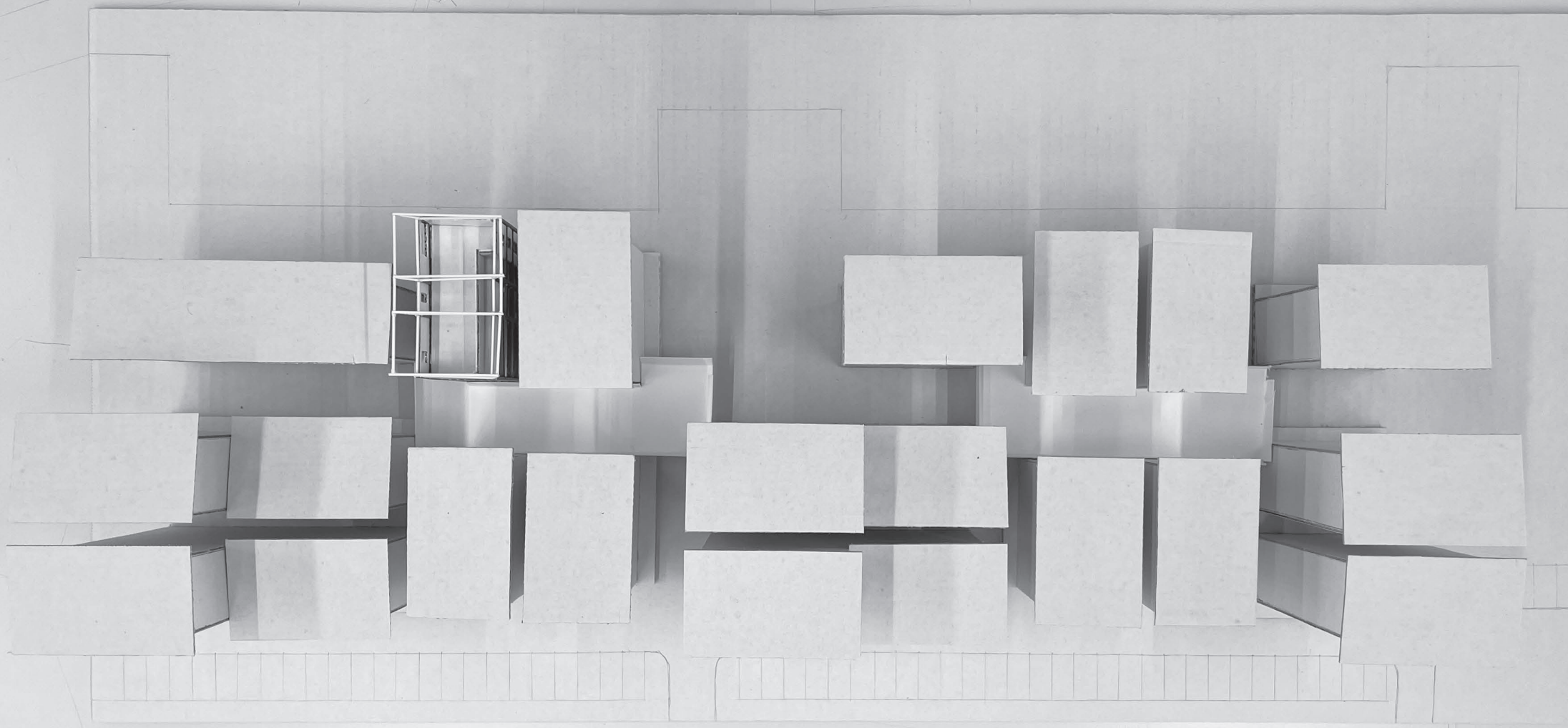


THE DICHOTOMY OF RIVERBANKS

Paradox of wasted landscapes and housing redevelopment

Keane Bridge, Sylhet, BANGLADESH

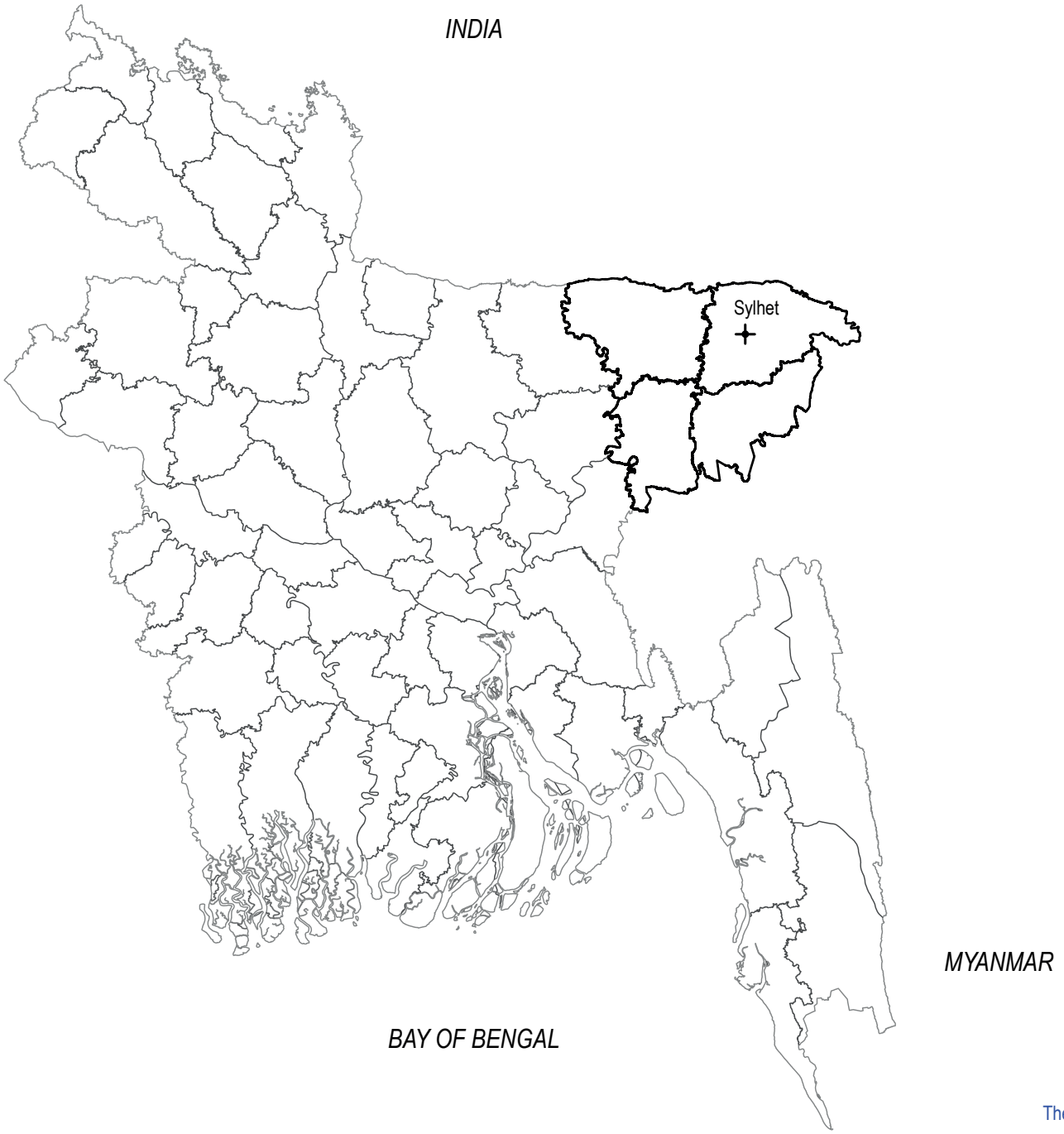
GEOGRAPHY

RESEARCH

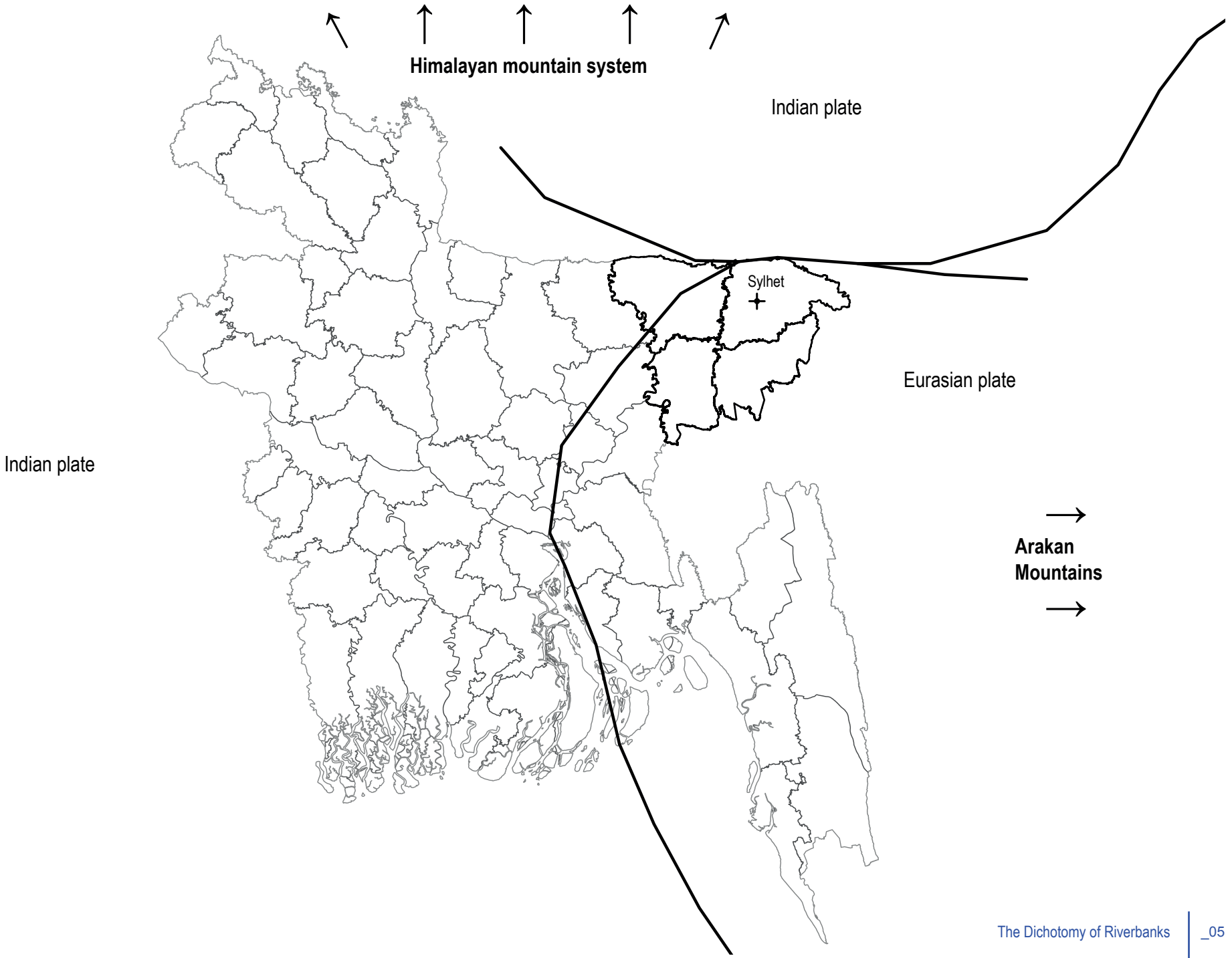
DESIGN

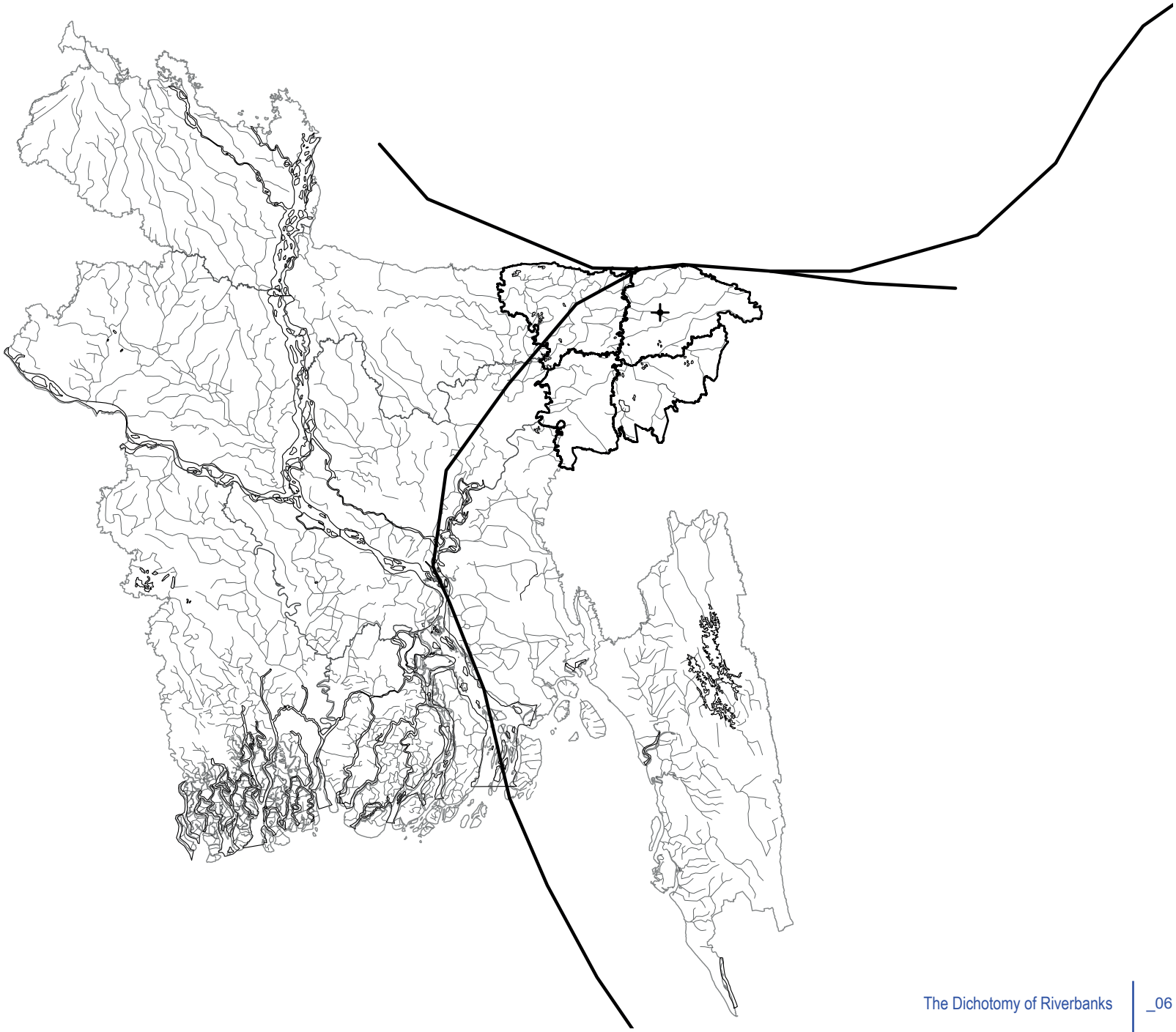
GEOGRAPHY

Sylhet Division

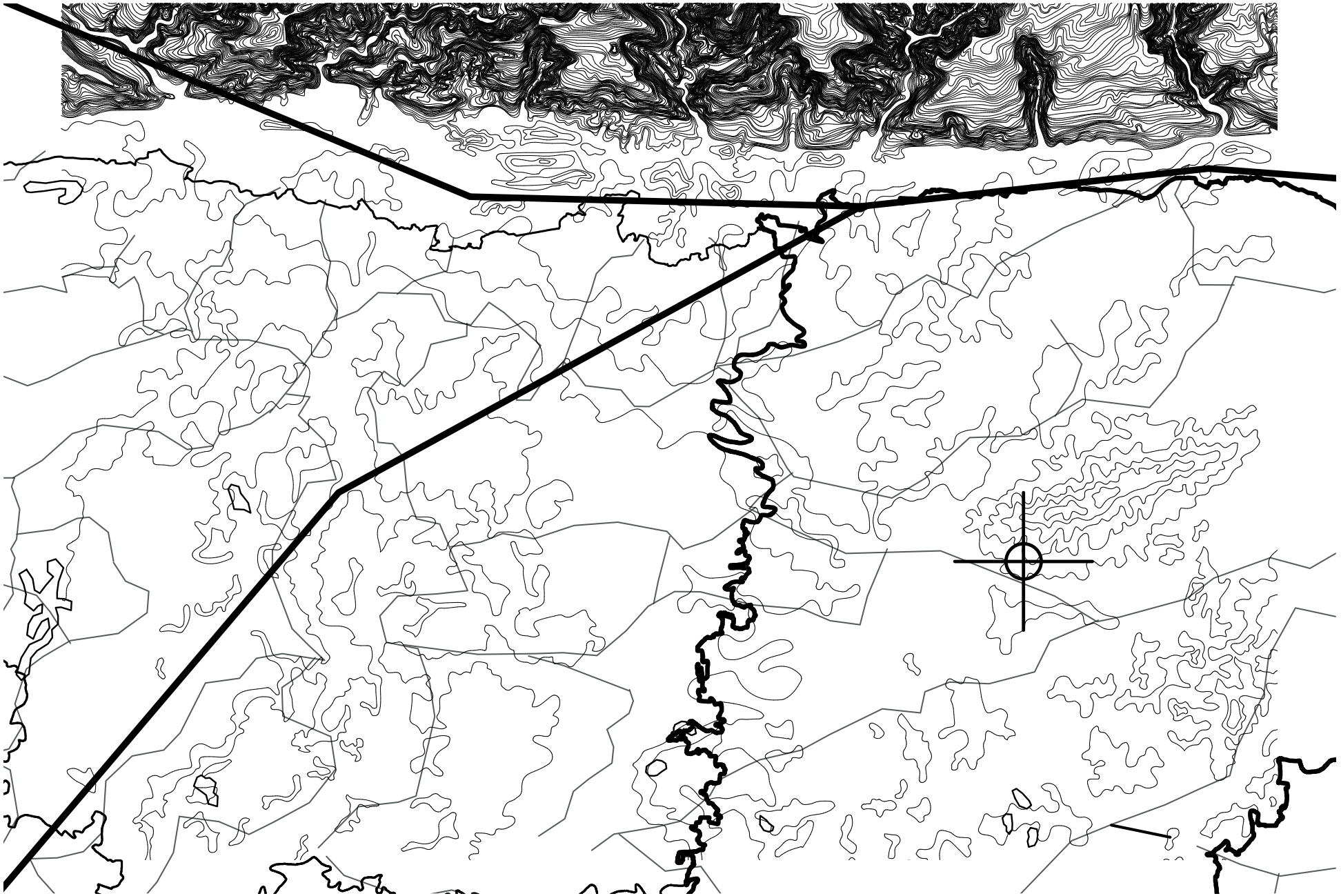


Seismic sensitive zone



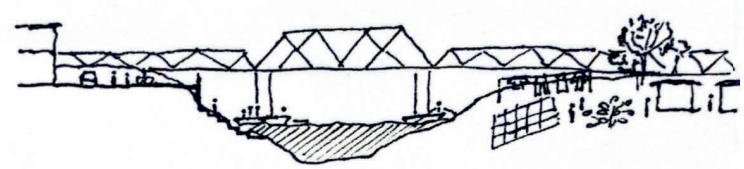


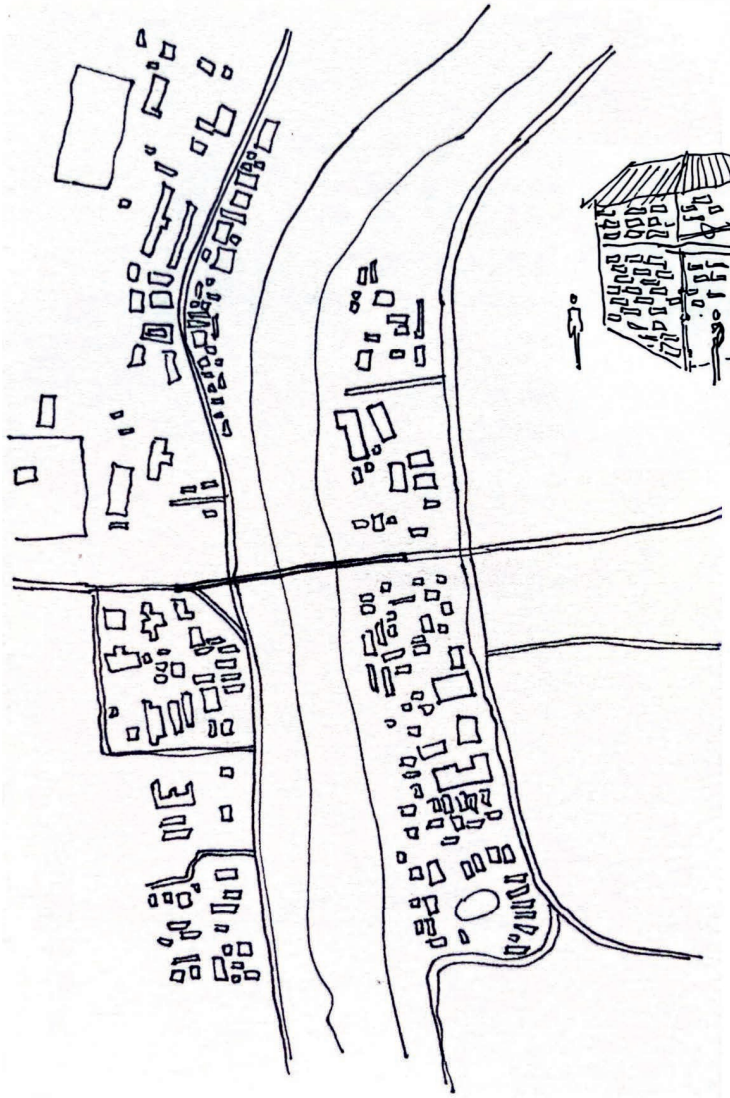
Cherrapunji

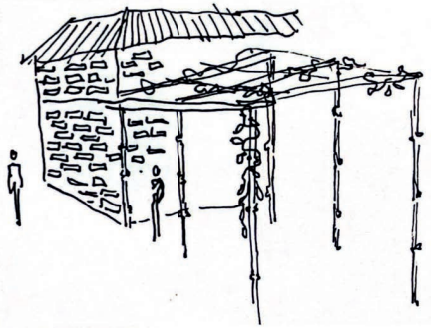


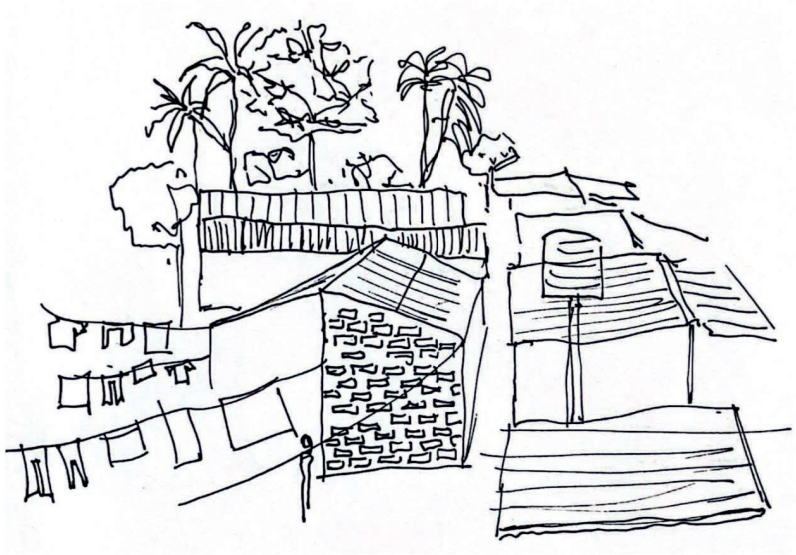
Flood situation in Sylhet, Surma River overflows, 17/06/2022.

