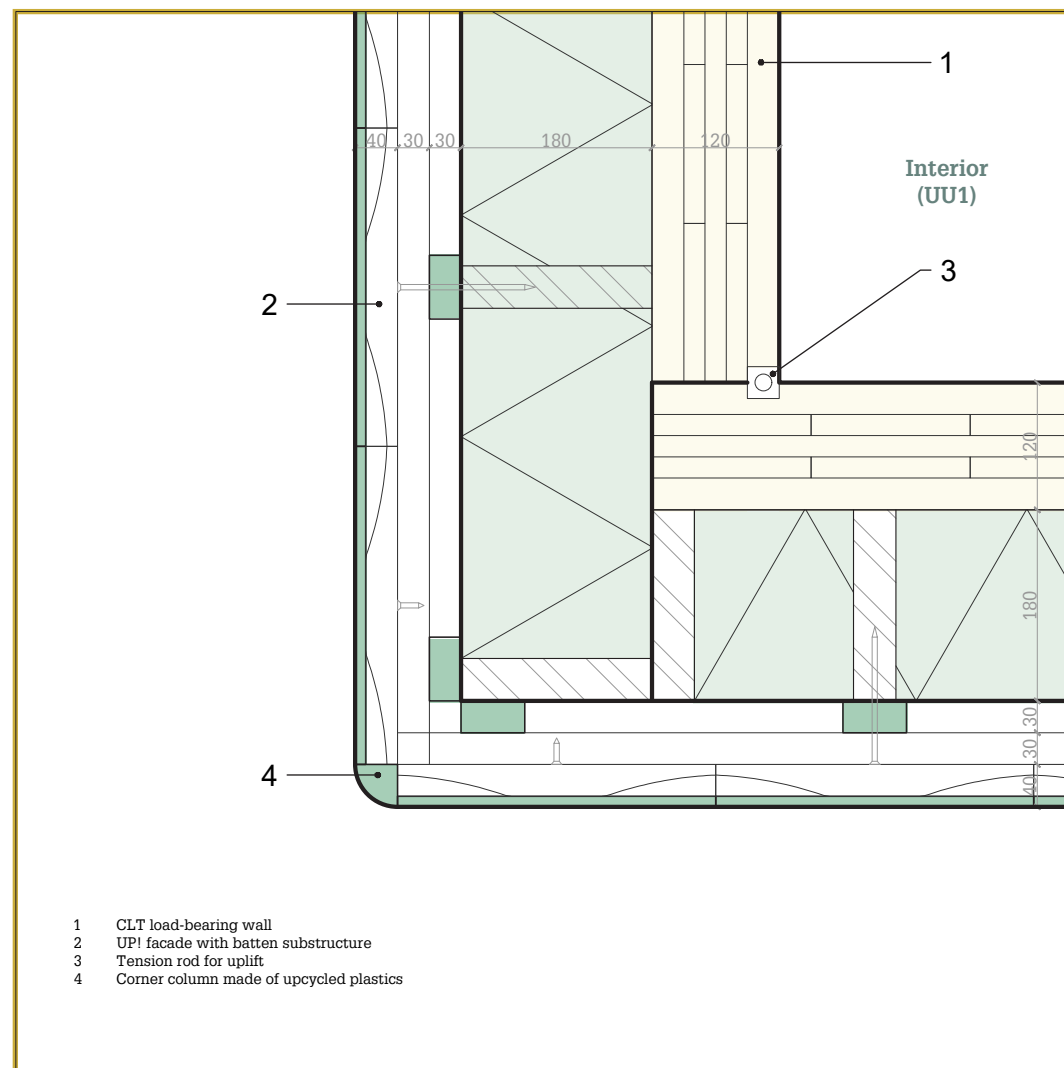


40 x 40 mm



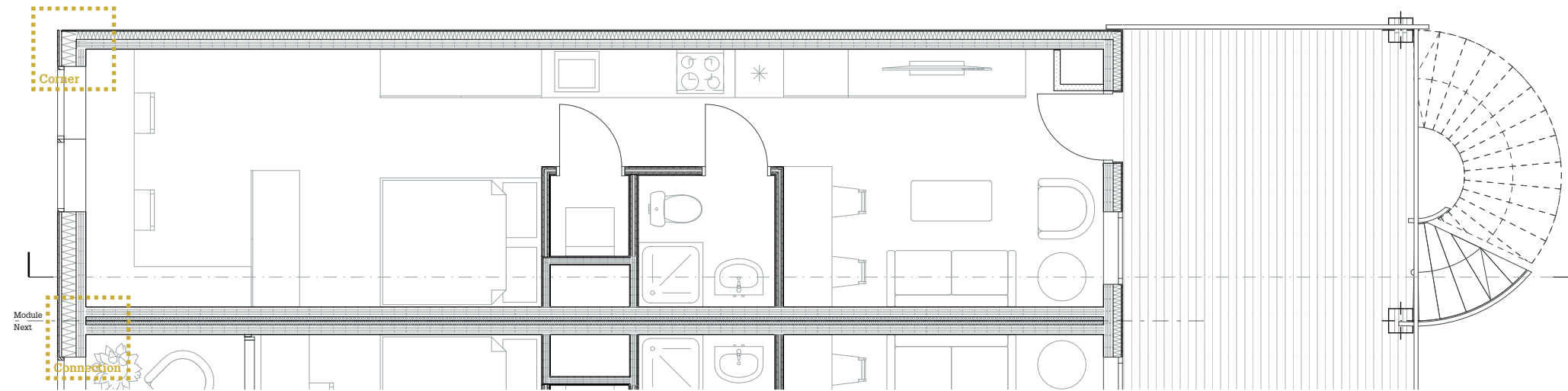
RE!FACADE

Video - implementation with structure



RE!FACADE

Modular construction with recycled plastics



Space plan: 1140 kg

Partition: 1000 kg

Floors: 80 kg

Wall tiles: 60 kg

Skin: 1600 kg

RE!facade: 100 kg

Insulation: 1000 kg

Services: 75 kg

= 2.800 kg recycled plastics

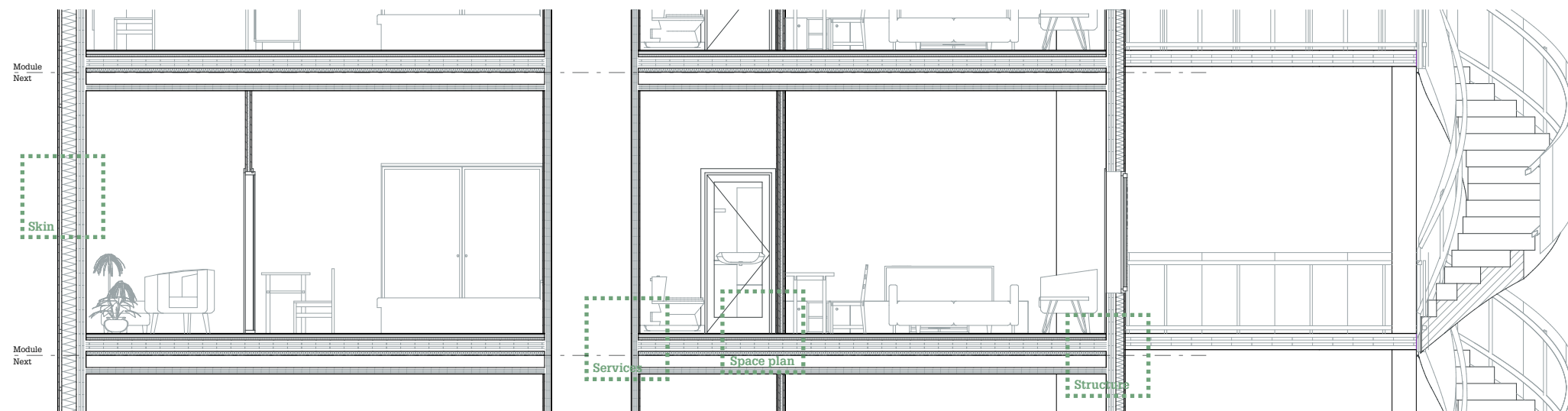
= **280.000** plastic bottles

= save **9.000** kg of CO₂

300 units

= 840 tons of plastics

= 7.5 months to collect (1.380 tons per year)

