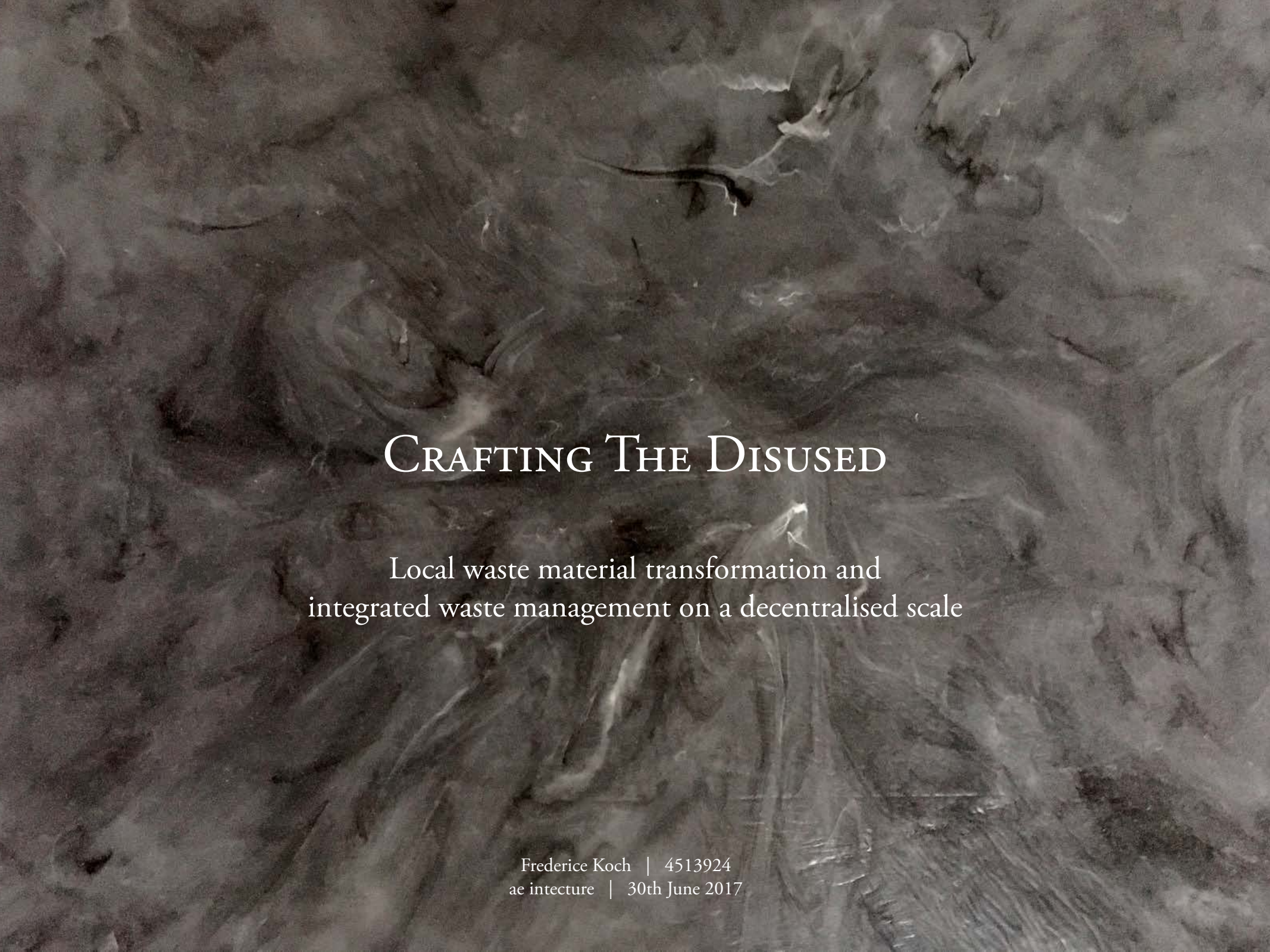


Crafting The Disused

Local waste material transformation and integrated waste management on a decentralised scale

Frederice Koch | 4513924
ae intecture | 30th June 2017

Content

Introduction

research/ context
objective/ concept

Design Development

guidelines
layout
structure
climate and energy scheme

Introduction

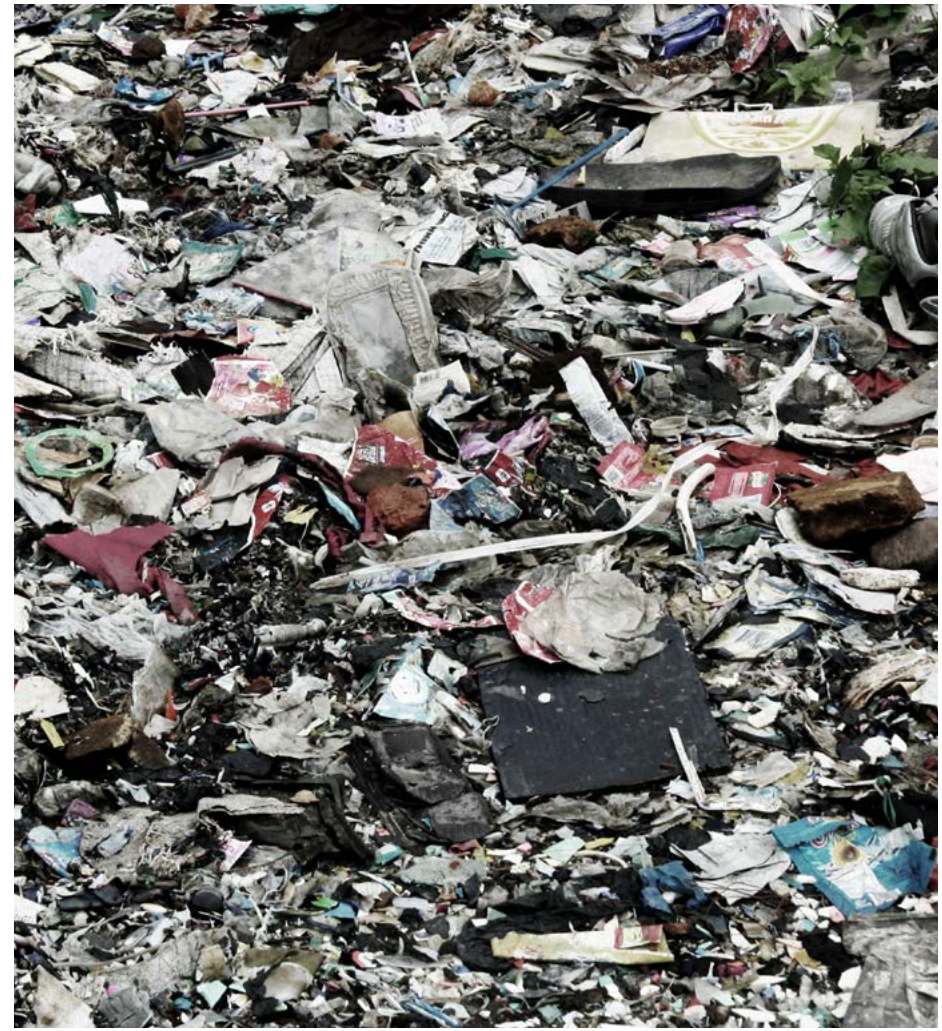
INTRODUCTION

overview

64 MILION TONS
of waste produced in Indonesia
every year

ONLY 7.5%
of waste is recycled
(prevailingly in mayor cities)

15 MILION TONS
of waste is illegally
dumped or burned every year



INTRODUCTION

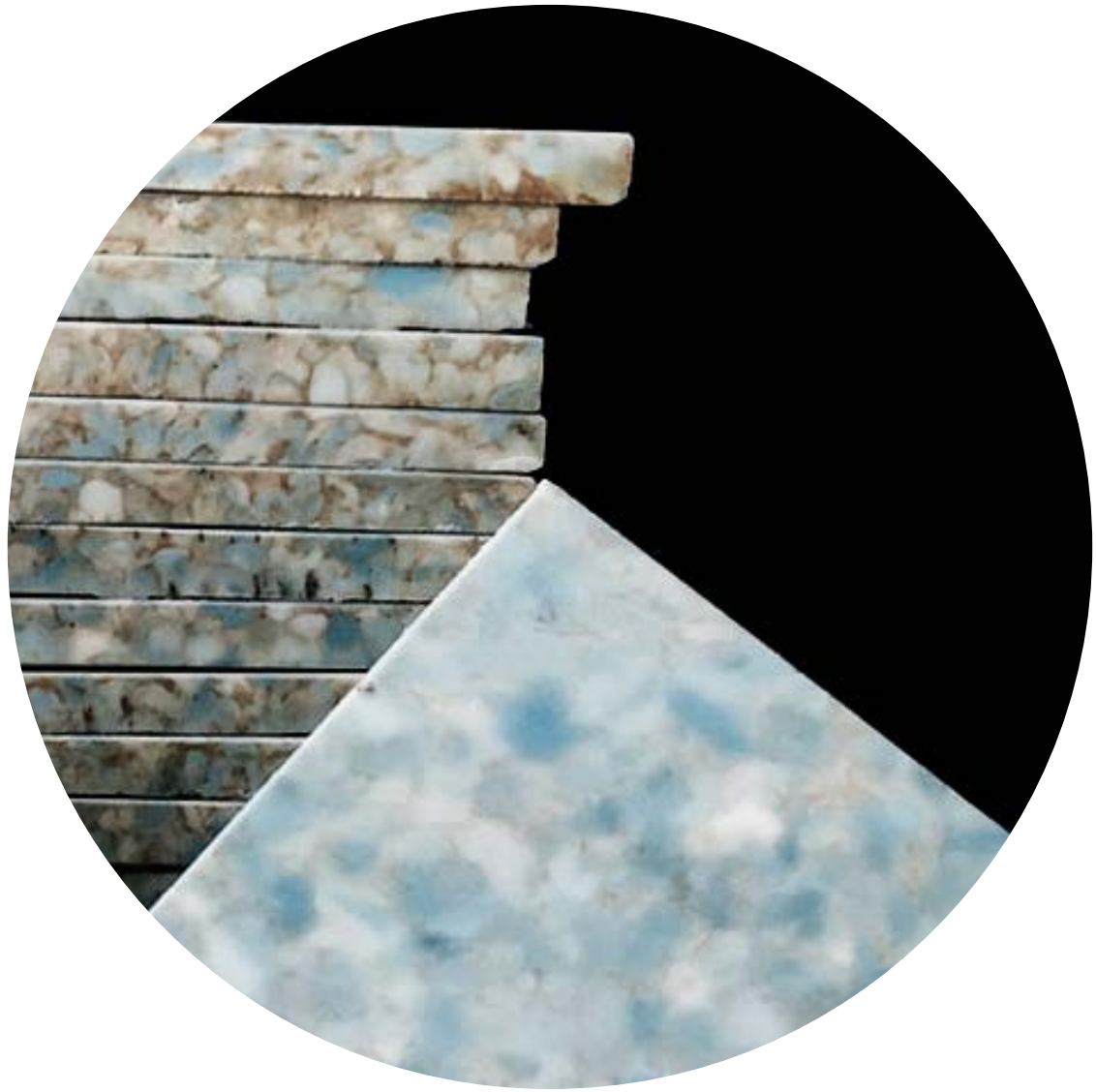
research focus

Byfusion bricks

[ByFusion Limited]

INTRODUCTION

research focus



Squarry
[Better Future Factory]

INTRODUCTION

research focus

Bima Micro Library
[Shau Architects]

INTRODUCTION

research focus

Trinket Series
[Bethany Walker]

