

BIOTECTURE VILLAGE

Bernard A.M. Oussoren | 4017919
Graduation project Architectural Engineering
2016-2017

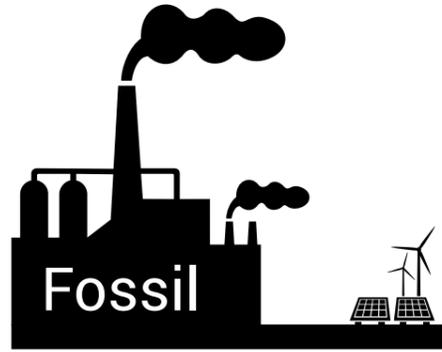
Annebregje Snijders
Engbert van der Zaag
Jan Jongert





I N T R O

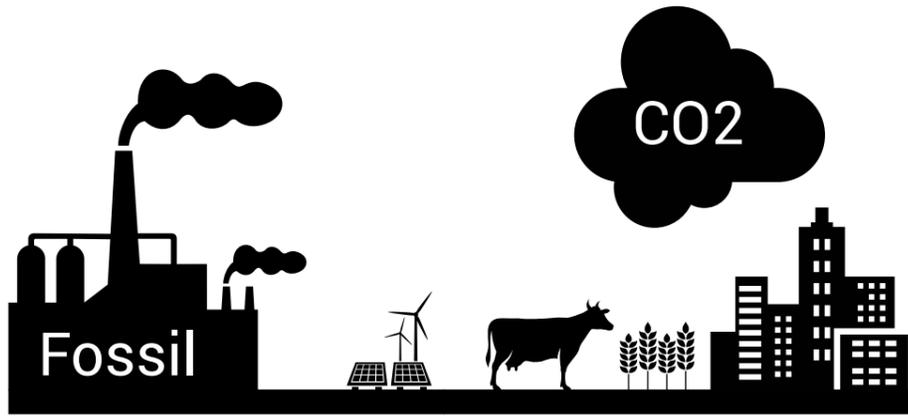
P r o b l e m
s t a t e m e n t



95%

I N T R O

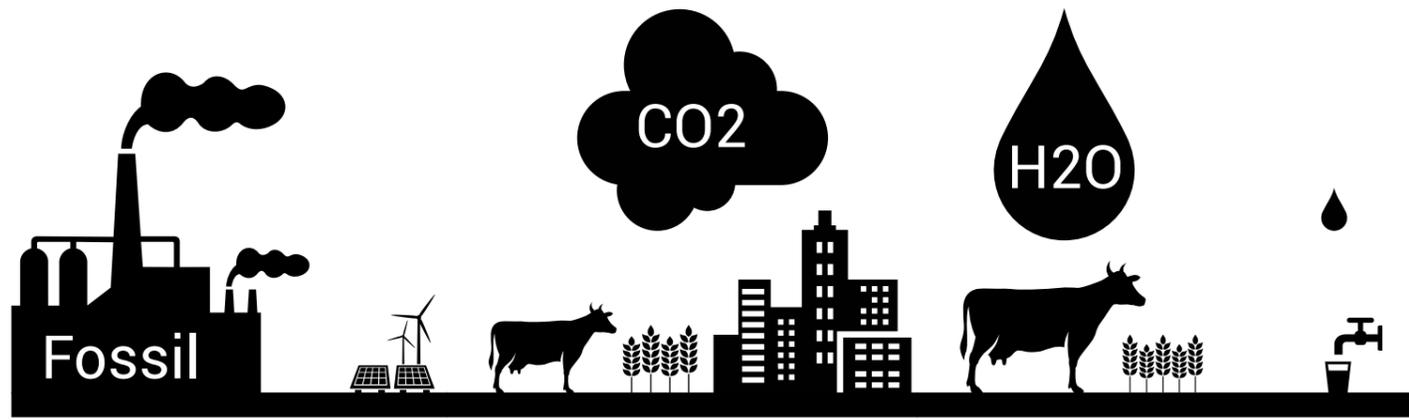
P r o b l e m
s t a t e m e n t



67%

INTRO

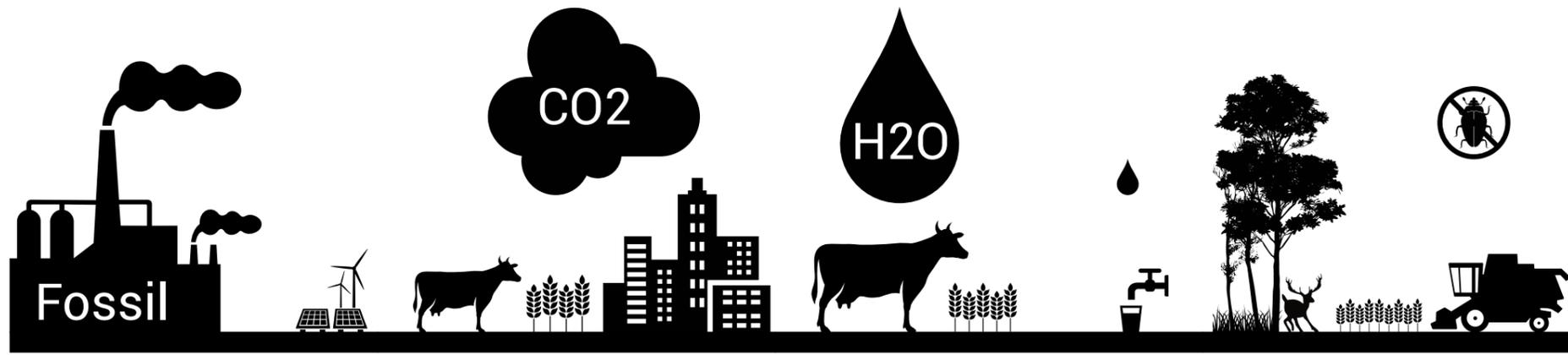
Problem
statement



85%

I N T R O

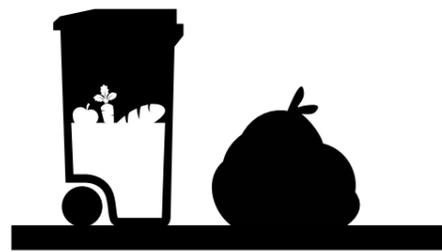
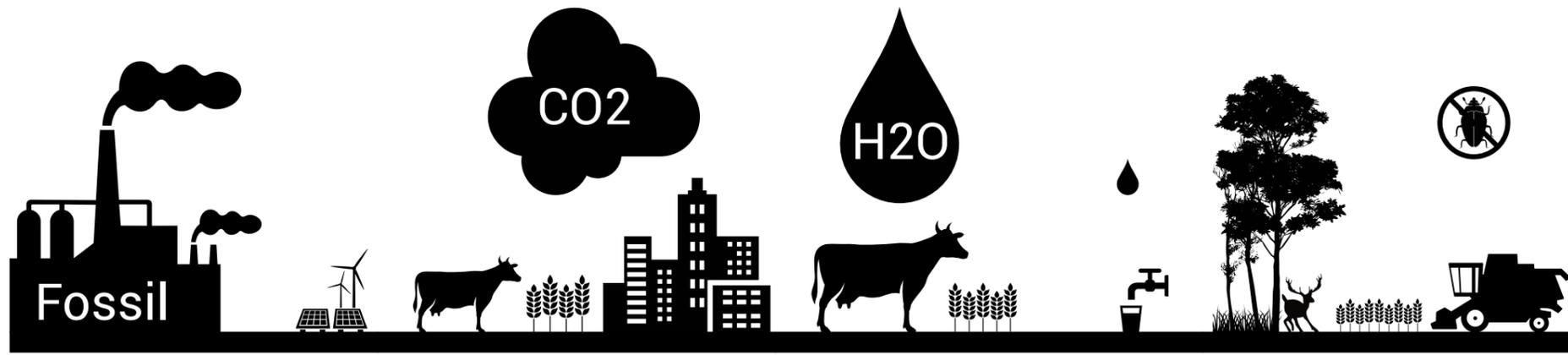
P r o b l e m
s t a t e m e n t



50%

INTRO

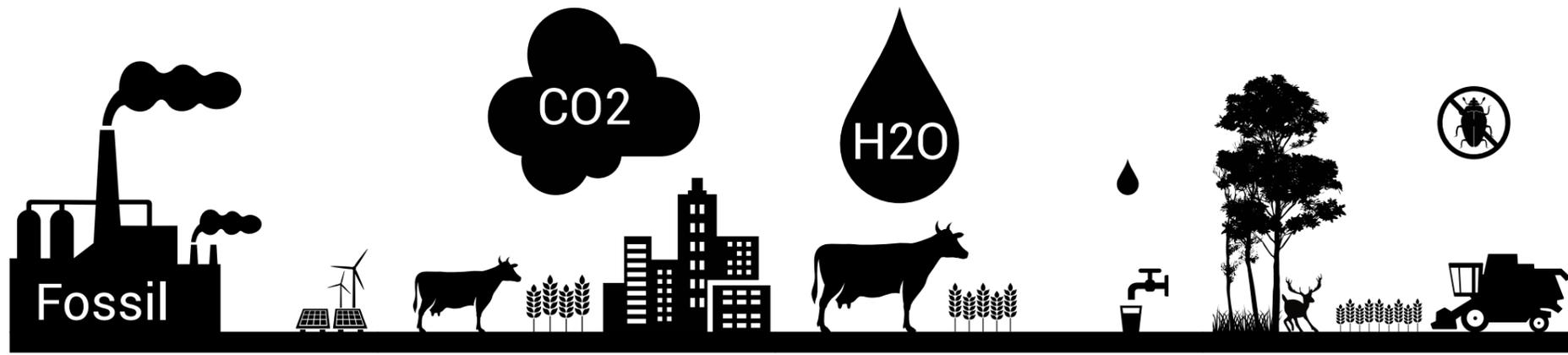
Problem
statement



14%

I N T R O

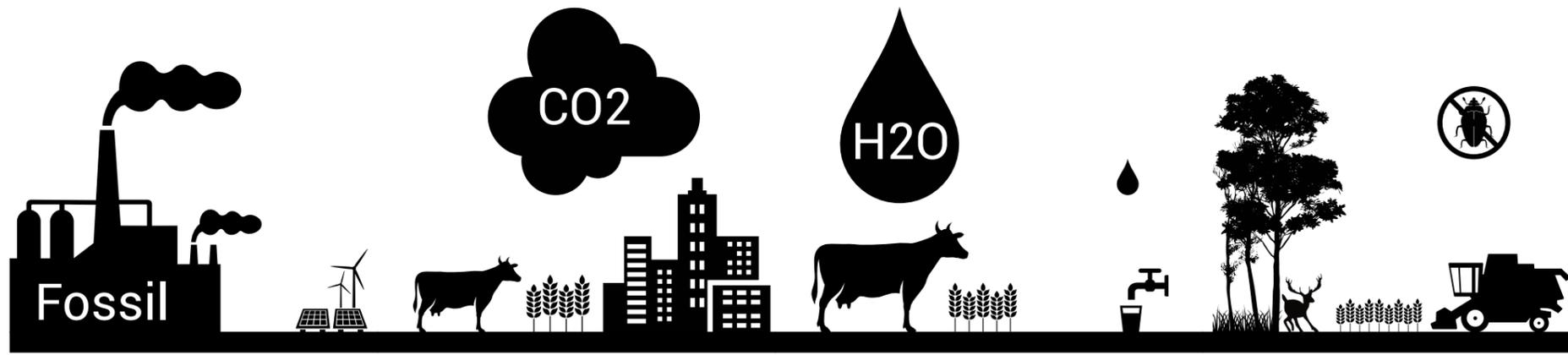
P r o b l e m
s t a t e m e n t



11%

I N T R O

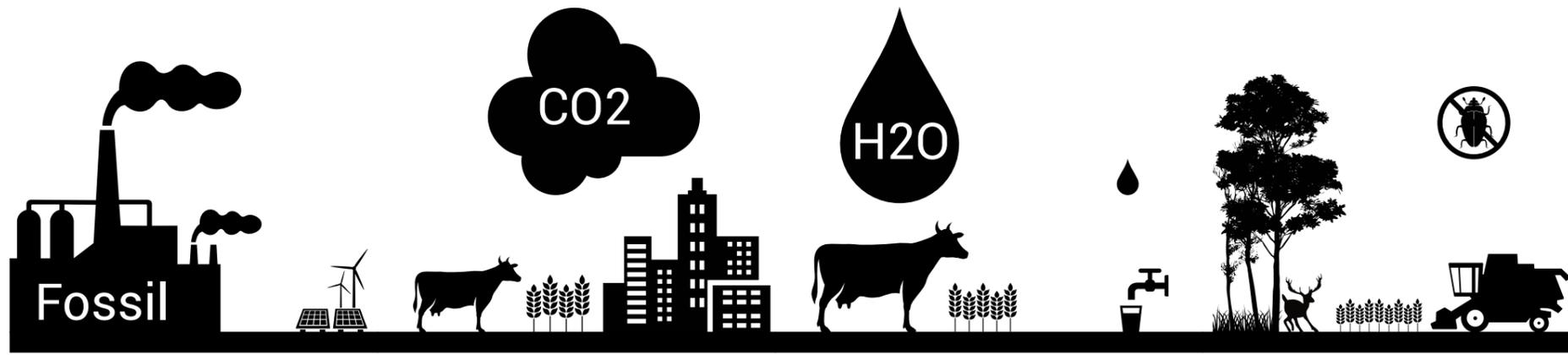
P r o b l e m
s t a t e m e n t



69%

I N T R O

P r o b l e m
s t a t e m e n t



250%

I N T R O

P r o b l e m
s t a t e m e n t

2020



20% renewable

INTRO

Problem
statement

2017



5%

I N T R O

P r o b l e m
s t a t e m e n t

2050



100%?

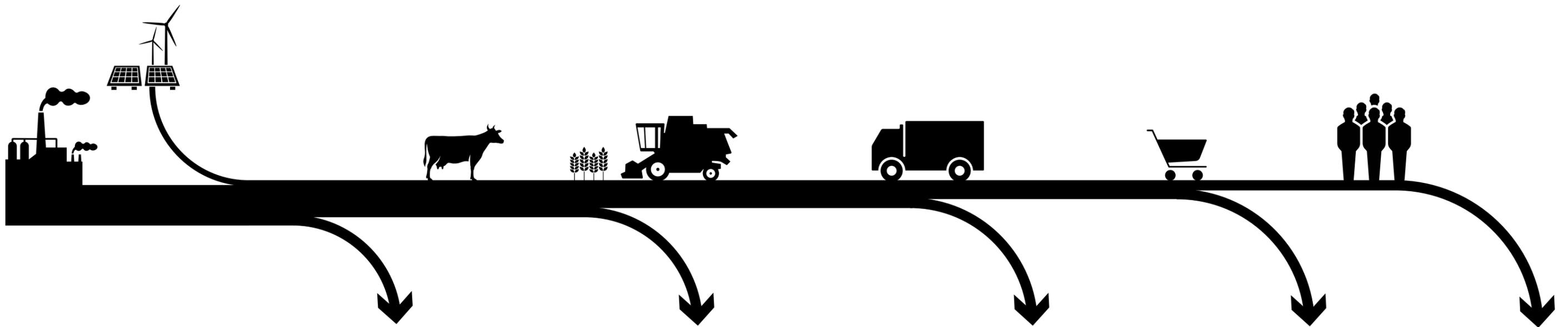
I N T R O

P r o b l e m
s t a t e m e n t

We need to change the way we produce and consume food, water and energy in order to substantially reduce the need for fossil fuels.

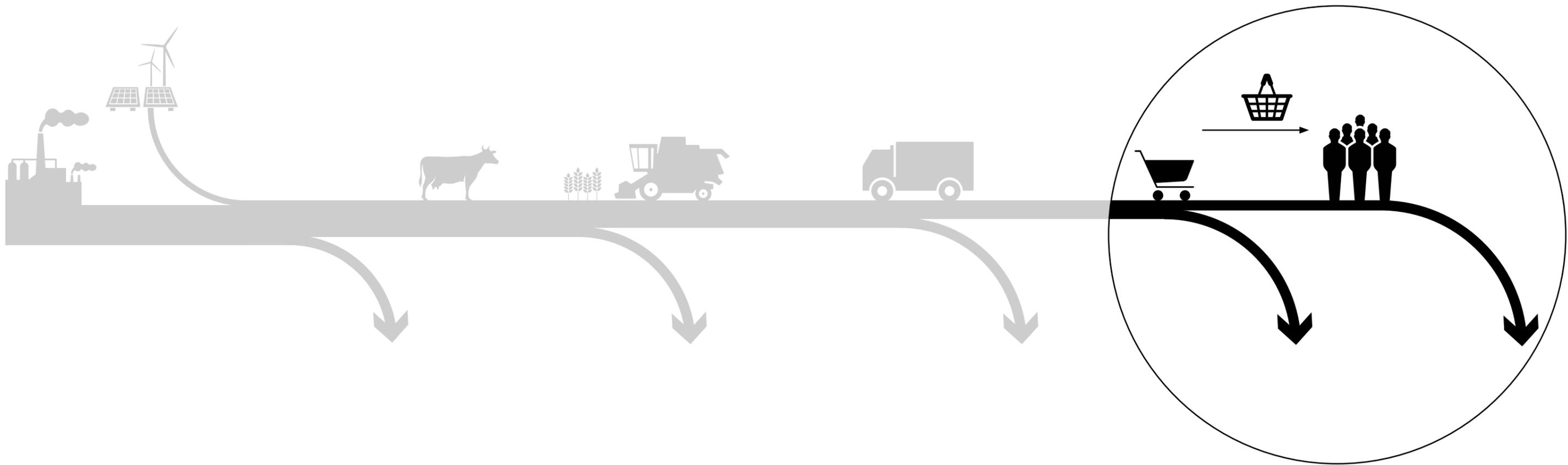
INTRO

Problem
statement



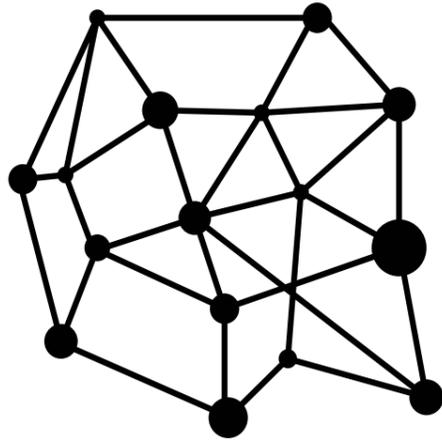
INTRO

Problem
statement



I N T R O

O b j e c t i v e

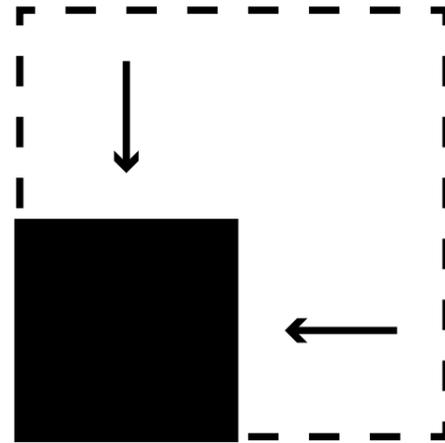
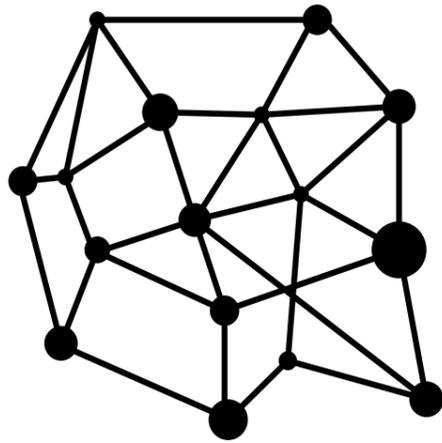


Decentralization

Decentralized production of food, water and energy reduces the distance resources travel, dependency to third parties and engages the consumers more directly.