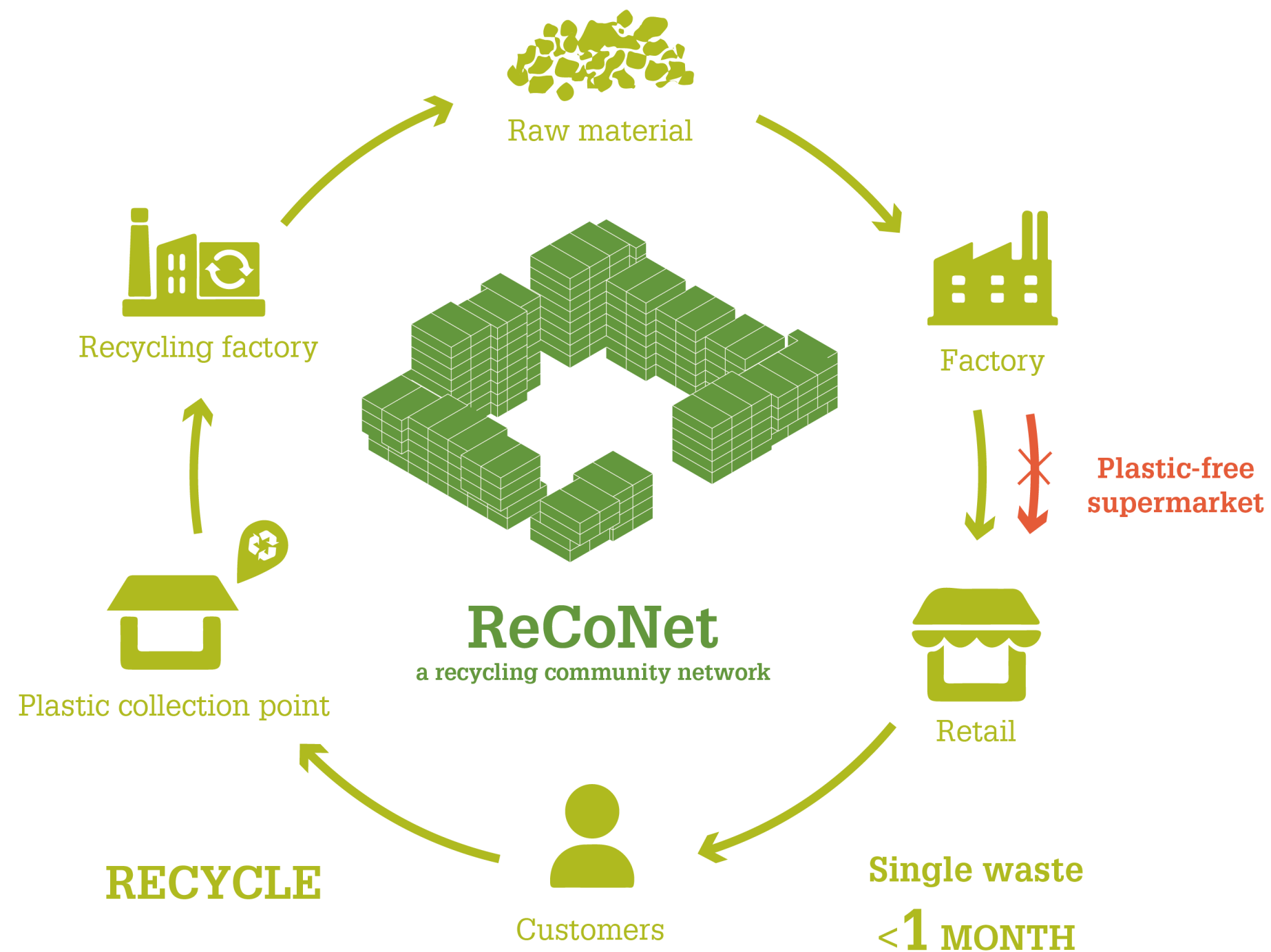


RE!FACADE

1:20 model

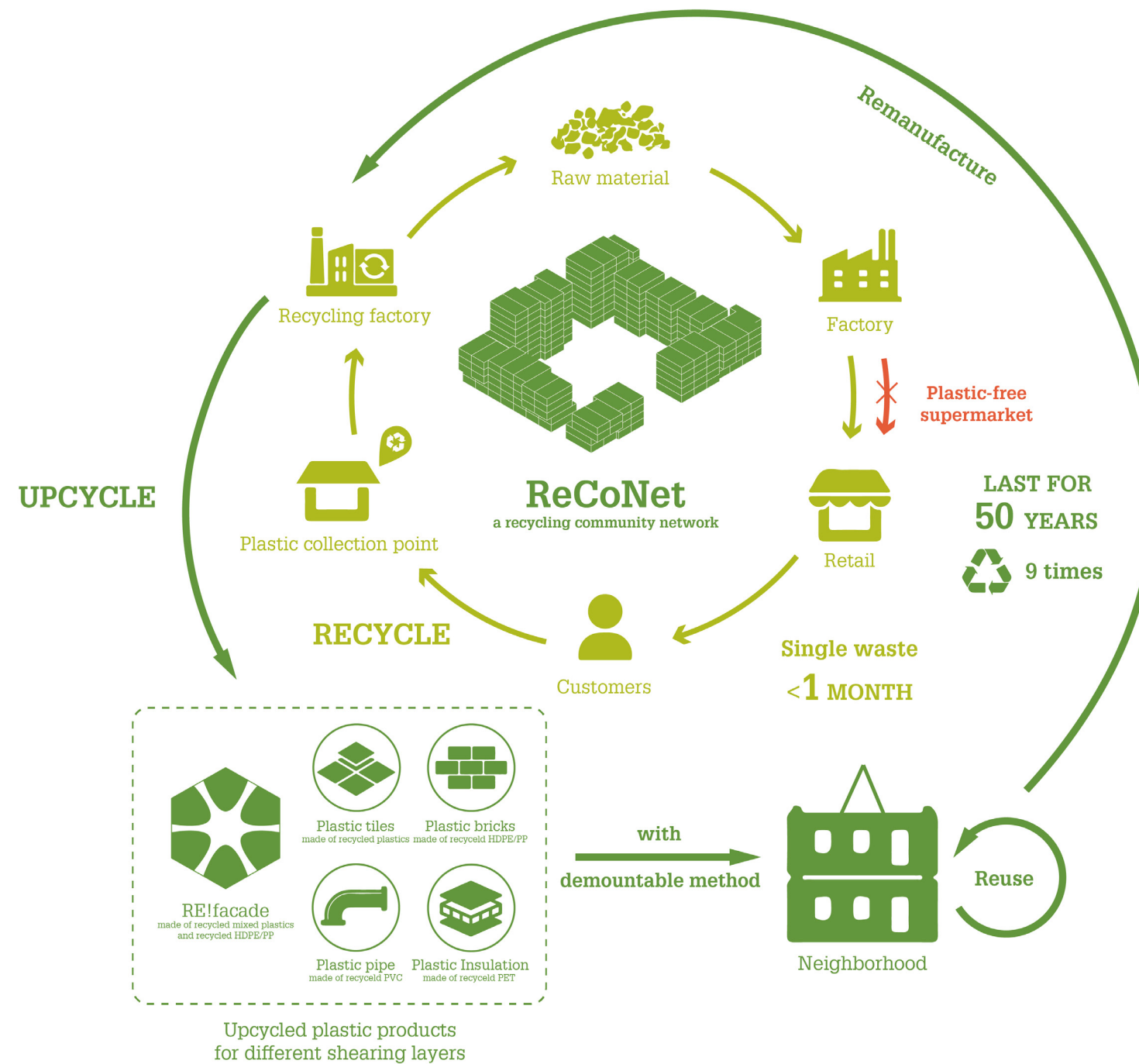
CIRCULAR CONCEPT

Circular material - recycle



CIRCULAR CONCEPT

Circular material - upcycle



CLIMATE SCHEME

Energy-neutral circular building

Rain water for flushing toilet

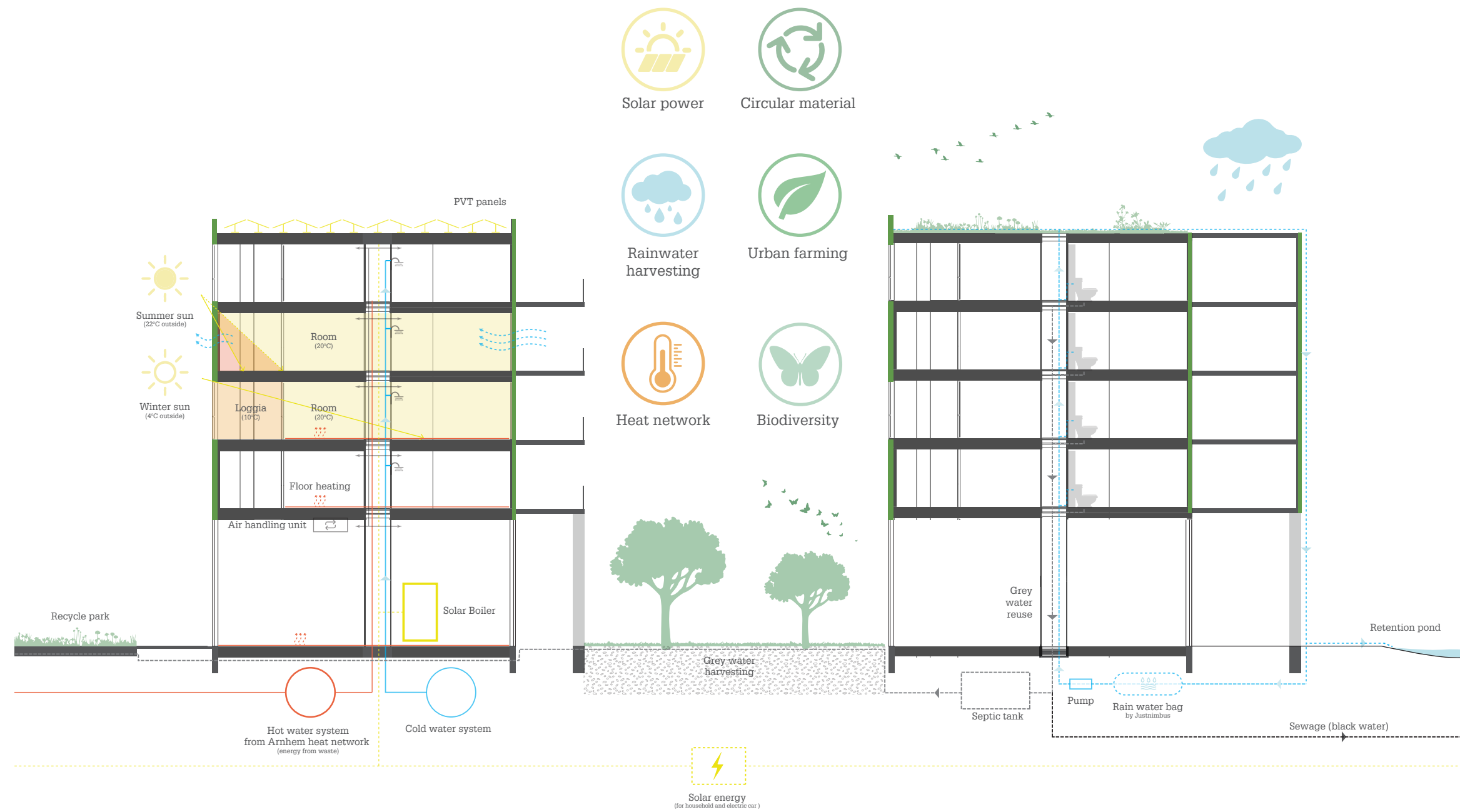
72%
of the consumption
(save 5300m³ water per year)

Calculation
Average annual precipitation: 850mm
Number of consumers: 600
Roof surface: 9000 m²
Average water consumption per person per day: 34L



CLIMATE SCHEME

Energy-neutral circular building



CLIMATE SCHEME

PVT panels calculation

Solar energy for residents and retails

131%
of the consumption
(save 1.000.000 kWh per year)

Extra: for electric bikes and cars

Calculation
Total surface area: 30000 m²
Number of residents: 600
Roof surface: 9000 m²

Also input of:
Area of each facade, Type of heating, Type of ventilation, Thermal mass etc.