INTRODUCTION

research focus

Bandung was build as a

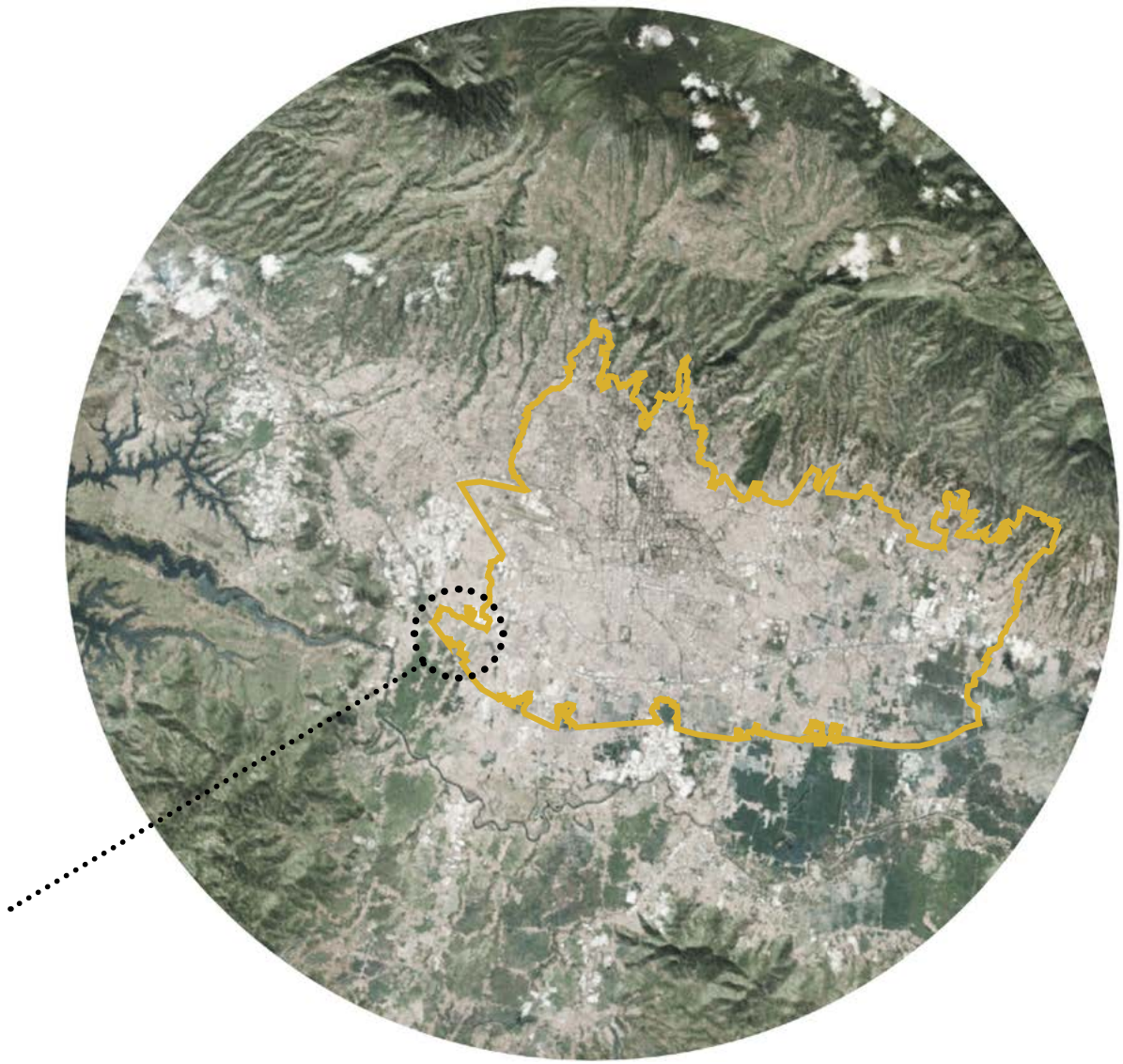
GARDEN CITY

1980

arrival of large scale
fashion industry leads to
rapid urban growth

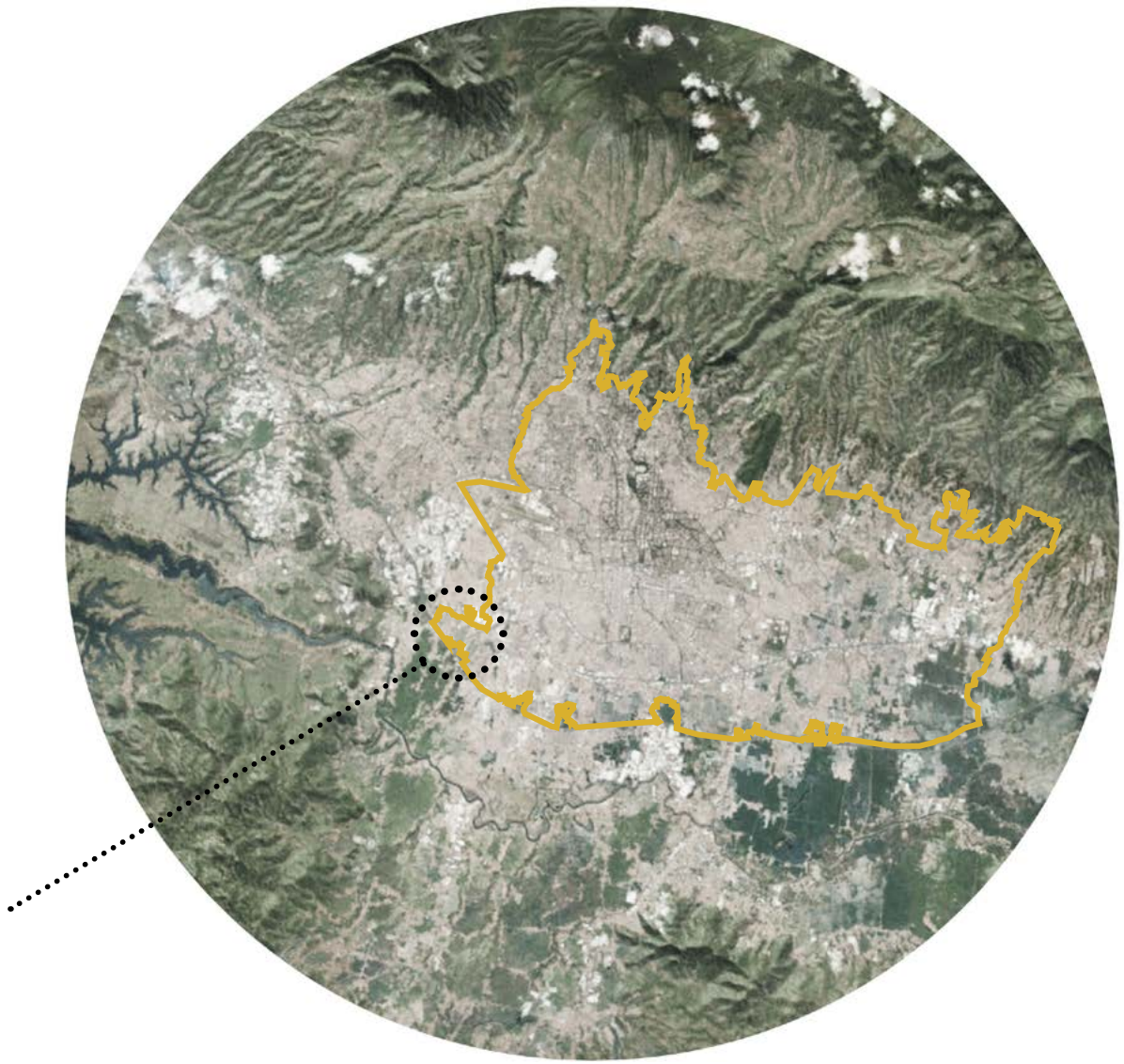
INTRODUCTION

Bandung



INTRODUCTION

Bandung



INTRODUCTION

Cigondewah

INTRODUCTION

Cigondewah

Rukun Warga
02 & 12
(neighbourhood)

INTRODUCTION

RW02 & RW12

RESIDENTS: 3100

60%

40%

INCOME:

66%	< 6.750k Rp (480€)
29%	6.750k - 13.500k Rp (480€-960€)
5%	> 13.500k Rp (960€)

demographics - data source: Sakina, B et al. (2015) & Guratman, H. D. H. (2016)
income - data source: Surahman, U. et al. (2015)

CIGONDEWAH FOOTBALL FIELD

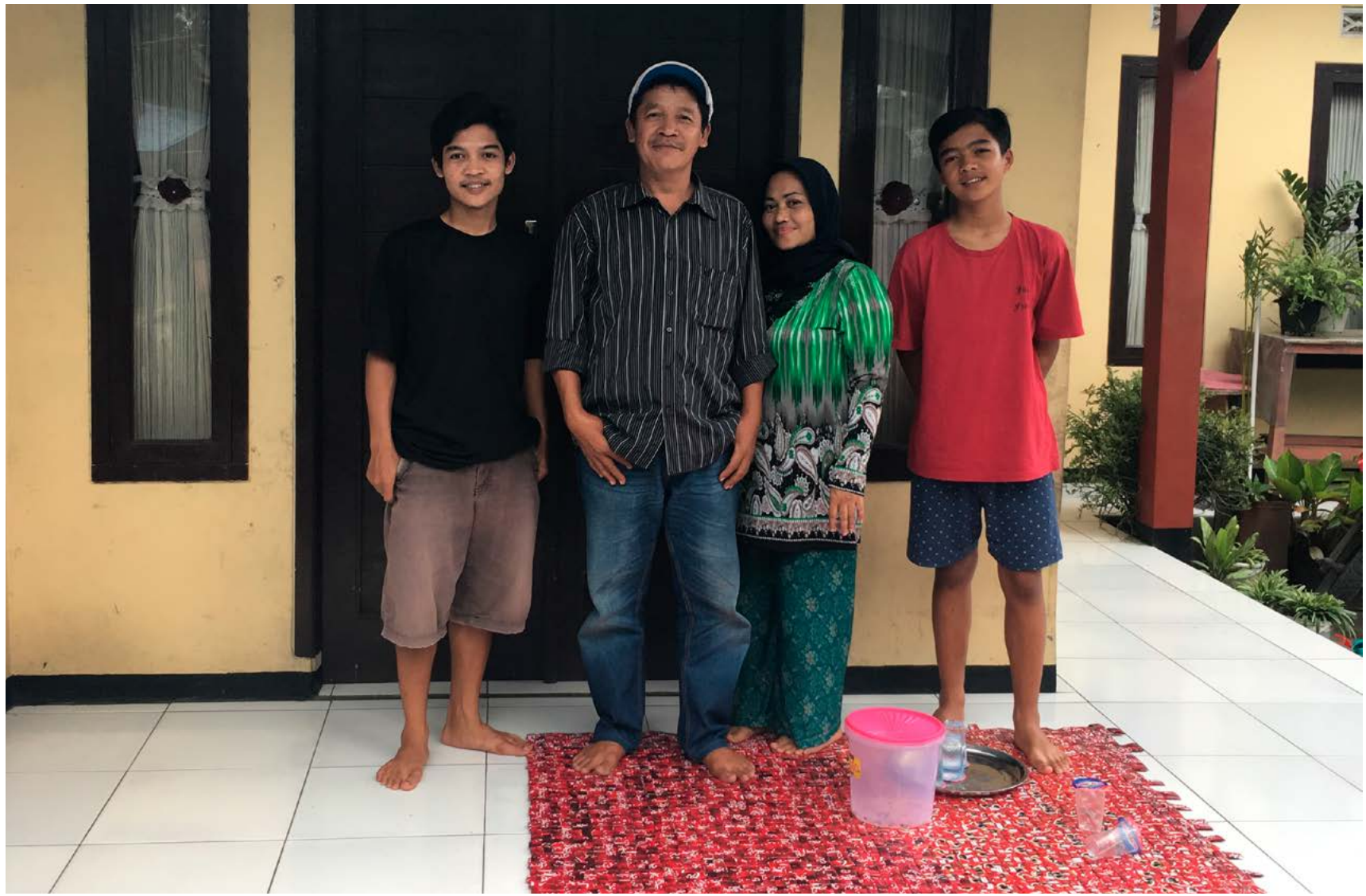
CIGONDEWAH RIVER

CIGONDEWAH KAHLER

cigondewah Footballl Field

Recycling Business

Commercial Cardboard Recycling



Recycled Mat

Mr Dudun & Family

Research

Waste Occurence

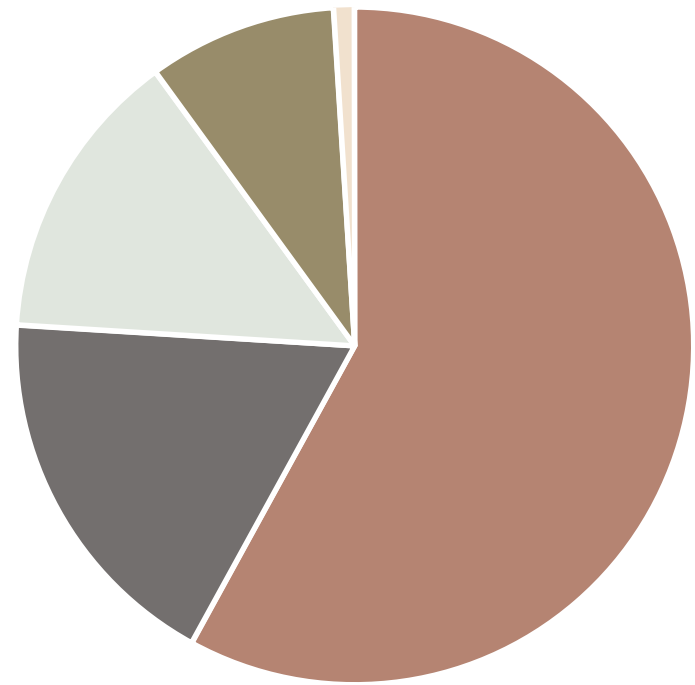
currently:

0,0007ton per day

15ton per week

in 10-15 years:

25ton per week



Waste accumulation - data source: Rahayu, N. & Yudoko, G. (2012)
Waste composition on weekly basis - data source: Damanhuri, E. et al. (2009)

Introduction

objective

Facilitating sufficient waste management and the production of waste material into vernacular building material in support of a cleaner kampung and a sustainable and extendable housing model

I

Central Collection point
Sampah Bank

I

Central Collection point
Sampah Bank

waste collection point
bank administration
sorting and storing space
cleaning
drying

1

Central Collection point
Sampah Bank

waste collection point
bank administration
sorting and storing space
cleaning
drying

2

Processing
Factory

1

Central Collection point
Sampah Bank

waste collection point
bank administration
sorting and storing space
cleaning
drying

2

Processing
Factory

secondary sorting
shredding
heating
compressing
cooling
finishing
storing
trading

1

Central Collection point
Sampah Bank

waste collection point
bank administration
sorting and storing space
cleaning
drying

= 100m²

2

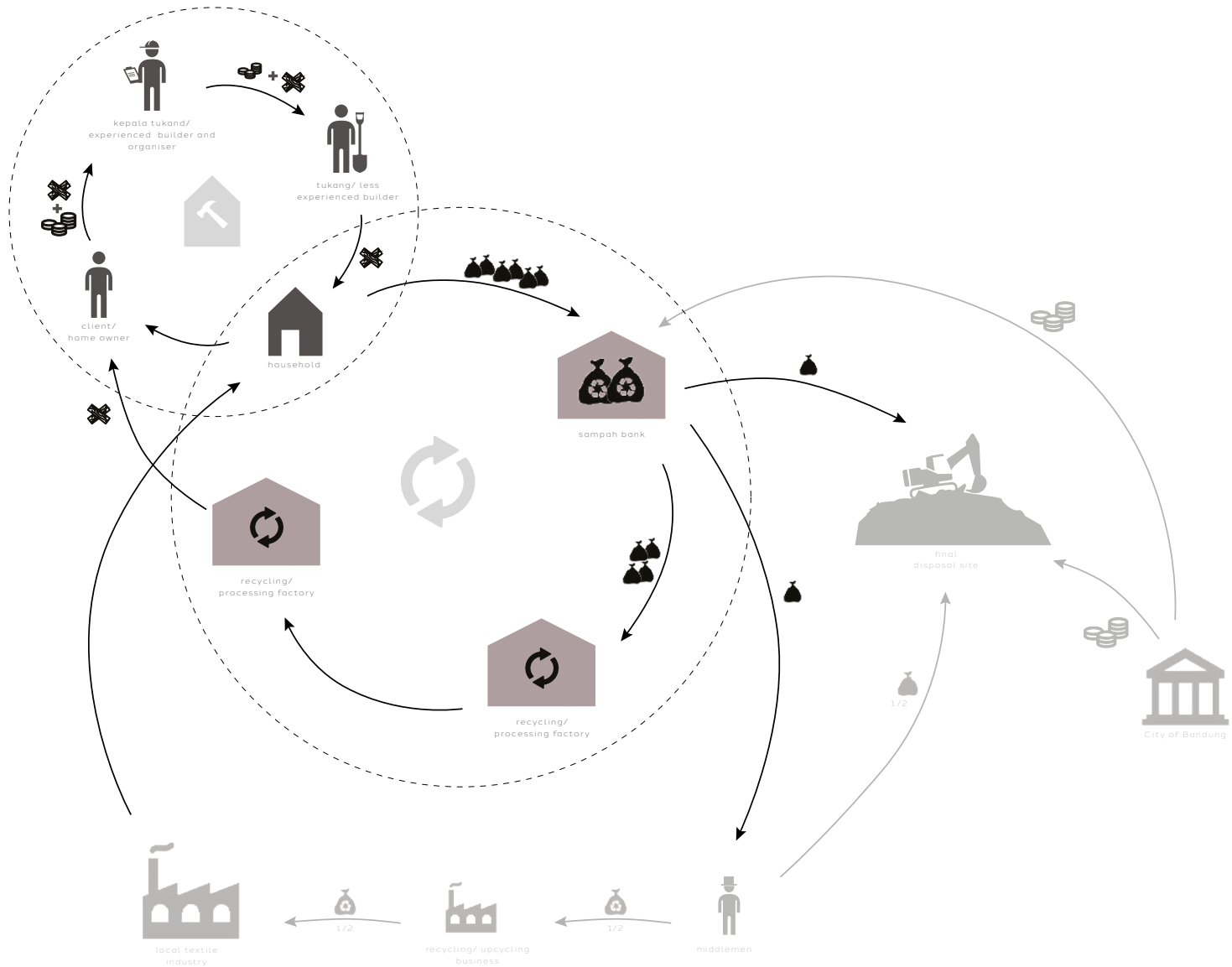
Processing
Factory

secondary sorting
shredding
heating
compressing
cooling
finishing
storing
trading