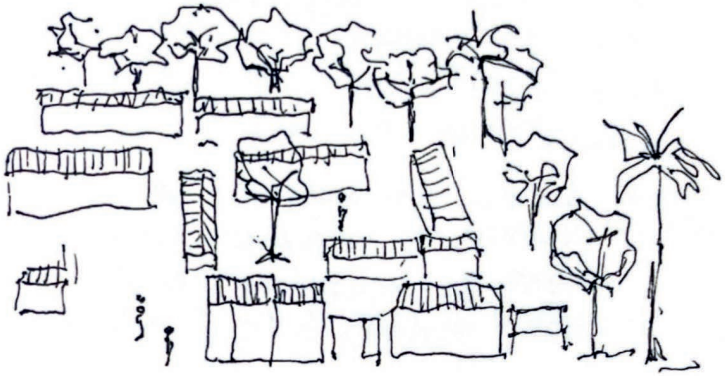
RESEARCH









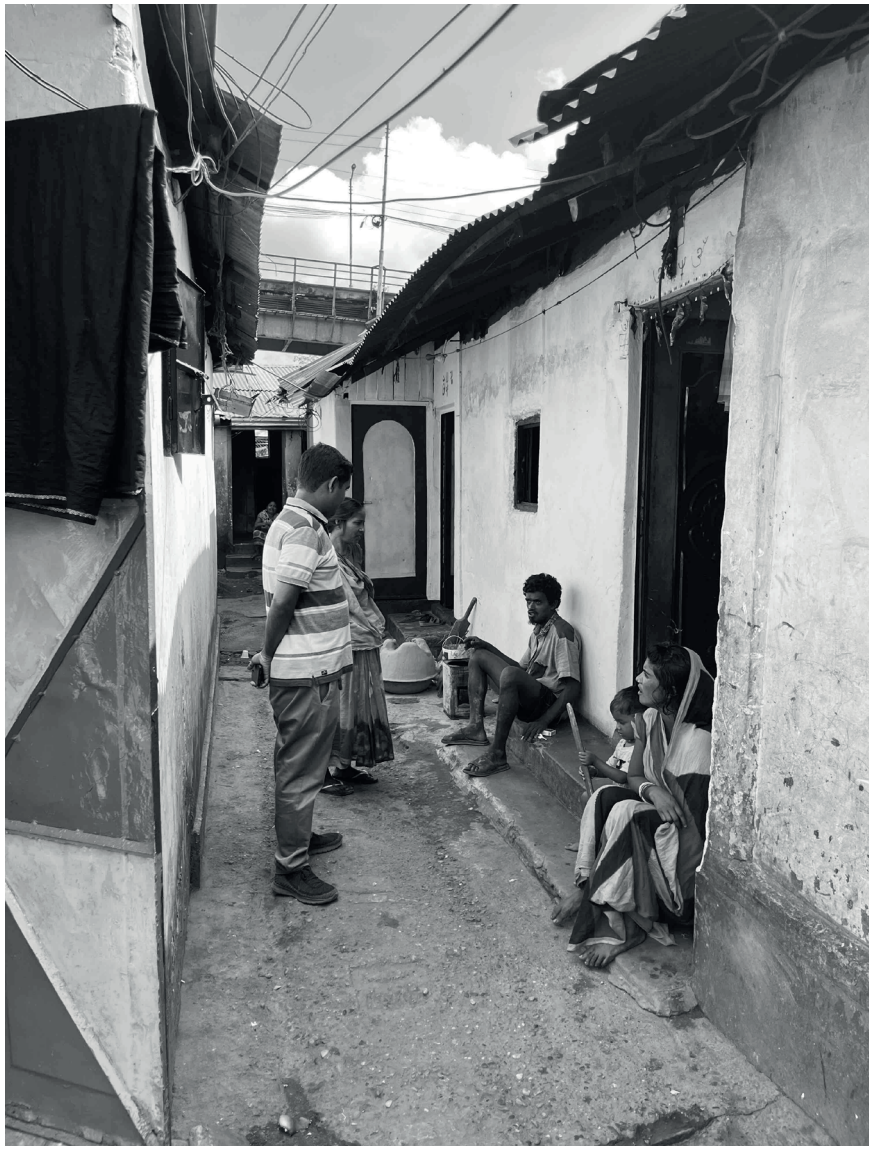


Sylheti population : Muslims : 92,5%
Hindus : 7,3%

Dalits :
"untouchable caste, poor, marginalised, limit acces to education, employment, heath, housing & public services"

Living conditions :
Housing → unsanitary and polluted areas
→ public housing or slums
→ 99% in 1-2 room houses
→ no landownership
(abandoned field or government land)

traditional **occupations** : "dirty jobs"
-Sweepers
-washer men
-Barbers
-Blacksmiths
-fishermen
-oil-pressers

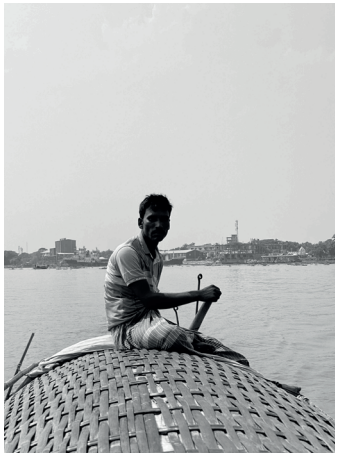
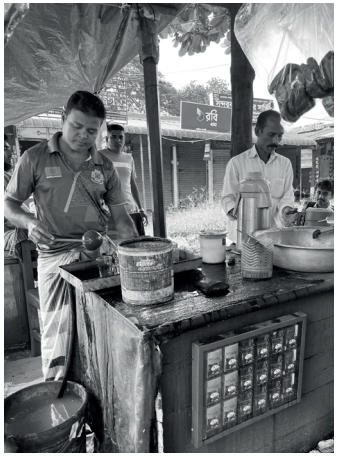


Hindu settlement, E.V.

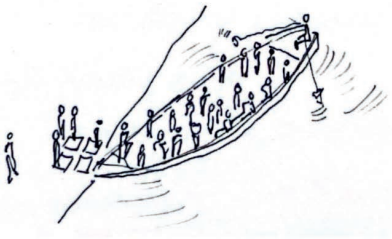
Muslim settlement, E.V.

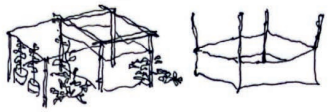


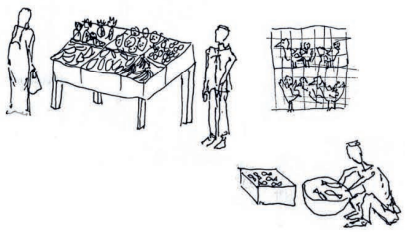


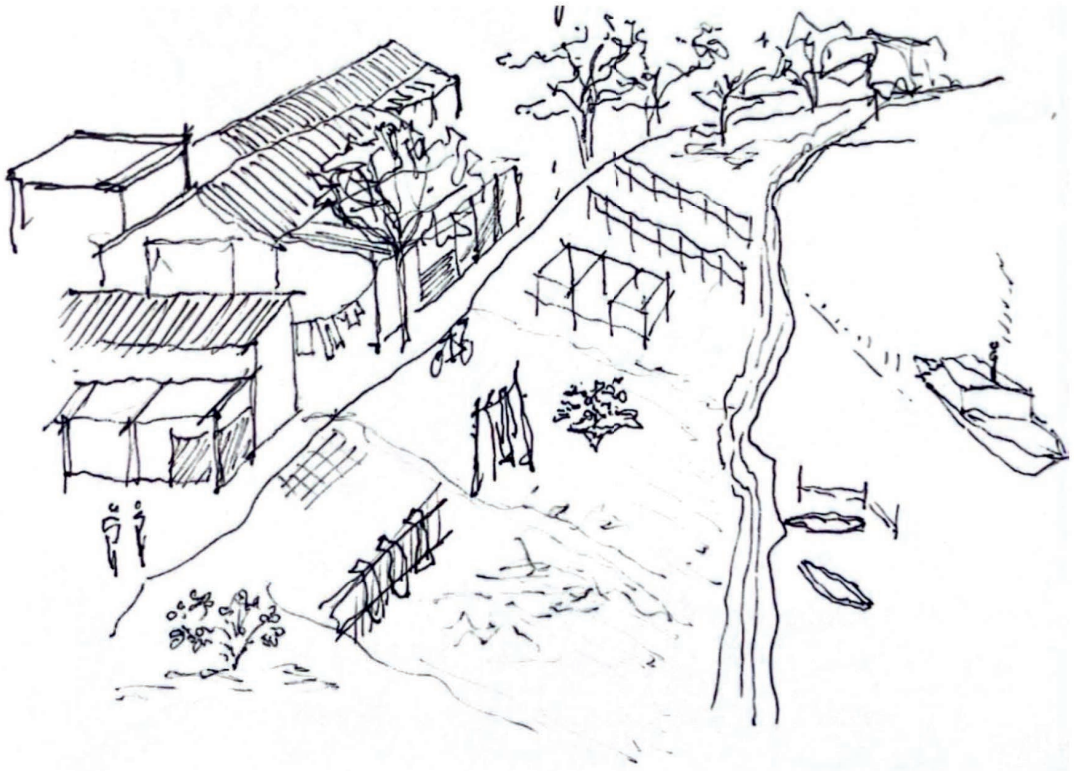





Amenities around Keane Bridge









In developing countries, **MANAGING SOLID WASTE** is :

- one of the most **difficult environmental problem** in the urban centres
- one of the most **costly** urban services, typically absorbing up to 20 to 40 per cent of municipal revenues

Domestic waste

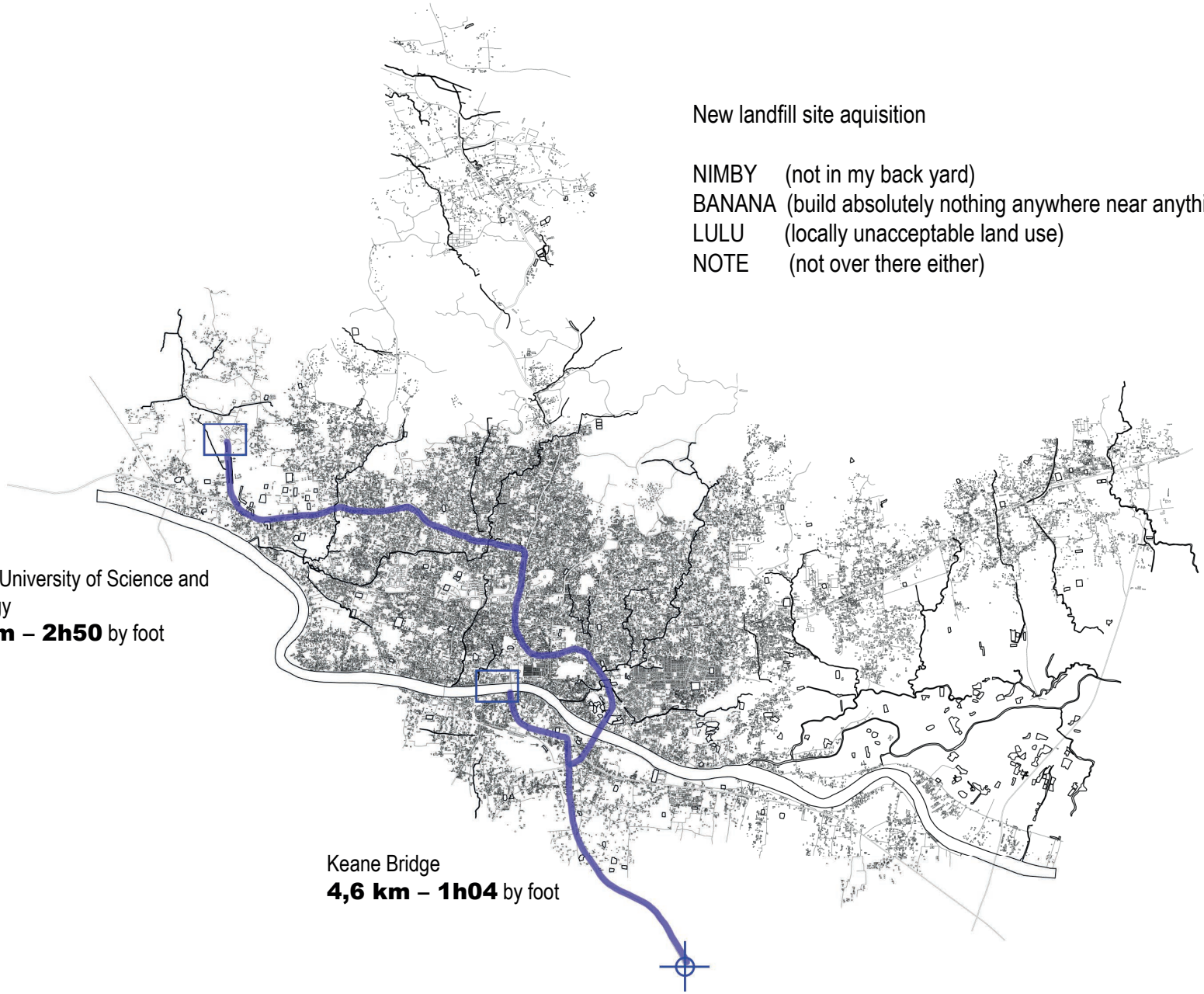
collection of the waste with vans → openspace / illegal dumping
→ street side dustbin
→ inadequate service : > 50% uncollected

↓

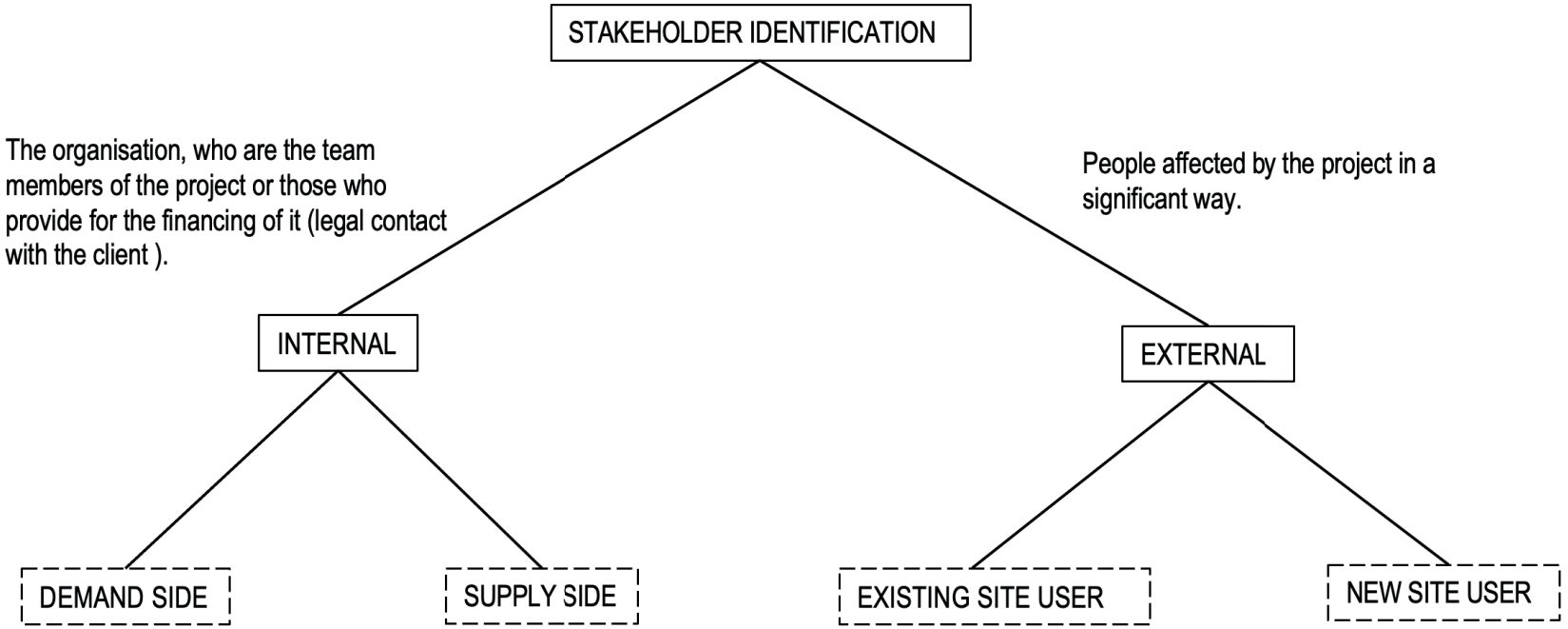
gathering the waste in secondary transfer stations

↓

transfering waste to landfill Lalmatia → no segregation
→ illegal collection & re-selling
→ open burning to reduce volume


New landfill site aquisition
NIMBY (not in my back yard)
BANANA (build absolutely nothing anywhere near anything)
LULU (locally unacceptable land use)
NOTE (not over there either)
Shahjalal University of Science and Technology
12,4 km – 2h50 by foot
Keane Bridge
4,6 km – 1h04 by foot

DESIGN



- Sylhet City Corporation (SCC)
- Railway Company
- Developer
- bank

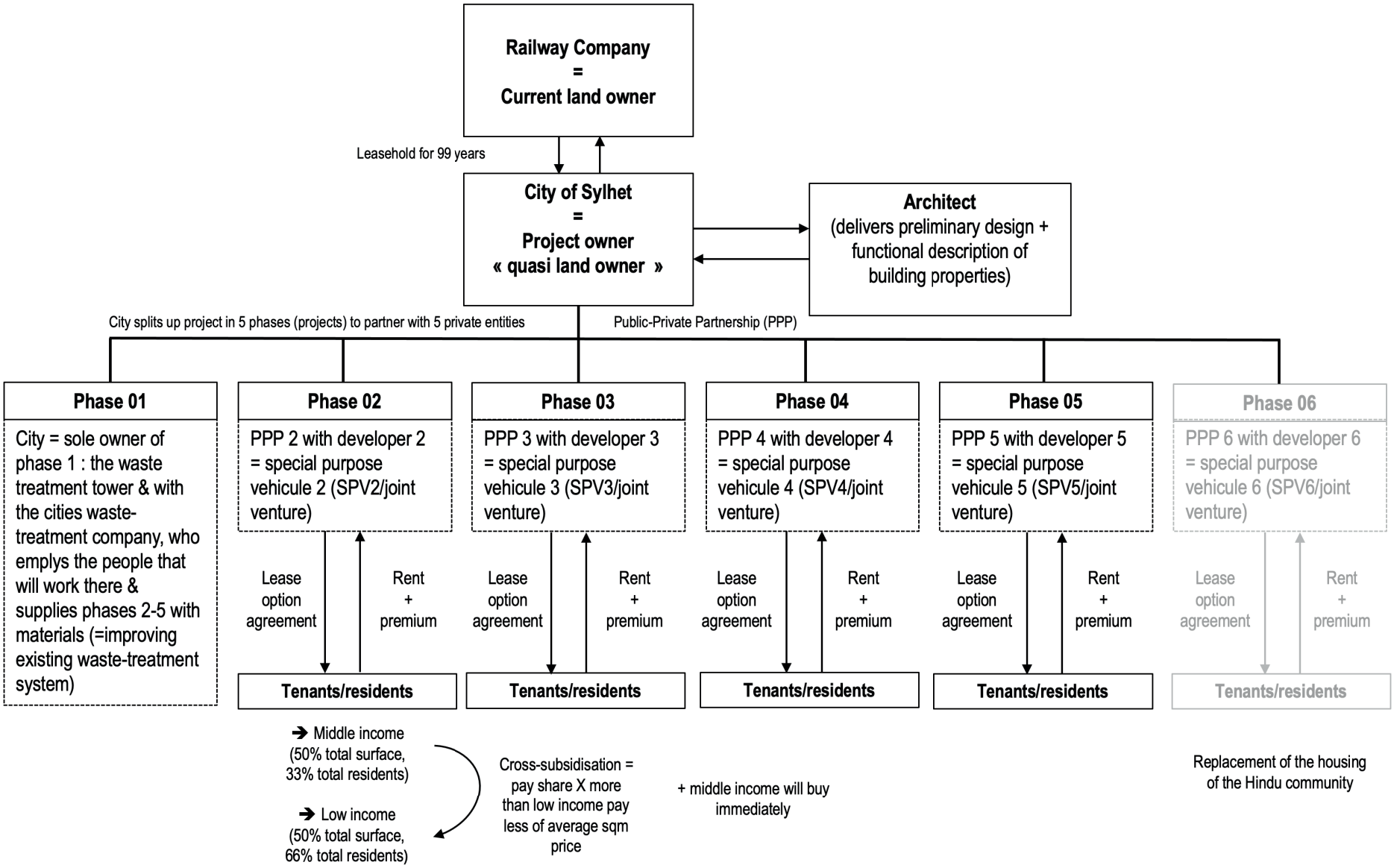
- architect
- Engineers
- Contractors
- Material suppliers