Indicatief BENG-label


Project

ReCoNet

KENTALLEN


Gebruiksoppervlakte Ag	m ²	30000
Verliesoppervlakte/Volume	m ² /m ³	0.27
Ugemiddeld	W/m ² K	0.419
Glaspercentage*ZTA-zonwering	%	0.12
% Natuurlijke ventilatie	%	80
% Daglicht	%	70
Elektriciteitsproductie /Ag	kWh/m ²	34.3

BENG indicatoren

Energiebehoefte


< 65.8

32 kWh/m²

Primair fossiel energiegebruik

< 51.5

-5 kWh/m²

Aandeel hernieuwbare energie

> 38.5

131 %

A+++ building

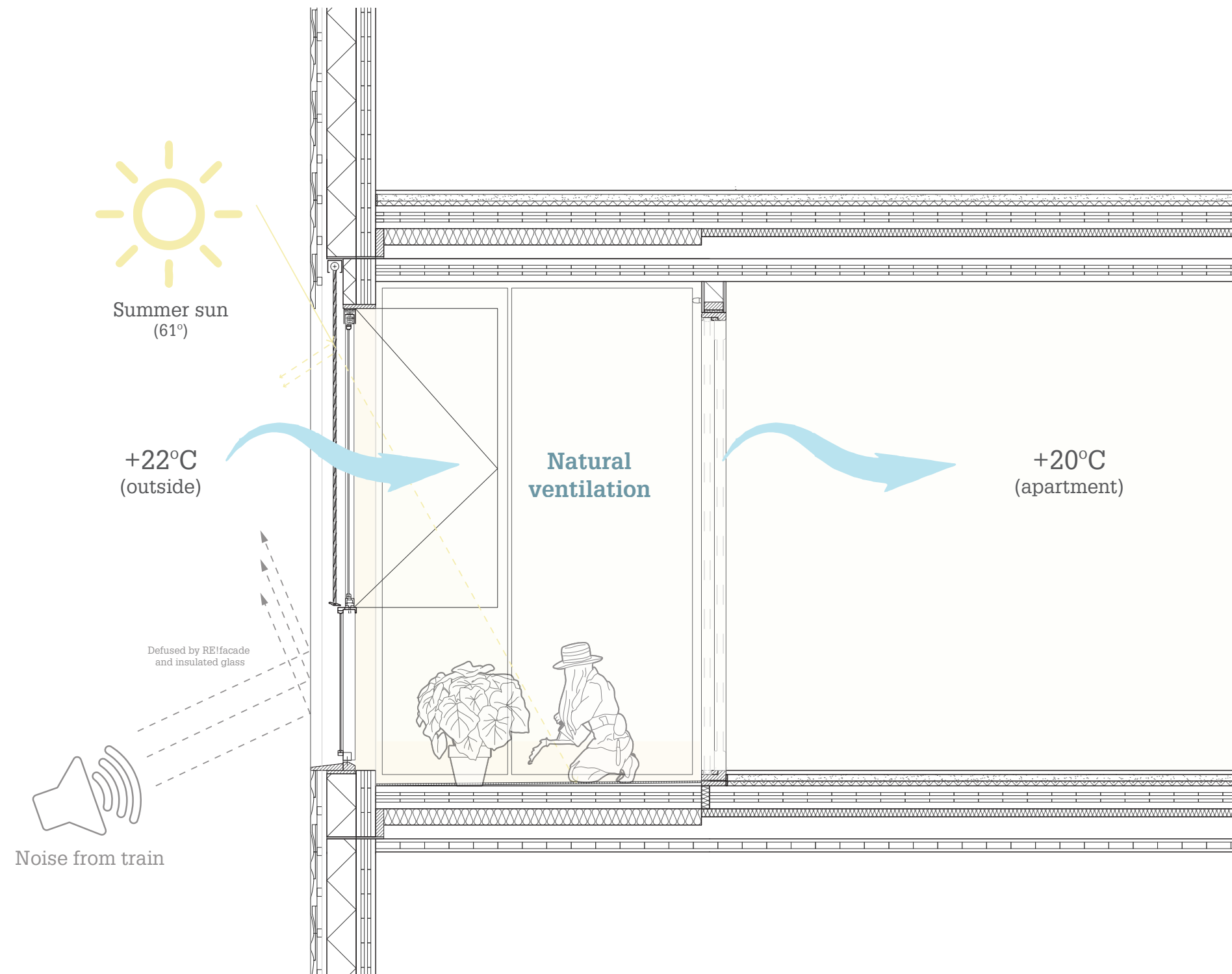
Dit energielabel geeft een indicatie van de energiezuinigheid van het ontwerp.

Versie 3.06 20210416 Alleen te gebruiken voor onderwijsdoeleinden.