= 100m²

Research

Conclusion



Research

Waste Distribution and Routing

scavenger cart routes RW 02

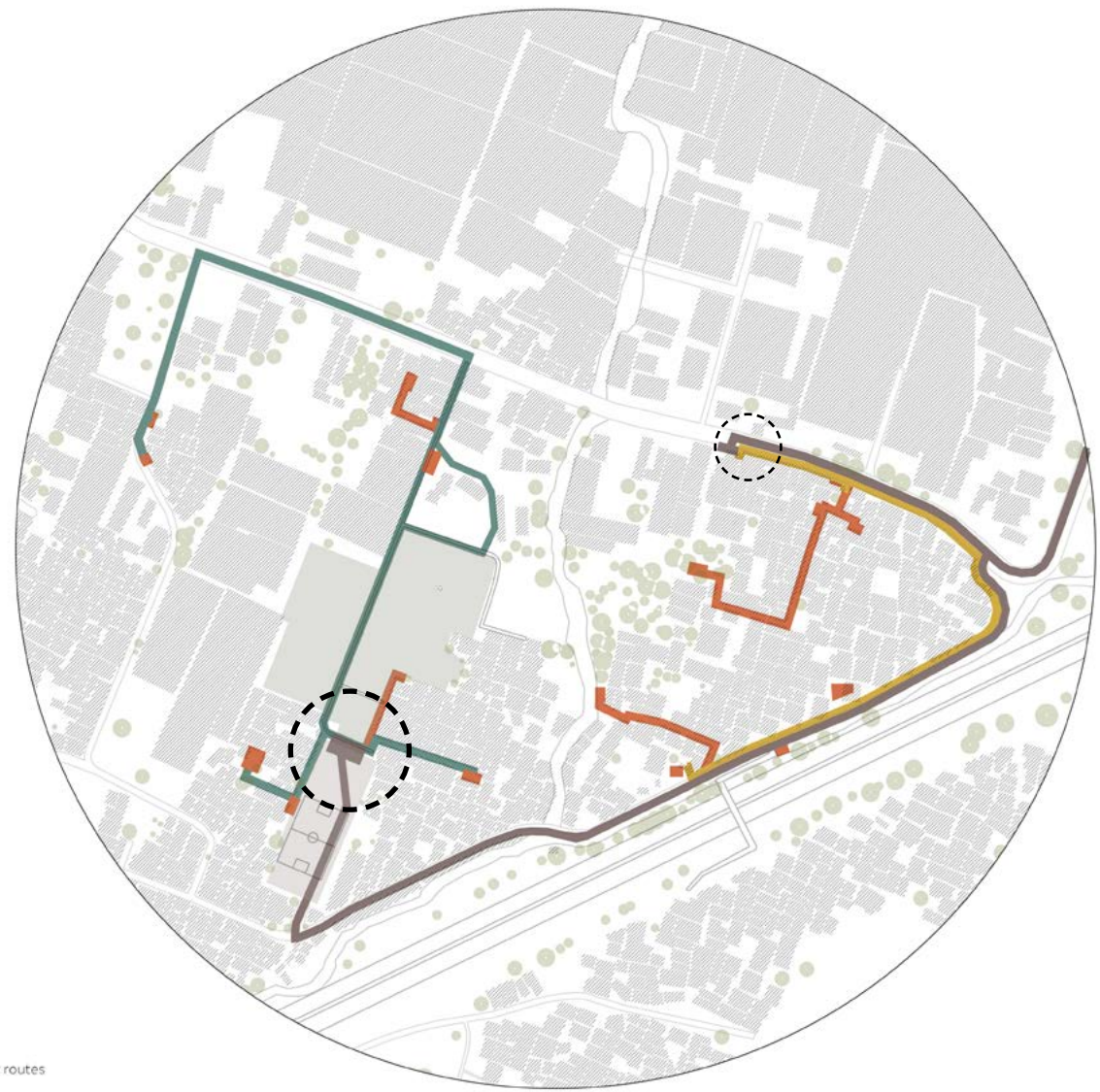
scavenger cart routes RW 12

waste truck to disposal site

informal temporary shelter points & janitor routes

Research

Site Location Options



scavenger cart routes RW 02

scavenger cart routes RW 12

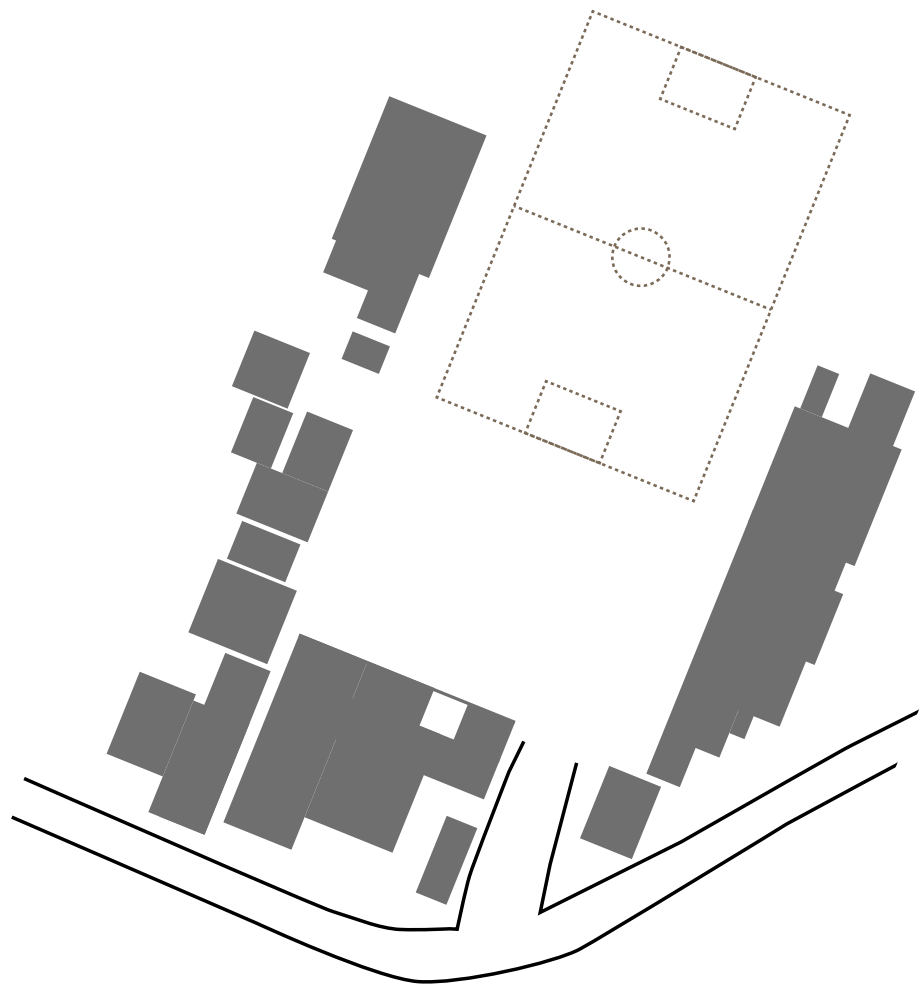
waste truck to disposal site

informal temporary shelter points & janitor routes

