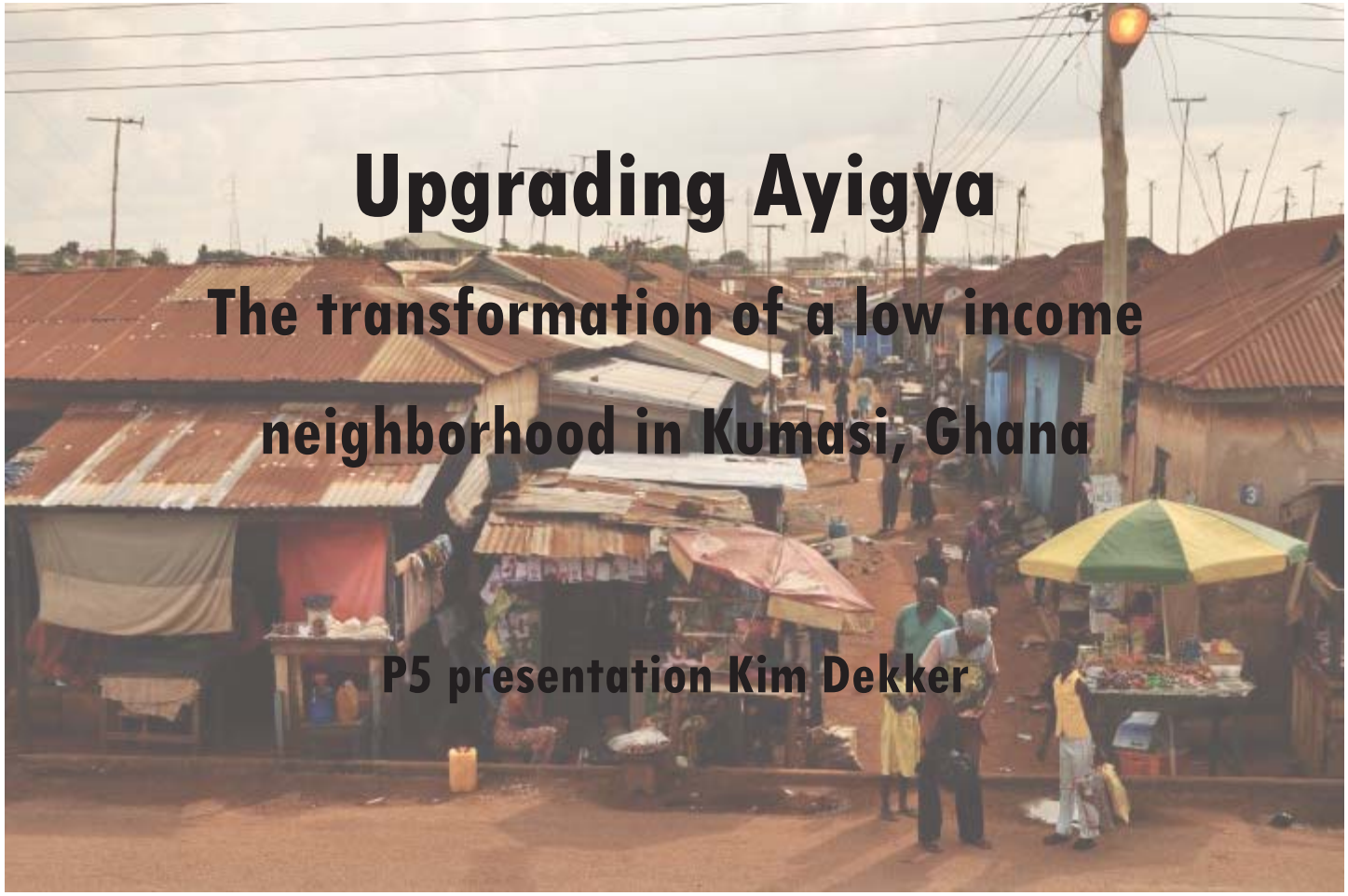


Upgrading Ayigya

The transformation of a low income neighborhood in Kumasi, Ghana

P5 presentation Kim Dekker

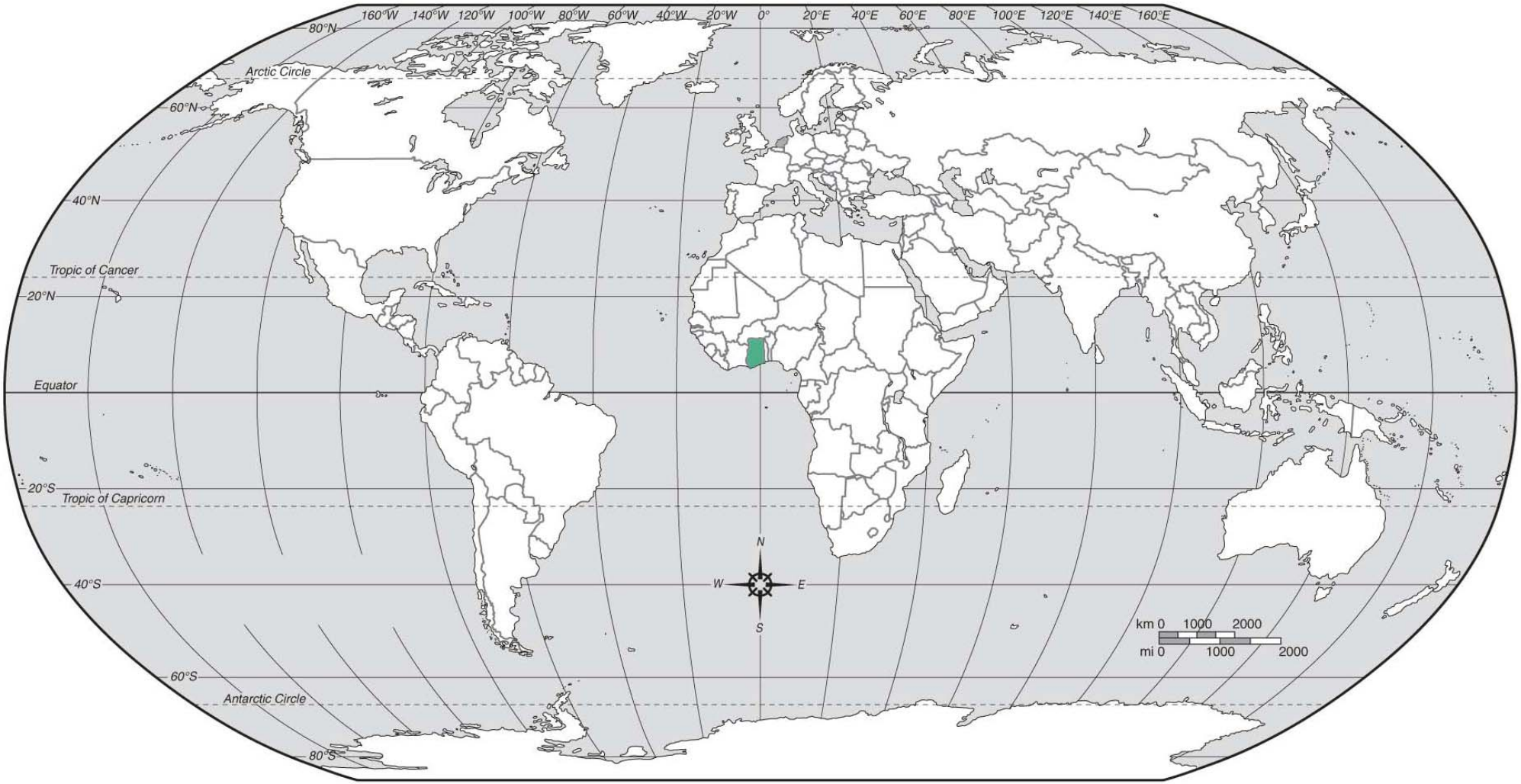
Introduction to Ghana

Ayigya
urban design strategies

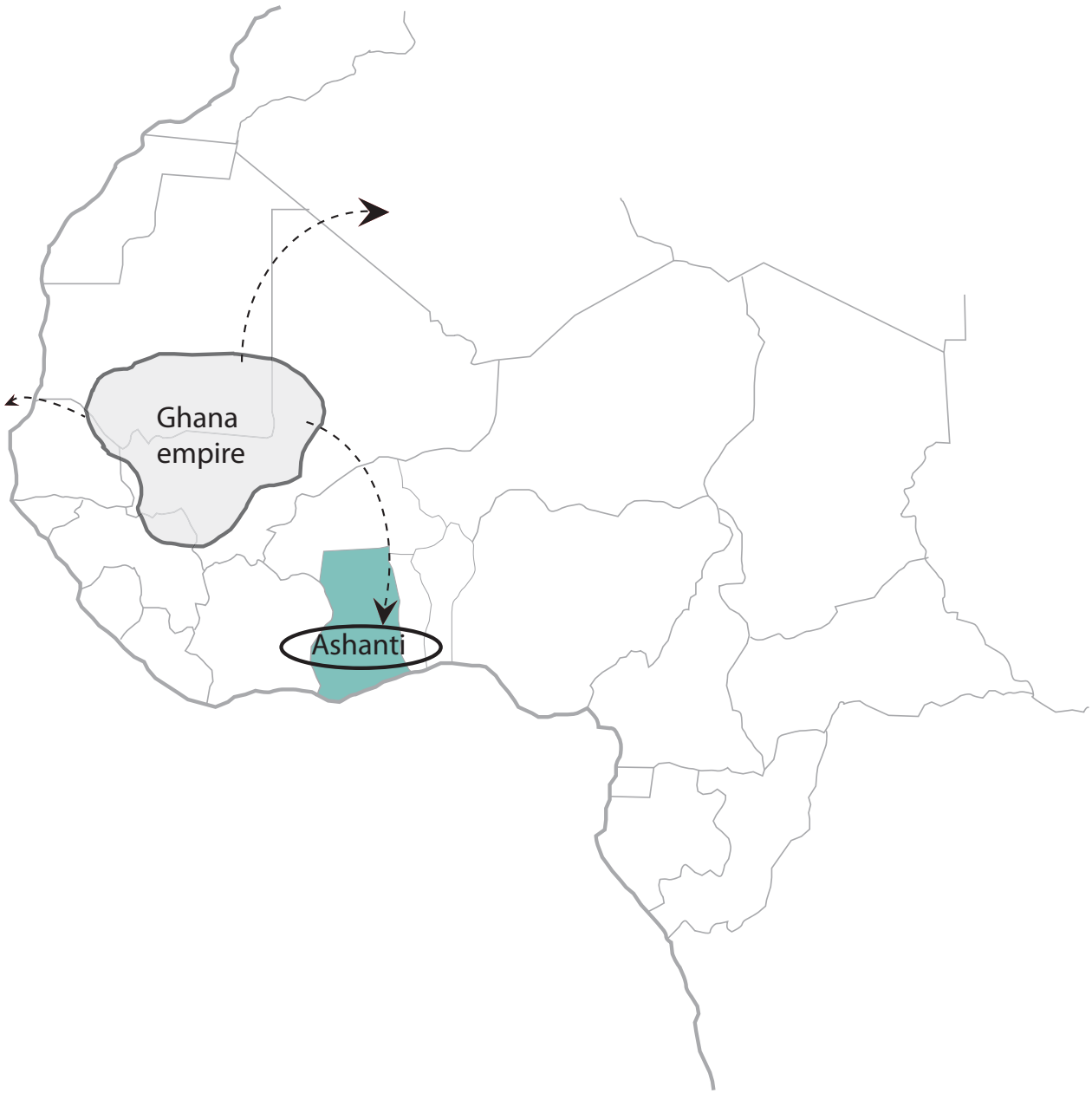
The compound
architectural design strategies

Conclusion

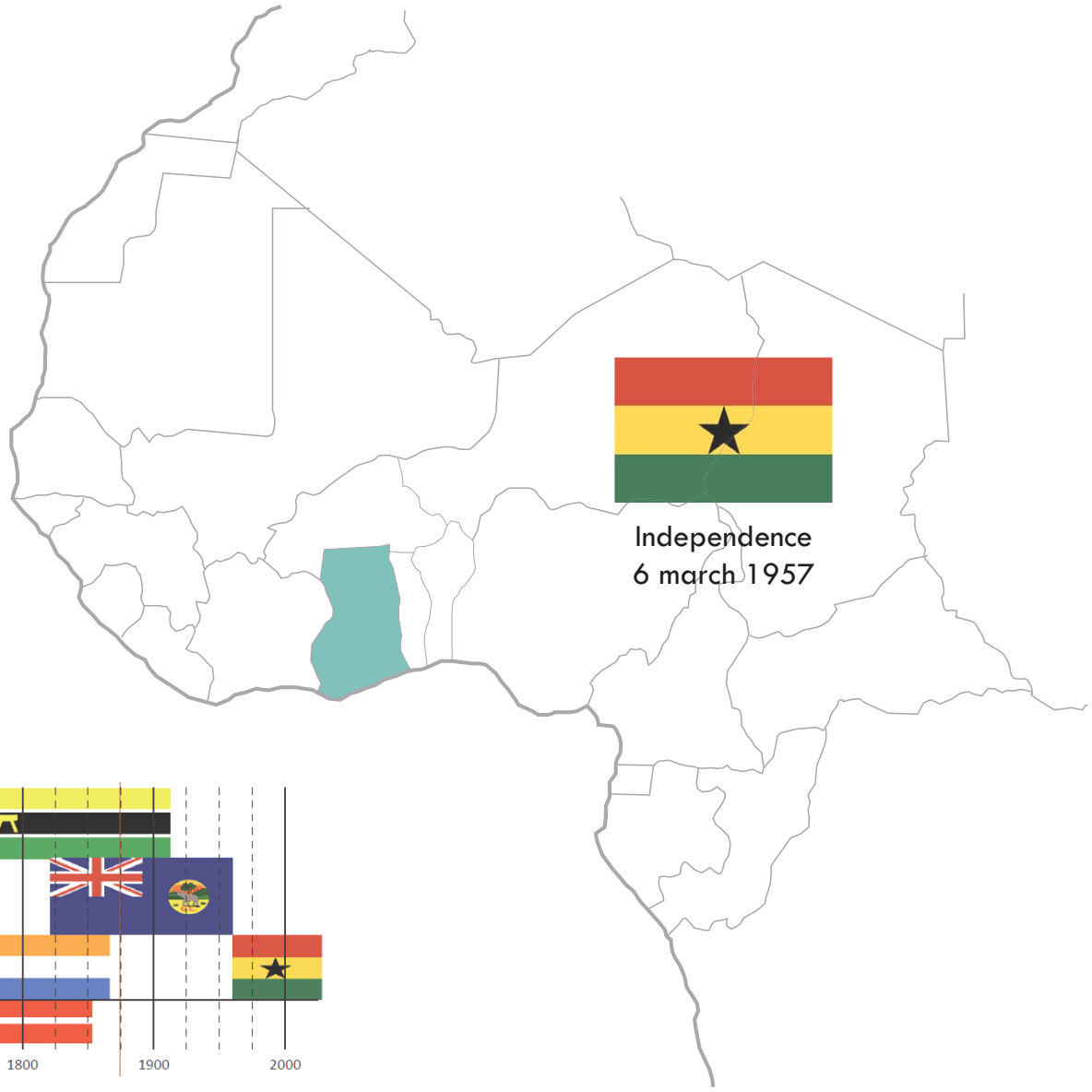
Ghana

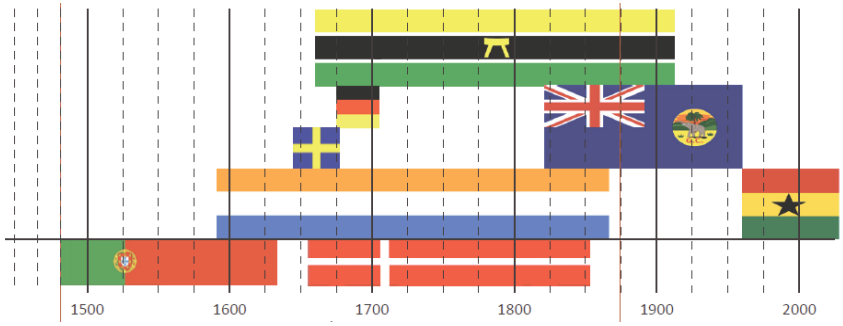

160°W
140°W
120°W
100°W
80°W
60°W
40°W
20°W
0°
20°E
40°E
60°E
80°E
100°E
120°E
140°E
160°E
80°N
Arctic Circle
60°N
40°N
Tropic of Cancer
20°N
Equator
20°S
Tropic of Capricorn
40°S
60°S
Antarctic Circle
80°S
N
W
E
S
km 0 1000 2000
mi 0 1000 2000

Ghana empire - Ashanti



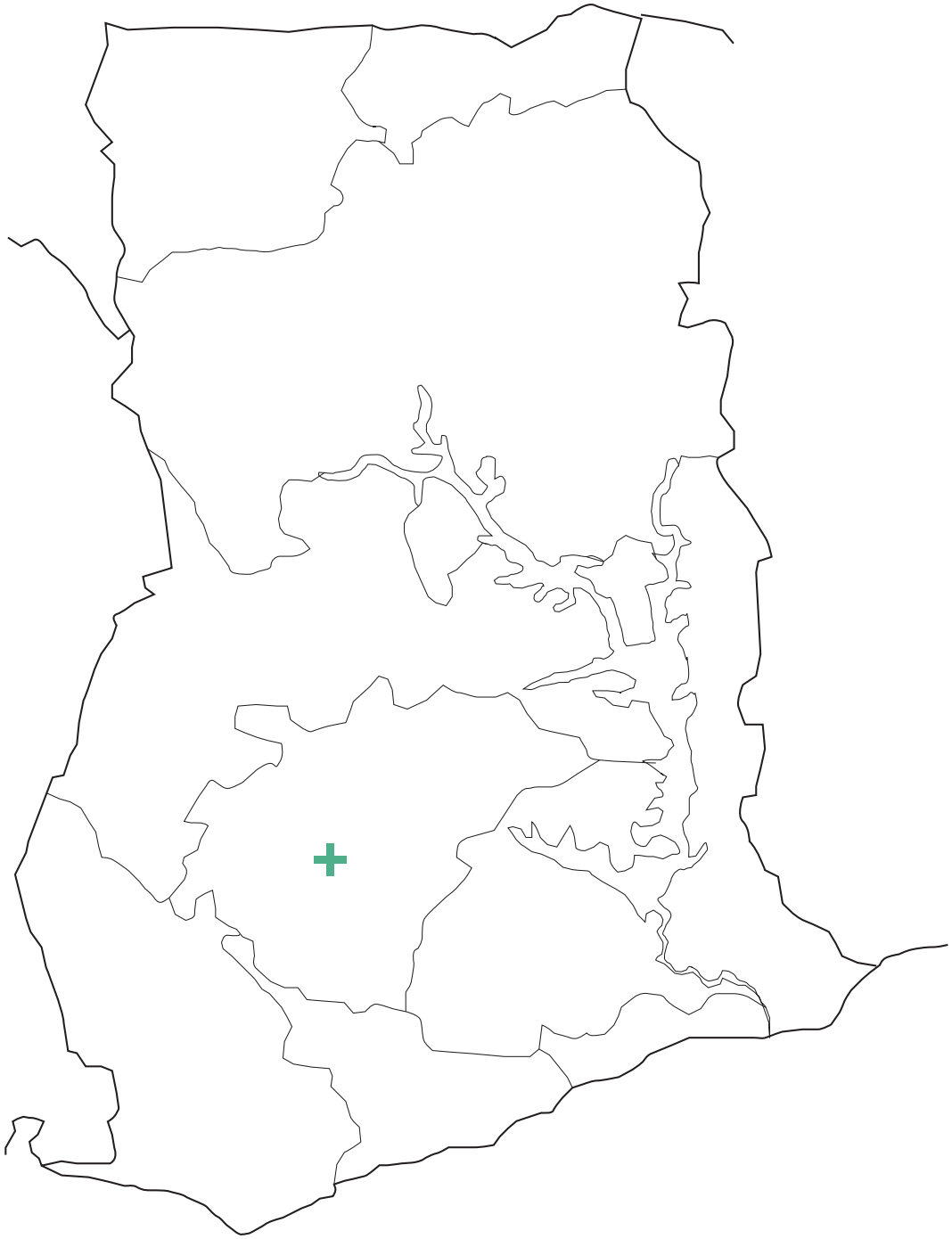
Ghana - Colony and independence





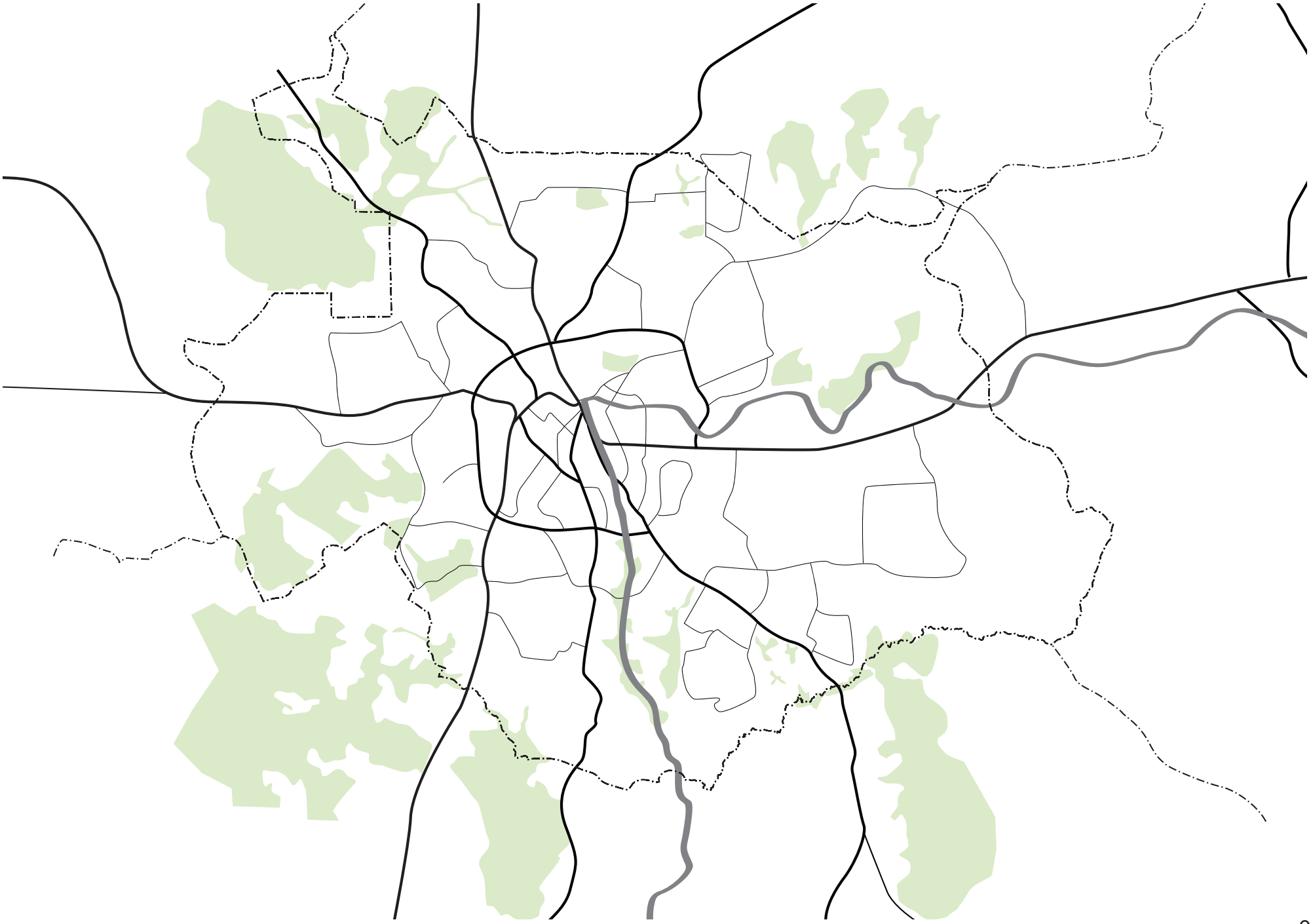
Ghana now

Kumasi



Kumasi

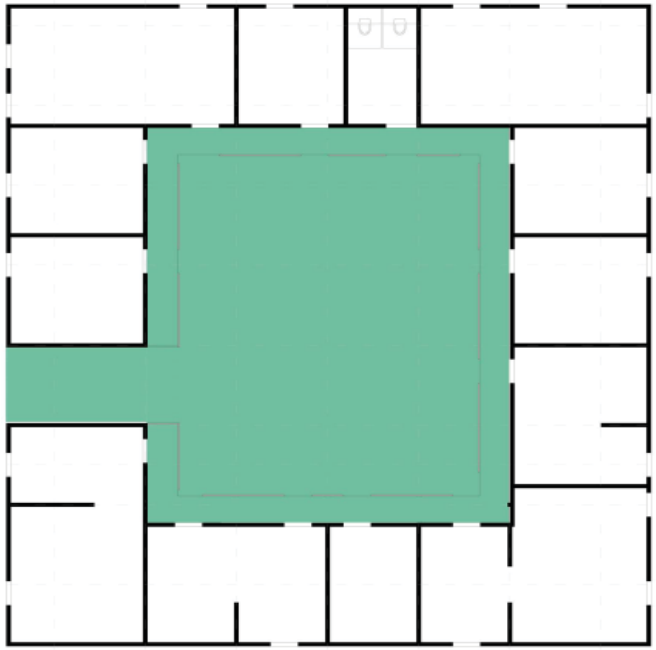
Amsterdam




The wall of the zoo
Kumasi zoo
Kejetia lorry park
Kejetia central market
BRT system
Railway station
Skill centre & school
Sustainable dwellings
Urban agriculture
Faculty of art
KNUST