5240913

CLIMATE SCHEME

Summer

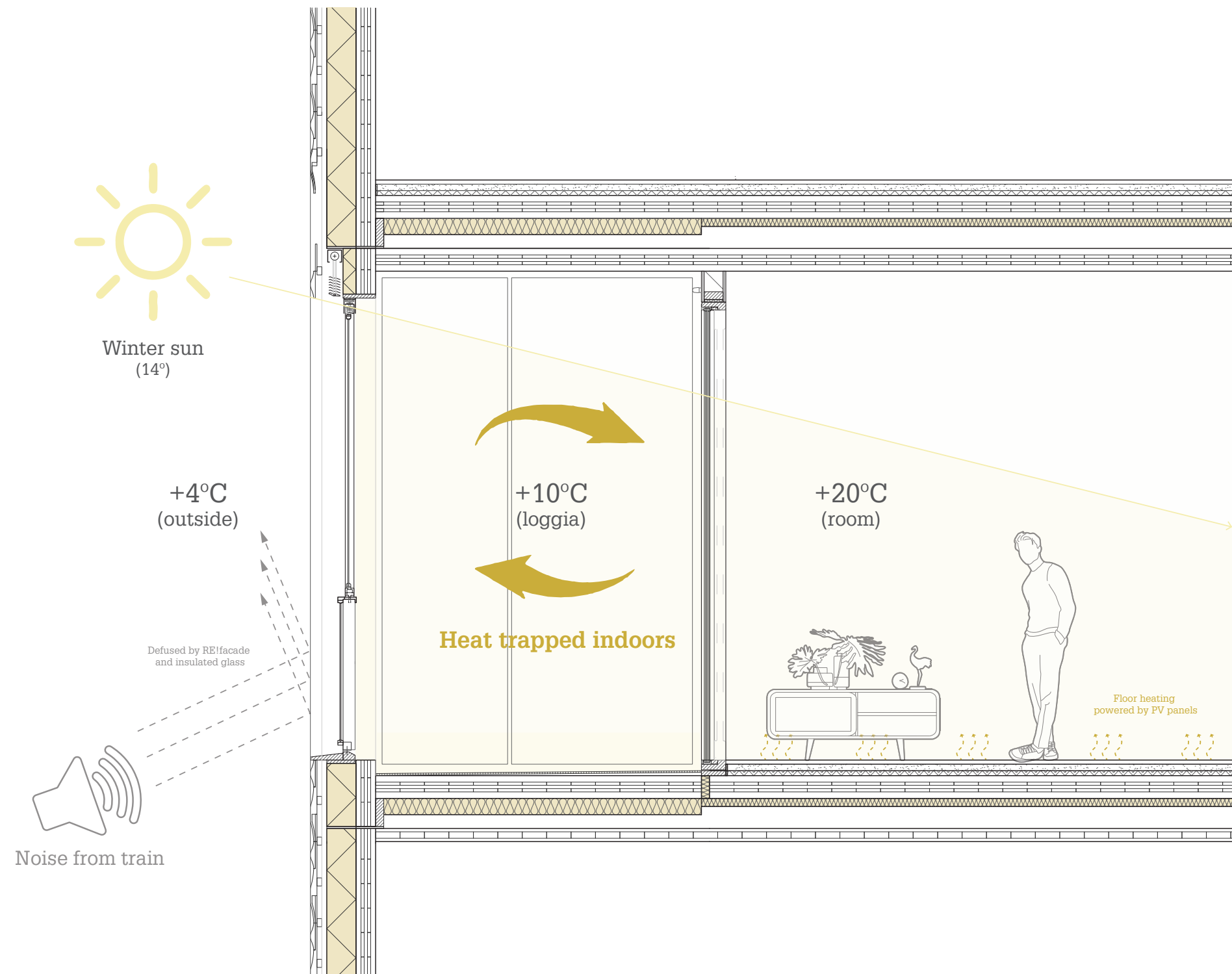


Loggia: buffer zone

Facade: noise diffused
($\alpha = 0.5$)
as good as acoustic tiles

CLIMATE SCHEME

Winter



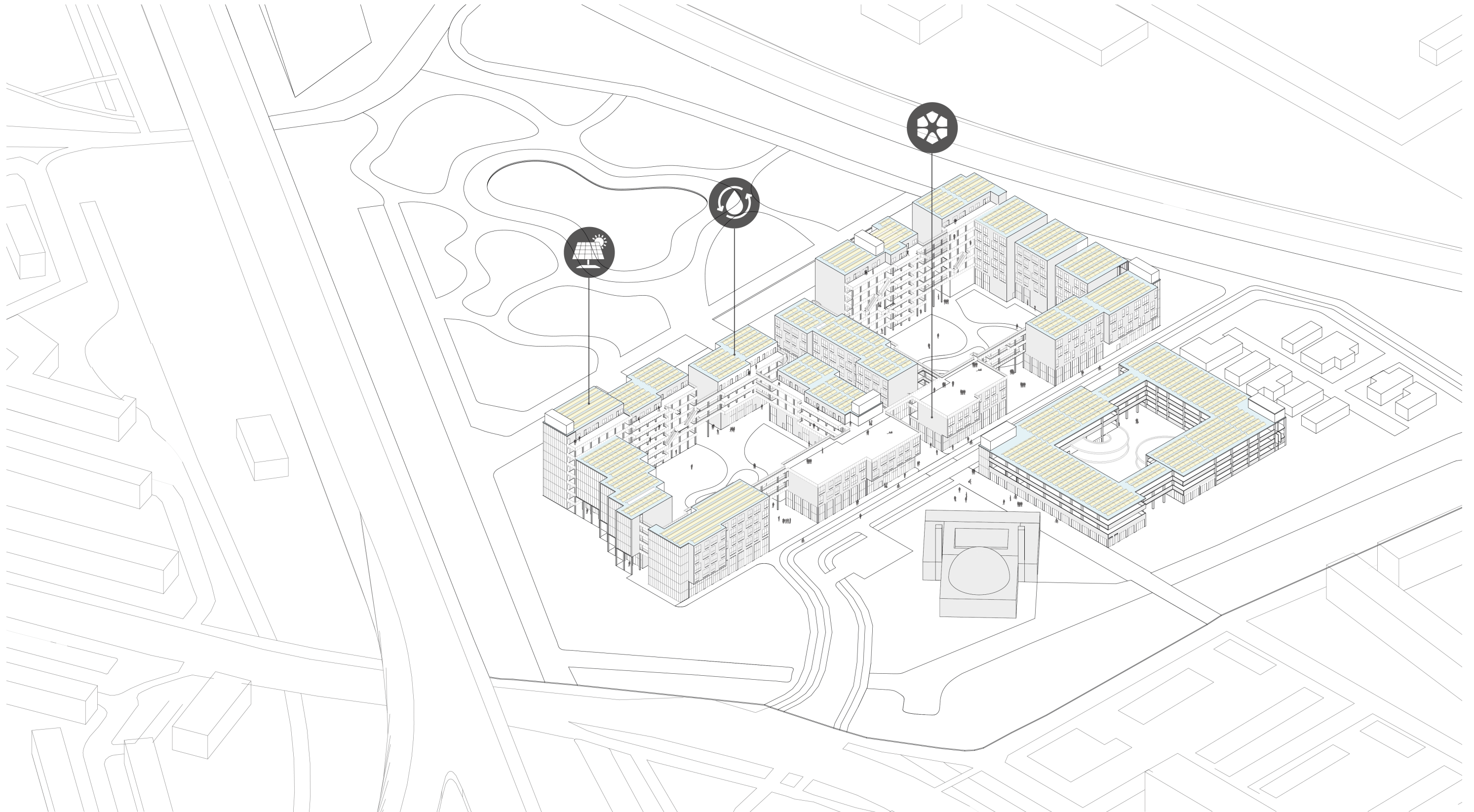
Loggia: buffer zone

Facade insulation
Rc-value: 6.5 (>3.7)
U-value: 0.035

Floor heating from the
heat network
(powered by the waste)