Architectural & Technical Design

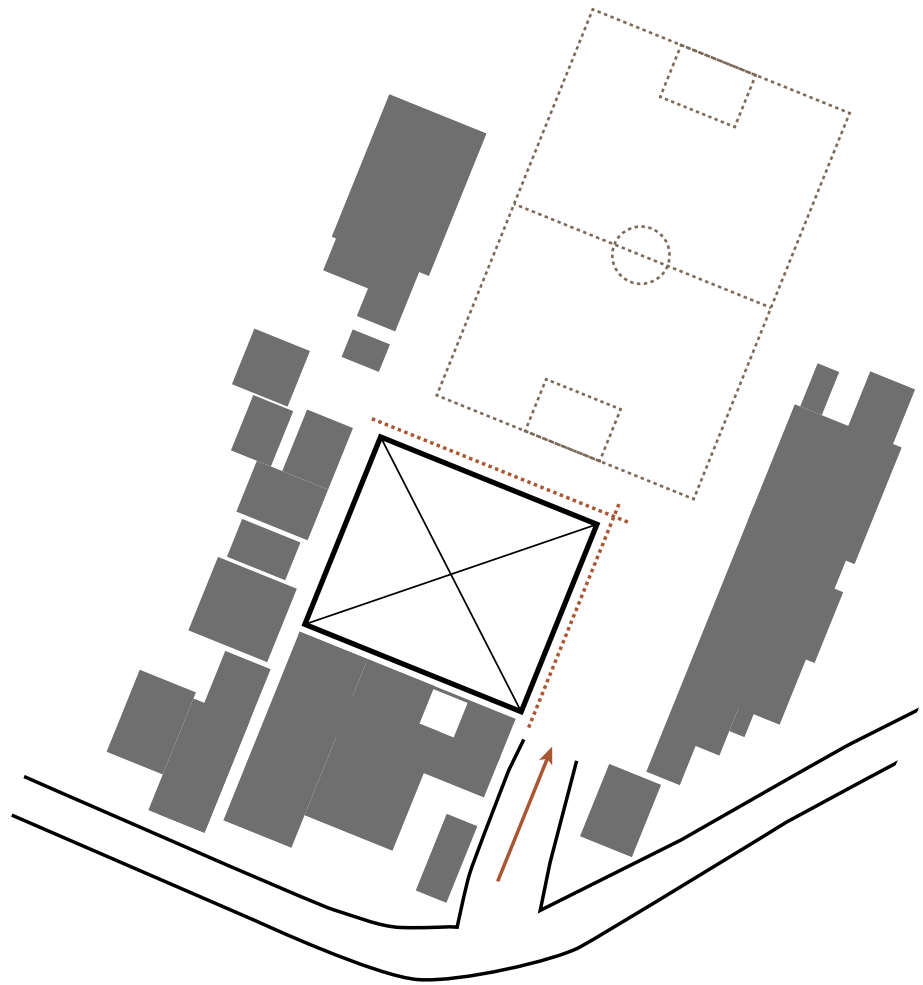
SITE

Design guidelines



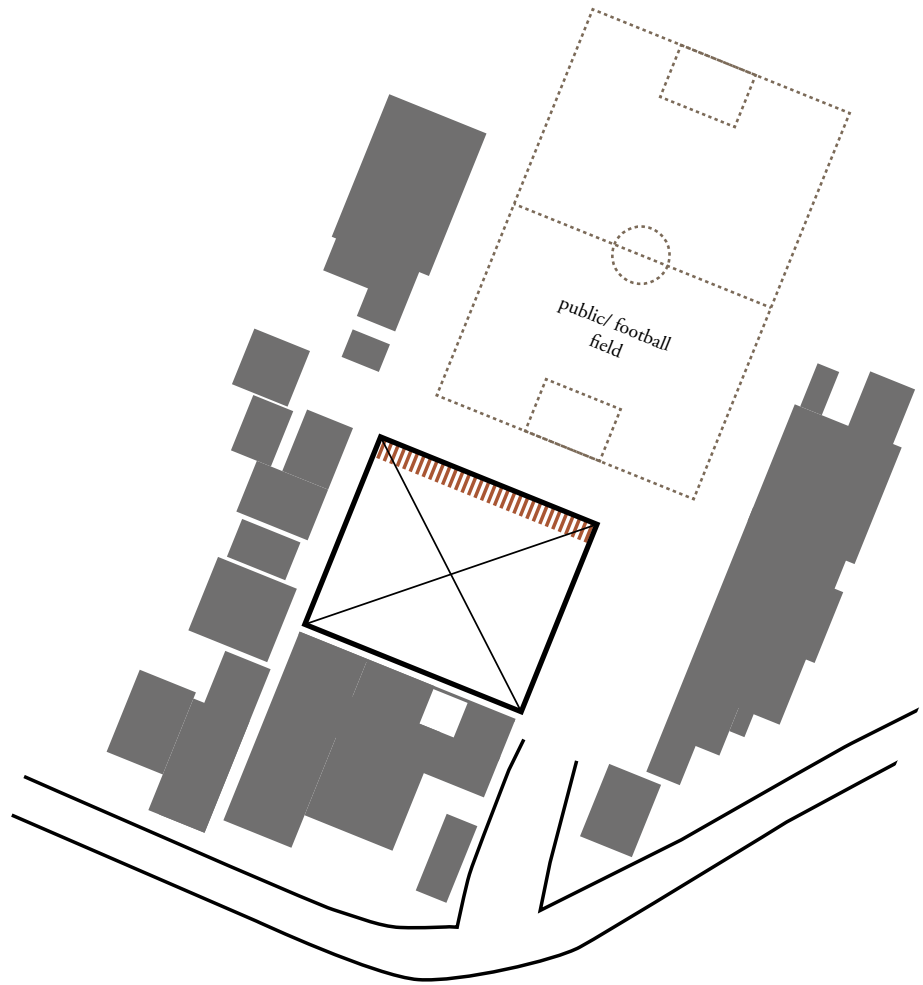
SITE

Design guidelines



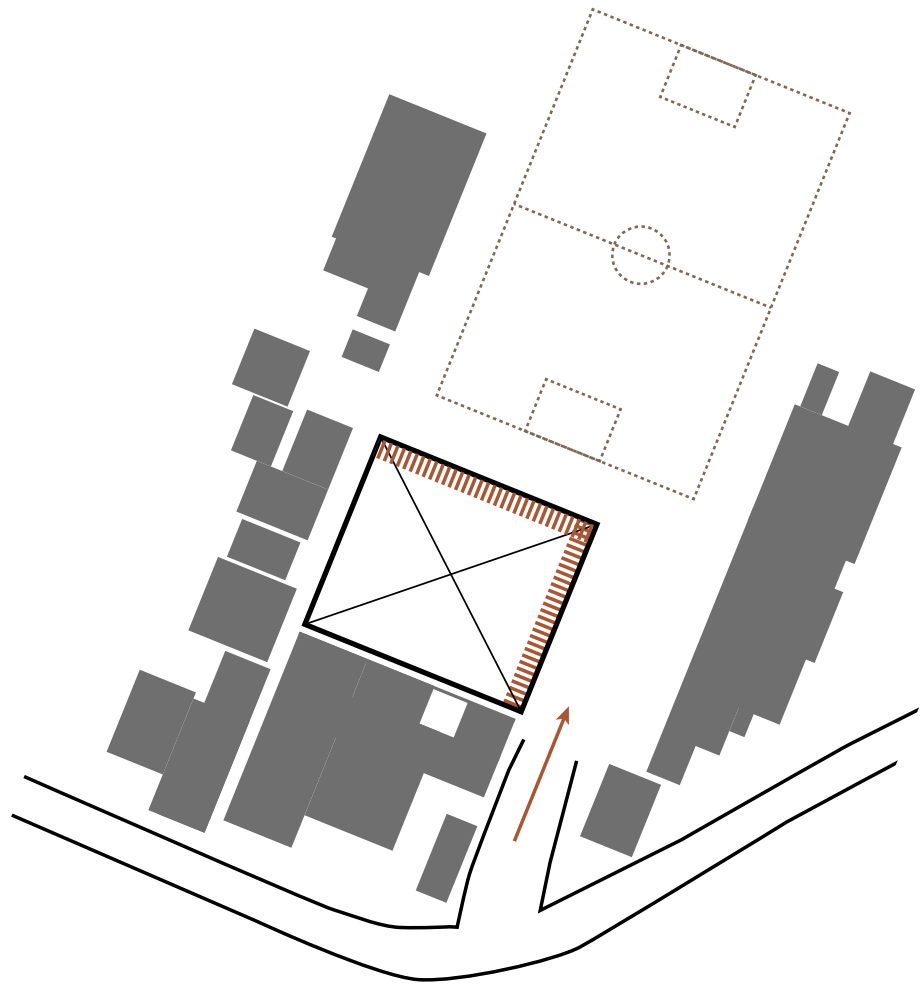
PLOT

Design guidelines



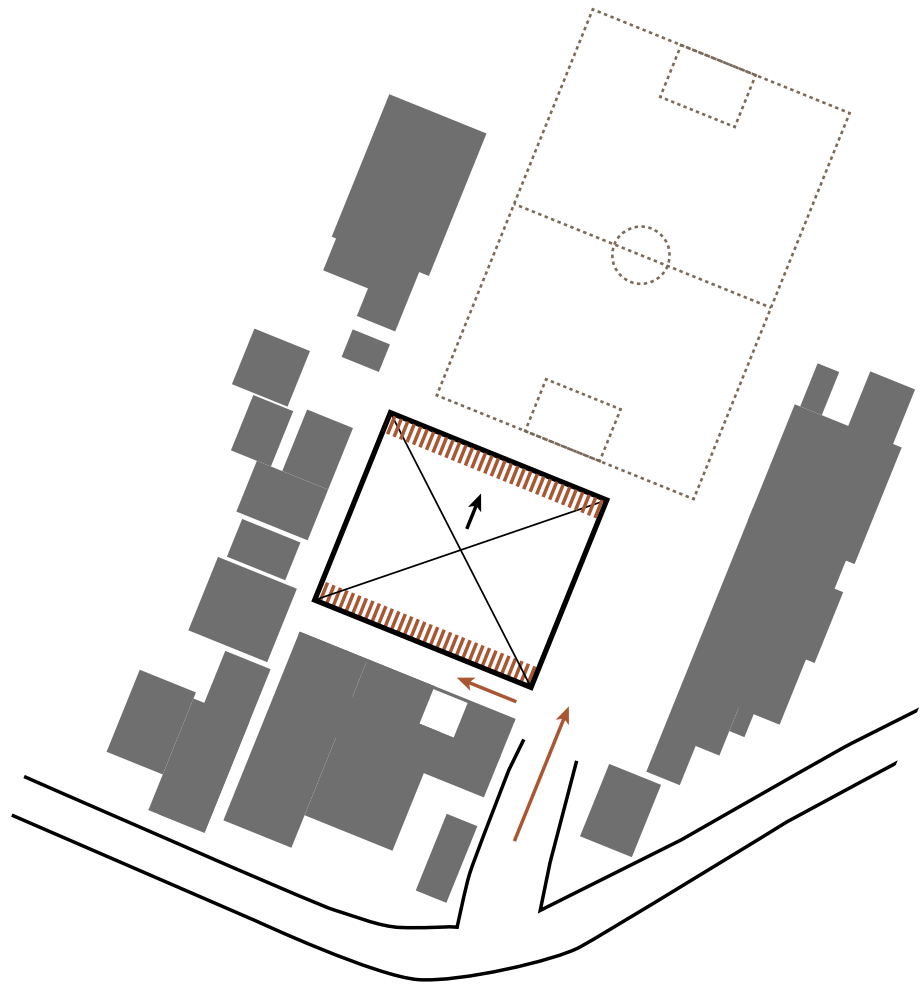
PUBLIC INTERACTION

Design guidelines



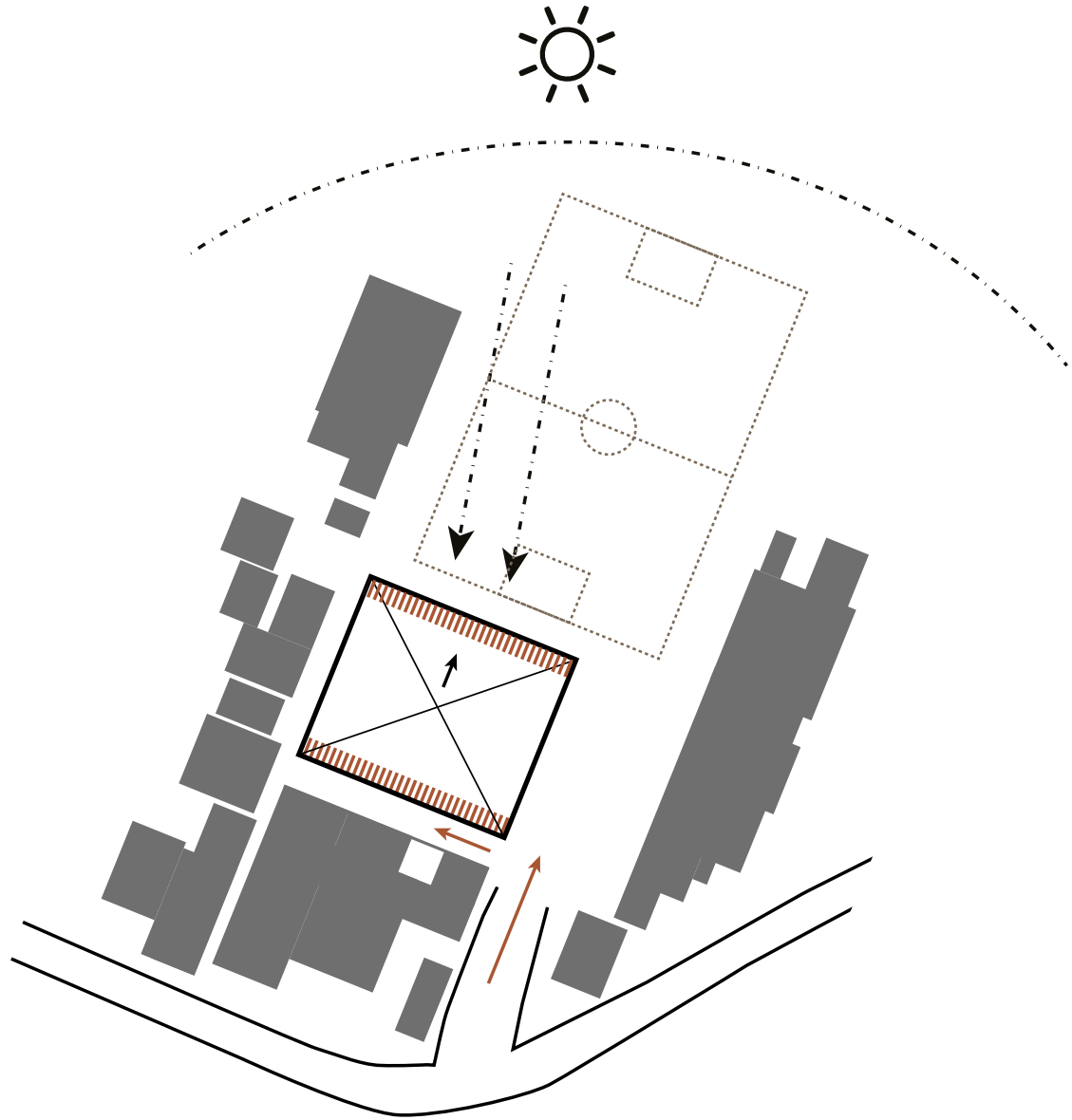
ACCES

Design guidelines



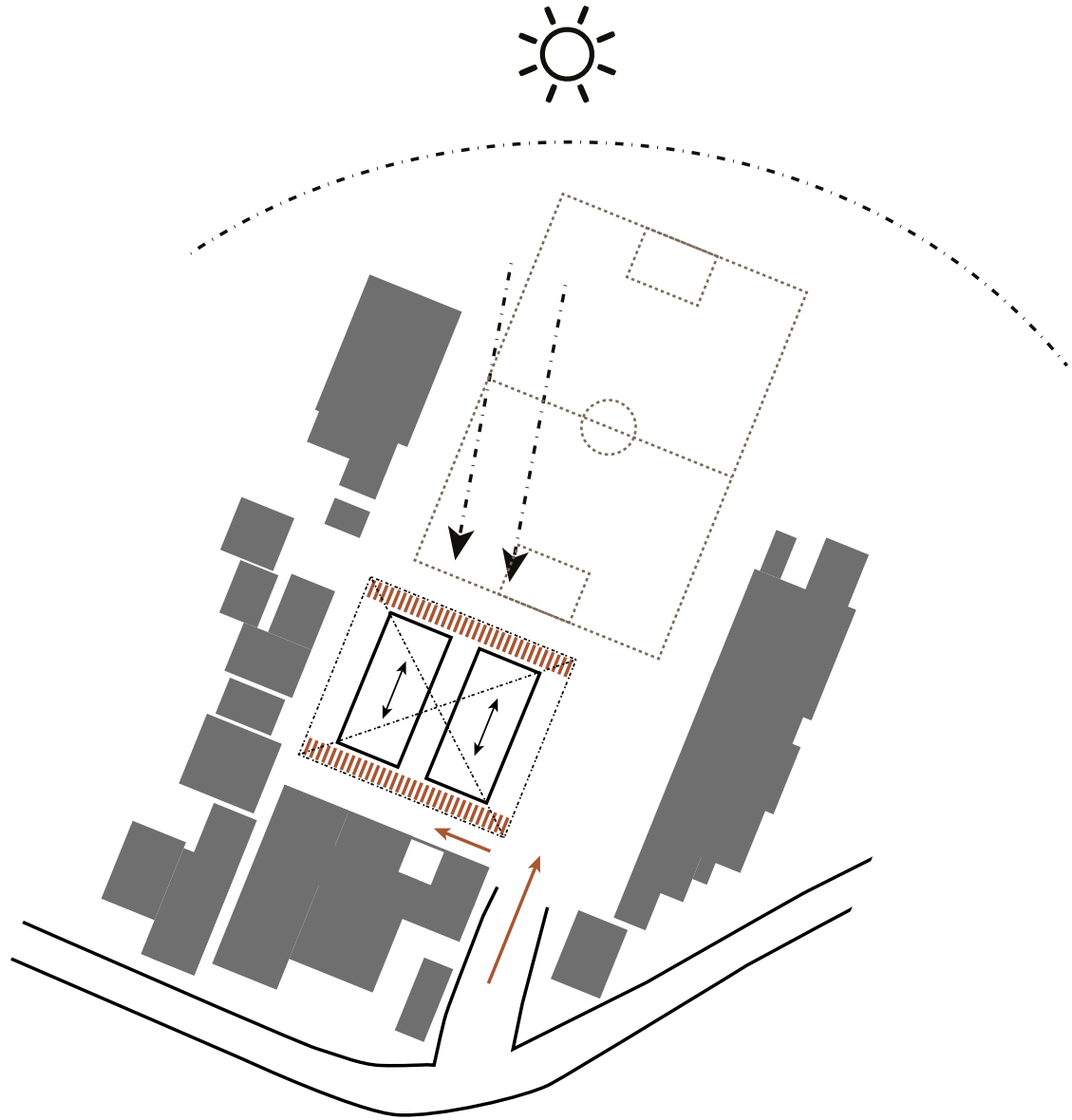