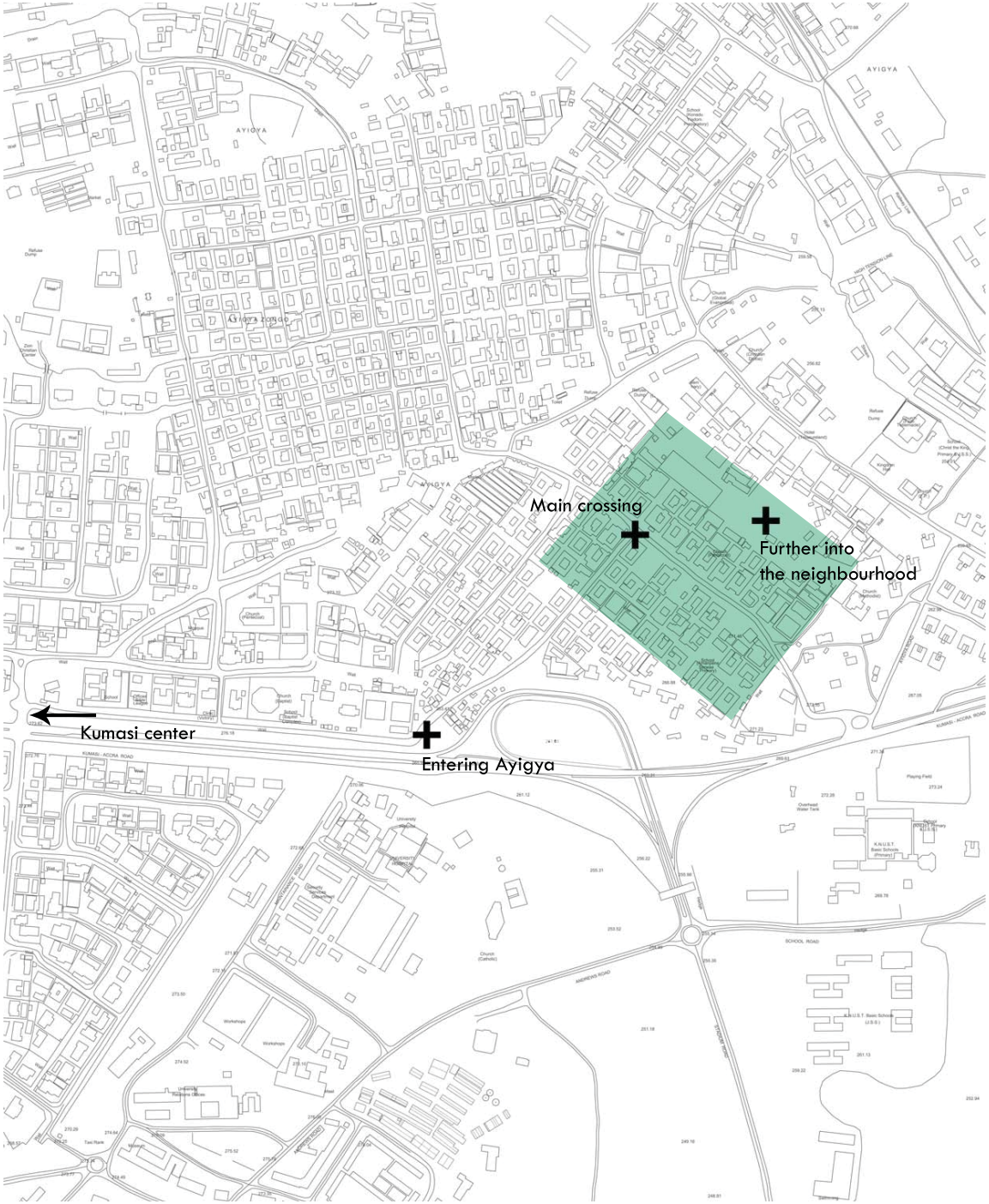
Kumasi Ayigya

Ayigya - compound typology

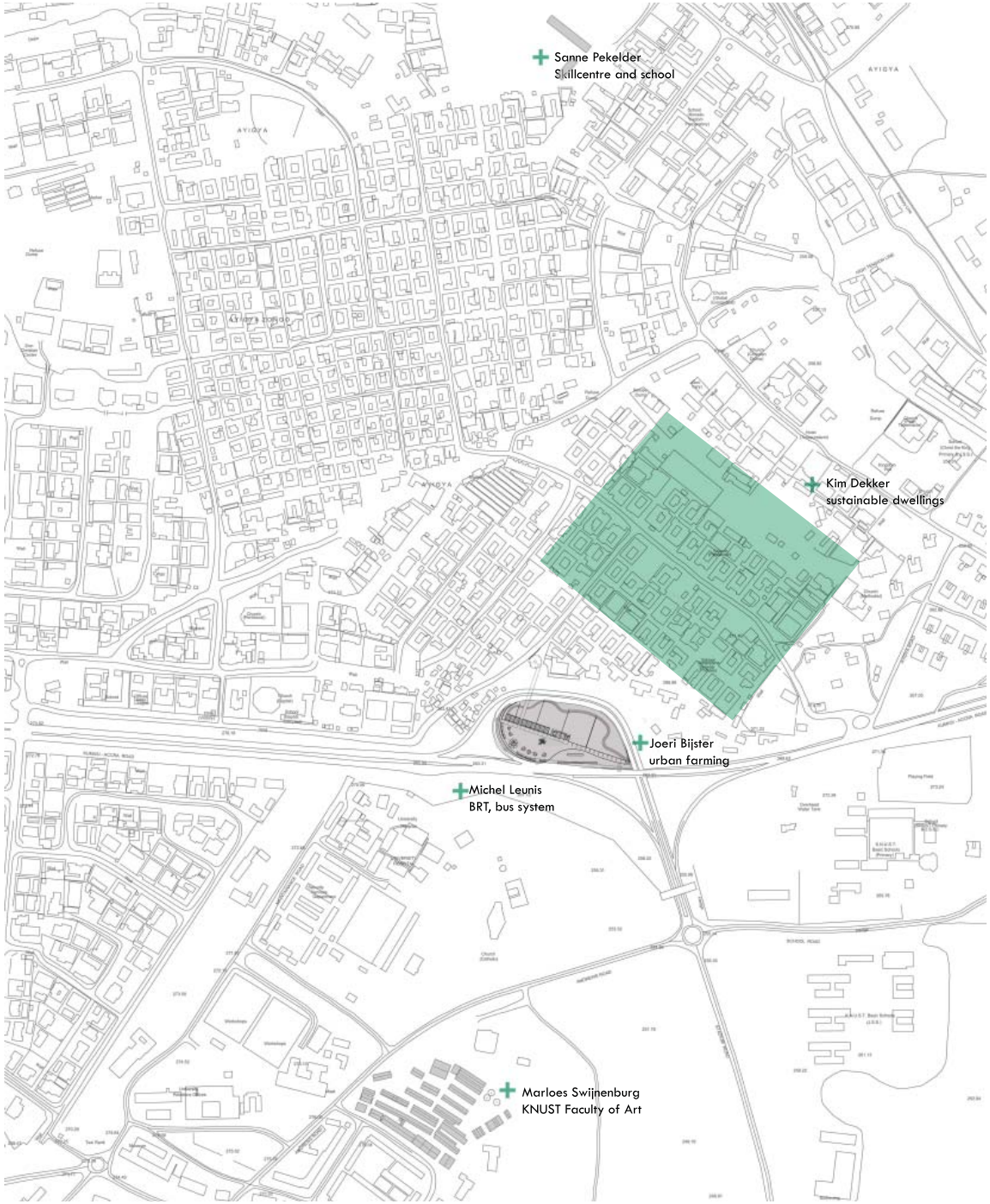


Ayigya - new building blocks

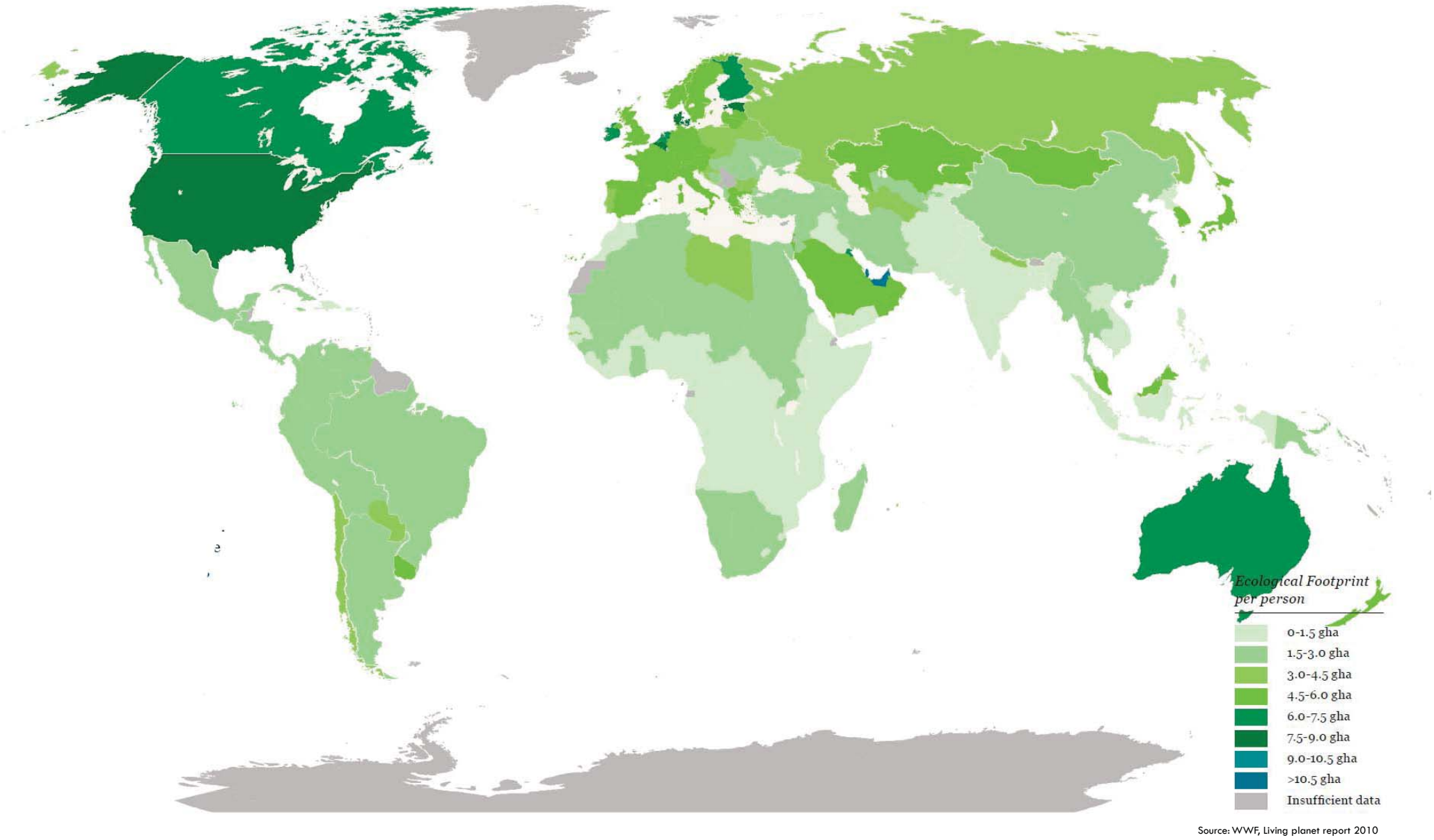
Ayigya - design area



Ayigya - surrounding plans studio Ghana



Ecological footprint



Source: WWF, Living planet report 2010

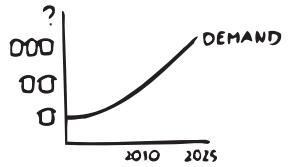
Self sufficiency


Ayigya
TAXI
GW 9100 Z
AS868ZW

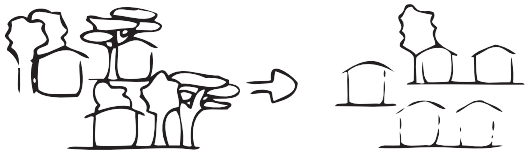
Design area


Kim Dekker
sustainable dwellings
Joeri Bijster
urban farming
Michel Leunis
BRT, bus system

Urban analysis findings



The housing demand is growing



Kumasi was once called the garden city

Social structures are changing

Unsave and unhealthy streets

The soil suffers from erosion

Tight and dense grid

Existing situation

New building blocks

Second floor

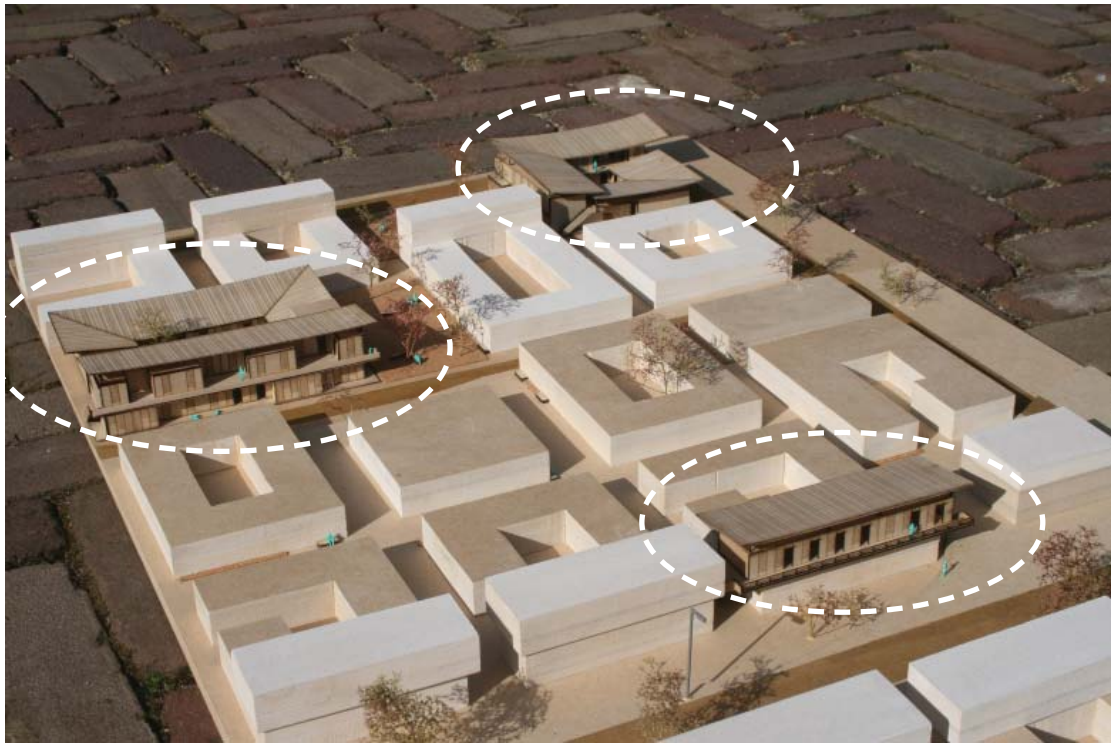
Second floor

3 types of compounds

A. New compound

B. New extended compound

C. Existing compound with plug in layer



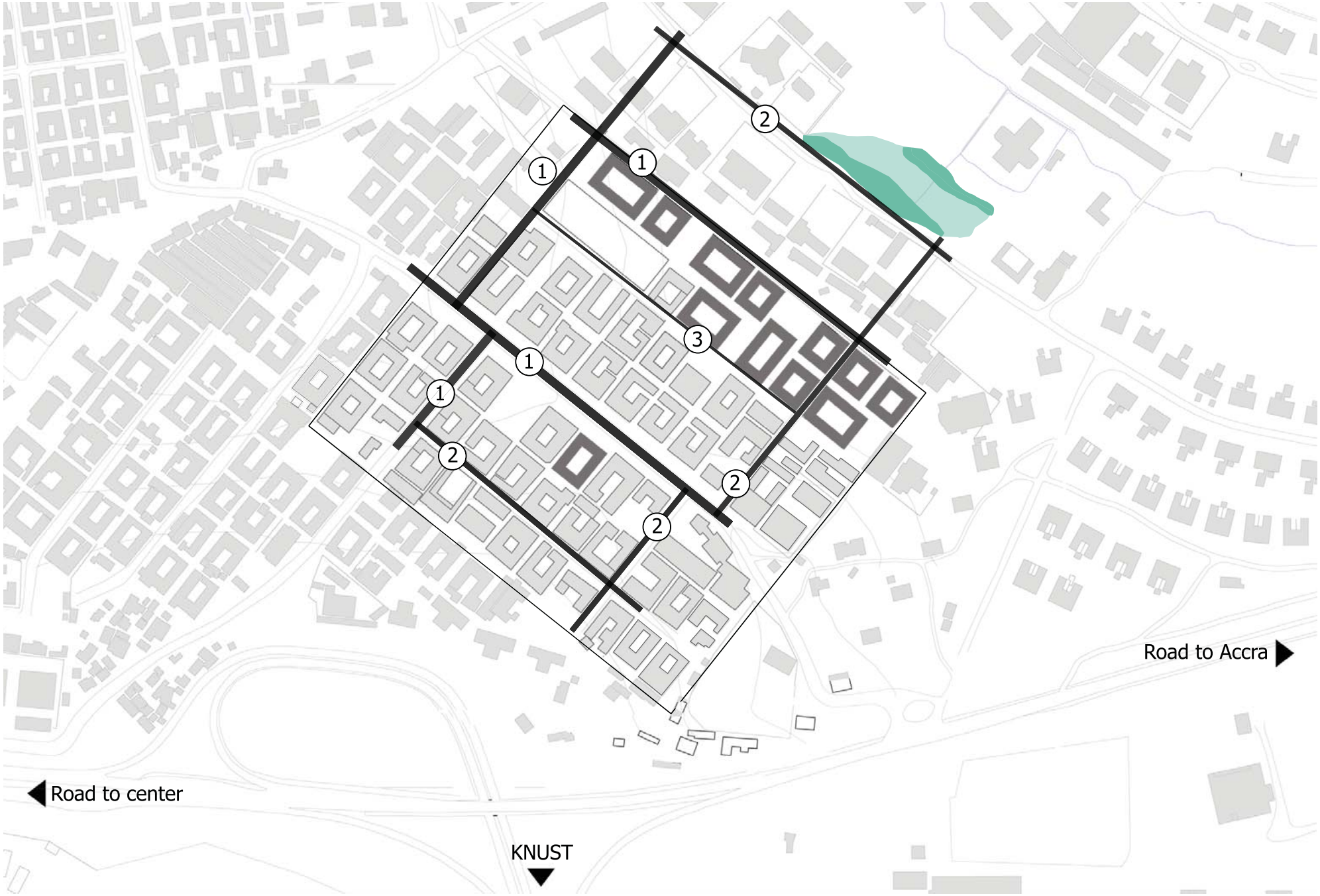
Common spaces

Layout of the common spaces

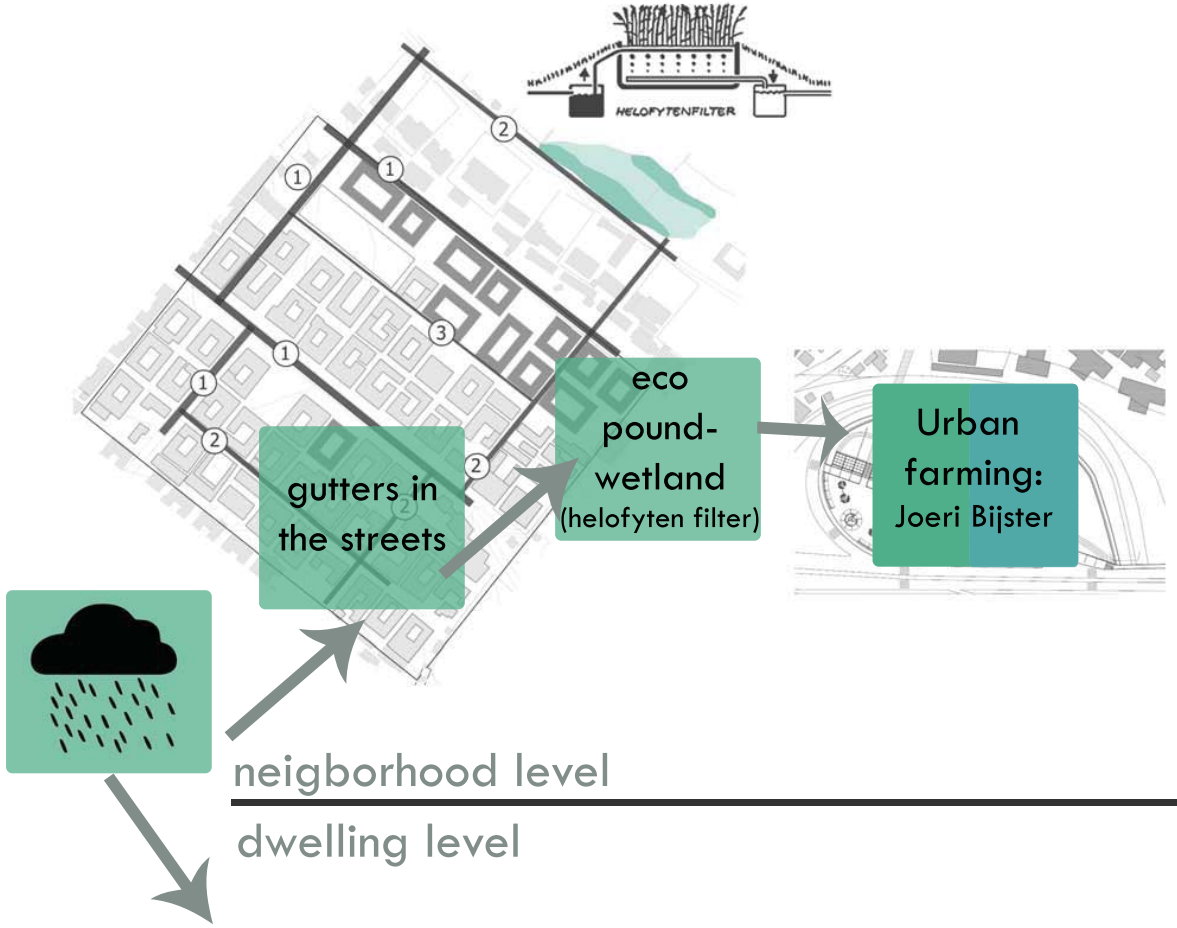
6 types of trees and plants as building material or food

Recycled elements used for sitting, playing, shelters for the rain.

Street pattern and water network

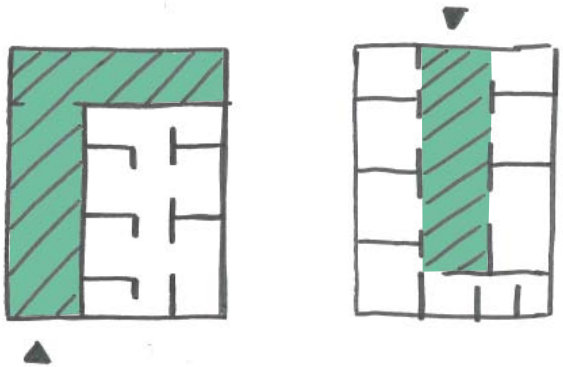


The loop of water

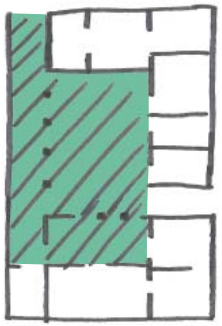


Final plan

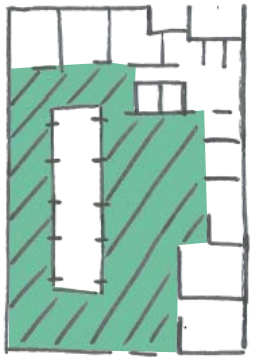

The compound



Early Egyptians - 5000 b.c.

