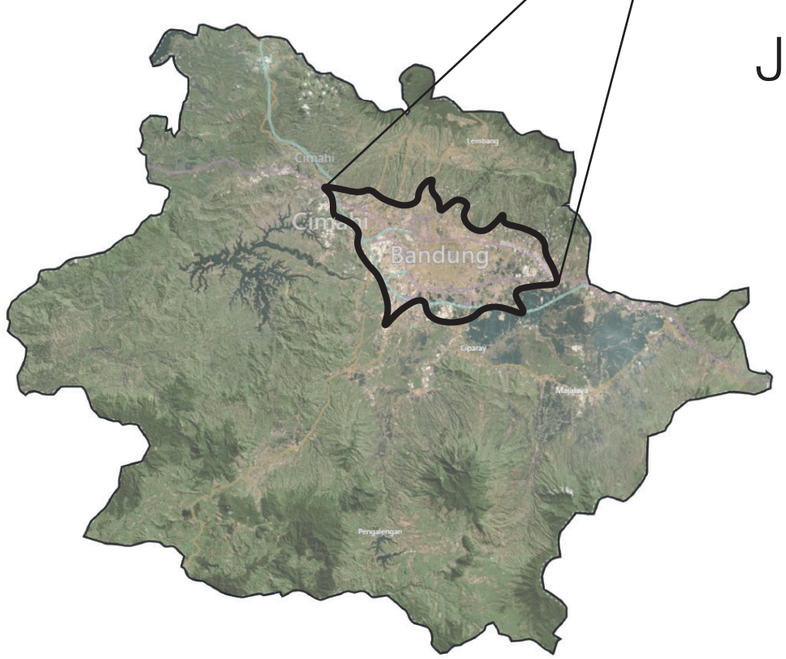
Kampung Circularity

Indonesia

Java



Bandung Municipality

2.5 million people

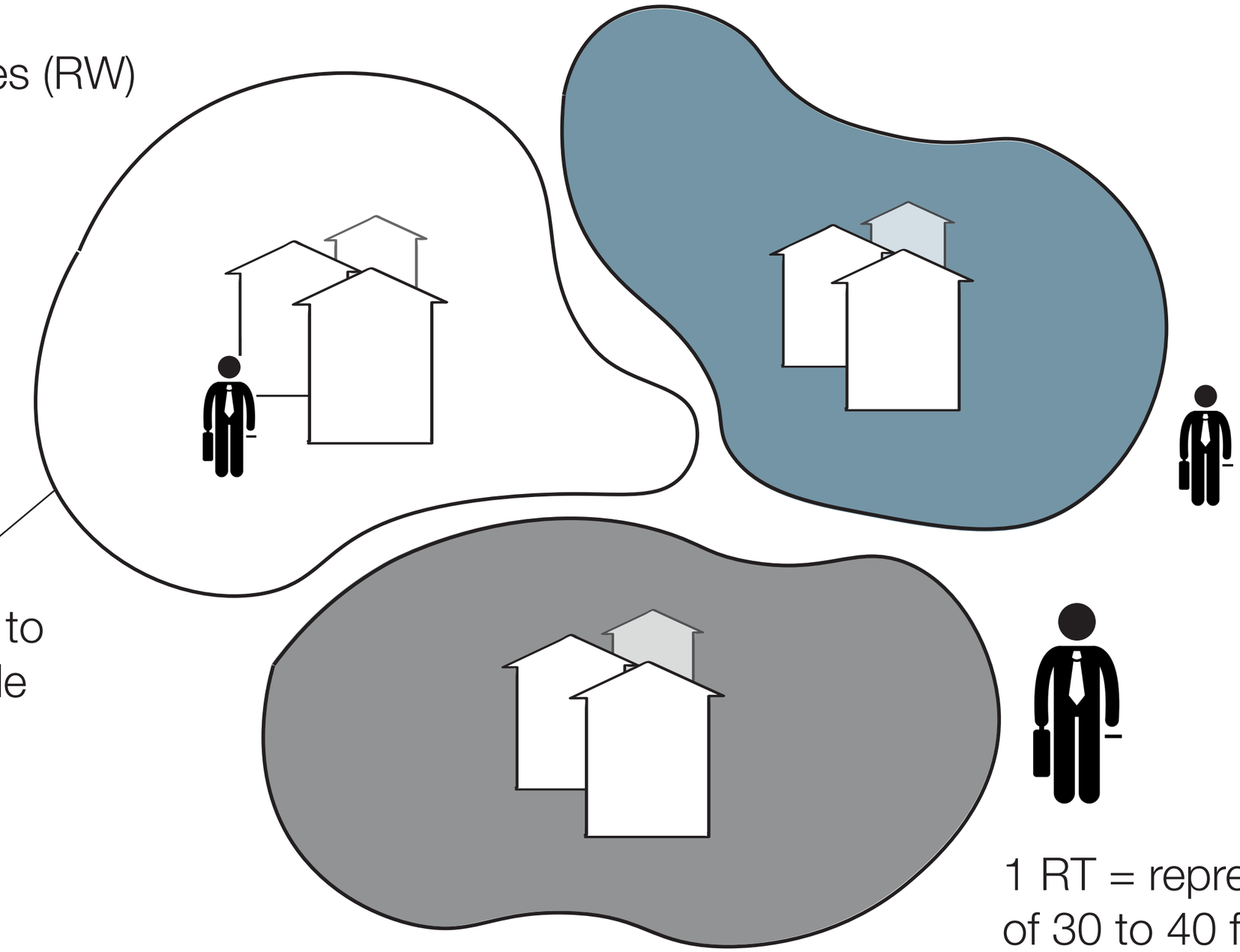
3rd city of Indonesia


KENDARAAN
GELIS
HARMONIS
NURUL&CHAIRUL


RGA YANGBAIK
ALUMEMBUANG
SAMPAH -
ATEMPATNYA

The Kampung system

Small villages (RW)



1 RW = up to
2000 people

1 RT = representative
of 30 to 40 families

Is it possible to build a circular kampung?

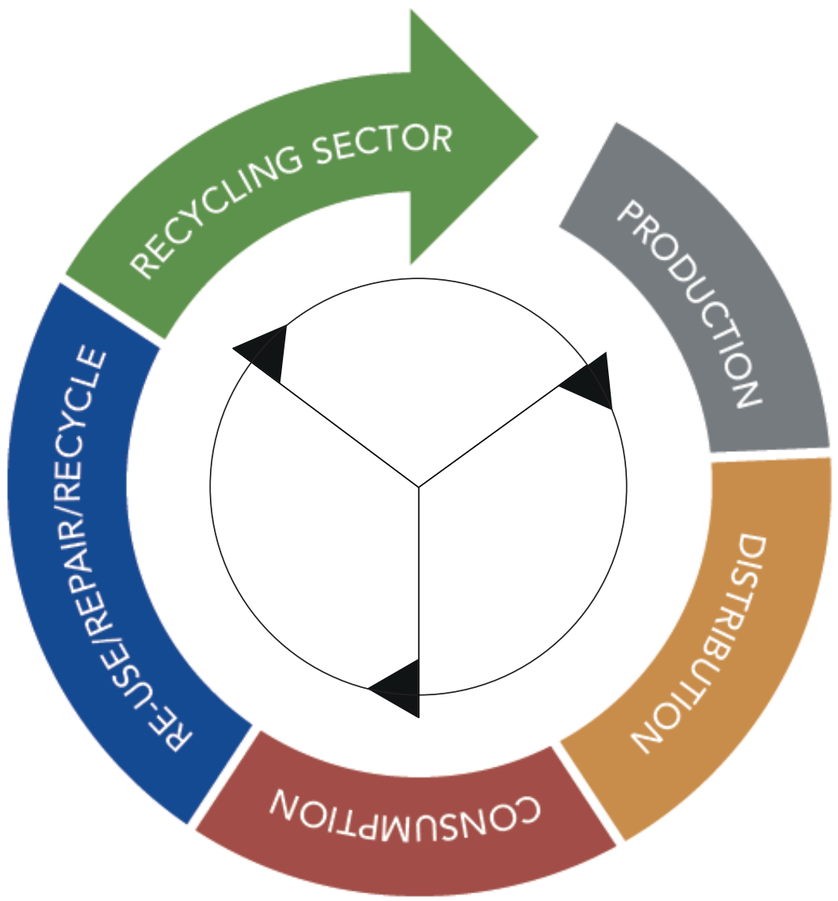
Historical use and reuse of materials

Kampung Naga
Traditional village

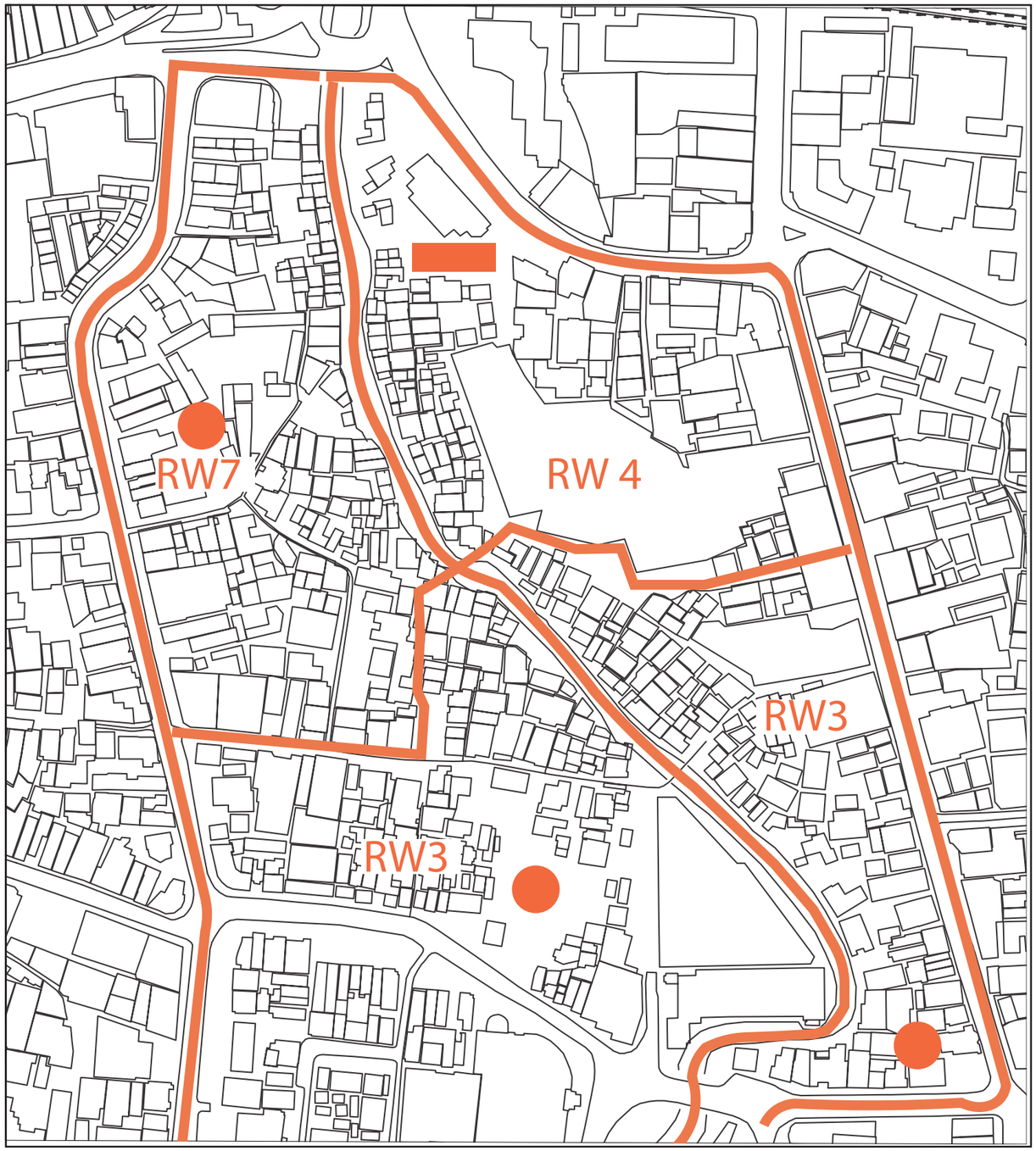
Succesful examples reuse

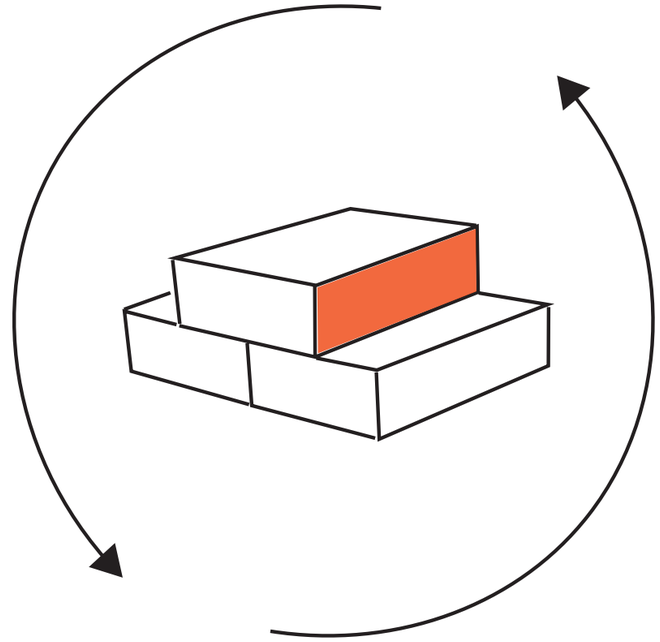
Unsuccesful examples reuse

Towards a circular system



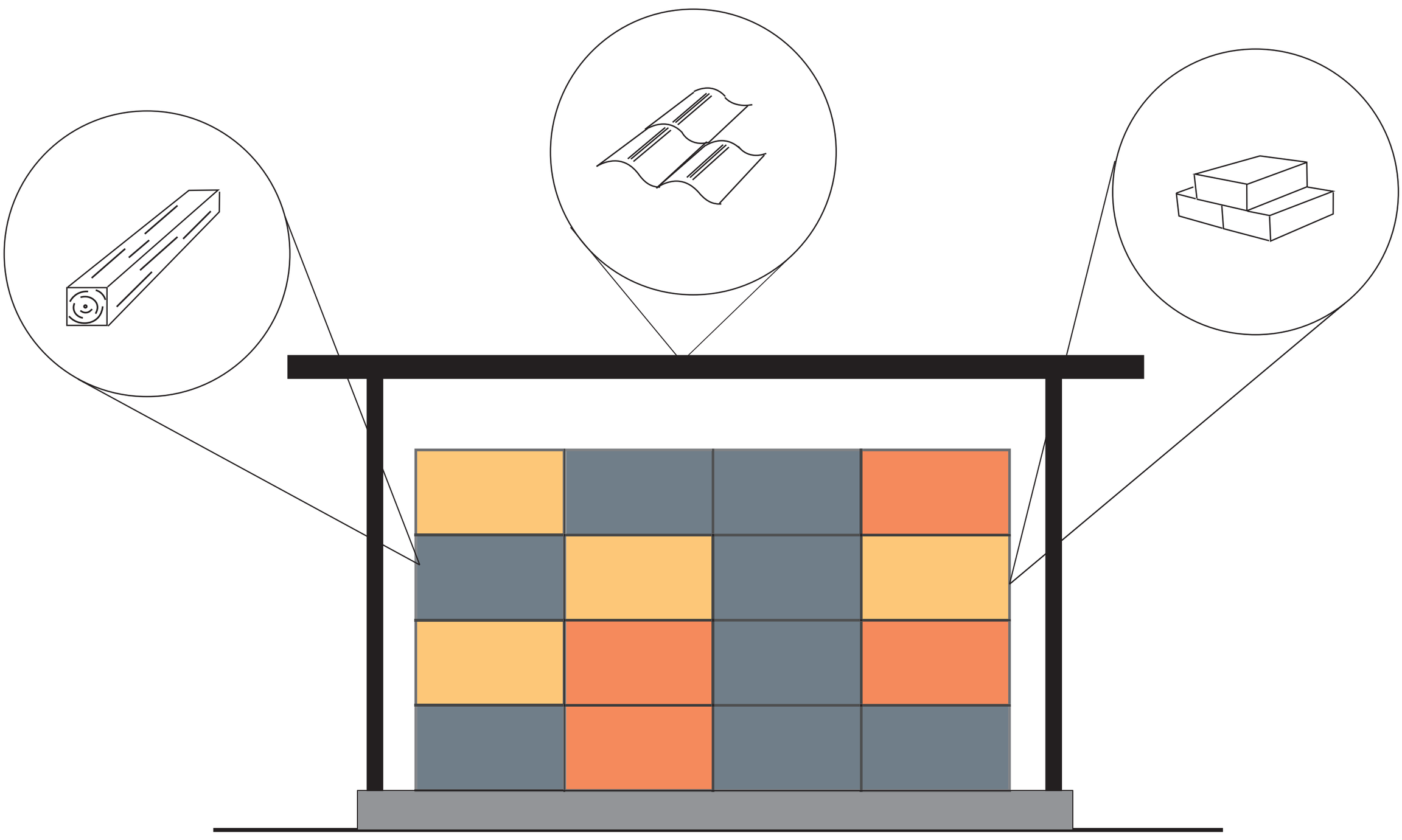
Strategy - Building Material Lab





Building material labs

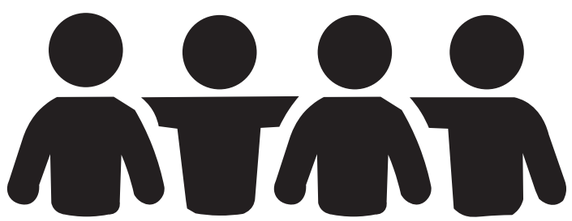
Project location



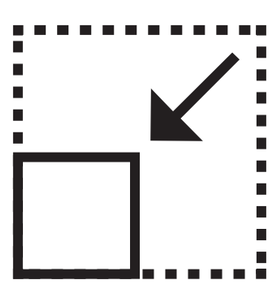
B ank Bahan Bangunan

Why in the kampung?