MICRO

reconnect the nature in a circular and sustainable way

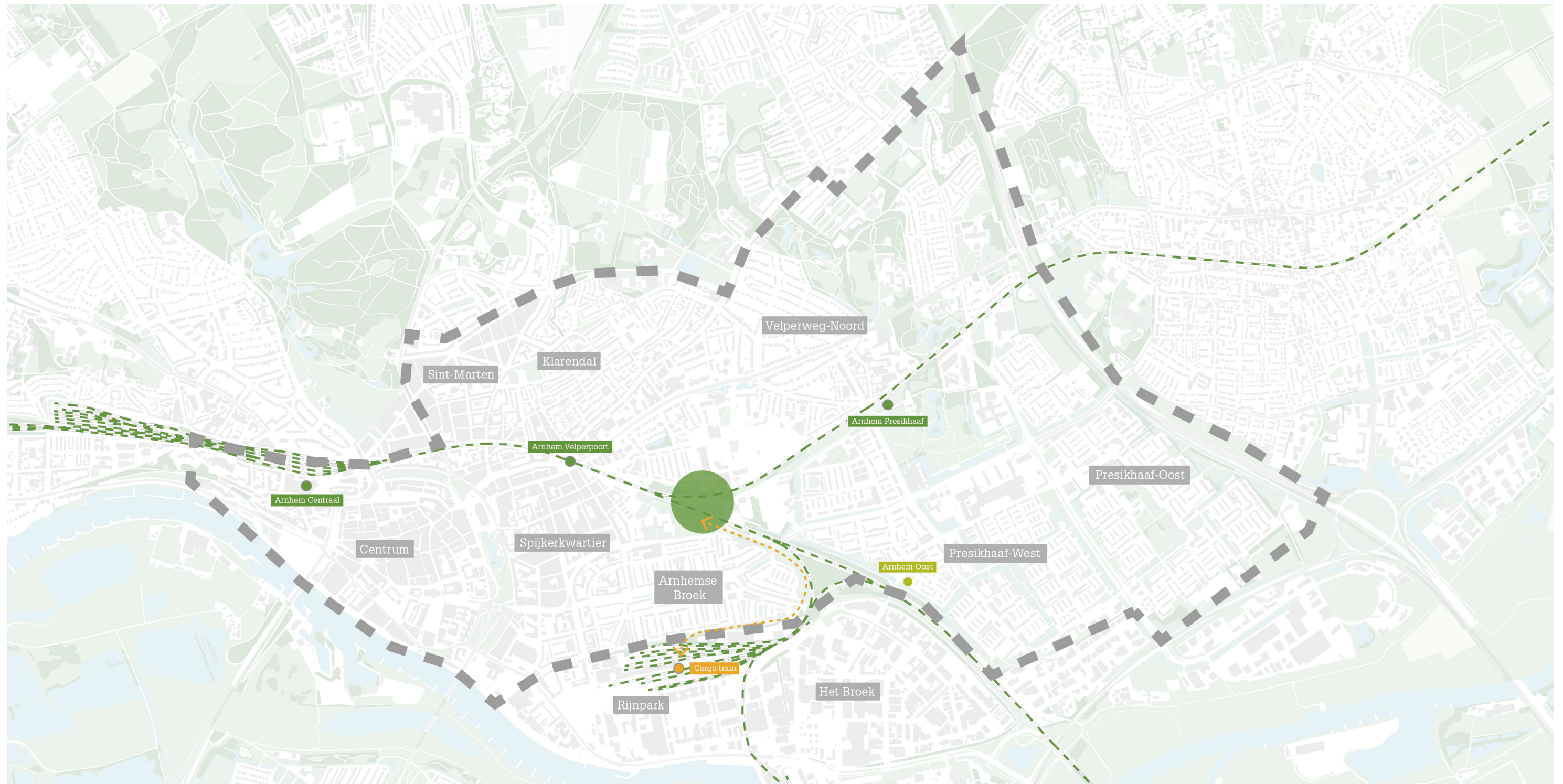


FUTURE DEVELOPMENT

Future-proof ReCoNet

EXPORTING THE PRODUCTS

Use the cargo train

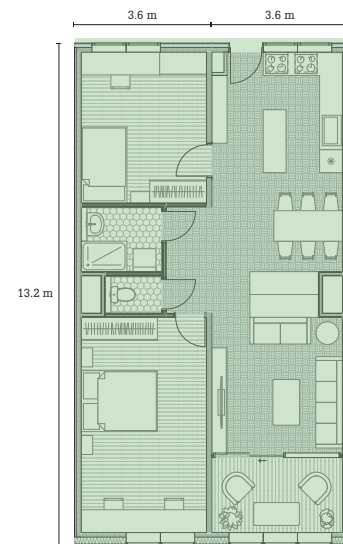


FLEXIBLE LAYOUT

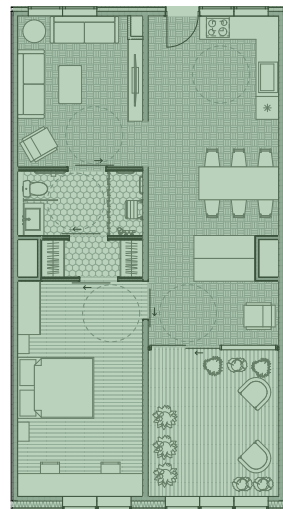
can be changed in the future (modular construction)