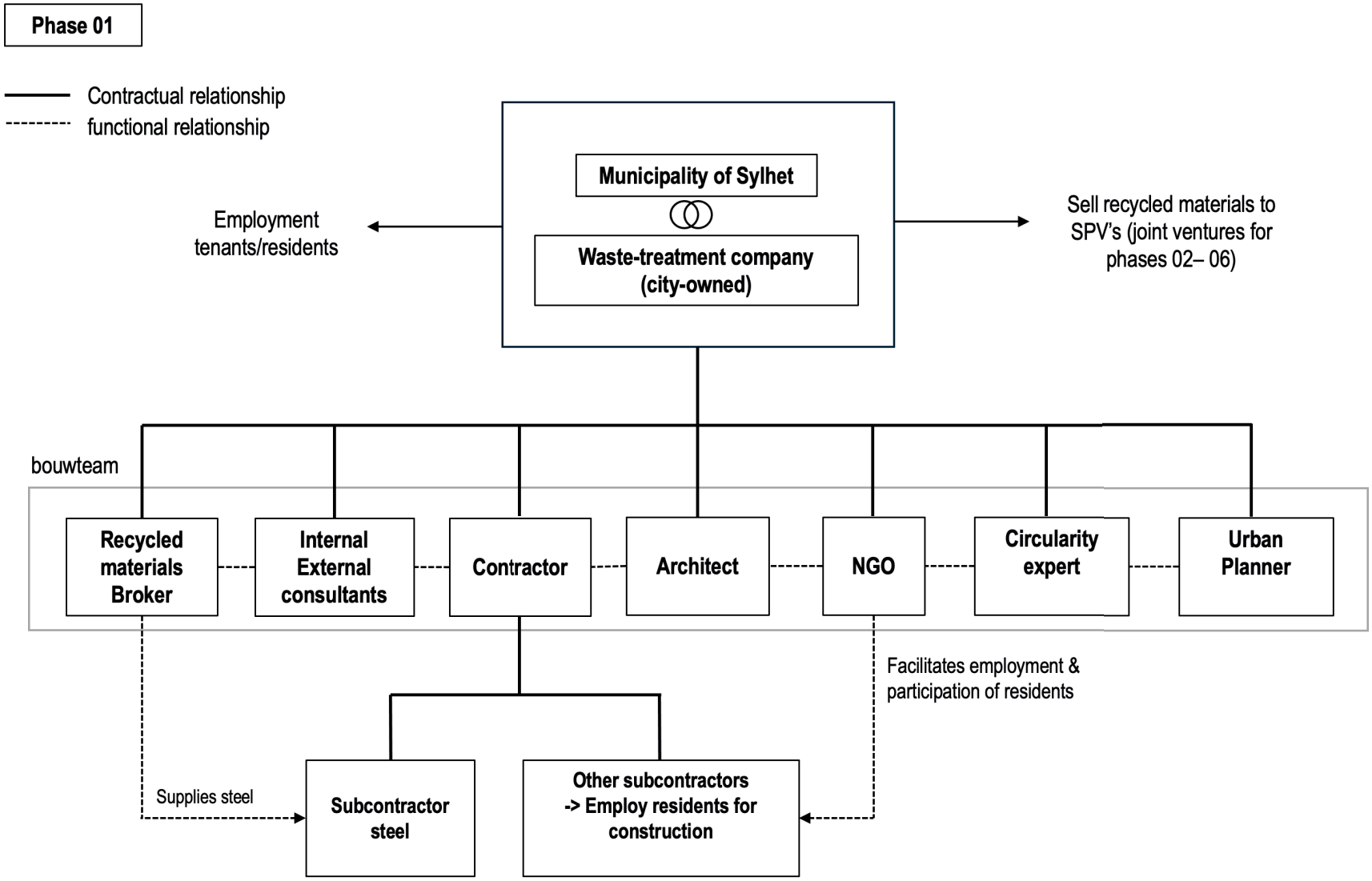
- Sweepers Colony
- Slum dwellers

- Middle income residents

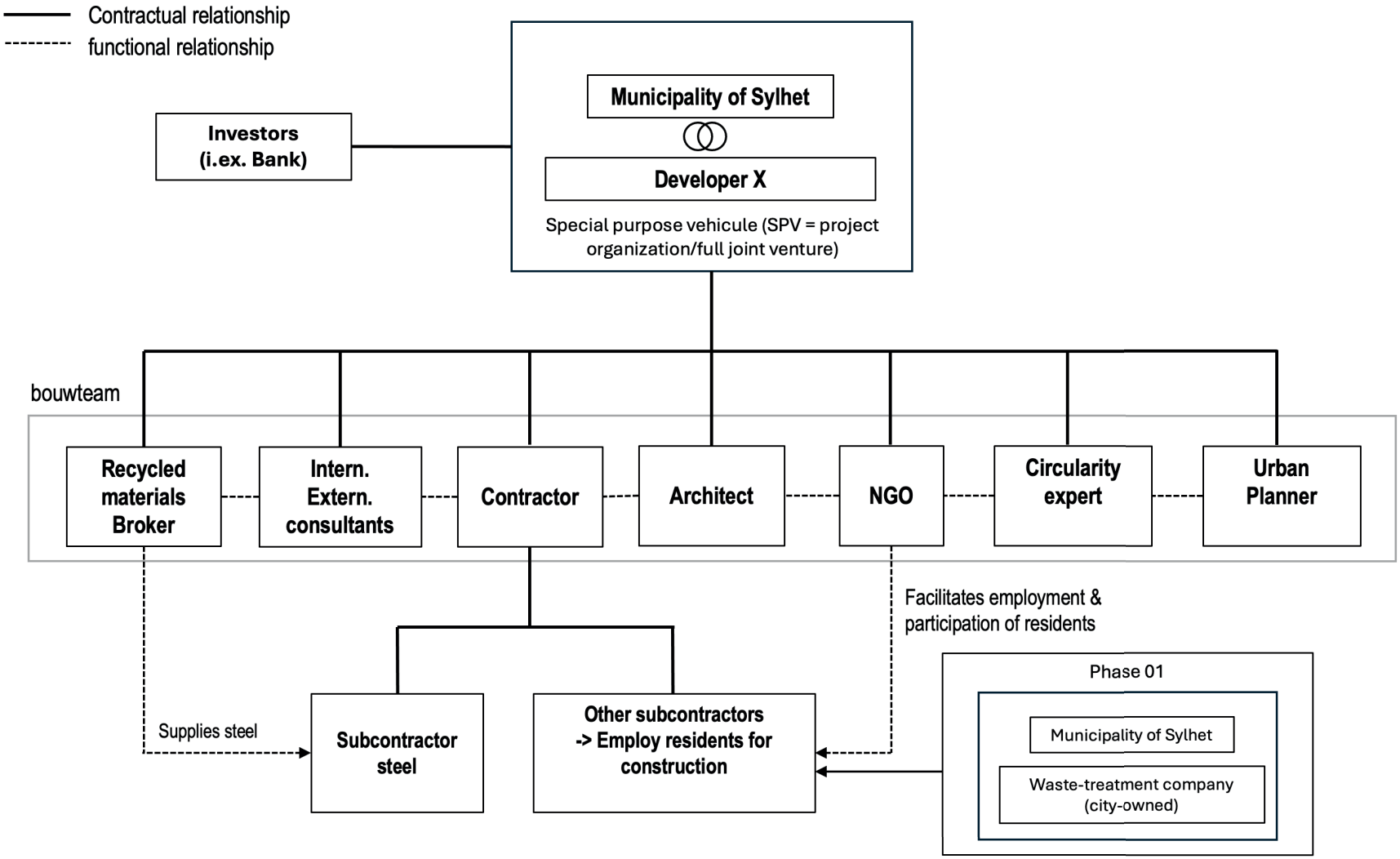
PUBLIC - PRIVATE PARTNERSHIP

	SCC	Railway Company	Developer	SweepersColony/ Slum dwellers	Middle income	Architect/engineer
ASPIRATIONS	- Housing - Densification (> FSI) - Solid waste management improvement - Good city image - Clean city & riverbanks - Rehouse slum dwellers (social interest)	- Site maintenance - Better land use - Social responsibility (house their employees)	- Return on investment - Make profit - Participate to a sustainable housing project	- Low cost housing - Rent-to-own housing - Rental housing - Better living conditions - Work opportunities	- Ownership - Pleasant living environment	- Money for the project - Participation from inhabitants
OFFERS	- Slum upgrading program - Income generation opportunities - Low incost housing - Subsidised rent for low income - Long term loan for stable income households	- Land	- Investment for project - On time & on budget delivery	- Labour - Money in the long term	- Investment for project : cross subsidisation	- Low cost housing design - Renewed image of city - Opportunities for income generation

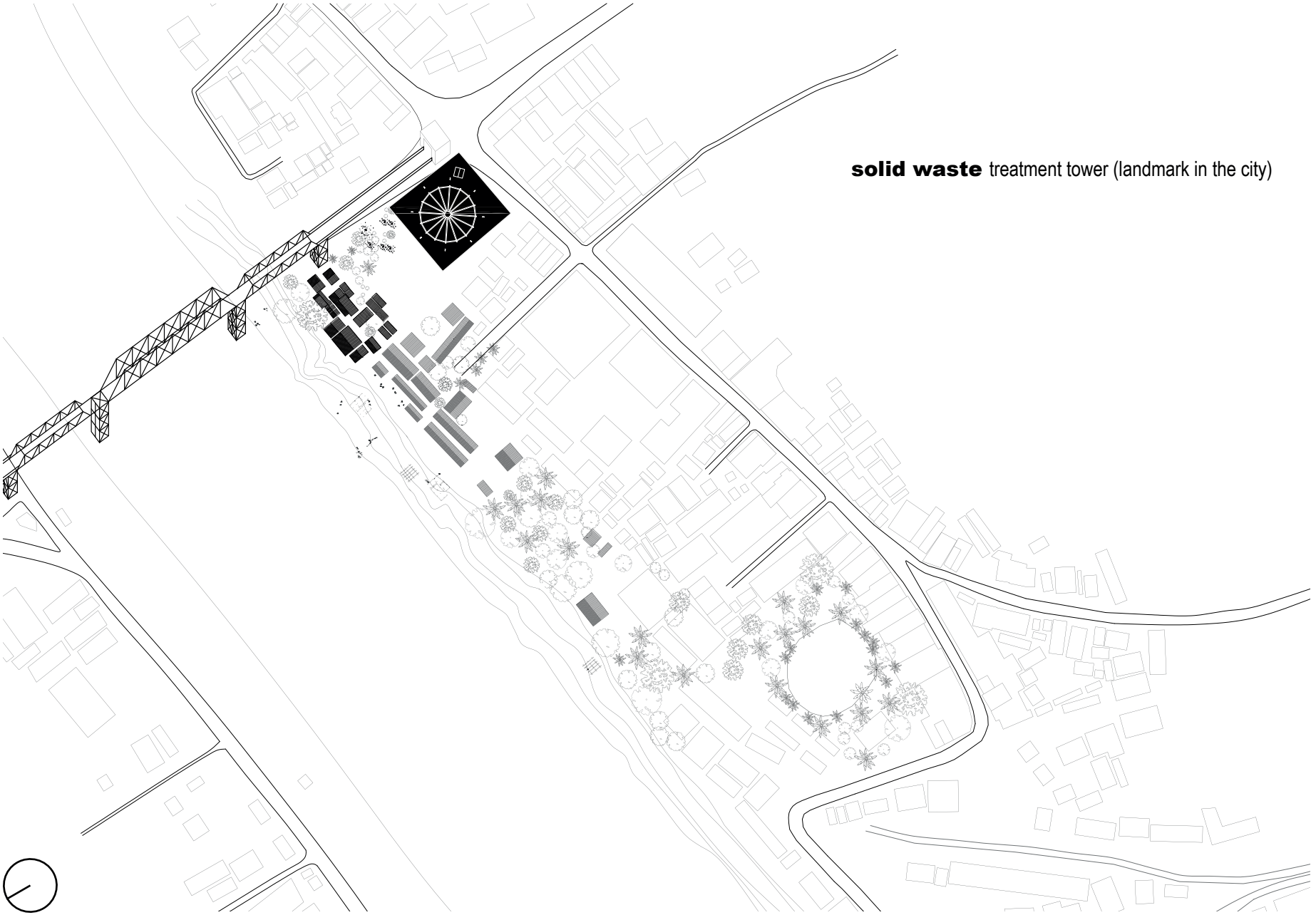

Railway Company
=
Current land owner
Leasehold for 99 years
City of Sylhet
=
Project owner
« quasi land owner »
Architect
(delivers preliminary design + functional description of building properties)
City splits up project in 5 phases (projects) to partner with 5 private entities
Public-Private Partnership (PPP)
Phase 01
City = sole owner of phase 1 : the waste treatment tower & with the cities waste-treatment company, who emplys the people that will work there & supplies phases 2-5 with materials (=improving existing waste-treatment system)
Phase 02
PPP 2 with developer 2 = special purpose vehicule 2 (SPV2/joint venture)
Phase 03
PPP 3 with developer 3 = special purpose vehicule 3 (SPV3/joint venture)
Phase 04
PPP 4 with developer 4 = special purpose vehicule 4 (SPV4/joint venture)
Phase 05
PPP 5 with developer 5 = special purpose vehicule 5 (SPV5/joint venture)
Phase 06
PPP 6 with developer 6 = special purpose vehicule 6 (SPV6/joint venture)
Lease option agreement
Rent + premium
Tenants/residents
➔ Middle income (50% total surface, 33% total residents)
➔ Low income (50% total surface, 66% total residents)
Cross-subsidisation = pay share X more than low income pay less of average sqm price
+ middle income will buy immediately
Replacement of the housing of the Hindu community


Phase 01
Contractual relationship
functional relationship
Municipality of Sylhet
Waste-treatment company (city-owned)
Employment tenants/residents
Sell recycled materials to SPV's (joint ventures for phases 02– 06)
bouwteam
Recycled materials Broker
Internal External consultants
Contractor
Architect
NGO
Circularity expert
Urban Planner
Facilitates employment & participation of residents
Supplies steel
Subcontractor steel
Other subcontractors -> Employ residents for construction

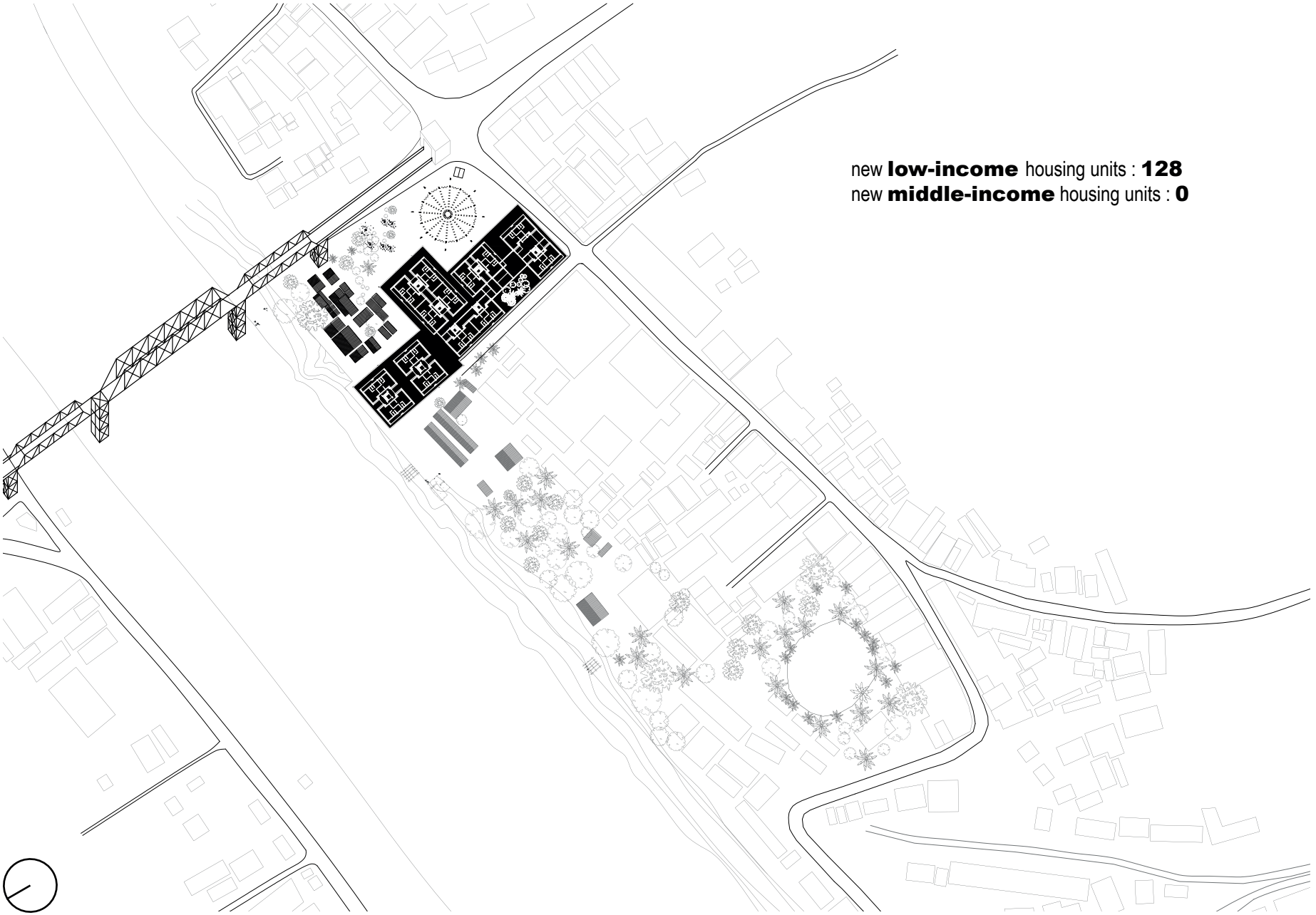
Phase 02-06


Contractual relationship
functional relationship
Investors (i.ex. Bank)
Municipality of Sylhet
Developer X
Special purpose vehicule (SPV = project organization/full joint venture)
bouwteam
Recycled materials Broker
Intern. Extern. consultants
Contractor
Architect
NGO
Circularity expert
Urban Planner
Facilitates employment & participation of residents
Supplies steel
Subcontractor steel
Other subcontractors -> Employ residents for construction
Phase 01
Municipality of Sylhet
Waste-treatment company (city-owned)

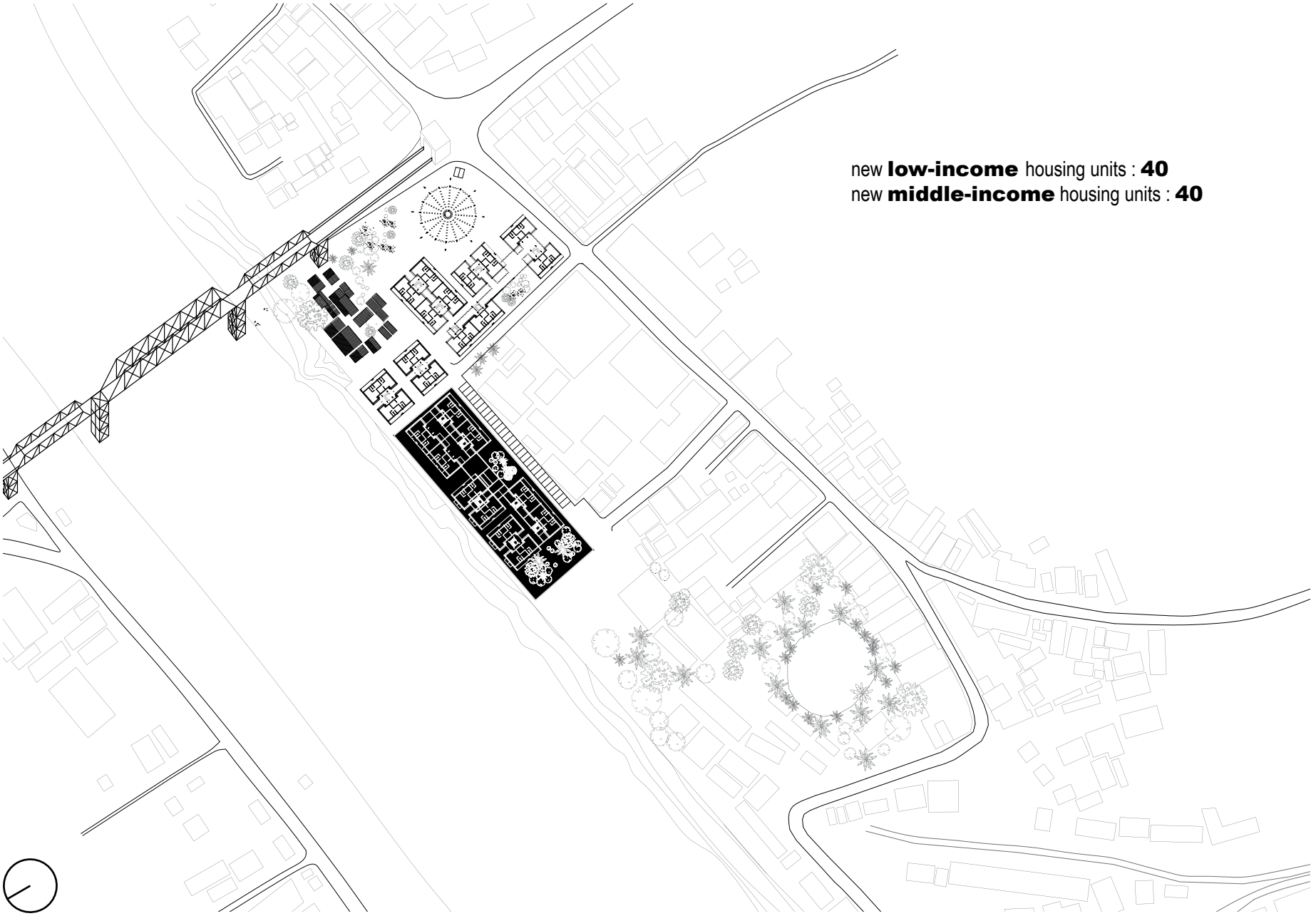
existing low-income housing (Sweepers) : 20