I N T R O

O b j e c t i v e

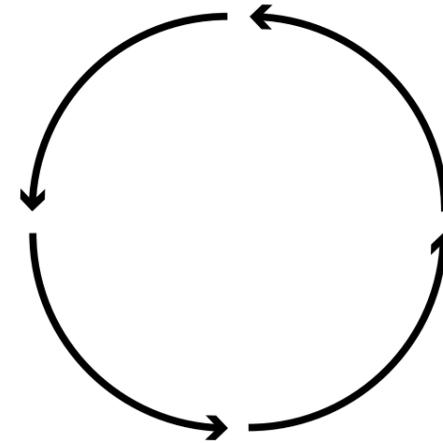
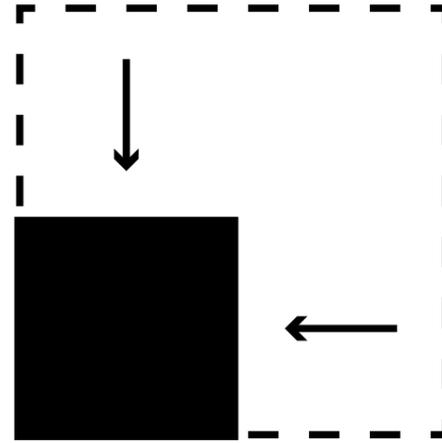
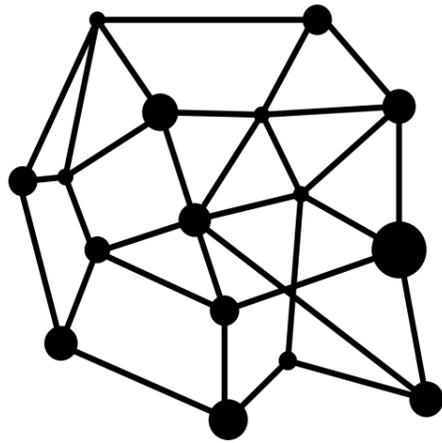


Reduction of volume

Increased resource efficiency reduces waste and need for resources.

I N T R O

O b j e c t i v e



Closing of cycles

Resources and energy that go into the cycle should be equalled in quality and quantity by what comes out of the cycle.

I N T R O

R e s e a r c h
q u e s t i o n

How can the **flows** of food, energy, water and waste be **locally organized** through permaculture and incorporated in the design of an **autarkic eco-village**?

I N T R O

A u t a r k y



Economic self-sufficiency using **local and renewable resources**.
Autarky is a subject in its own and should be **combined with aesthetics**.

I N T R O

A u t a r k y



INTRO

Eco-village



An intentional **community** whose goal is to become more **socially, culturally, economically** and **ecologically** more **sustainable**.

EWA Lanxmeer, Culemborg



Regen Village, Almere

I N T R O

Permaculture



The development of **agricultural ecosystems** intended to be **sustainable** and **self-sufficient**, integrating **plants, animals, buildings, people and communities**.

INTRO

Permaculture



We can all contribute by starting small!

I N T R O

Eco-village
objective



1. Decentralized
renewable
resources

I N T R O

D e s i g n
o b j e c t i v e

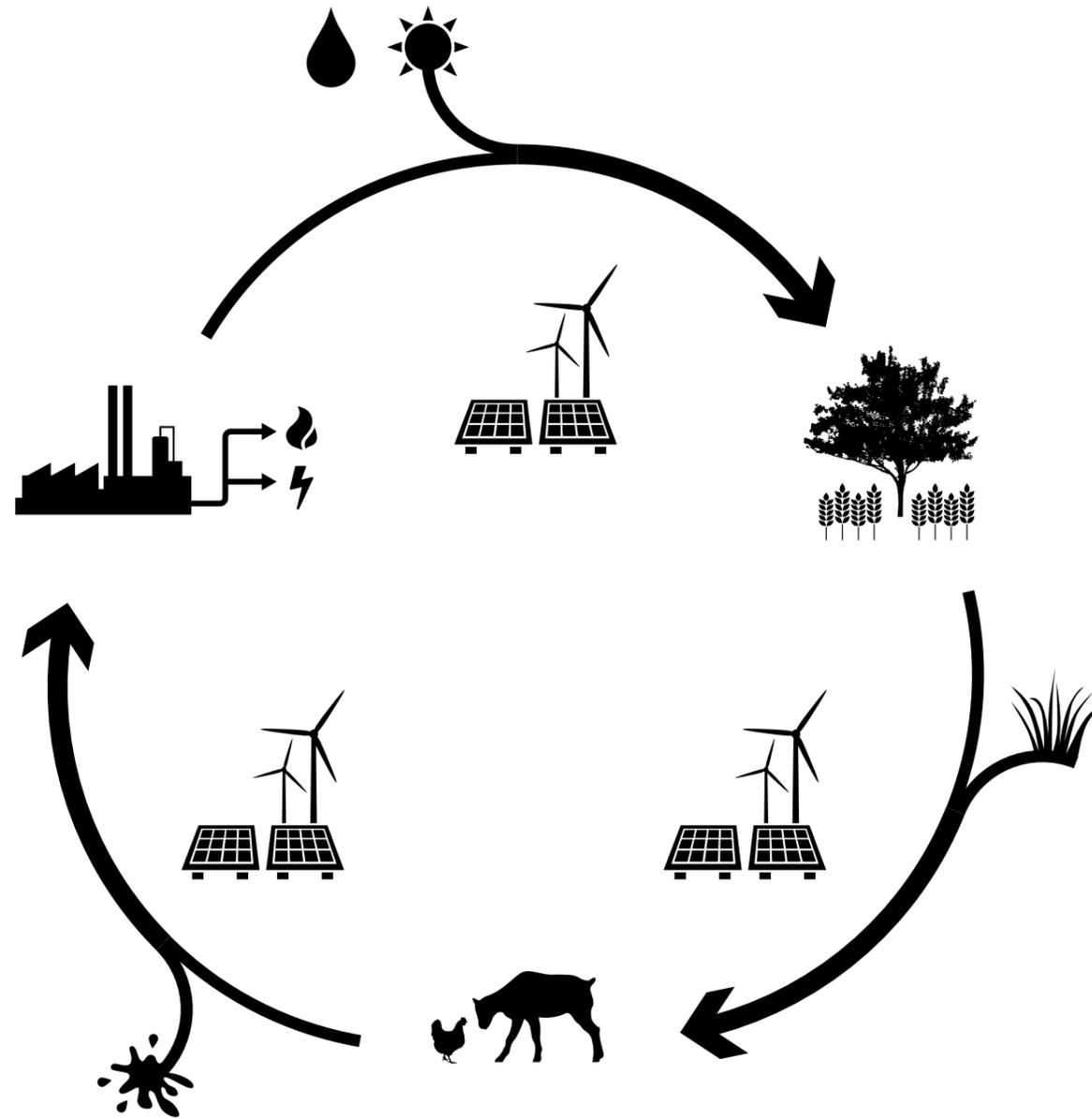


1. Decentralized
renewable
resources

2. Integrated
permaculture

I N T R O

D e s i g n
o b j e c t i v e



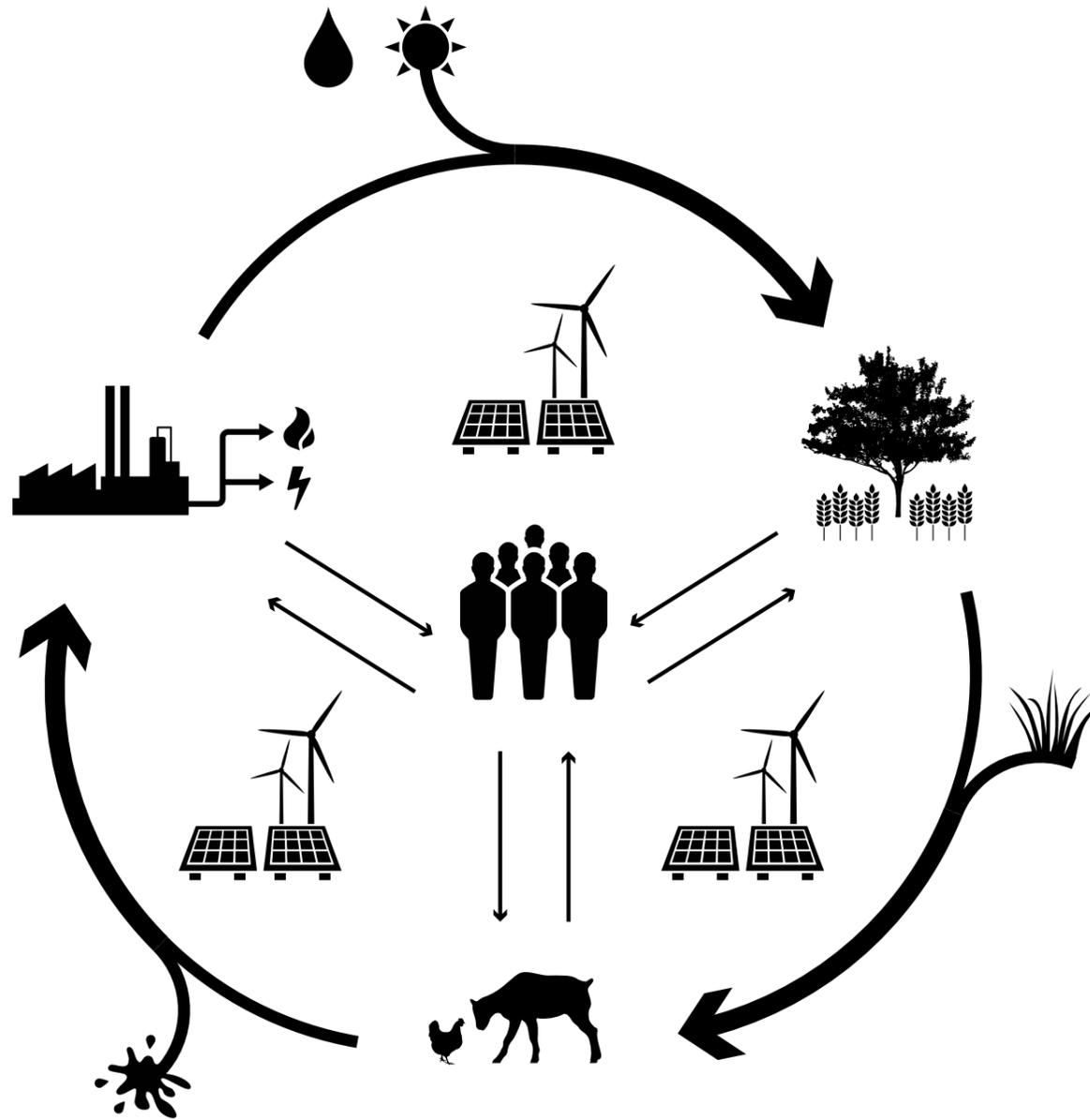
1. Decentralized
renewable
resources

2. Integrated
permaculture

3. Perpetual life
cycles of mutual
benefit

INTRO

Design
objective



1. Decentralized
renewable
resources

2. Integrated
permaculture

3. Perpetual life
cycles of mutual
benefit

4. Social
community with
local economy

INTRO

V i d e o



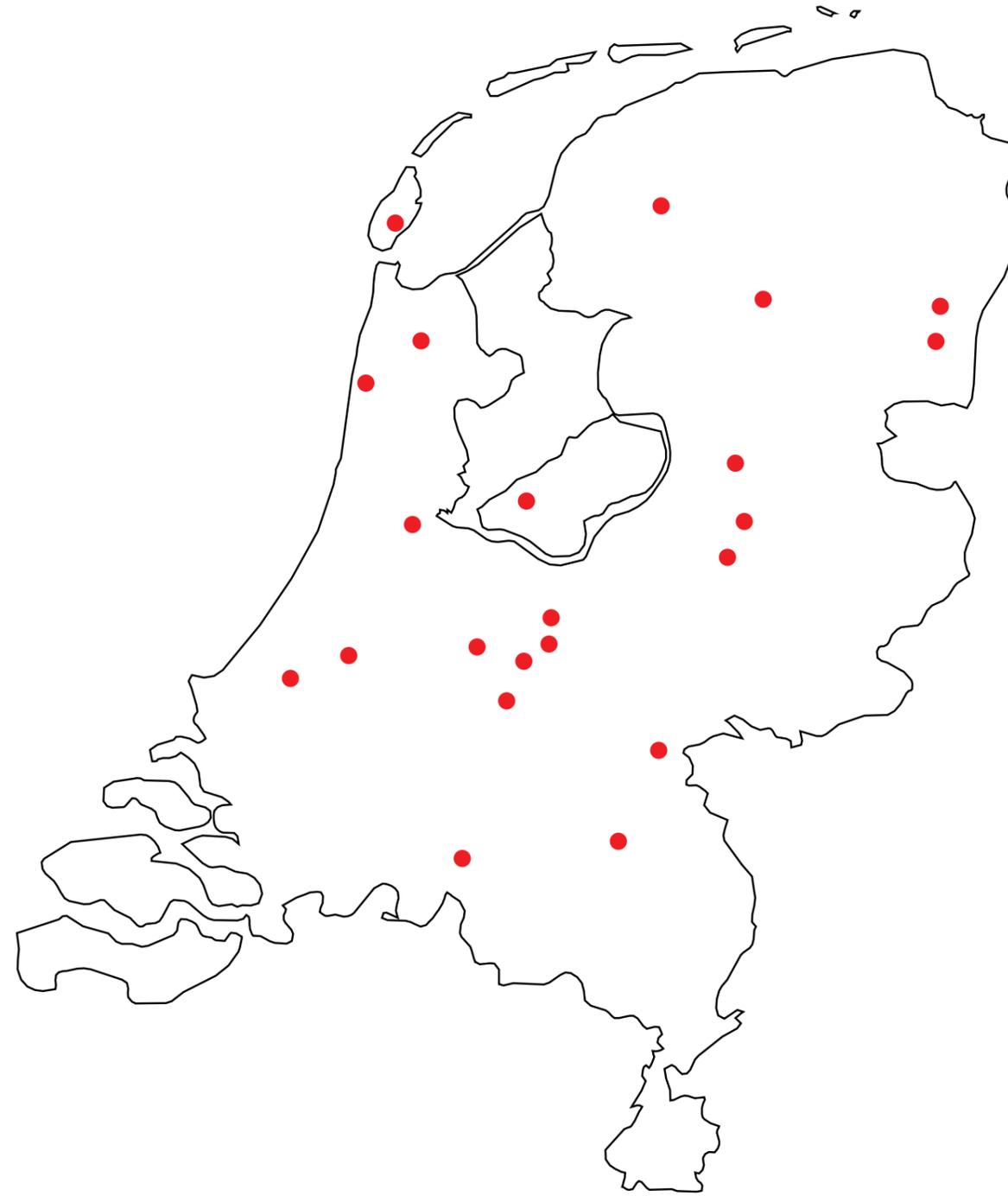
Niet alleen voor hippies

Zelfvoorzienende wijken rukken op

RTLnieuws

CONTEXT

Netherlands



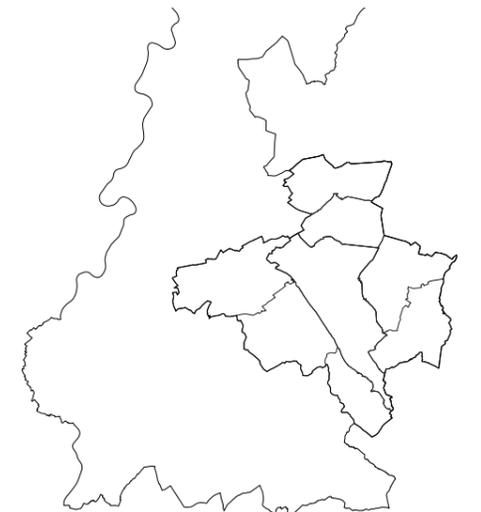
Places in The Netherlands where eco-villages exist or are being developed in the near future.

CONTEXT

P a r k s t a d

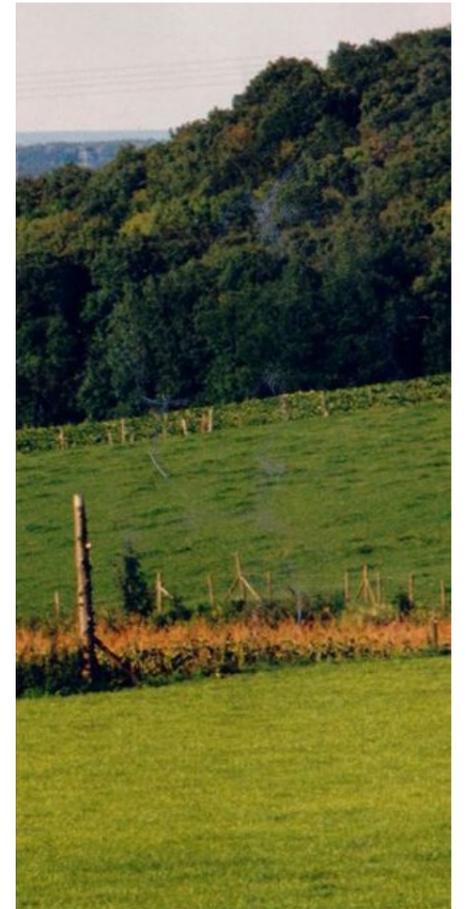


Parkstad has the ambition to become a self-sufficient region in 2050.



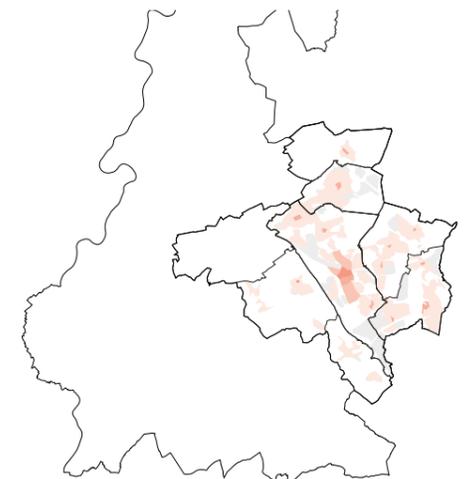
CONTEXT

P a r k s t a d



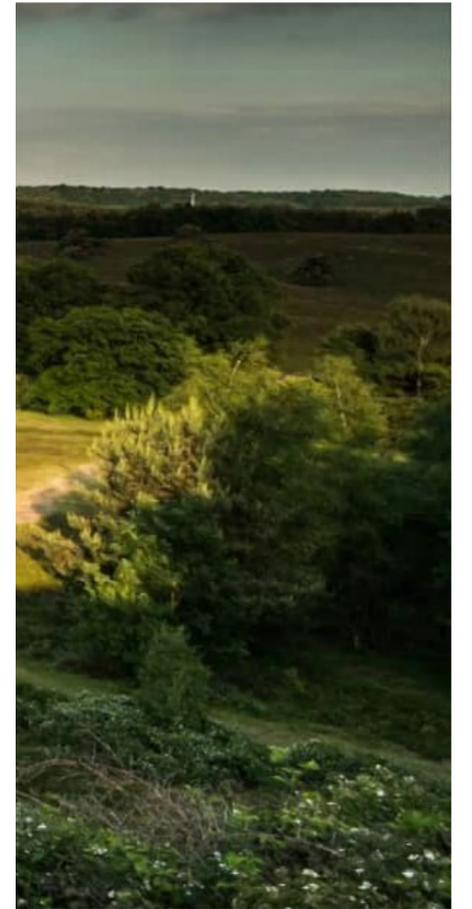
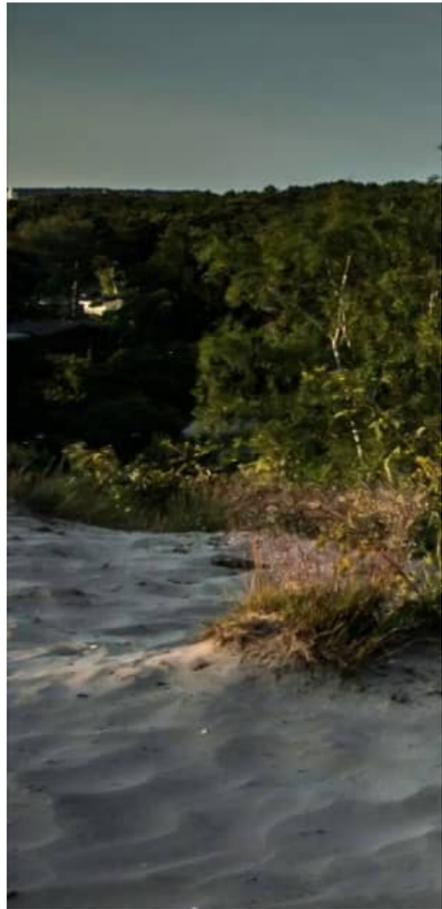
Parkstad is a former coal mining region in South-eastern Limburg comprised of 8 collaborating municipalities, with a total of 255.000 inhabitants.

Image: view over Heerlen



CONTEXT

P a r k s t a d



Parkstad is characterized by remarkable heathland hills and stream valleys, which contain unique flora and fauna.