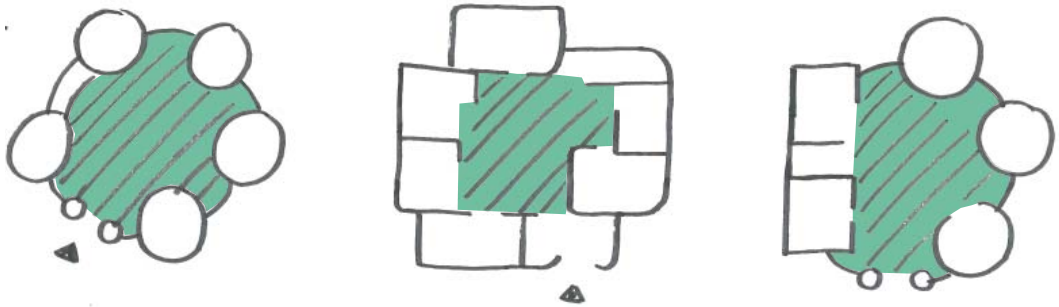


Early Greeks - 500 b.c.



Atrium housetype of Rome - 200 b.c.

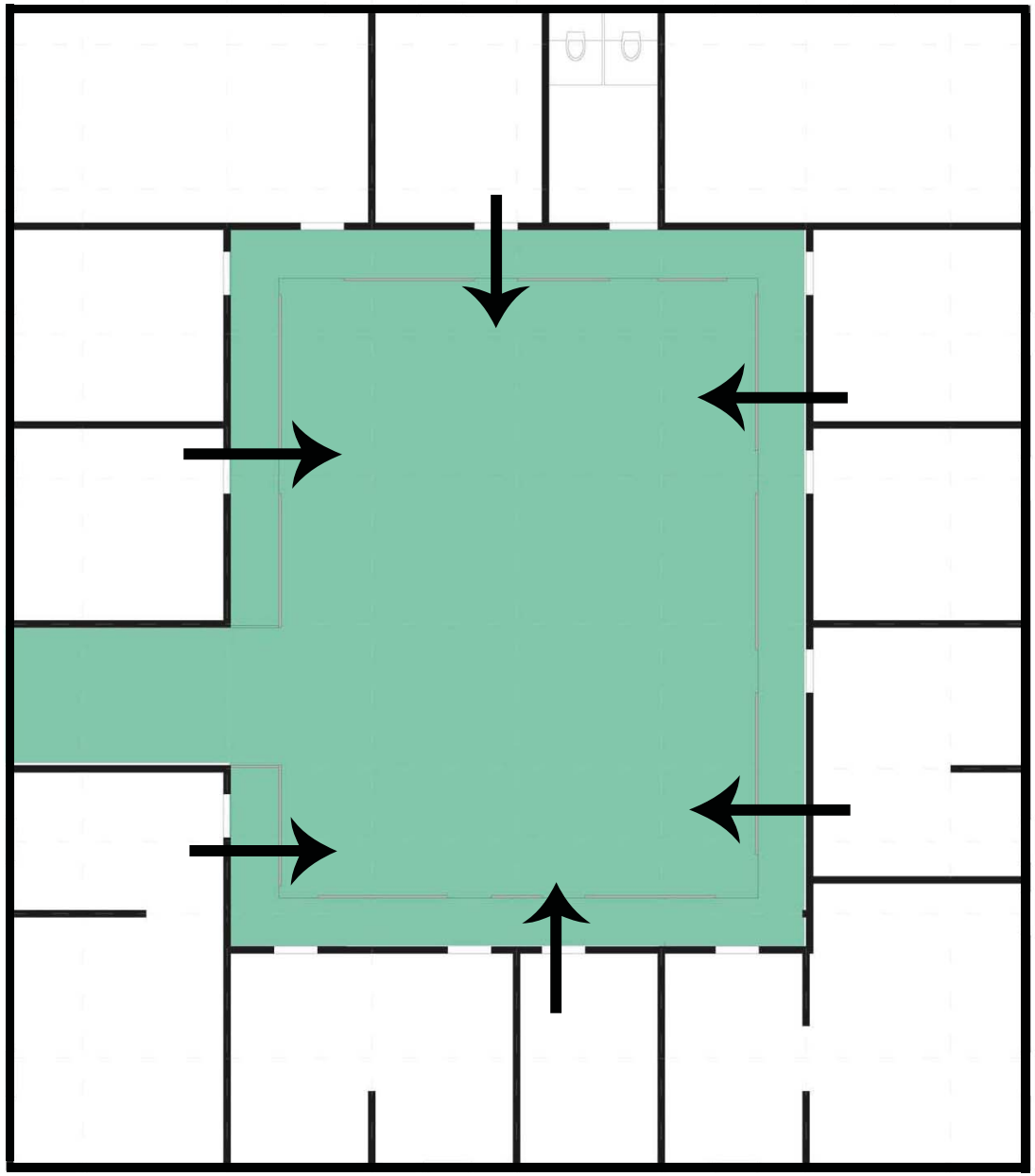
Courtyards in North Africa -



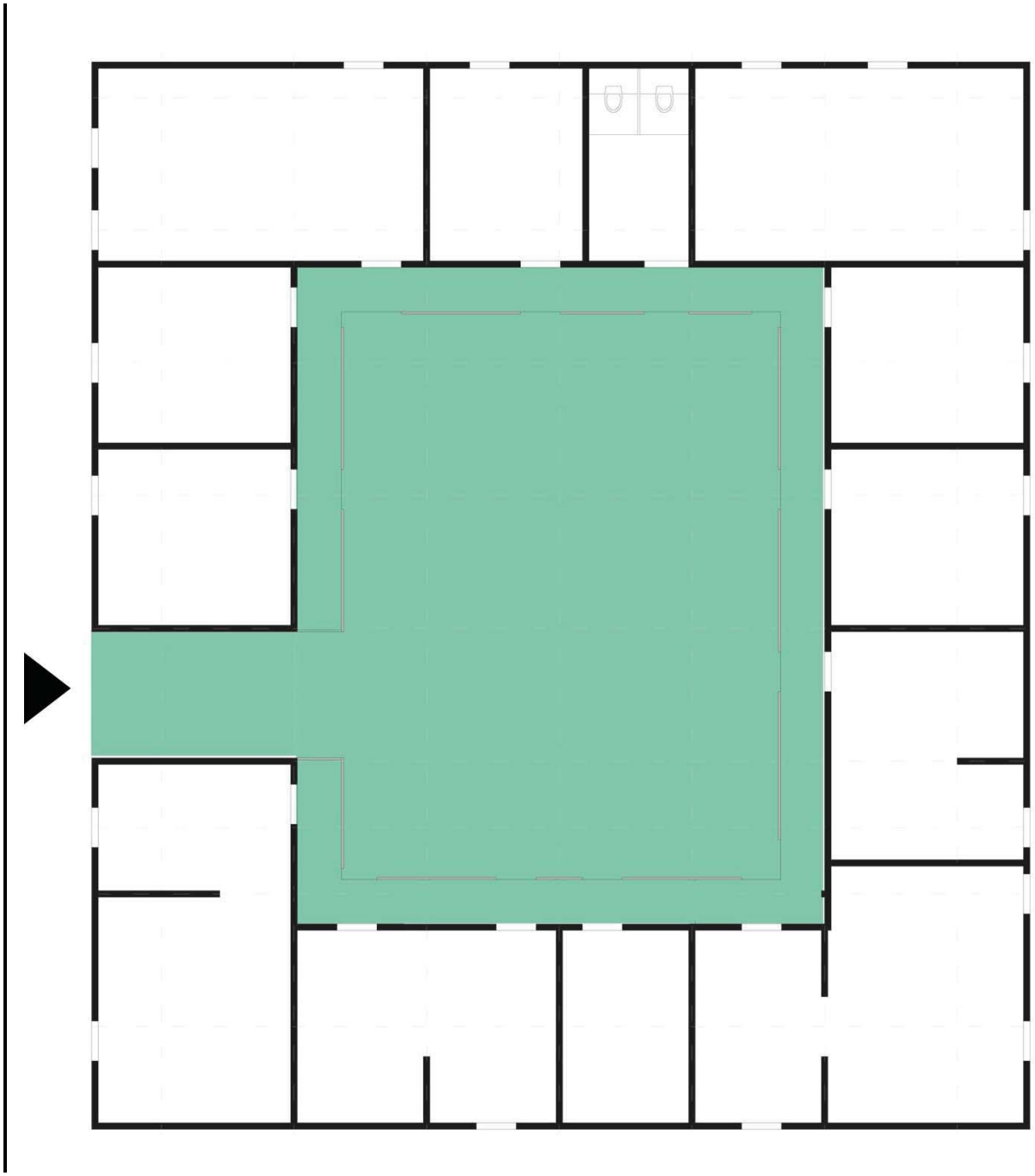
Courtyard houses in North Ghana

Current appearance compound

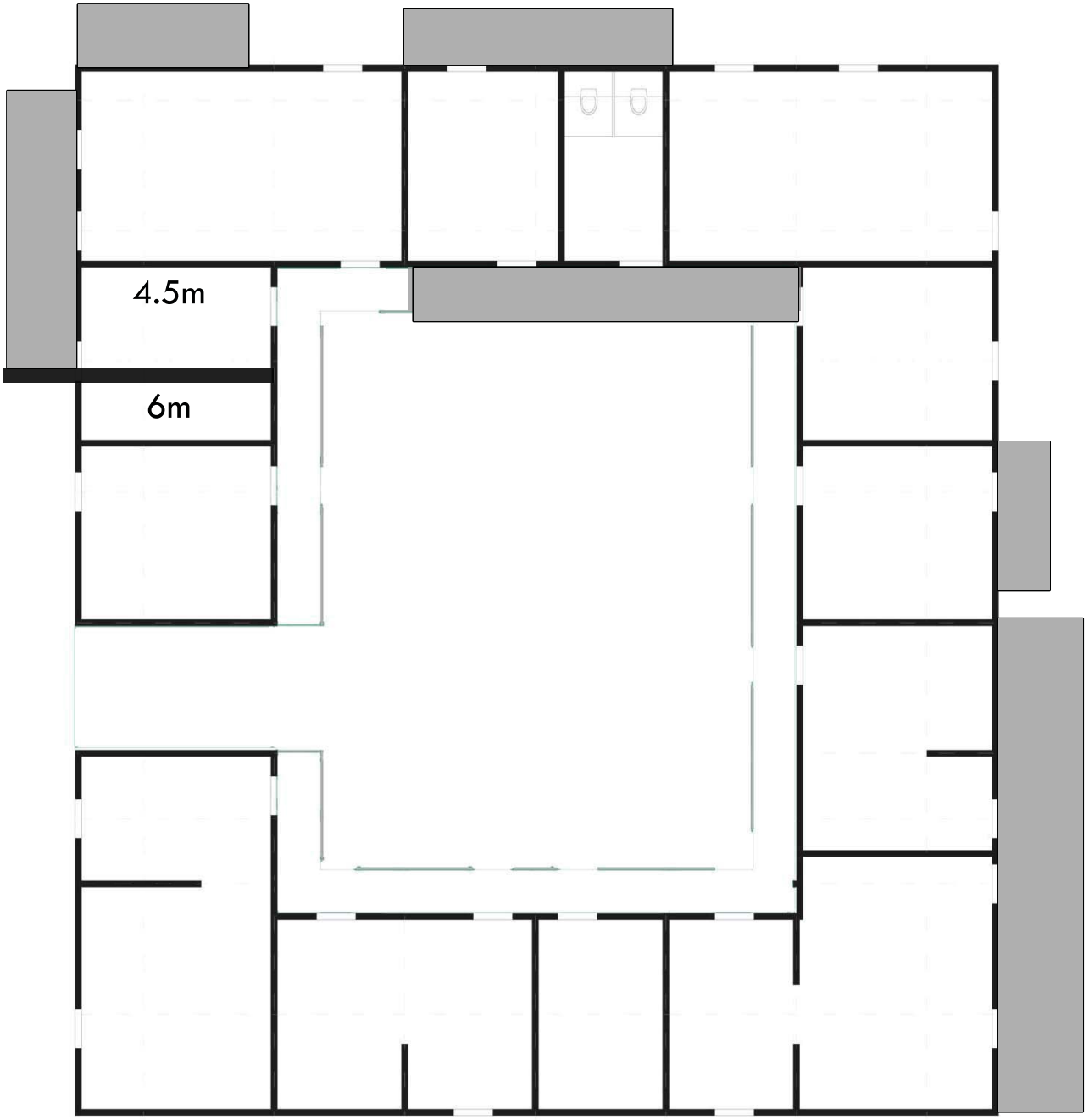
Analysis compound - courtyard



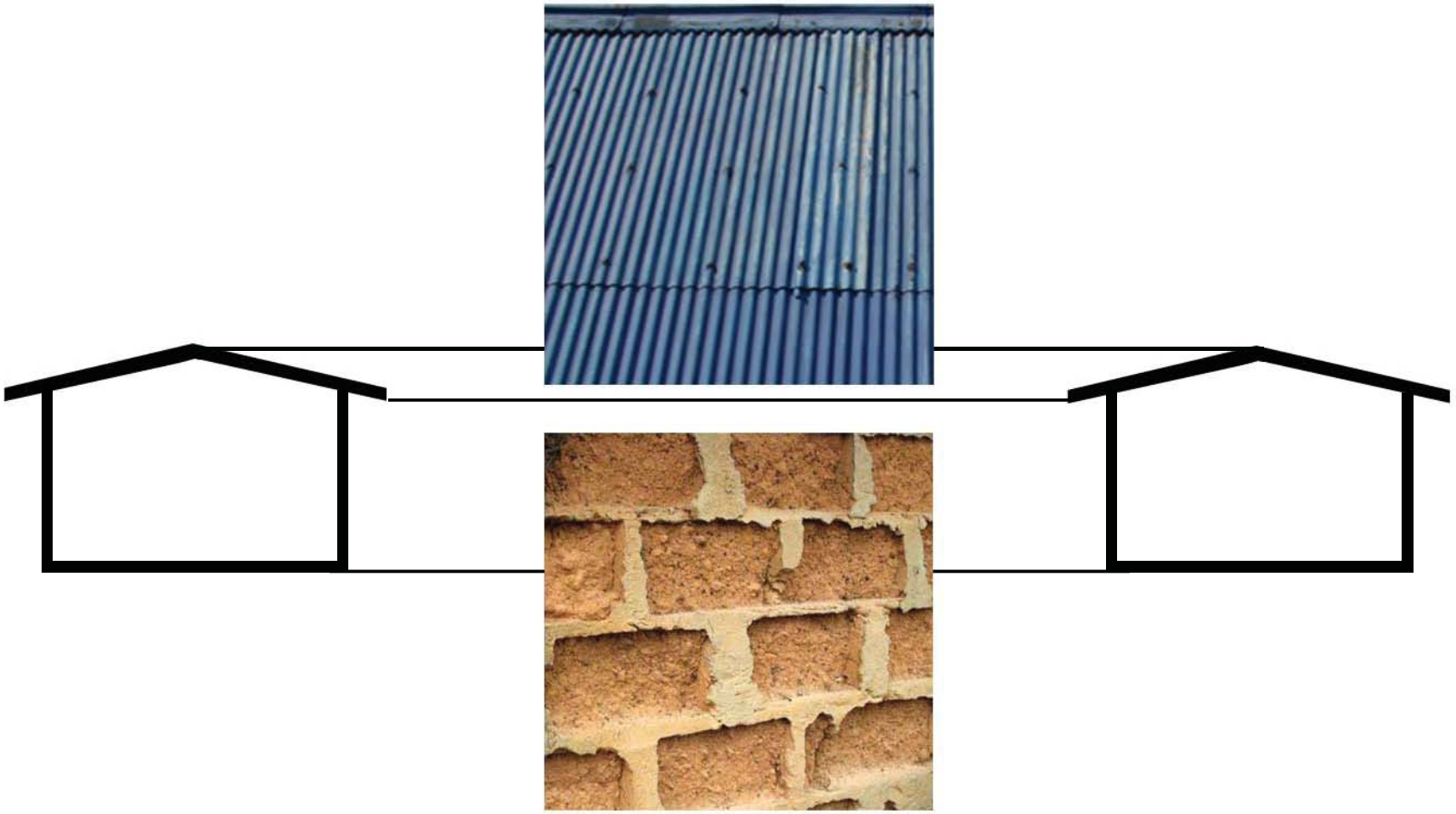
Analysis compound - courtyard



Analysis compound - extensions



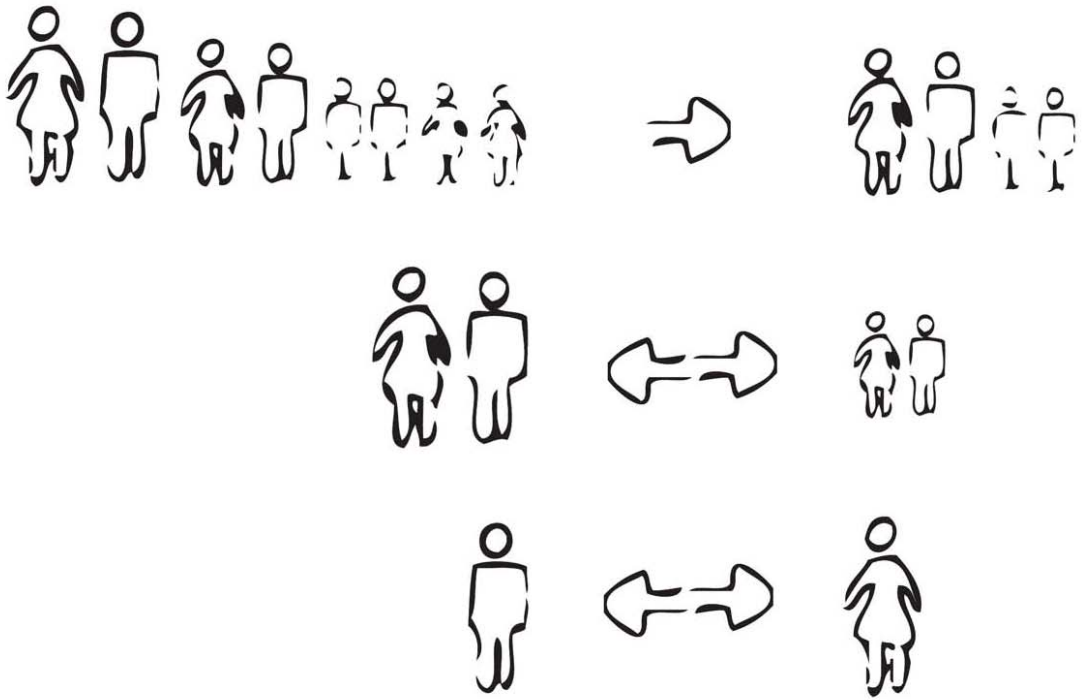
Analysis compound - materials

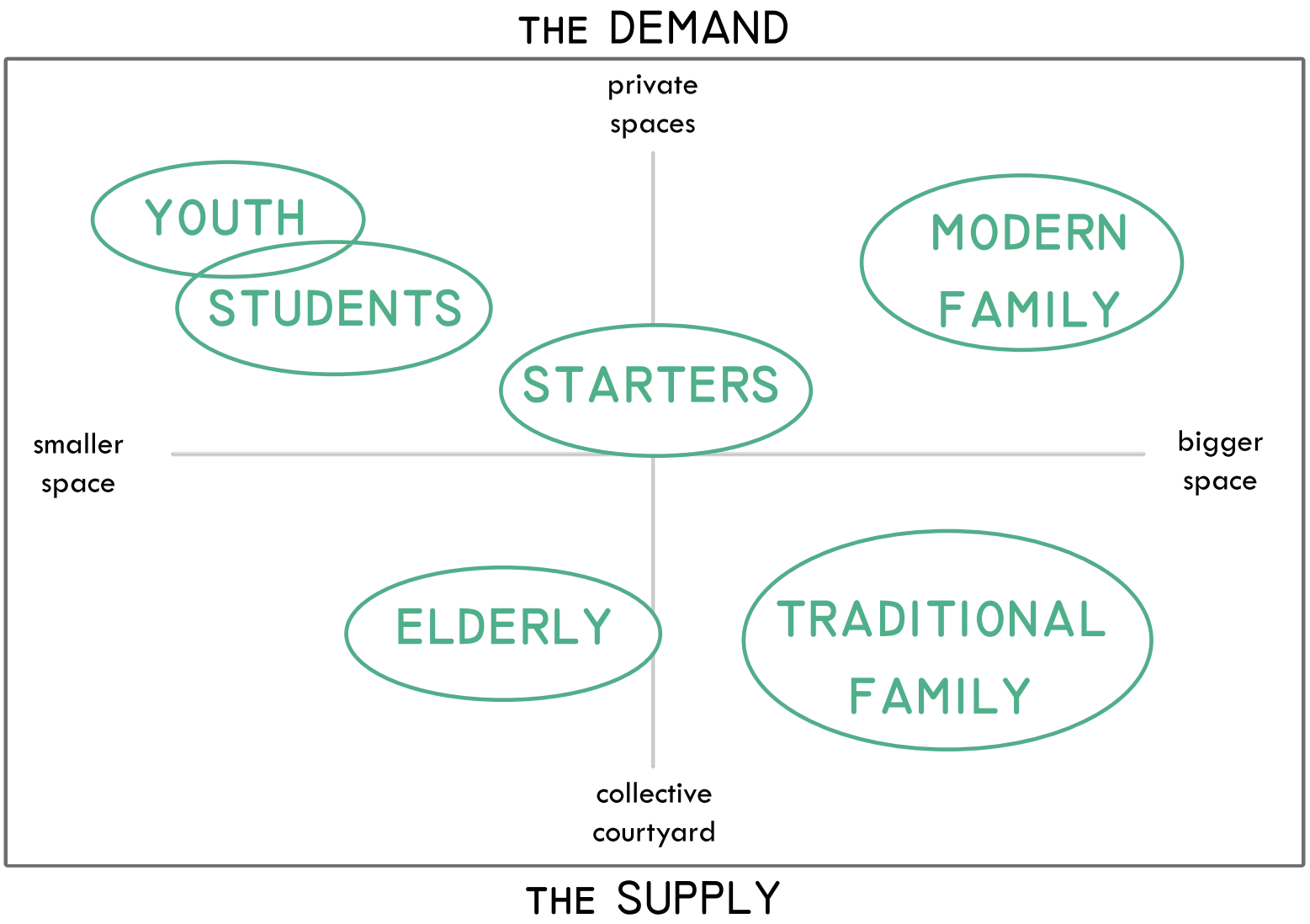


Basic needs

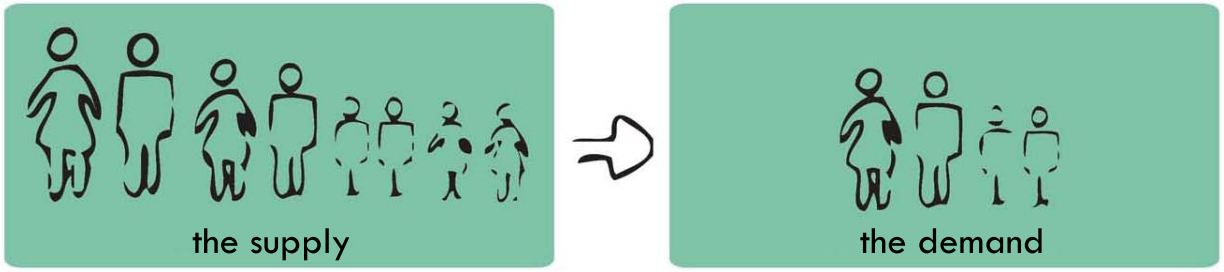
Division of space

Sustainability




THE DEMAND
private
spaces
YOUTH
STUDENTS
MODERN
FAMILY
STARTERS
smaller
space
bigger
space
ELDERLY
TRADITIONAL
FAMILY
collective
courtyard
THE SUPPLY