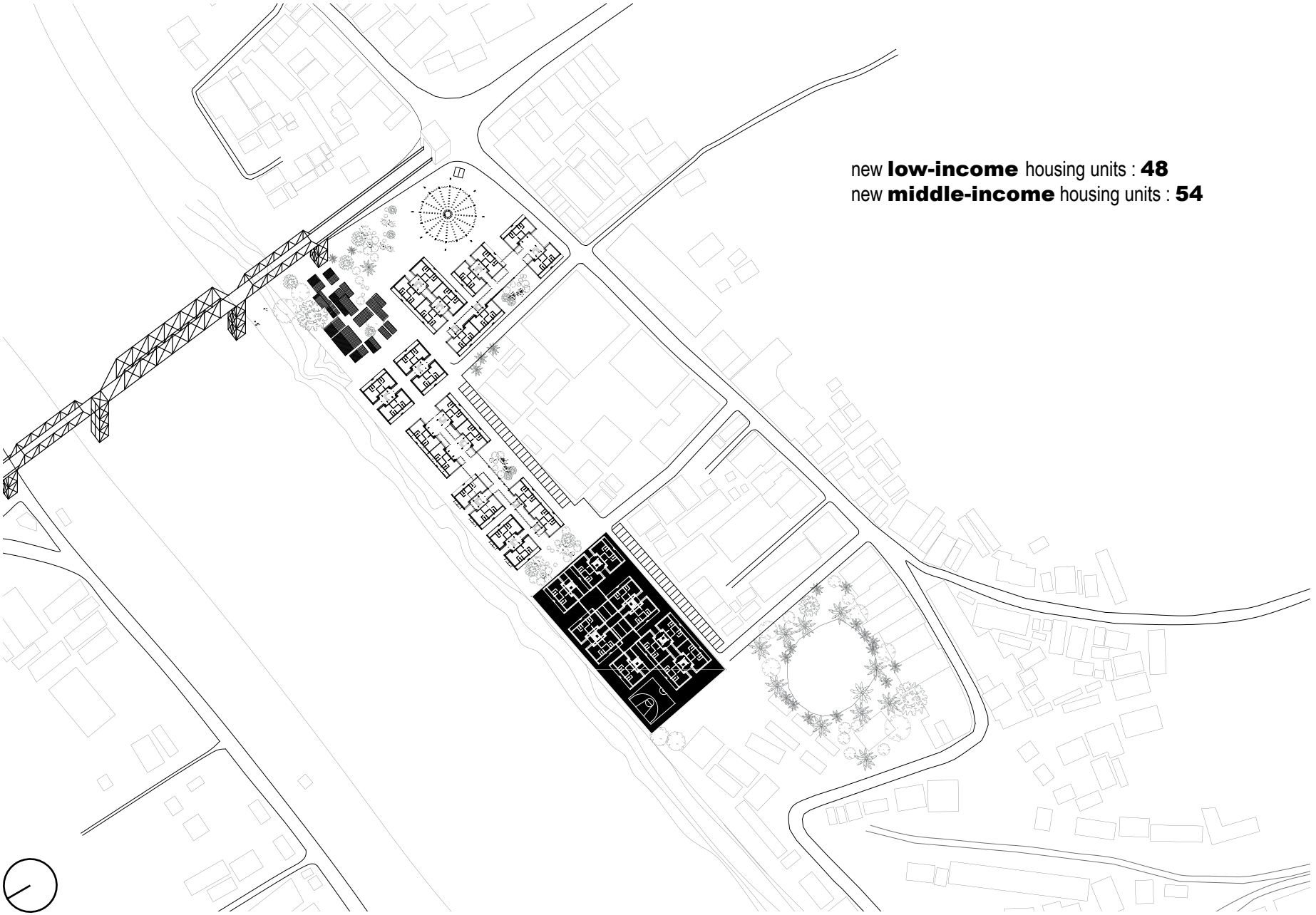
solid waste treatment tower (landmark in the city)



new **low-income** housing units : **128**
new **middle-income** housing units : **0**

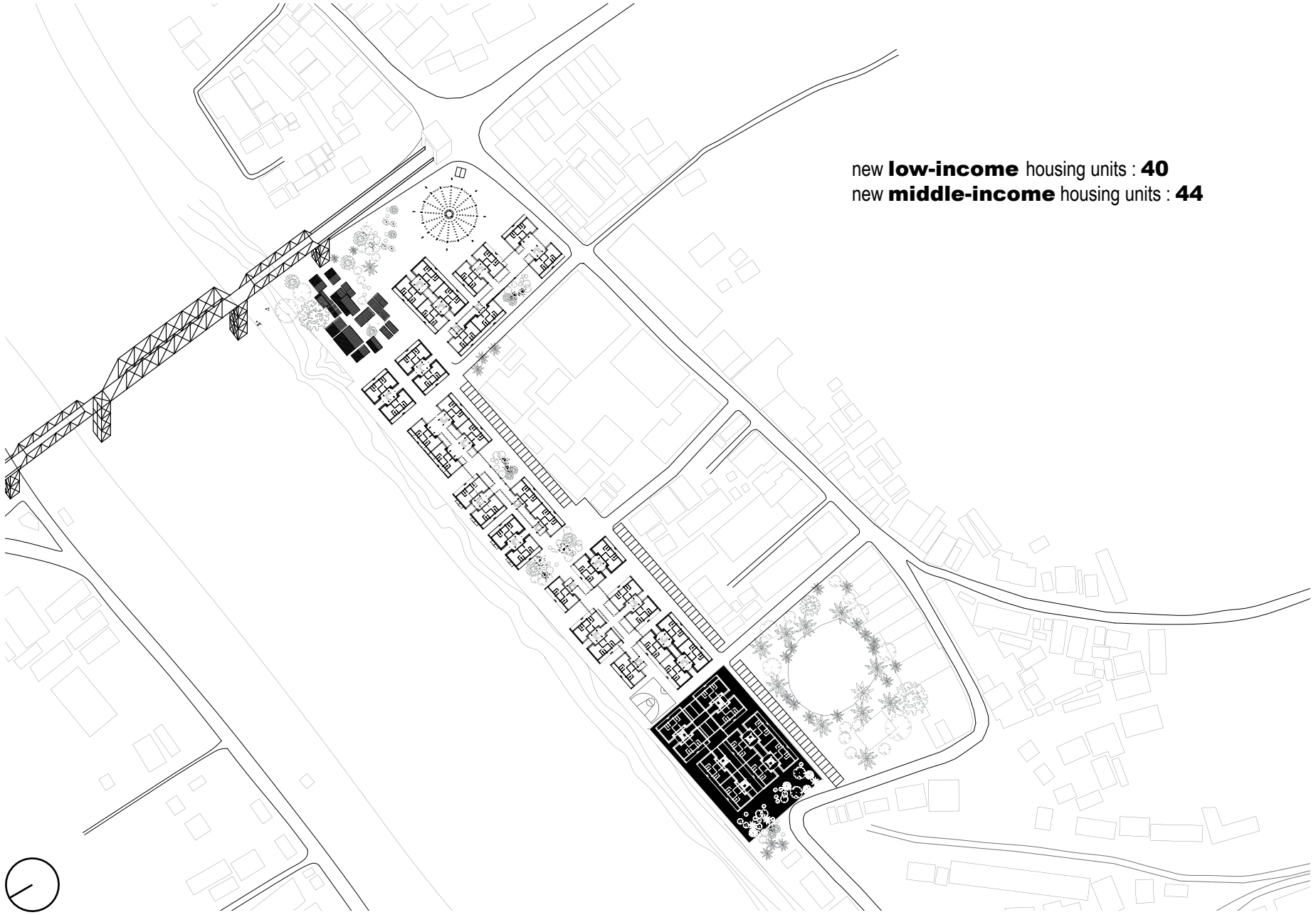


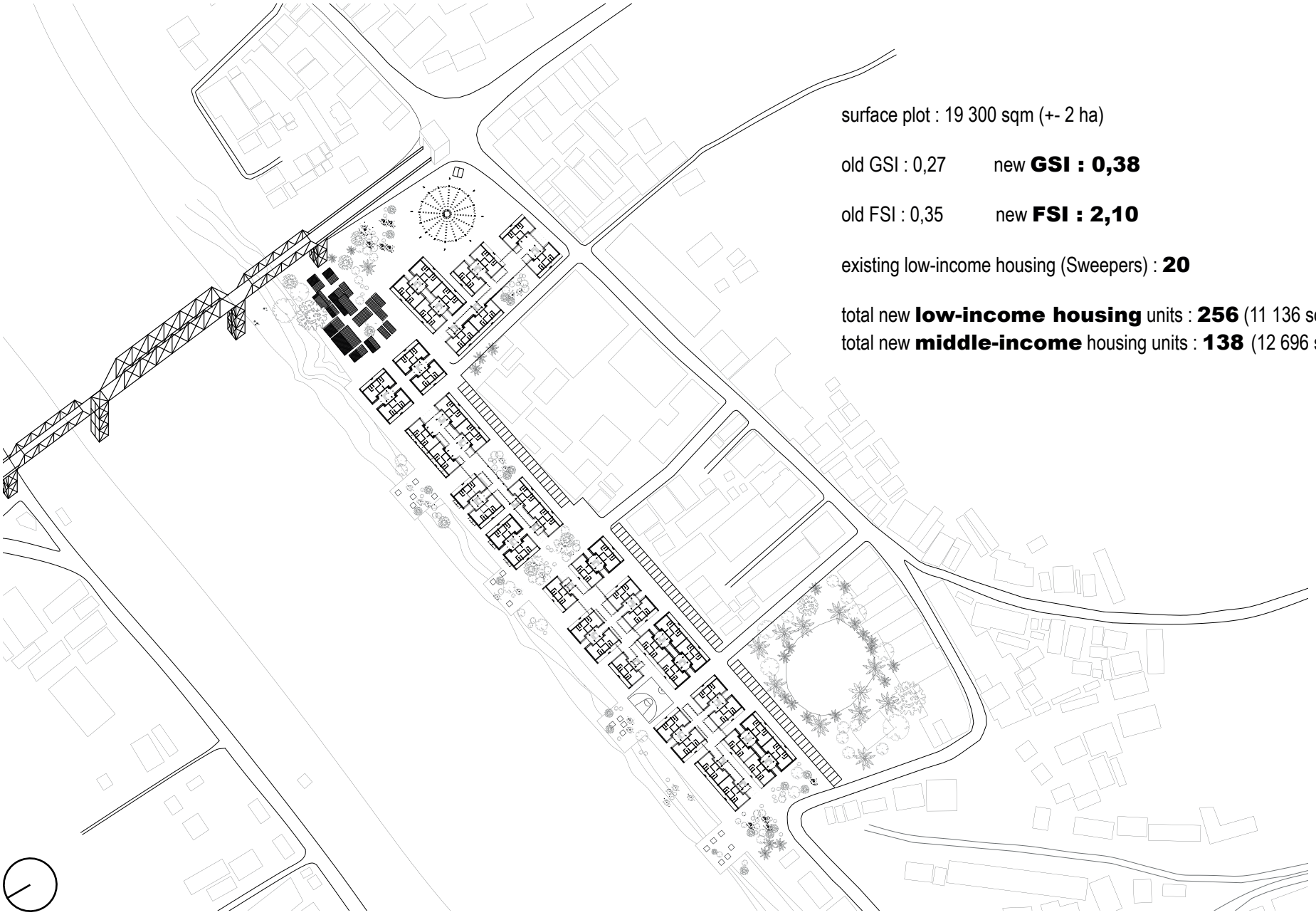
new **low-income** housing units : **40**
new **middle-income** housing units : **40**



new **low-income** housing units : **48**
new **middle-income** housing units : **54**

new **low-income** housing units : **40**
new **middle-income** housing units : **44**





surface plot : 19 300 sqm (+- 2 ha)

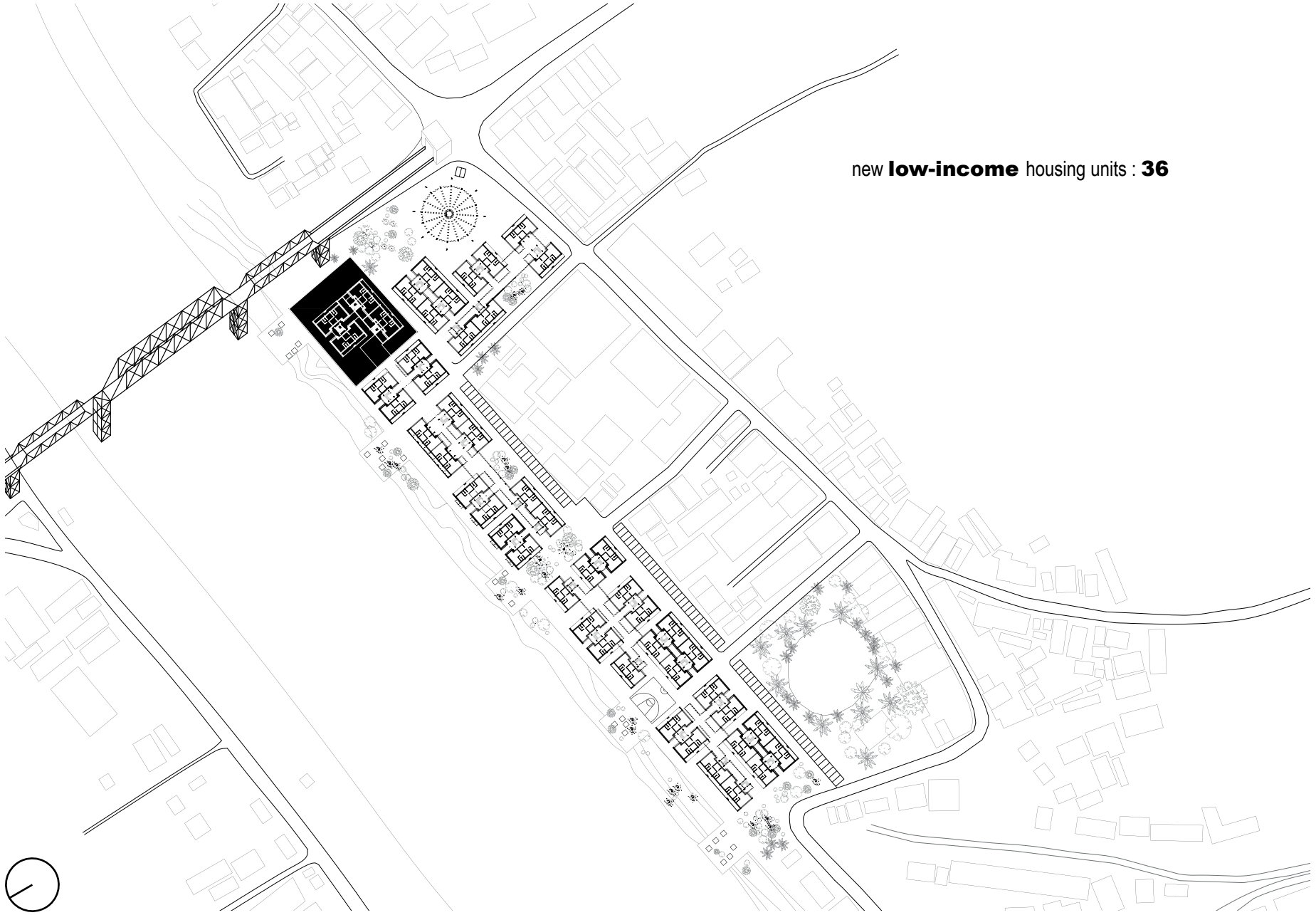
old GSI : 0,27 new **GSI : 0,38**

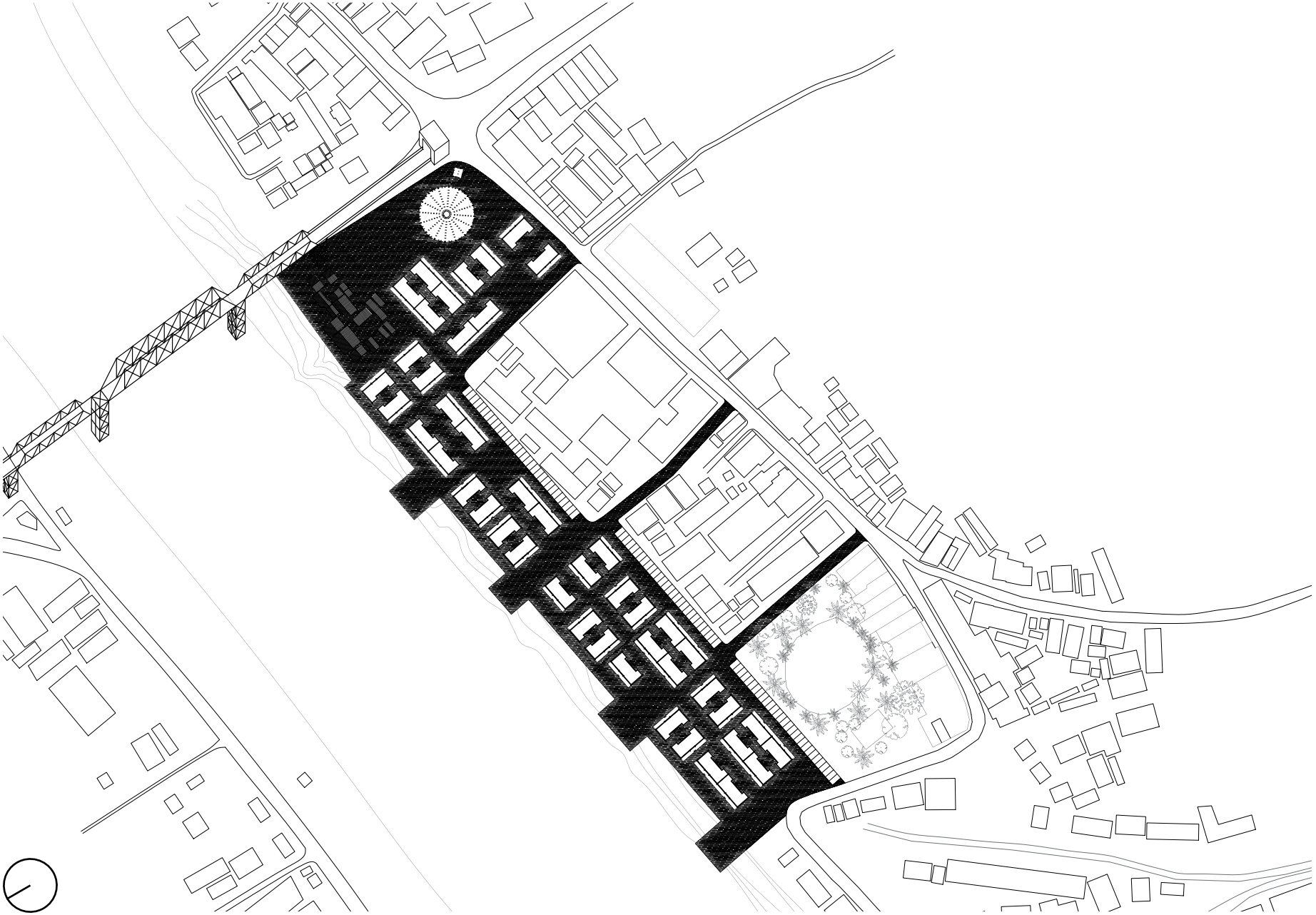
old FSI : 0,35 new **FSI : 2,10**

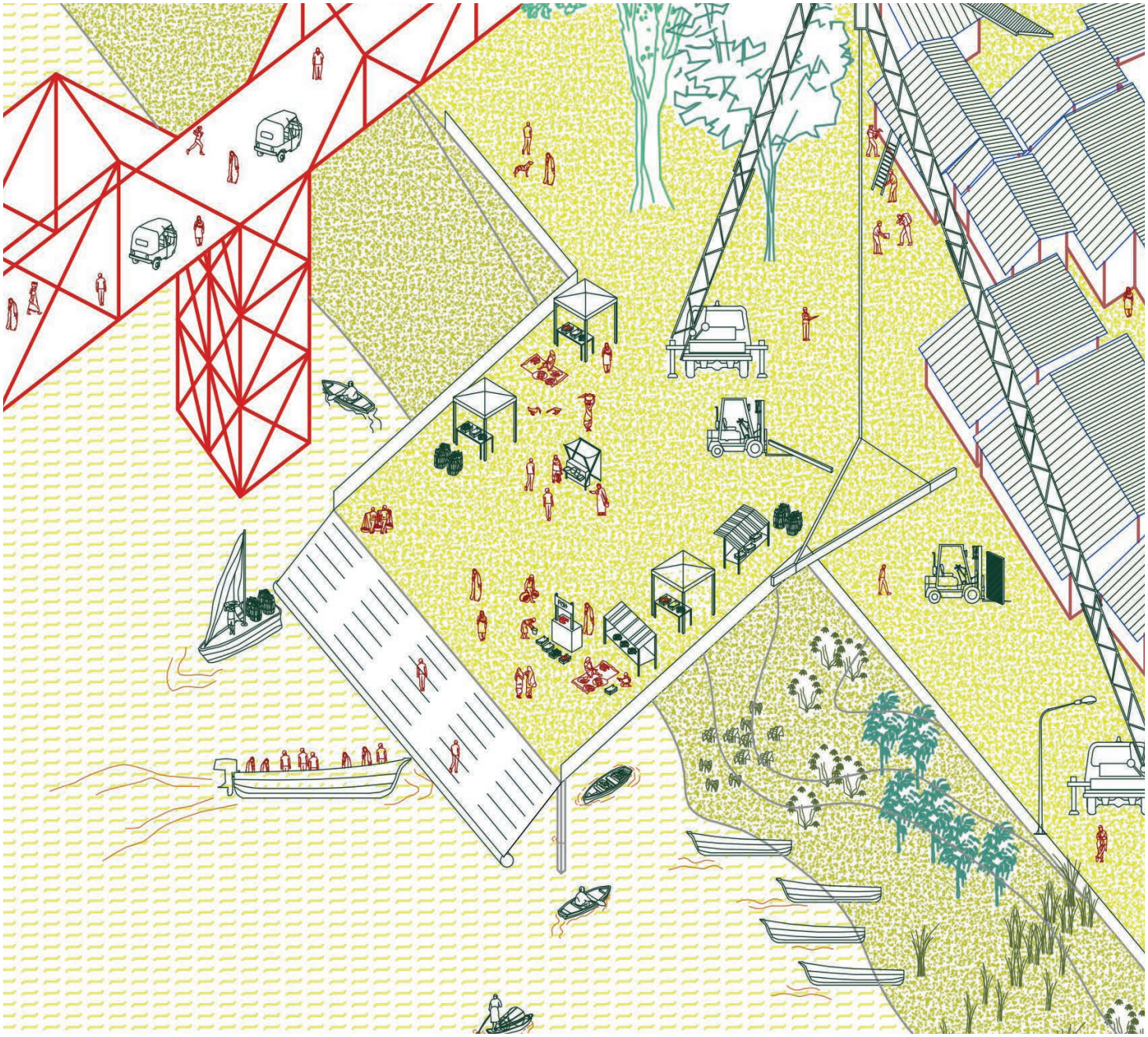
existing low-income housing (Sweepers) : **20**