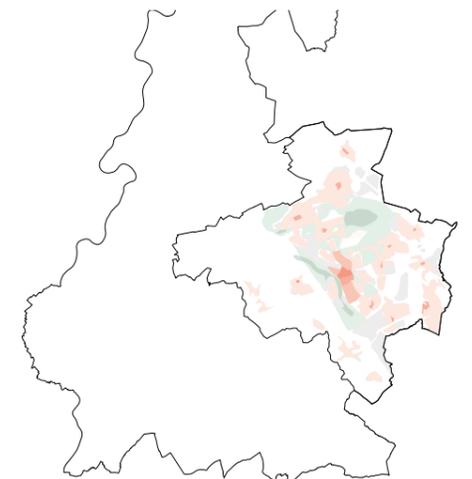
Image: Brunssummerheide natural reserve

CONTEXT

P a r k s t a d



The region has great potential to be a hotspot for leisure, culture and nature recreation.



CONTEXT

P a r k s t a d



However, the region has not been able to recover from transition from coal mining, resulting in **changing demographics, vacancy** and an **absence of identity**.

CONTEXT

I B A
P a r k s t a d



Which is why the International Bauausstellung (IBA) is being applied in Parkstad as an **experimental instrument for transformation** to let the region **recover its identity**.



CONTEXT

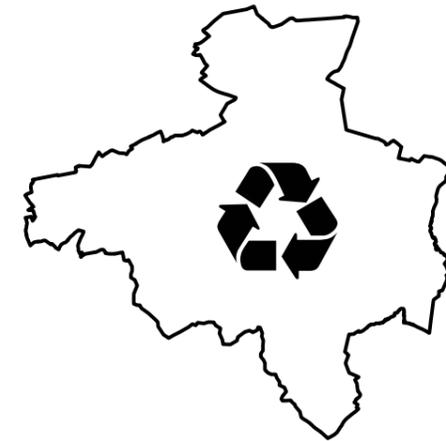
I B A
P a r k s t a d



"Flexible city"



"Energy city"

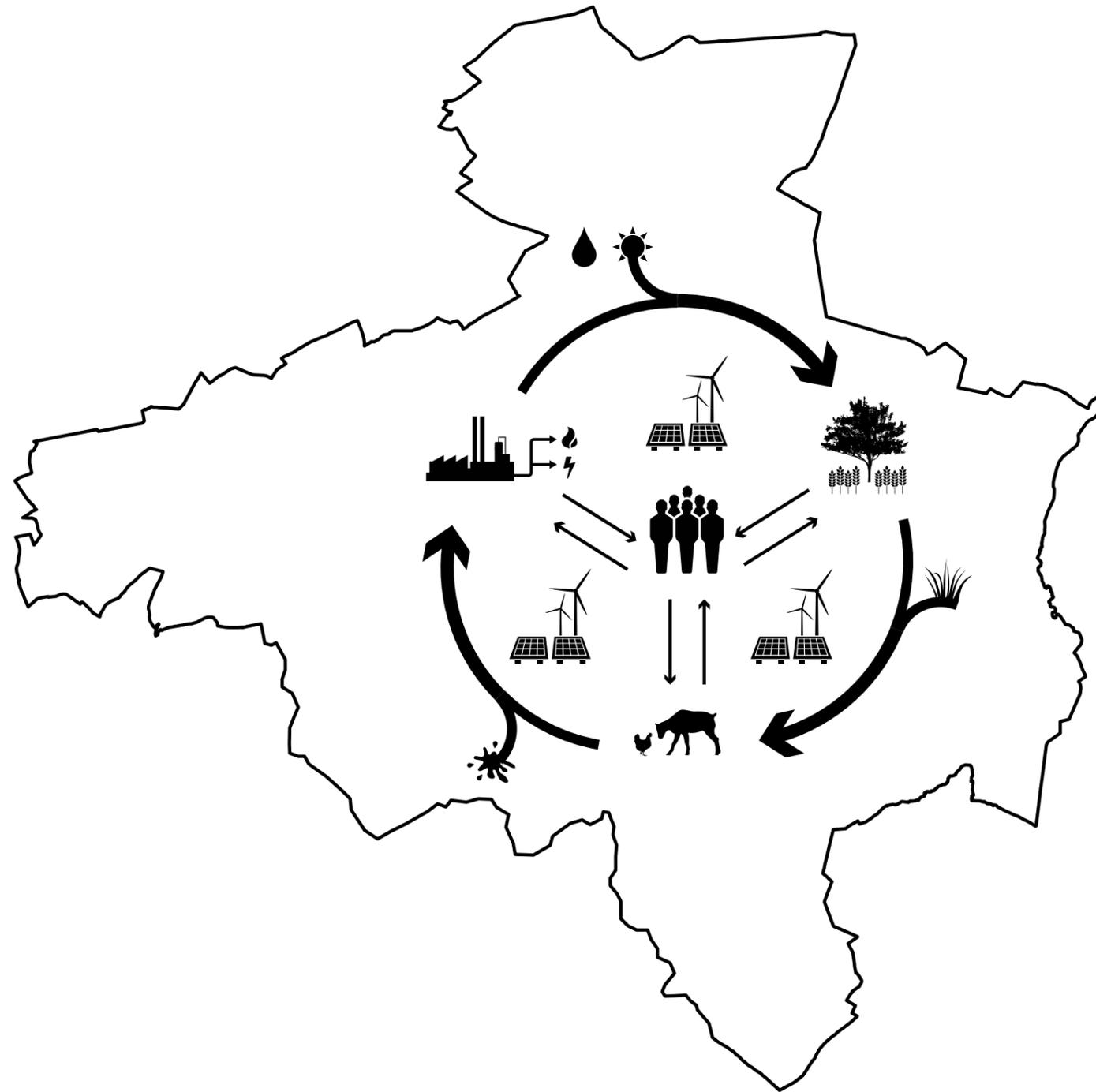


"Recycle city"

IBA works following three themes to ensure innovative solutions will sustainably reinvigorate the **spatial, social and economic** aspects of the region.

CONTEXT

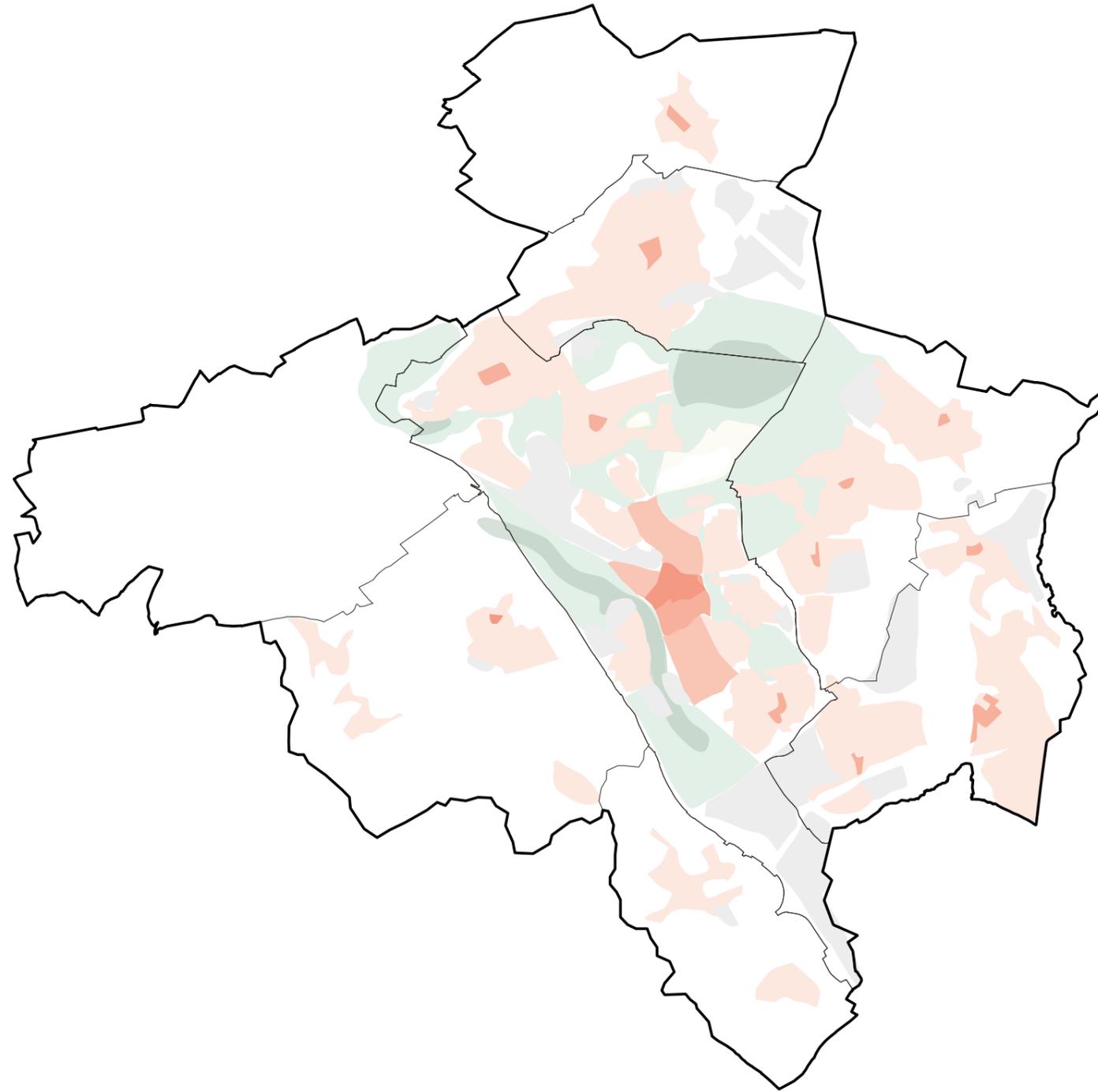
I B A
P a r k s t a d



Thus, an eco-village may be able to reinvigorate the local **identity** following all three themes by **closing energy and food production cycles** in **areas of transition**, therefore increasing their living quality.

CONTEXT

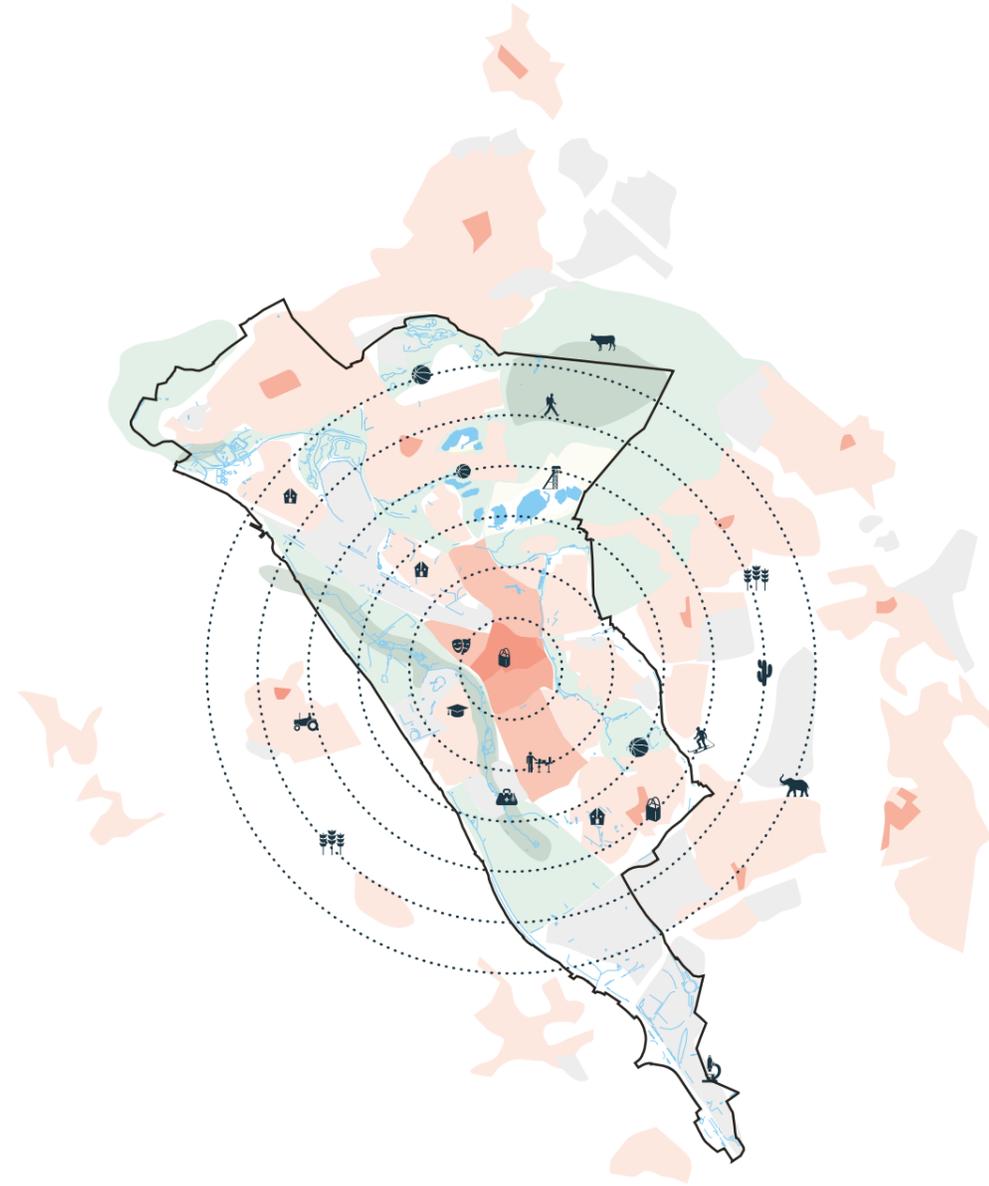
I B A
P a r k s t a d



An autarkic eco-village can add **meaning** to the local **energy landscape** by providing opportunities for **education** and **social cohesion**.