ACCES

Design guidelines



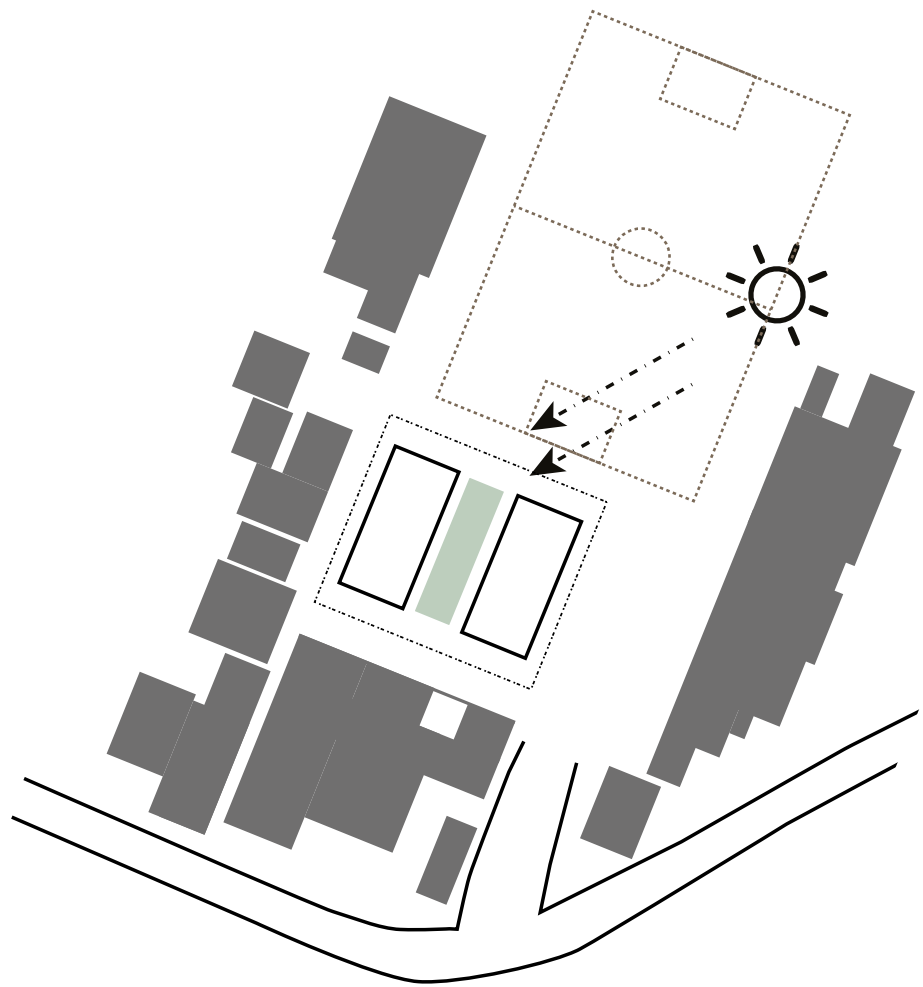
ACCES

Design guidelines

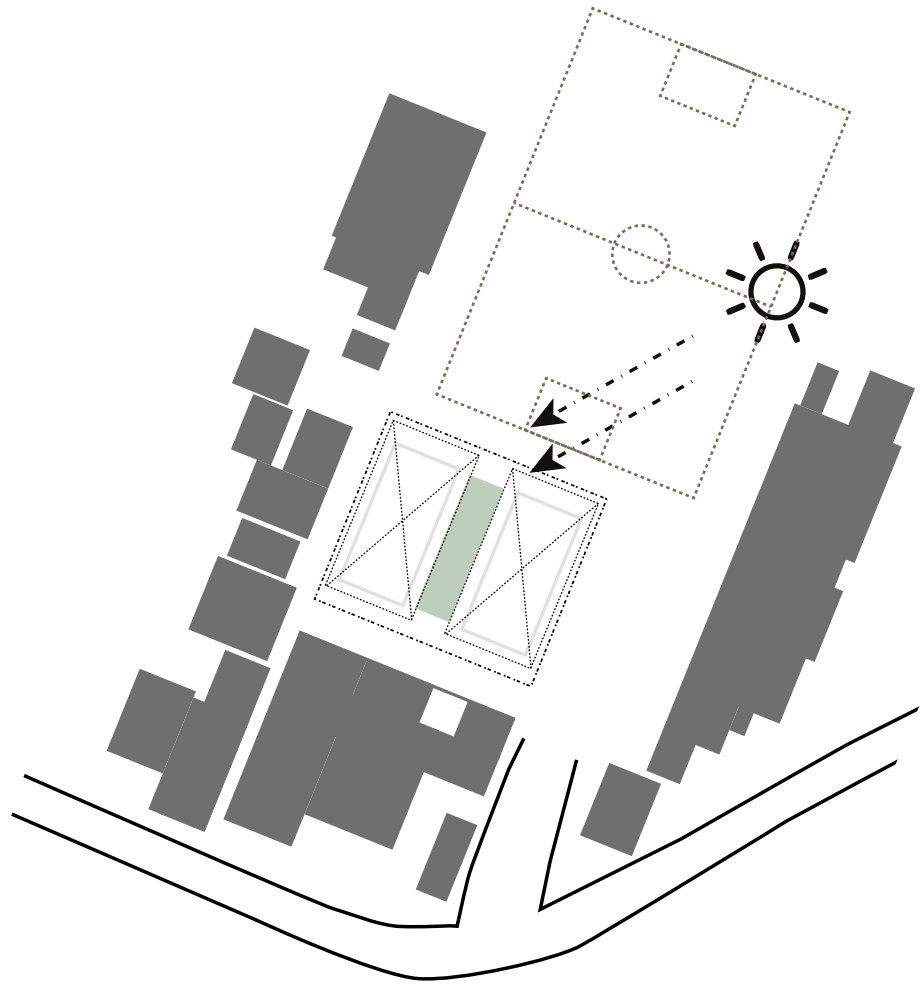


BLOCK DEFINITION

Design guidelines

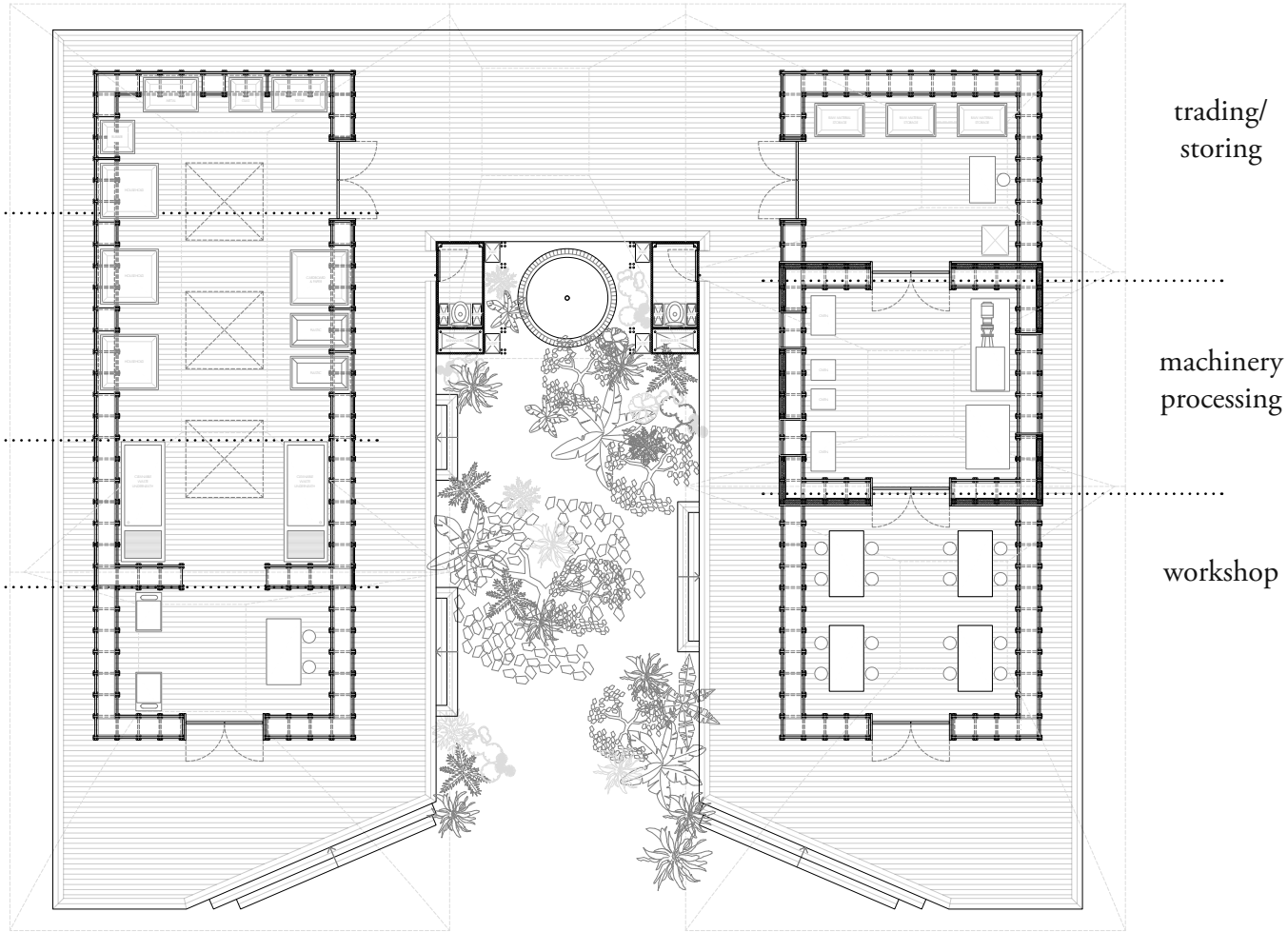


GARDEN



Roof Overhang

Plan

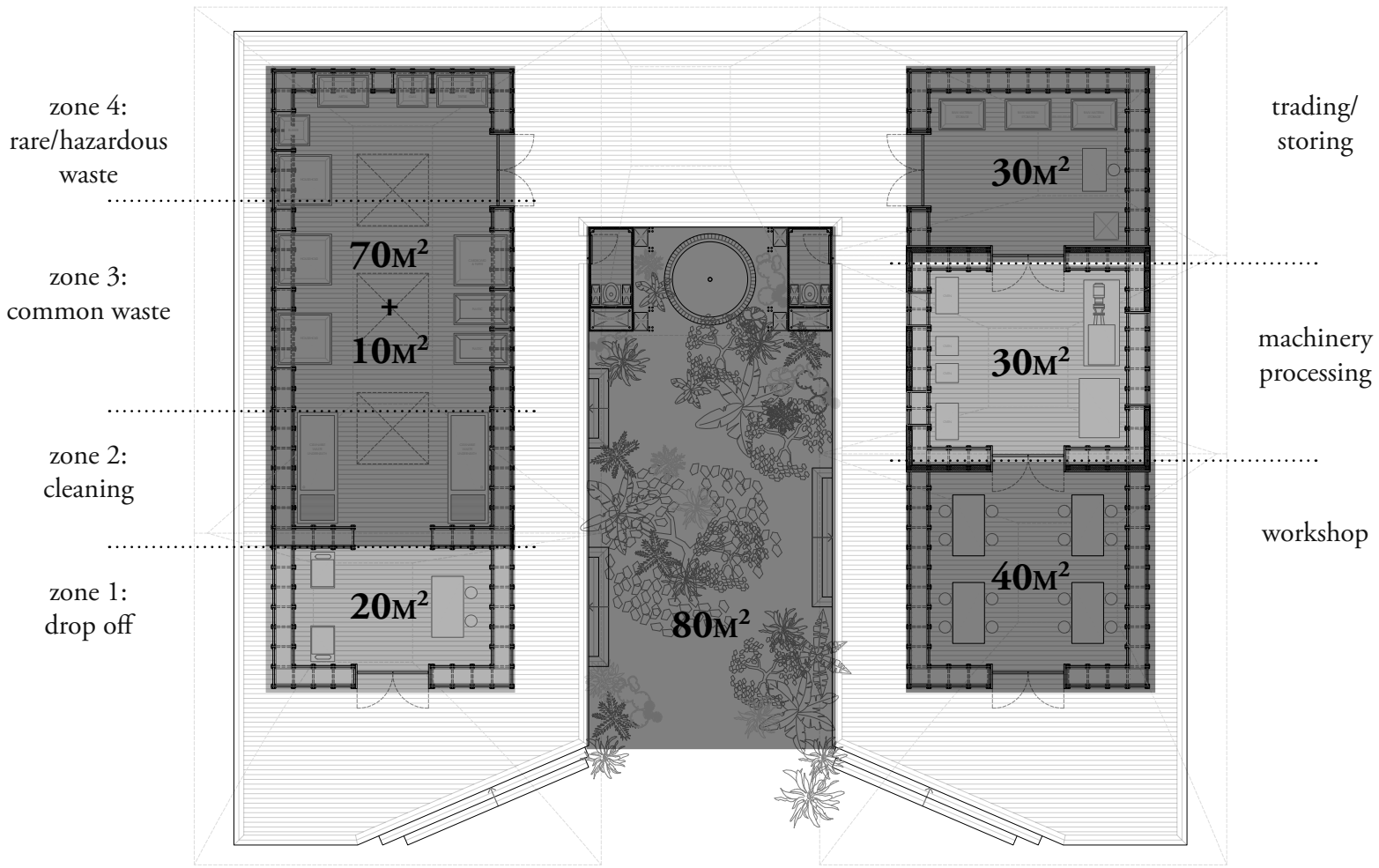


Bank Sampah

Perma Culture Garden

Factory

Plan

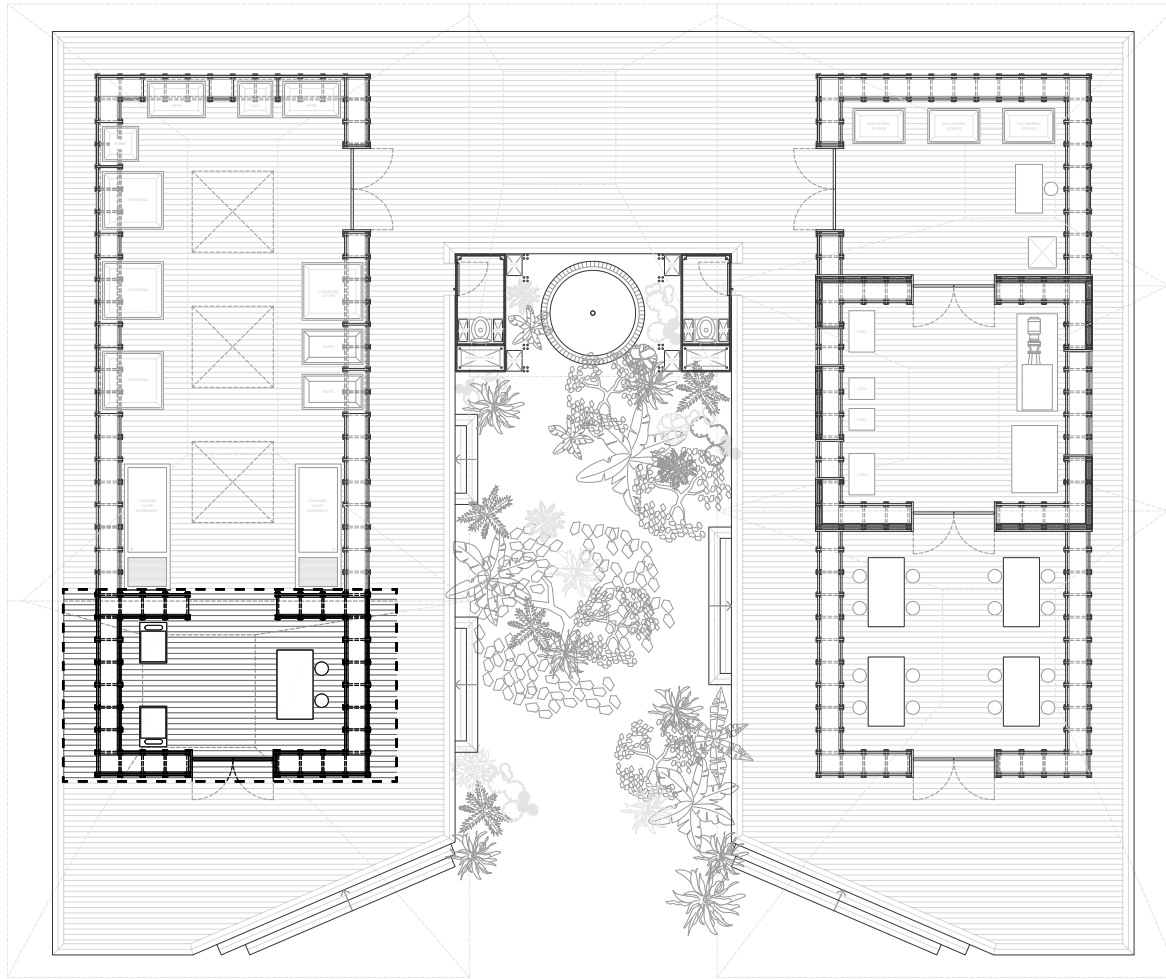


100M²
Bank
Sampah

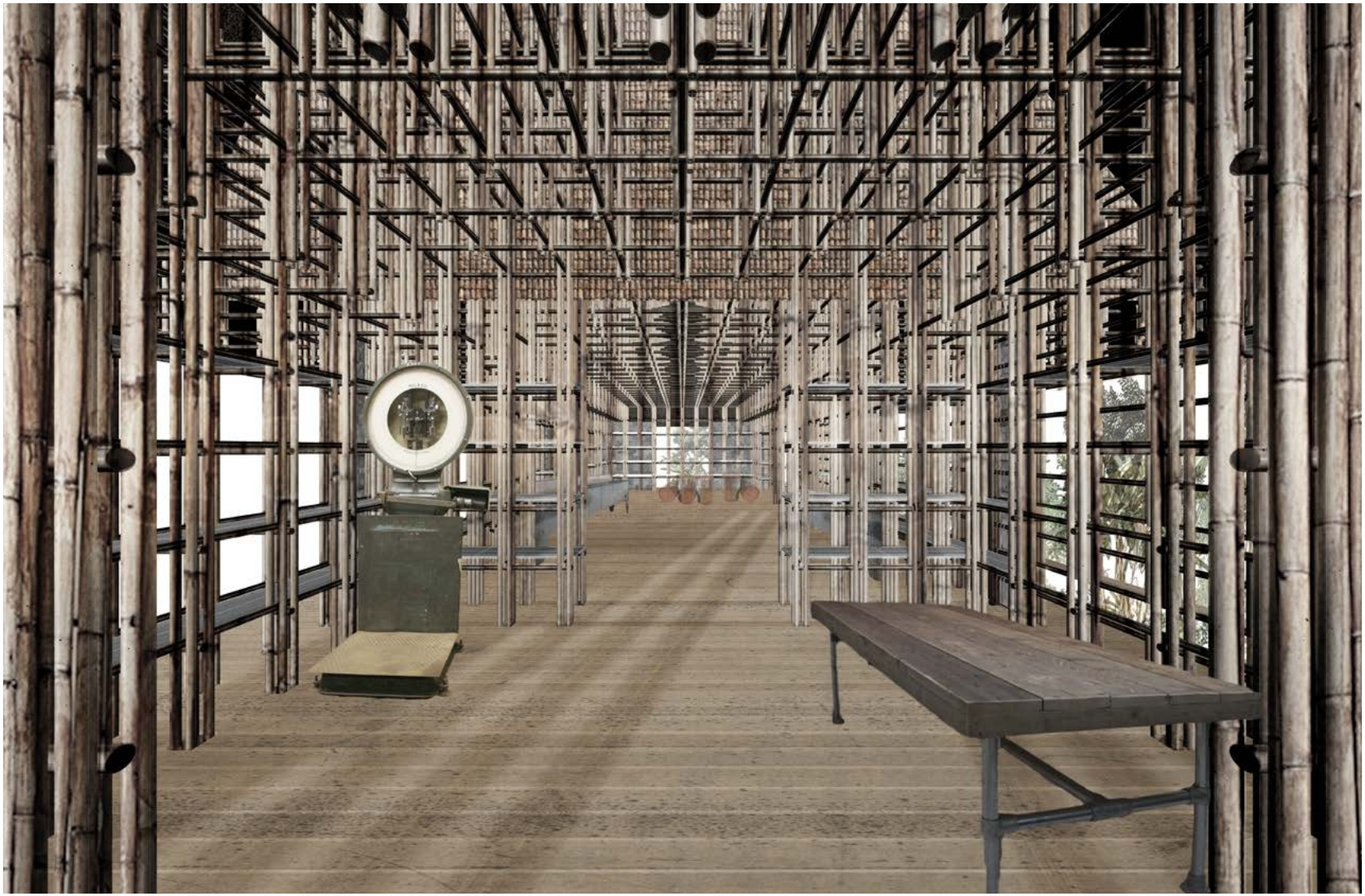