From supply to demand



all dwellings

no dwellings

Basic needs

Division of space

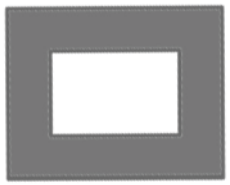
Sustainability

Flexible/Adjustable

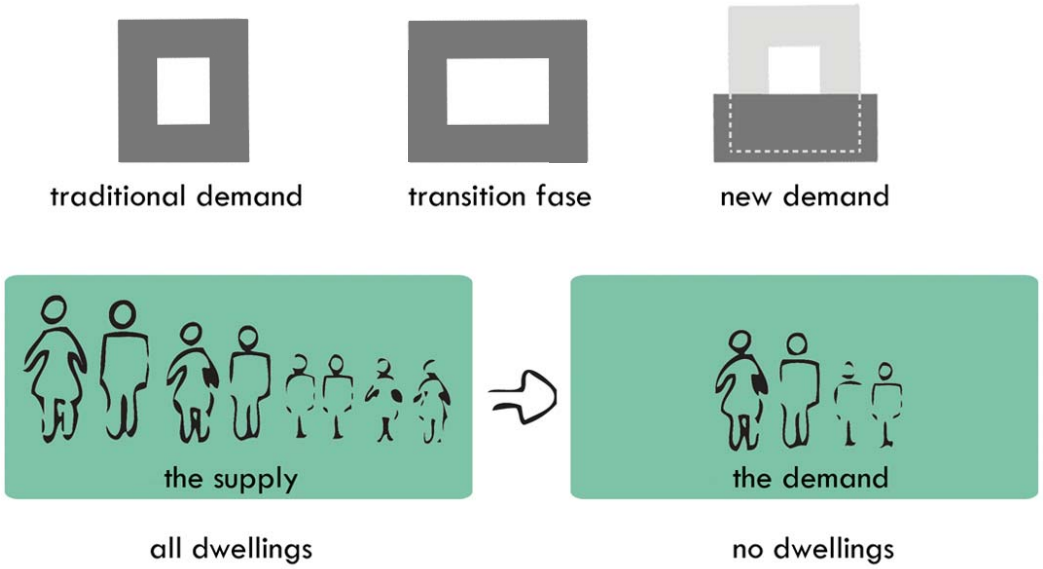
Three compound types

A. New compound

B. New extended compound



C. Existing compound with plug in layer


traditional demand
transition fase
new demand
the supply
the demand
all dwellings
no dwellings

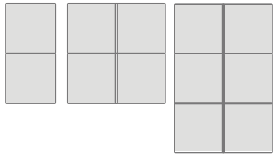
Concept structure

basic
rectangular form
courtyard
6m width

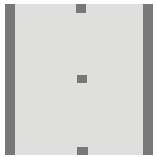
shell
1.5 m width
2m height

2 ‘closed’ sides

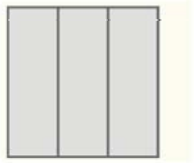
2 ‘open’ sides



house of
2, 4 or 6 units



load bearing elements

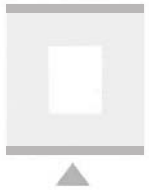


organized with frames

The basic

basic
rectangular form
courtyard
6m width

shell
1.5 m width
2m height



2 ‘closed’ sides

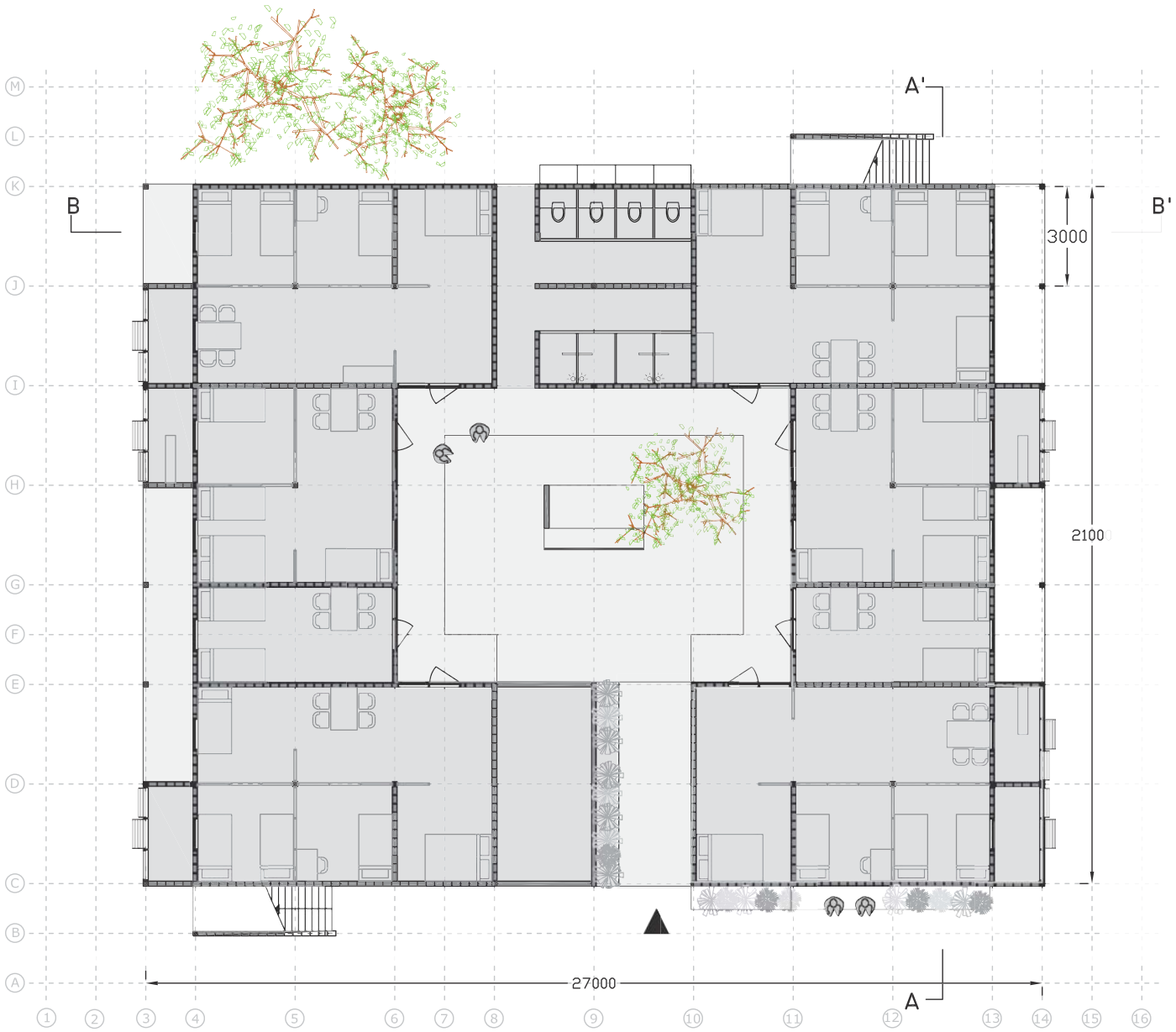
2 ‘open’ sides

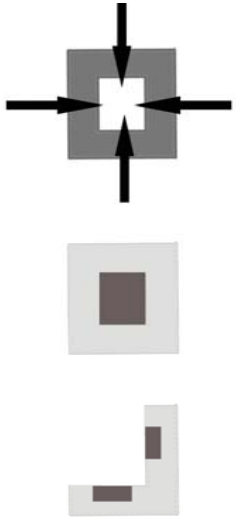
house of
2, 4 or 6 units

load bearing elements

organized with frames

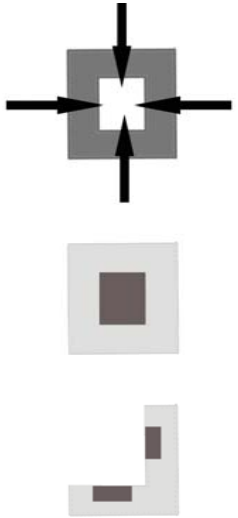
Type A


A'
B
B'
3000
2100
27000
A
M
L
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

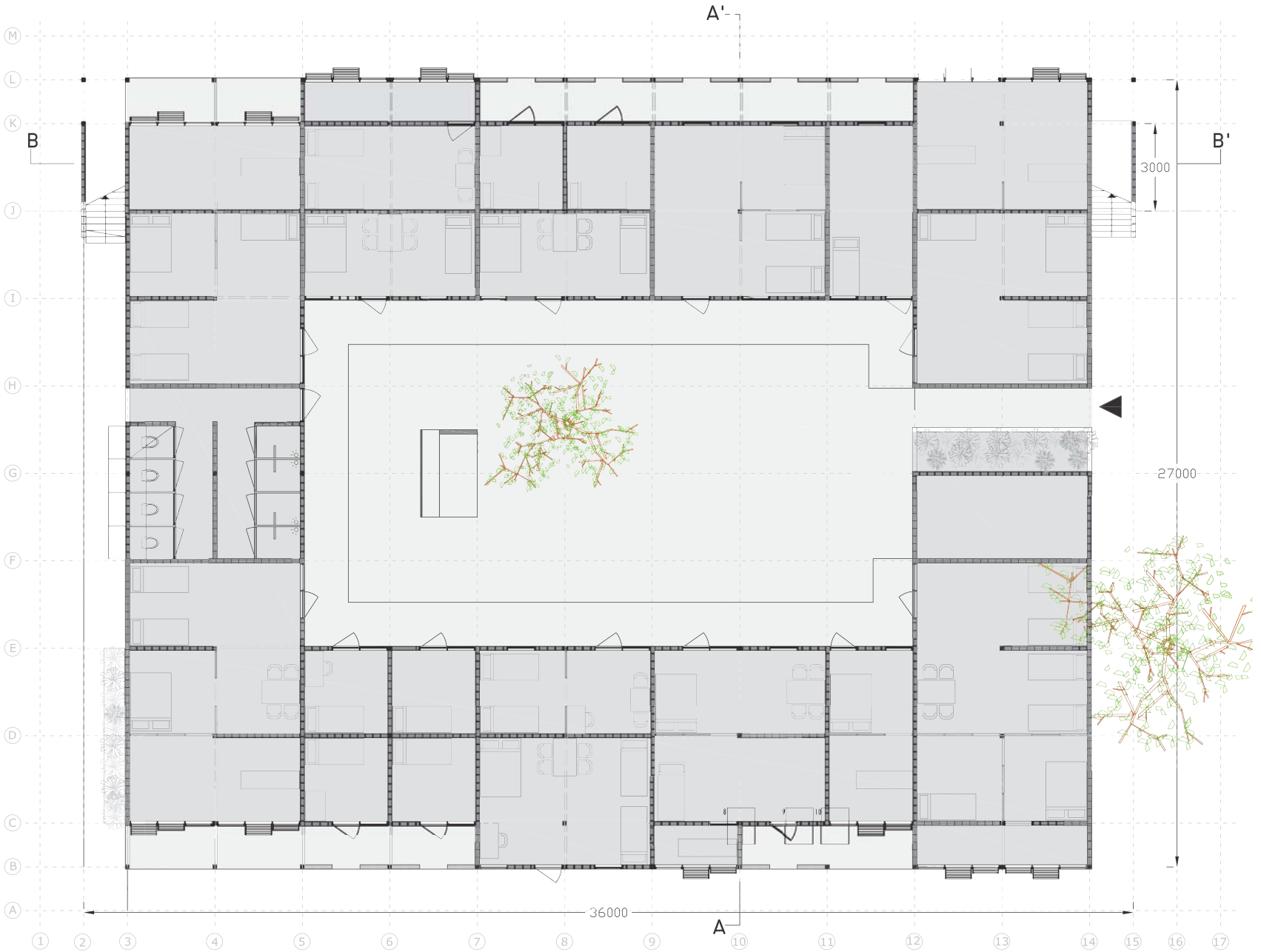


Type A

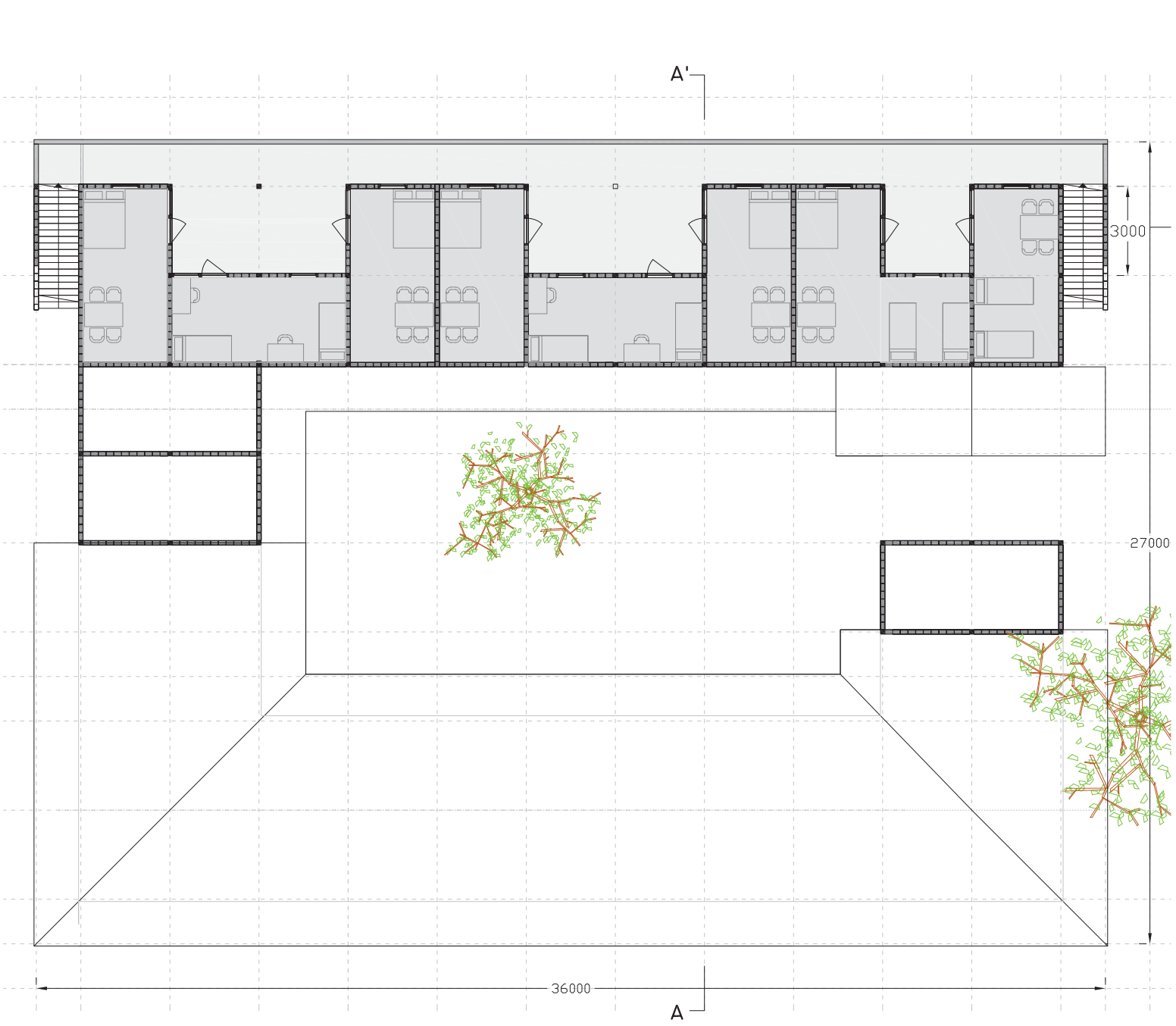

A'
B
B'
3000
21000
27000
A
M
L
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16



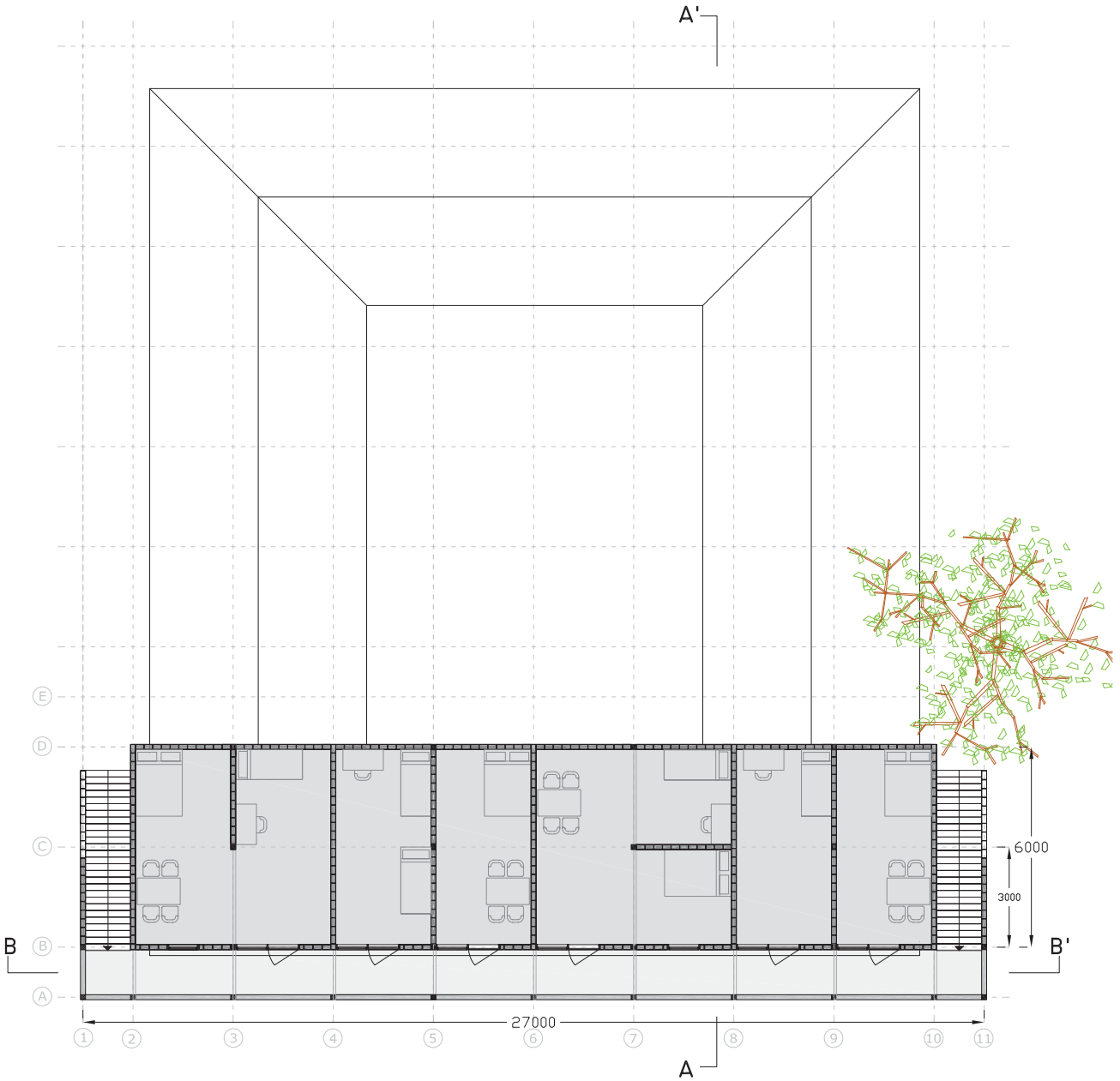
Type B


A'
B
B'
A
3000
27000
36000
M
L
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

Type B



Type C

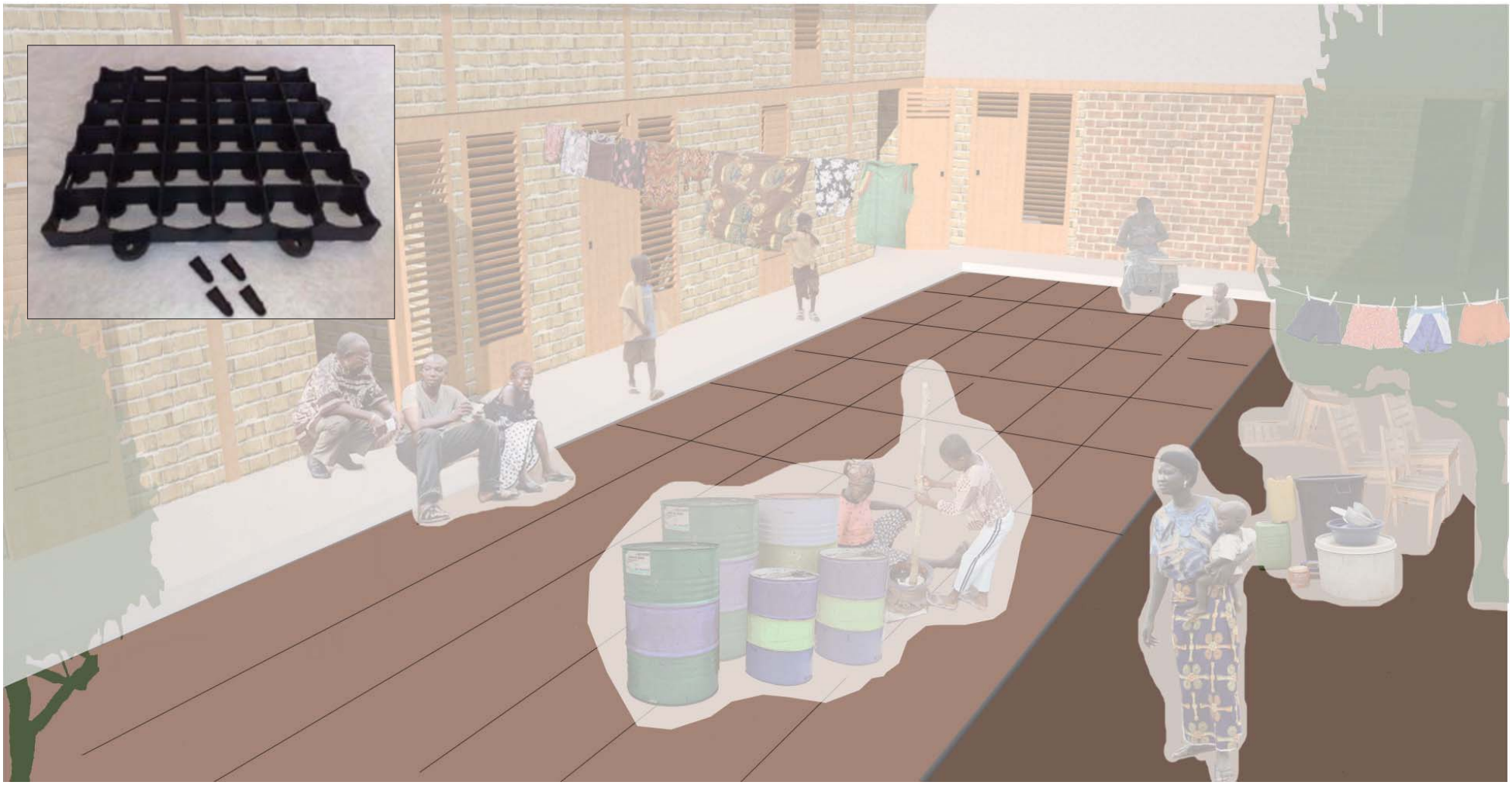


The courtyard

The courtyard

The courtyard

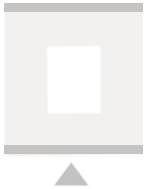
The courtyard



Shell

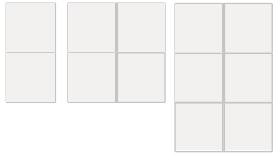
basic
rectangular form
courtyard
6m width