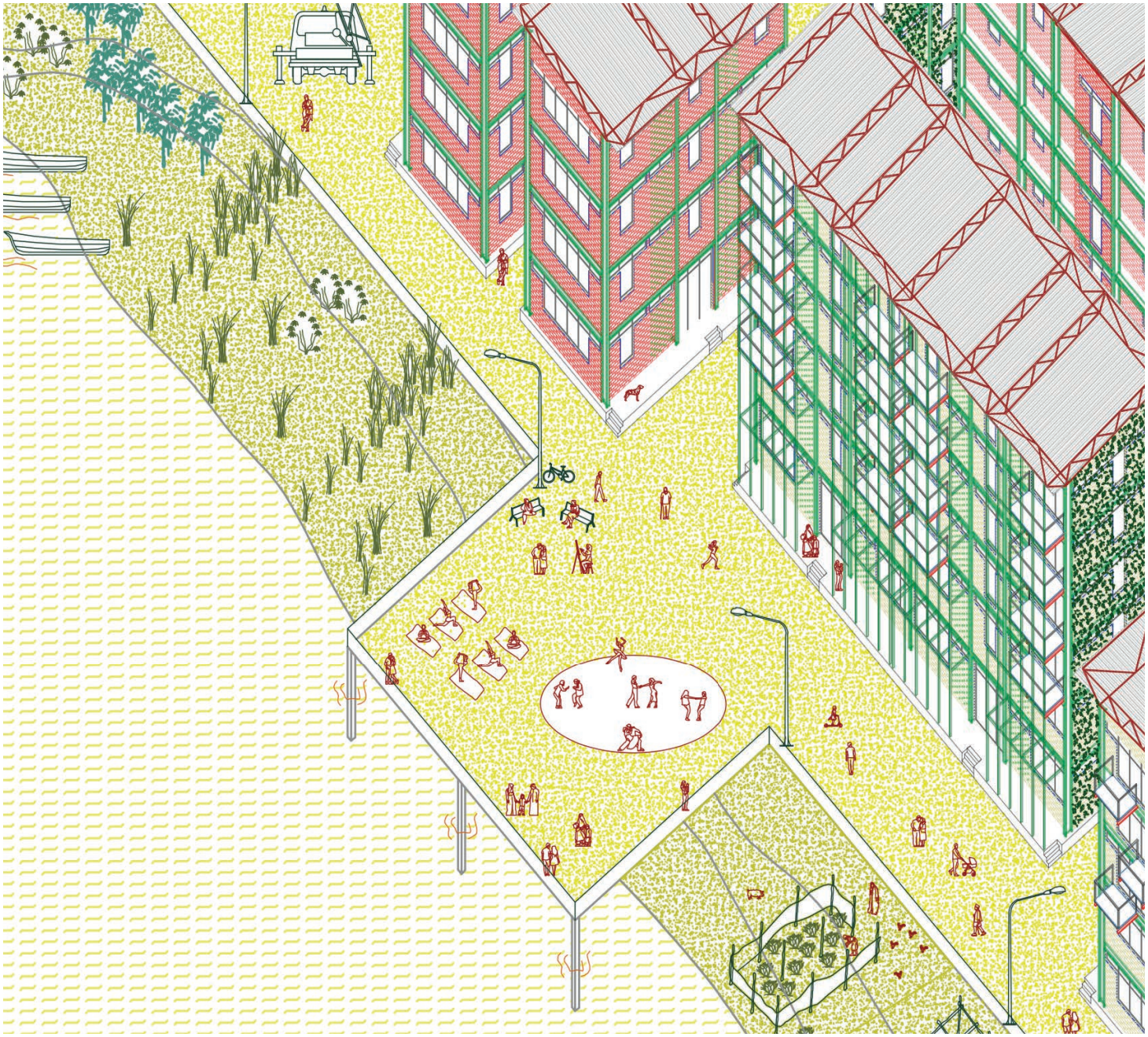
total new **low-income housing** units : **256** (11 136 sqm)
total new **middle-income** housing units : **138** (12 696 sqm)

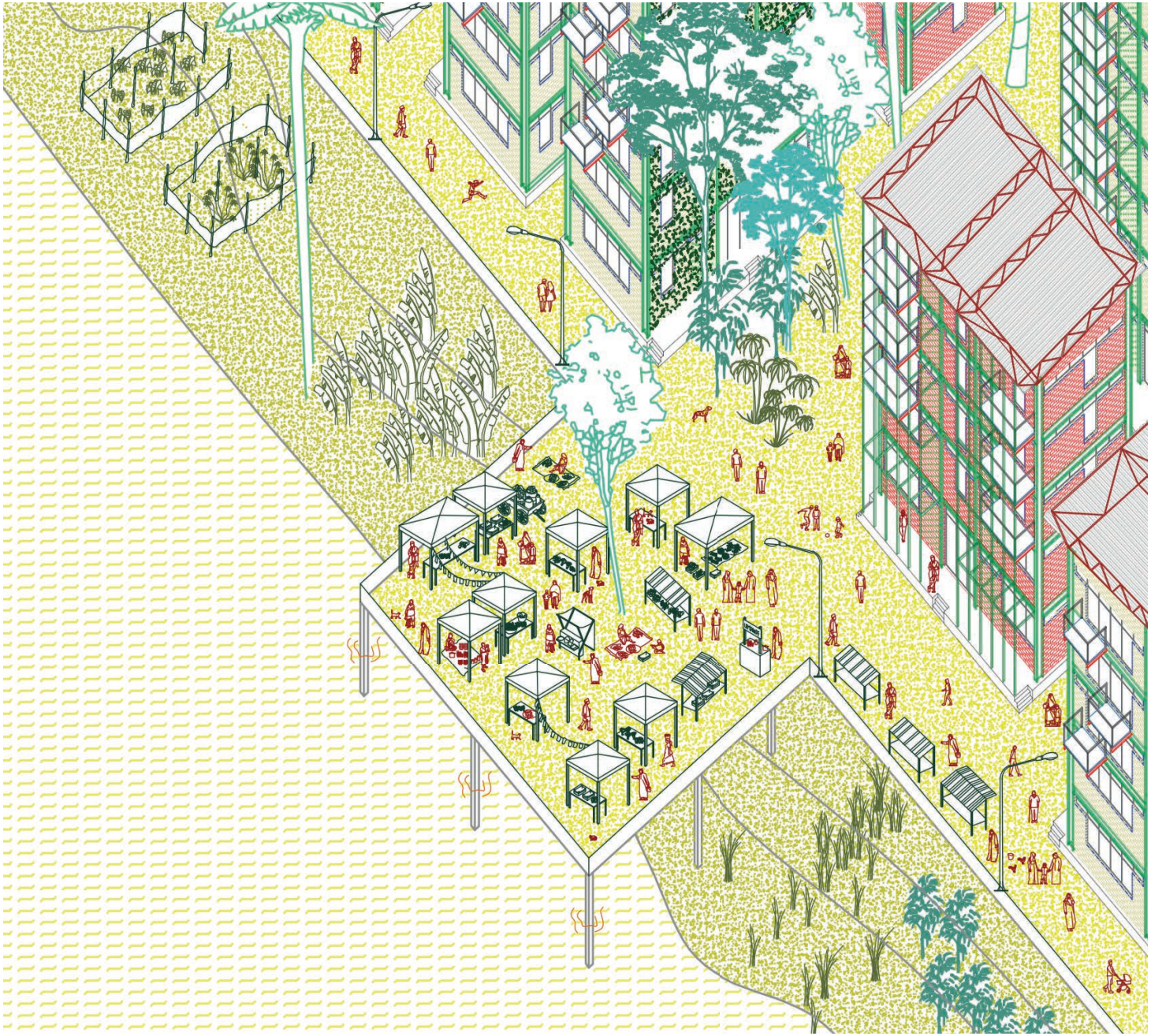
new **low-income** housing units : **36**