80M²
Perma Culture
Garden

100M²
Factory

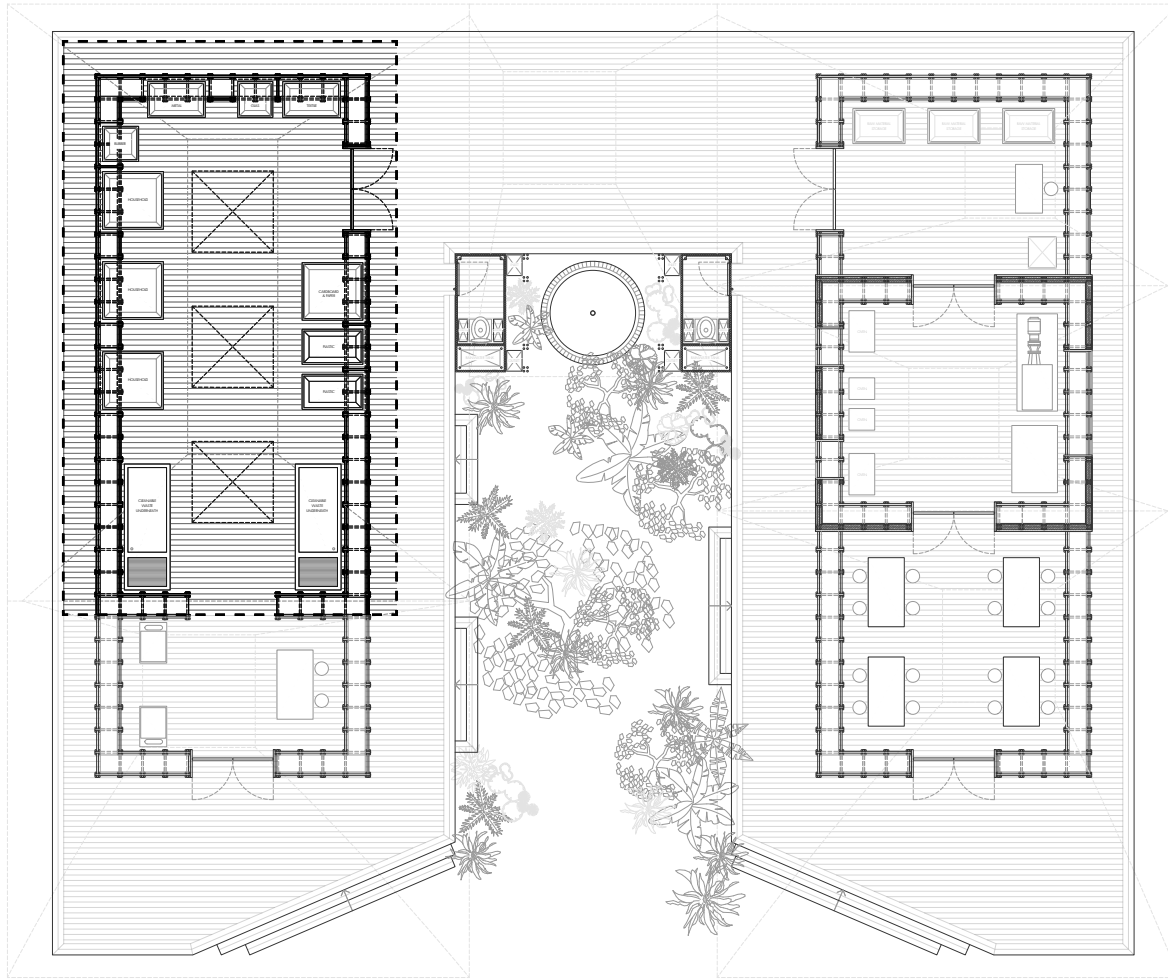
Plan



Reception

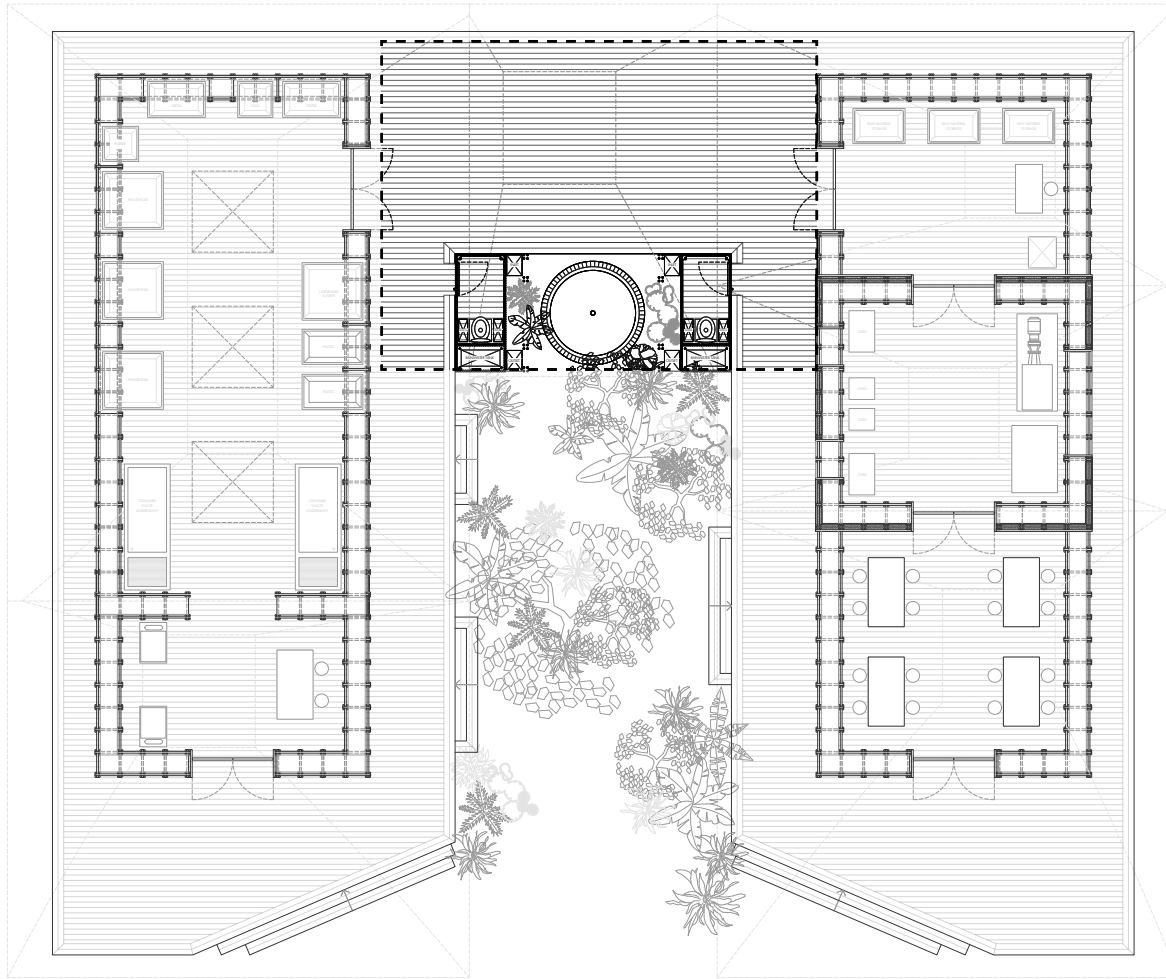


Plan



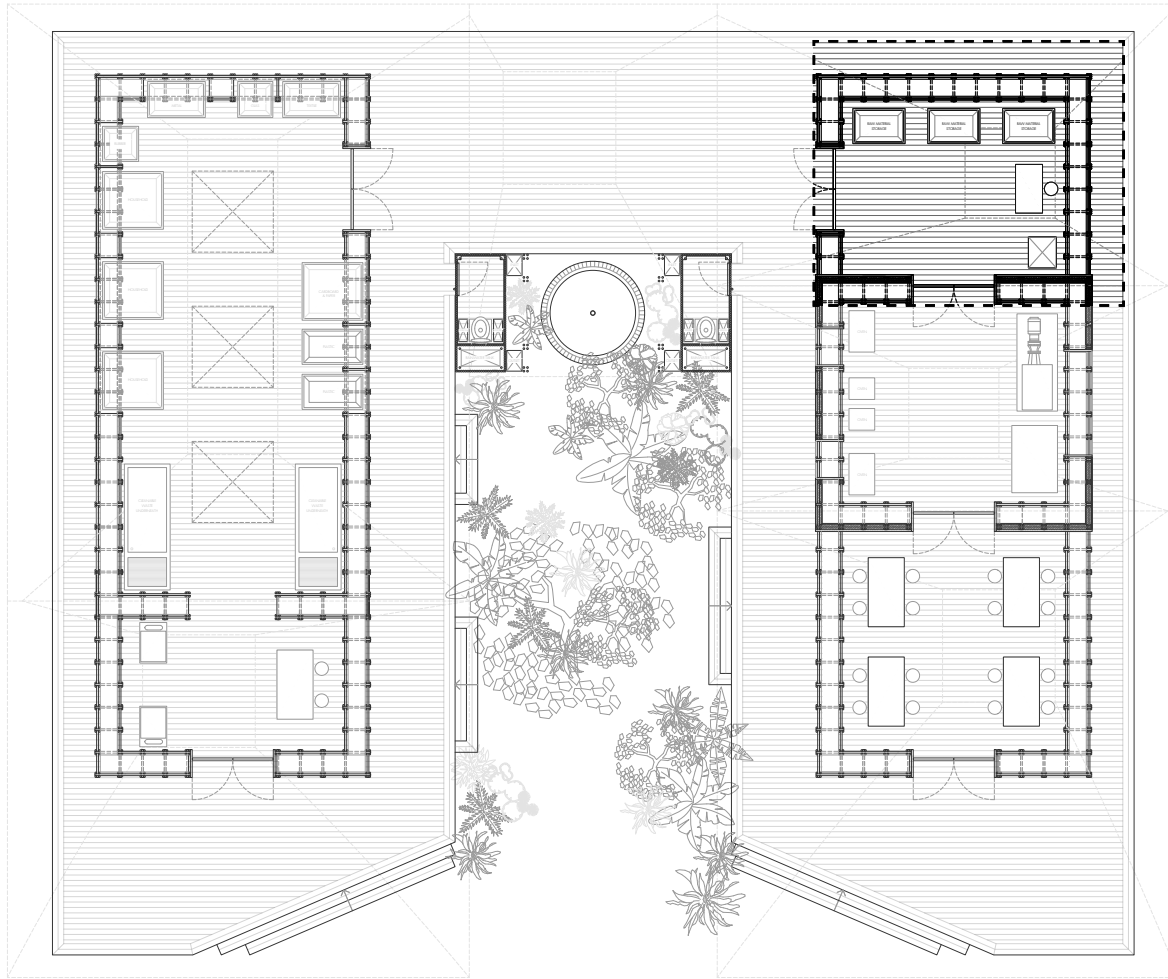
Cleaning & Storage

Plan



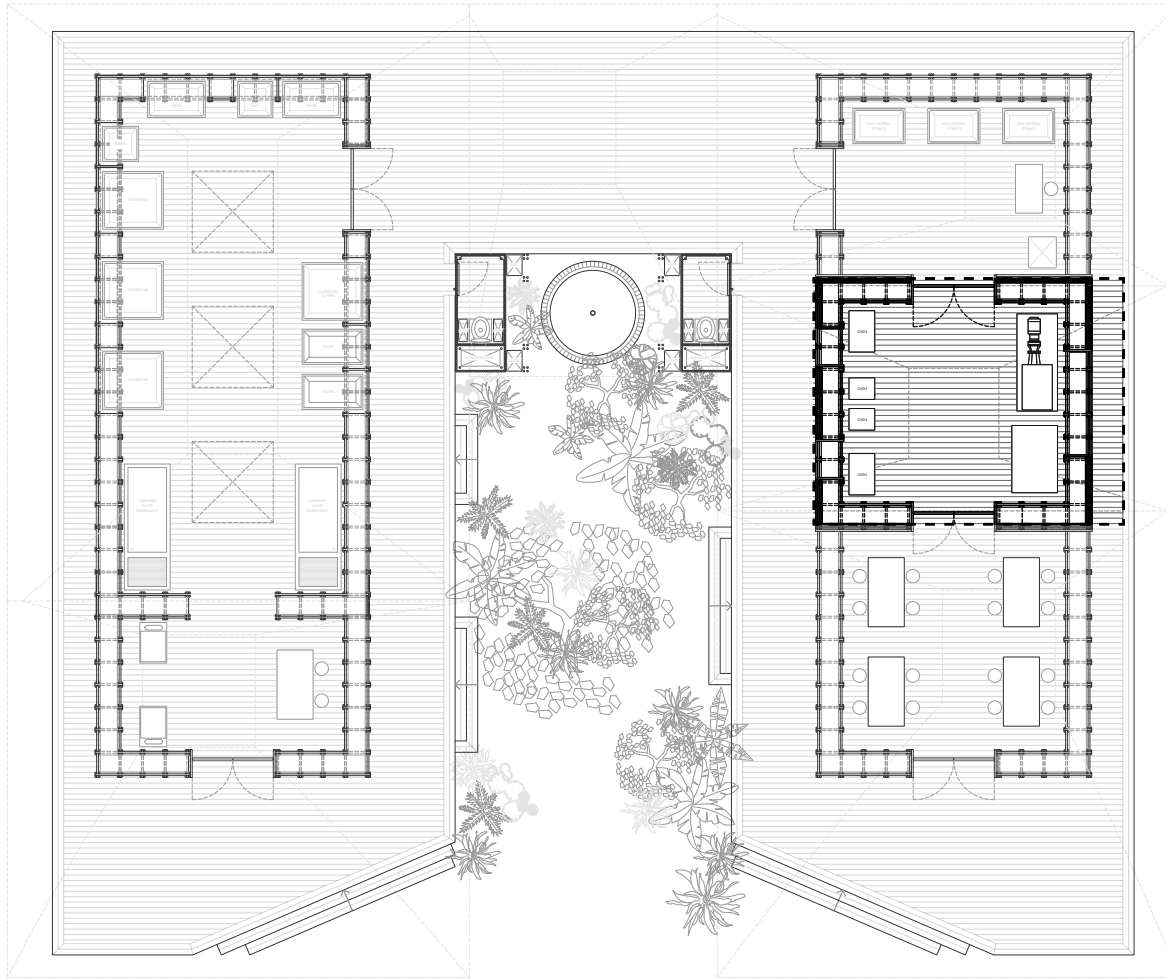
Pick Up & Delivery,
Public Toilet

Plan

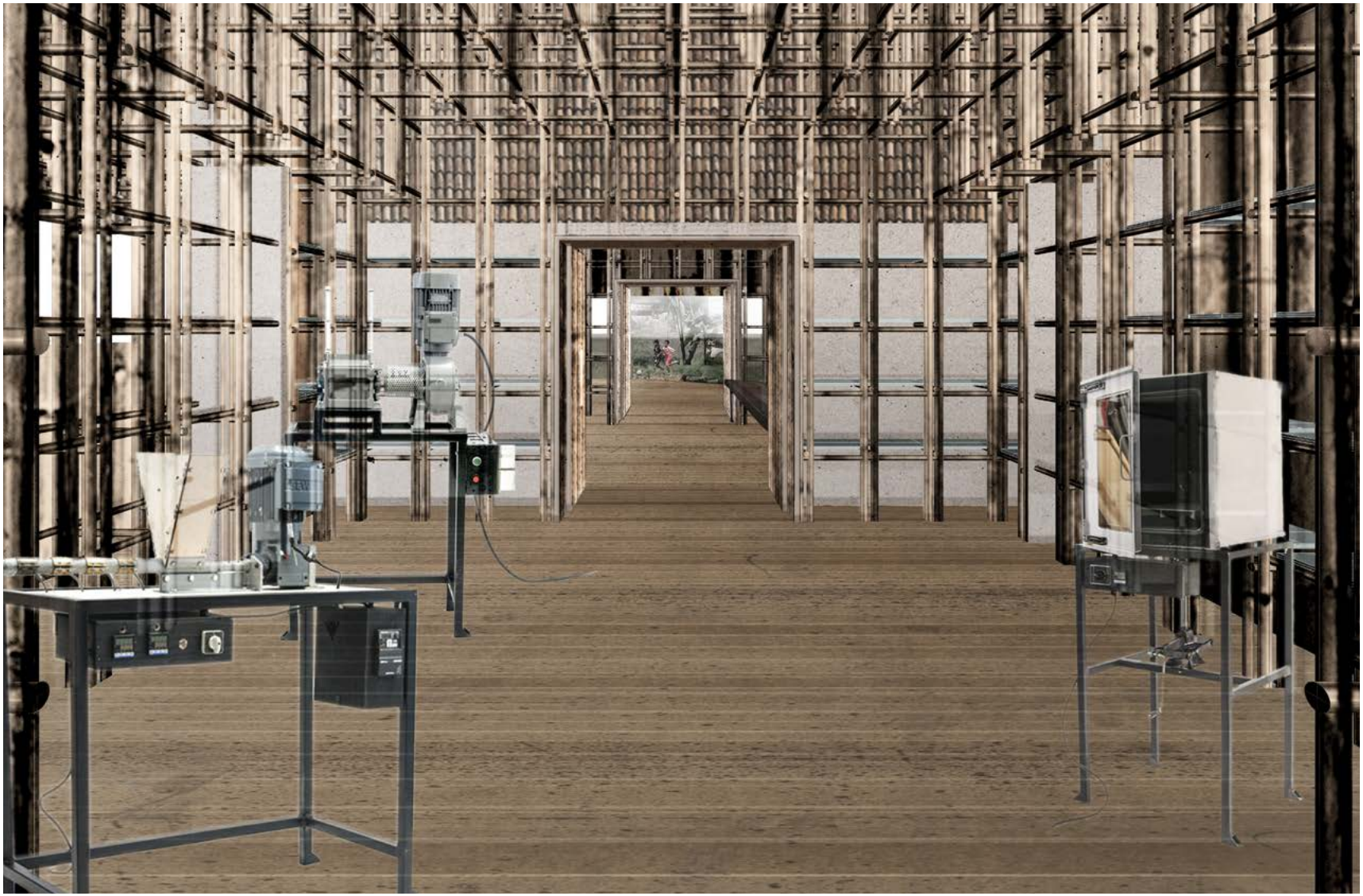


Storage & Trading

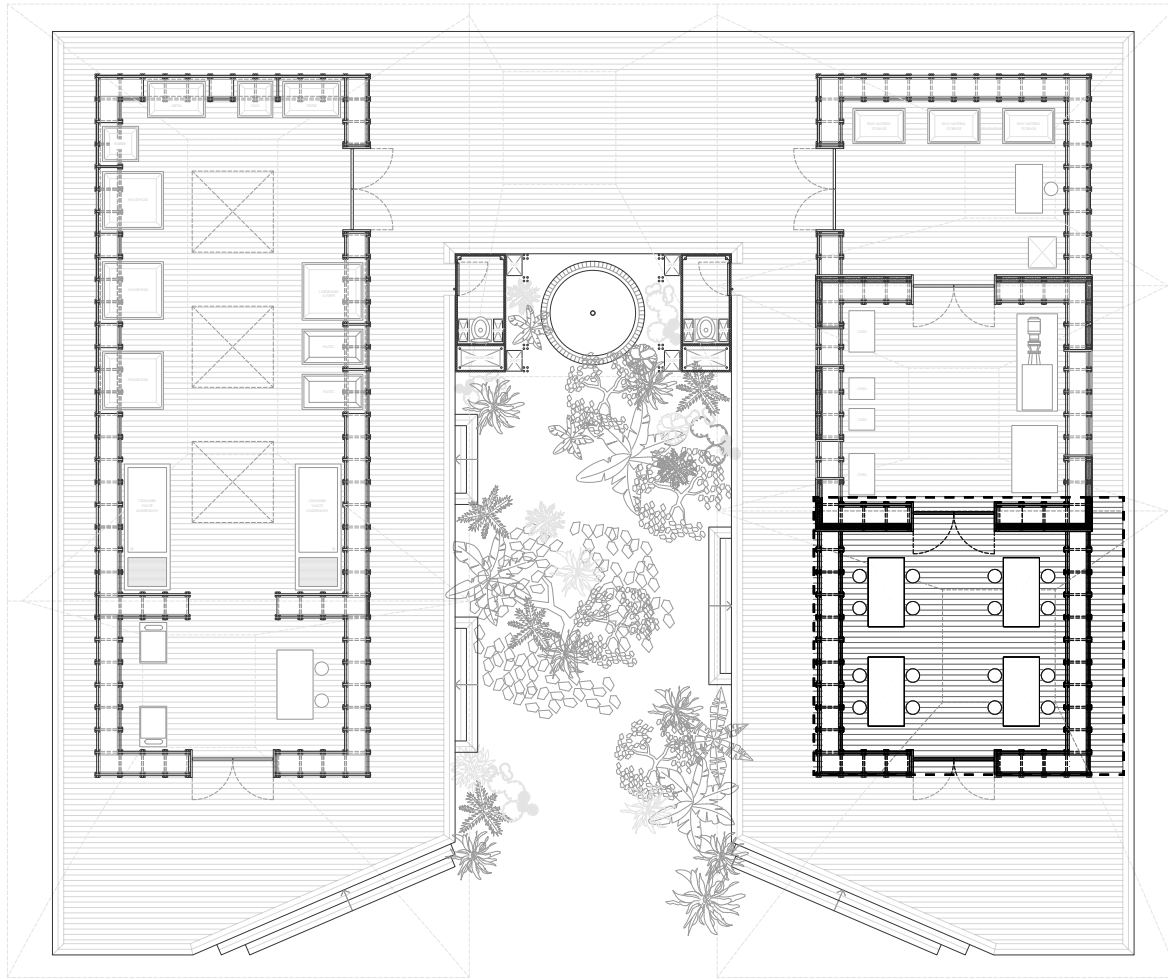
Plan



Machinery Processing