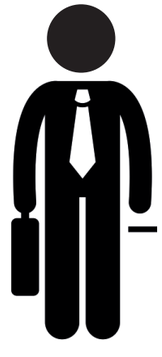
- Tight knit communities



- Small scale

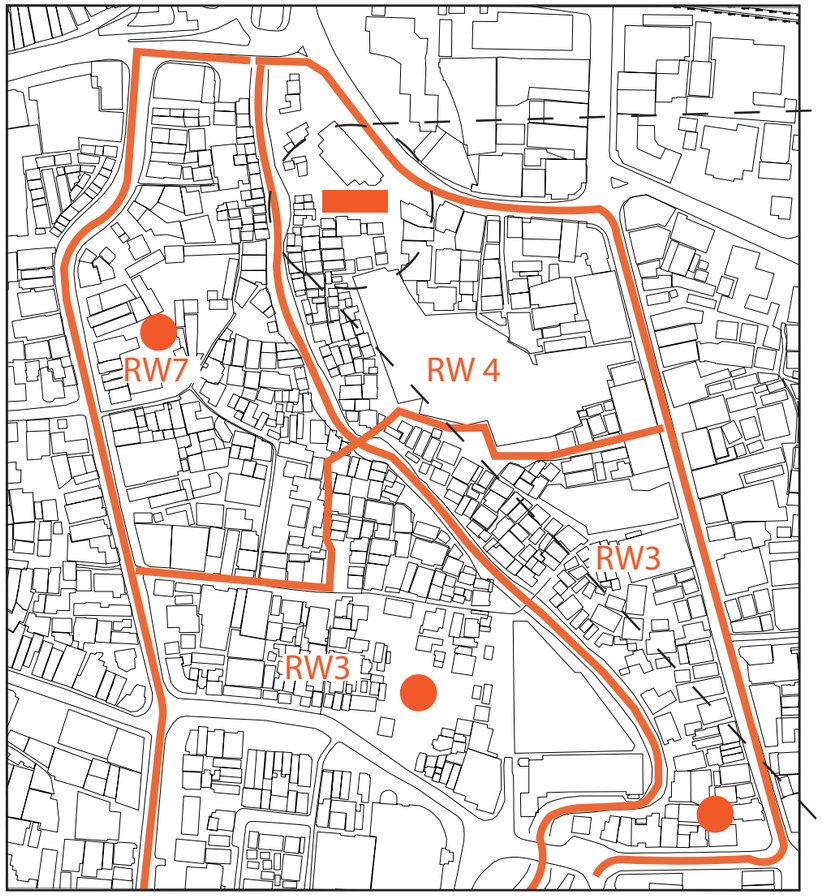


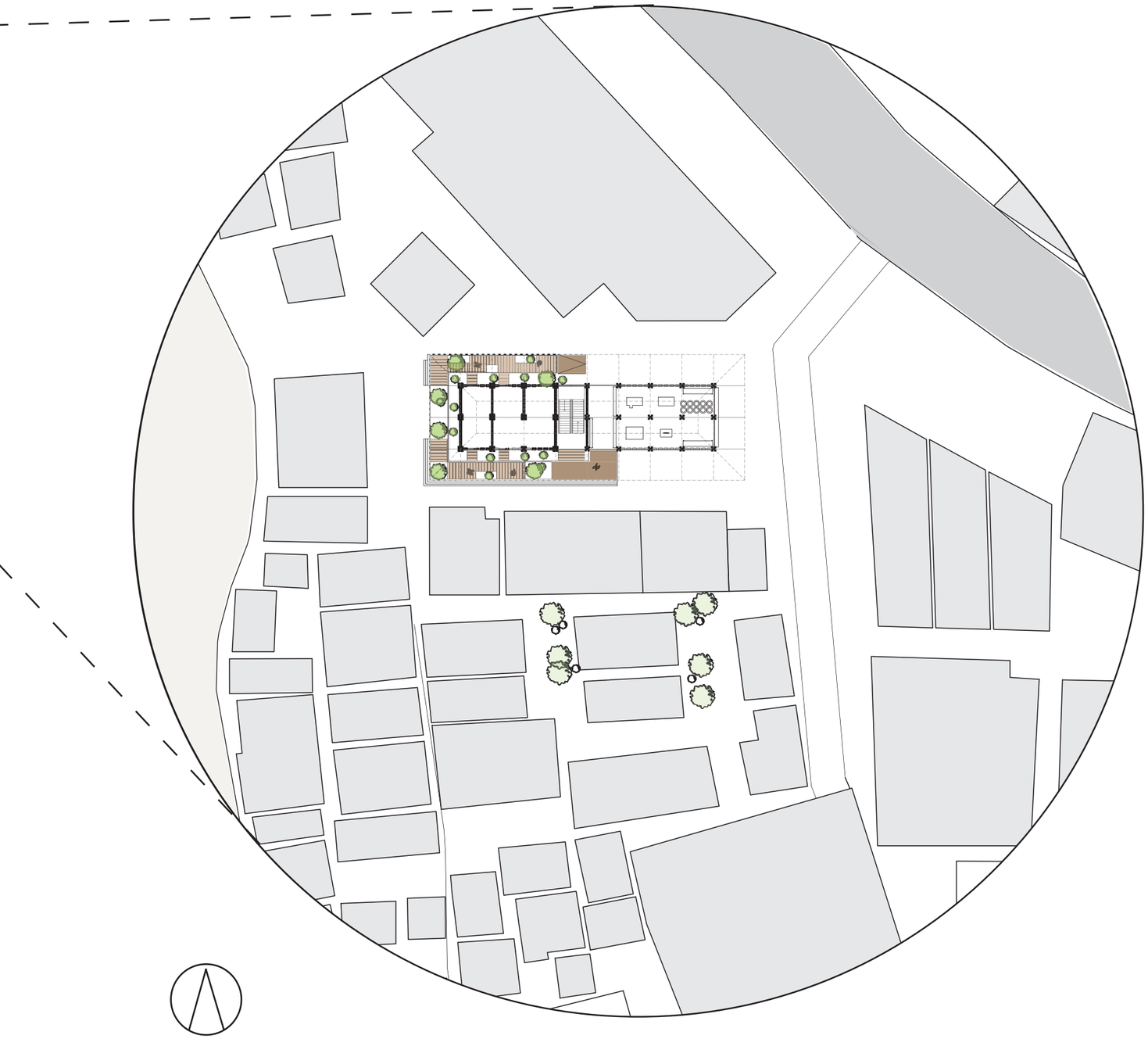
- Huge Entrepeneurship



Meeting the Entrepeuneurs from the kampung

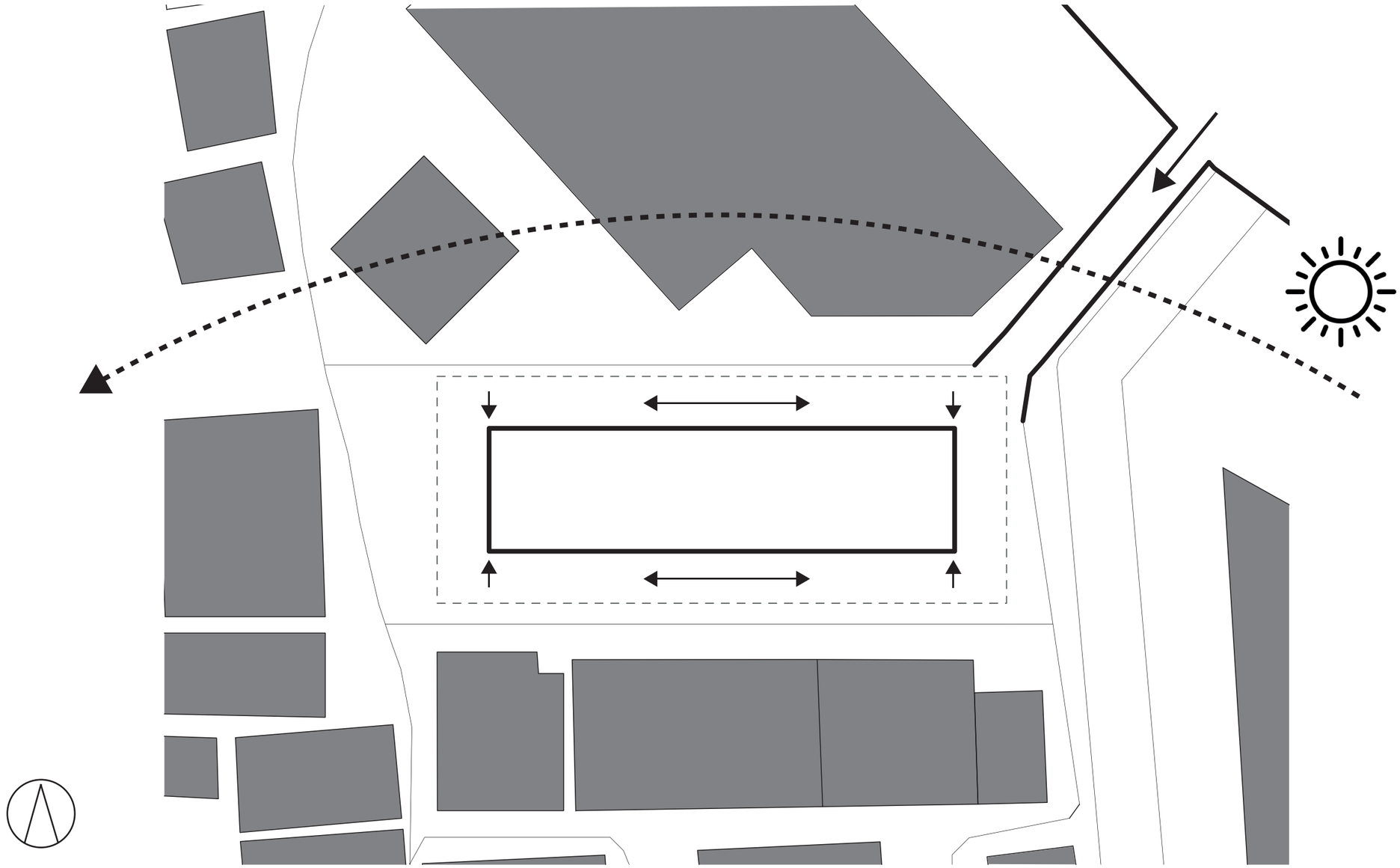
Location



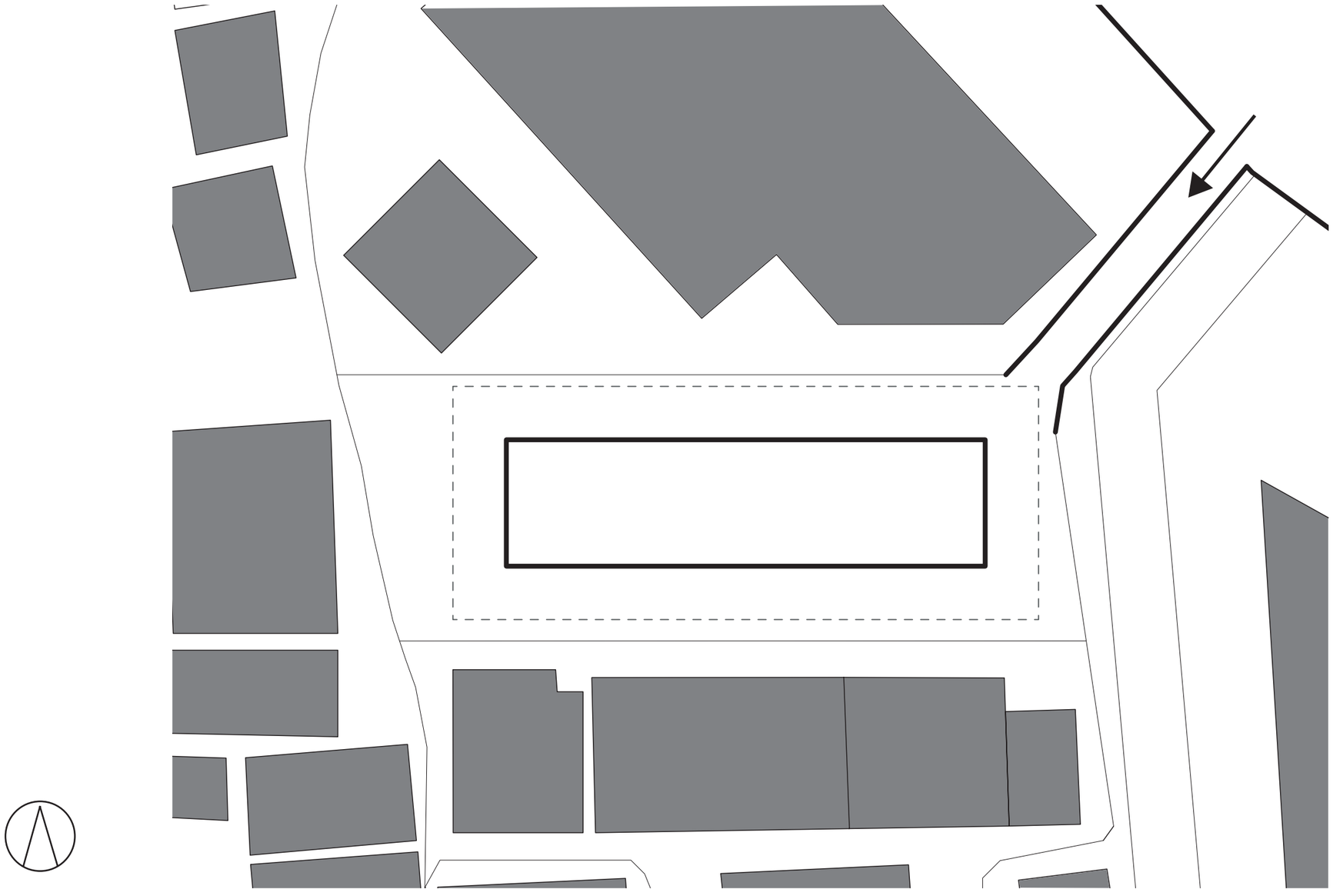



BAKSO
NASI GORENG
REMPAH
ABANG
GOLD'S
GYM
JUSTUS STEAK HOUSE

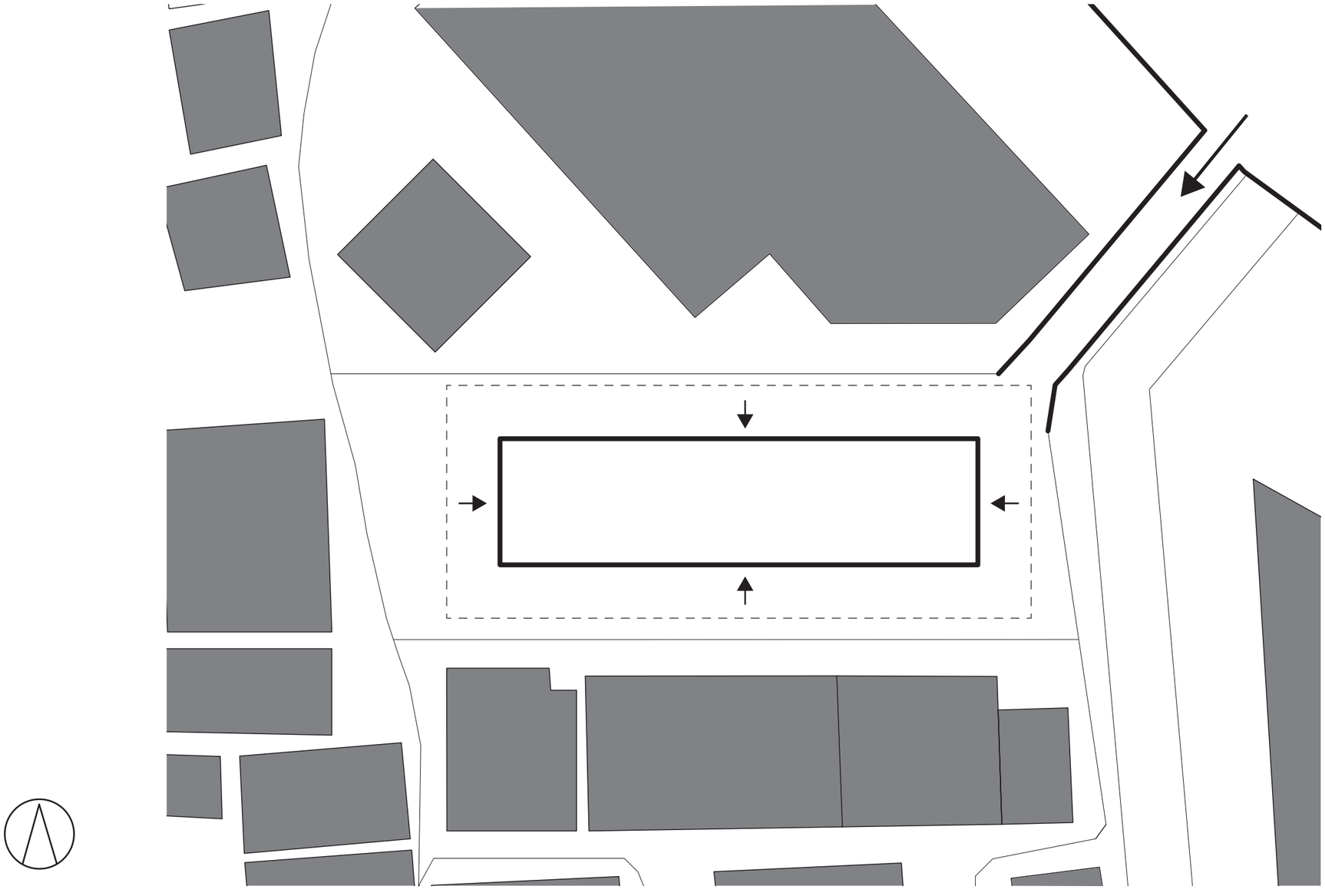
Design - climate



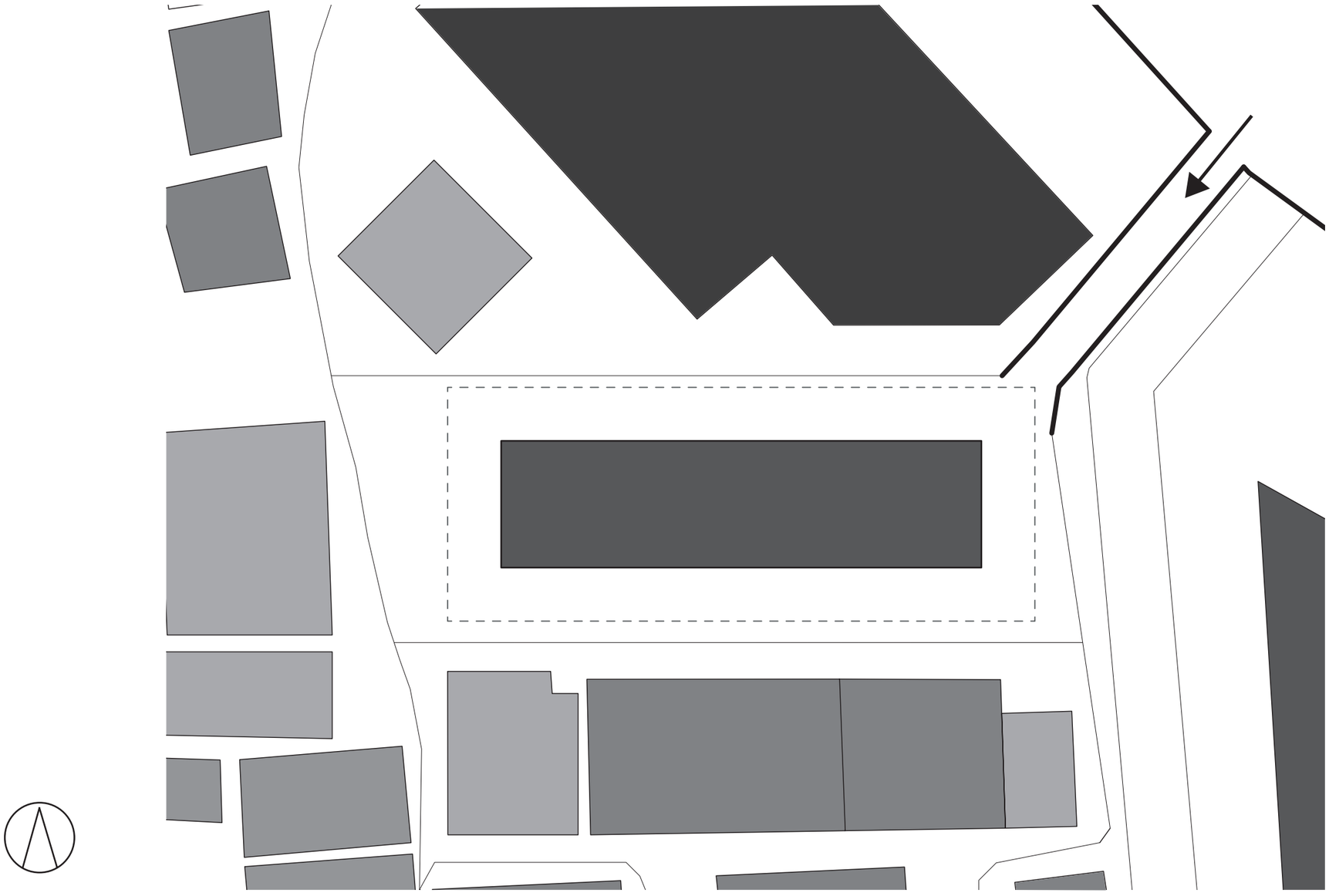
Design - accessibility



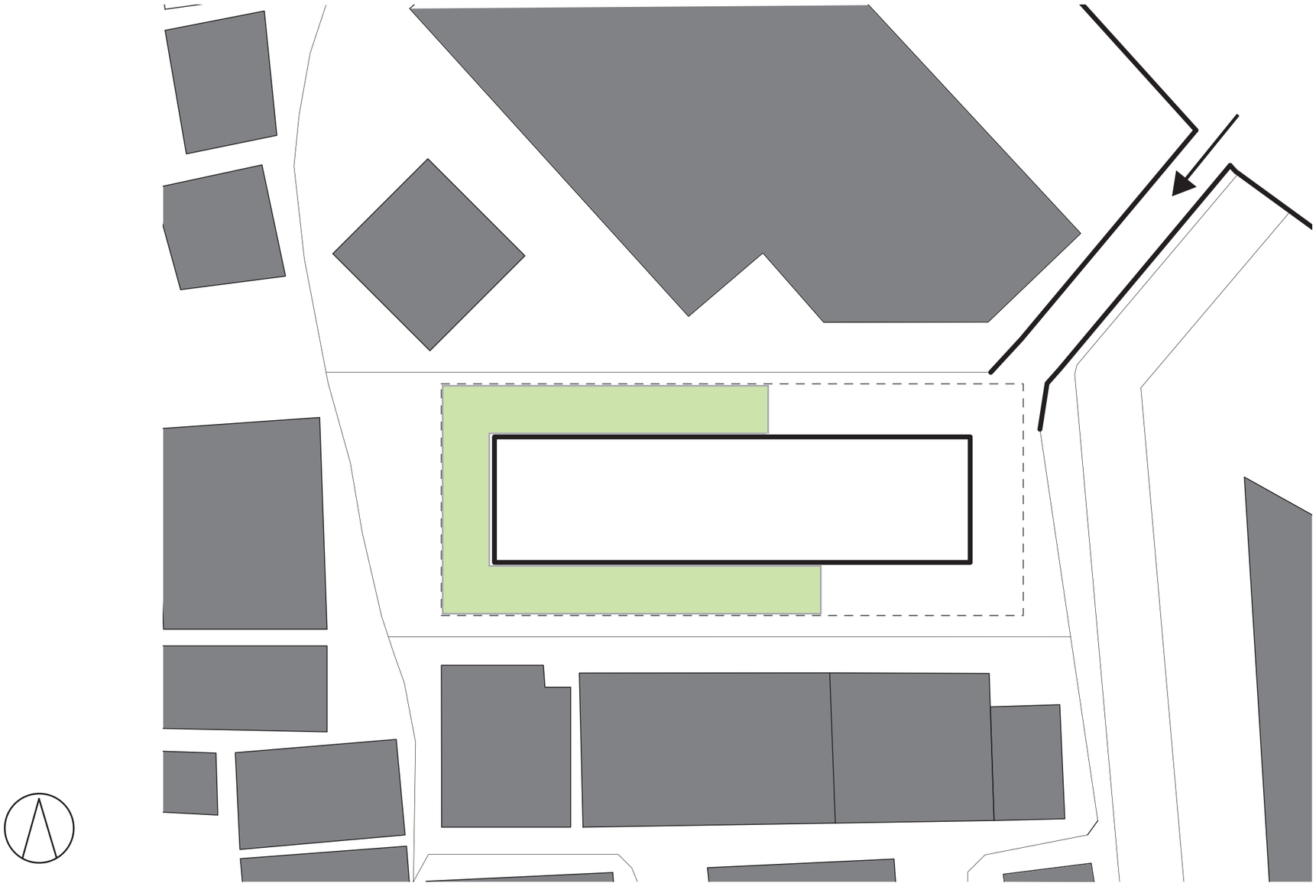
Design - distance kept with existing



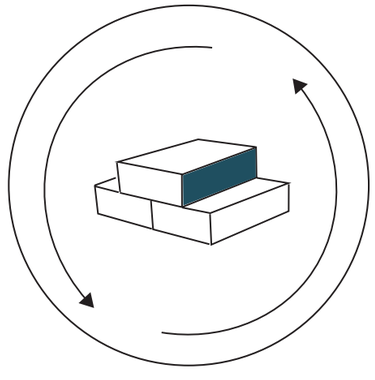
Design - building height



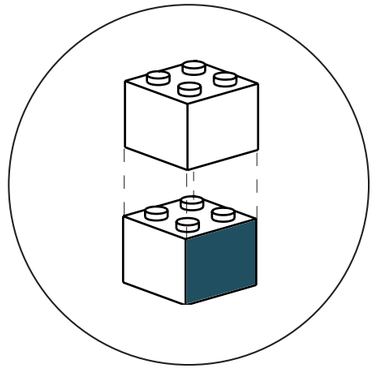
Design - public green space



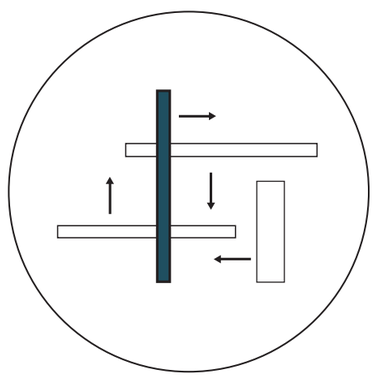
Base principles for circular building



Materialisation



Design for disassembly



Flexibility

RESEARCH QUESTION

What are the building material flows that are at work within urban kampung areas and what is their potential within the existing systems to increase reuse and upcycling?