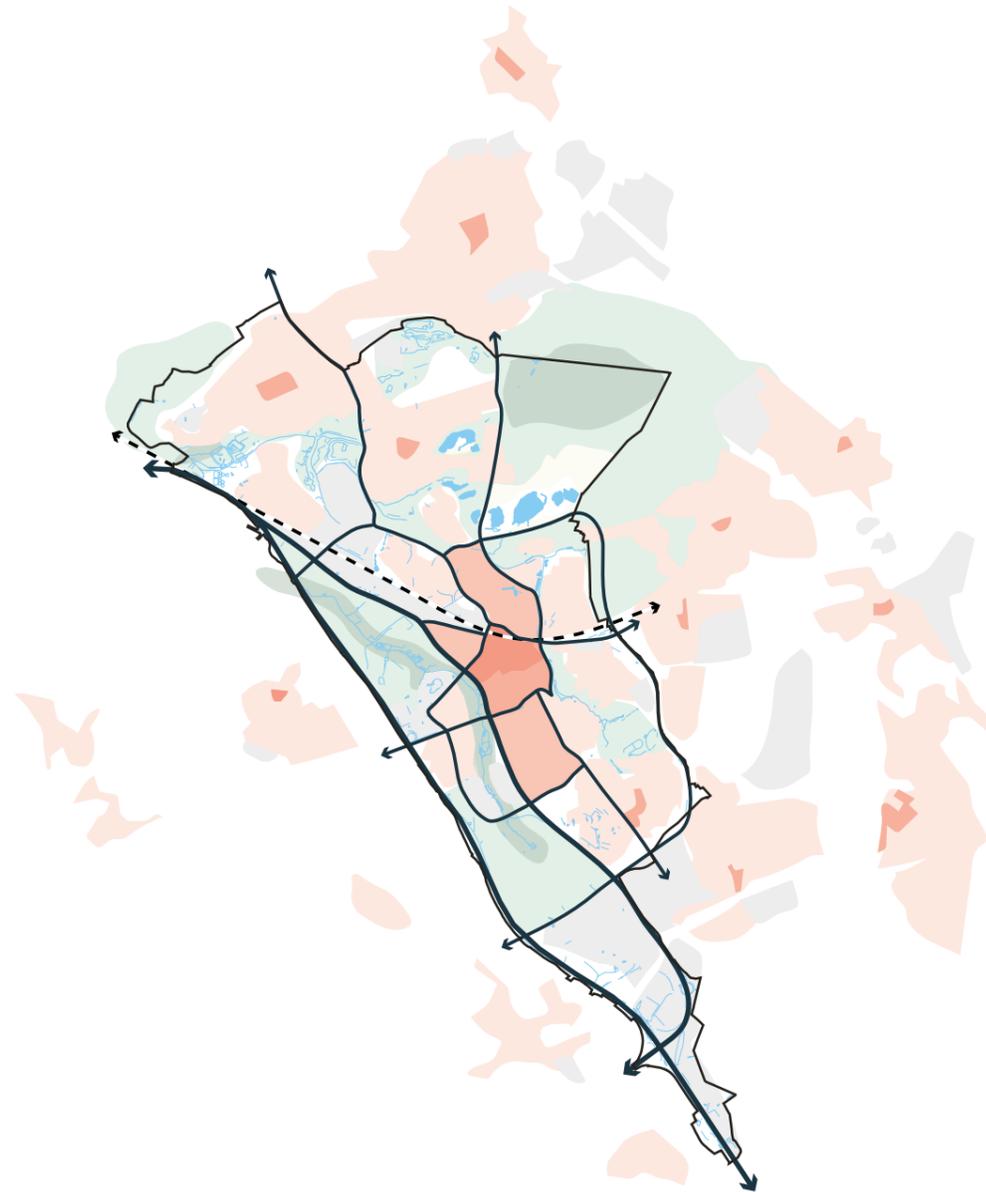
CONTEXT

H e e r l e n



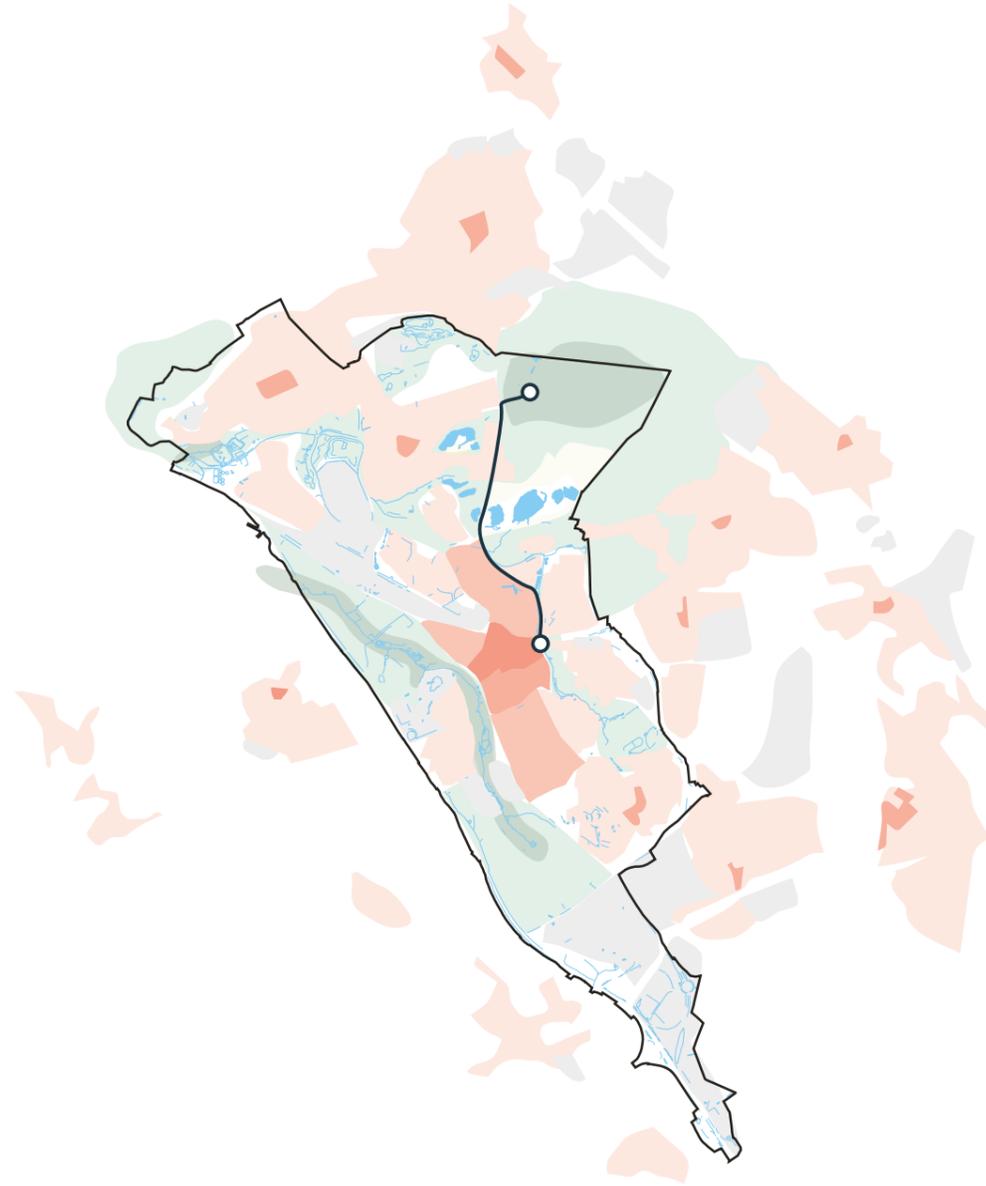
CONTEXT

H e e r l e n



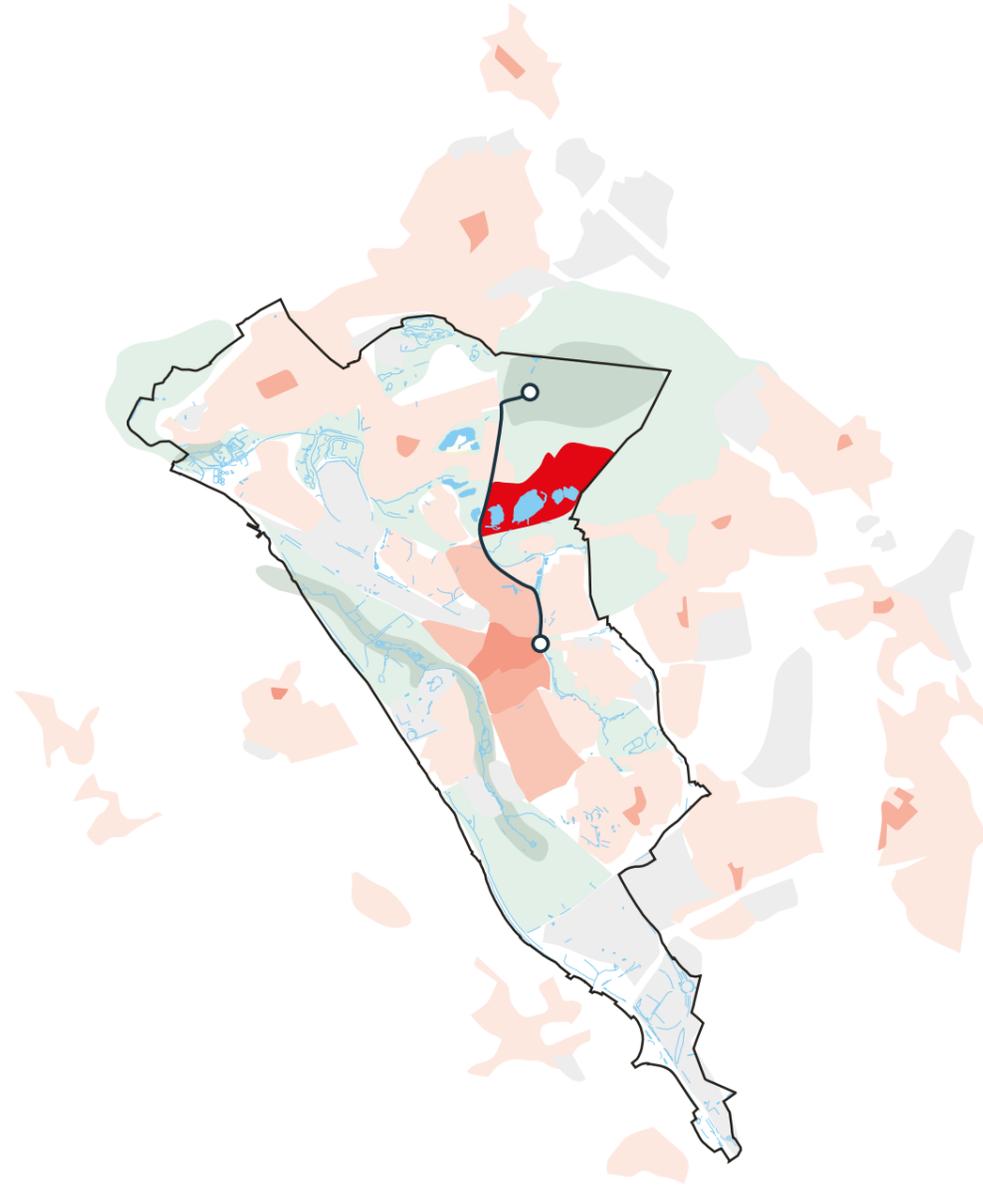
CONTEXT

H e e r l e n



CONTEXT

H e e r l e n



"The objective is to search for promising areas in the existing urban fabric to add innovative high-quality neighbourhoods that can adhere urban professionals."

Structuurvisie Heerlen 3035

CONTEXT

S i b e l c o



CONTEXT

S i b e l c o



2017: Sibelco and Beaujean sand quarries

CONTEXT

S i b e l c o



2020: Sibelco quarry is transformed into a recreational area.

CONTEXT

Beaujean



2025: Municipal aim to transform the Beaujean quarry into an innovative neighbourhood.

CONTEXT

B e a u j e a n



View over Parkstad from the Beaujean sand quarry.

CONTEXT

Beaujean



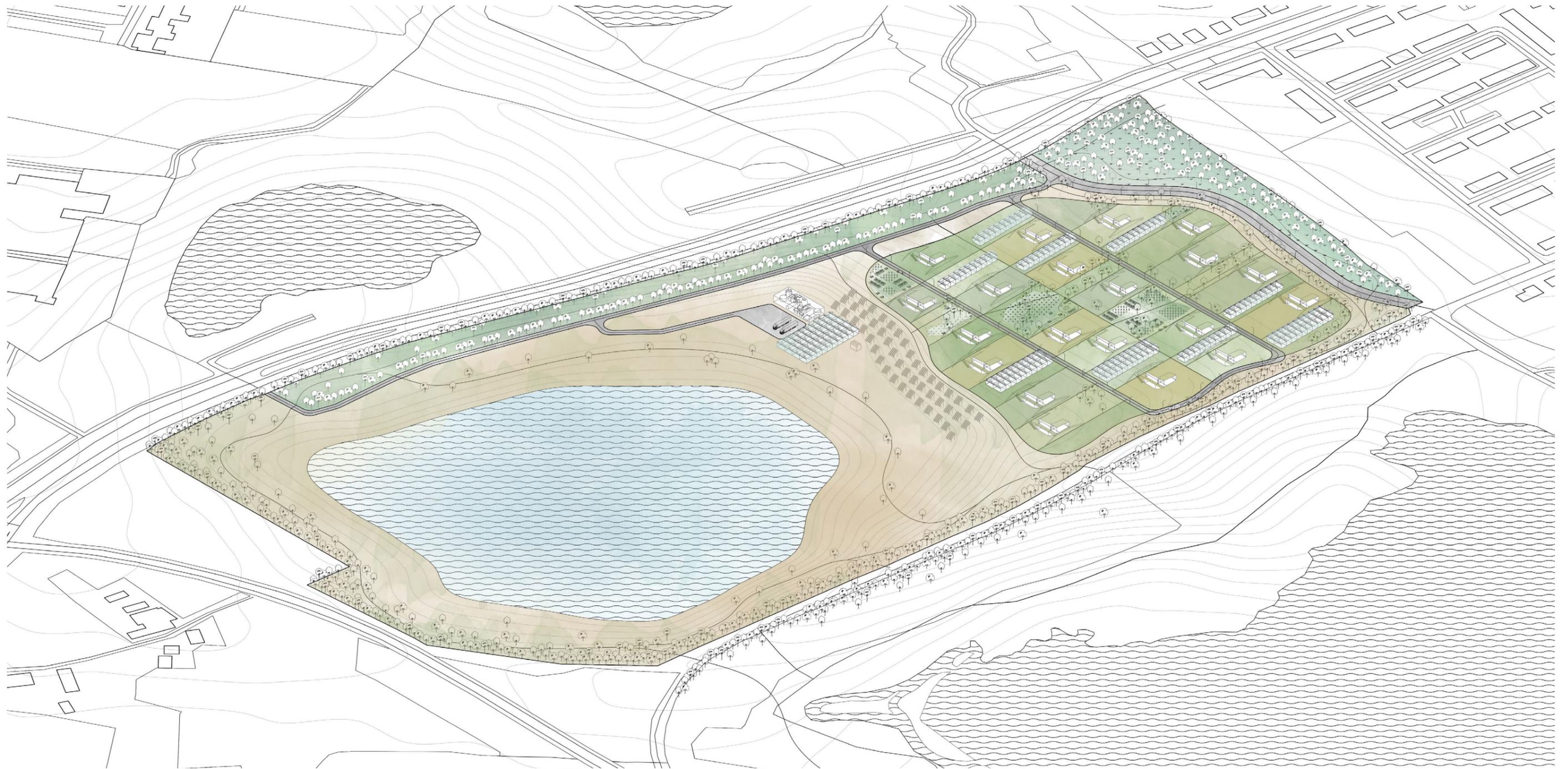
DESIGN

Beaujean
Transformation



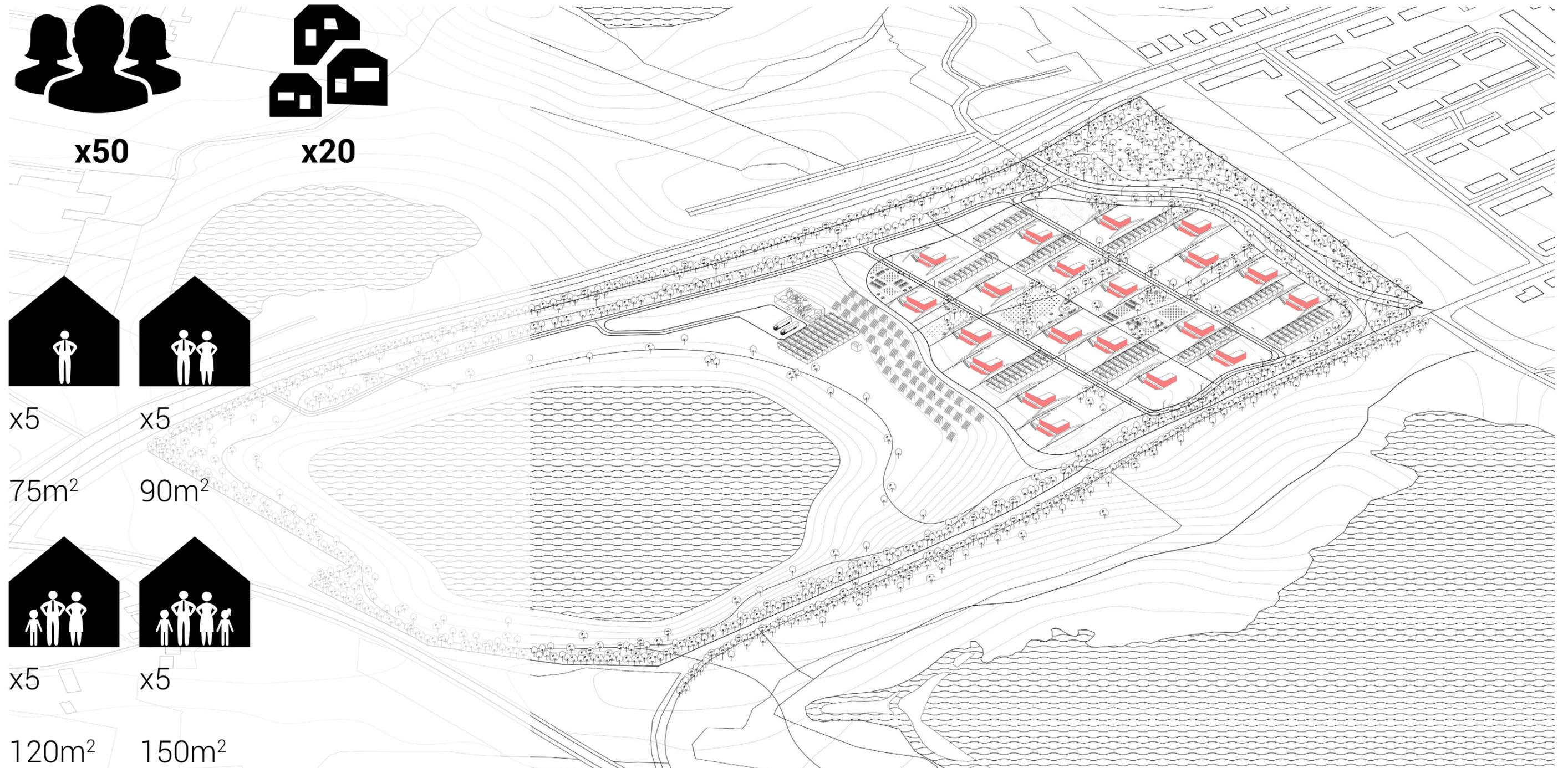
DESIGN

Beaujean
Eco-village



DESIGN

Program



RESEARCH

Nutrition



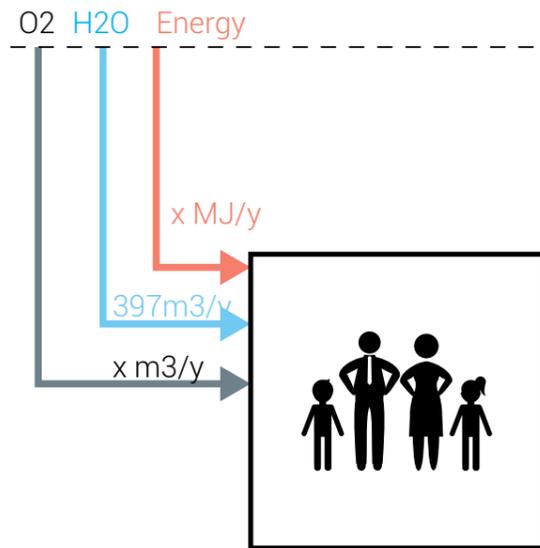
RESEARCH

Nutrition



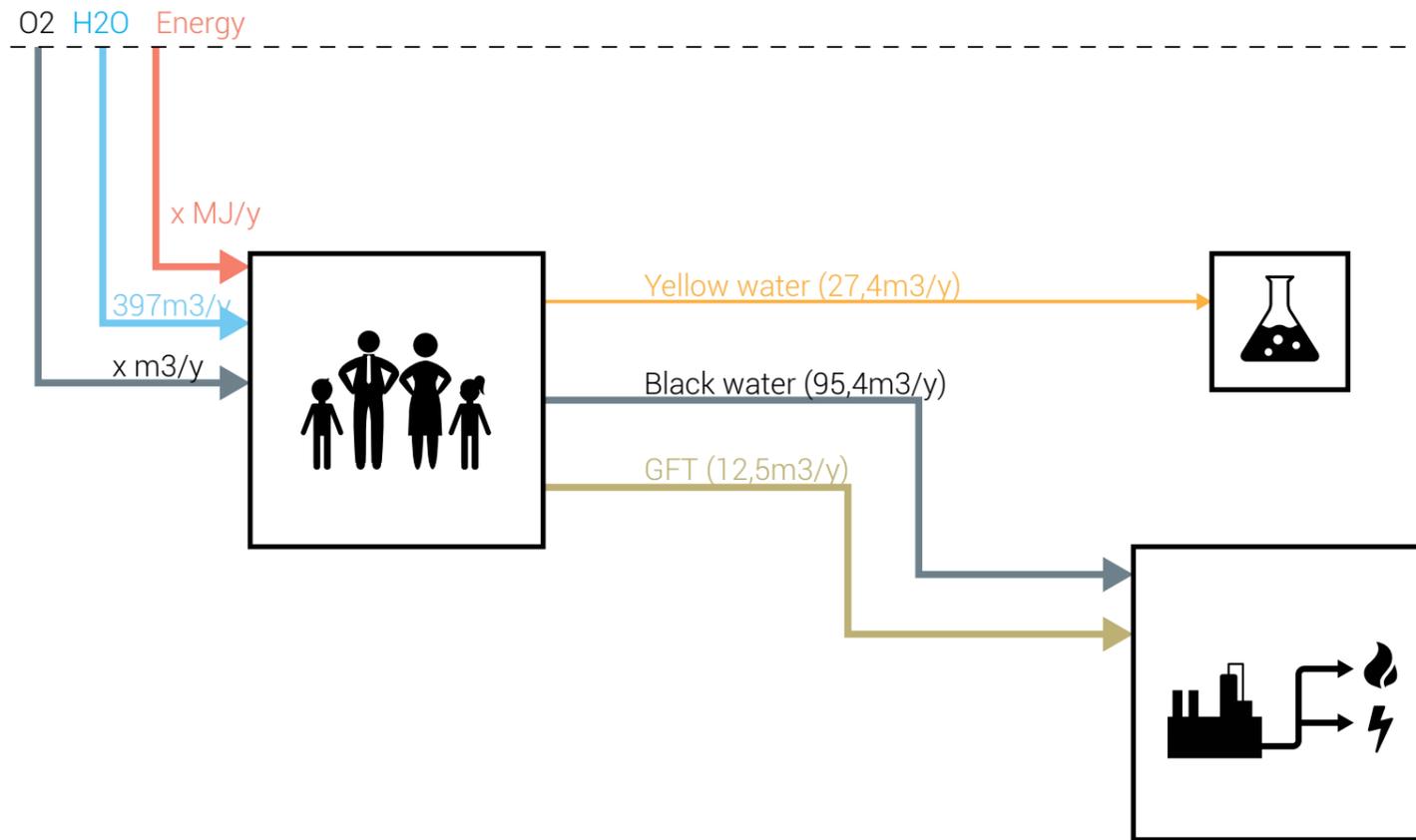
RESEARCH

F I O W S



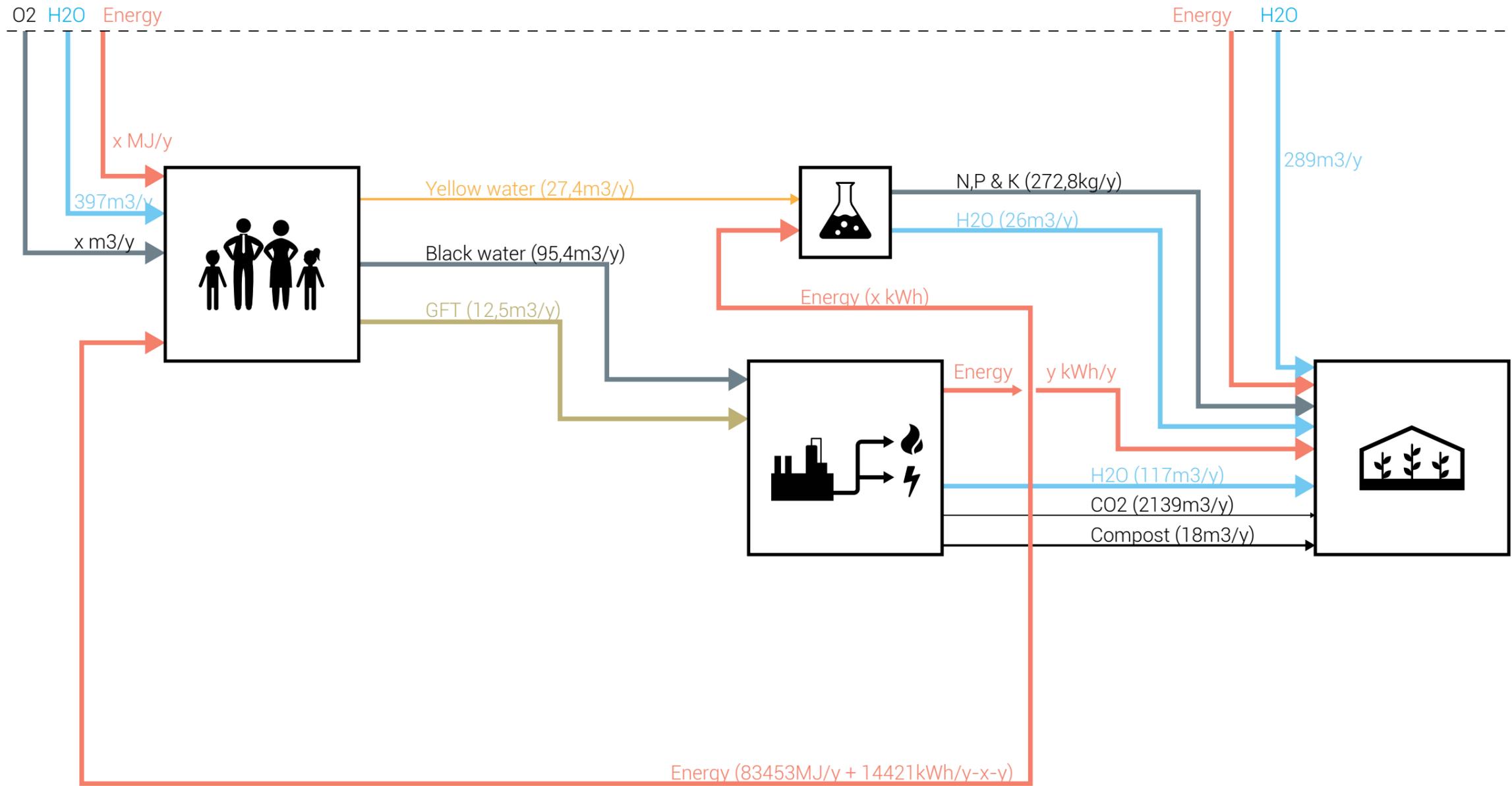
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F I O W S