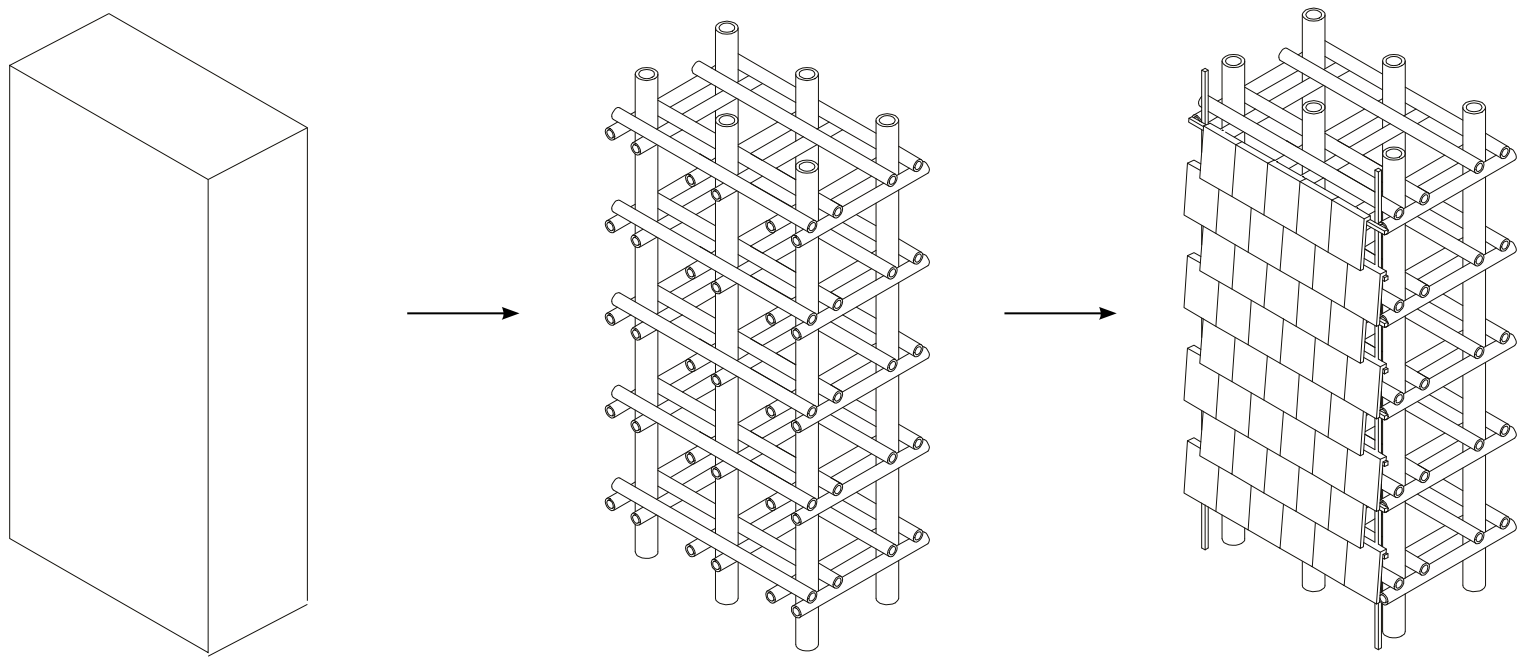


Plan

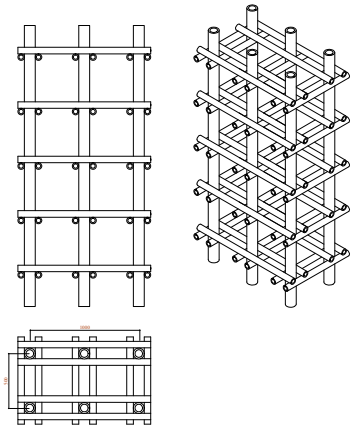


Workshop

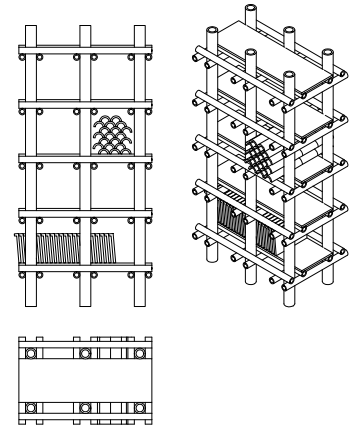
Wall Concept



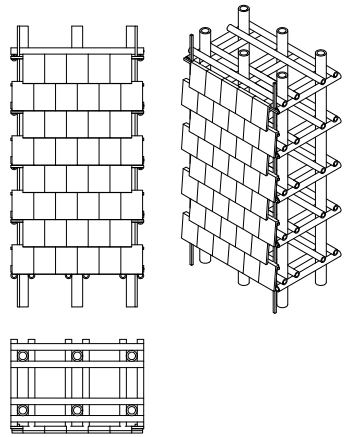
Wall Concept



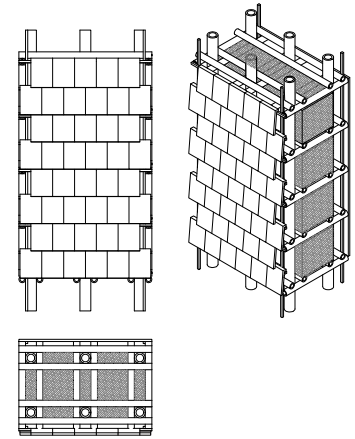
Type 1:
open structure



Type 2:
open structure defining space and
acting as storage unit



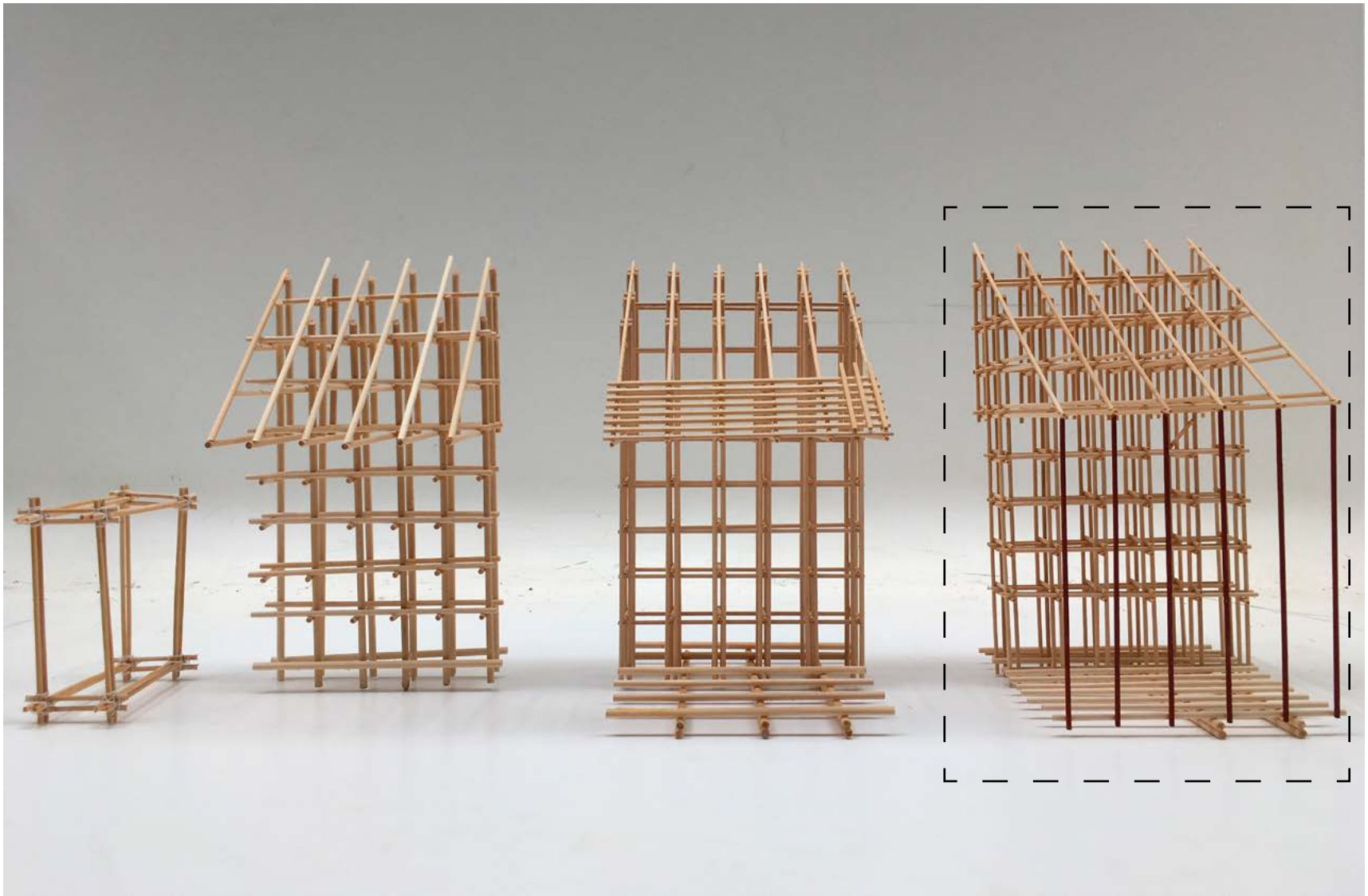
Type 3:
clad but with open, usable
storage from the inside