Material flow analysis - Bandung

Concrete
Timber
Clay Brick
Asbestos
Rest

Building materials sourced from all over Indonesia distributed to small material shops

> 210 billion kg/year

Sample size of 247 dwellings

7.720 billion kg (building stock)

Building Material Waste 210 billion kg/year

Concrete 144.6 billion kg/year

Timber 15 billion kg/year

Clay Brick 41 billion kg/year

Clay roof tiles 2 billion kg/year

Rest 7 billion kg/year

Indonesia

System Boundary Bandung City

Landfills/Inceneration

Site observations

Simple house

- Brick base structure
- Tmber top construction
- Corrugated sheets as roof and infill

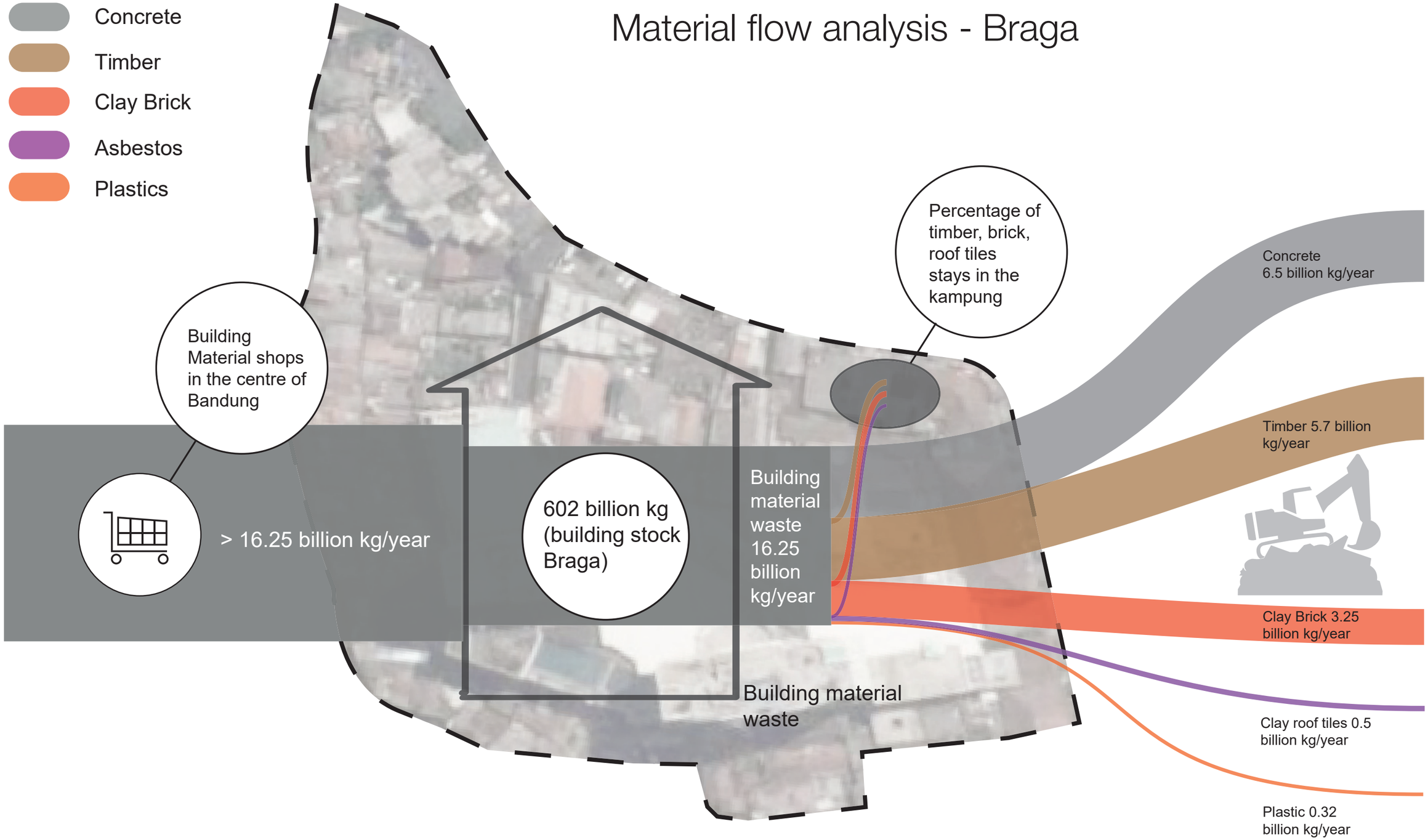
Medium house

- Concrete base structure
- Timber top construction
- Corrugated sheets as roof
- Infill of brick and corrga ted sheets

Luxurious house

- Stone base construction
- Tmber top construction
- Clay roof tile roof
- Brick infill

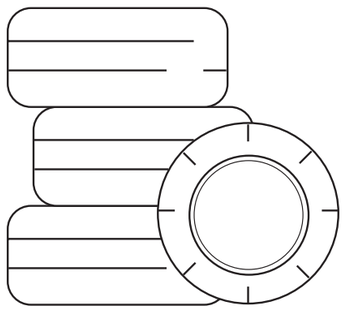
Material flow analysis - Braga

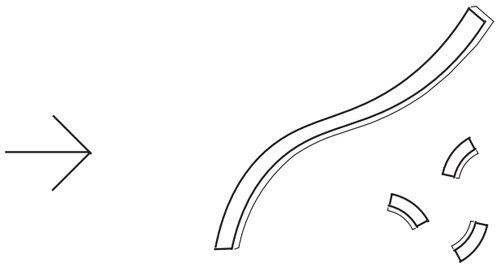


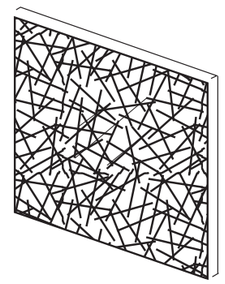
Bandung City

System Boundary kampung Braga

Landfills/inceneration





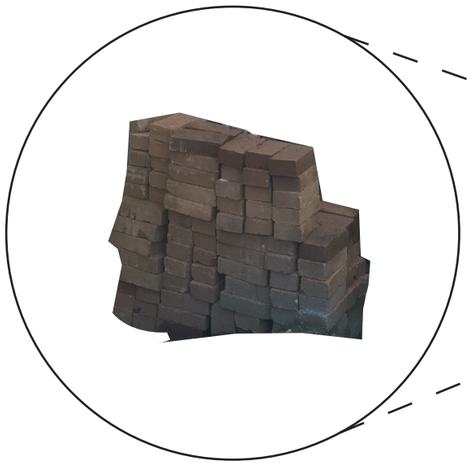


Local Tire Industry

Tire waste

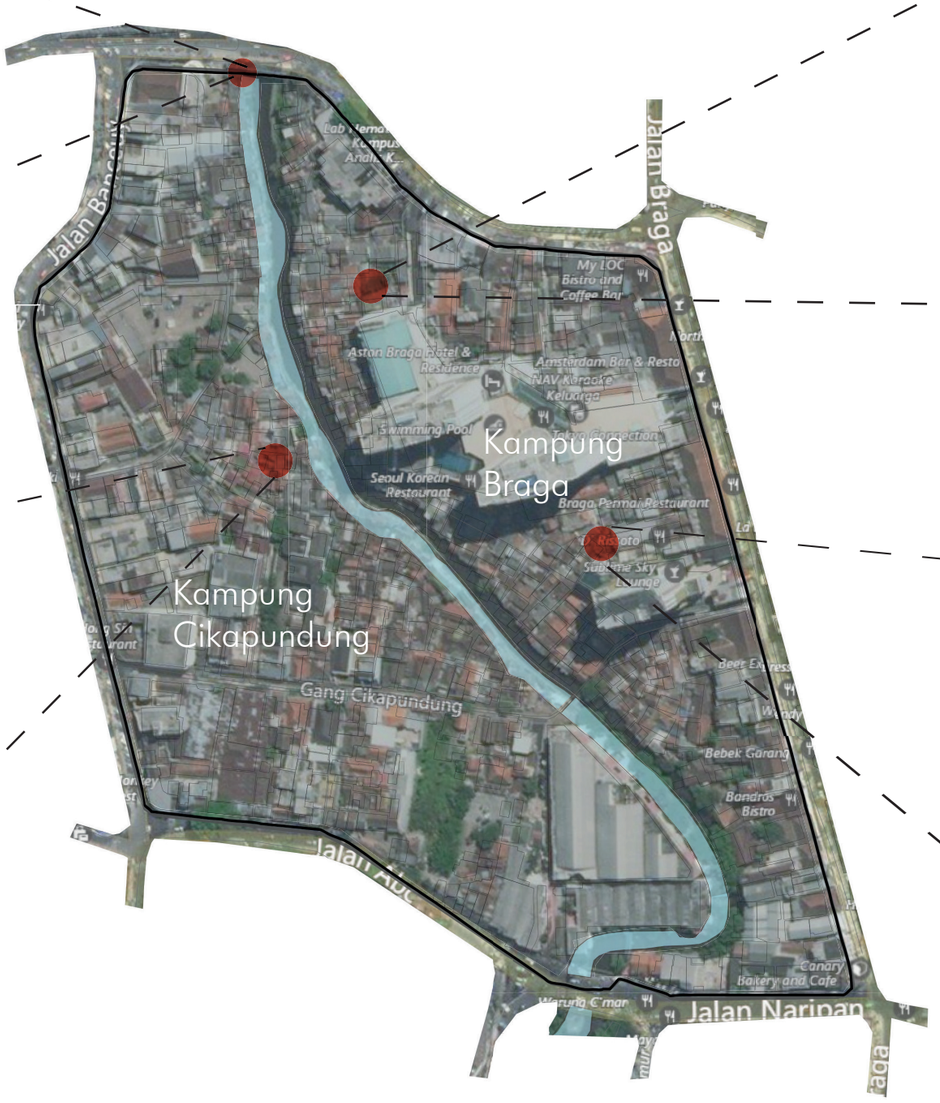
Building products

Conclusions



BATU

KARET

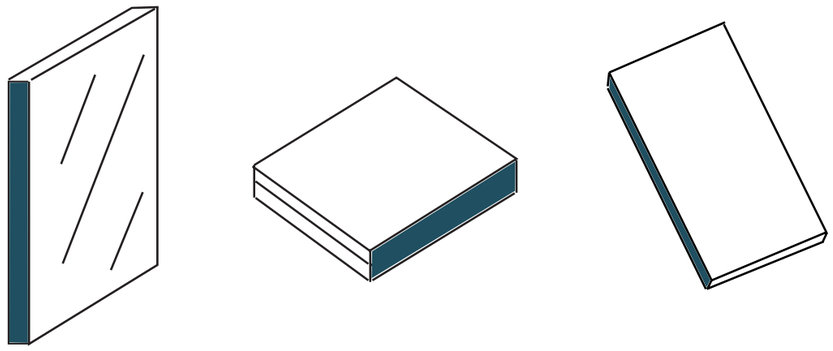


KAYU

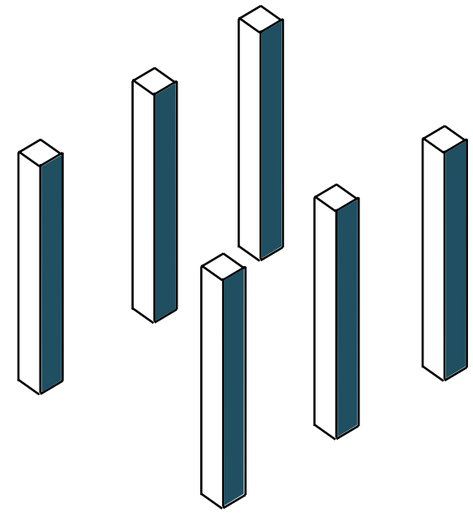
PLASTIK

Materialisation strategy Design

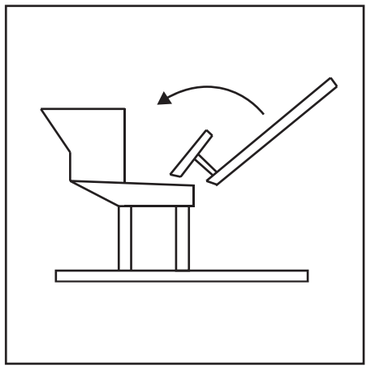
Step 1 - Use reused and
upcycled materials
as much as possible



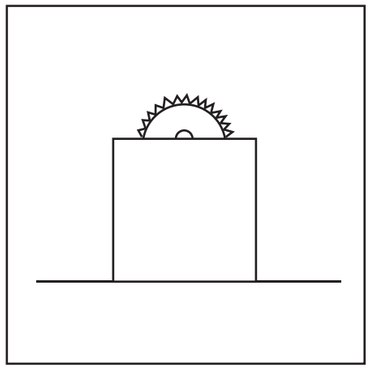
Step 2 - Use materials out
of the bio cycle preferably
with the lowest embodied
energy