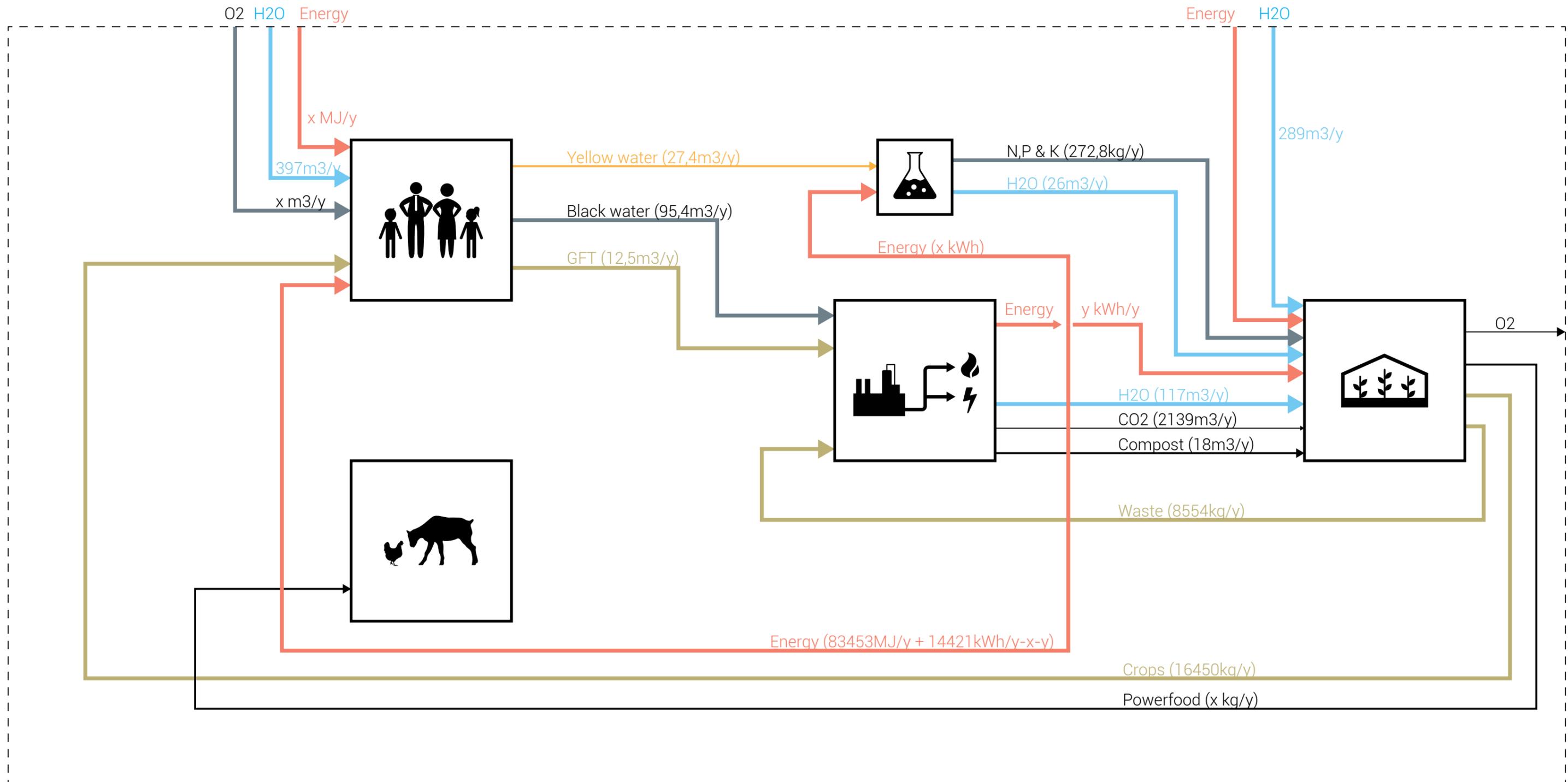
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F I O W S



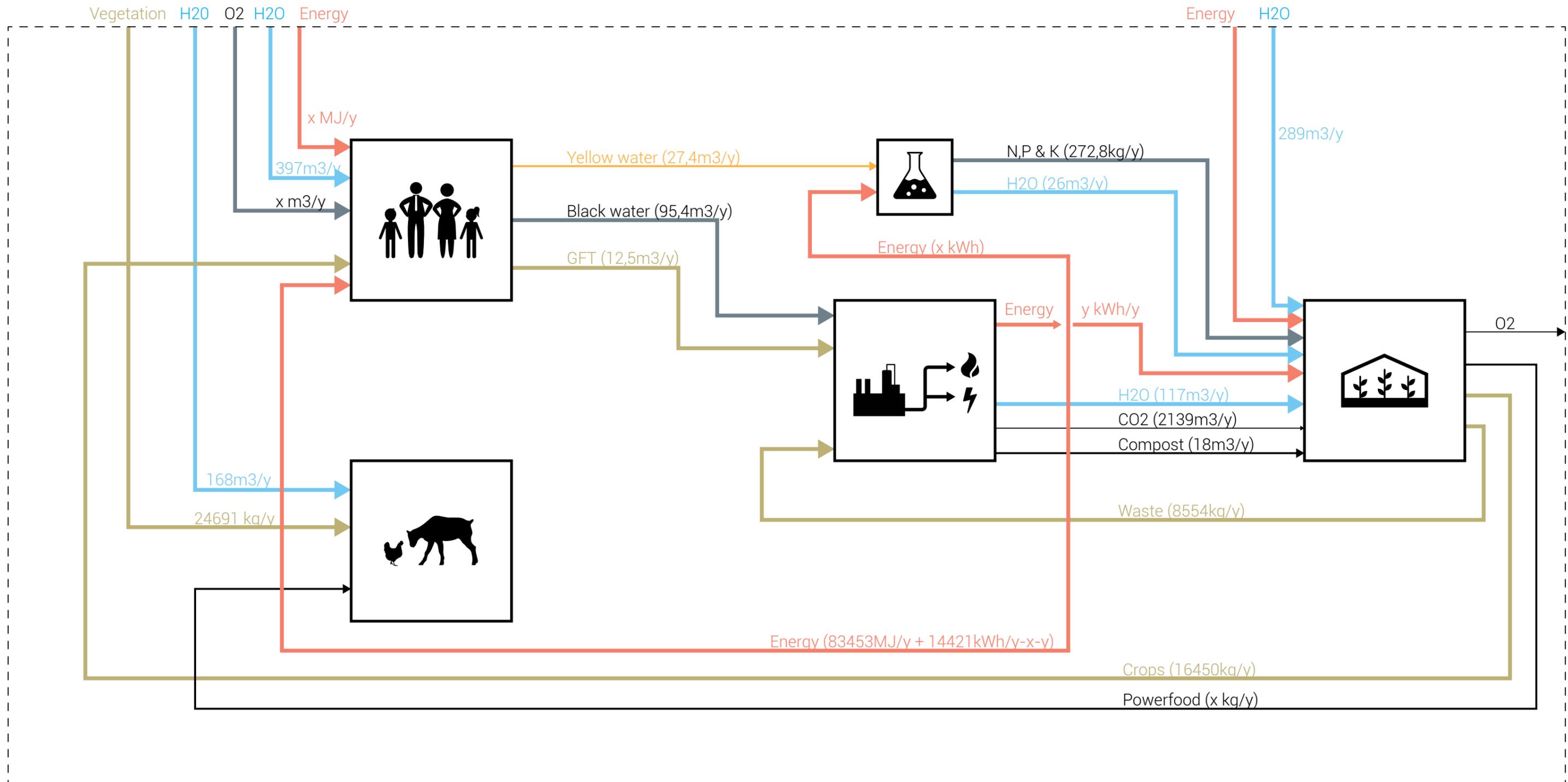
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F I O W S



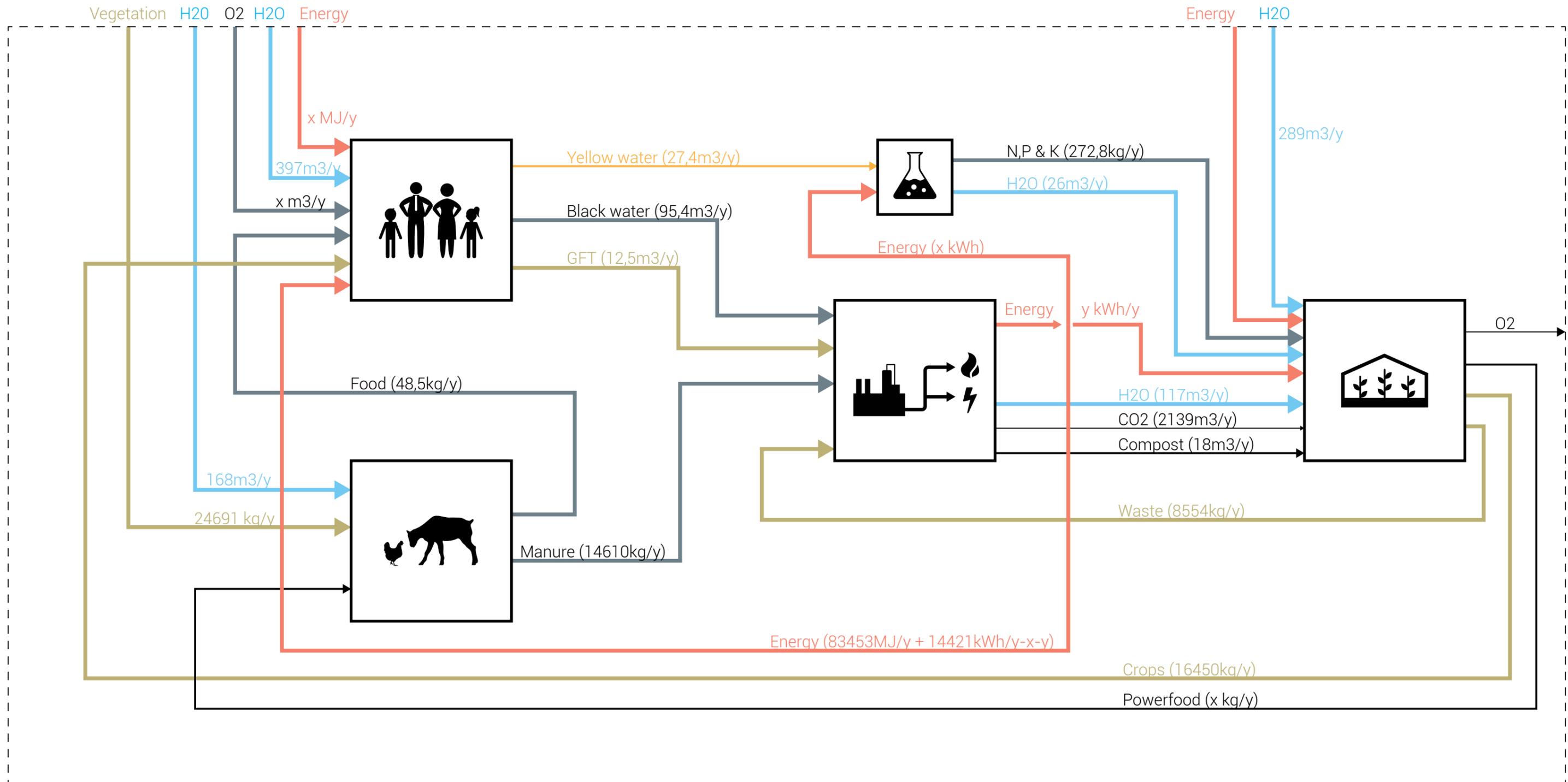
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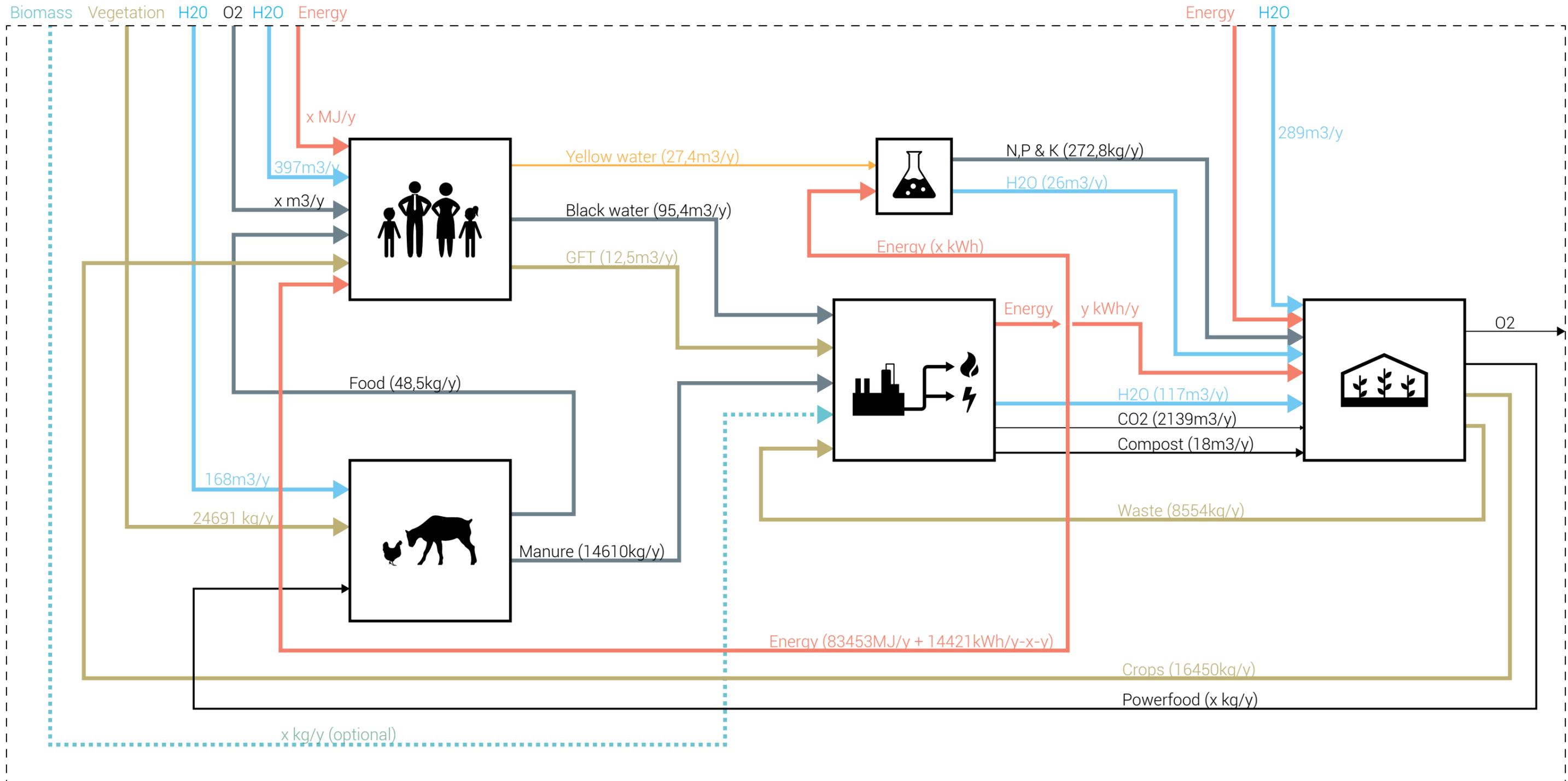
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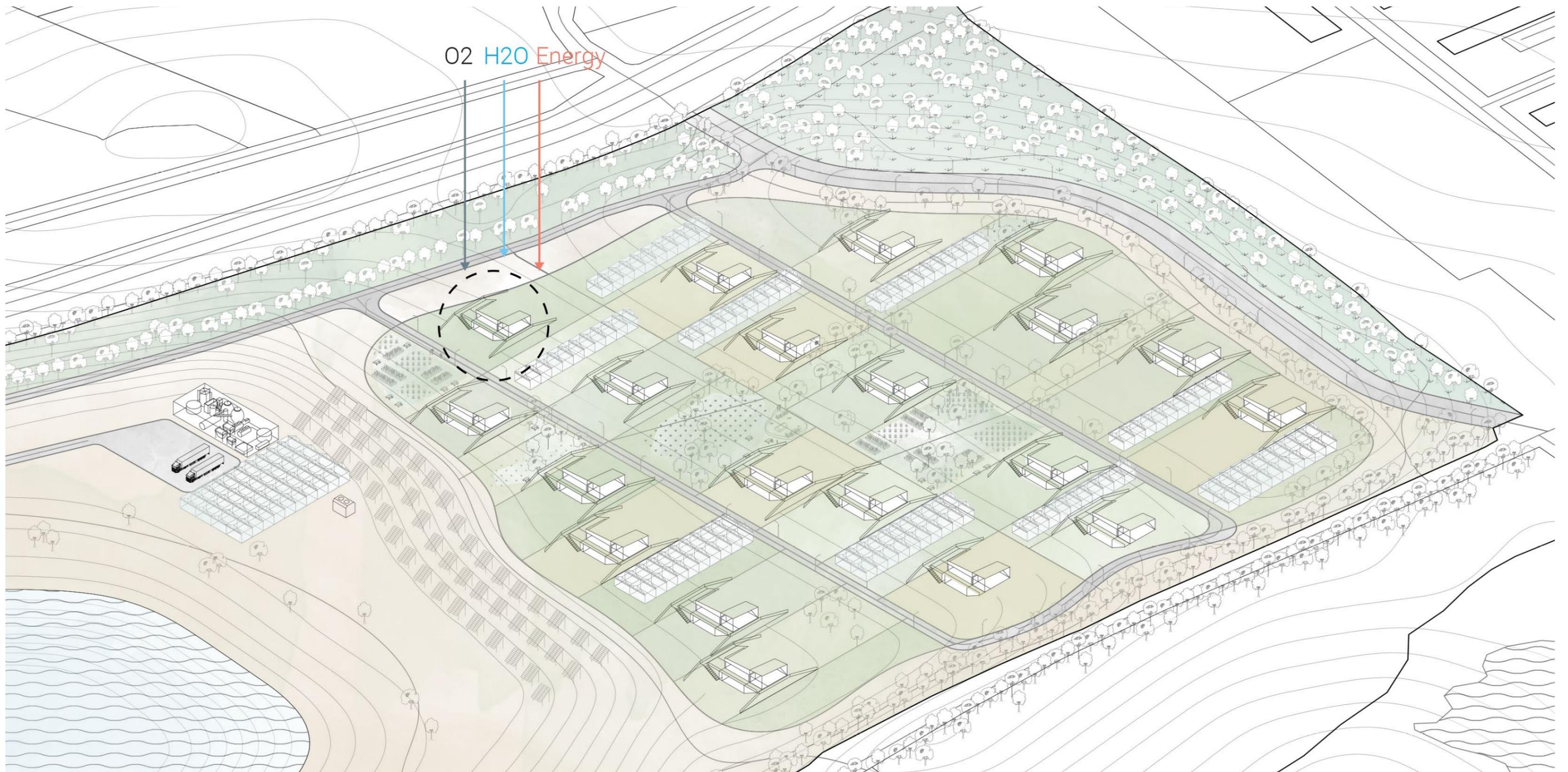
RESEARCH