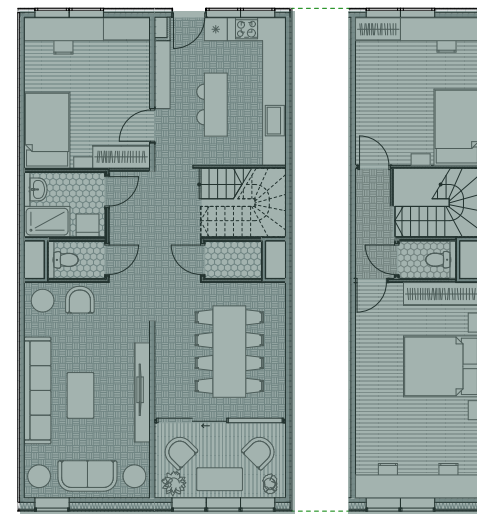
Studio (A&B) 47.5 m²
1-2 people



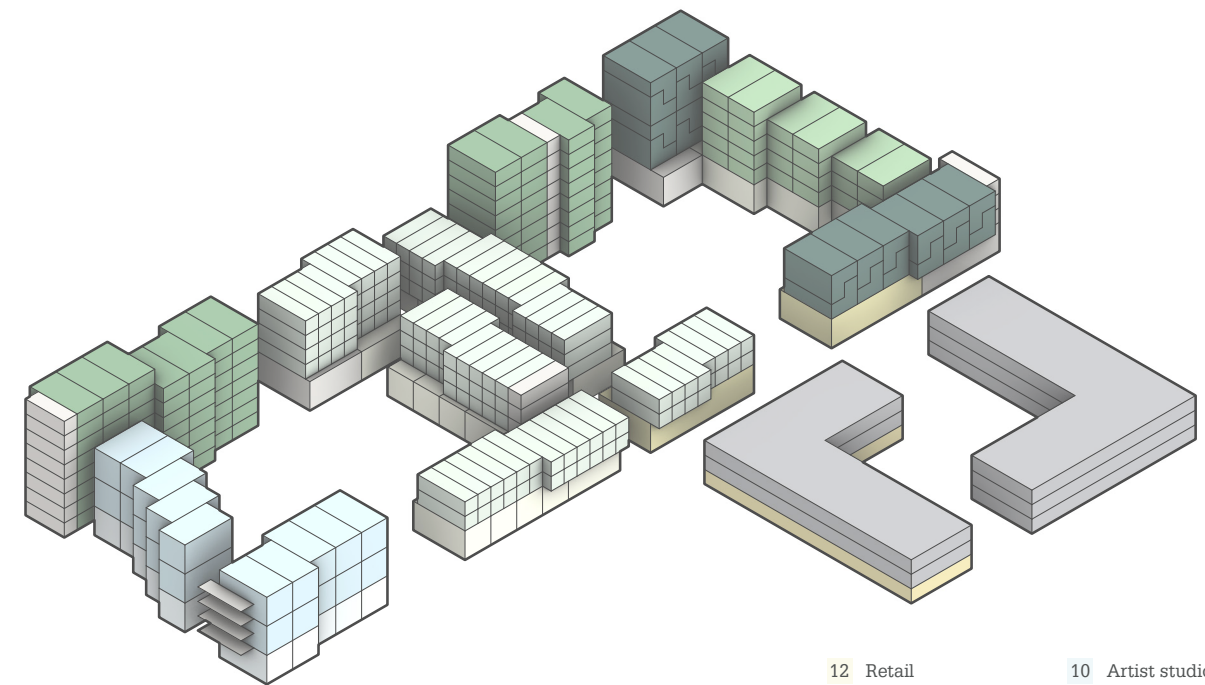
Family 95 m²
2-3 people



Senior 95 m²
2 people



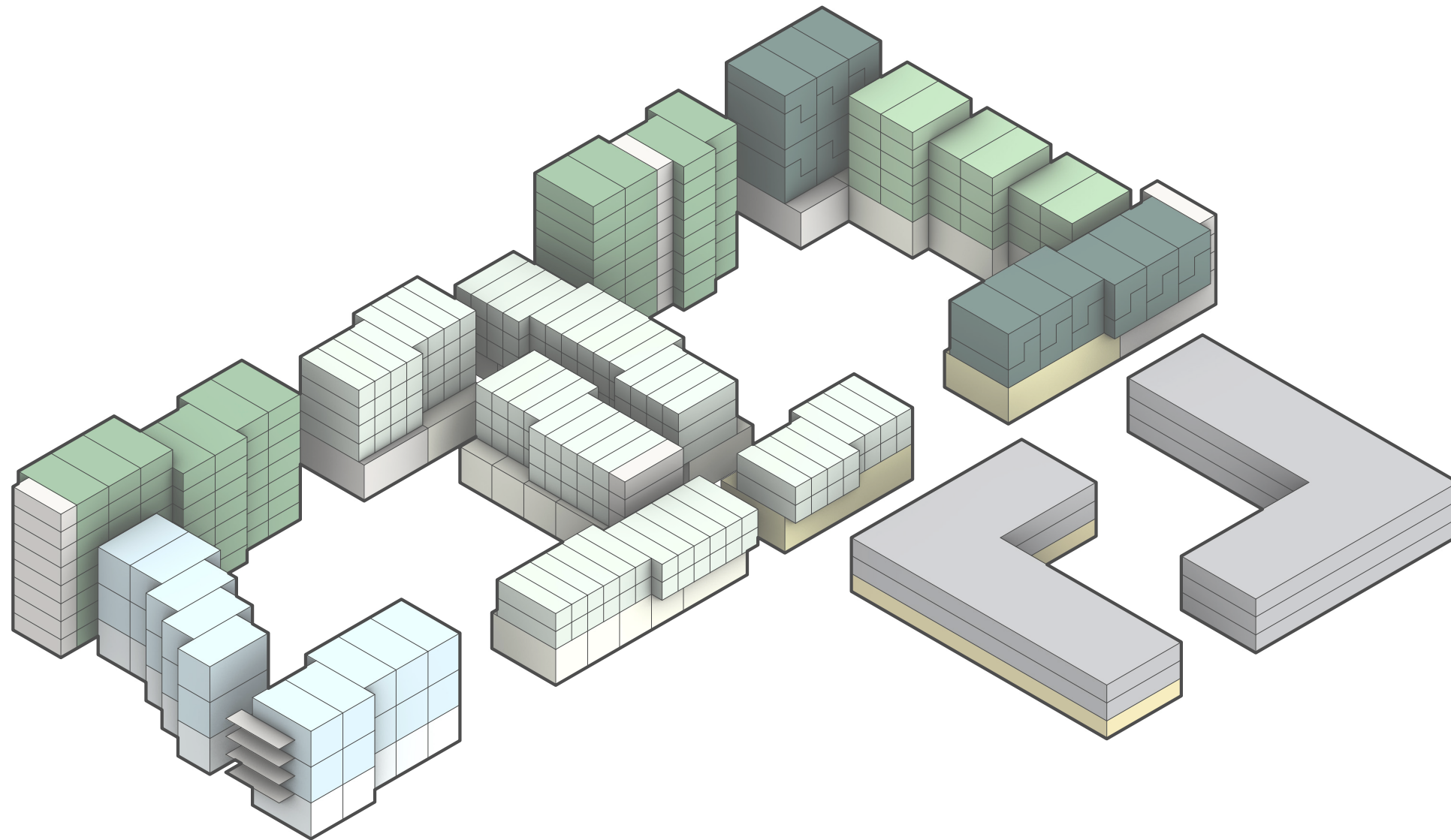
Family loft 142.5 m²
4-5 people



- | | |
|--------------------------|---------------------|
| 12 Retail | 10 Artist studio |
| 2 Plastic-related | 20 Artist co-living |
| 1 Community centre | 141 Single studio |
| 4 Lobby | 24 Family |
| 350 Car rental + Parking | 84 Senior |
| | 24 Family loft |