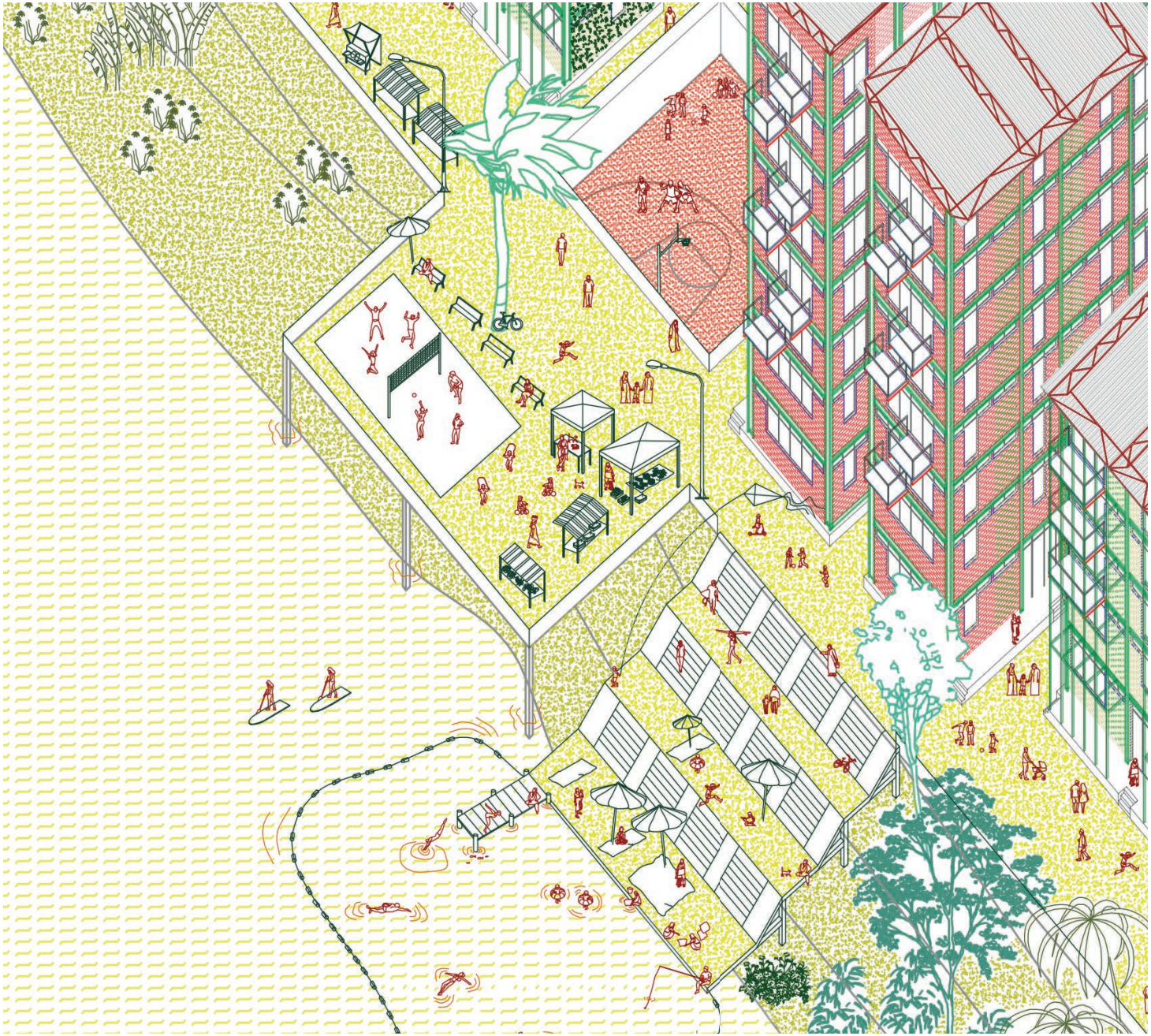


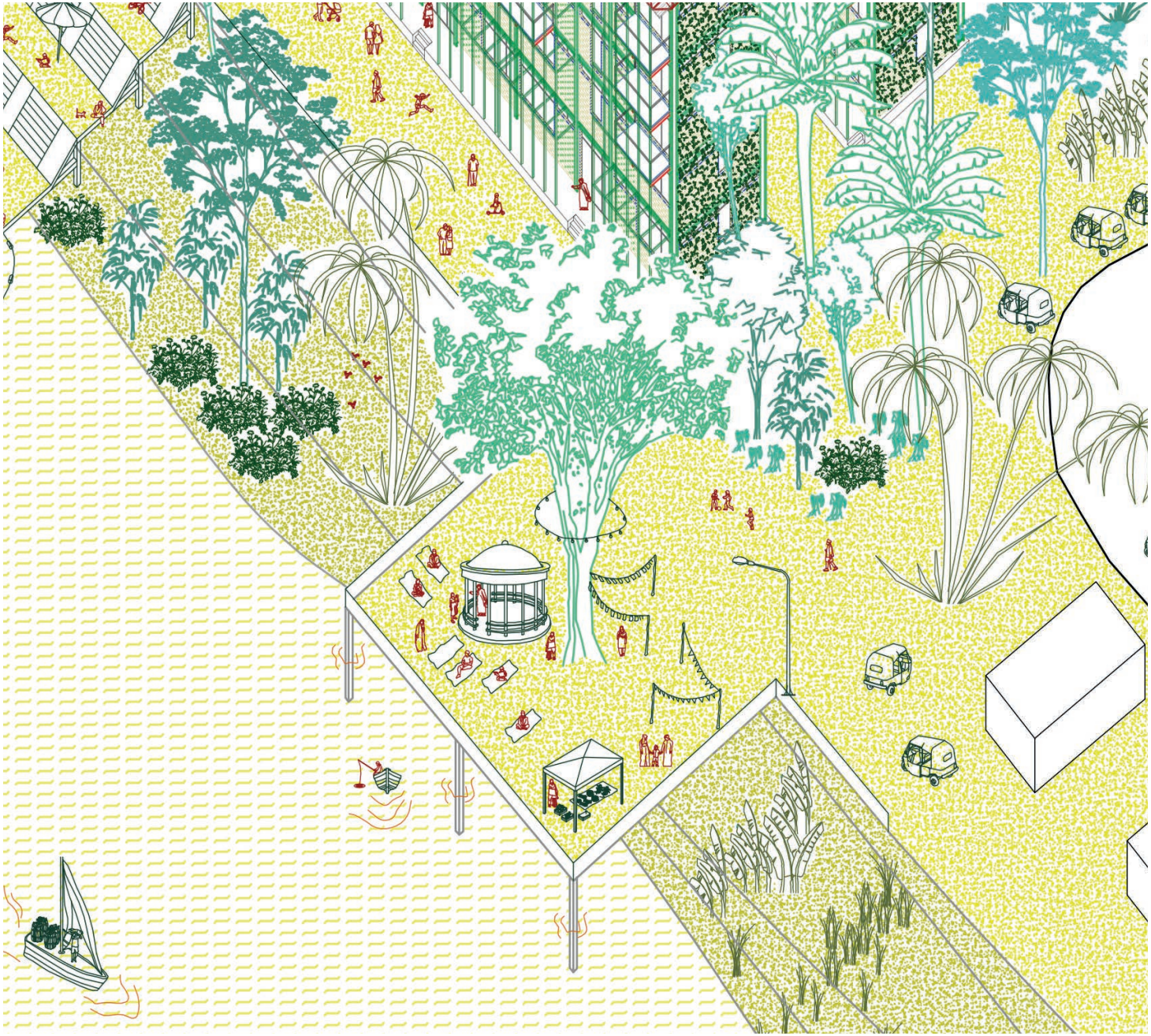


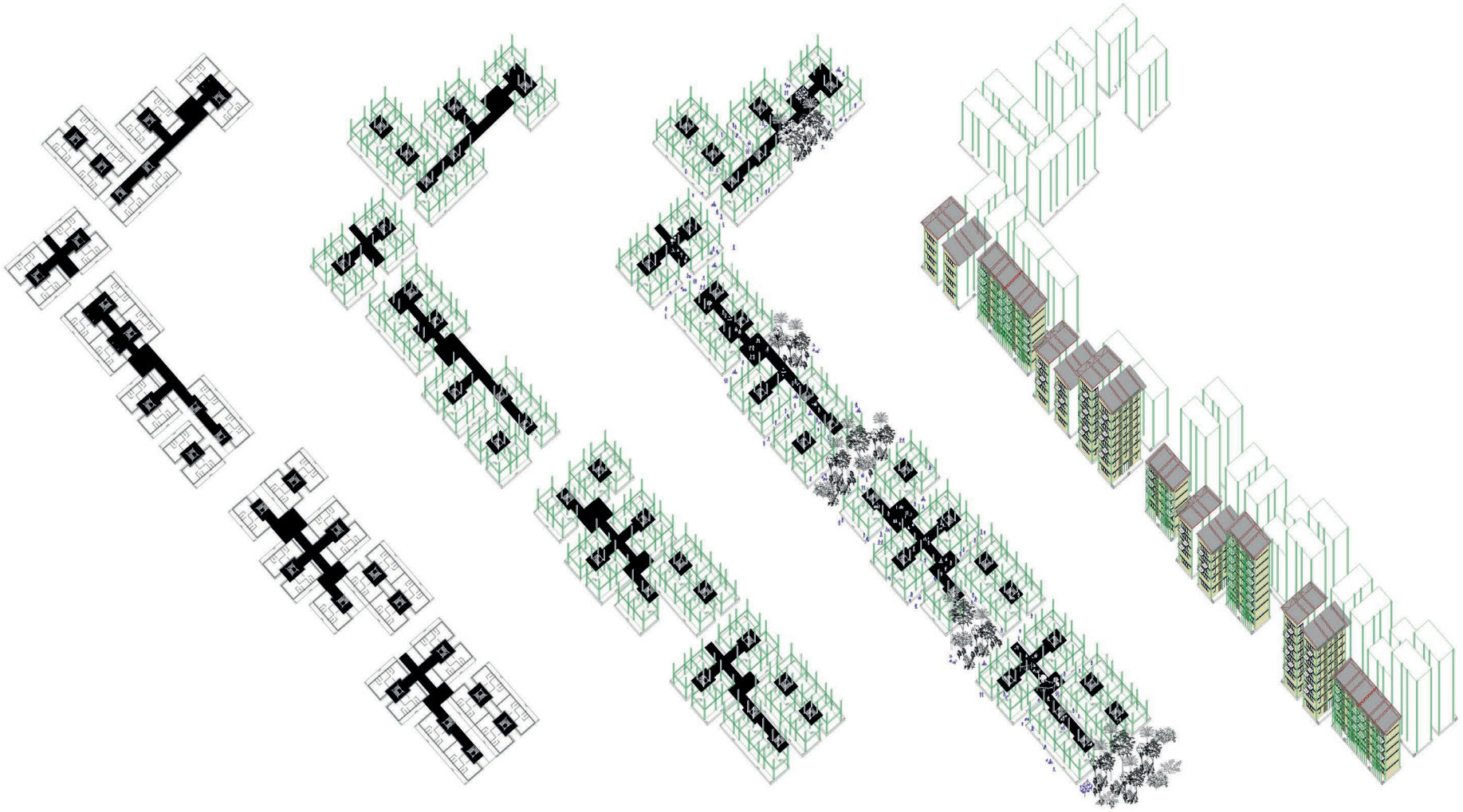




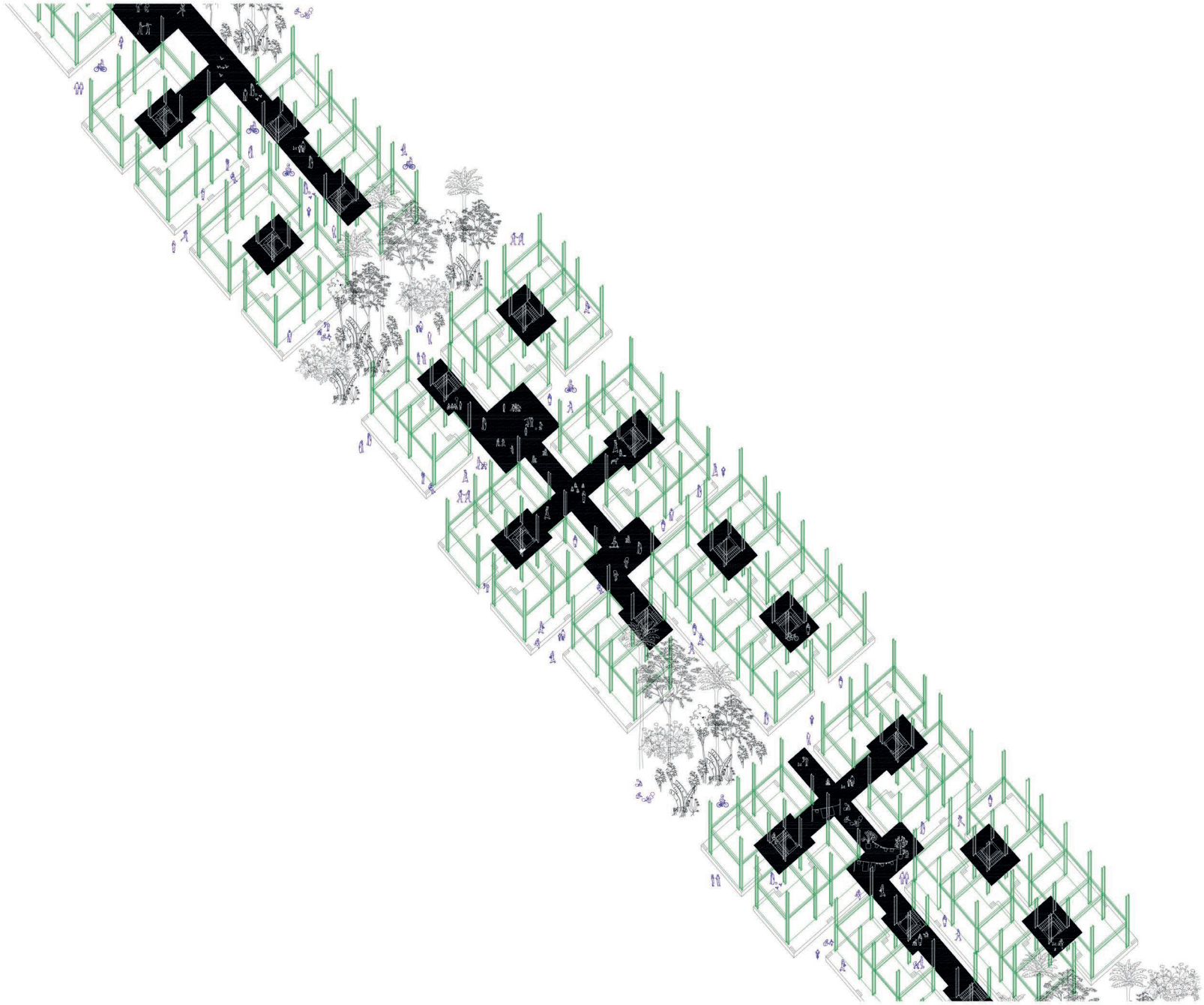








Cluster strategy



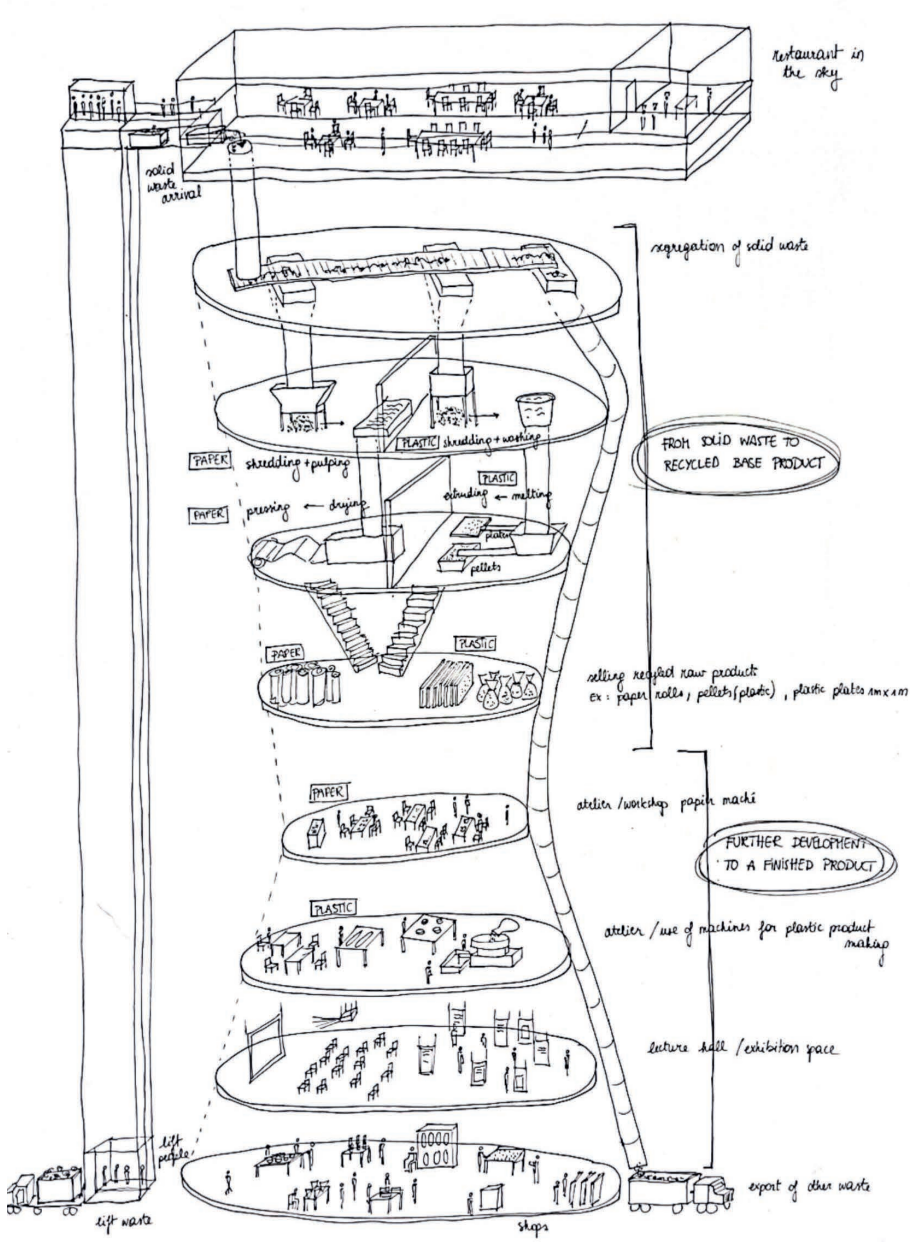

OIL

Street life under platform

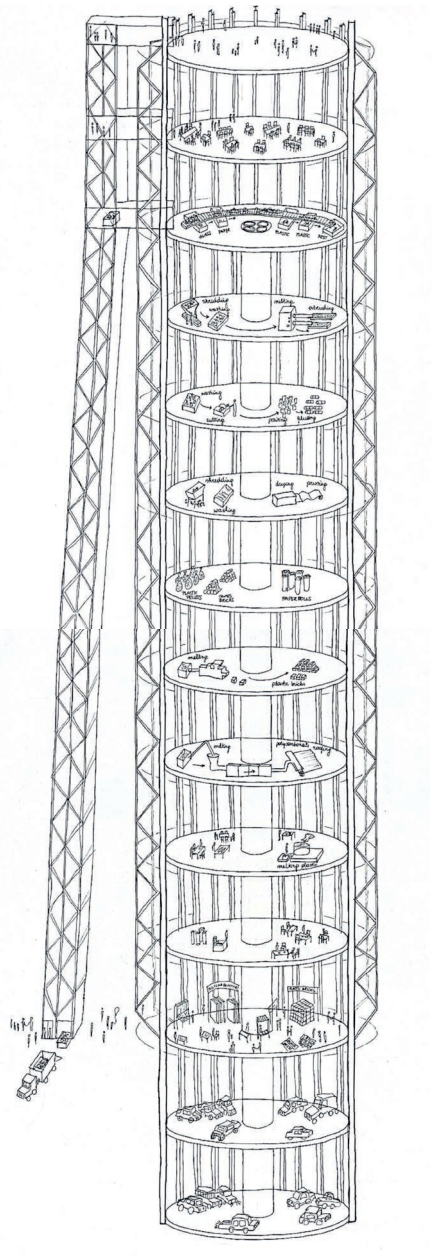
number sqm low-income housing units
= sqm middle-income housing units

number of low-income housing units
= 2 times the number of middle-income housing units