F I O W S



RESEARCH

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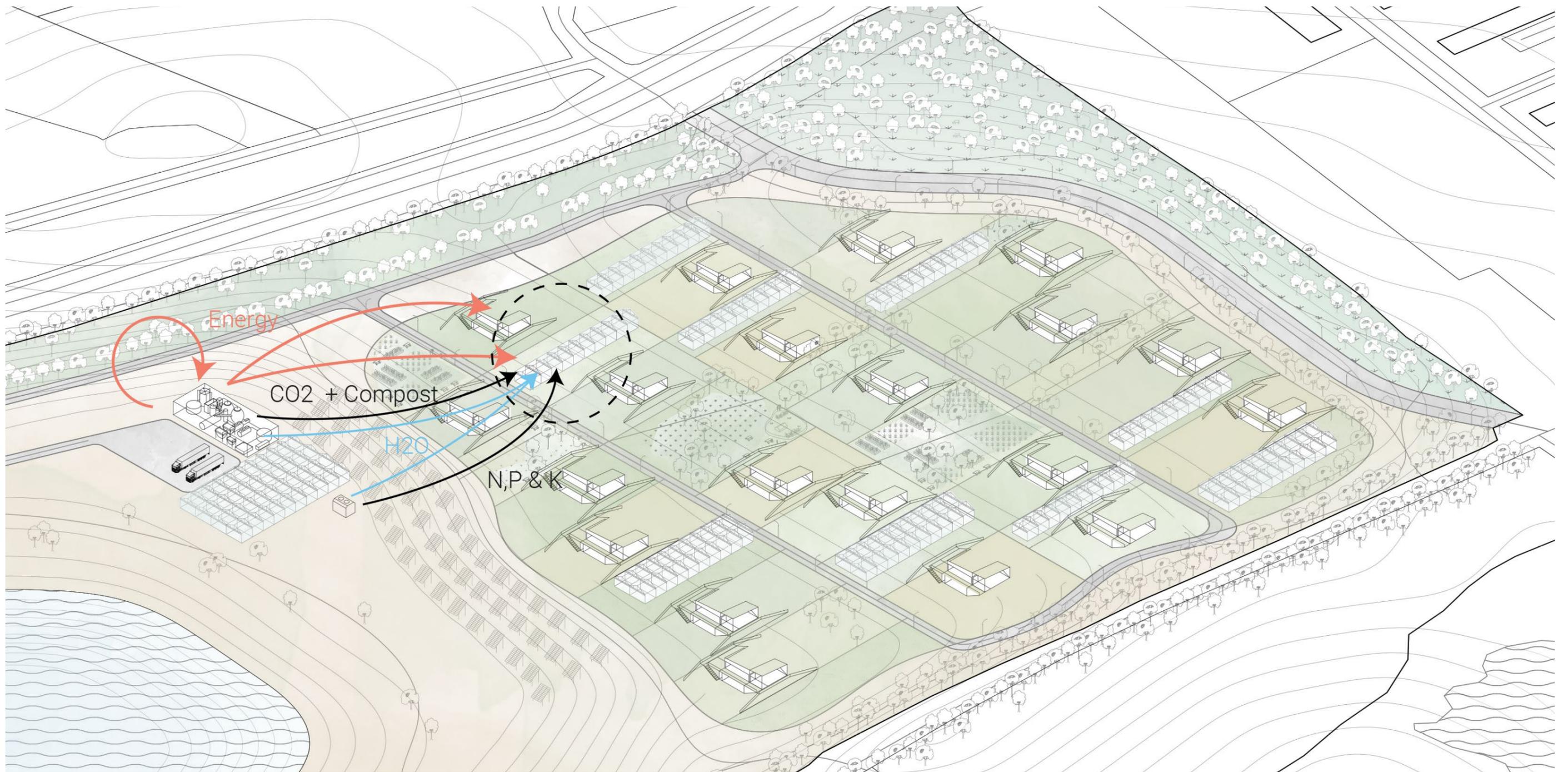
RESEARCH

F I O W S



RESEARCH

F I O W S



RESEARCH

F I O W S



DESIGN

References



DESIGN

Case-studies

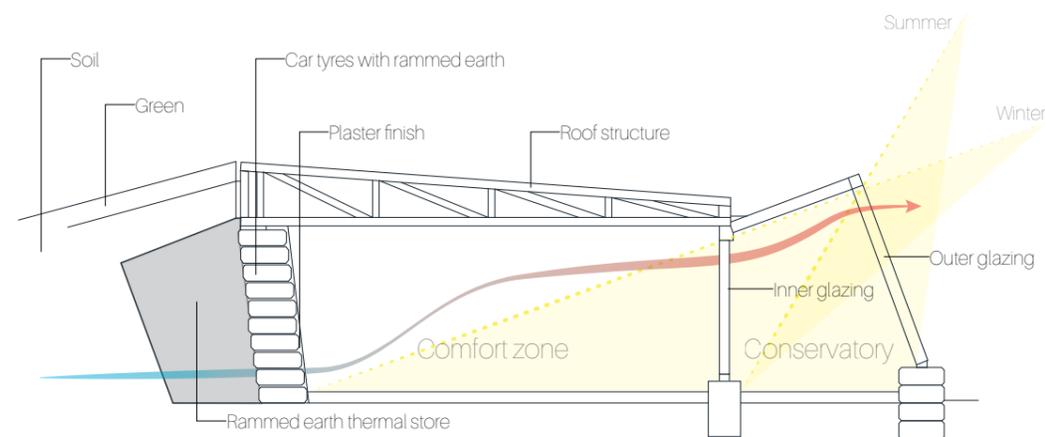
Case Study 1 Brighton Earthship

Overview

Architect	RH Partnerships (Brighton) based on drawings by Michael Reynolds
Project developer	Low Carbon Network (Brighton)
Service engineers	John Parker Associates
Building period	2007
Type	Detached
Rooms	5 (Conservatory, Nest module, Hut module, Kitchen, Bathroom)
Floor area	125m ²
Cost	£330.000
Autarky	Fully off-grid

Systems

Ventilation	Natural
Heating	Heat storage through earth sheltering
Thermal mass	Car tyres with rammed local chalk, in-filled with bottles and cans
Cooling	Heat sink cooling and natural ventilation
Electricity	18 photovoltaic panels, 900W wind turbine and 40 batteries
Hot water	Solar flat plate water heating system
Drinking water	7 Filters in rain purification system
Water treatment	2 Grey water planters, combined area 12,5m ² and black water botanical treatment cells
Lighting	5 Skylights also used for natural ventilation, LED-fixtures



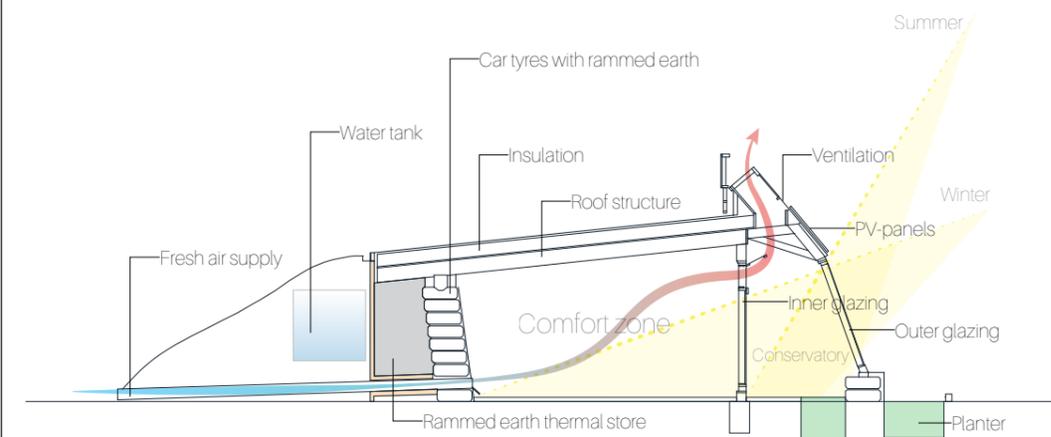
Case Study 2 Global Model Earthship

Overview

Architect	2012 Architects, based on drawings by Michael Reynolds
Project developer	Woningstichting SWZ (Zwolle)
Building period	2008 - 2009
Function / type	Teahouse / detached
Rooms	3 (Mess hall, Kitchen, Bathroom)
Floor area	100m ²
Cost	€550.000
Autarky	Fully off-grid

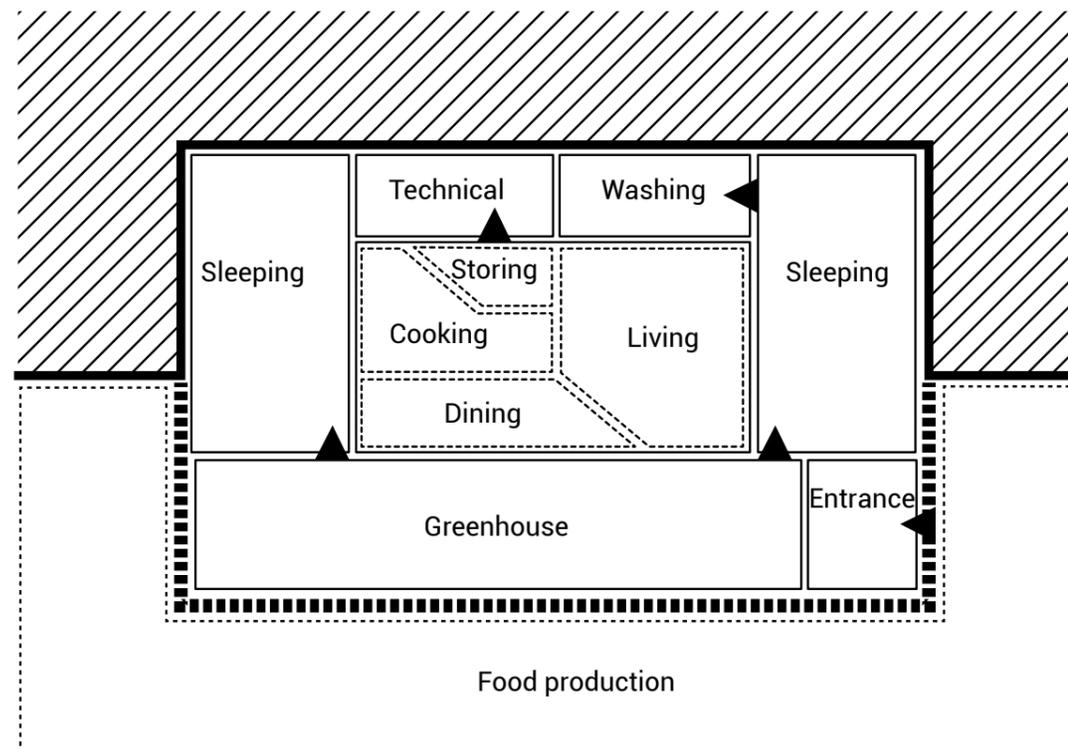
Systems

Ventilation	Natural
Heating	Heat storage through earth sheltering
Thermal mass	Car tyres with rammed local earth
Cooling	Natural ventilation through dissipation
Electricity	Photovoltaics
Hot water	Solar flat plate water heating system
Drinking water	Biological filtering system
Water treatment	2 Grey water planters, combined area 12,5m ² and black water botanical treatment cells
Lighting	Rooflights and bottles through outer wall



DESIGN

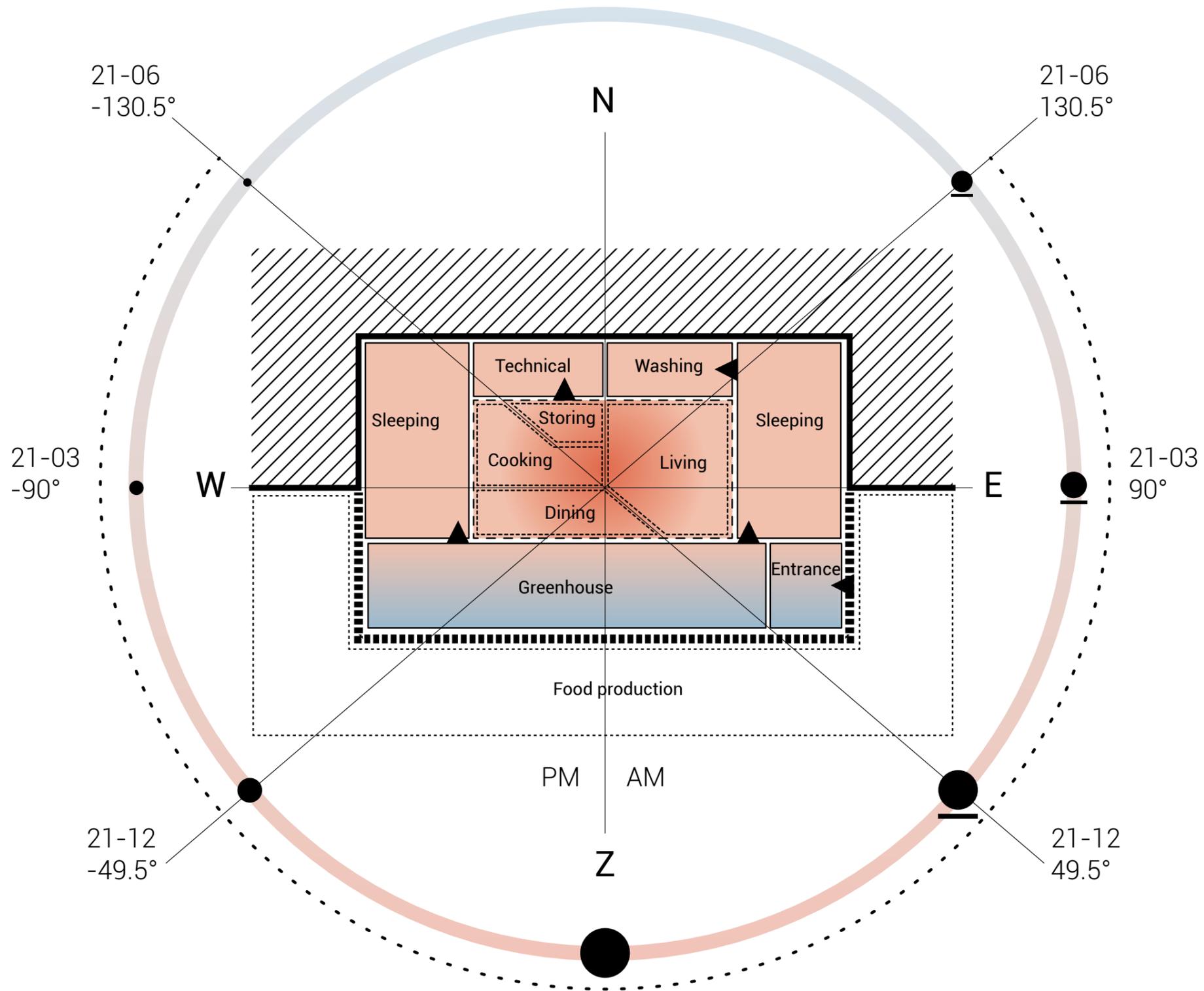
Case-studies



- Thermal encapsulation
- Clear glazing envelope
- Extravert room boundary
- Introvert room boundary
- Activity area
- Door