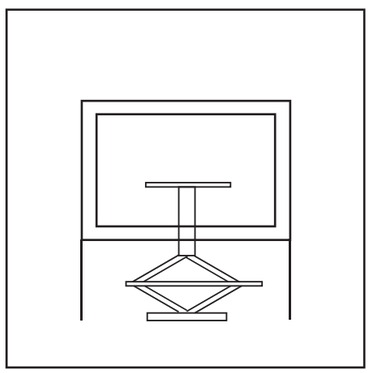
Processing



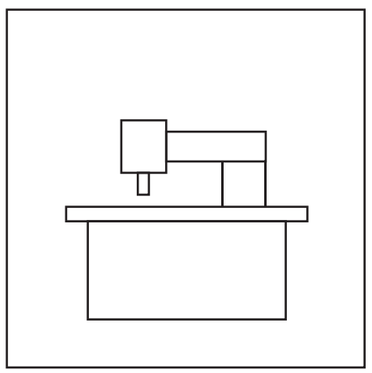
Brick press



Saw table



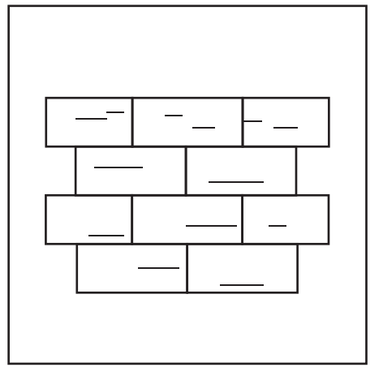
Hot press



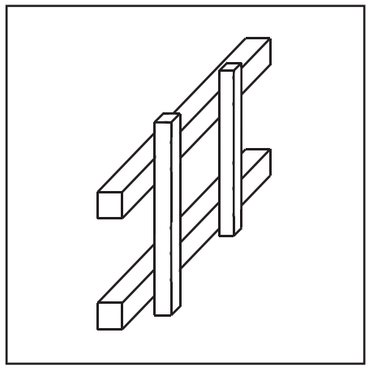
CNC Milling

DESIGN

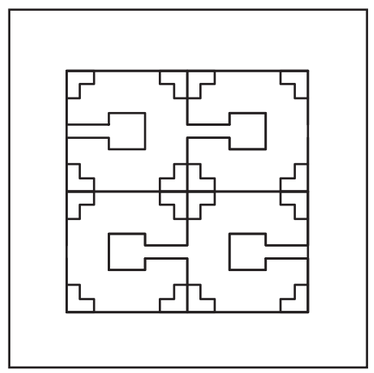
Products



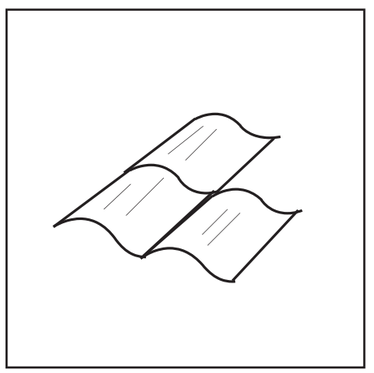
Bricks



Panels

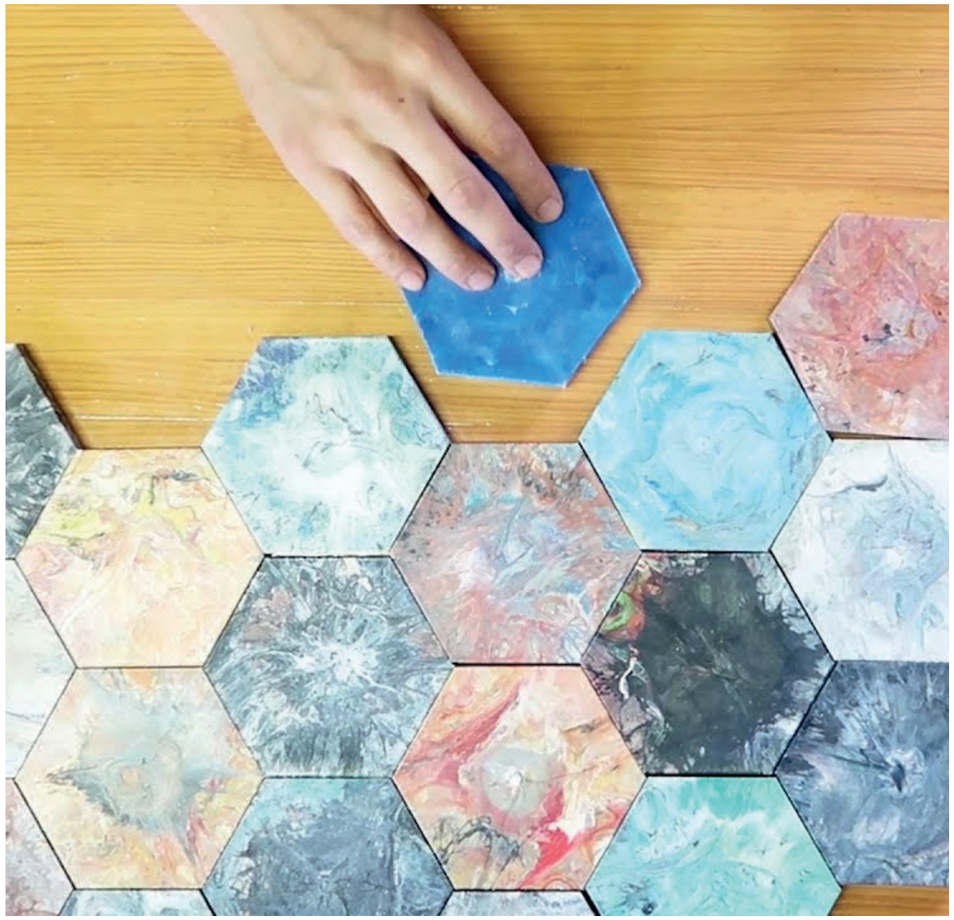


Acoustic
Insulation

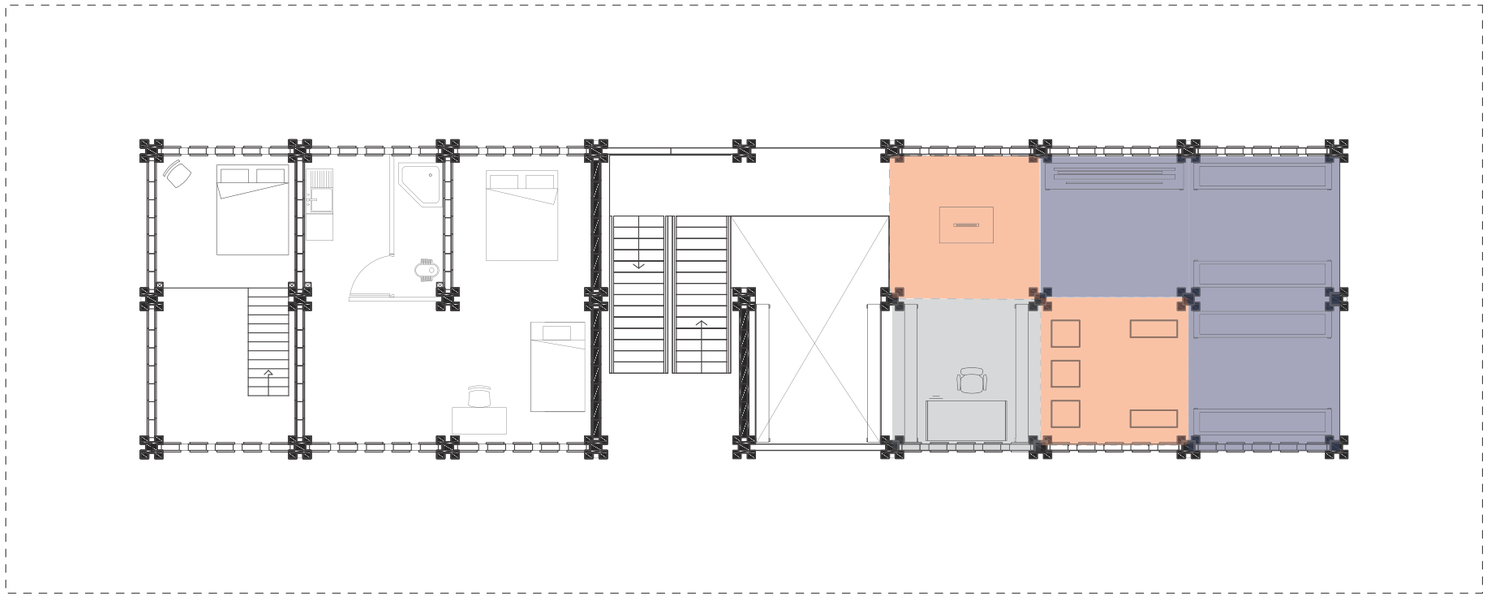


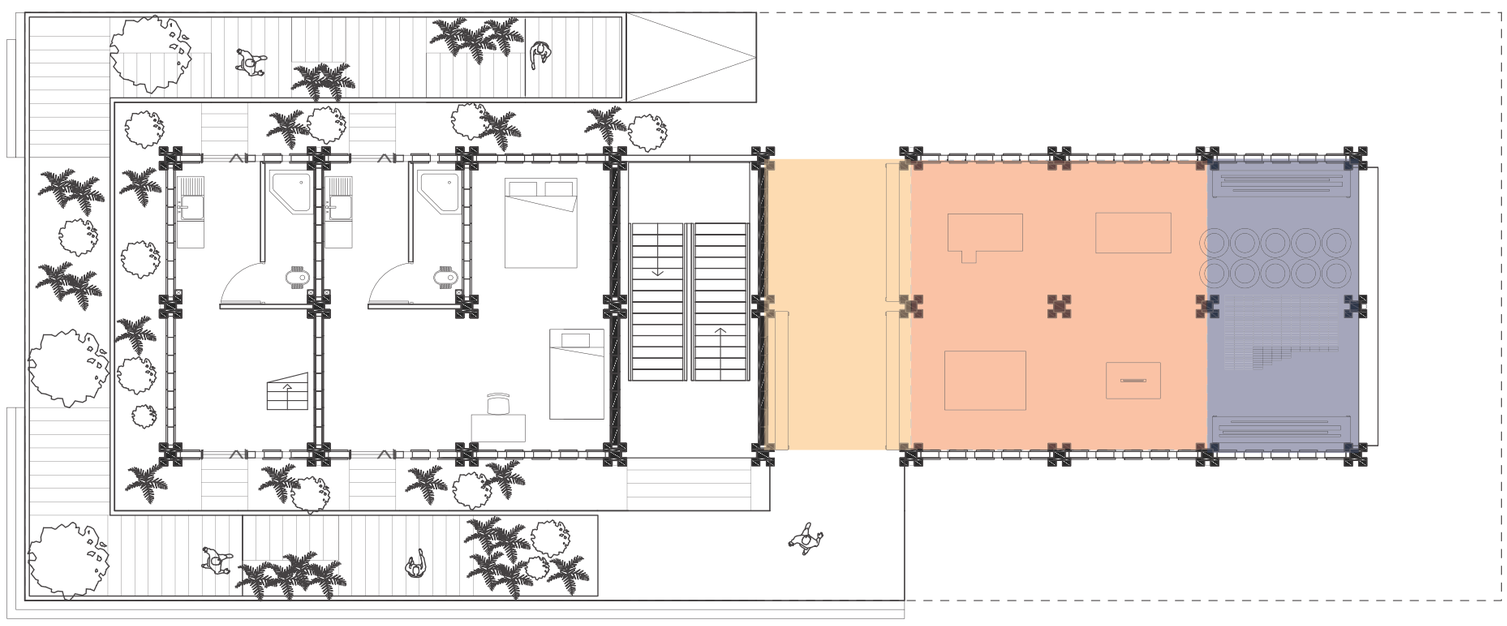
Plastic
Roof tiles

Examples



Program building material lab





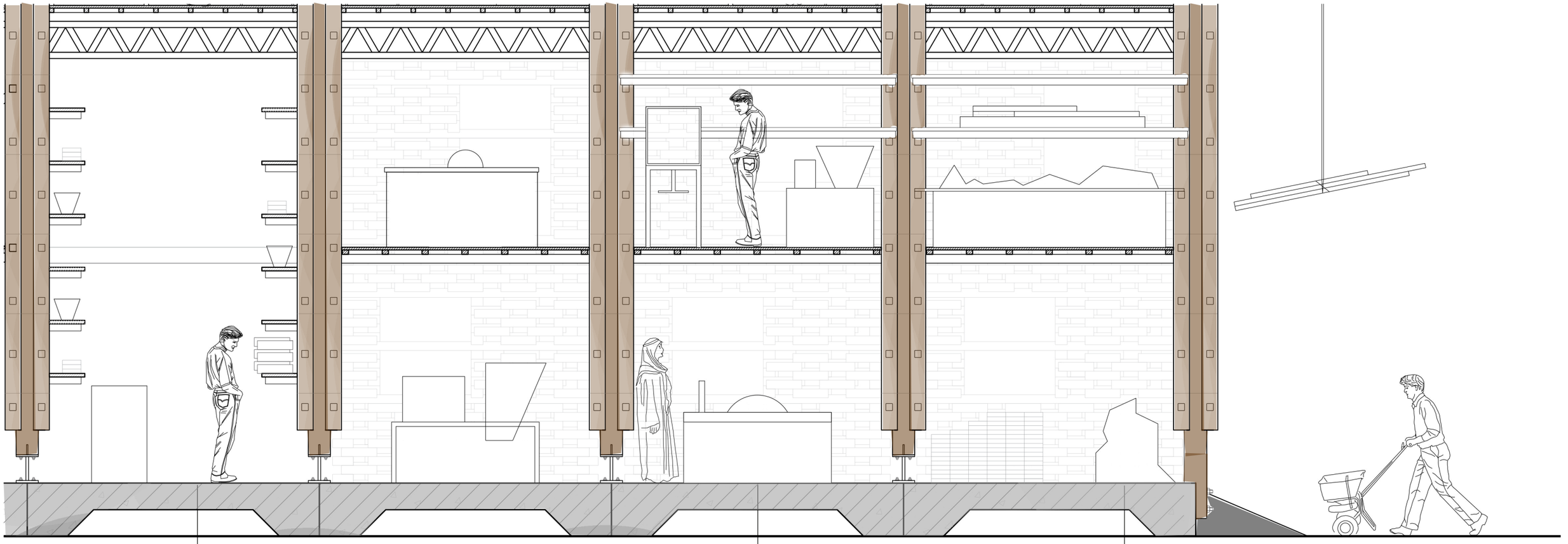
production (60m2)

storage (50m2)

shop (20m2)

office (10m2)