shell
1.5m width
2m height



2 ‘closed’ sides

2 ‘open’ sides

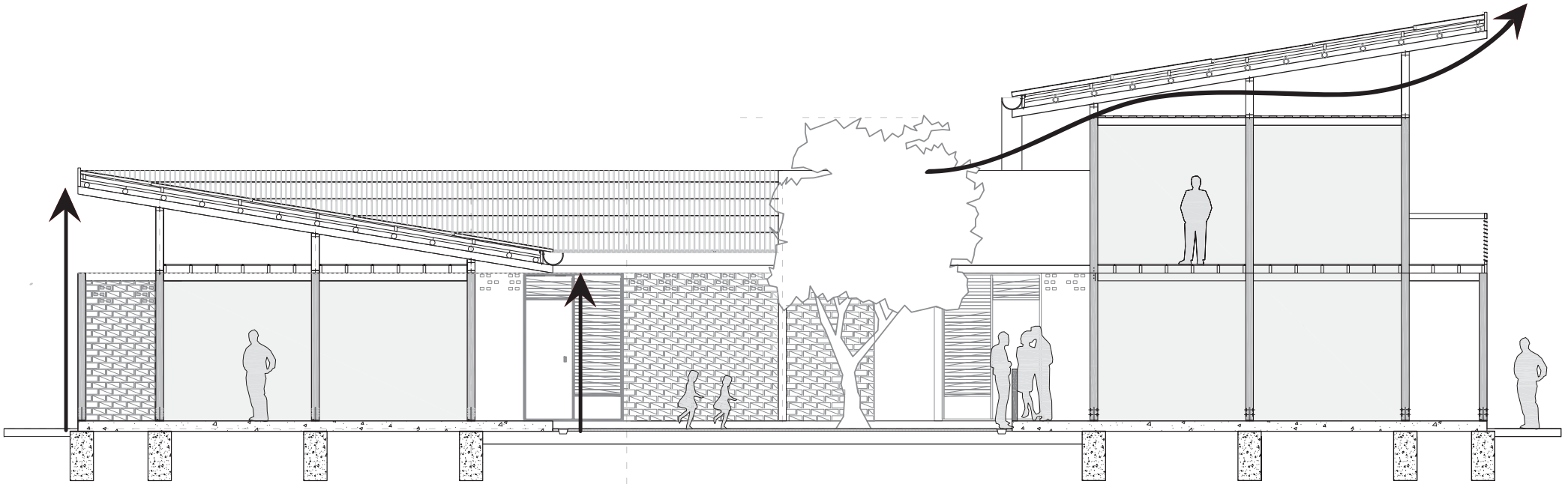


house of
2, 4 or 6 units

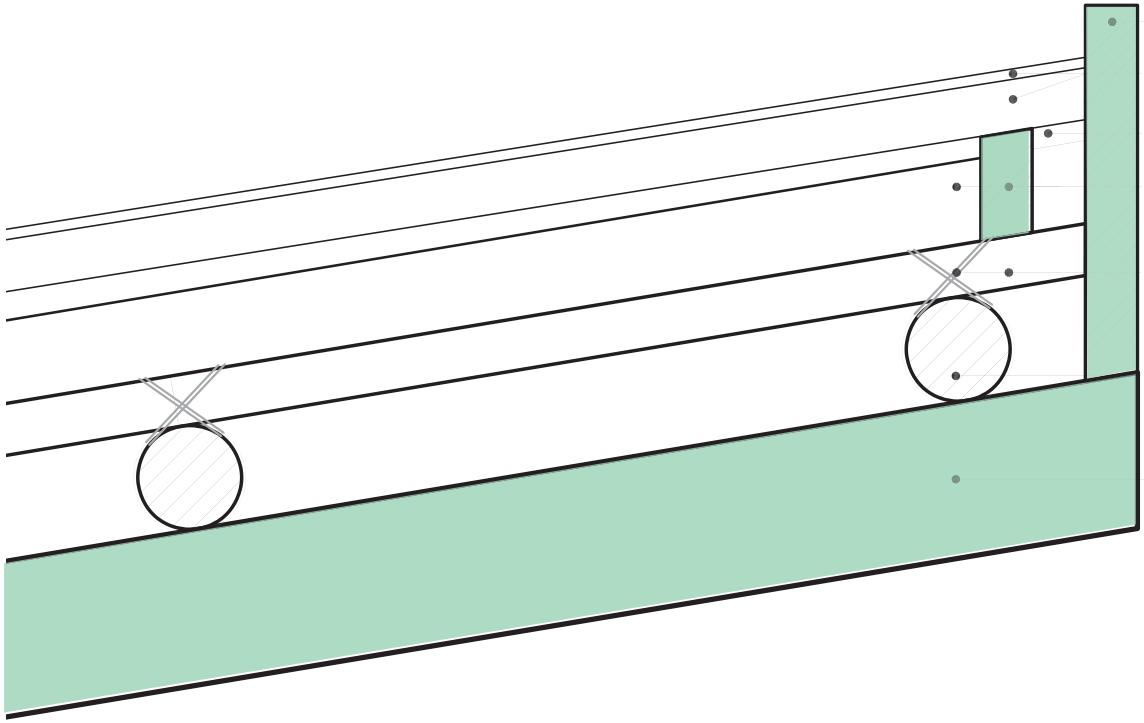
load bearing elements

organized with frames

Open roof and natural ventilation

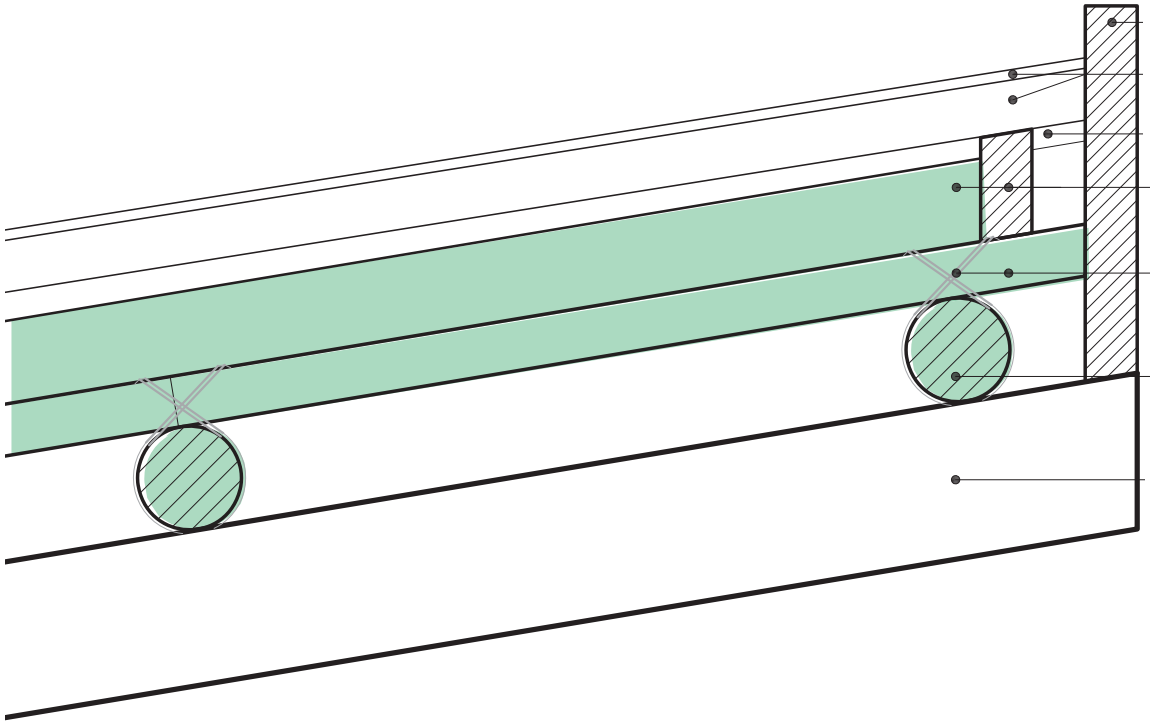


Roof construction

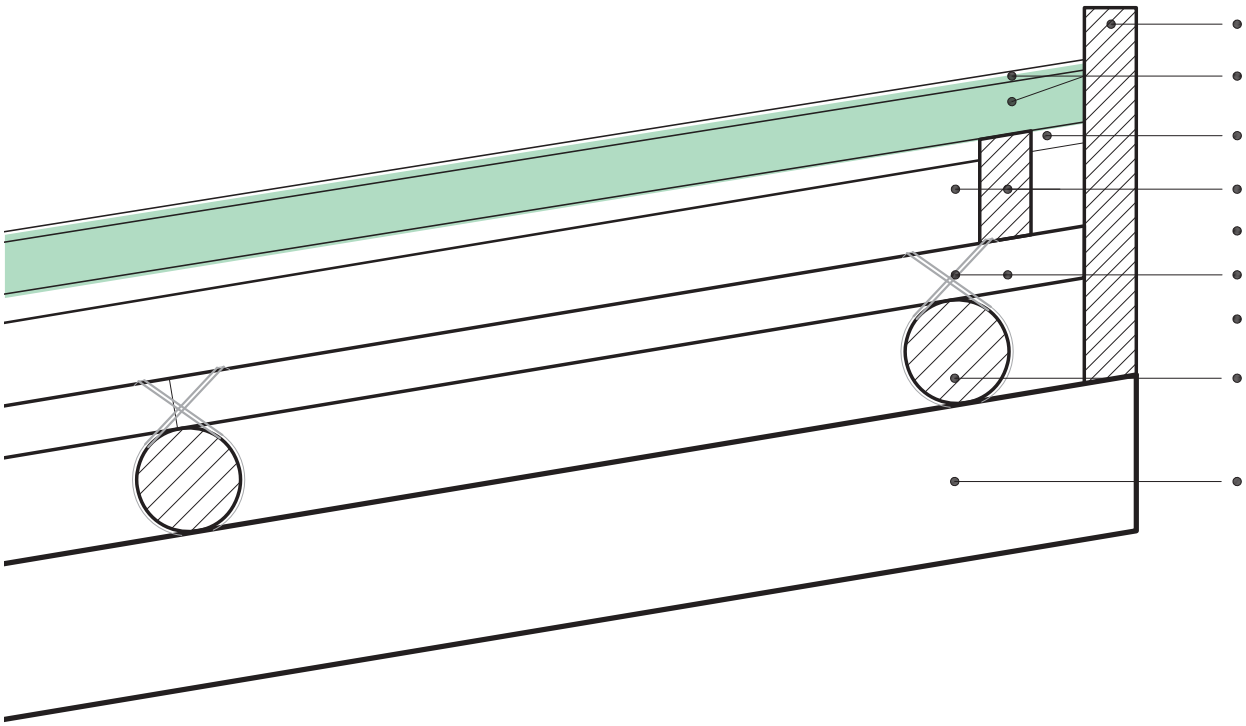


- timber slat
- timber partition 100x50mm
- timber rafter 150mm

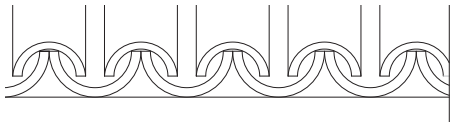
Roof construction

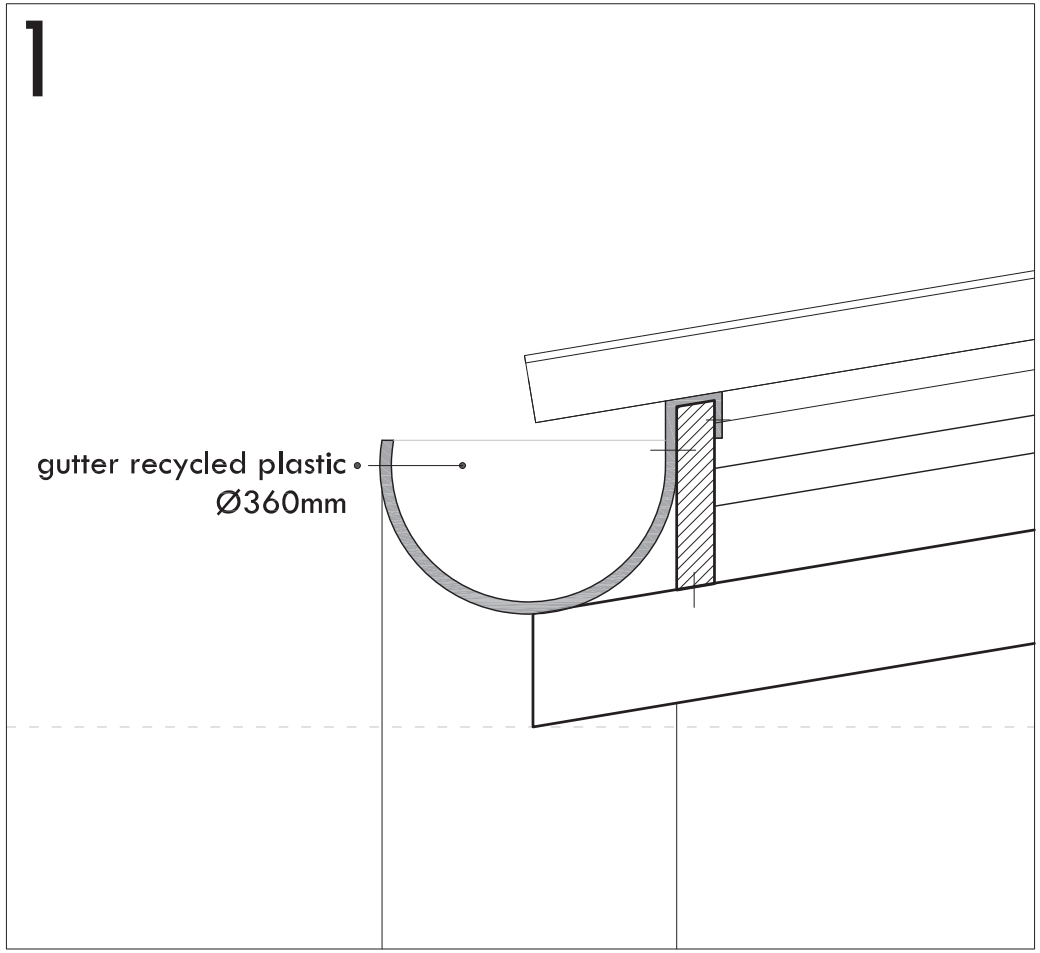


- thatch 80mm
- transverse tree trunk Ø50m
- rope
- tree trunk Ø100mm

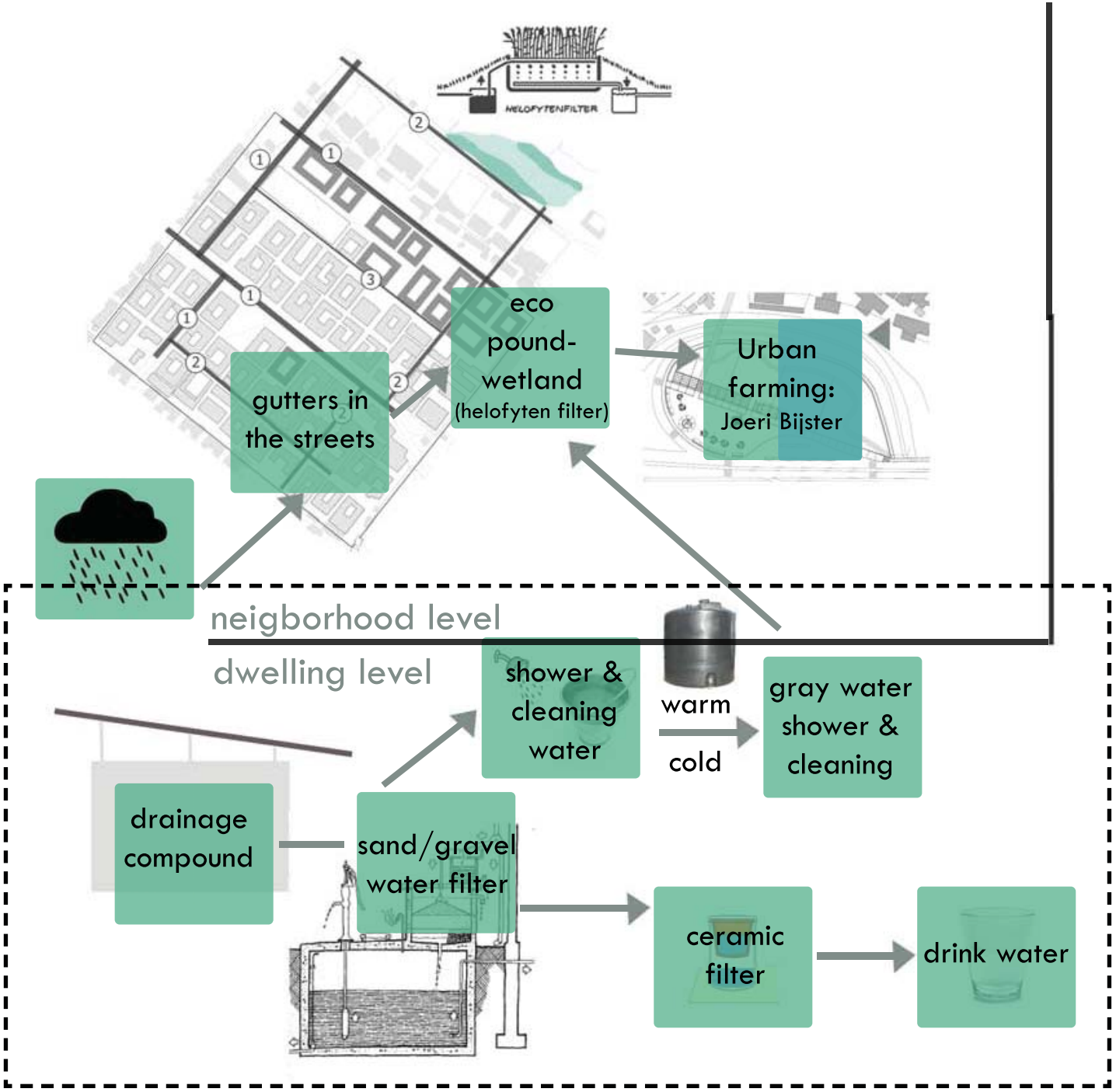


- timber slat
- halved bamboo trunk 50mm
- cavity 20mm
- thatch 80mm
- timber partition 100x50mm
- transverse tree trunk Ø50m
- rope
- tree trunk Ø100mm
- timber rafter 150mm

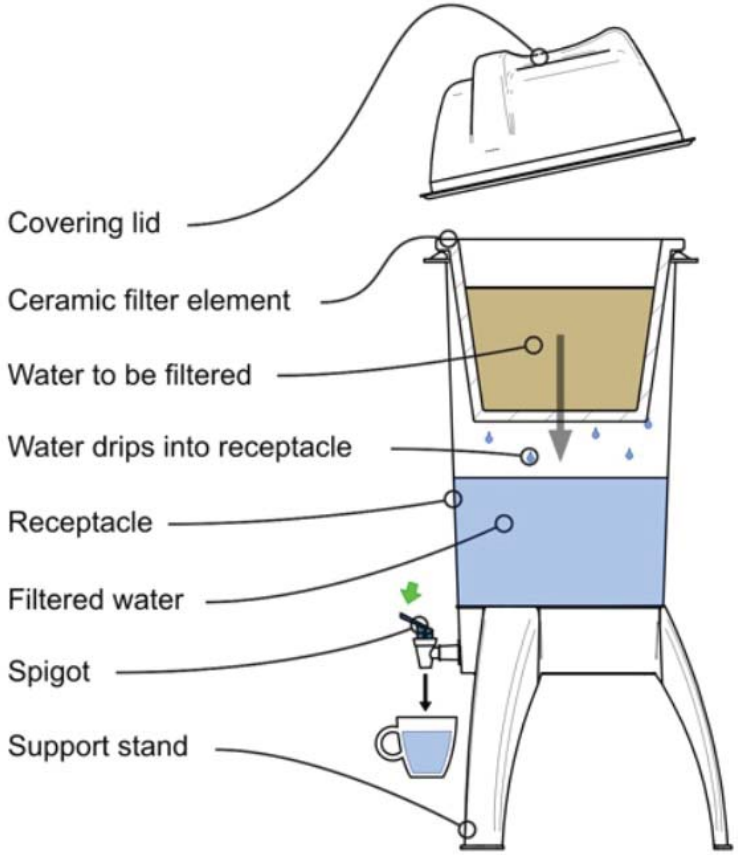



1
gutter recycled plastic
Ø360mm

Water loop


HELOFYTENFILTER
gutters in the streets
eco pound-wetland (helofyten filter)
Urban farming: Joeri Bijster
neigborhood level
dwelling level
shower & cleaning water
warm
cold
gray water shower & cleaning
drainage compound
sand/gravel water filter
ceramic filter
drink water

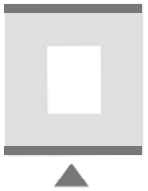
Ceramic filter - drinkwater



Closed sides

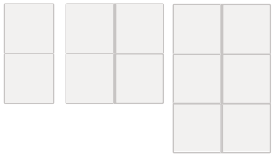
basic
rectangular form
courtyard
6m width