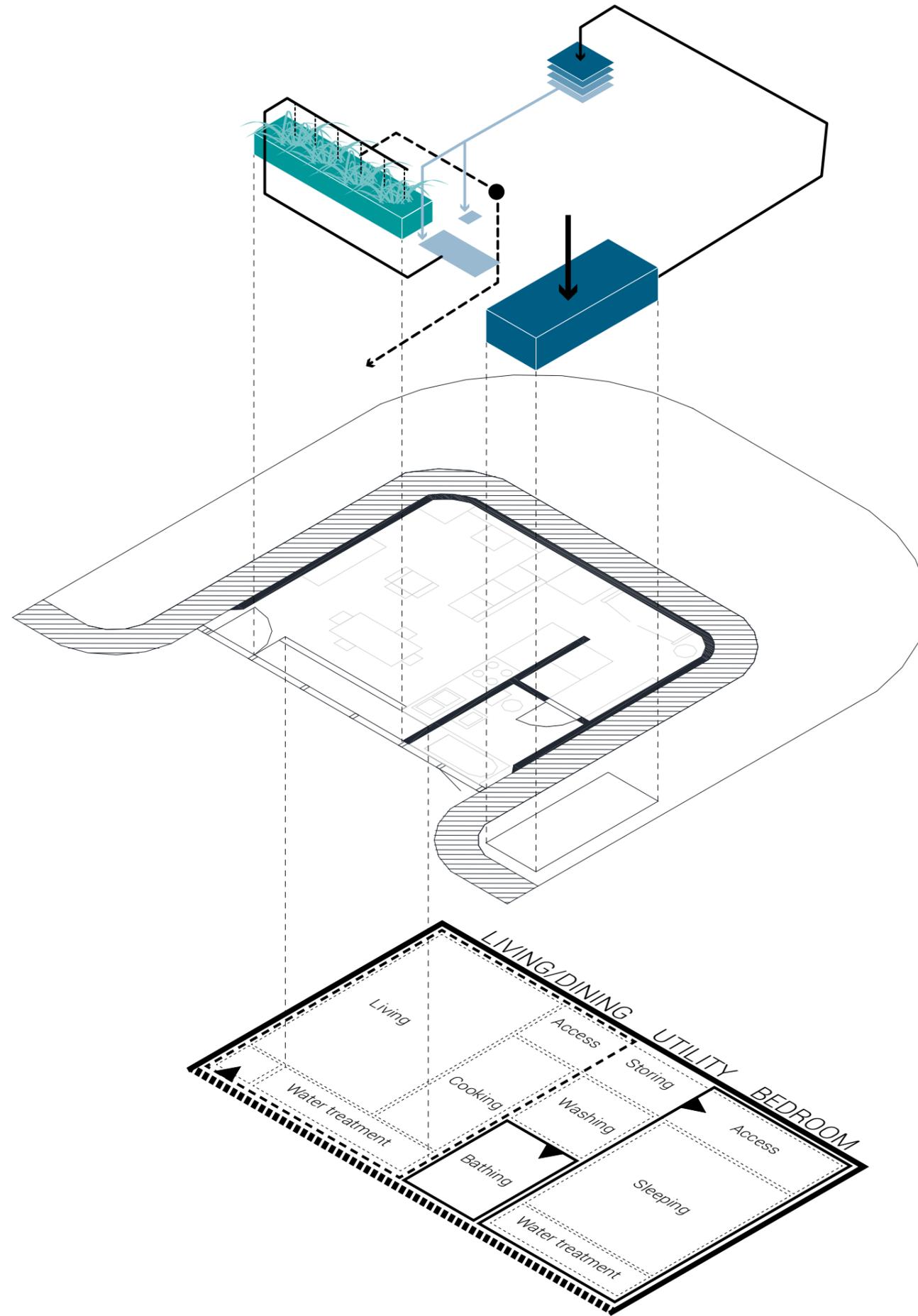
DESIGN

Case-studies



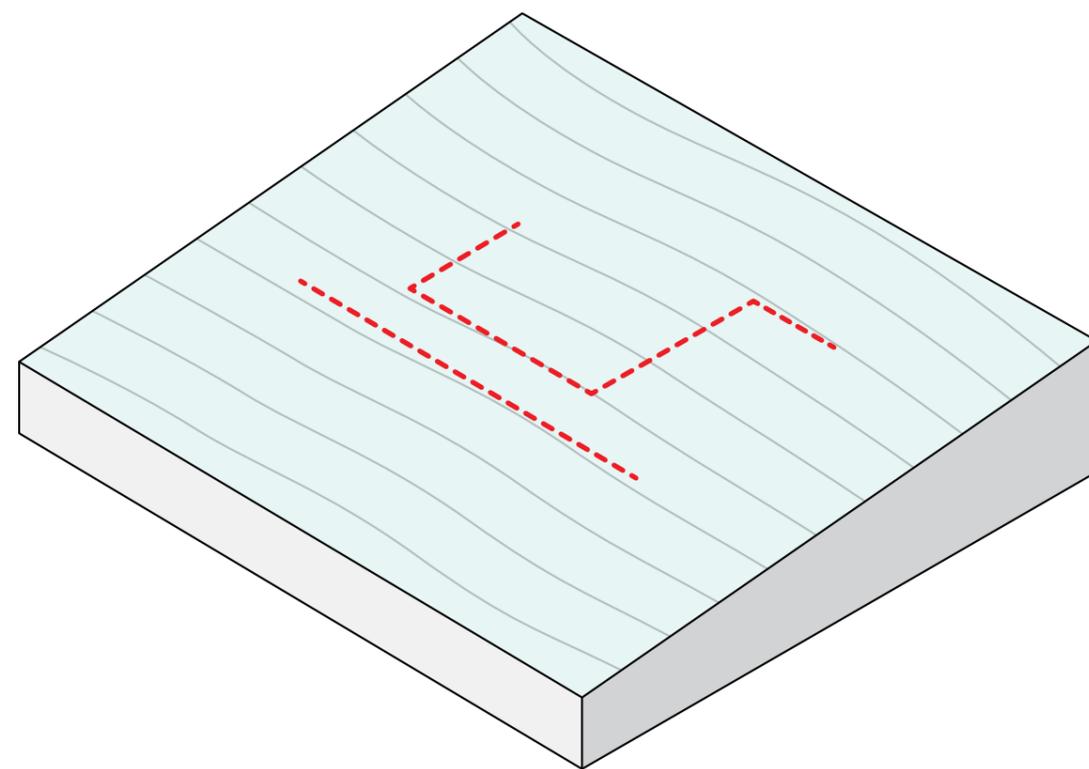
DESIGN

Case-studies



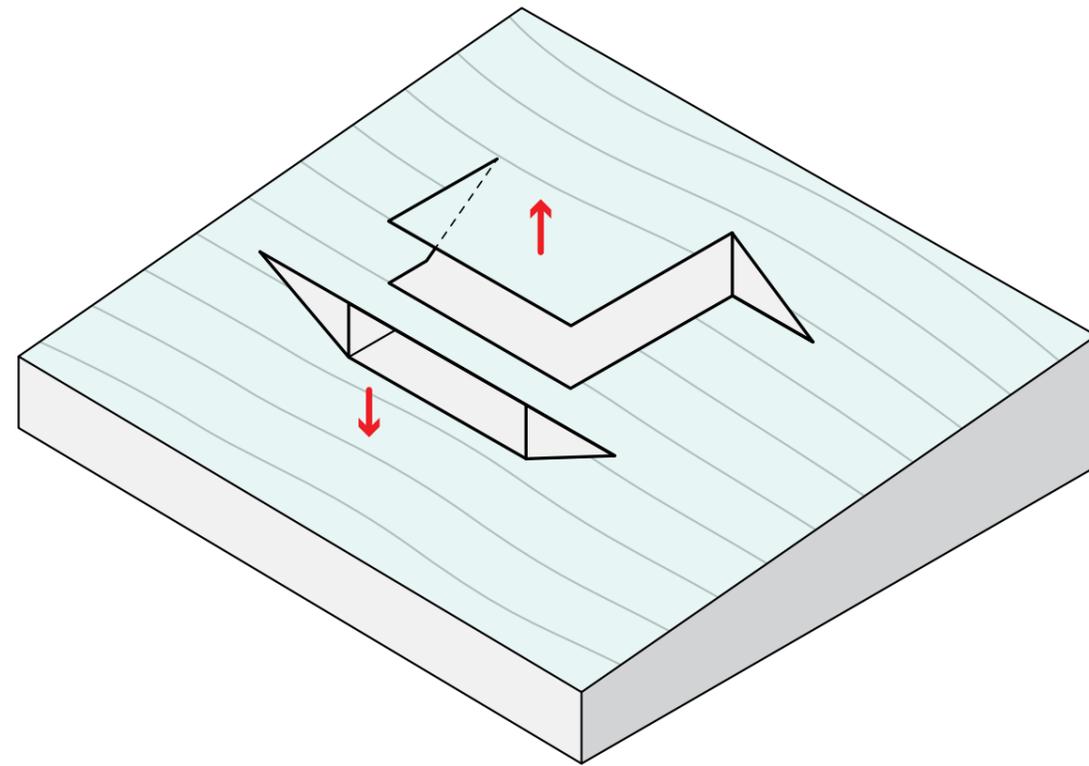
DESIGN

Dwellings



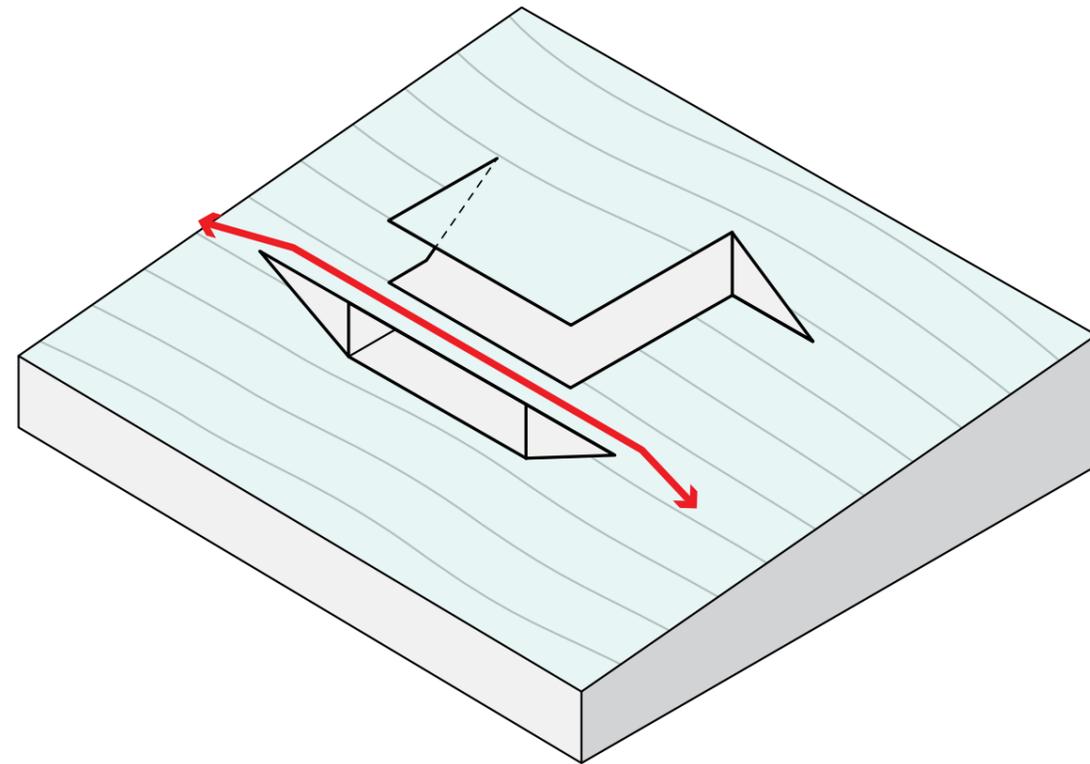
DESIGN

Dwellings



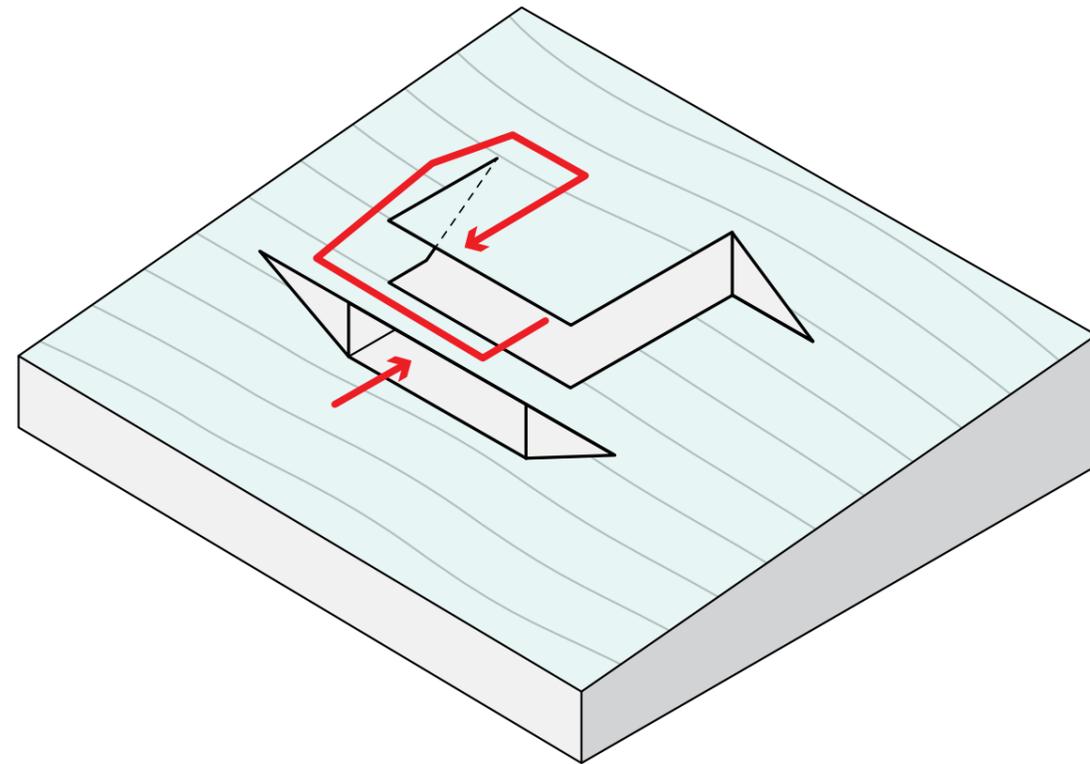
DESIGN

Dwellings



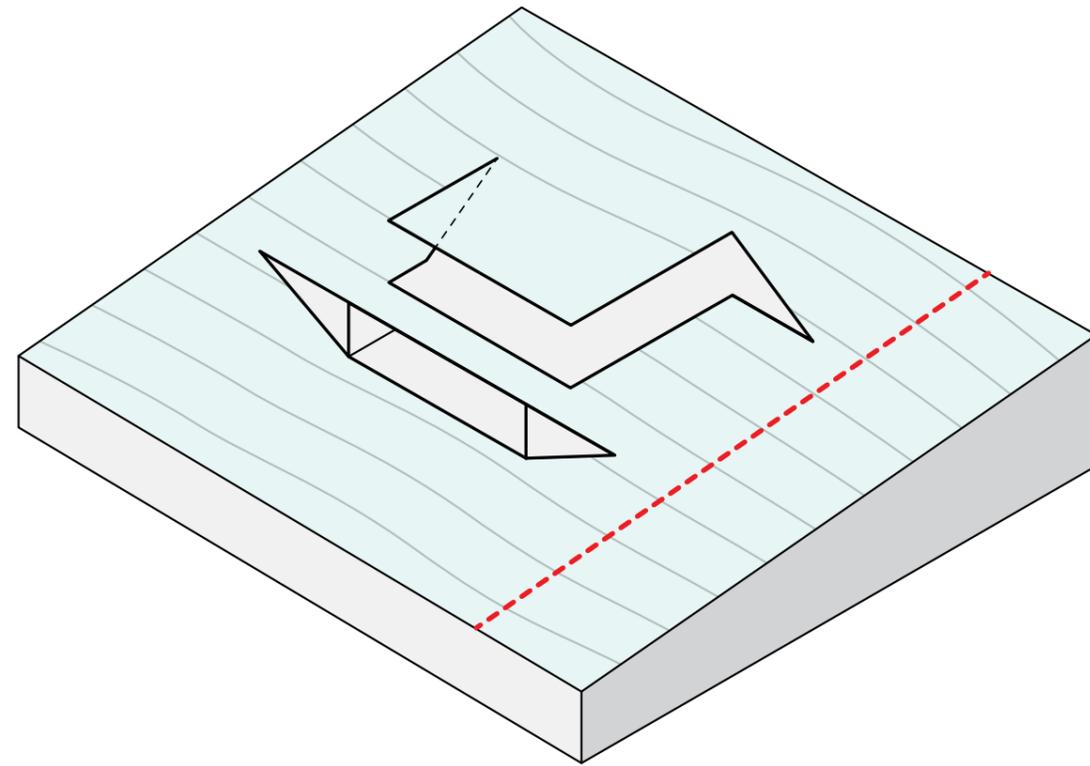
DESIGN

Dwellings



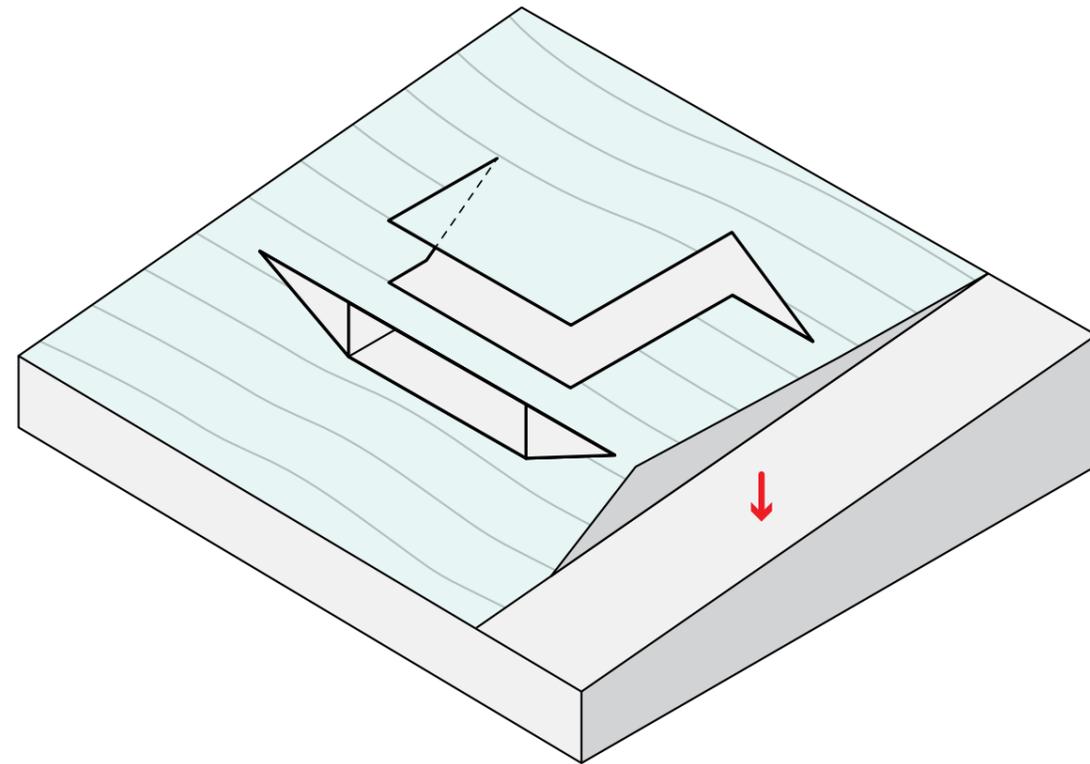
DESIGN

Dwellings



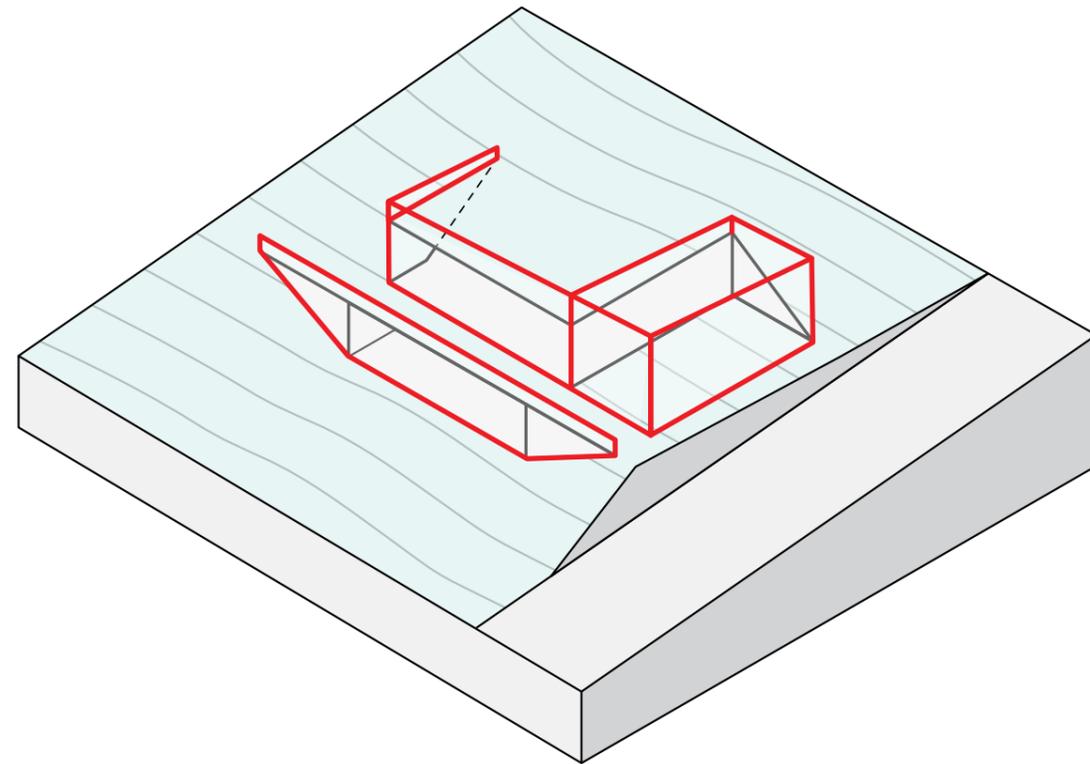
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Dwellings

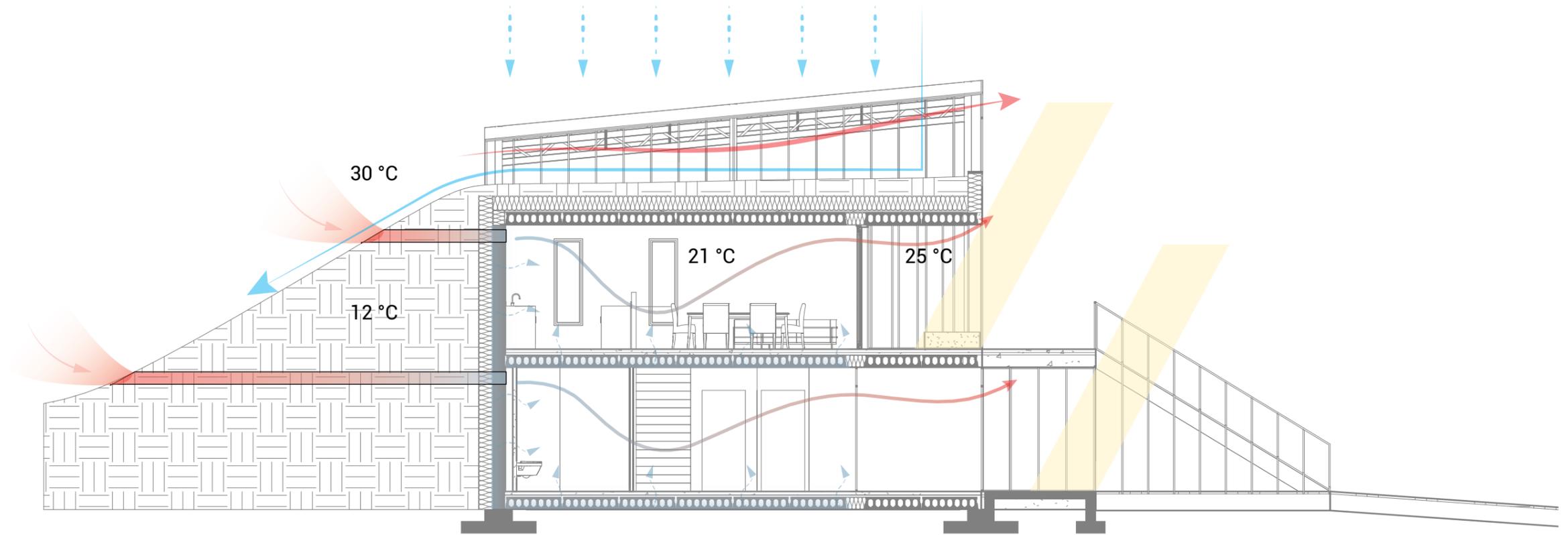


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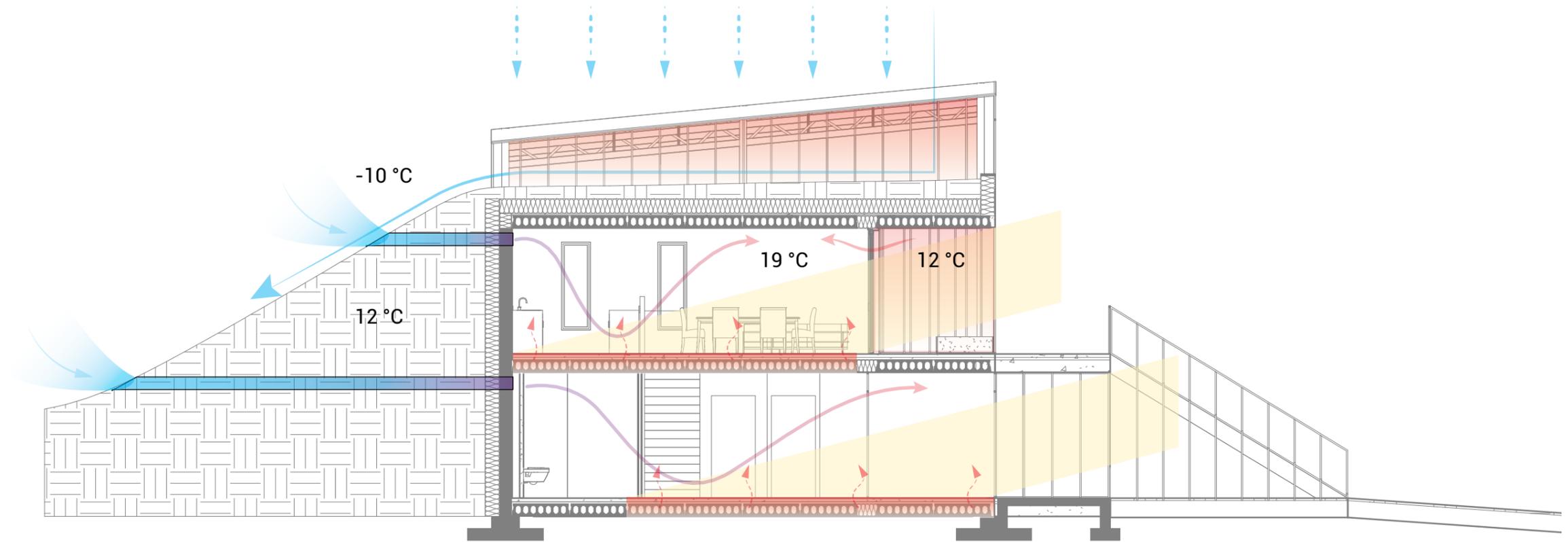
Dwellings