Section fragment



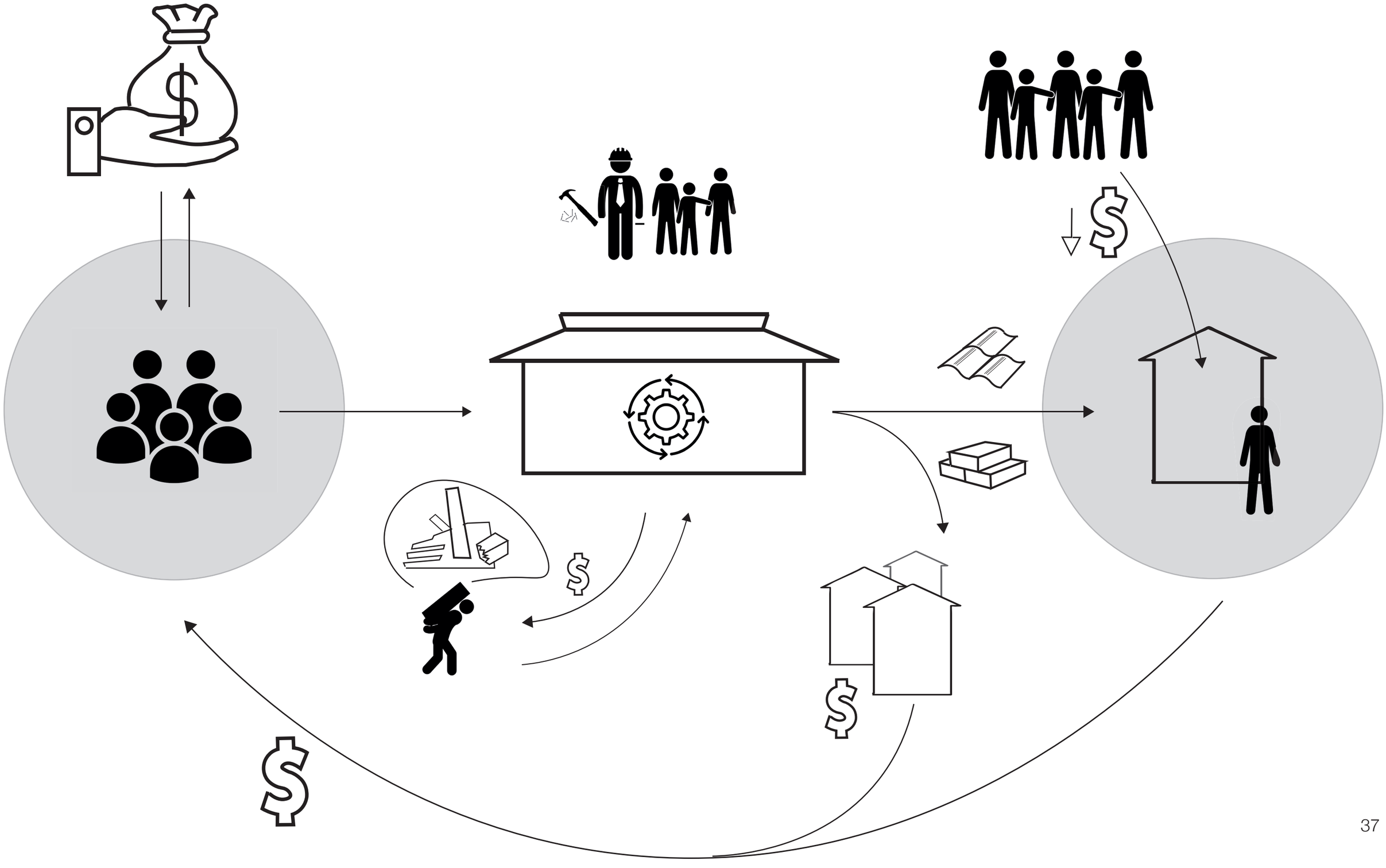
Shop

Processing

Material storage

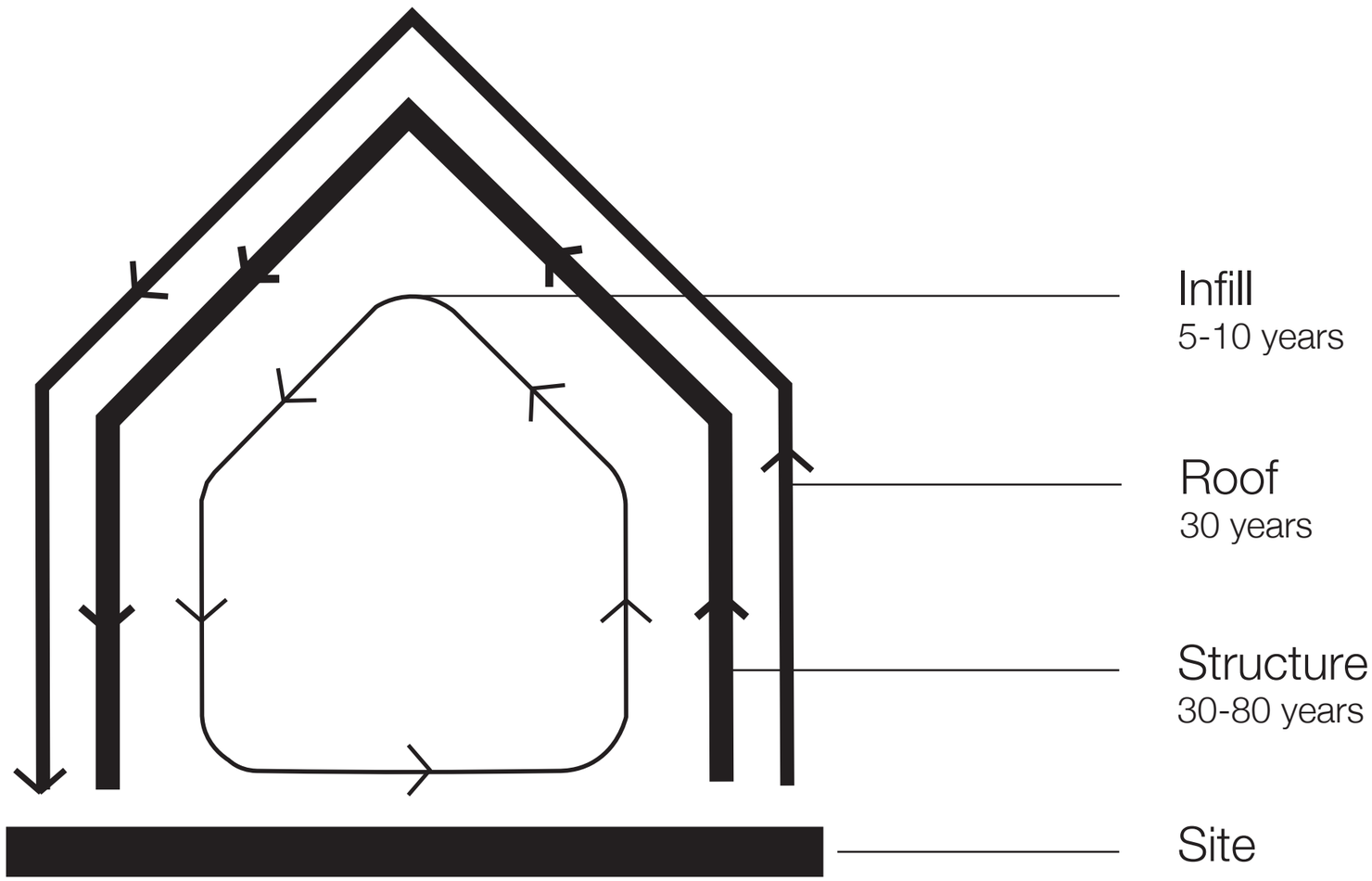
Impression workspace

Stakeholders and cooperation system



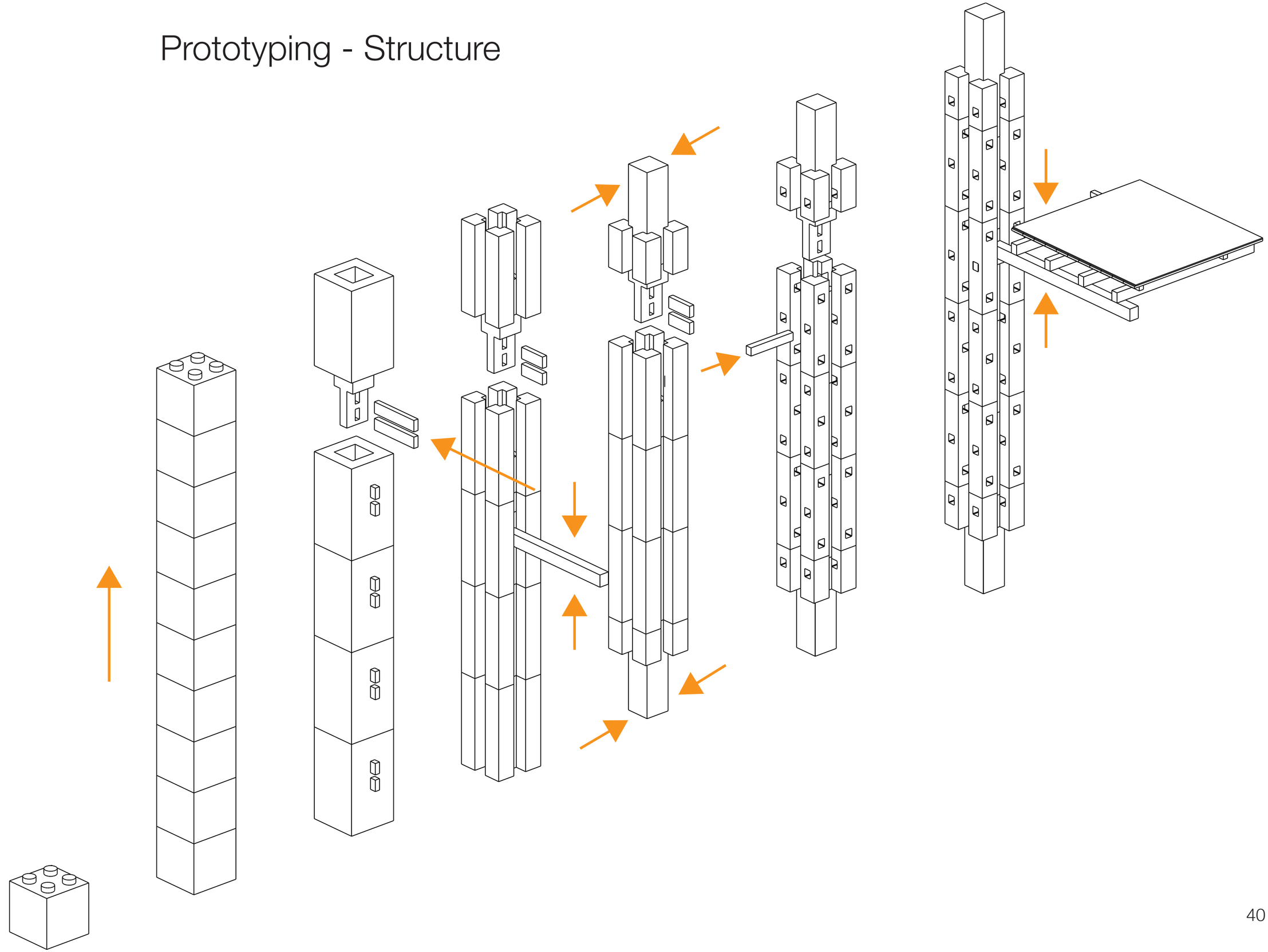
Nendra decides to rent a space

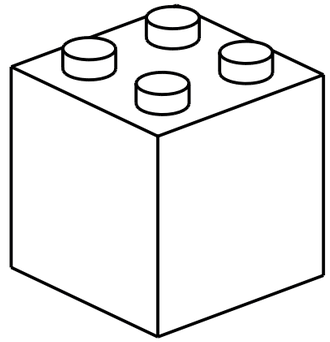
Design for Disassembly



Shearing layers -
Stuart Brand

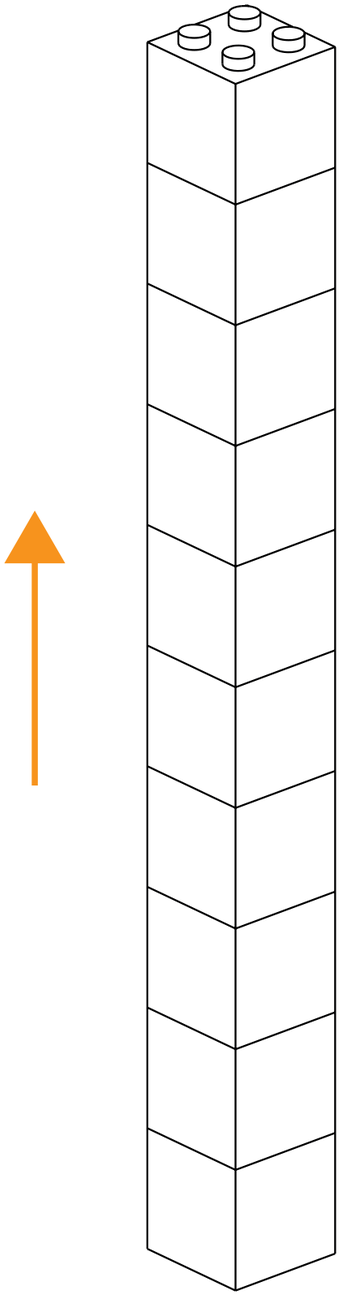
Prototyping - Structure



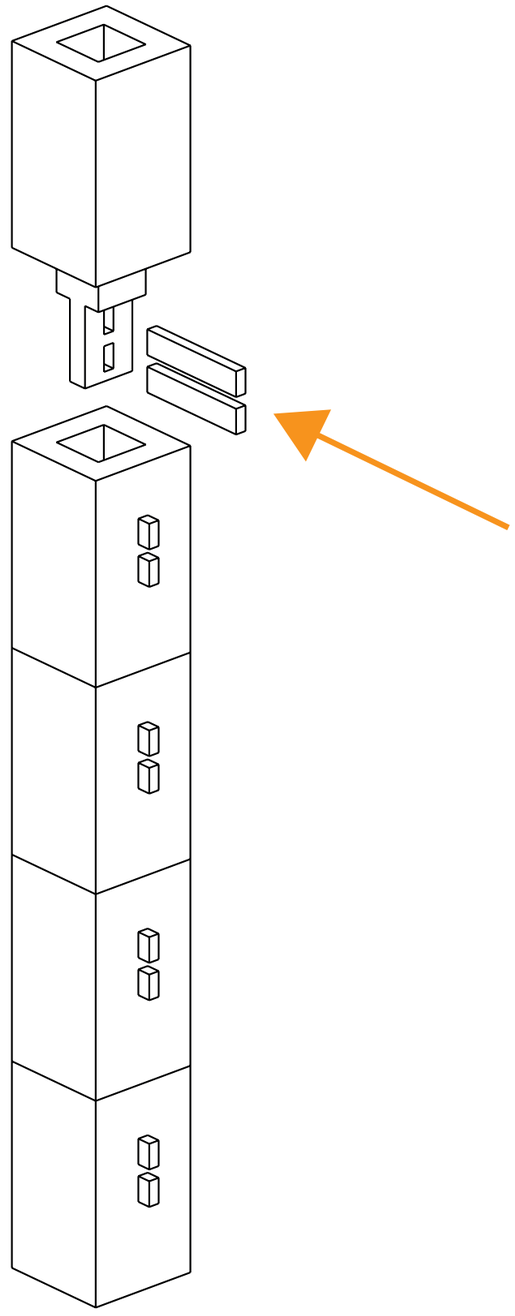


A basic building block
that can be easily assembled
and disassembled

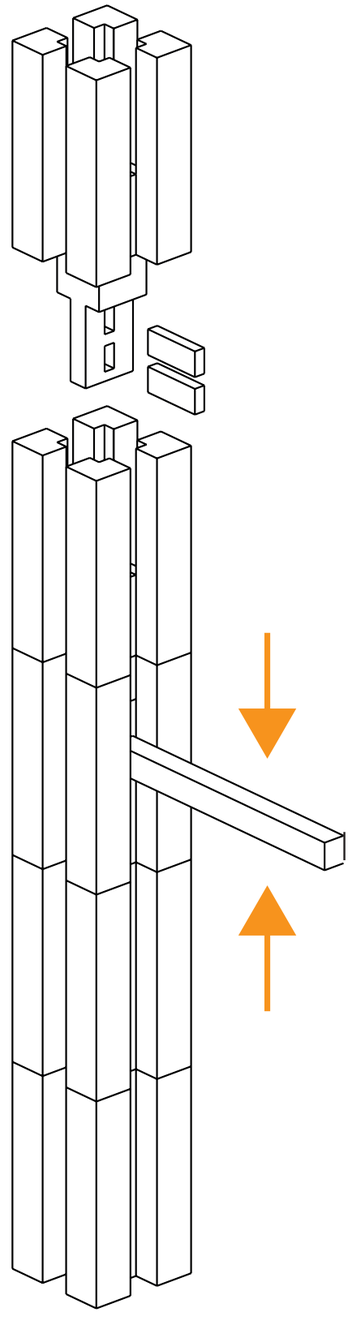
Columns allow for a
flexible use of space



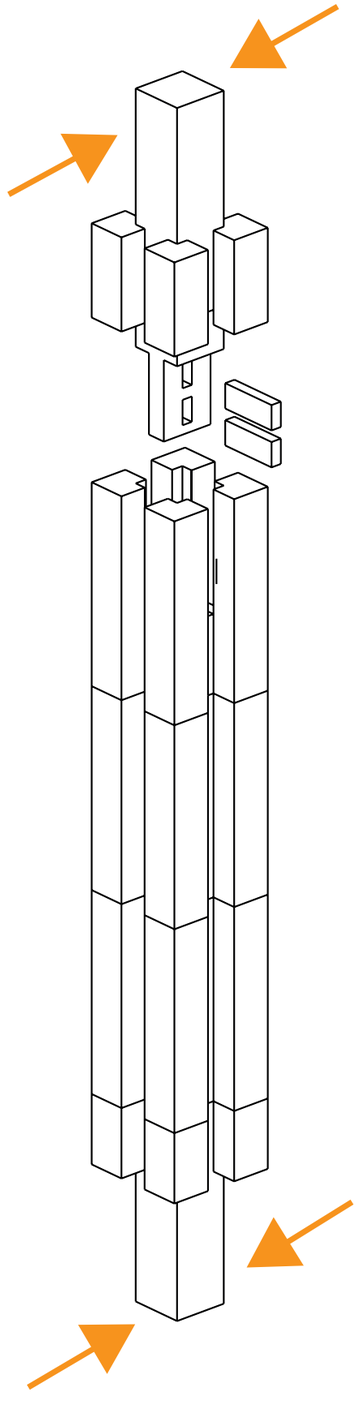
Friction fit connection
no bolts needed



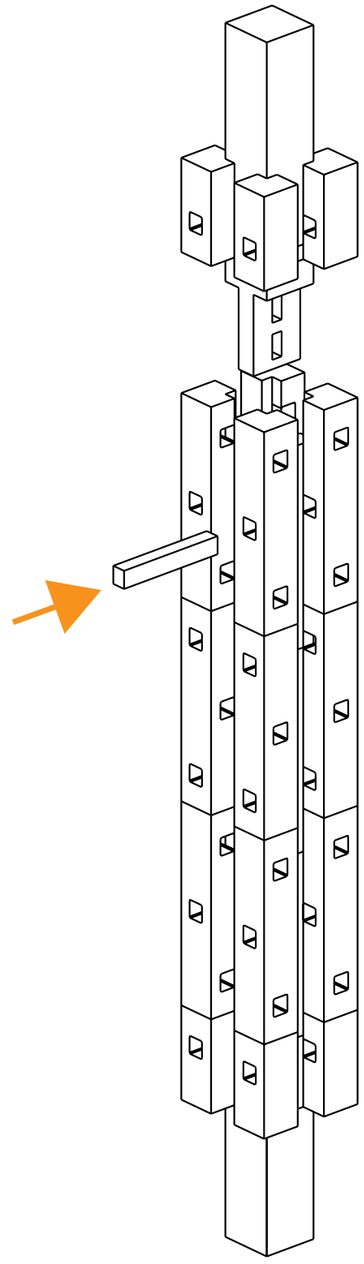
Slots are created to allow
Infill to slide up and down



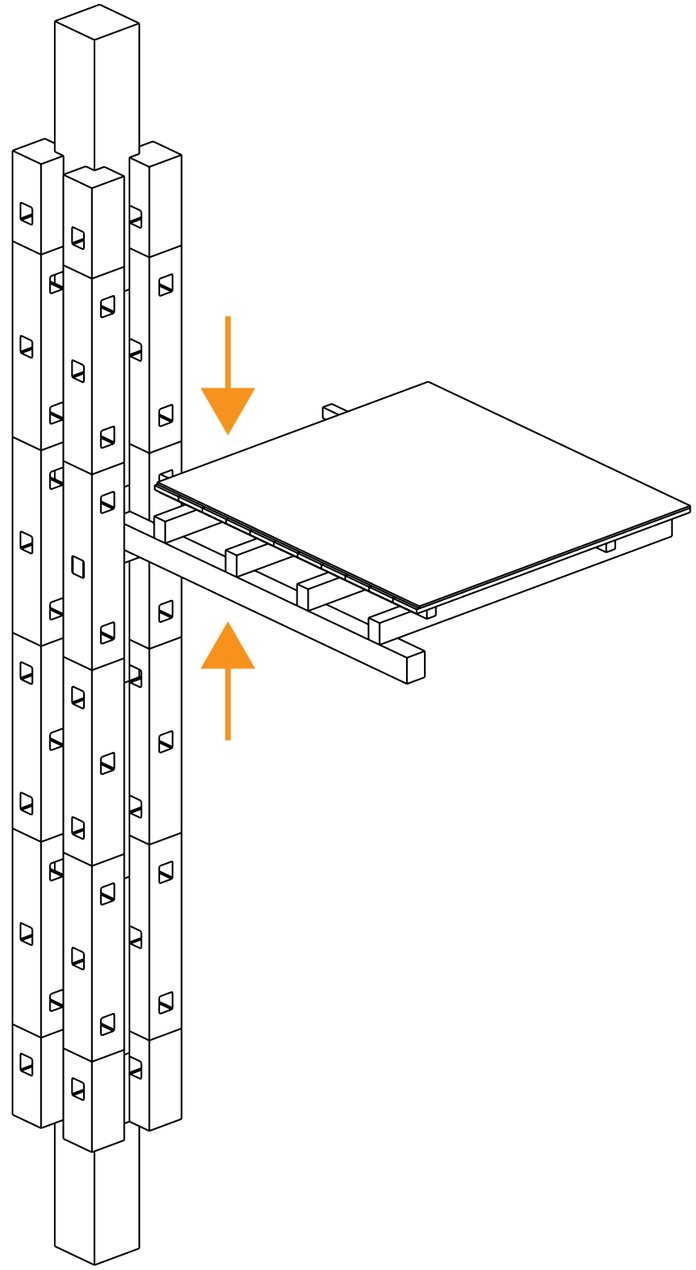
Ends are tapered to allow building components to be inserted



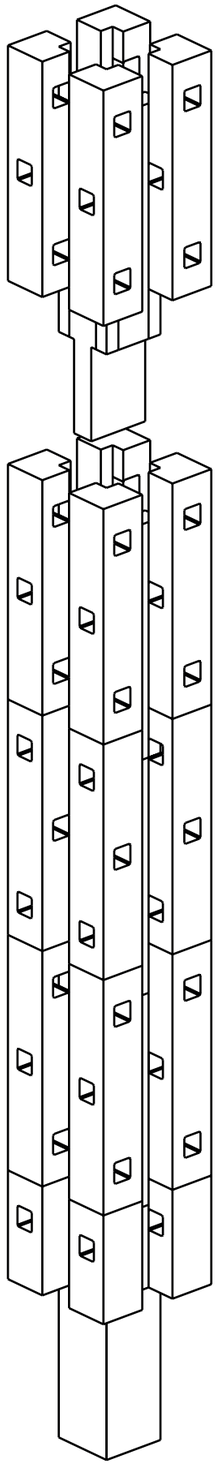
Openings allow supports to be placed at different elevations