shell
1.5 m width
2m height



2 ‘closed’ sides

2 ‘open’ sides



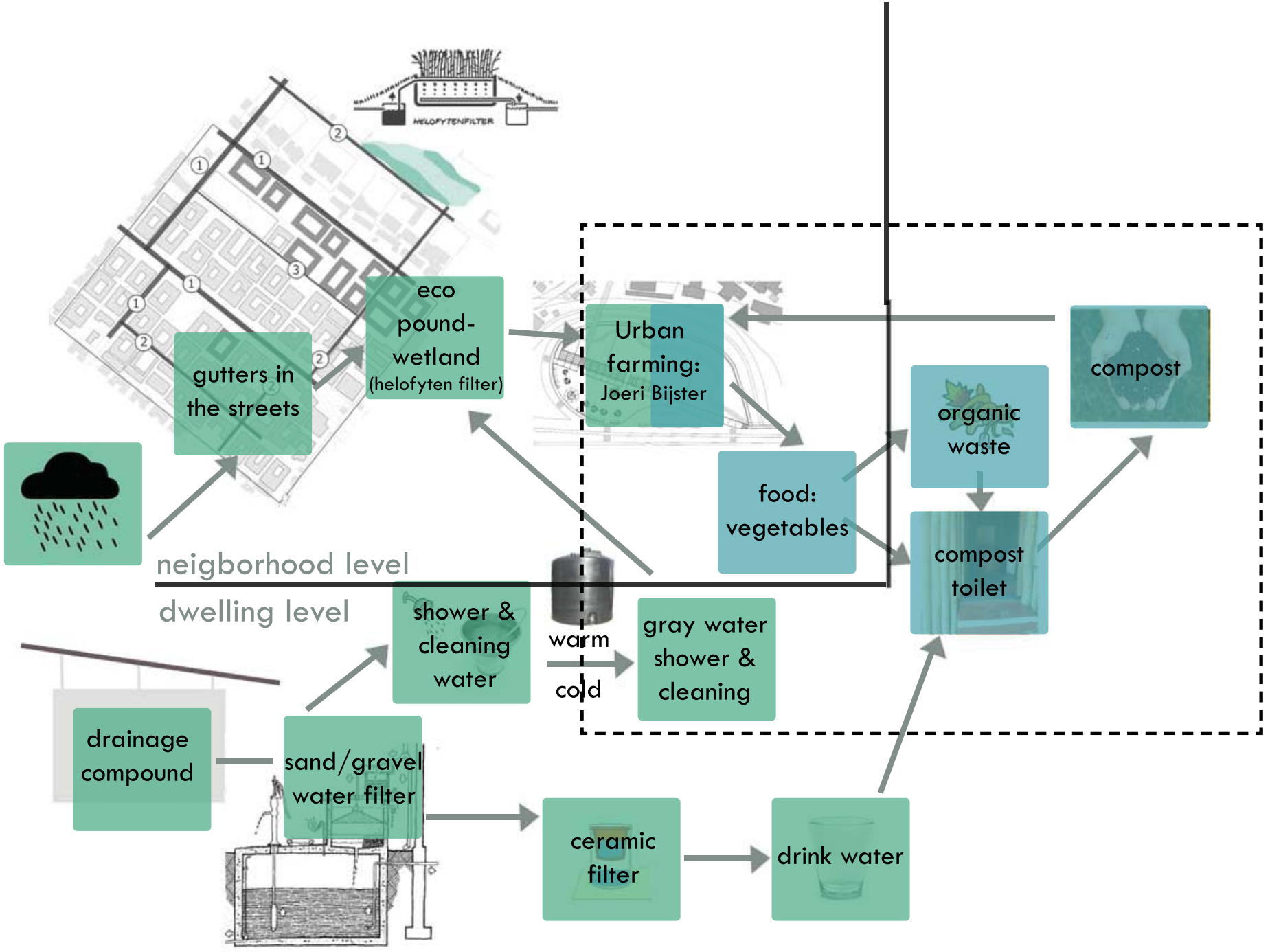
house of
2, 4 or 6 units

load bearing elements

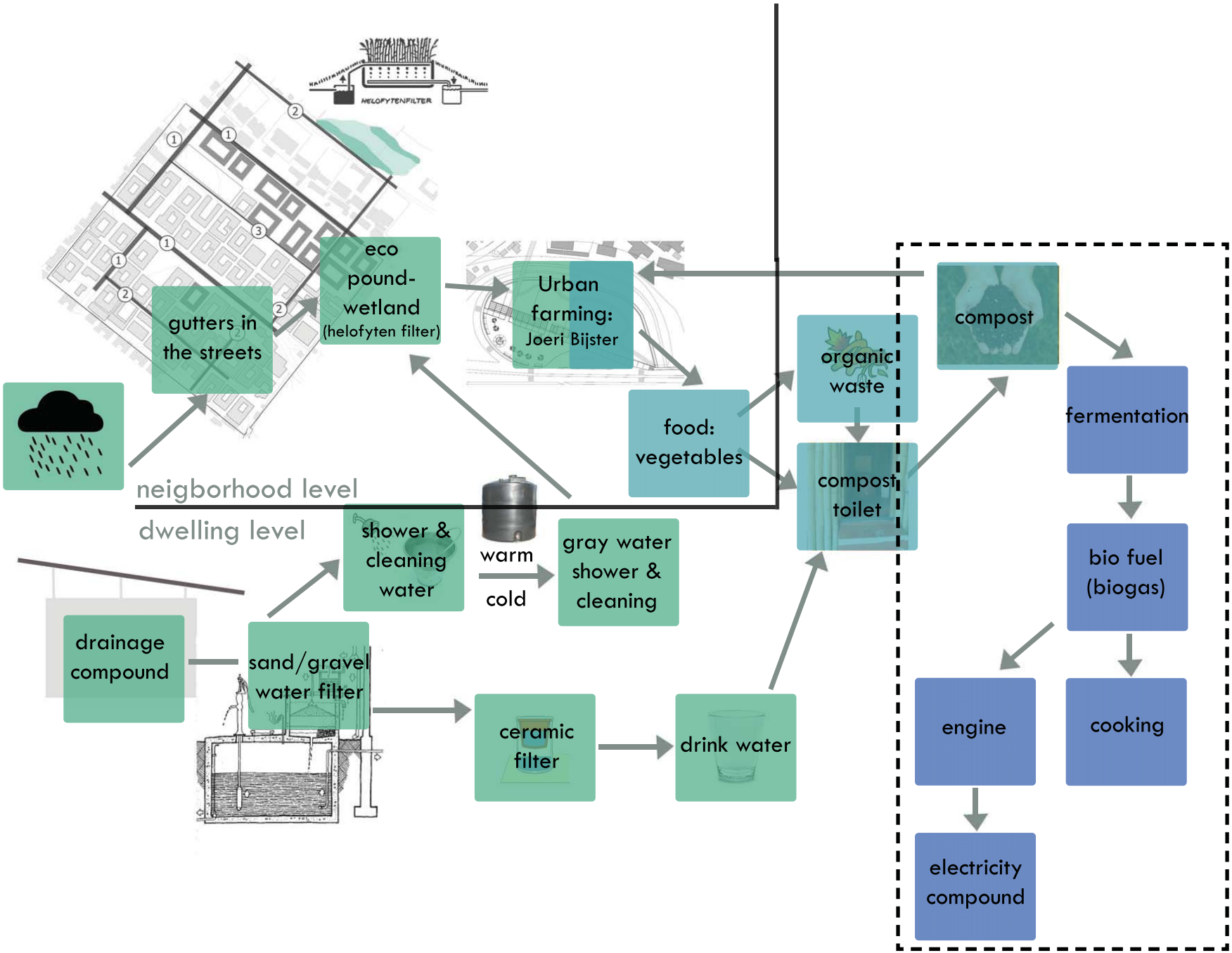
organized with frames

Closed sides

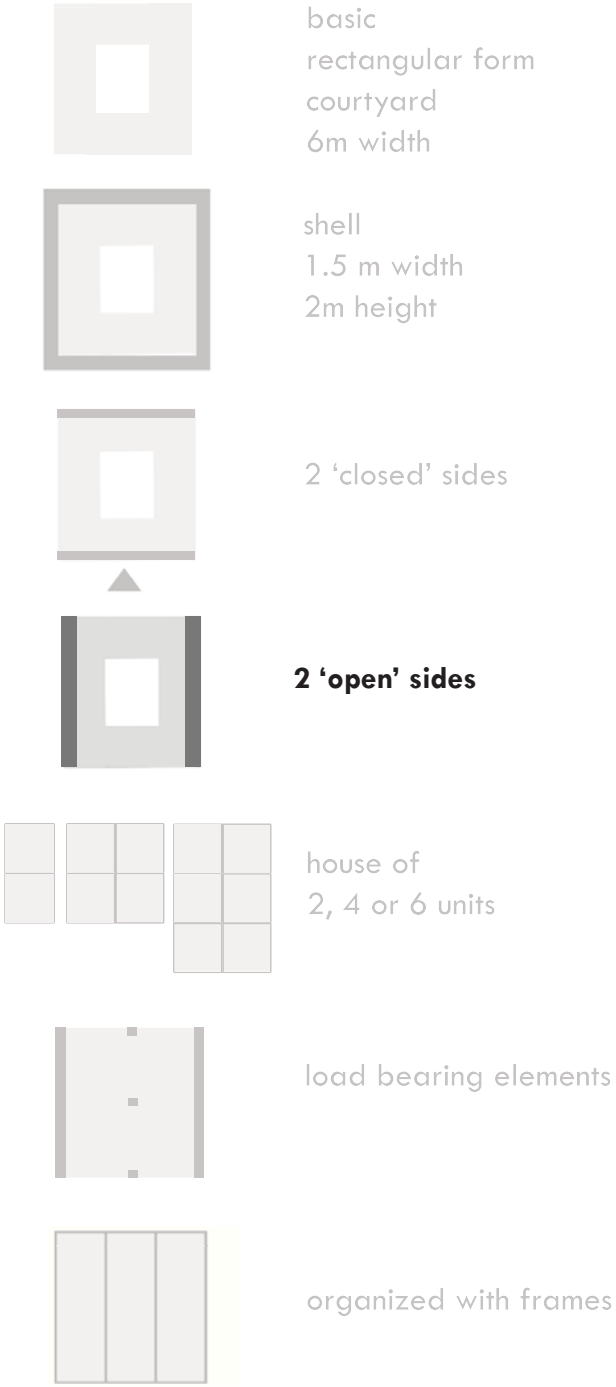
Organic waste loop



Energy loop


HELOFYTENFILTER
eco pound-wetland (helofyten filter)
gutters in the streets
Urban farming: Joeri Bijster
food: vegetables
organic waste
compost
compost toilet
fermentation
bio fuel (biogas)
engine
cooking
electricity compound
neigborhood level
dwelling level
shower & cleaning water
warm
cold
gray water shower & cleaning
drainage compound
sand/gravel water filter
ceramic filter
drink water

2 open sides



basic
rectangular form
courtyard
6m width

shell
1.5 m width
2m height

2 ‘closed’ sides

2 ‘open’ sides

house of
2, 4 or 6 units

load bearing elements

organized with frames

Open - extension side

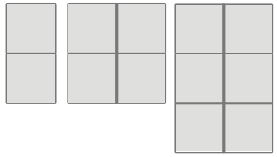
House of 2, 4 and 6 units

basic
rectangular form
courtyard
6m width

shell
1.5 m width
2m height

2 ‘closed’ sides

2 ‘open’ sides

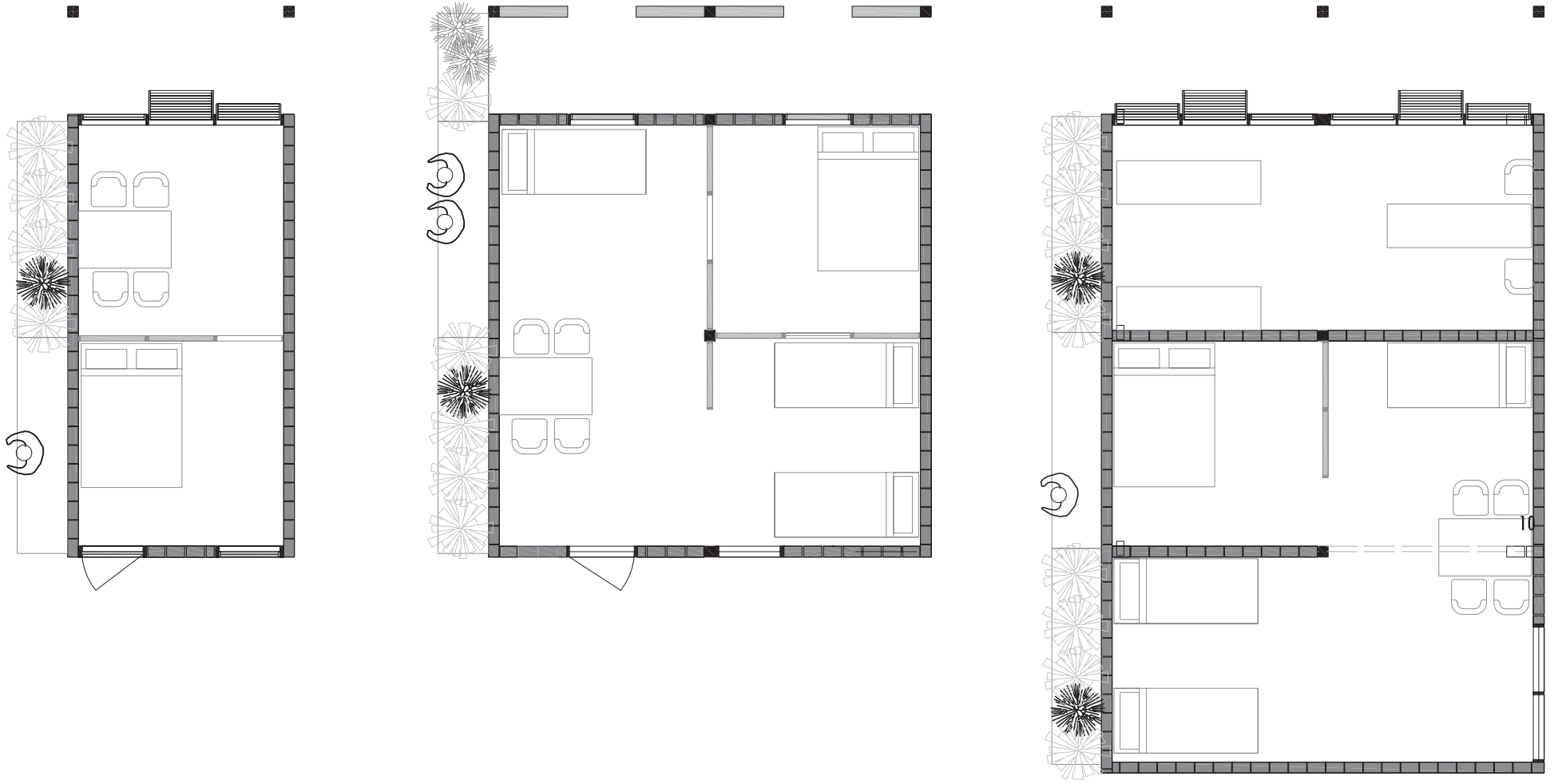


house of
2,4 or 6 units

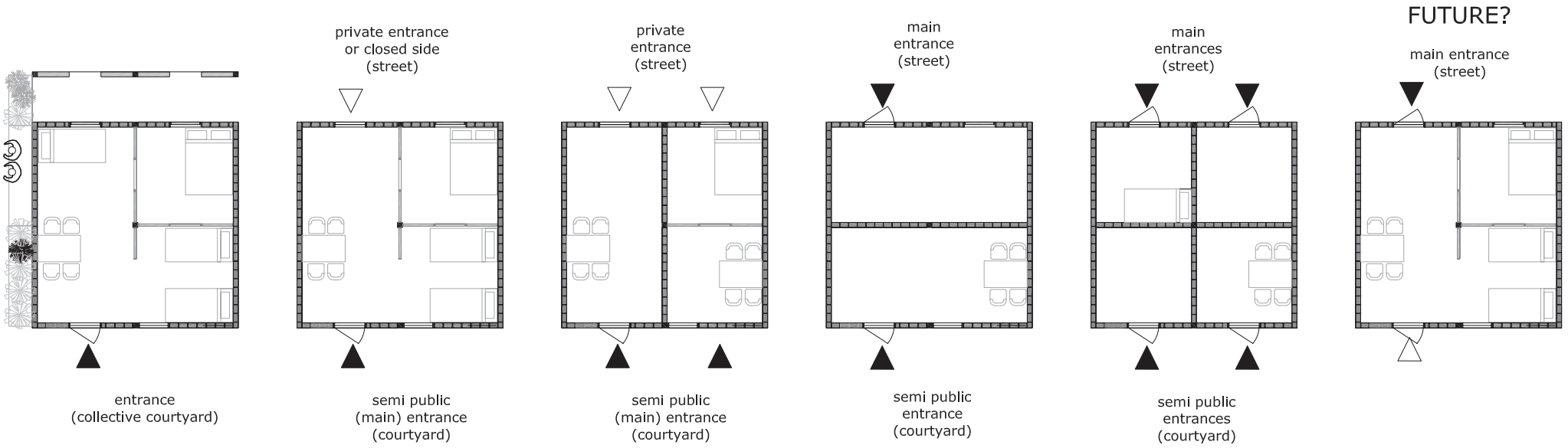
load bearing elements

organized with frames

House of 2, 4 and 6 units



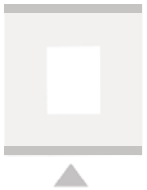
Possible development for the housing blocks



Load bearing elements

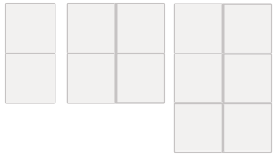
basic
rectangular form
courtyard
6m width