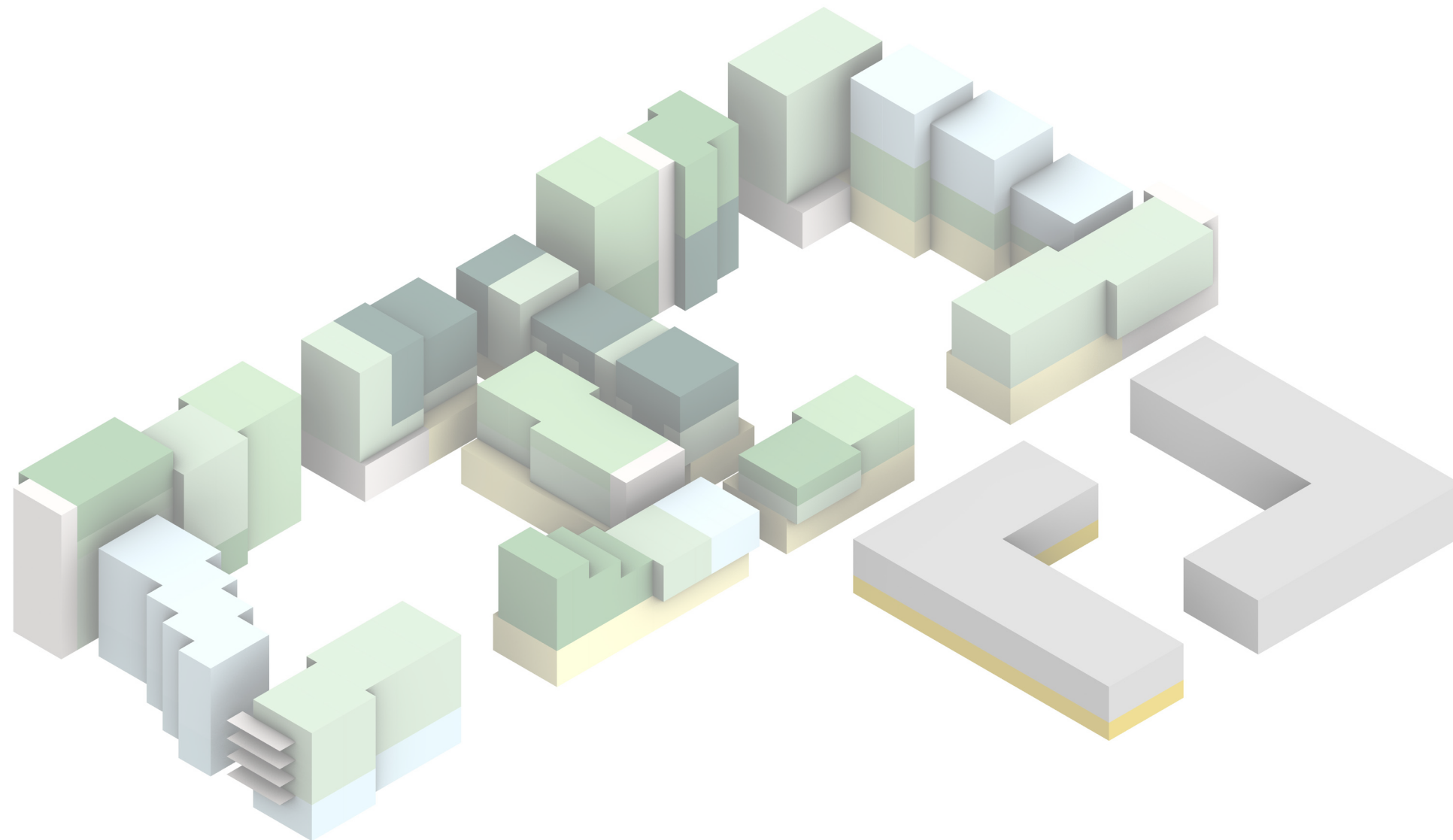
FLEXIBLE LAYOUT

Original arrangement



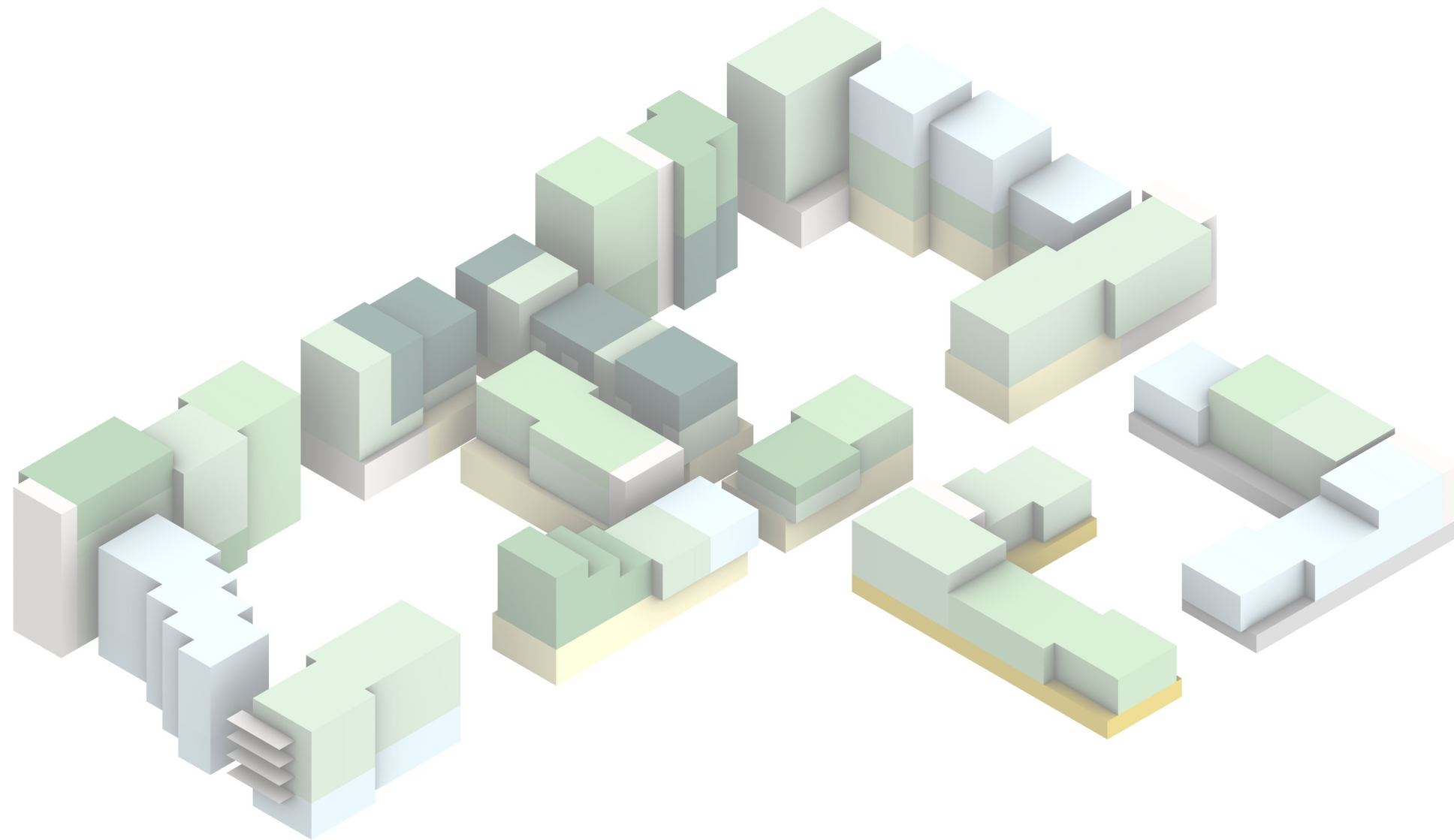
FLEXIBLE LAYOUT

Possible future arrangement



FLEXIBLE LAYOUT

Carpark can be transformed to housing



CARBON AMBITION

Reduce carbon emission significantly



Greenery
85000 m²



CLT construction
-600 kg CO₂ per m³ (500 kg)



Zero-energy building
with solar power



Recycled plastics
from 3.2 kg CO₂ to 1 kg CO₂
Factory: saving 300 tons of
CO₂ per year

VIDEO

QUESTIONS