Floors and infill panels can be assembled needing less materials or means



Technical Specifications

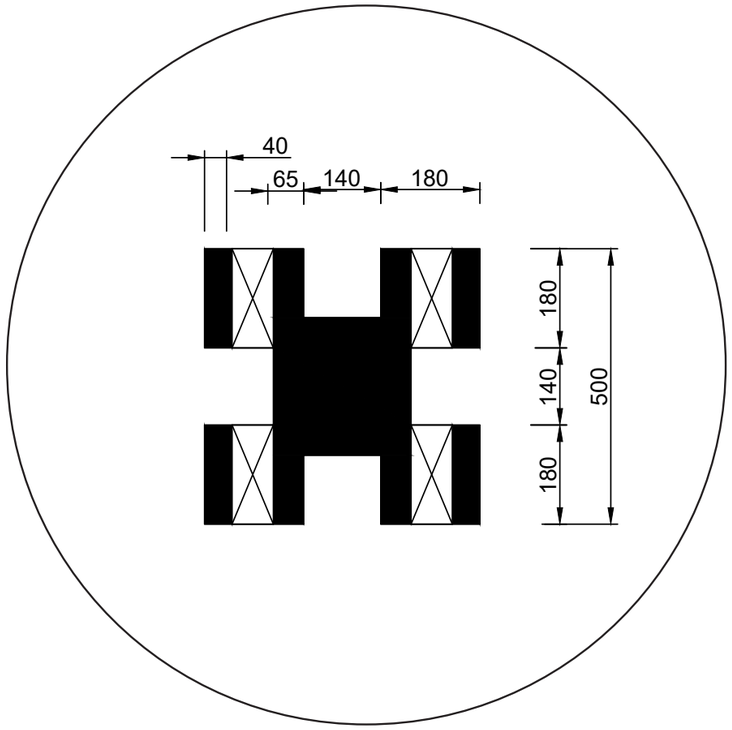


CNC milled locally

600mm

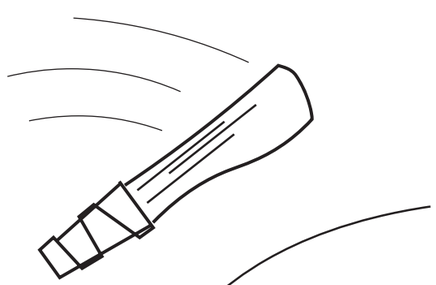
900mm

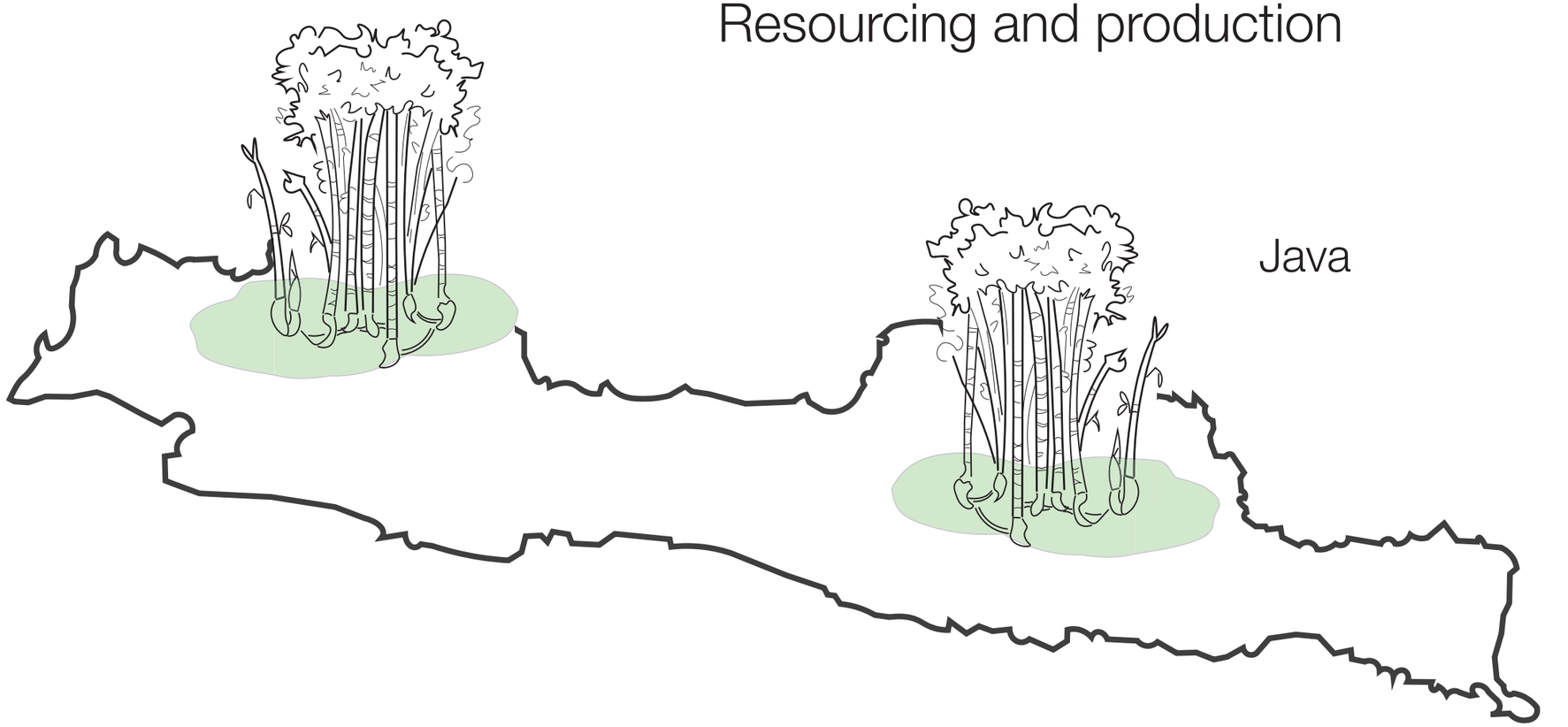
600mm

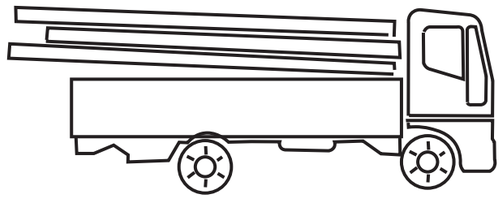


Engineered Glulam
Gadua bamboo

Resourcing and production

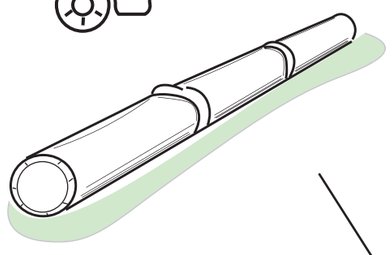


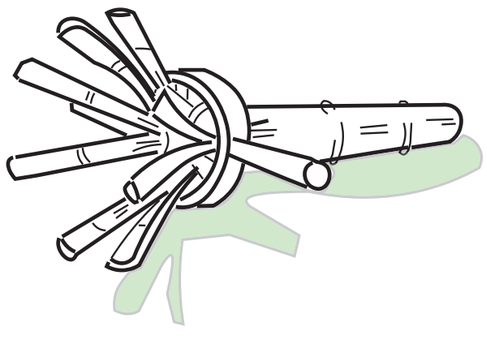




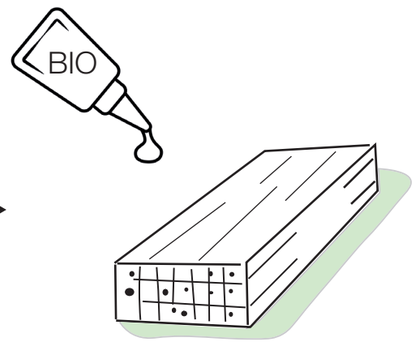
Transport

Sorting





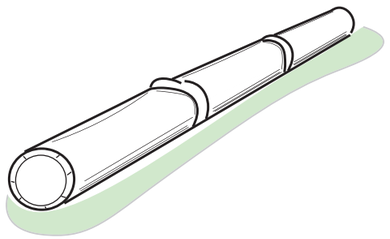
Splitting



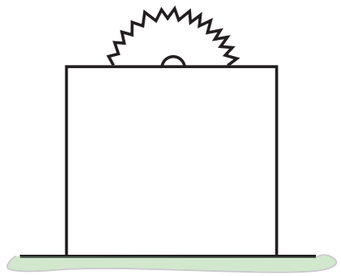
Laminating

Heat treatment

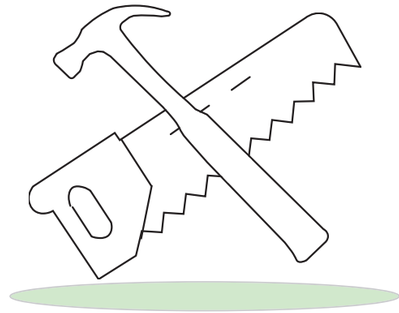
Production building material lab



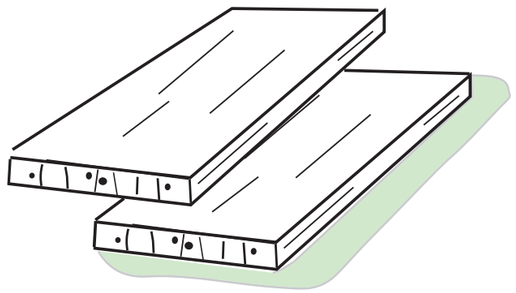
Culms



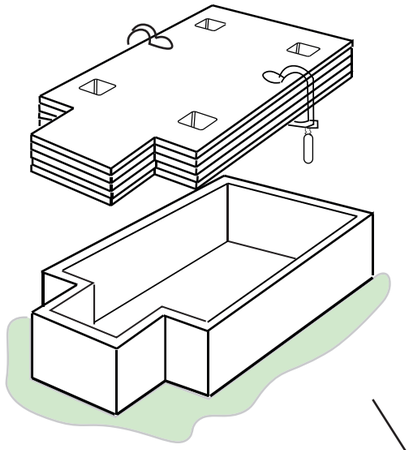
Sawing



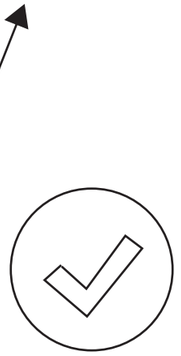
Building

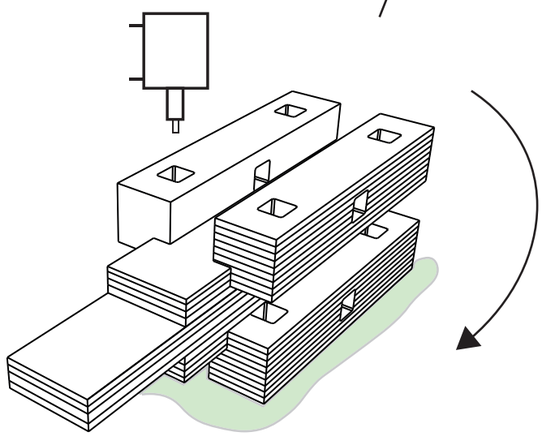


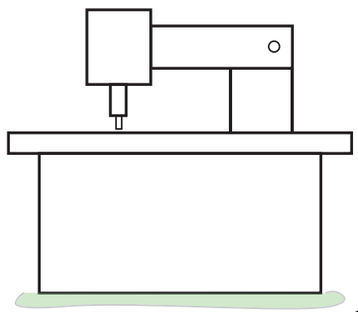
Plates

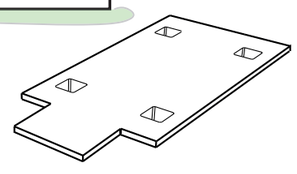


Glue in mould



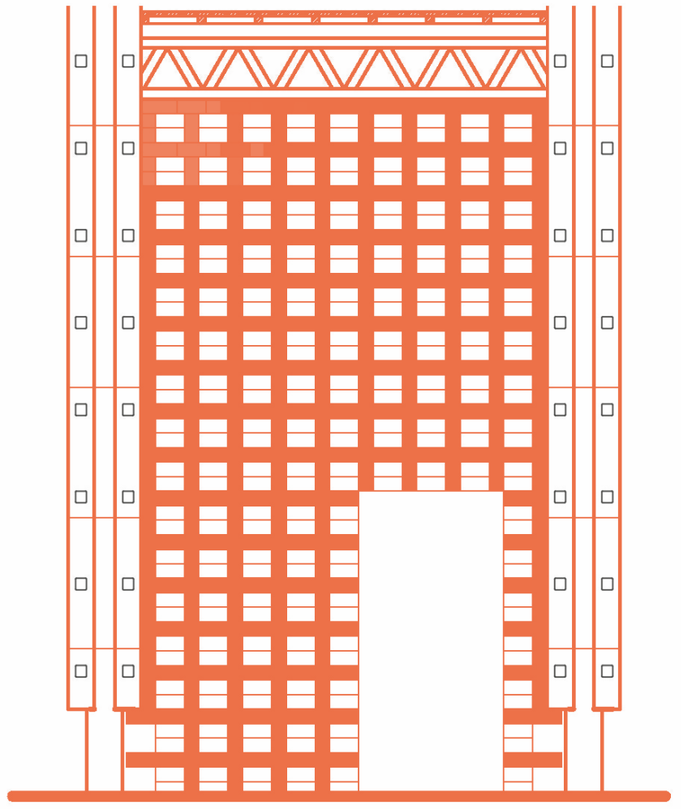






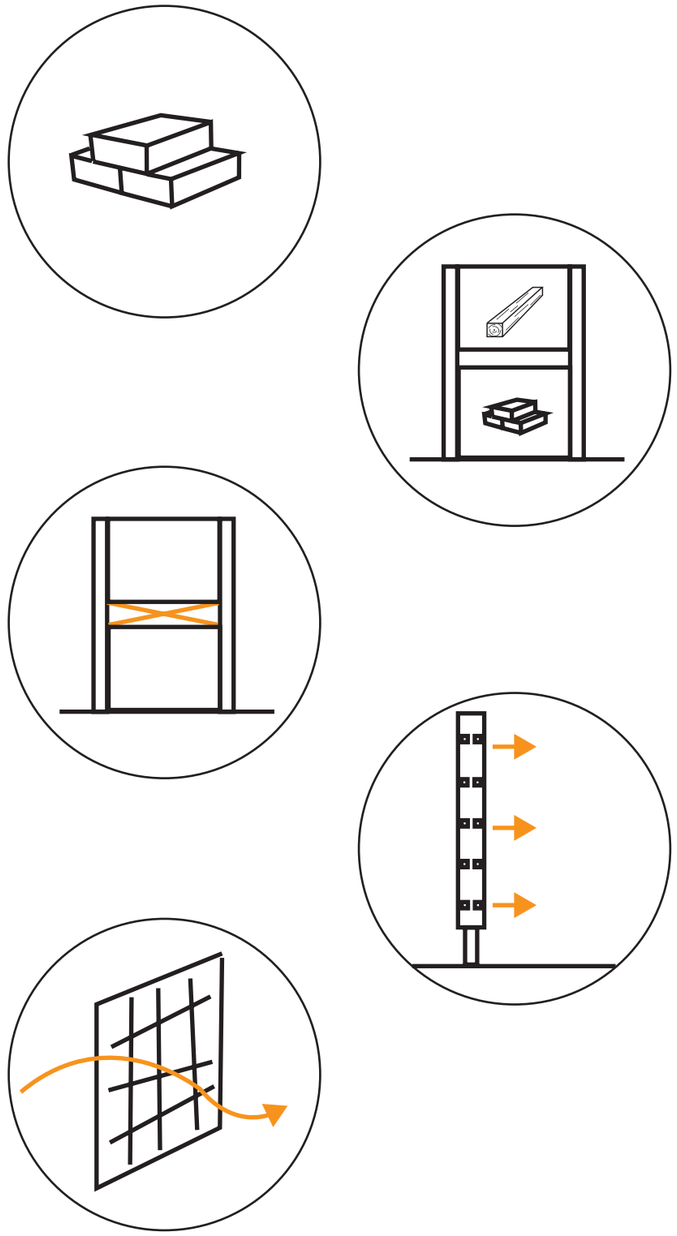
CNC milling

Infill strategy - Self building

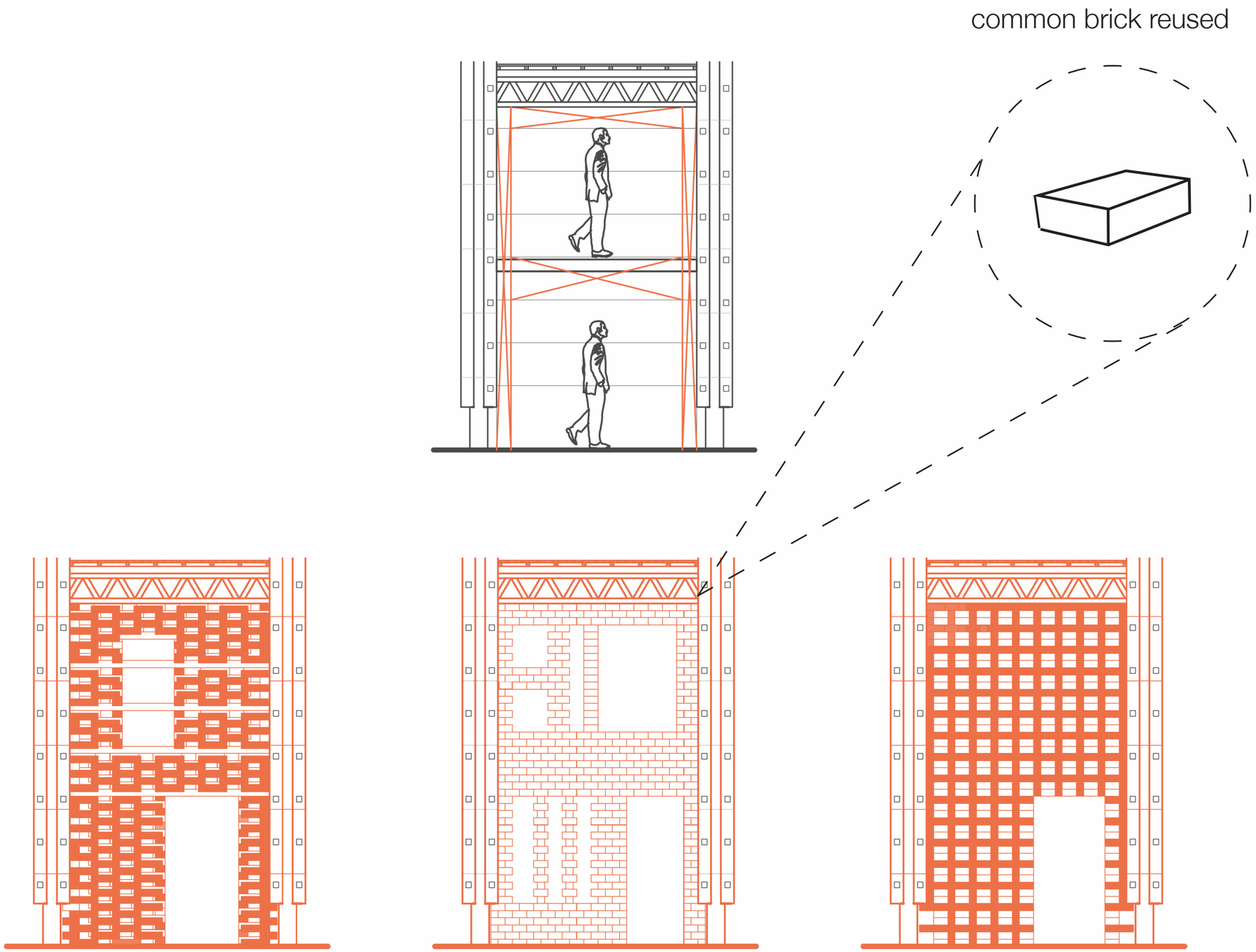


Infill design guidelines

- Make use reused/upcycled building products
- Heavy materials at the base, light top
- Openings are excluded from places of potential floor heights
- Column is kept free from openings
- Permeable entrance and exit

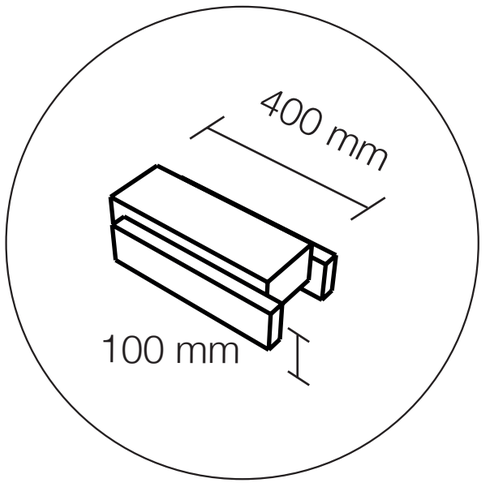


Infill guidelines examples

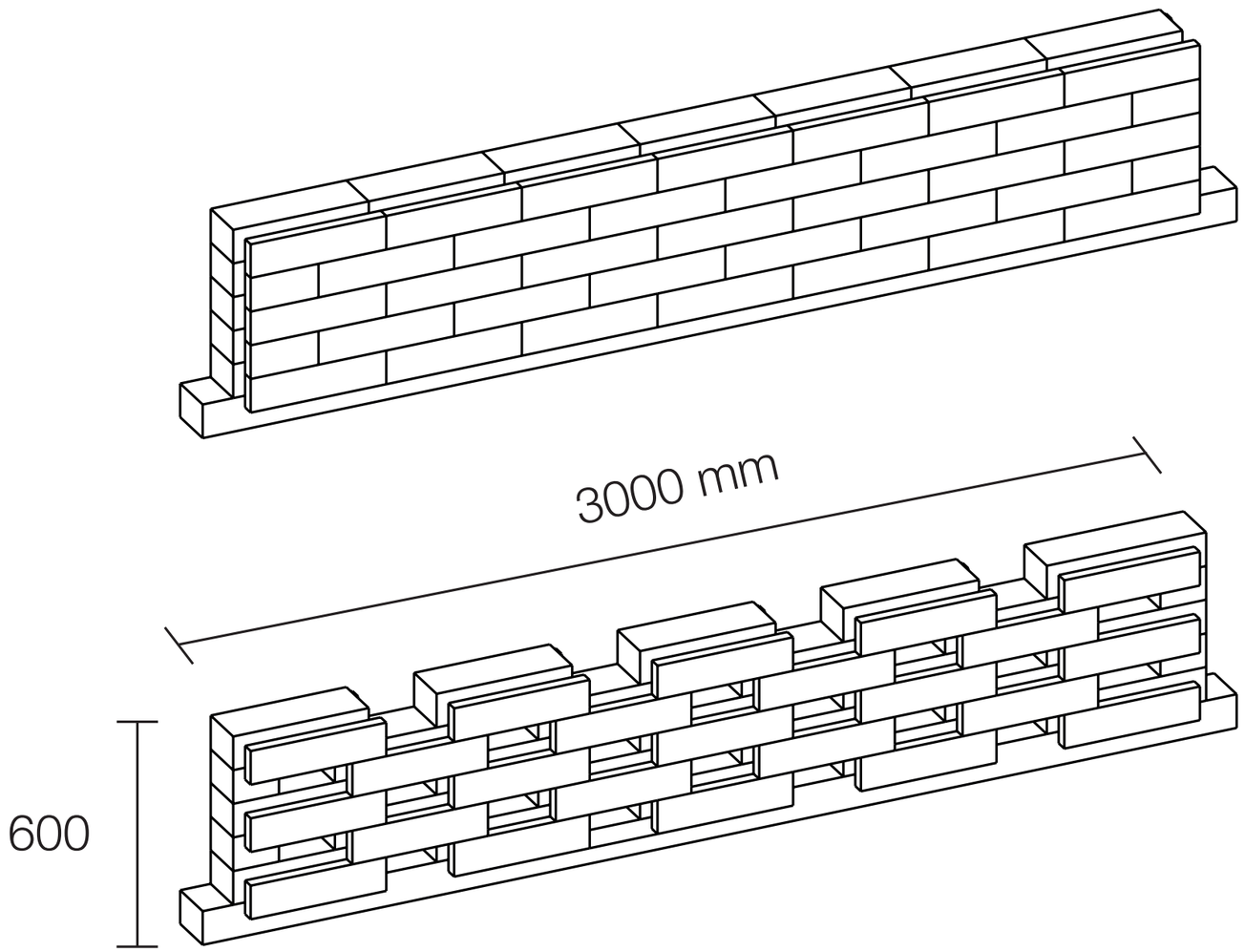


Infill Design

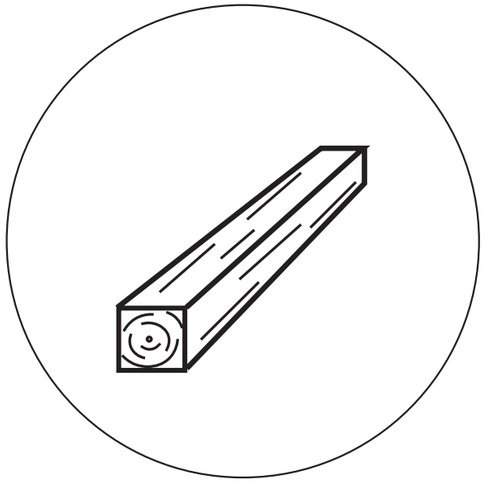
Building product – – – – – – – – – – – – – – – – → Building module



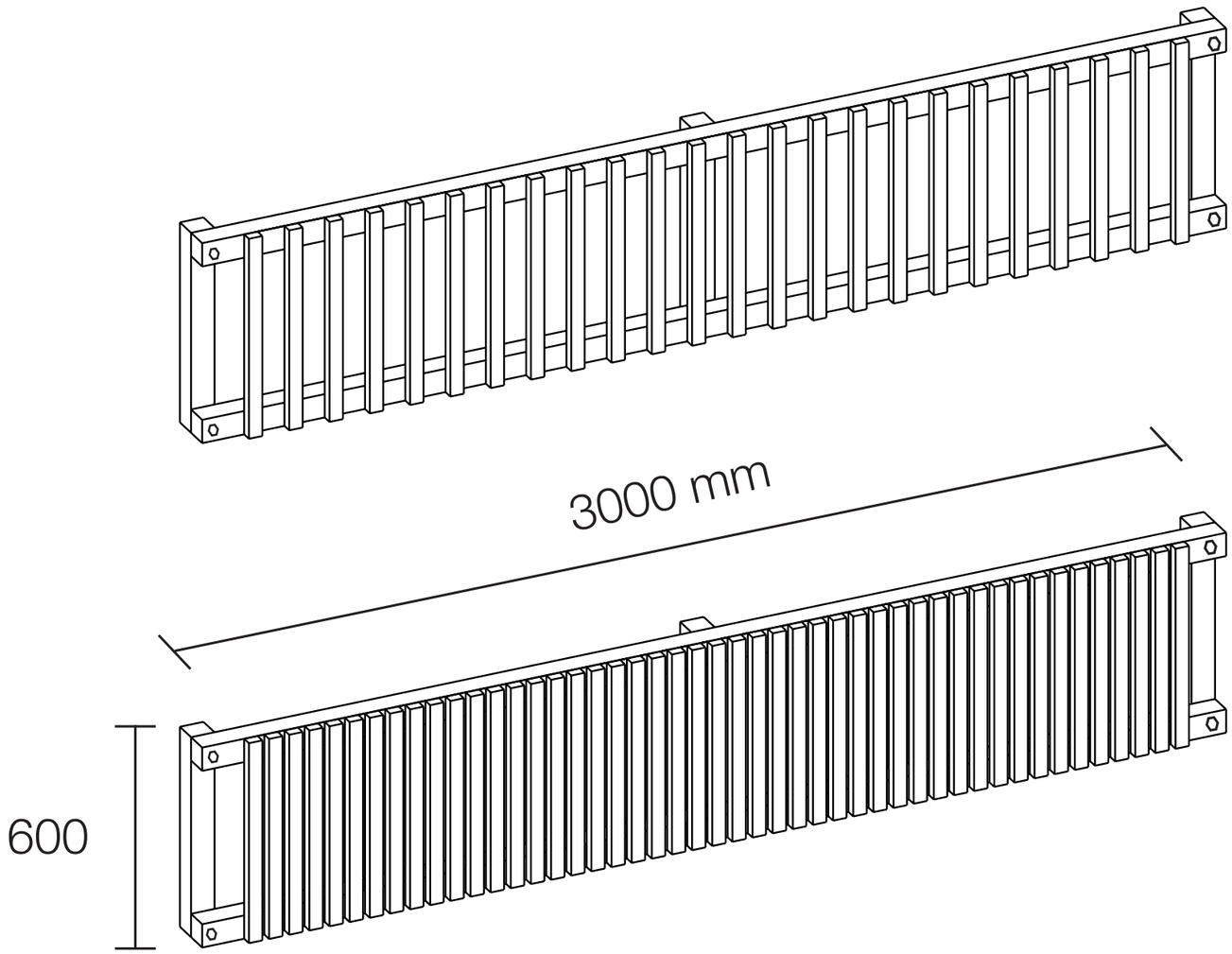
Upcycled bricks with friction fit connection