Preliminary design



Final design



observatoire 11

restaurant 10

arrival waste + segregation 09

plastic treatment 08

glass treatment 07

paper treatment 06

shop 05

plastic bricks 04

polycarbonate plates 03

plastic atelier 02

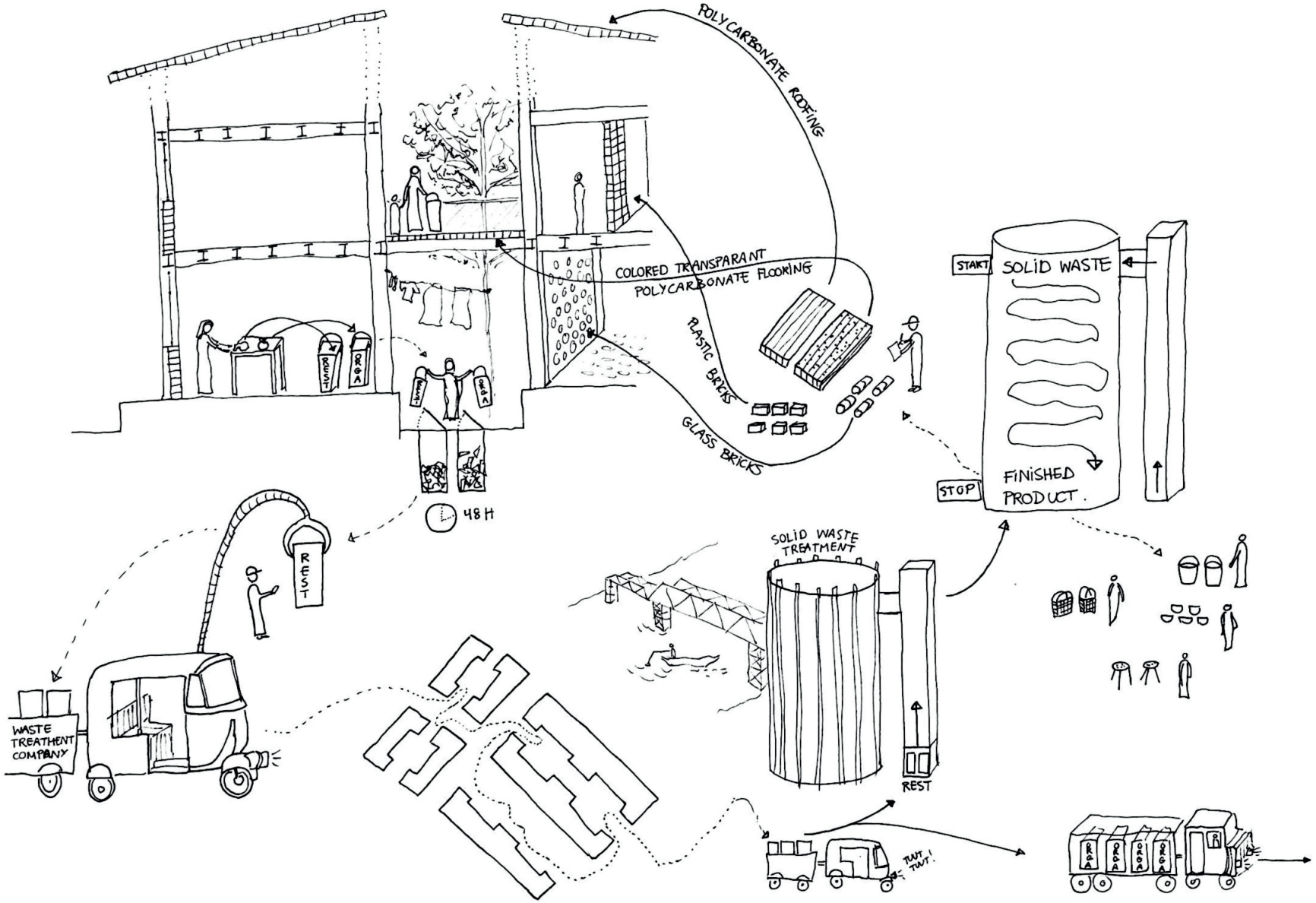
paper atelier 01

market - 0

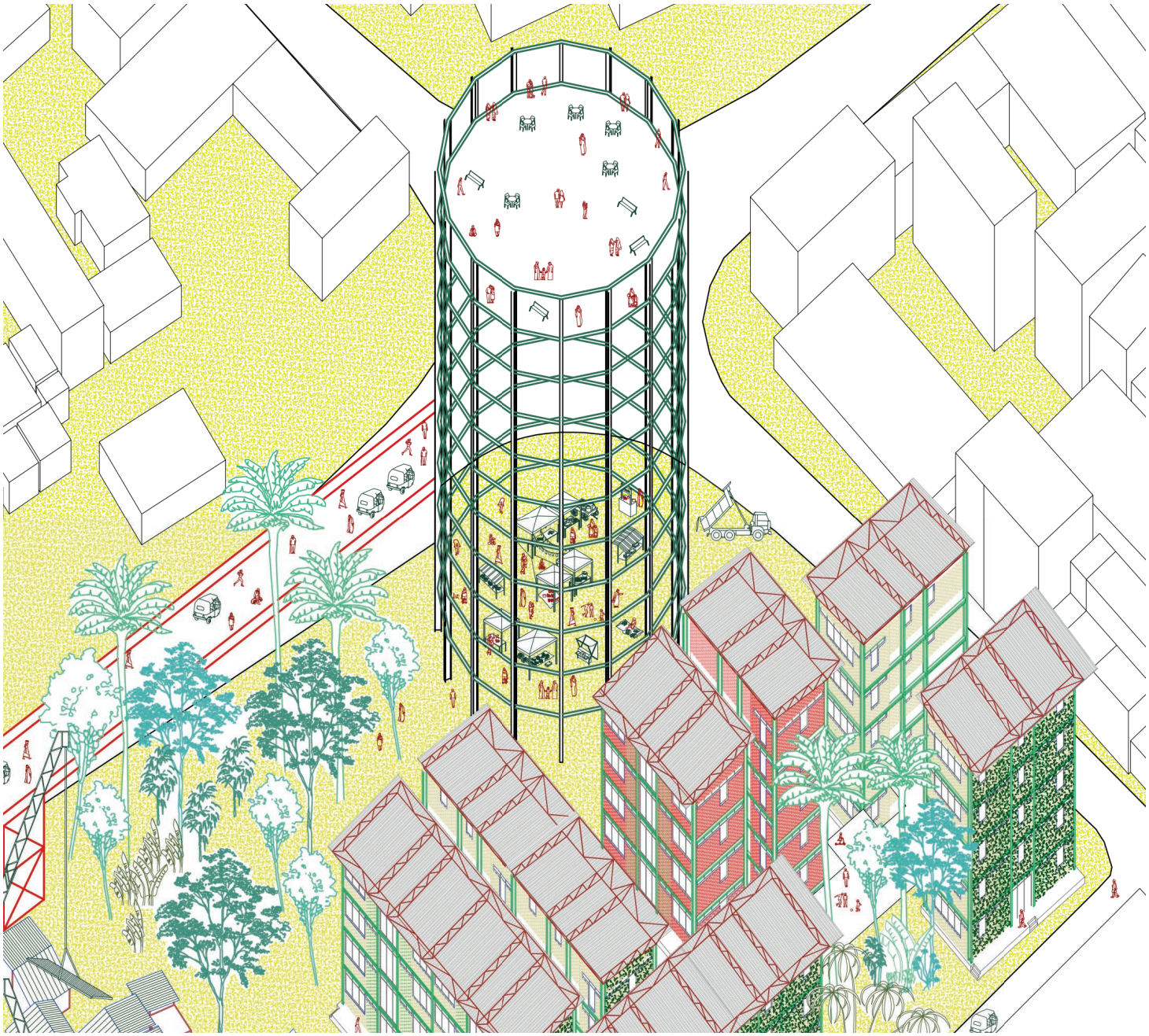
parking - 01

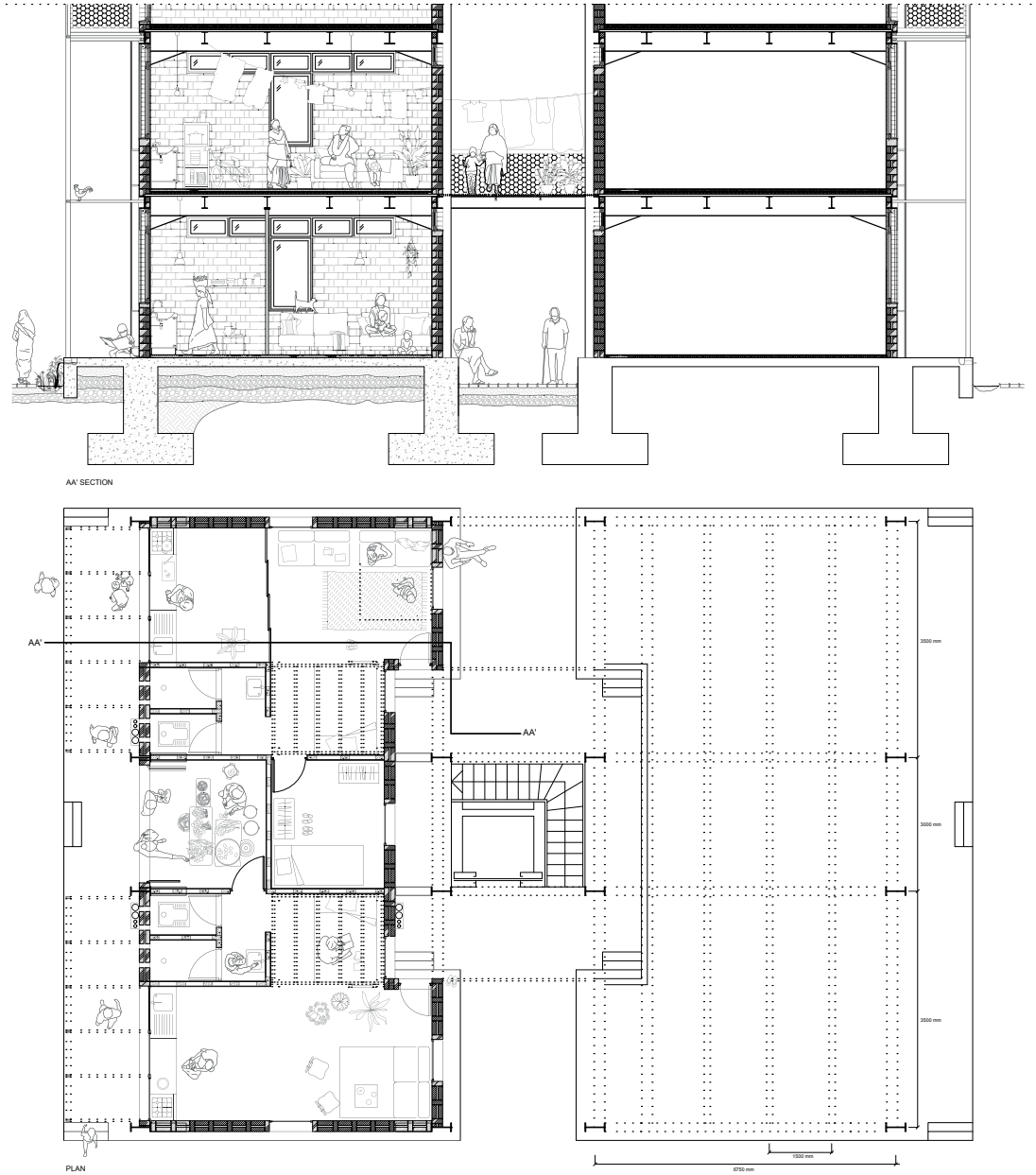
parking - 02

Solid waste treatment concept



Solid waste treatment concept





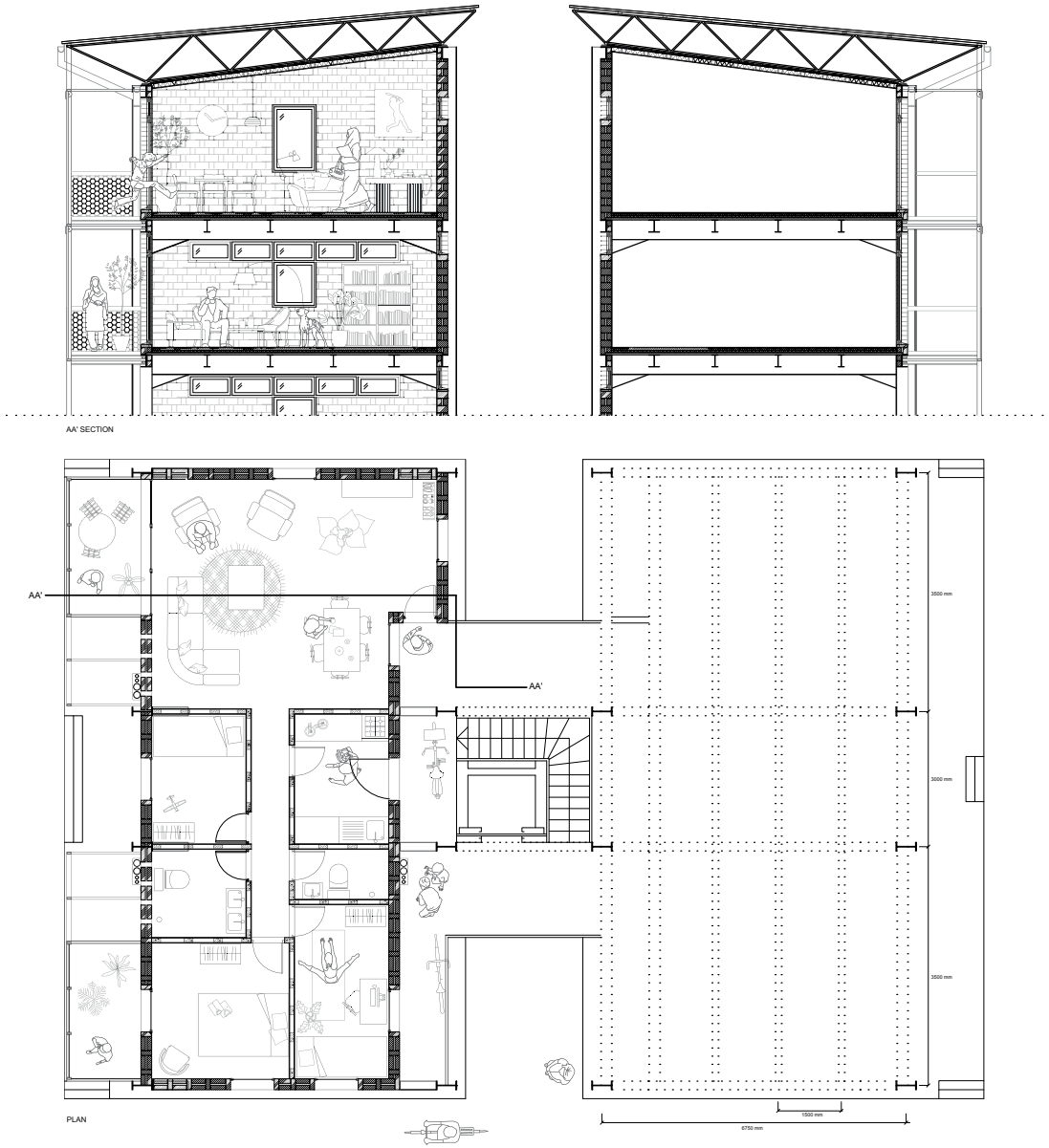
surface 1 housing unit : **43,5 sqm**

surface 1 housing unit with mezzanine : **48,5 sqm**

surface separated modular room : **9 sqm**

3 facades appartement

access : staircase

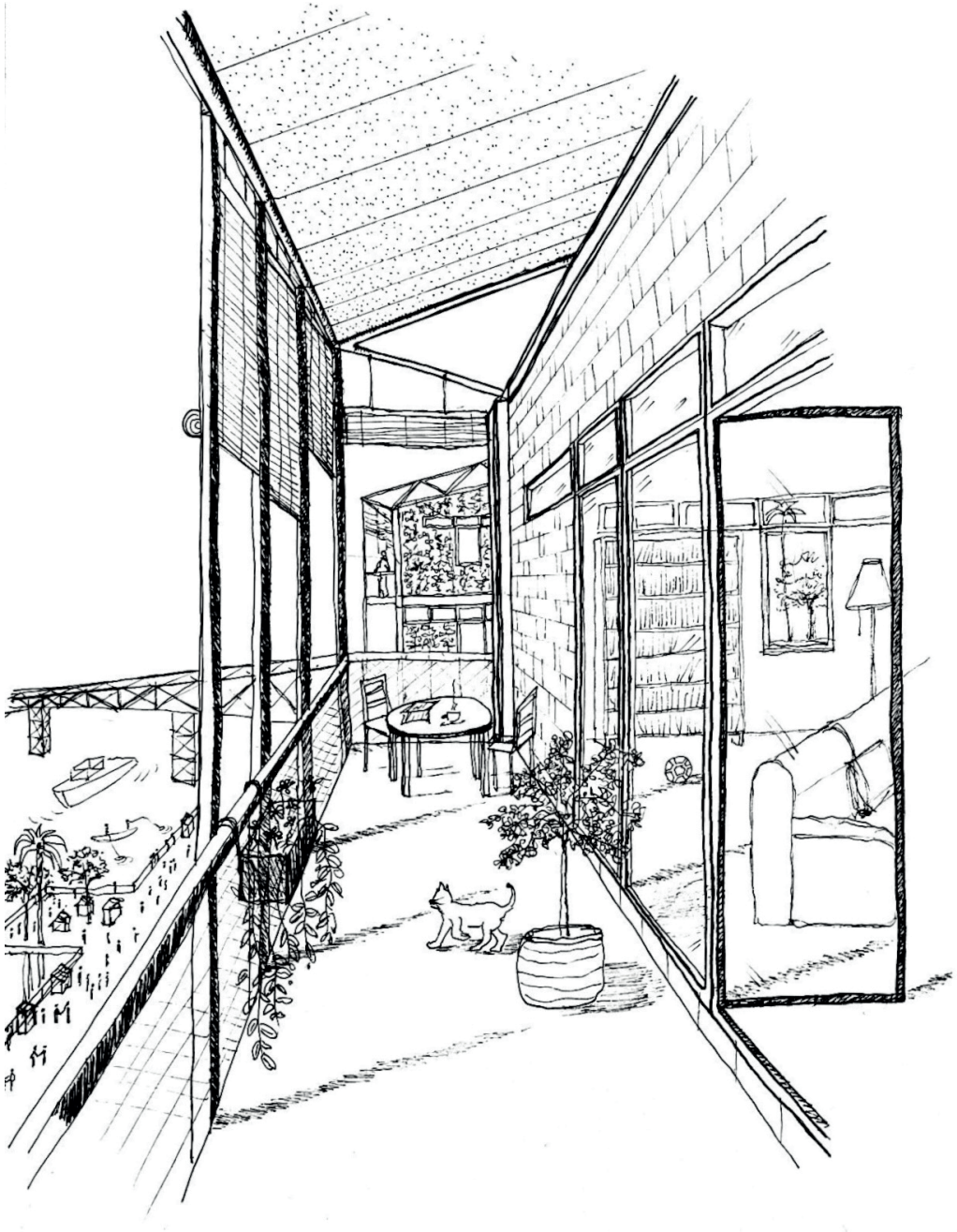


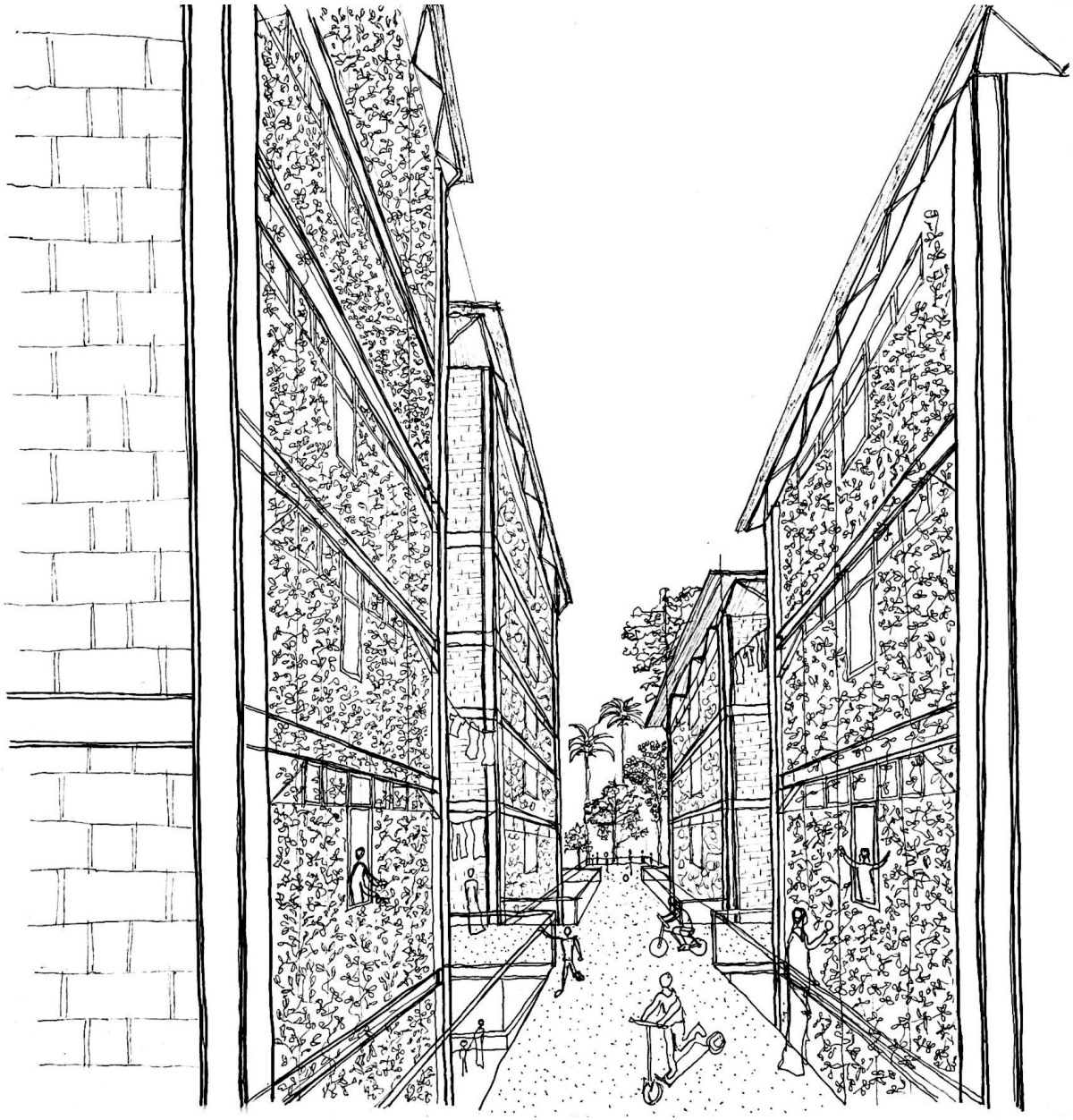
surface 1 housing unit : **92 sqm**

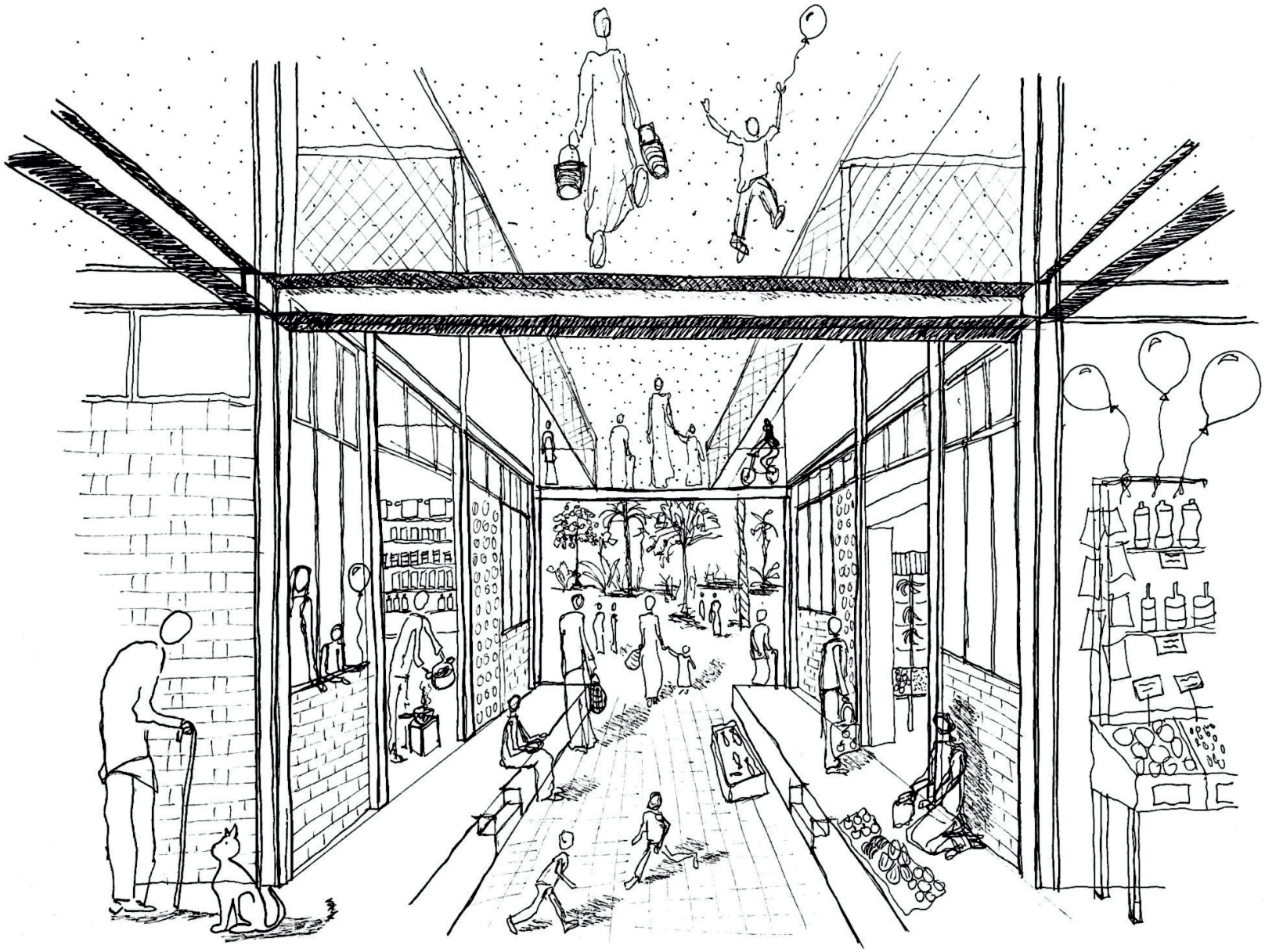
balcony and gallery

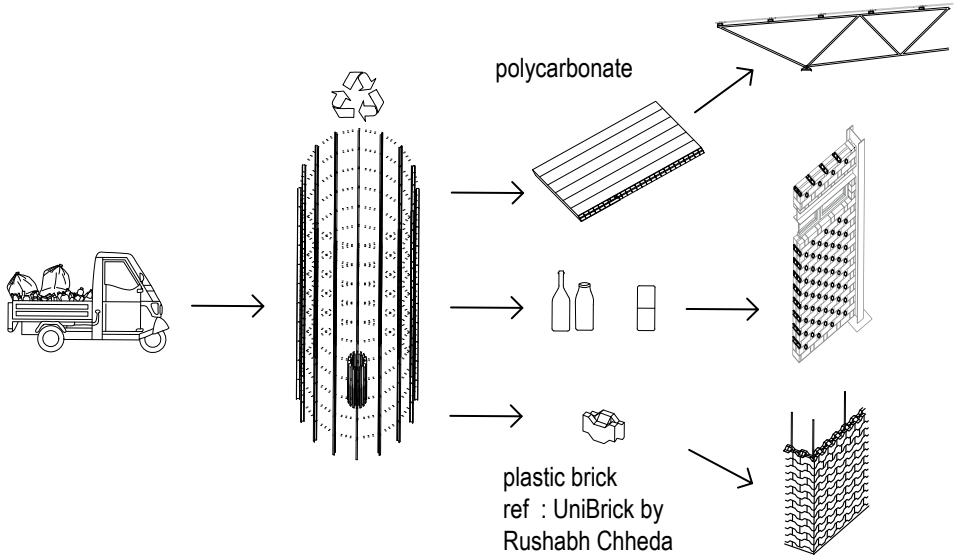
4 facades appartement

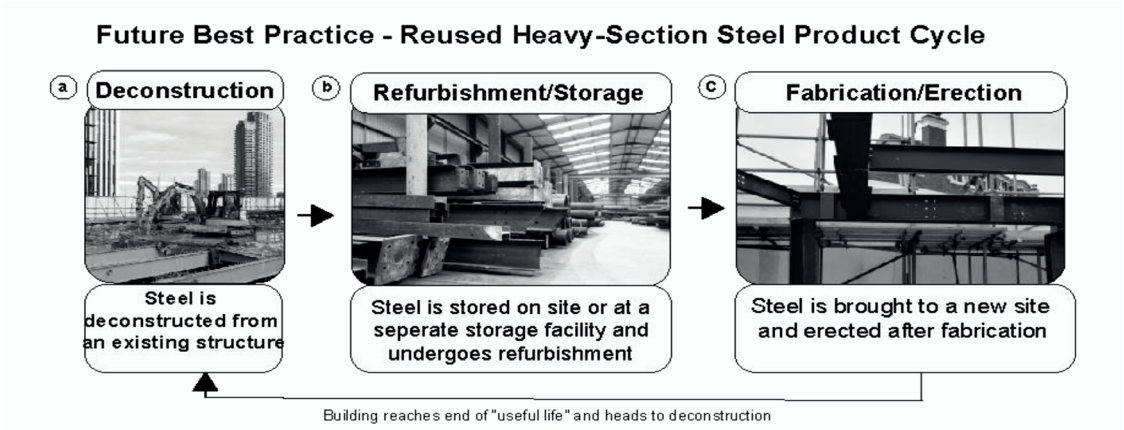
access : elevator/staircase







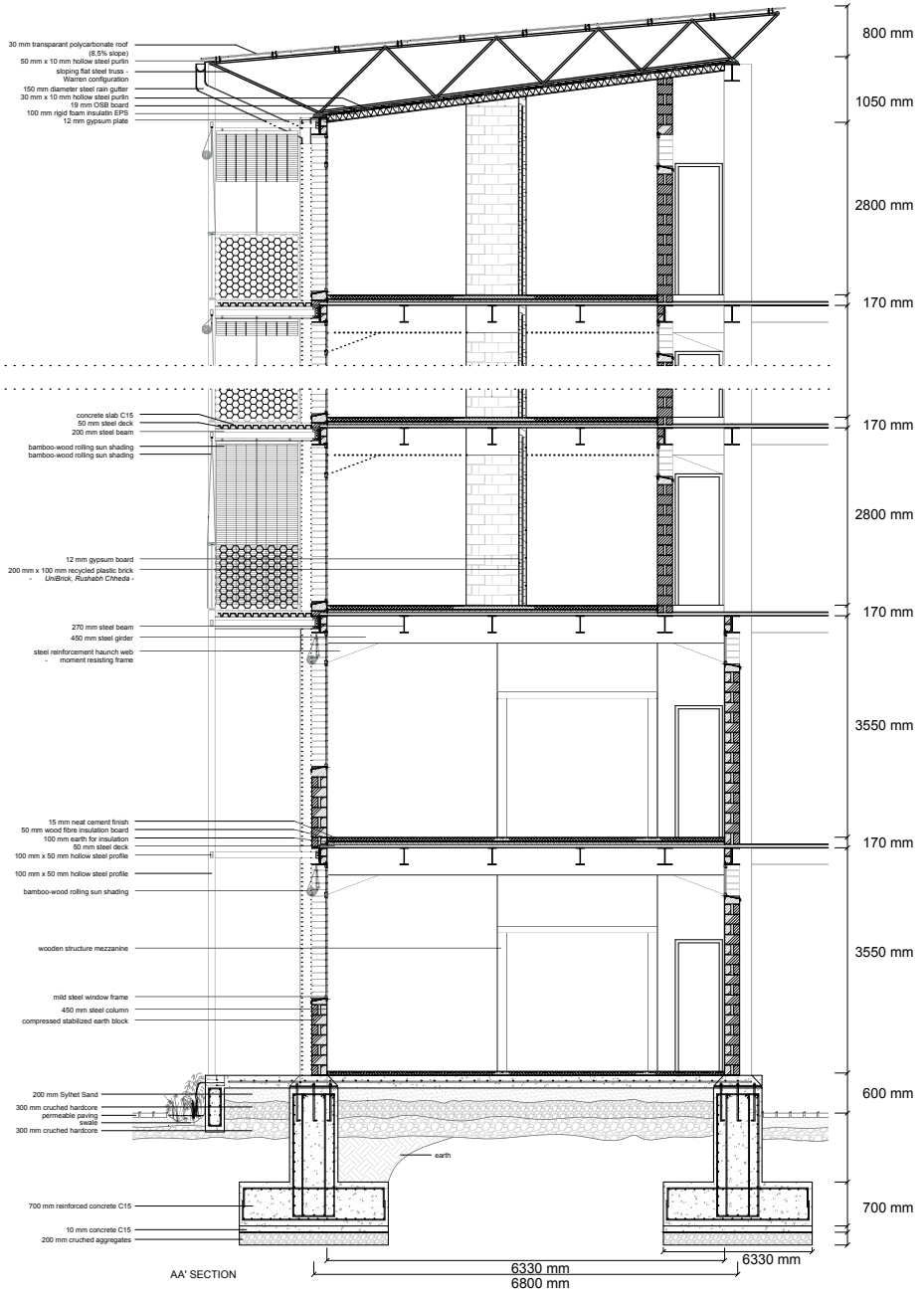




Holbein Gardens: Delivering a low-carbon structure with reclaimed steel, Mills, 2023.