shell
1.5 m width
2m height

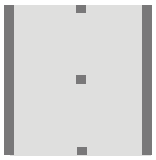


2 ‘closed’ sides

2 ‘open’ sides

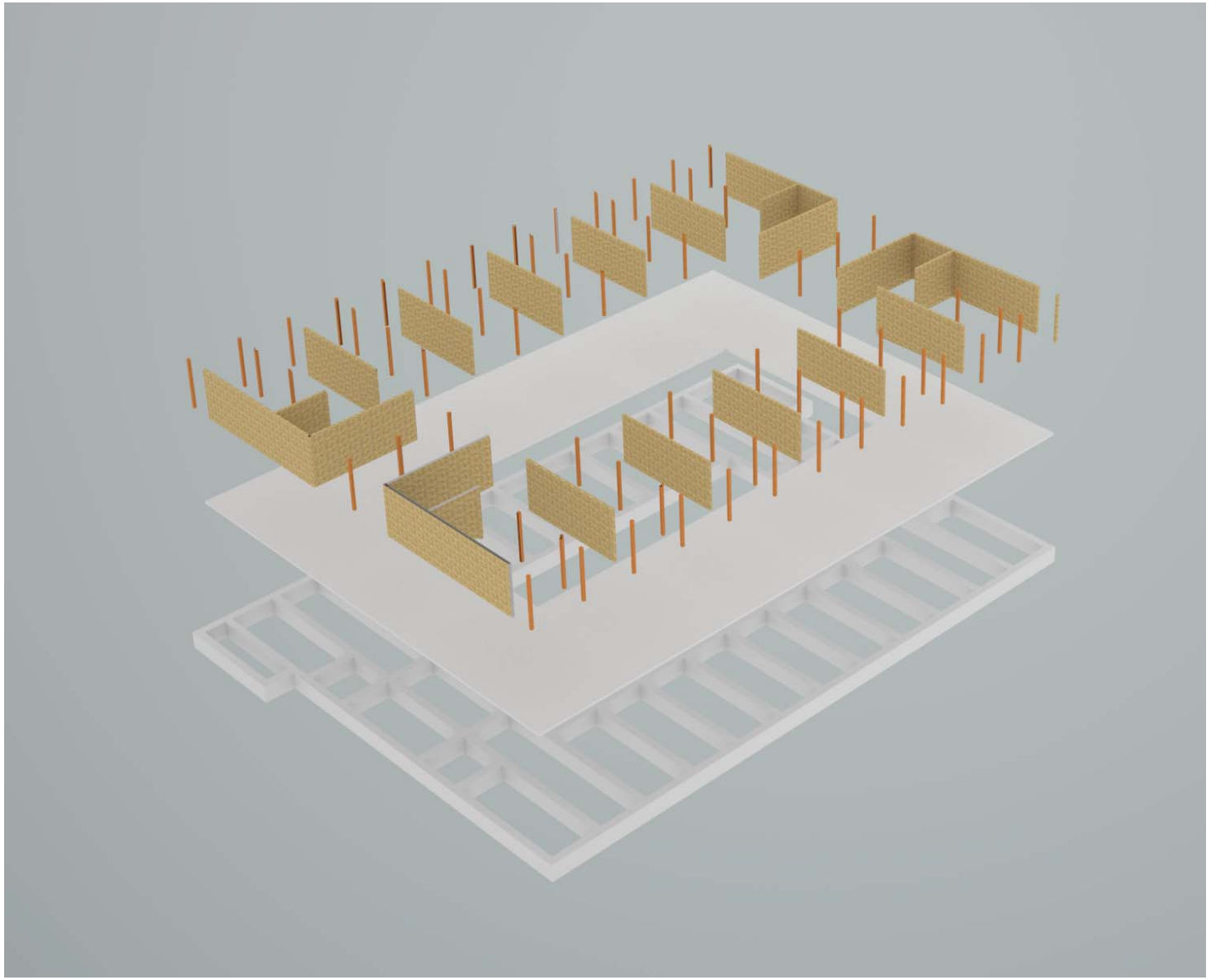


house of
2, 4 or 6 units

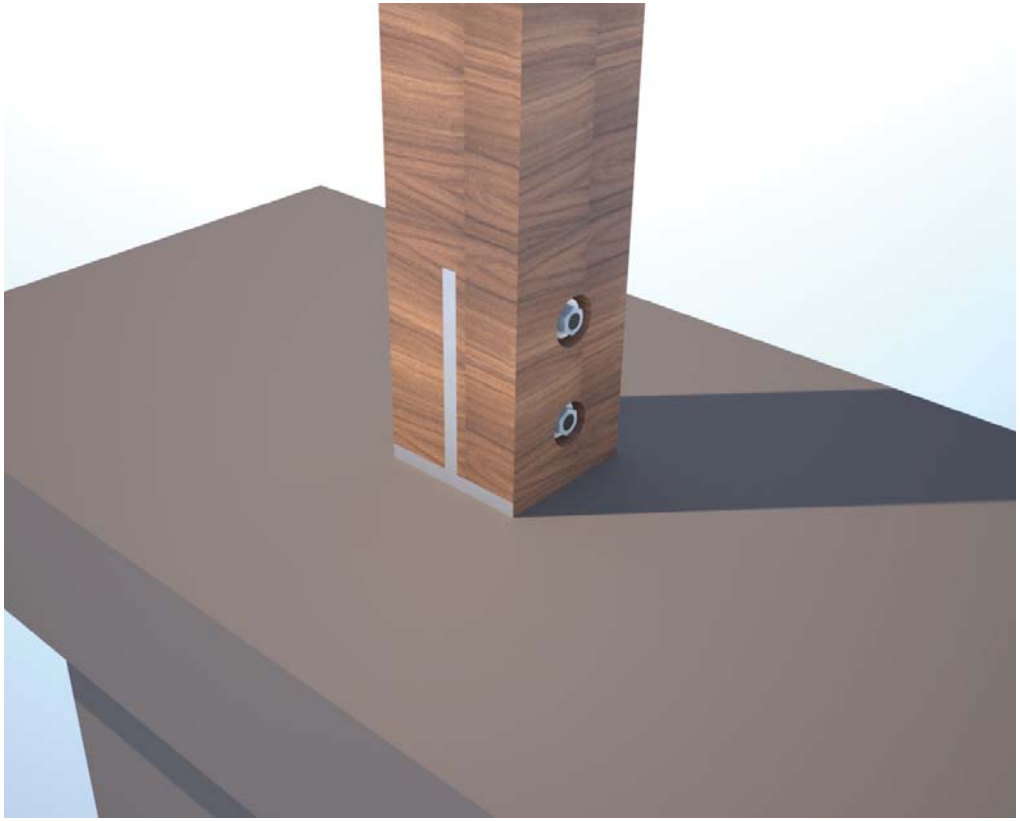


load bearing structure

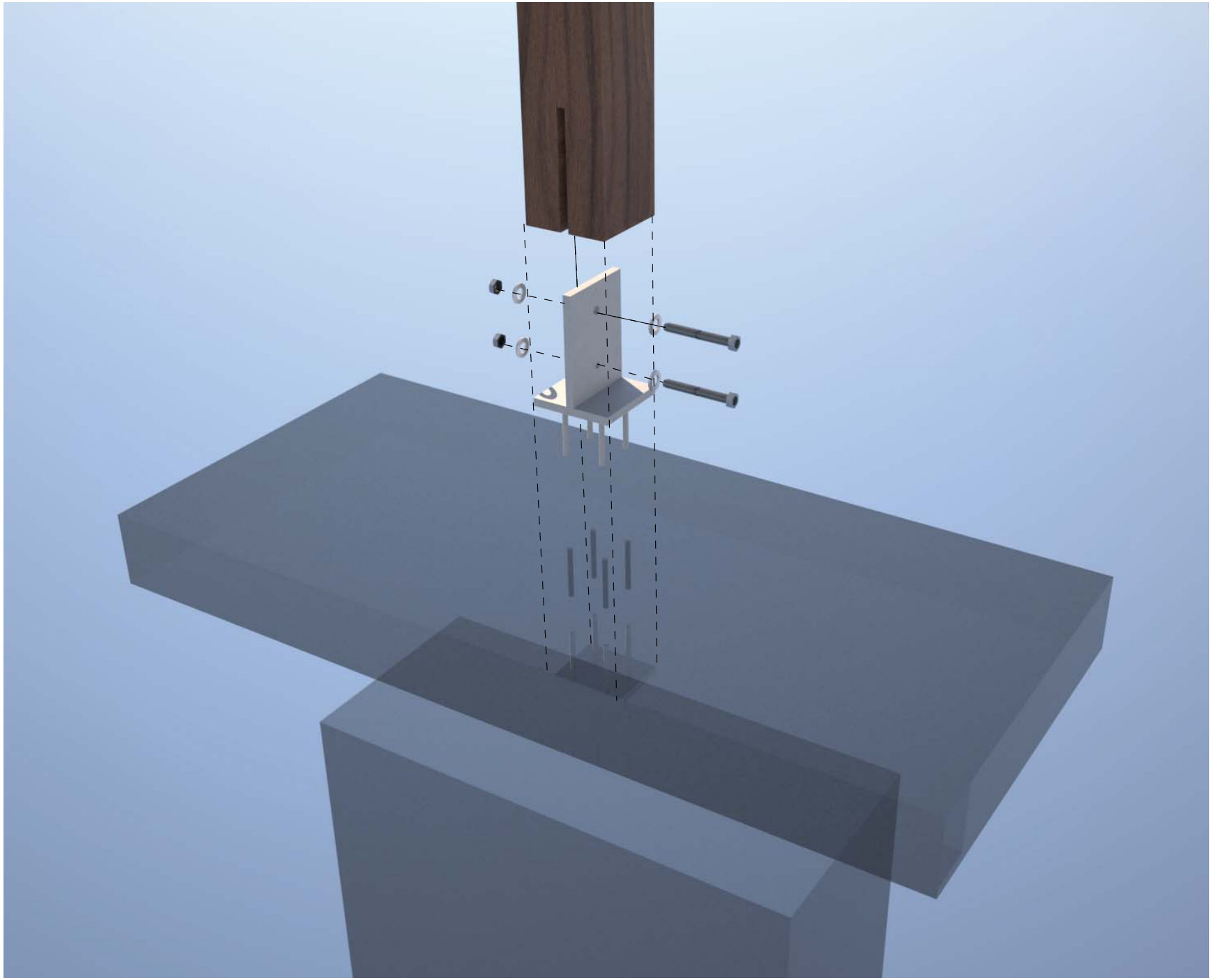
organized with frames

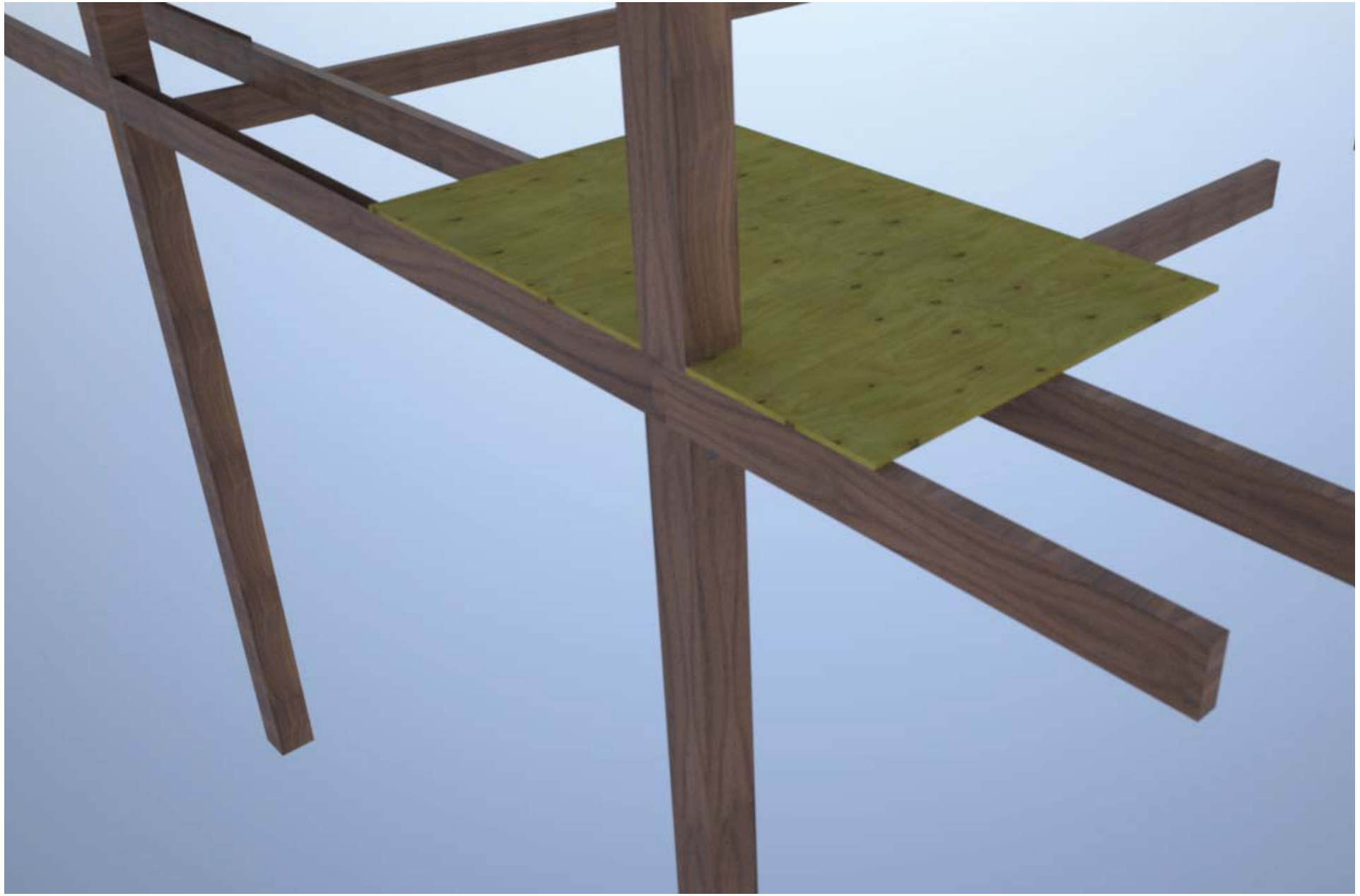


Column foundation

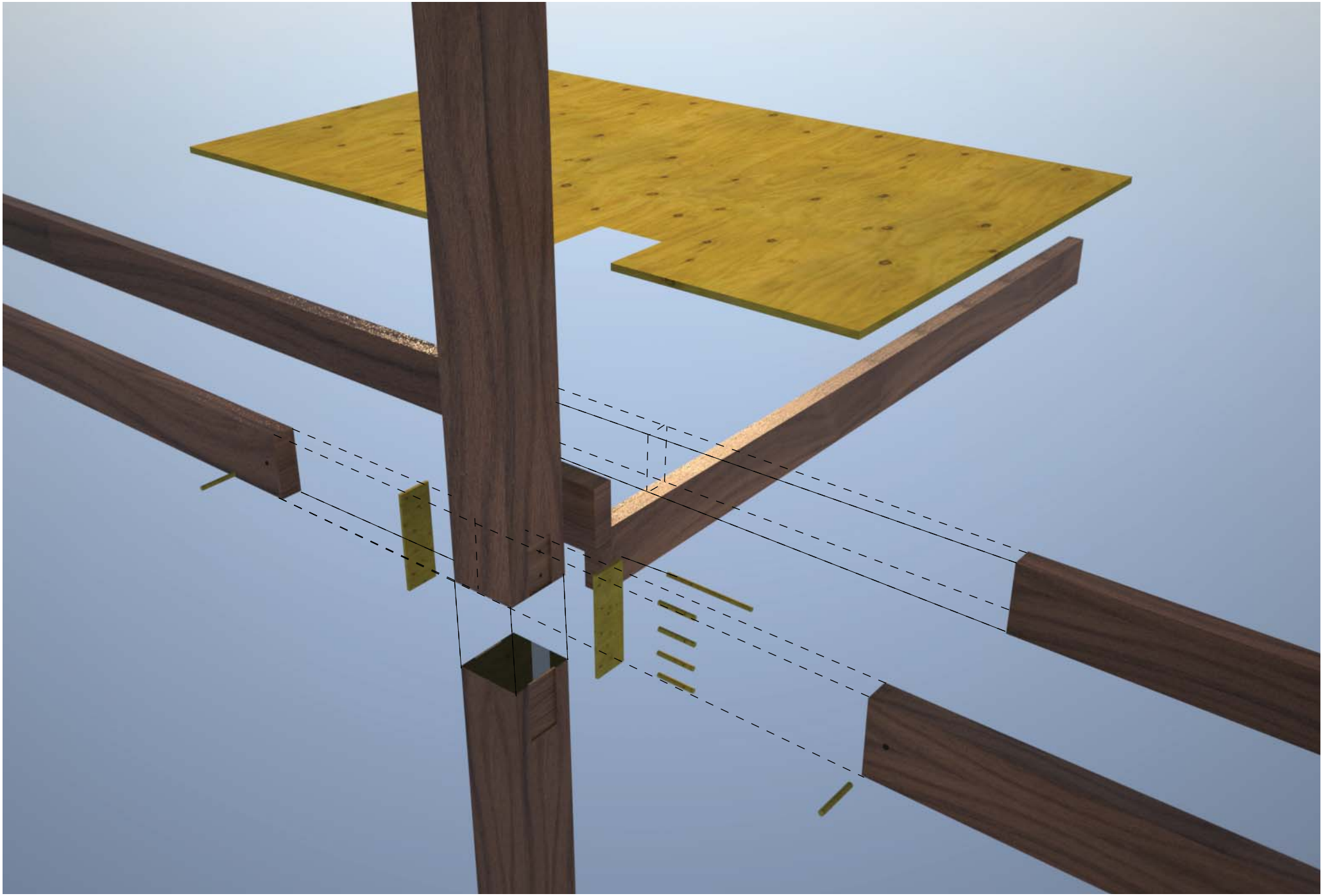


Exploded view foundation - column

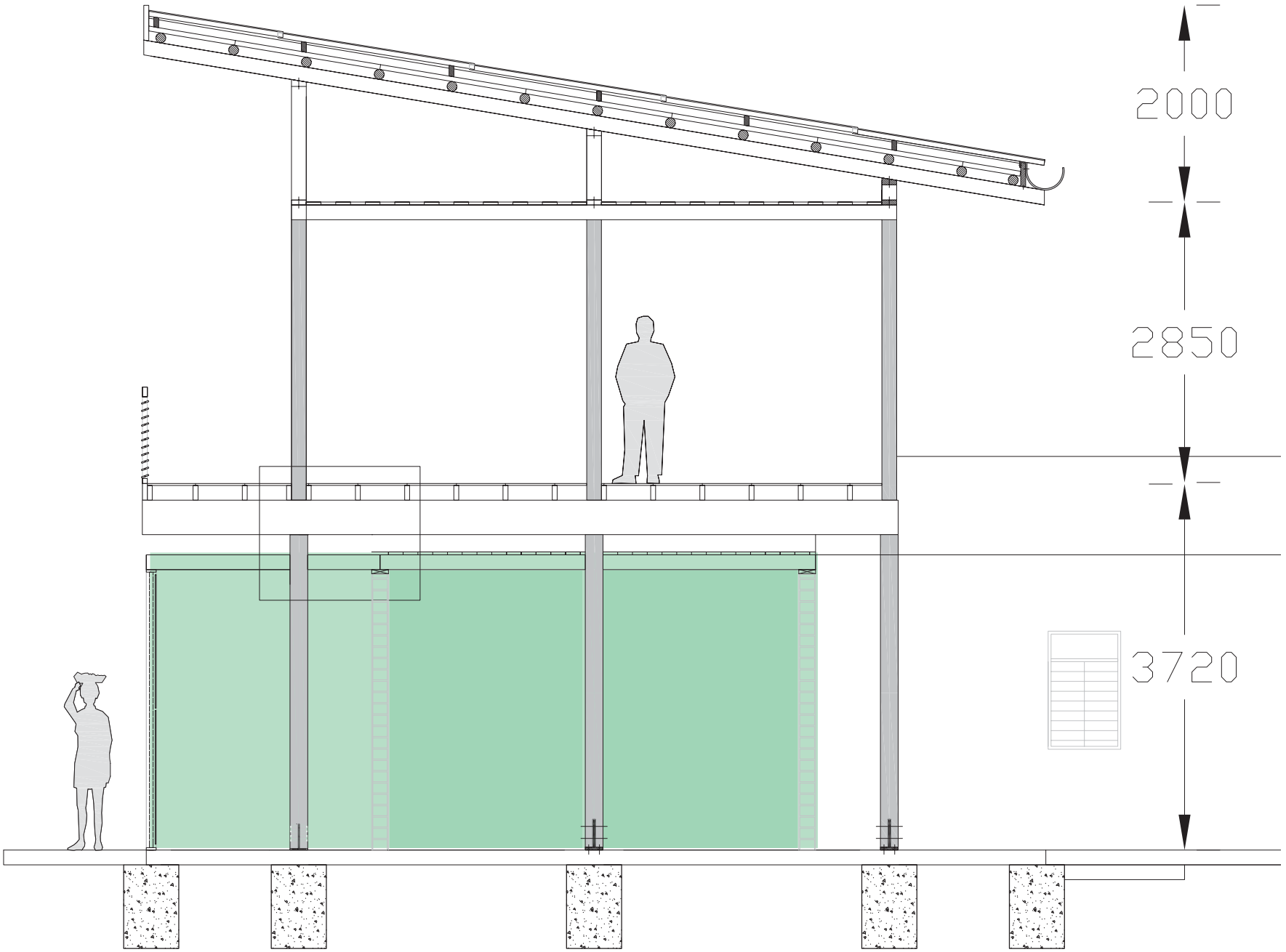




Exploded view columns - beams



Connection new old



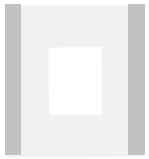
Connection new old

The frames

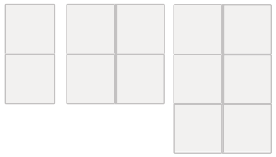
basic
rectangular form
courtyard
6m width

shell
1.5 m width
2m height

2 ‘closed’ sides

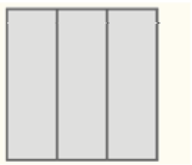


2 ‘open’ sides



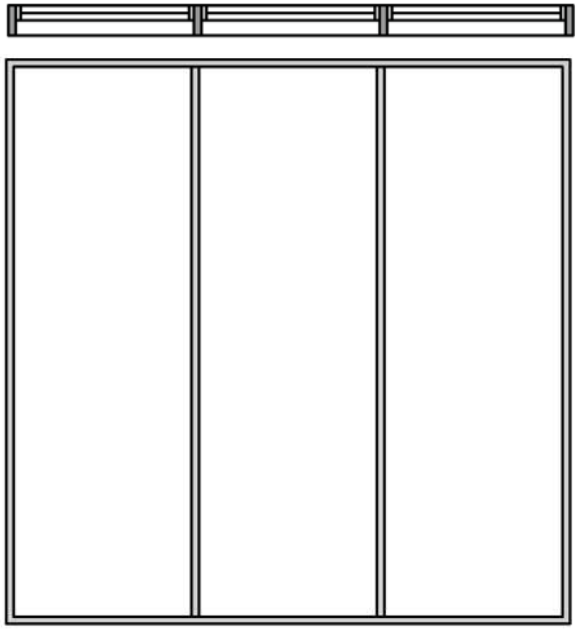
house of
2, 4 or 6 units

load bearing elements



organized with frames

Design frames - exterior



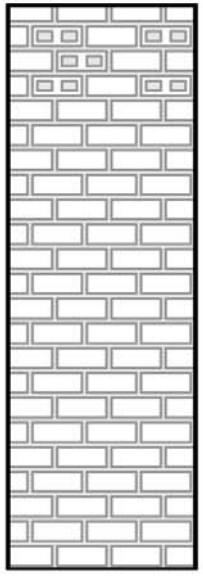
azobé

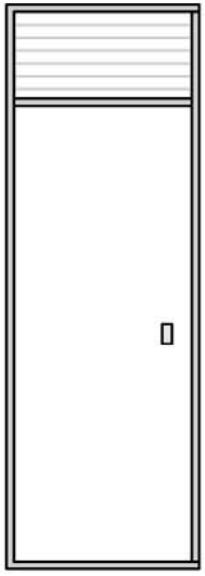
closed

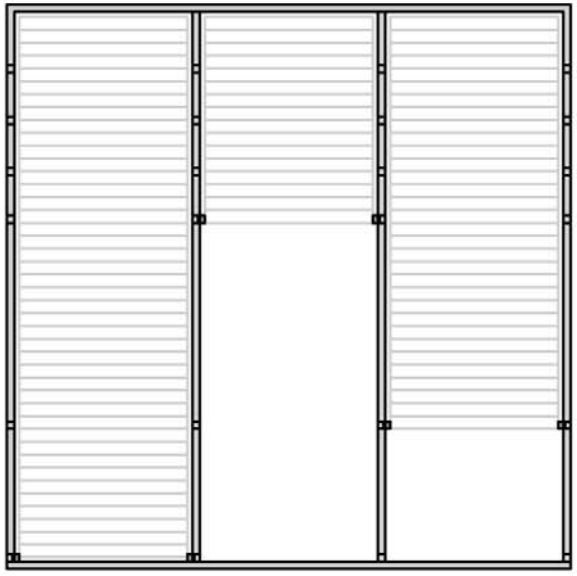
window

door

shop awning

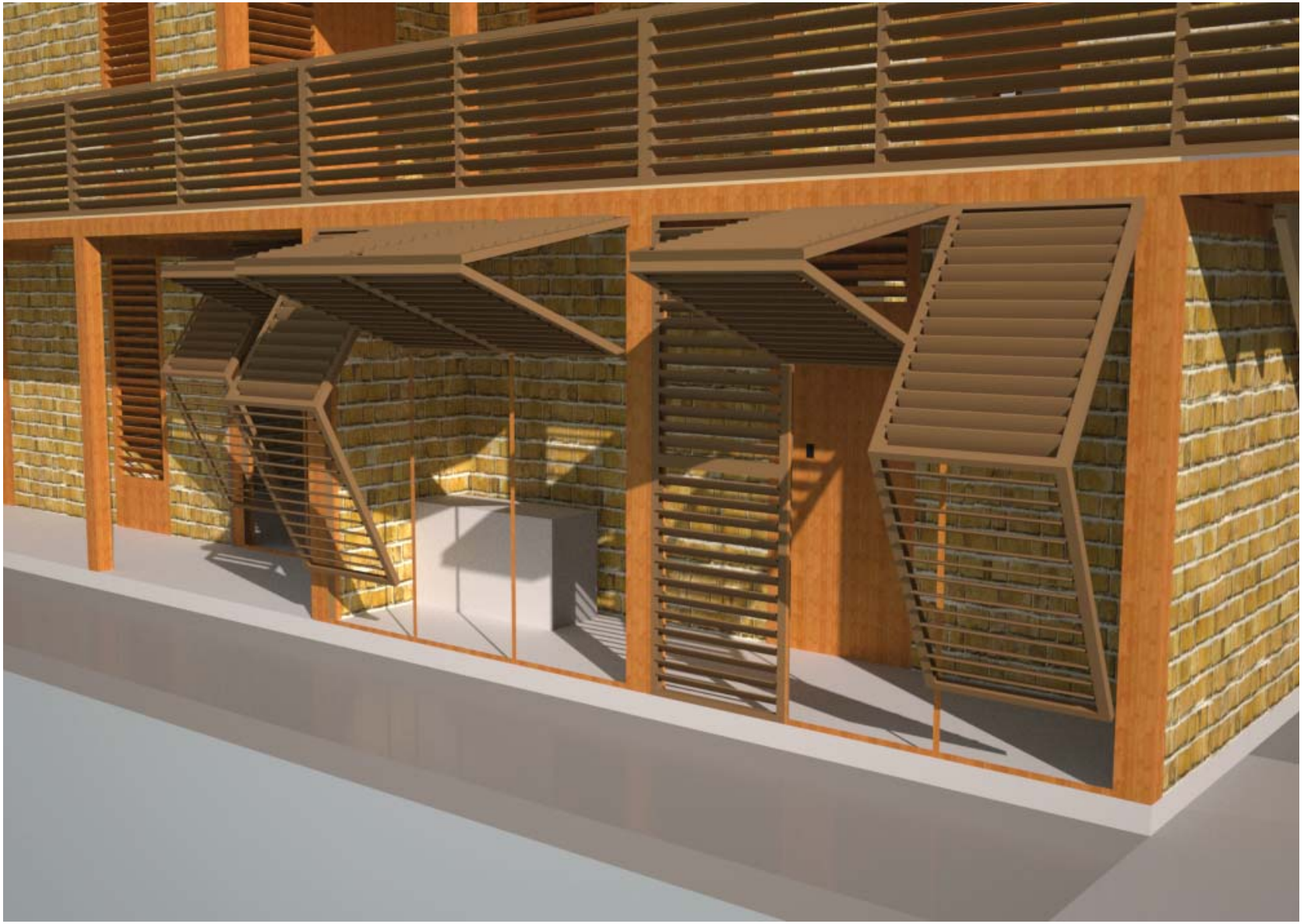




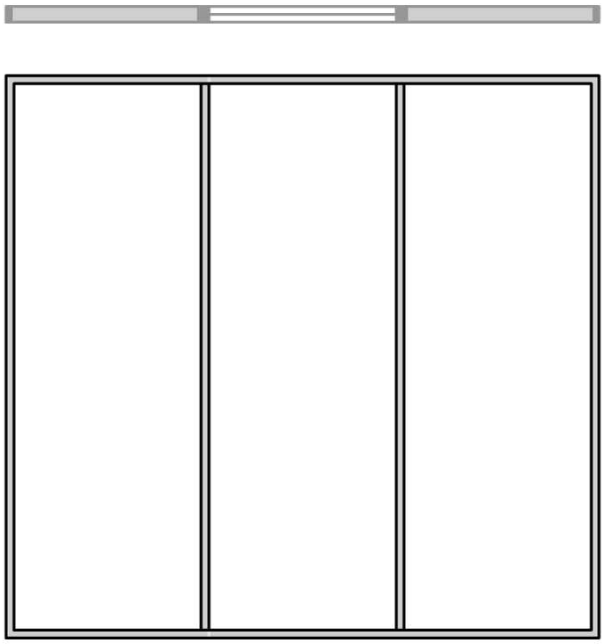


adobe - plaster

azobé - niangon

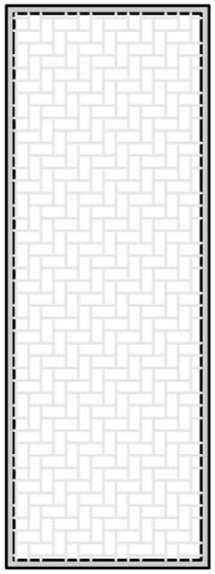


Design frames - interior



bamboo

closed

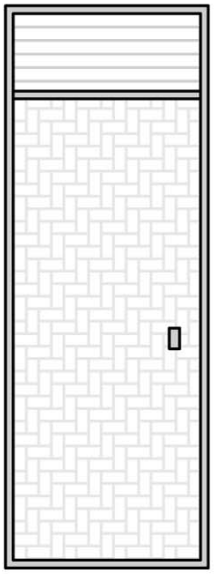


woven bamboo

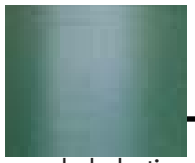
window

bamboo louvres

door



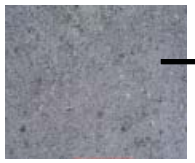
Materials



recycled plastic

azobé timber

adobe blocks
7% cement
80% laterite
13% water



concrete

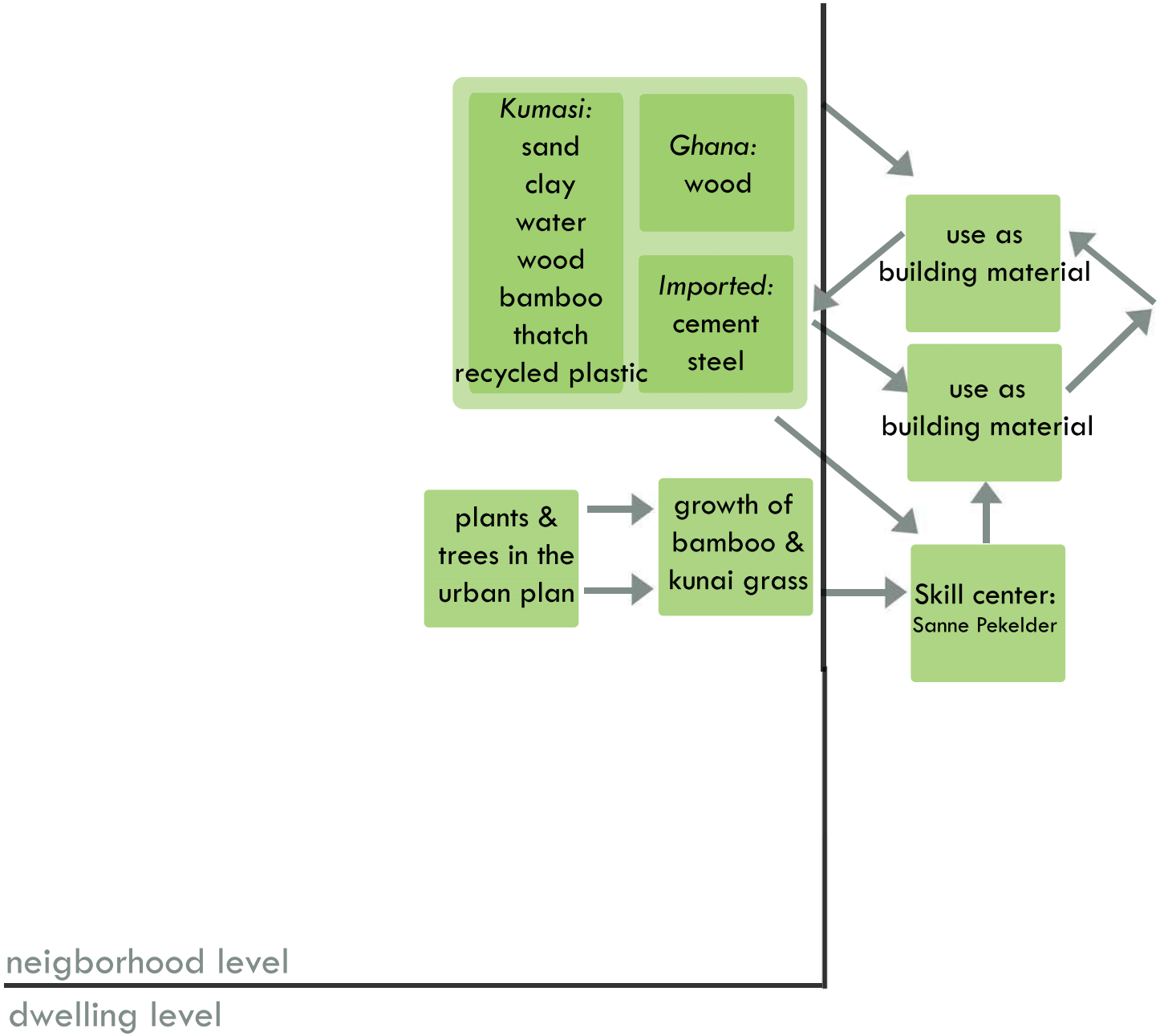
half bamboo trunks

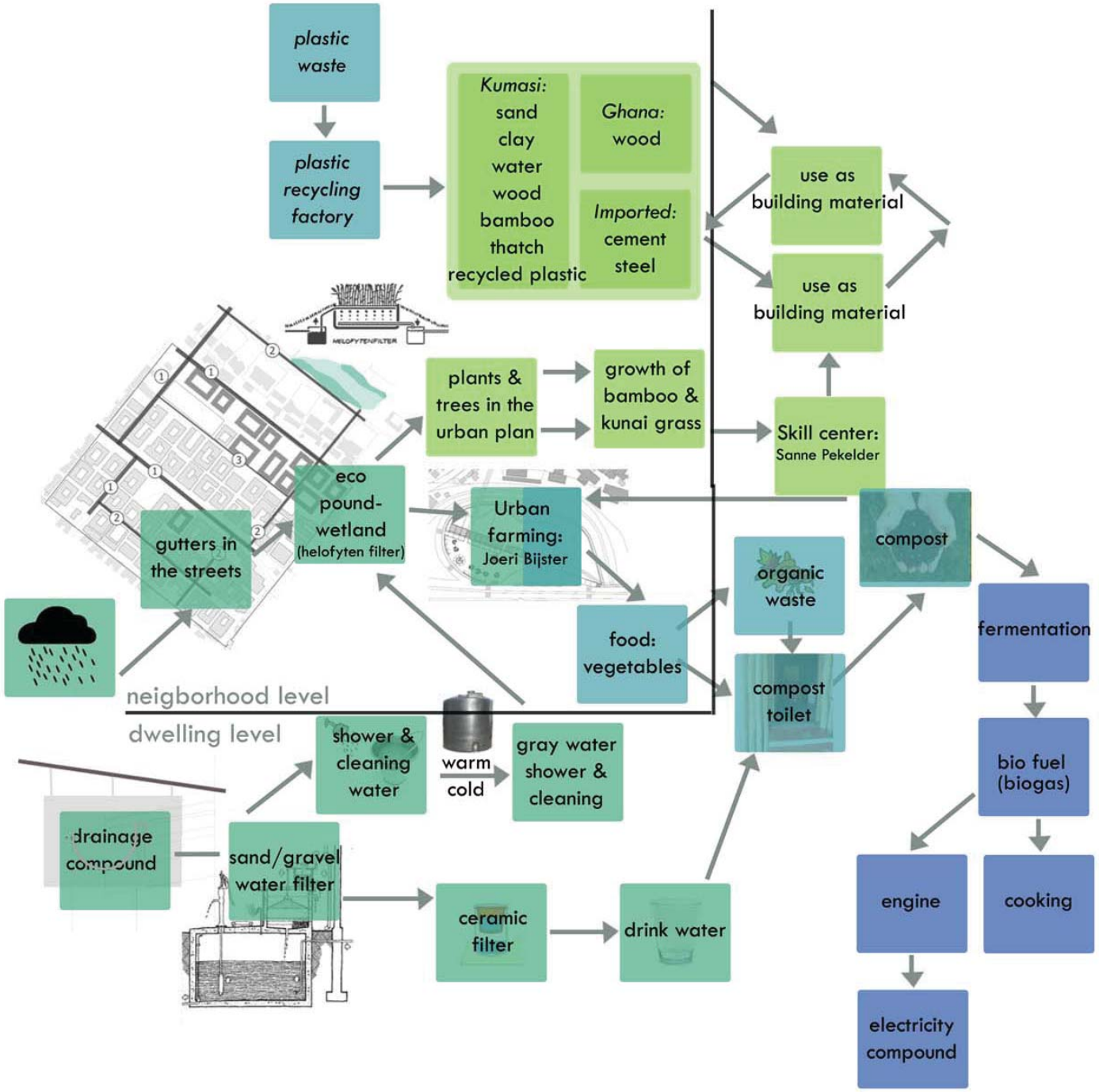
tree trunks and thatch

bamboo

(adobe) plaster

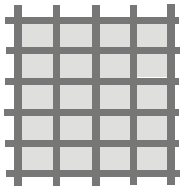
Material cycle



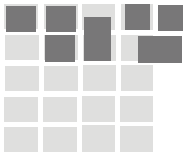

plastic waste
plastic recycling factory
Kumasi: sand clay water wood bamboo thatch recycled plastic
Ghana: wood
Imported: cement steel
use as building material
use as building material
plants & trees in the urban plan
growth of bamboo & kunai grass
Skill center: Sanne Pekelder
eco pound-wetland (helofyten filter)
gutters in the streets
Urban farming: Joeri Bijster
compost
organic waste
food: vegetables
compost toilet
fermentation
bio fuel (biogas)
neigborhood level
dwelling level
shower & cleaning water
warm
cold
gray water shower & cleaning
drainage compound
sand/gravel water filter
ceramic filter
drink water
engine
cooking
electricity compound


Questions?