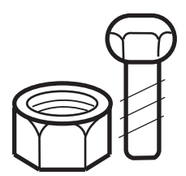
Infill Design



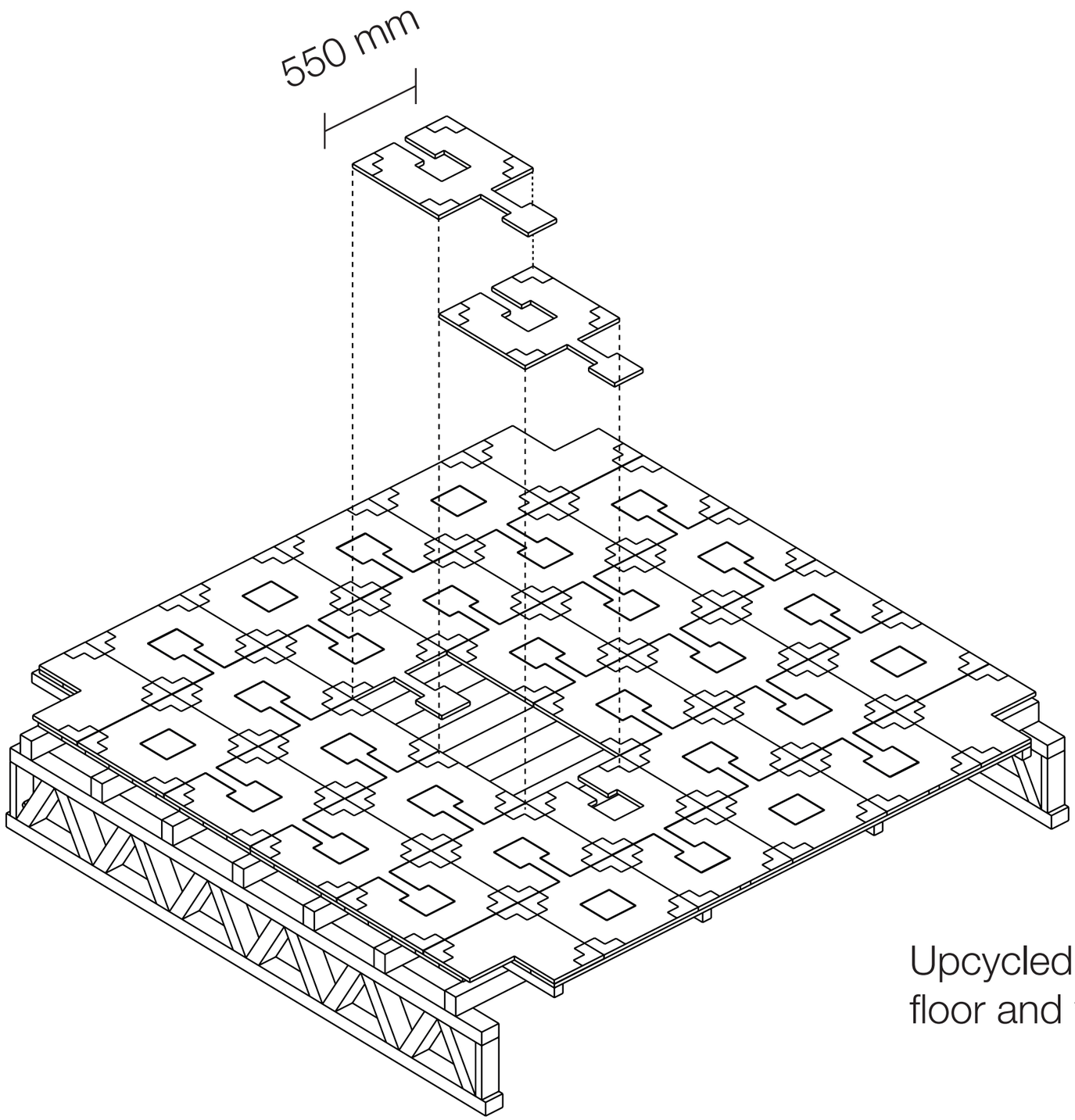
Reused timber
facade elements

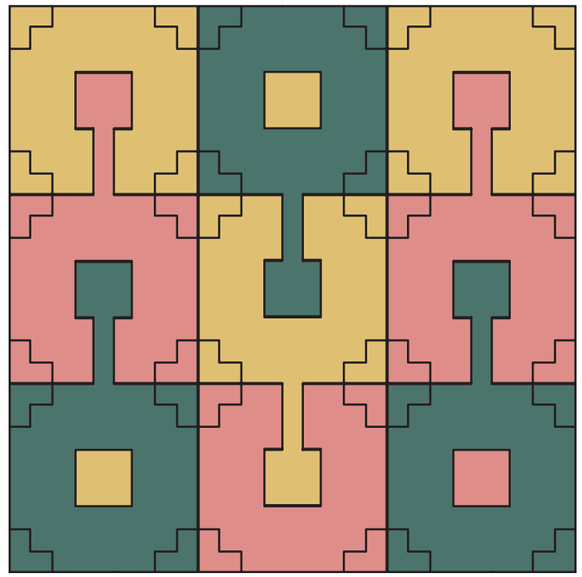


Nut and bolt
connections



Infill Design

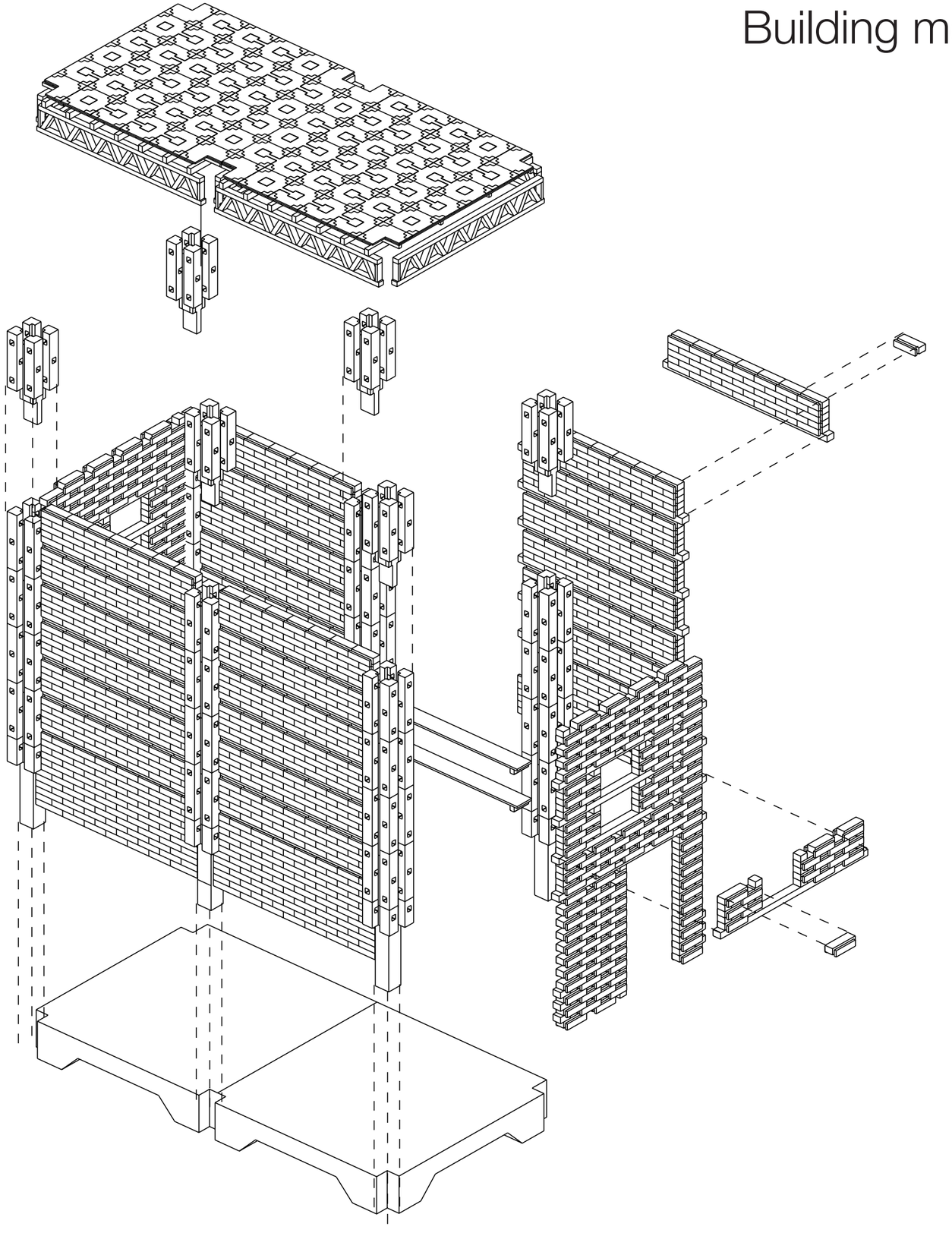


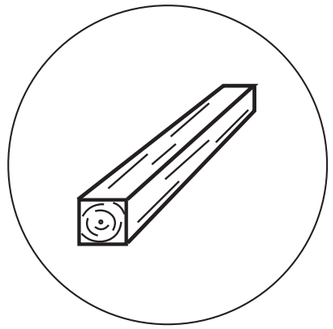


Self expression in colours

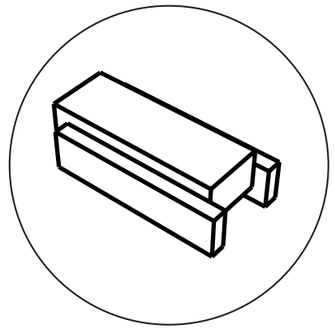
Upcycled Rubber
floor and wall tiles

Building modules implemented

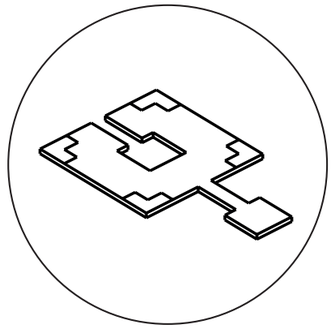




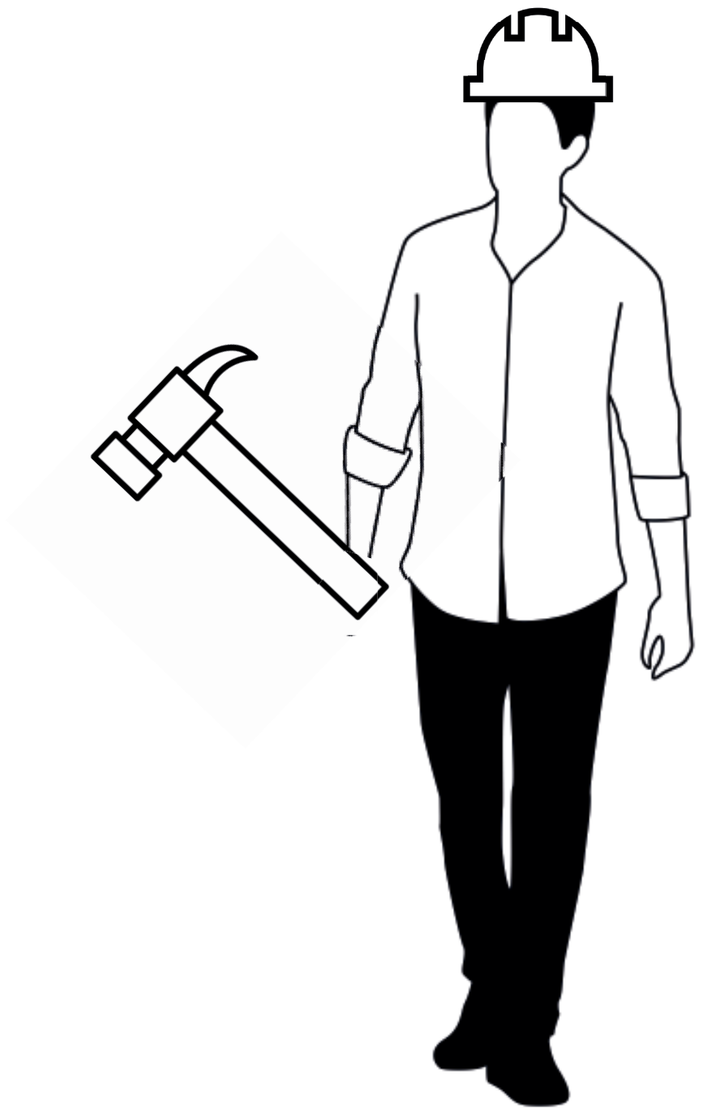
Reused timber



Upcycled bricks

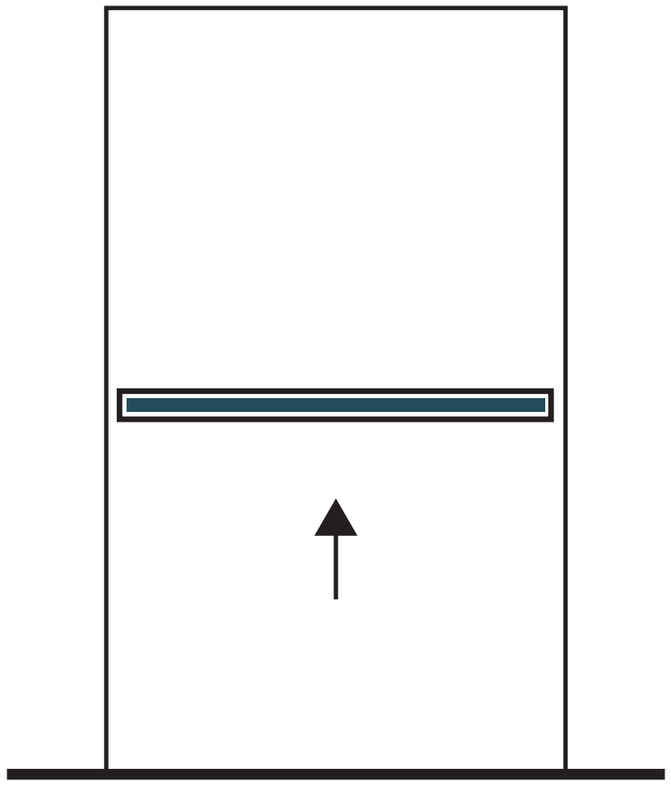


Rubber tiles

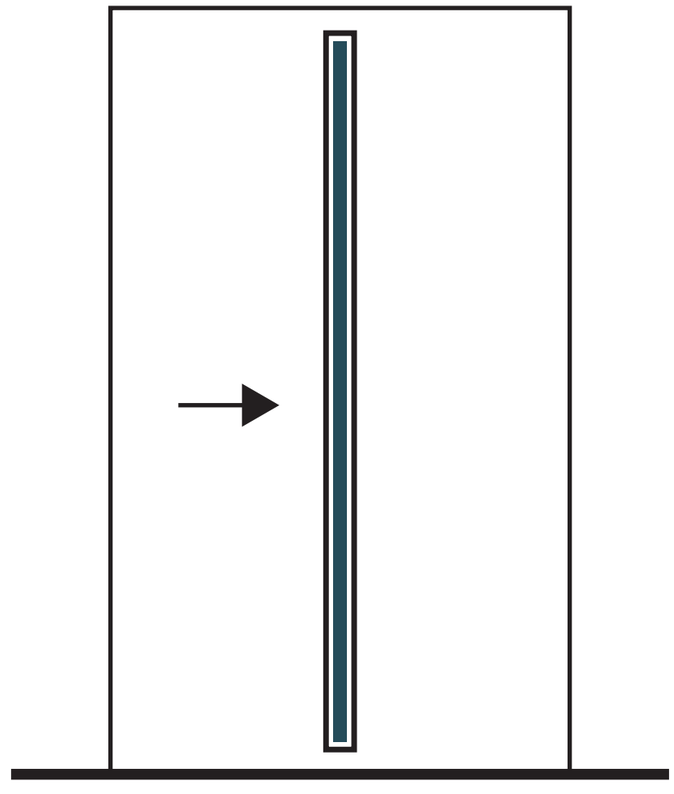


Nendra starts making
his own materials, builds
the infill and can express
his own ideas