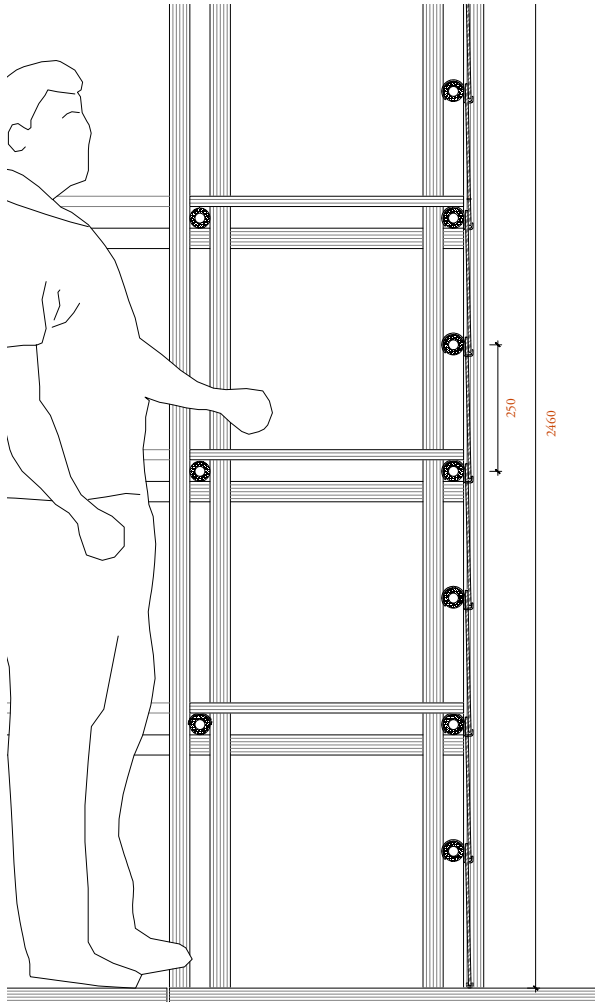
Type 4:
clad & fully insulated

Structure

Structure



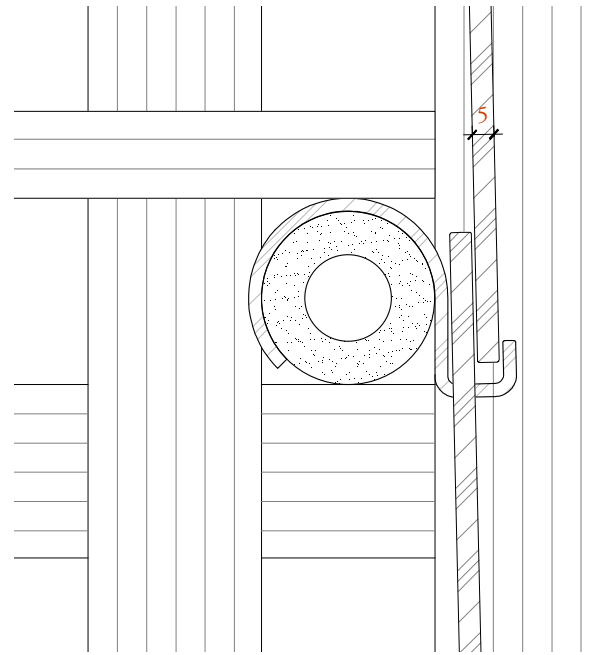
Cladding System



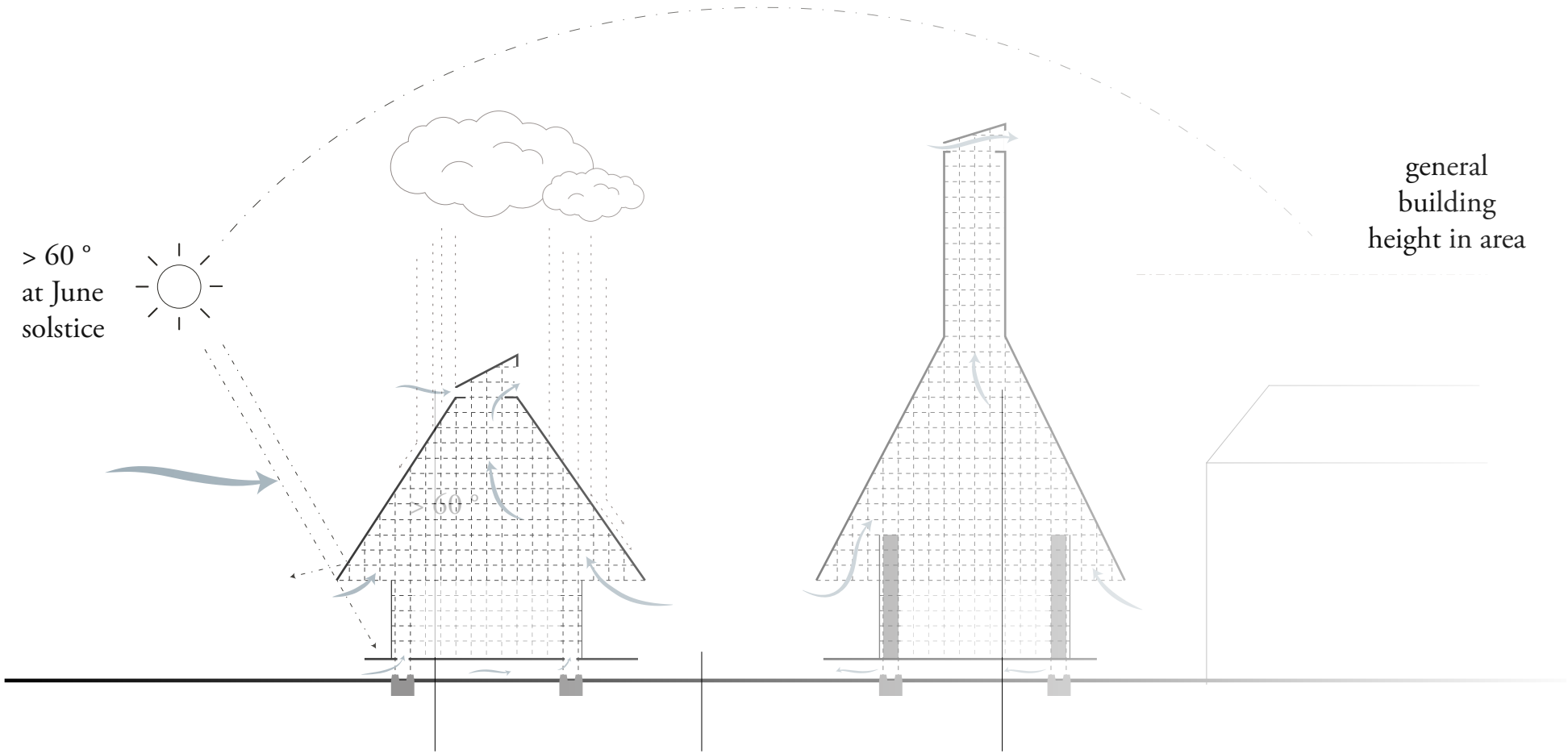
standing hook system

easy assemble - 3D printable

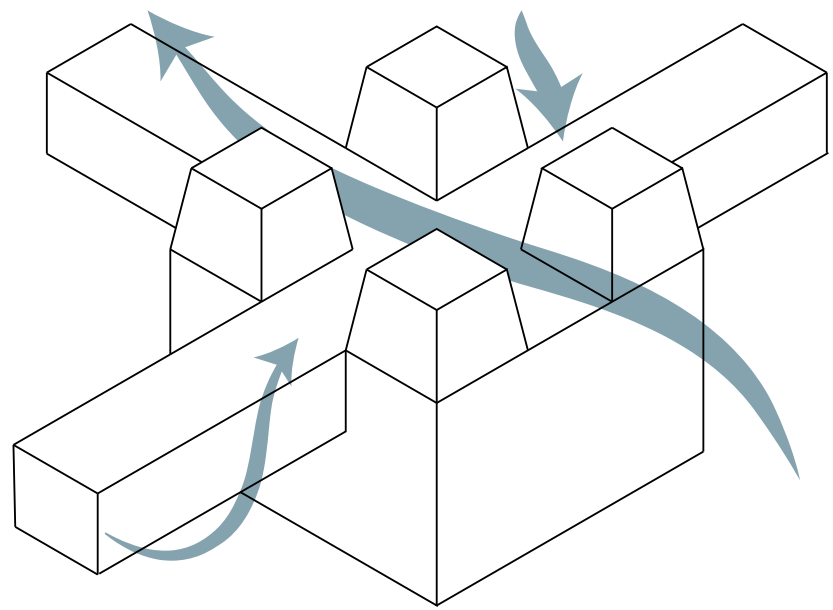
100% waste cladding



Climate Strategy



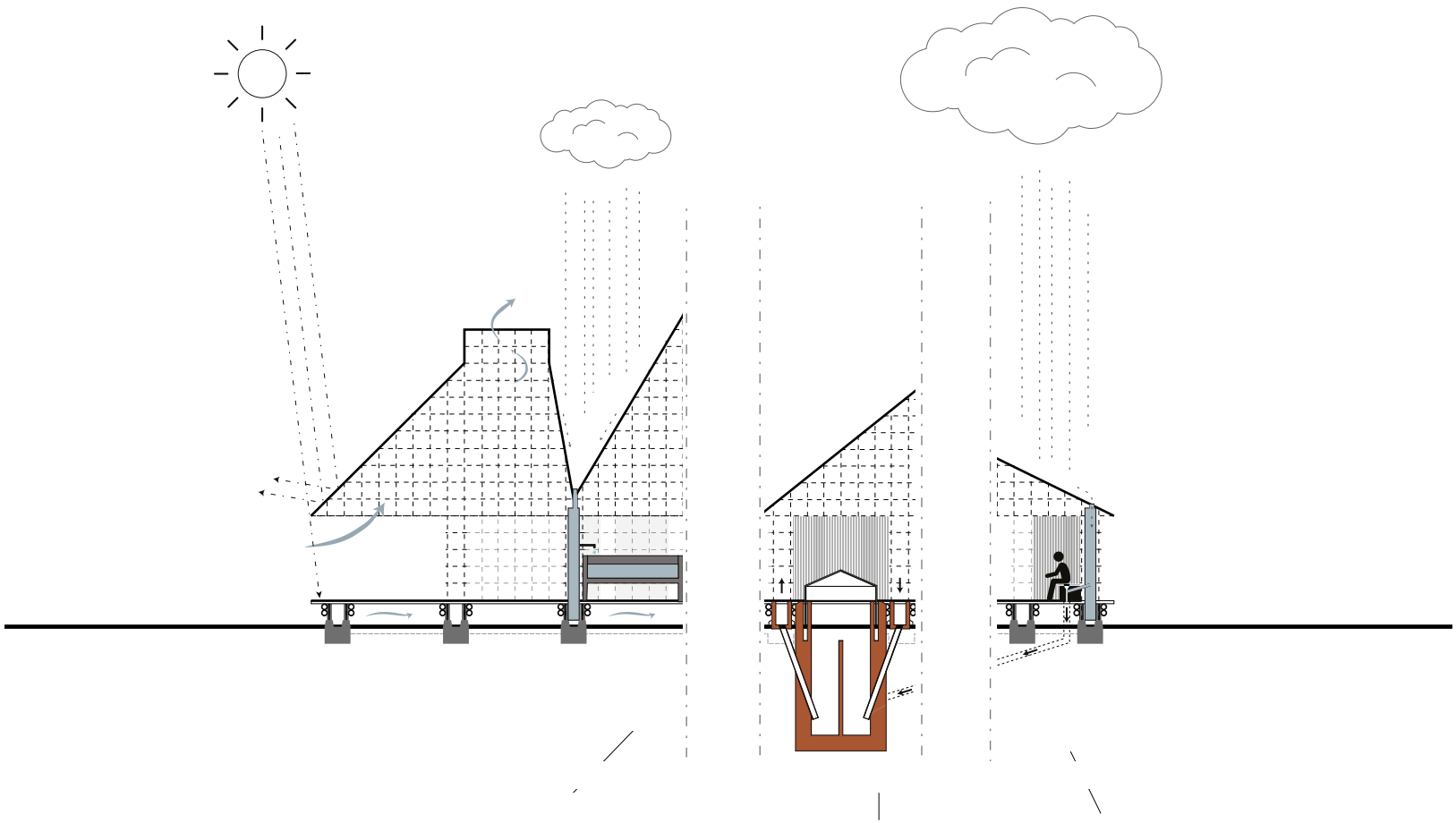
Climate Strategy



ANTI-FLOOD BLOCKAGE

FOUNDATION

Energy Strategy



RAIN WATER HARVESTING

BIOGAS DIGESTER [15m³]

PUBLIC TOILET

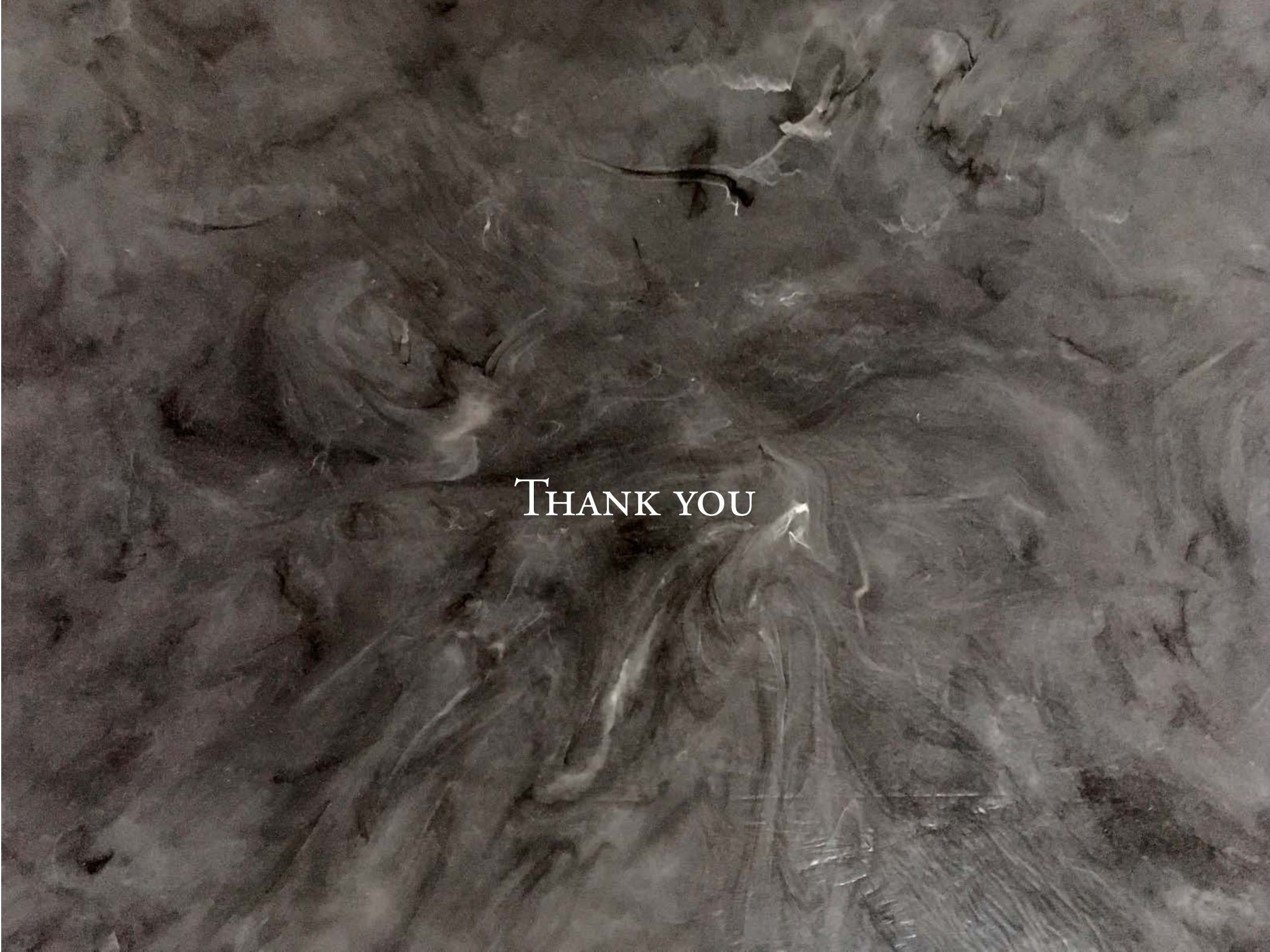
energy requirements for processing machines:

full capacity:
1740kWh/week

cigondewah:
900kWh/week

biogas digester capacity:

produces 2.4x the energy of the facilities consumption based on kampung waste


Thank you

	RW02&12 accumulating waste amounts in ton per week	spatial requirements/ dimensions of waste m^3	spatial requirements in m^2 on the basis of 2 metre height - rounded
Reception & Bank Administration			6
Initial Collecting & Sorting			
Organics	7,90	8,88	5
Plastic	1,60	1,78	1
Glass	0,30	0,83	0,5
Cardboard & Paper	1,30	13,00	7
Textile	1,20	0,86	1
Rubber	0,10	0,01	0,5
Metals	0,20	0,01	0,5
Rest Household Waste	2,60	21,67	11
Total Collection/ Sorting, incl. Admin and 8m^2 workspace			**40**
Processing			
Cleaning			20
Drying			40
Shredding			8
Heating			10
Compressing			10
Cooling			15
Casting			8
Finishing			9
Total Miminum Processing incl. 15m^2 work space			**135**
Trading			
Storing			20
Selling			5
Total Trading incl. 5m^2 work space			**30**
TOTAL			**205**

	Bandung (2011)		**Cigondewah RW02&12 (2011)**	
	in ton	in m^3	**in ton**	**in m^3**
day/cap.	0,0007	0,0019	**0,0007**	**0,0019**
day	1.800	4.952	**2**	**6**
week	12.601	34.664	**15**	**41**
month	54.760	150.639	**66**	**179**
year	657.051	1.807.473	**792**	**2.151**

Waste Composition	Bandung		**Cigondewah RW02&12**	
	ton	%	**ton**	**%**
Organic	6539,9	51,9	**7,9**	**51,9**
Inorganic	3893,7	30,9	**4,7**	**30,9**
Plastic	1524,7	12,1	**1,6**	**10,7**
Glass	453,6	3,6	**0,3**	**2,3**
Paper	1234,9	9,8	**1,3**	**8,4**
Textiles	441,0	3,5	**1,2**	**8,0**
Rubber	75,6	0,6	**0,1**	**0,5**
Metals	163,8	1,3	**0,2**	**1,0**
Other	2167,4	17,2	**2,6**	**17,2**
Total per week (in ton)	12.601,0	100,0	**15,2**	**100,0**

cigondewah has 7900kg organic waste weekly - 15.8m3 (without human feces)
1m3 gas is approx kwh calorific energy=2kWh usable electricity

15m3 = 1200m3 gas= 2400 kwh usable electricity

1200m3 gas produced weekly - 170m3 per day = 5,5m3 powers 2,4 times the energy consumption of my facility

extruder:
produces 120-180kg/h and uses 31kwh for that
selfbuilt extruder: 200-400€ (2.8-5.7mil rp)
weekly energy consumption: full capacity: 960kwH; cigondewah waste: 279kwh

shredder:
produces 100kg/h at 7.5-15kWh
bought: 920€ - 13mil rp
weekly energy consumption: full capacity: 330kwH; cigondewah waste: 170kwh

compression oven:
produces ? at approx 2.5kWh per oven (need 6; 2 big (double) 2 small)= 20kWh
selfbuilt at 120€ - 1.7mil rp
weekly energy consumption: full capacity: 450kwH; cigondewah waste: 450kwh

TOTAL:

with machines and cigondewah capacity together i can produce approx 1000 tiles per week - 1 roof