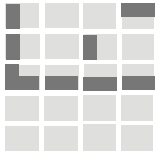
Urban concept structure



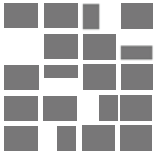
existing
tight and dense grid



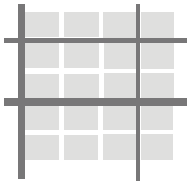
new compounds



2nd building layer

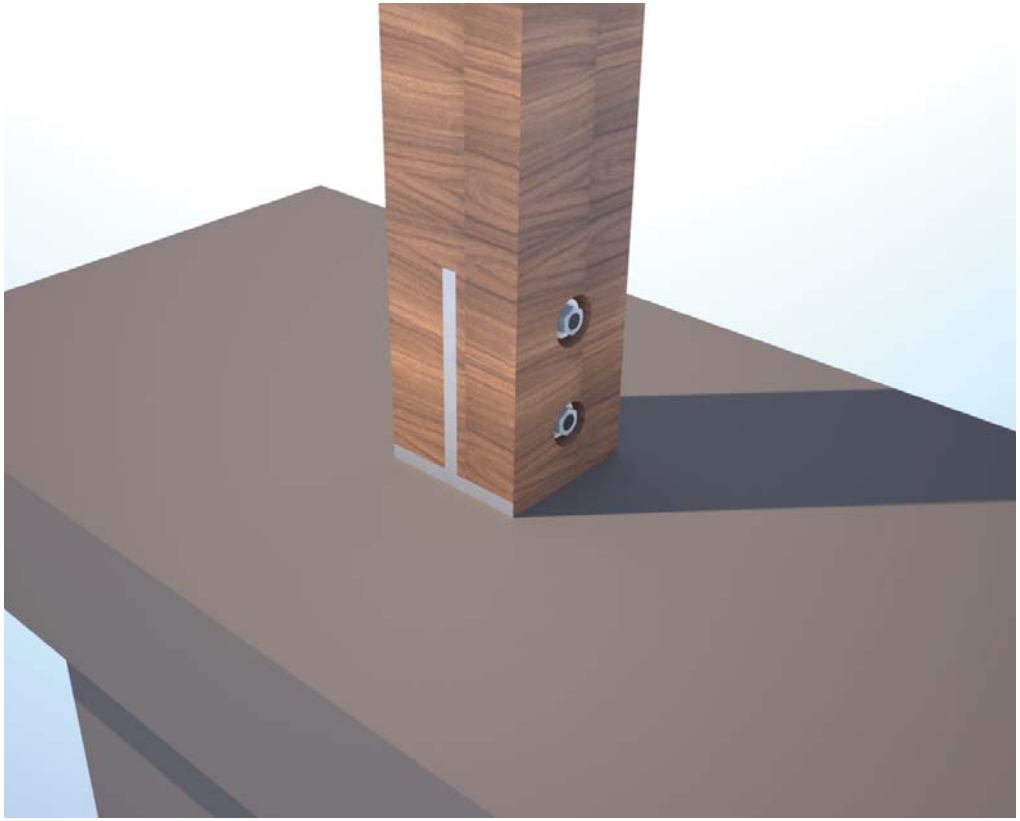


common spaces
opening grid



water/street network
regulating streams

Column foundation

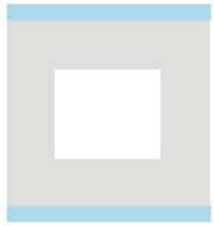


Waste collection

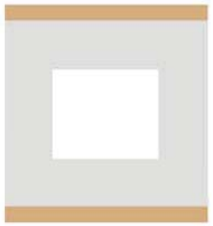

YESU
CYC
ADOM

Why open and closed shell?

2/2 sides

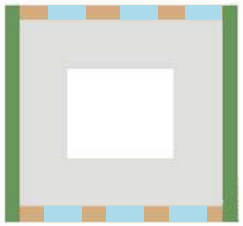


commercial vs
none



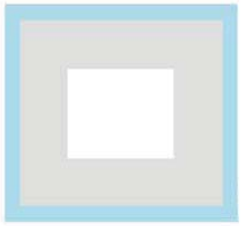
dwelling vs
none

comercial vs
dweling

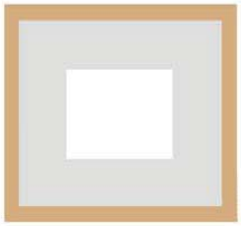


common vs
commercial&dwelling

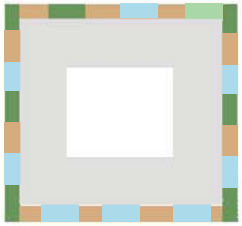
4 sides



commercial



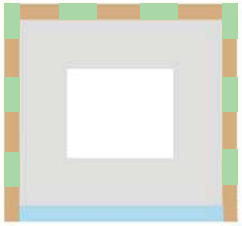
dwelling



common/comercial/
dwelling

??????
wel of niet
erin

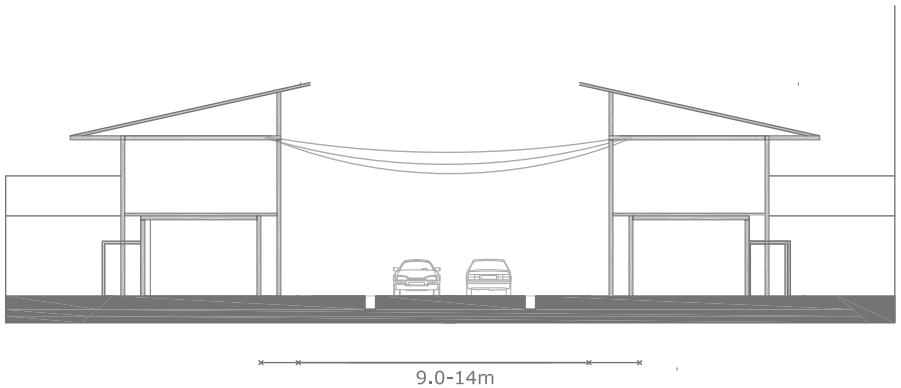
3/1 side
streetside



dwelling 3 sides
vs comercial
streetside

dwelling/common
3 sides vs comercial
streetside

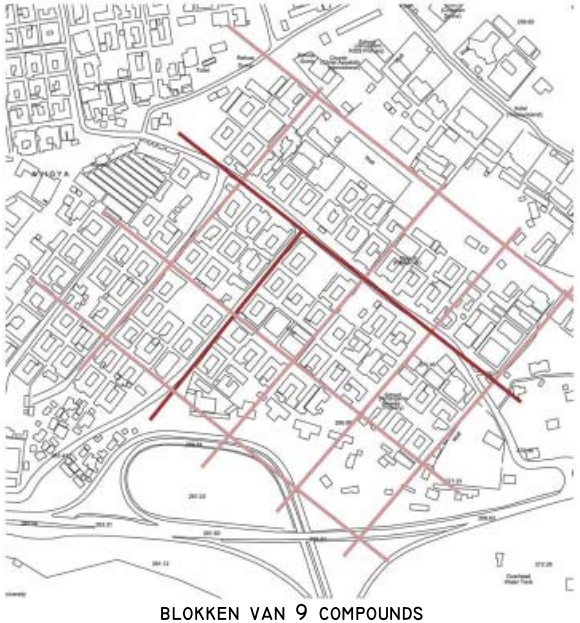
Street profiles with gutters



Options opening grid

BOUWMASSA'S IN GRID
OPENEN VAN HET GRID

BLOKKEN VAN 4 COMPOUNDS
ERG VAST, MET 1 BLOK OPEN TE WEINIG GEBRUIK VAN RUIMTE



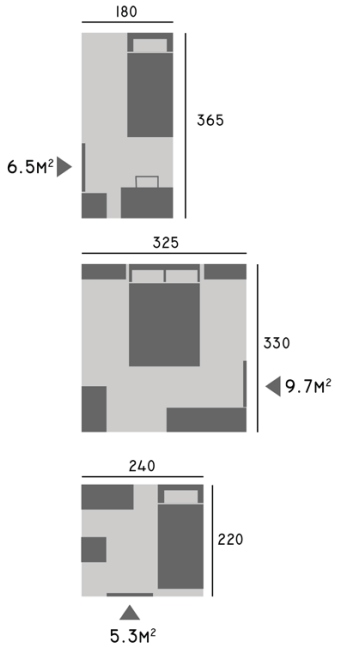
BLOKKEN VAN 9 COMPOUNDS
GOEDE SCHAALGROOTE. 1/2 A 1 BLOK OPEN RUIMTE

BOUWRICHTING 1 KANT OP
OPENBREKEN GRID

BOUWRICHTING 1 KANT OP
OPENBREKEN GRID

The 3x3m grid

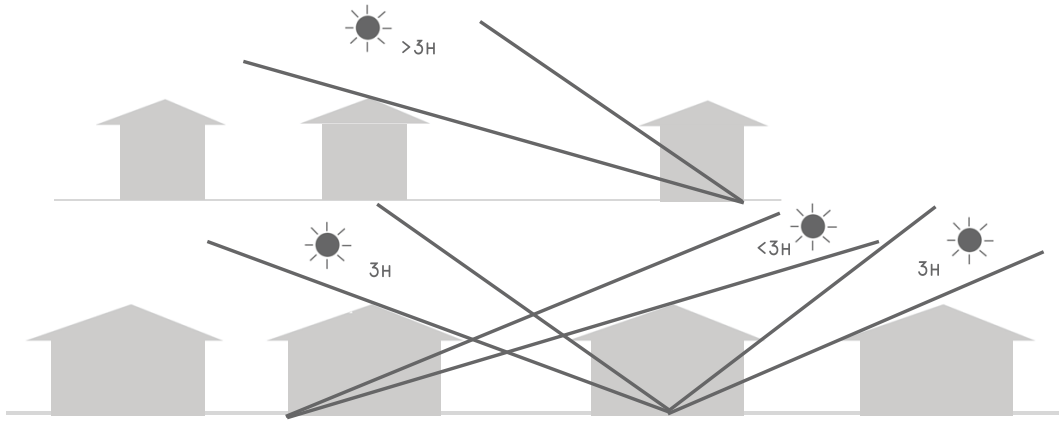
square grid -> mass production, repeating, reuse



minimal dimension room -> 8.5m

The 3x3m grid

Daylight



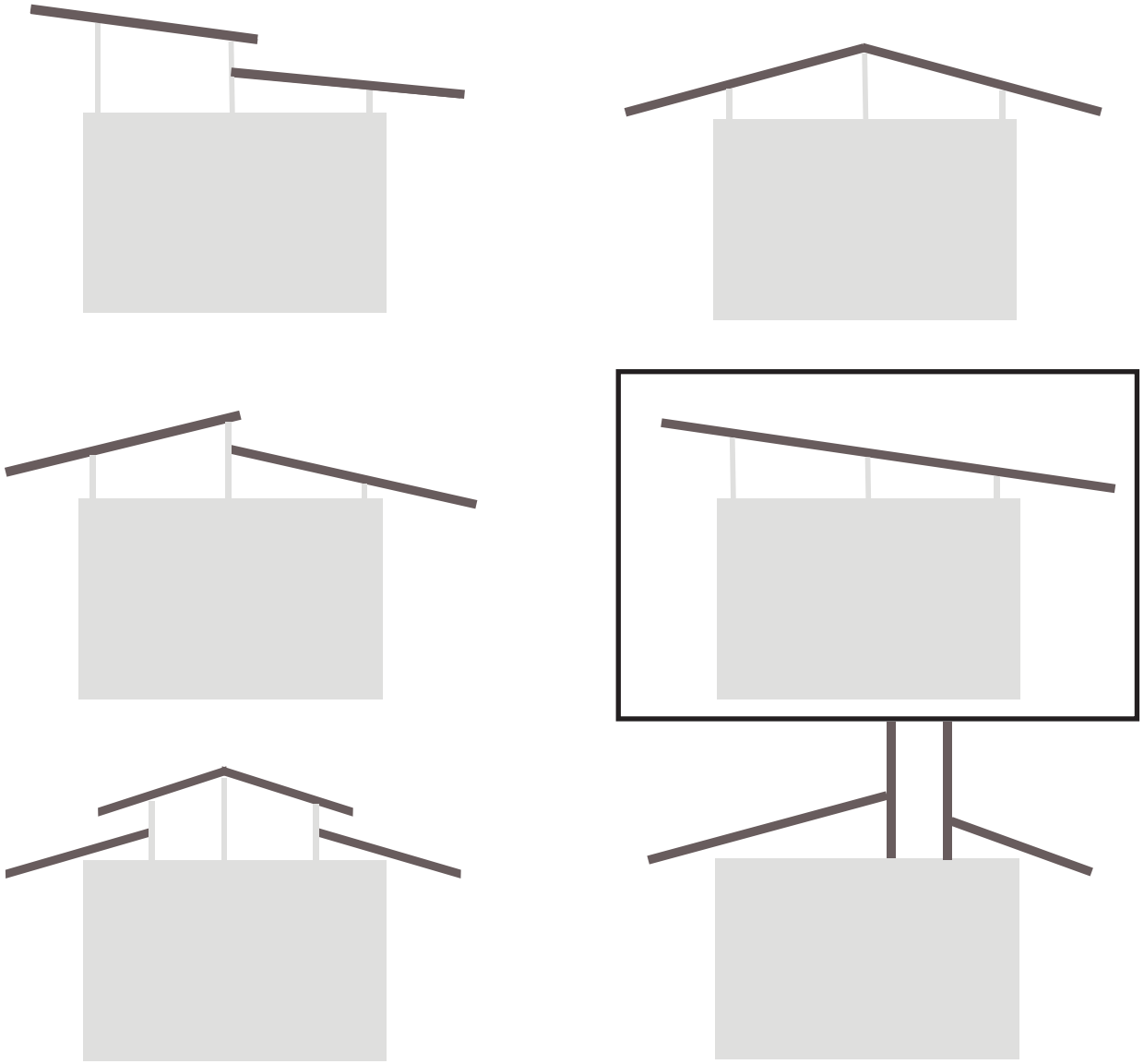
Compound - courtyard ratio

current: 4.5m - 1.5m

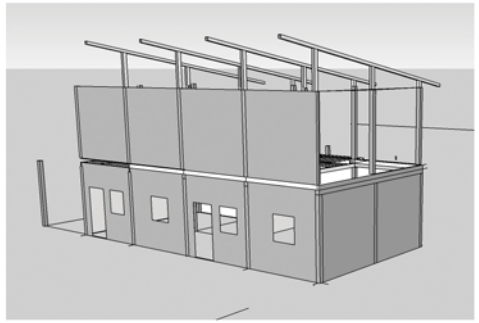
wider grid: 1.5m - 3m - 4.5m - 6m - 7.5m

Fitting the grid

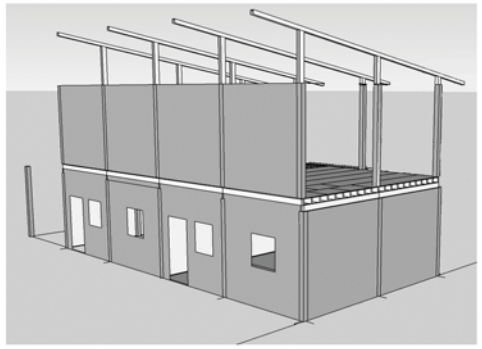
Roof desing options



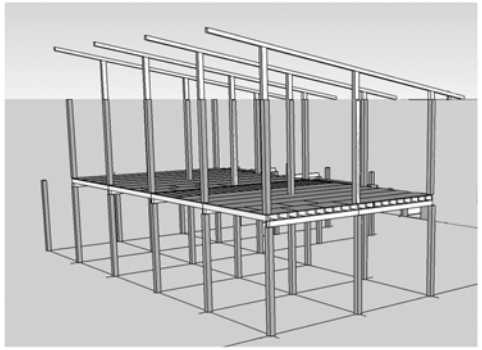
Construction options



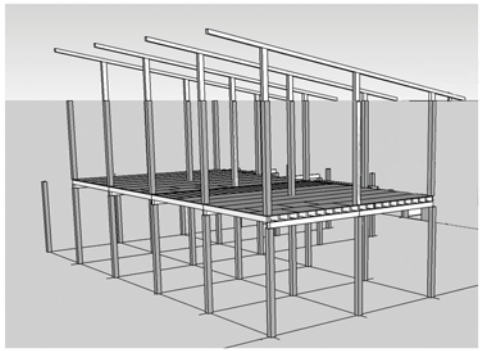
(pre-fab) concrete



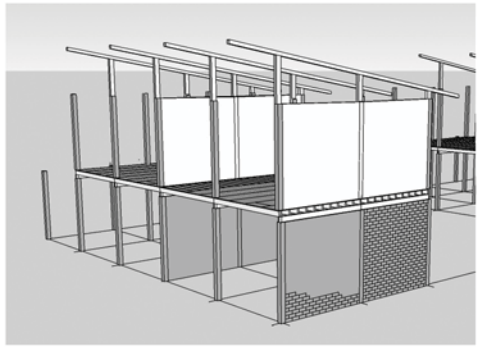
Wooden construction
filled with adobe blocks



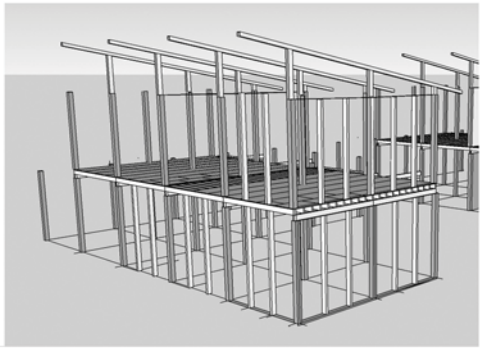
Timber construction
columns and beams



concrete construction
columns and beams

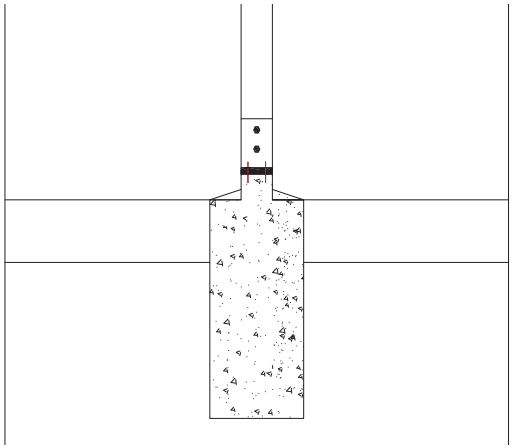


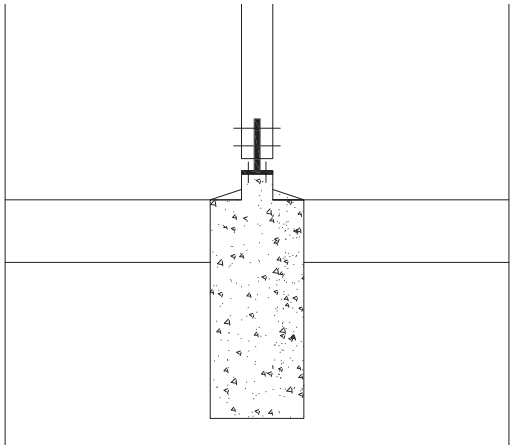
Timber columns
adobe brick walls

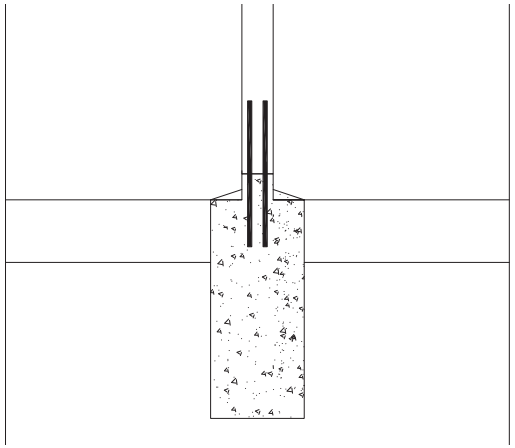


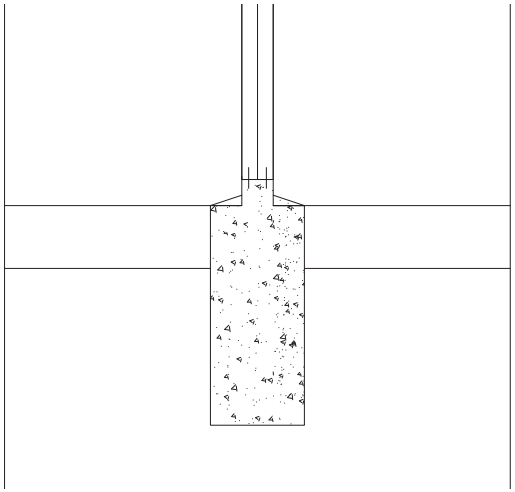
Balloon frame

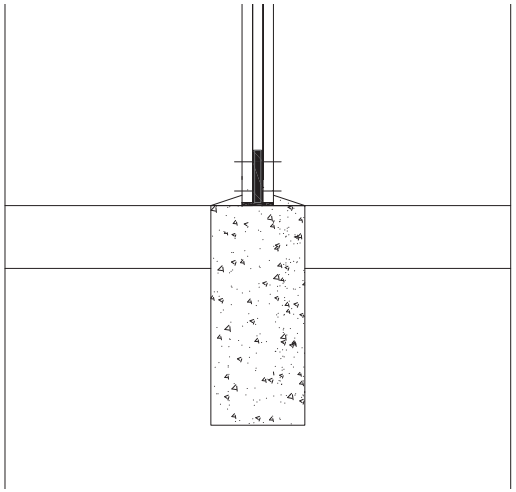
Options foundation - column

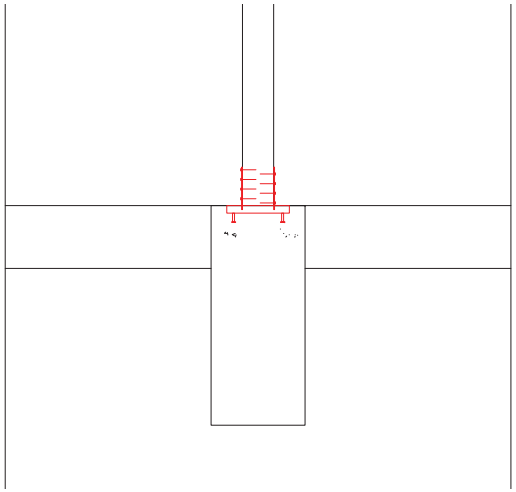












exploded view construction