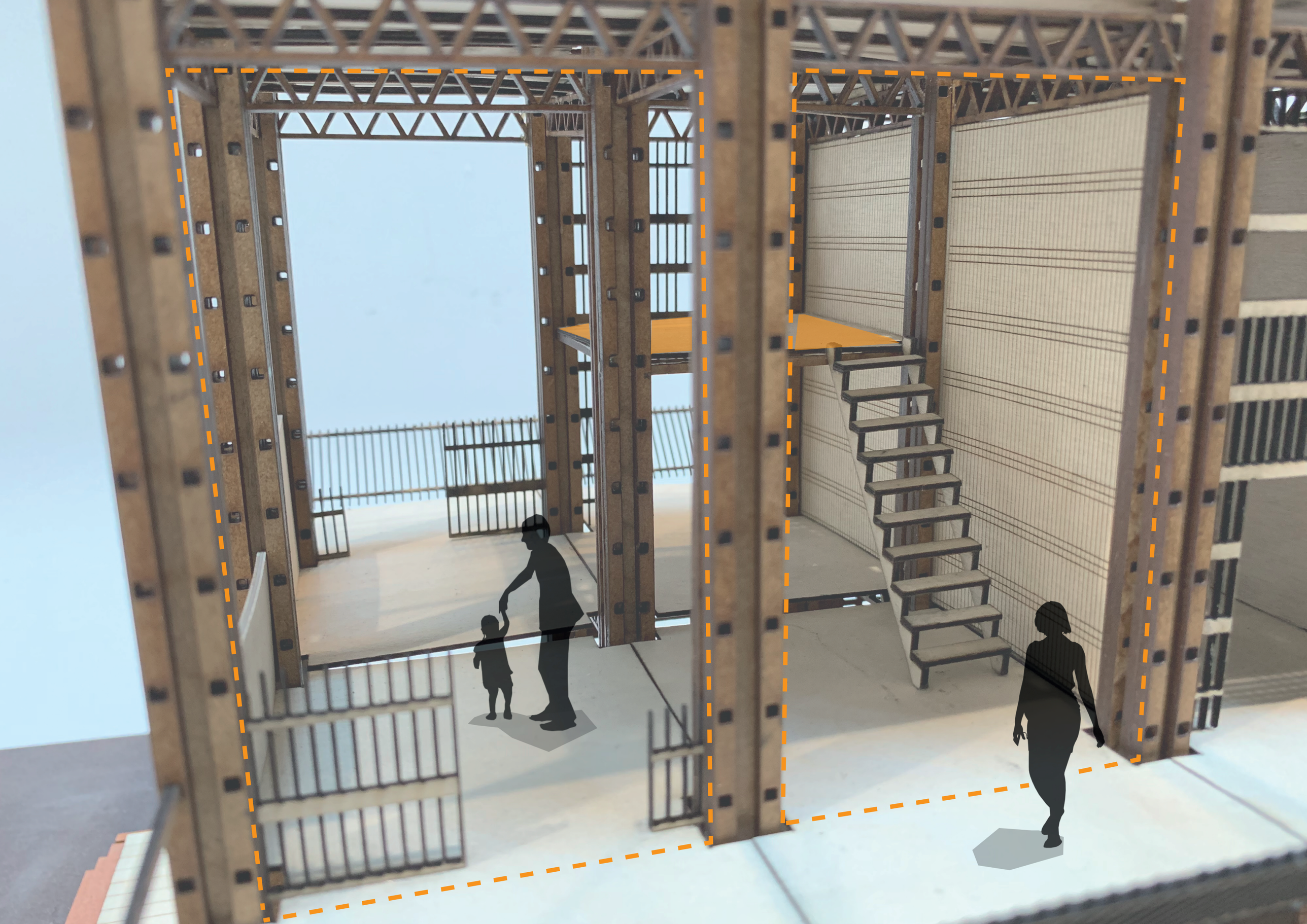
Flexibility



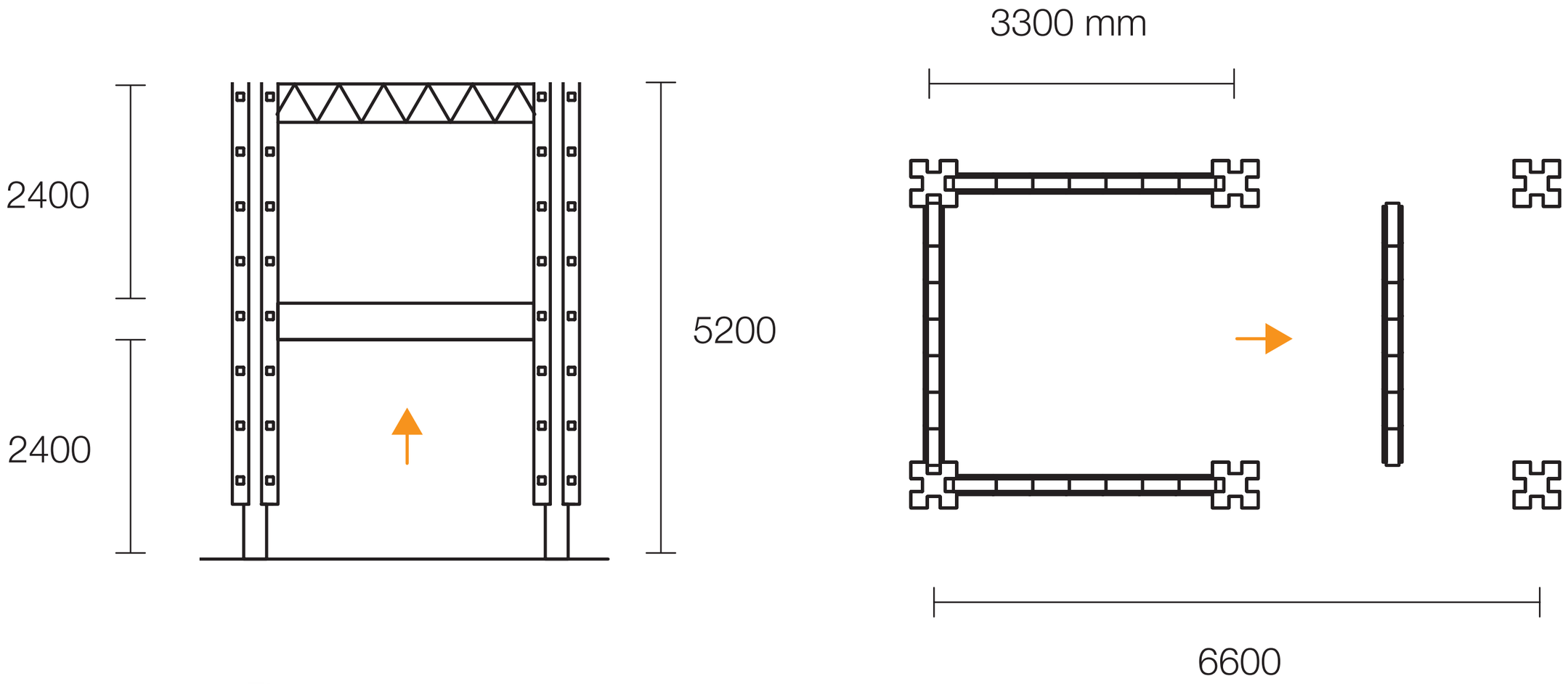
Vertical flexibility



Horizontal flexibility



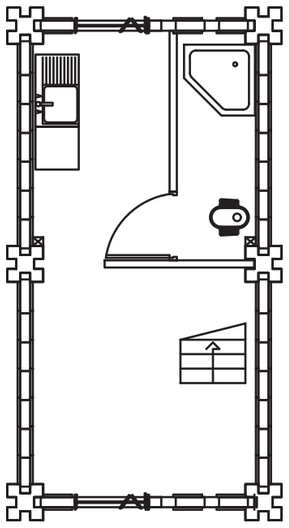
Flexibility

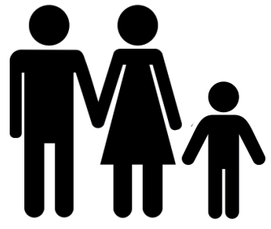


Floor
overdimensioned
reused timber

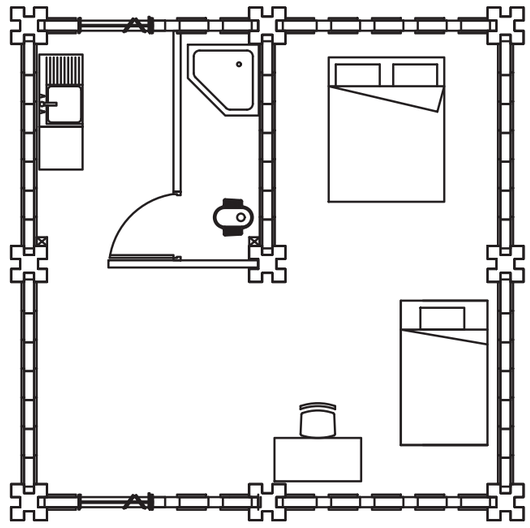
Different dwelling typologies

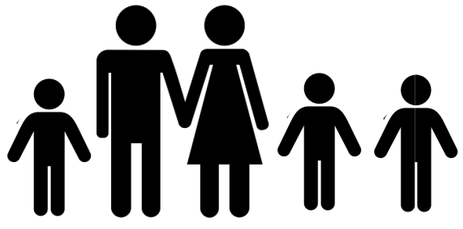
20 m2 -> 35m2





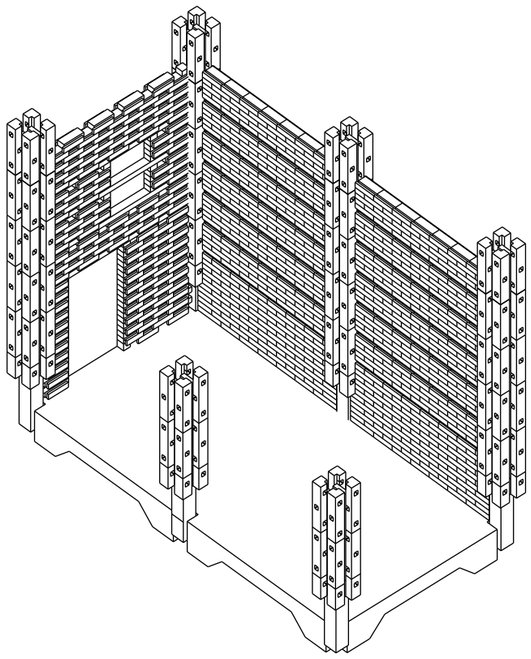
40 m2 -> 75 m2

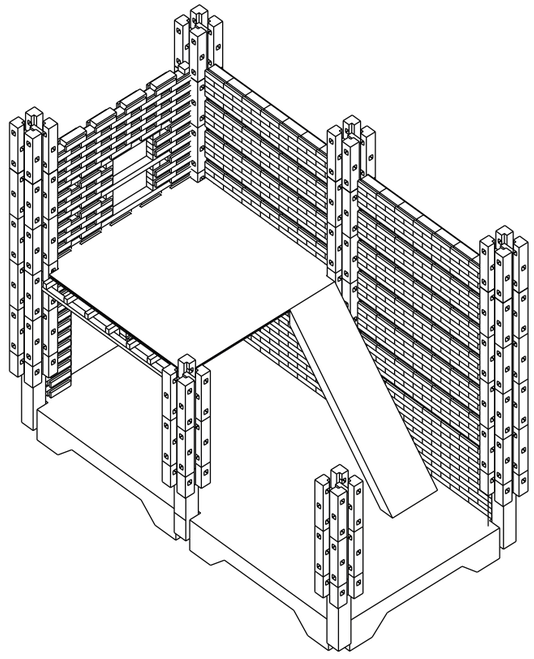


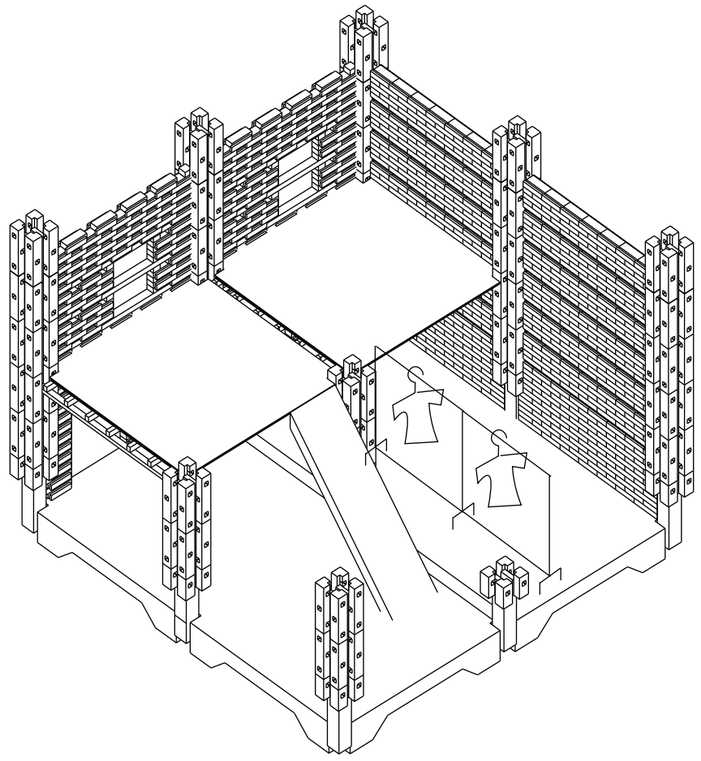


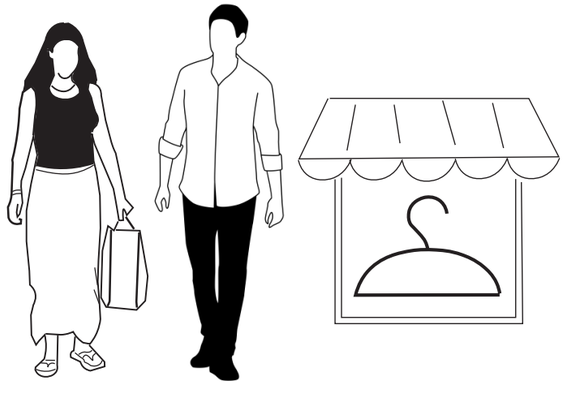
Nendra gets married

Nendra’s growth

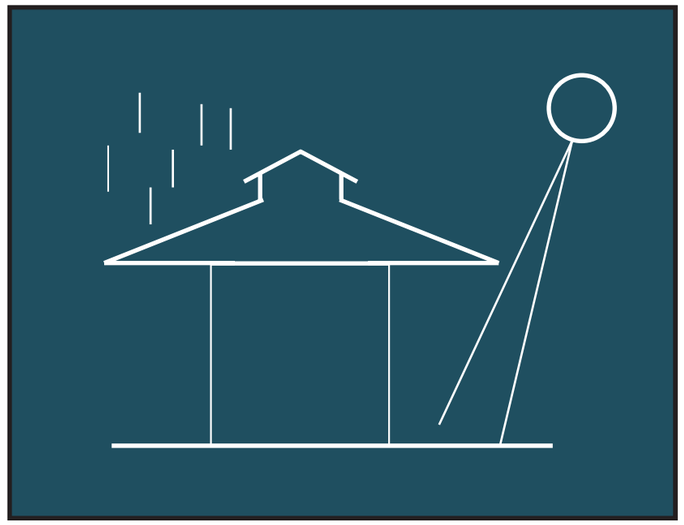




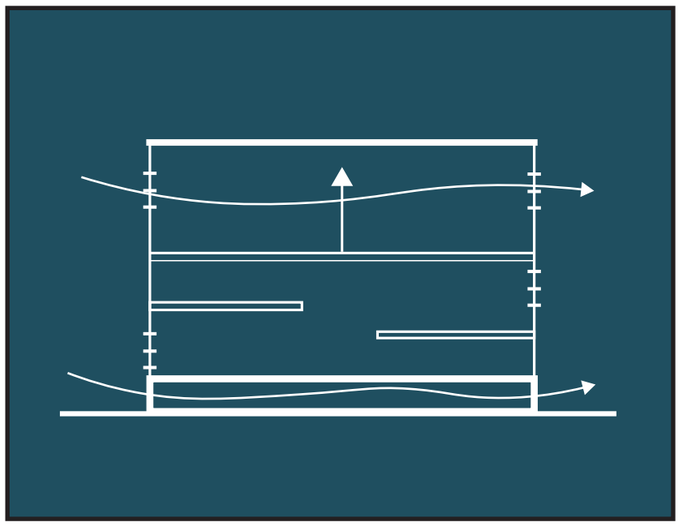




Form follows climate

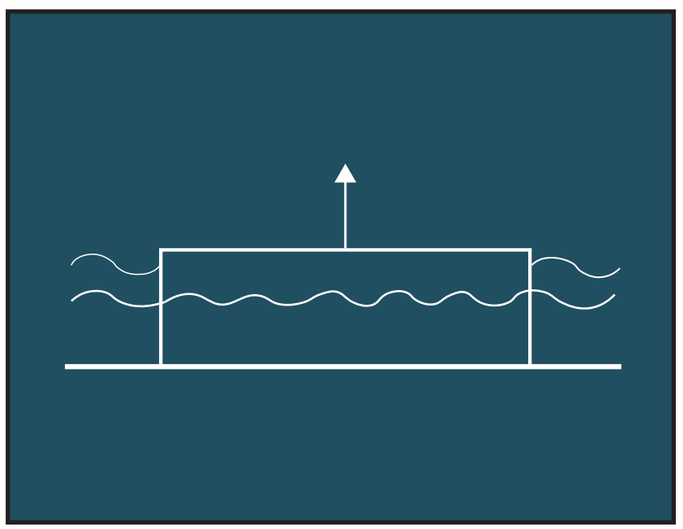


Large overhang roof



high ceilings and open facades

Rainwater harvesting



Elevated floors

Climate - smart roof

Glass panels
with PV - cells

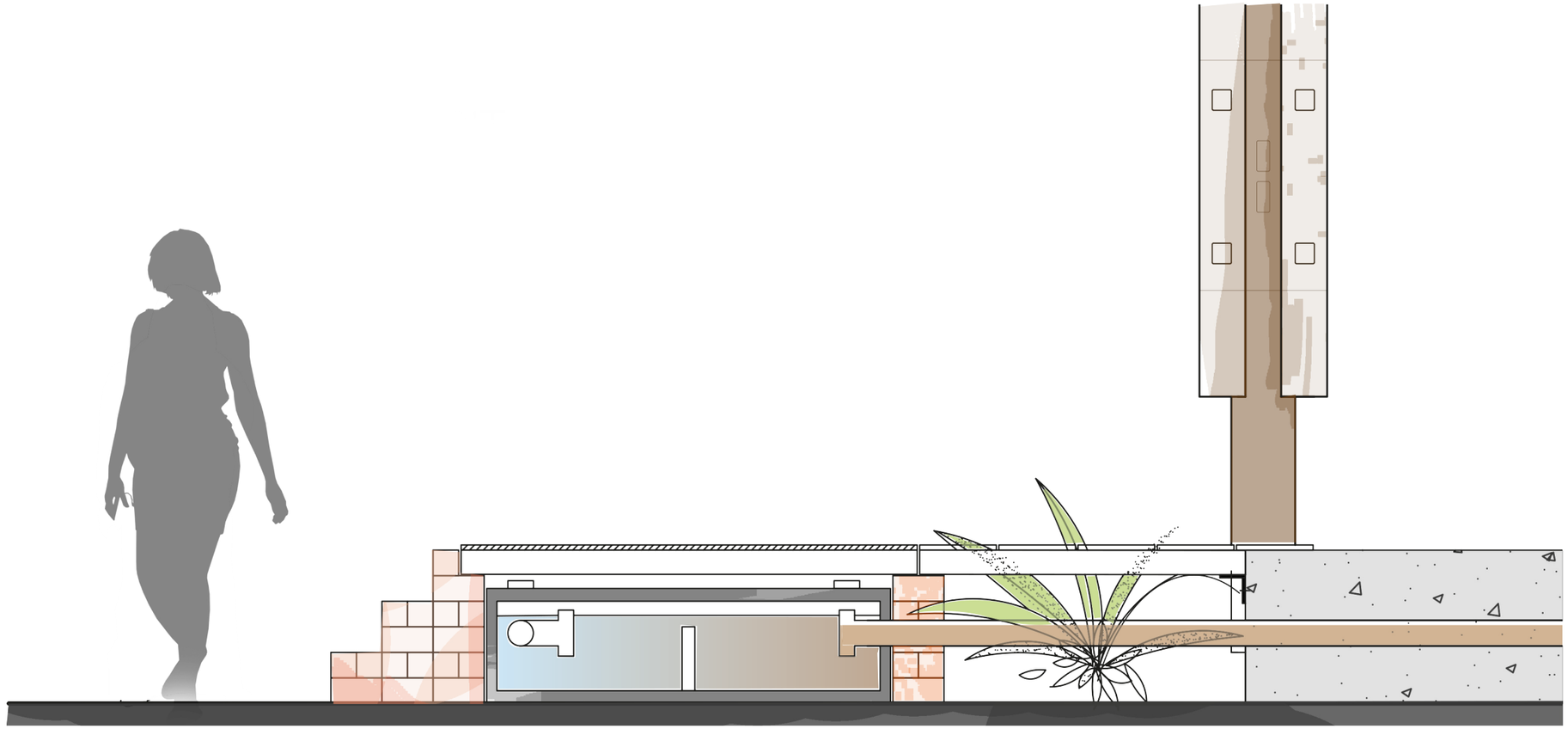
Water harvesting
and filtration

Community roof
farming

3000 mm

Large overhang provides
shade and rain protection

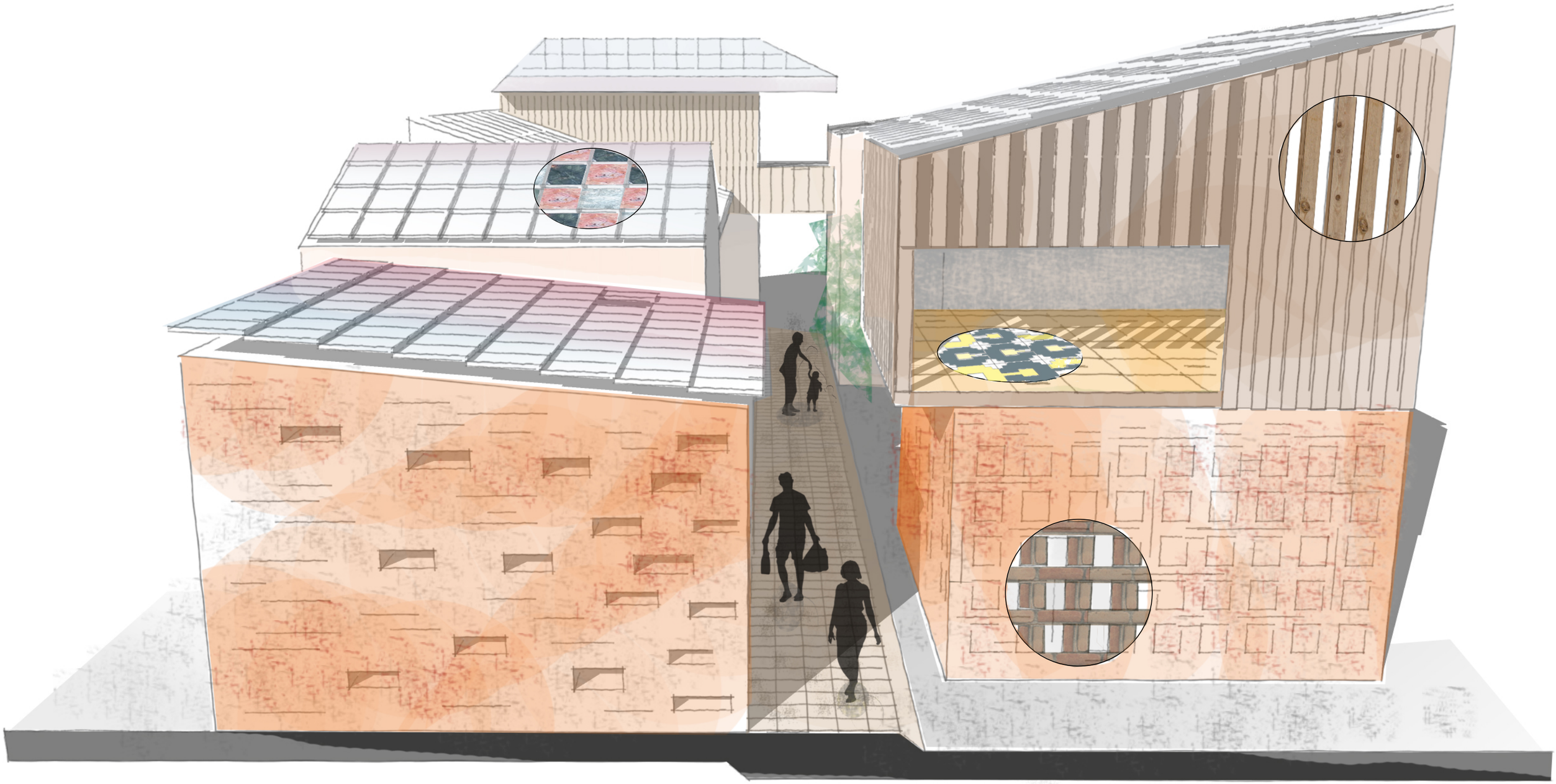
Waste water handling



waste water filtered through septic tanks before finally disposed in river

More comfort inside.
High ceilings, fresh air
and no more wet feet!

Conclusions



Terima Kasih

Thank You