DESIGN



DESIGN



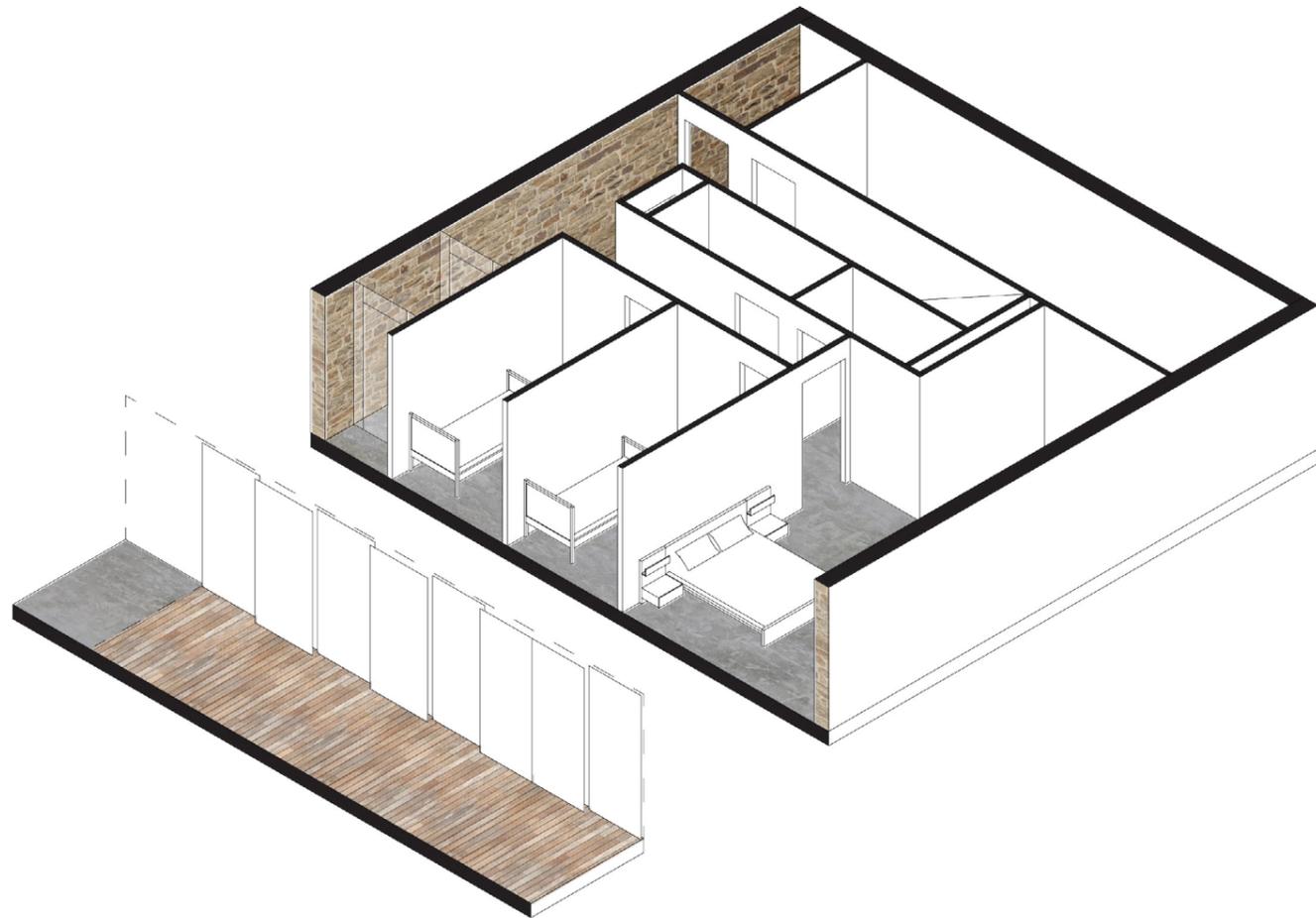
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Dwellings



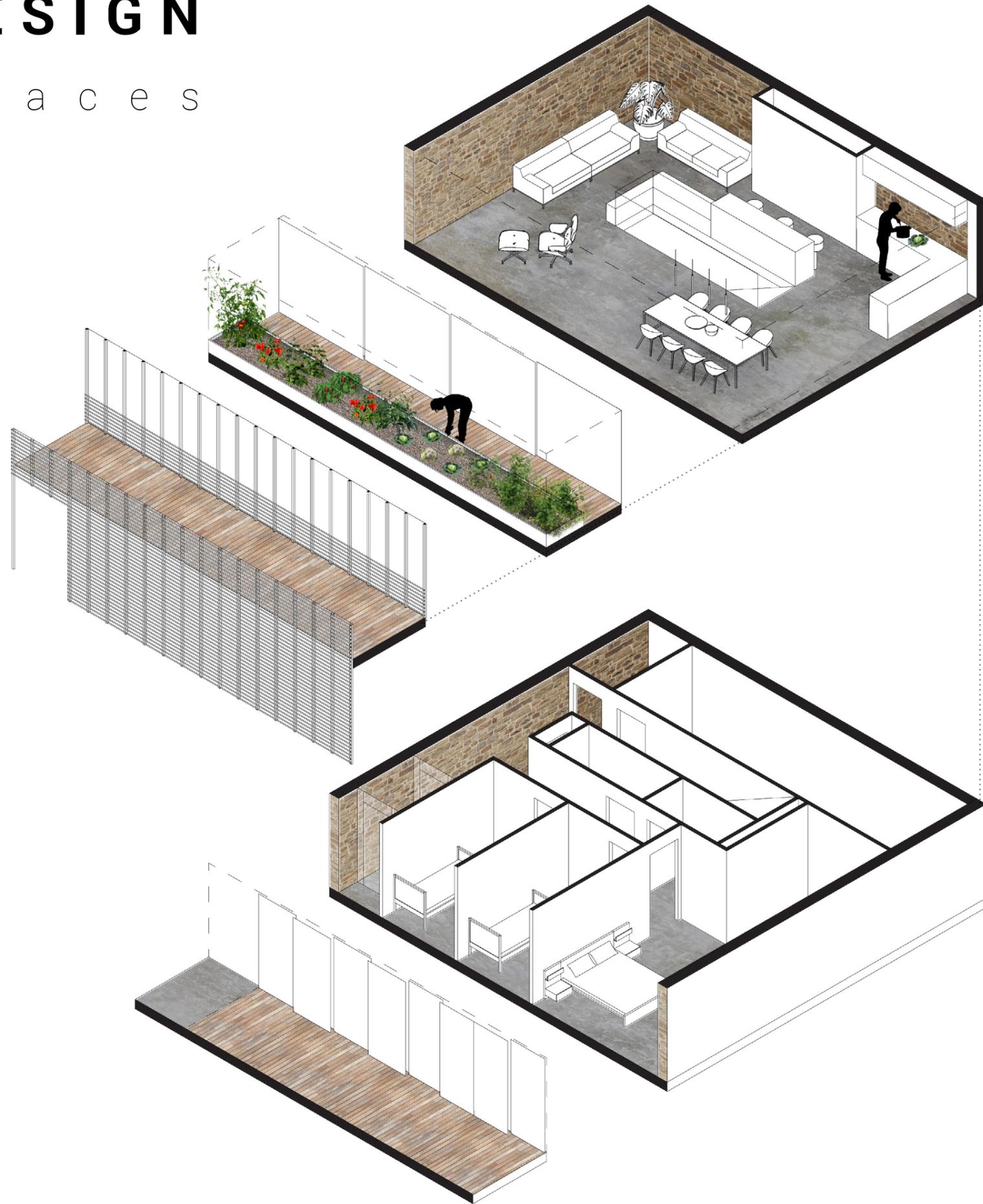
DESIGN

S p a c e s



DESIGN

S p a c e s



DESIGN

Impression



DESIGN

S p a c e s



DESIGN

Greenhouse



DESIGN

Greenhouse



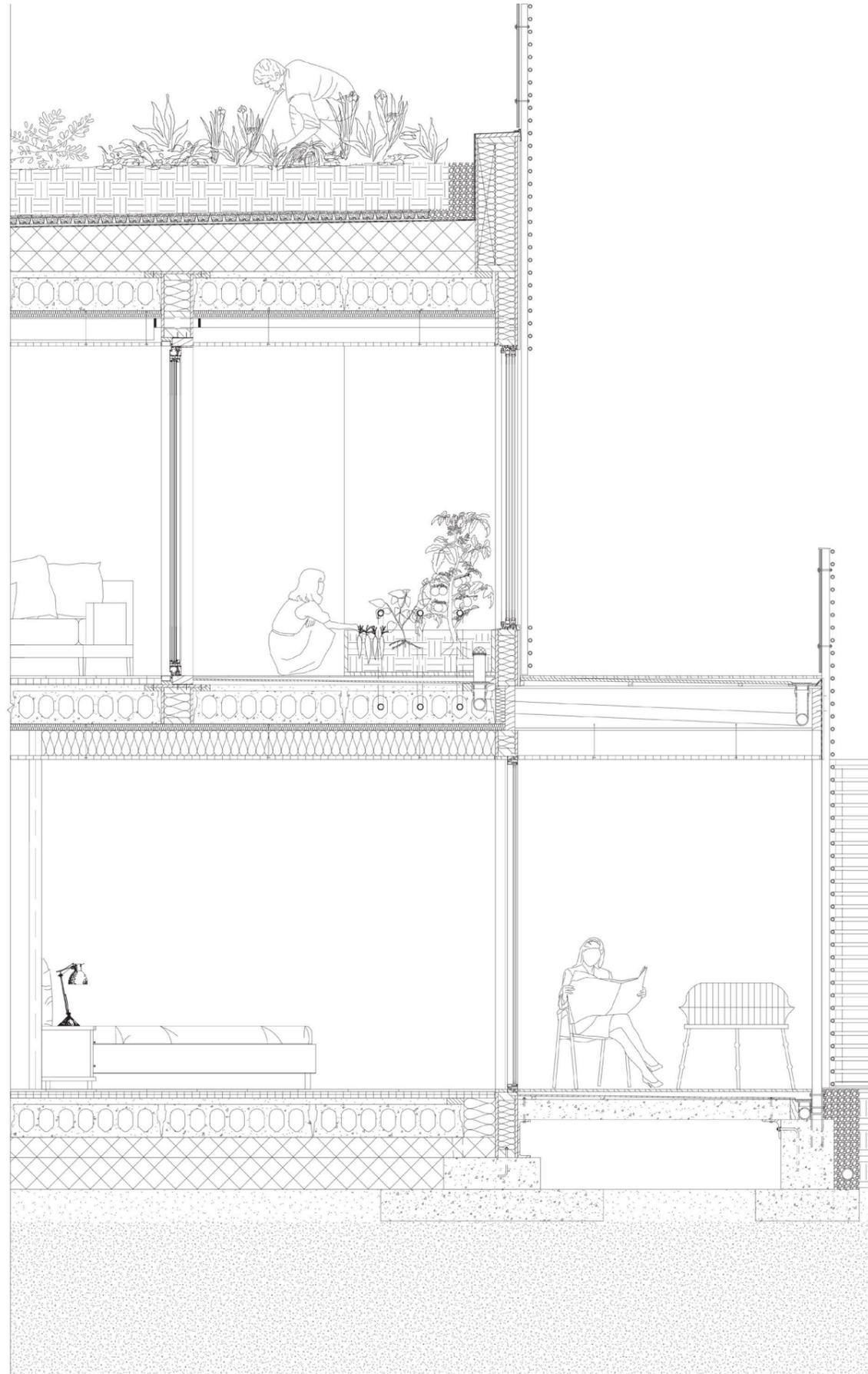
DESIGN

Materials



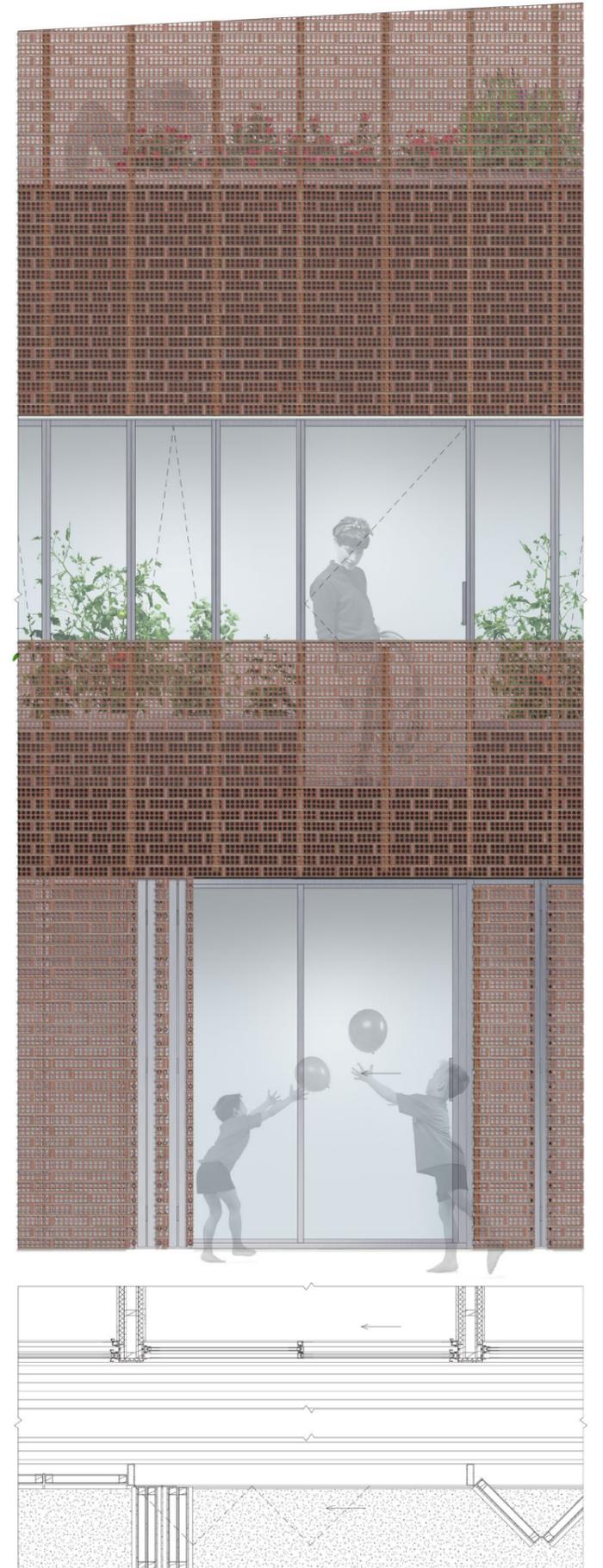
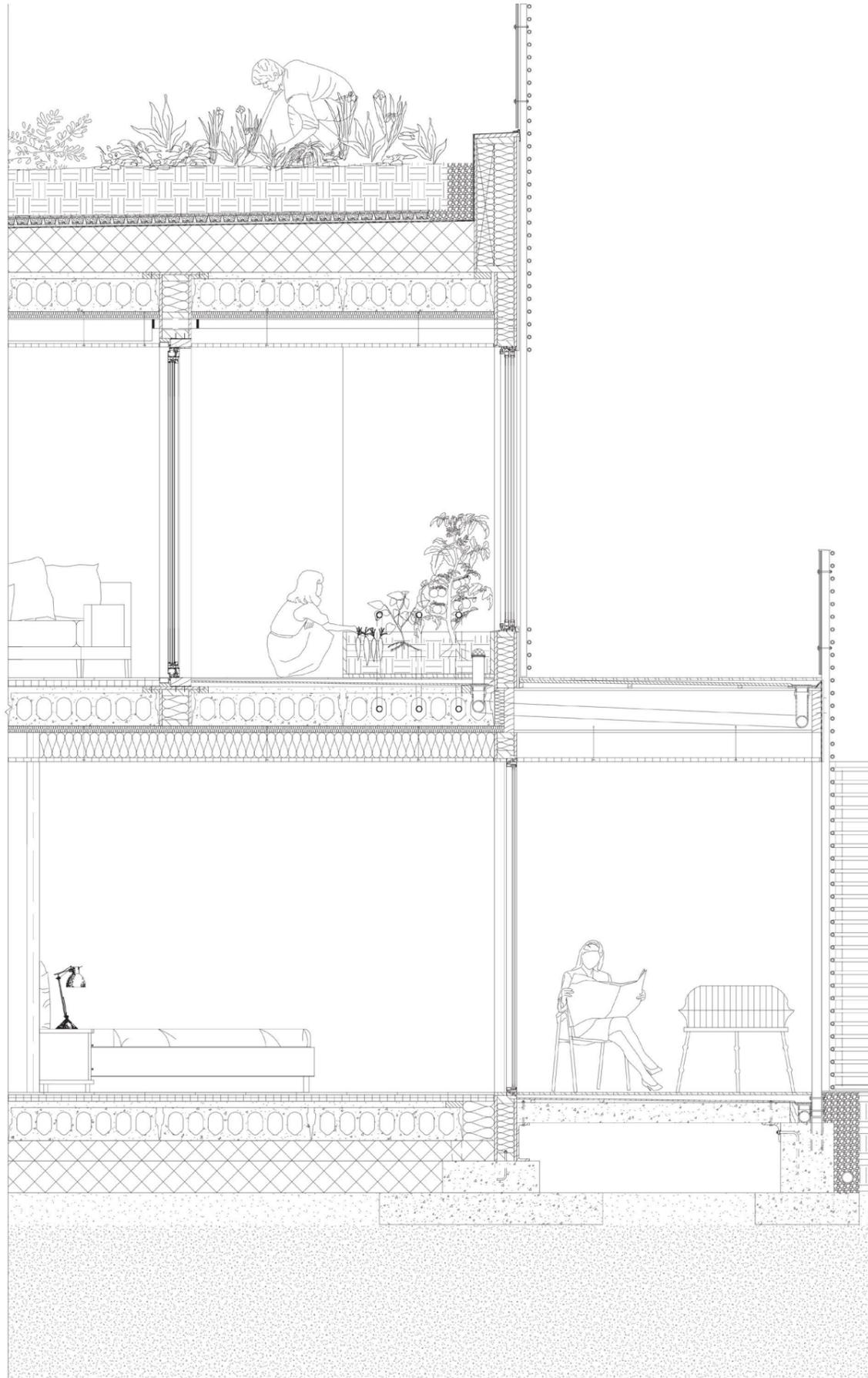
DESIGN

F a c a d e



DESIGN

F a c a d e



QUESTIONS?