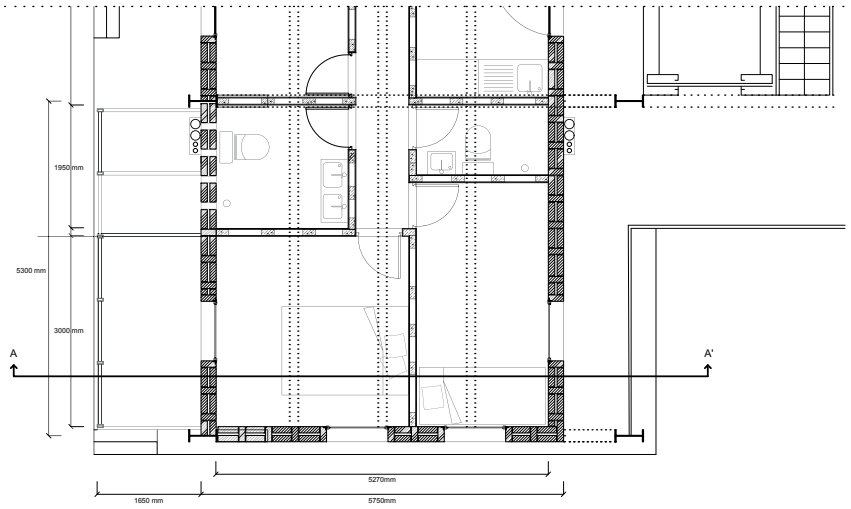
Technical fragment

ELEVATION

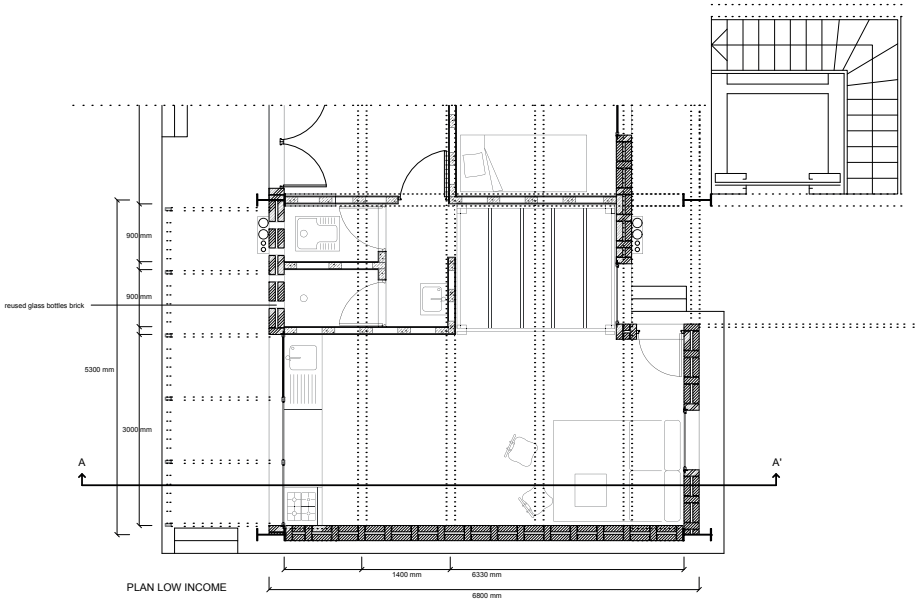


AA' SECTION

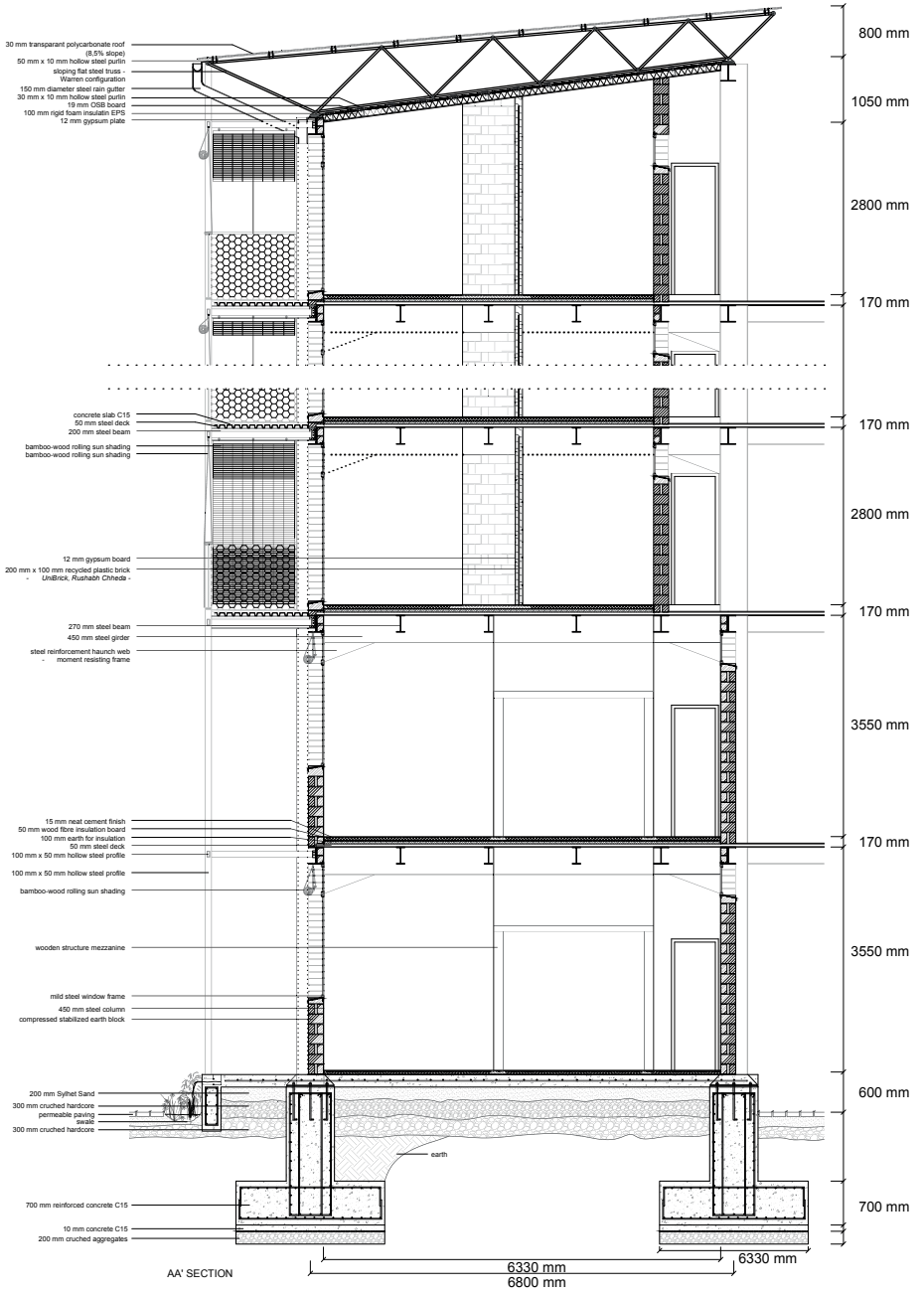
Technical fragment



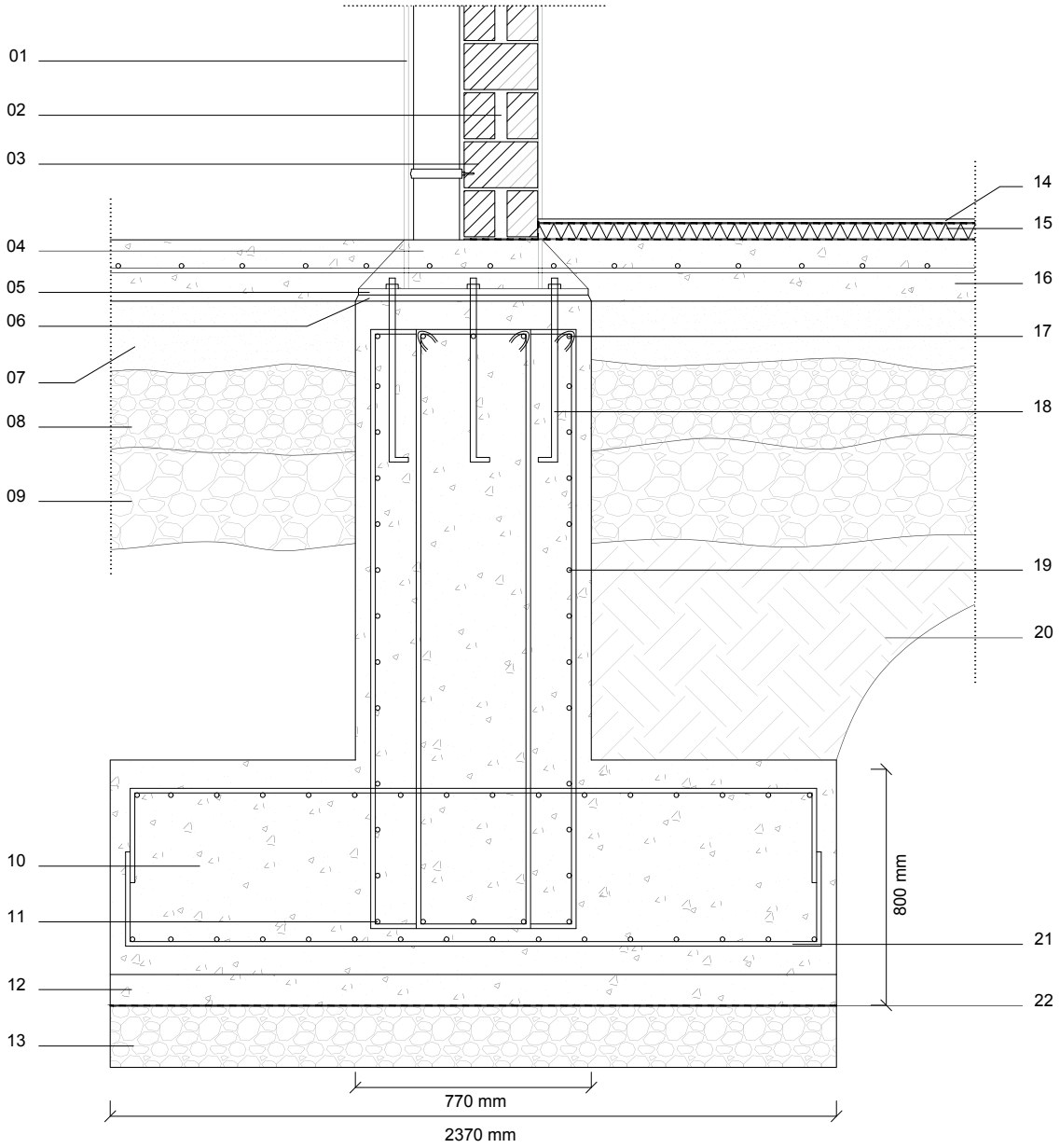
PLAN MIDDLE INCOME



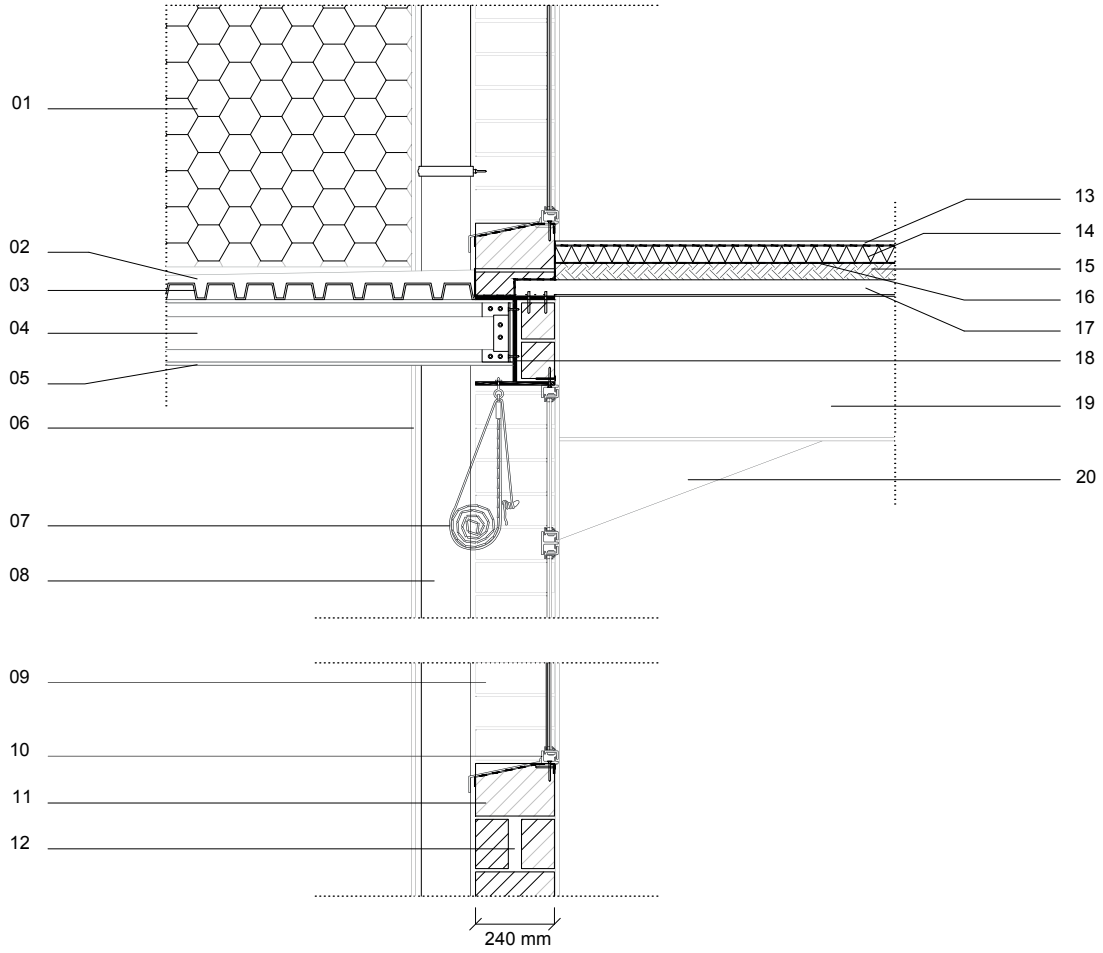
PLAN LOW INCOME



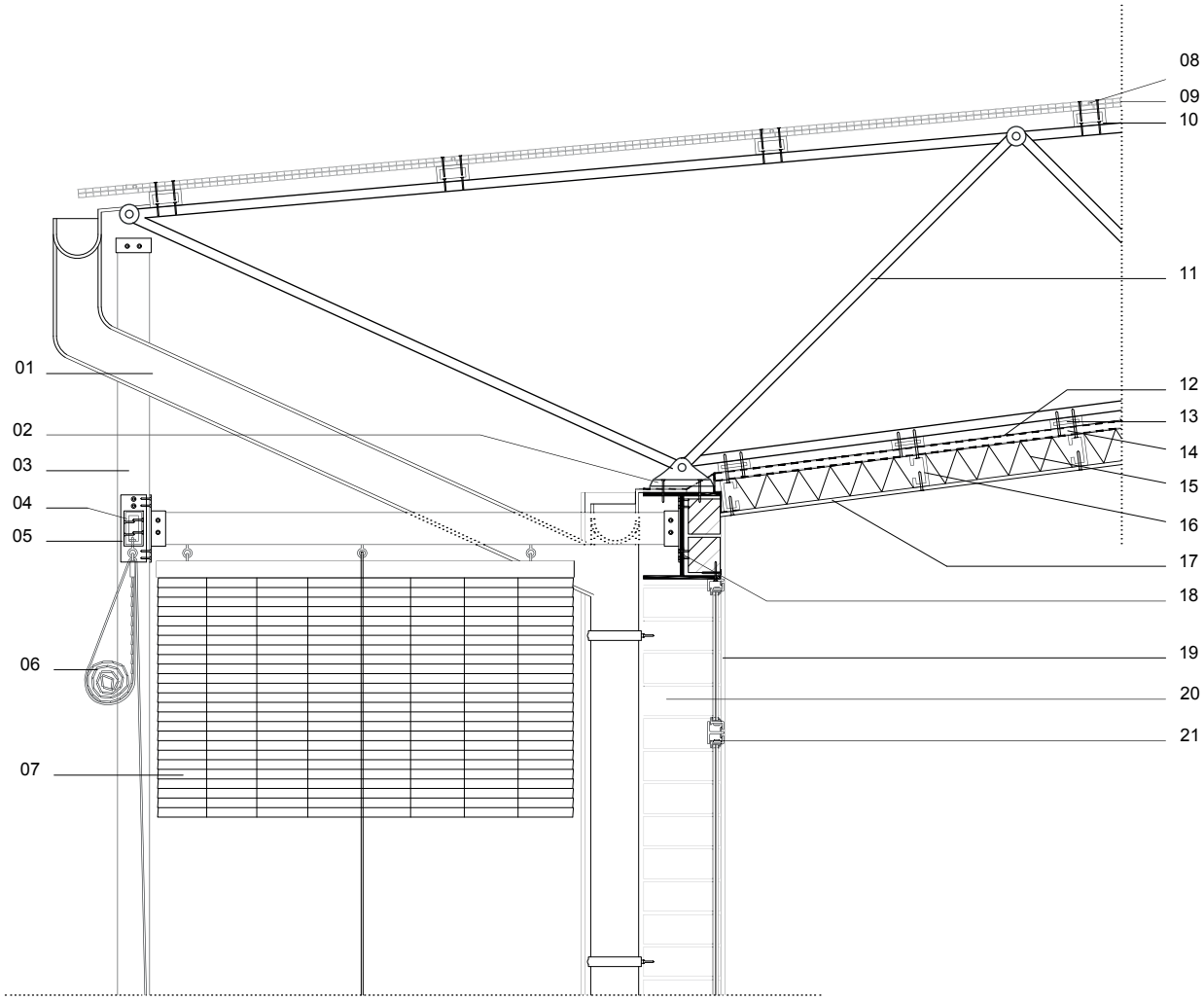
AA' SECTION



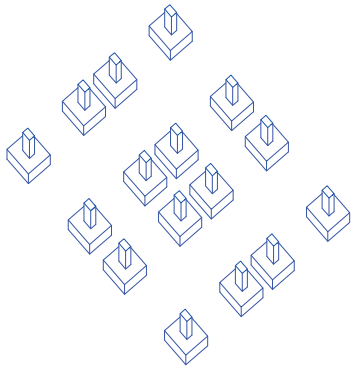
01_ 450 mm steel column
02_ 40 mm air
03_ compressed stabilized earth block
04_ stiffener plates - hight 150 mm
05_ steel column baseplate
06_ high strength concrete grouting
07_ 200 mm Sylhet Sand
08_ 300 mm cruched hardcore
09_ 300 mm cruched hardcore
10_ 700 mm reinforced concrete C15
11_ beam's top main reinforcement bars
12_ 10 mm concrete C15
13_ 200 mm cruched aggregates
14_ 15 mm neat cement finish
15_ 50 mm wood fibre insulation board
16_ 200 mm floor slab
17_ beam's top main reinforcement bars
18_ anchor bolts placed inside beam's stirrups
19_ beam's side torsional reinforcement bars
20_ earth
21_ footing bottom reinforcement mesh
22_ water insulation membrane



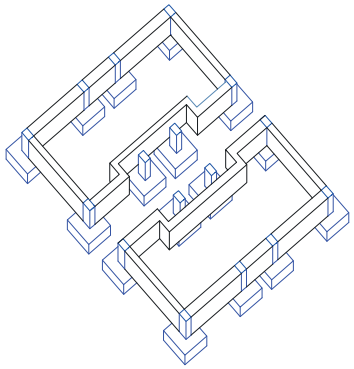
01_ garde corps mesh wire rope
02_ concrete slab C15
03_ 50 mm steel deck
04_ 100 mm x 50 mm hollow steel profile
05_ 200 mm steel beam
06_ 450 mm steel column
07_ bamboo-wood rolling sun shading
08_ bamboo-wood rolling sun shading
09_ compressed stabilized earth block
10_ mild steel window frame
11_ compressed stabilized earth block
12_ 40 mm air
13_ 15 mm neat cement finish
14_ 50 mm wood fibre insulation board
15_ 100 mm earth for insulation
16_ separation layer
17_ 50 mm steel deck
18_ 270 mm steel beam
19_ 450 mm steel girder
20_ steel reinforcement haunch web - moment resisting frame



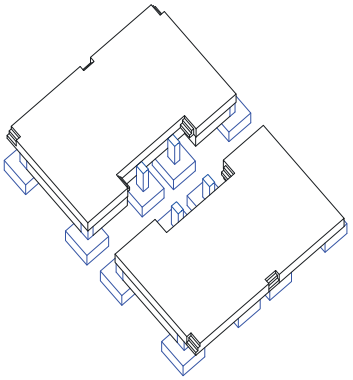
01_ 150 mm diameter steel rain gutter
02_ steel base plate footage
03_ 100 mm x 50 mm hollow steel profile
04_ 100 mm x 50 mm hollow steel profile
05_ mild steel clog
06_ bamboo-wood rolling sun shading
07_ bamboo-wood rolling sun shading
08_ interlocking of polycarbonate plates (clip)
09_ 30 mm transparant polycarbonate roof (8,5% slope)
10_ 50 mm x 10 mm hollow steel purlin
11_ sloping flat steel truss - Warren configuration - node connection
12_ waterproofing membrane
13_ 30 mm x 10 mm hollow steel purlin
14_ 19 mm OSB board
15_ 100 mm wood fibre insulation board
16_ 100 mm steel purlin
17_ 12 mm gypsum board
18_ 270 mm steel beam
19_ 450 mm steel column
20_ compressed stabilized earth block
21_ mild steel window frame



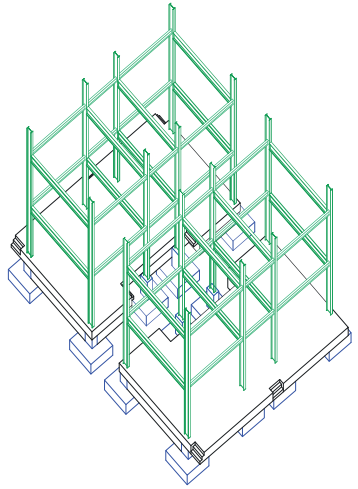
foundation steel columns



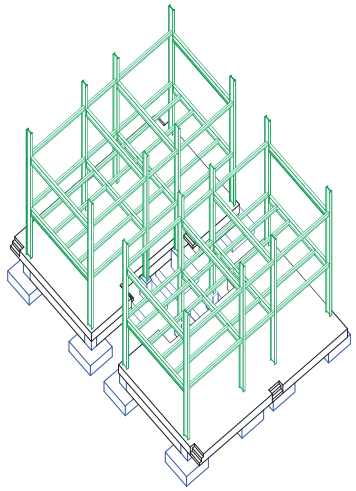
foundation non-bearing walls



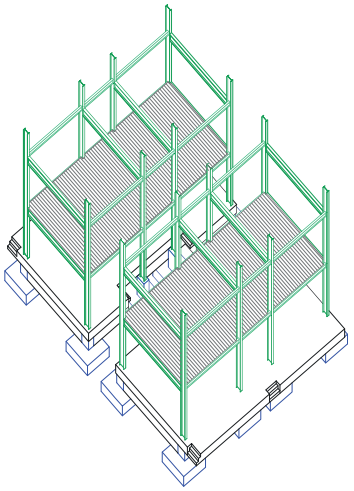
concrete slab



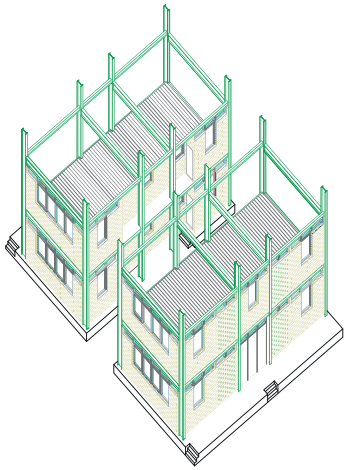
primary steel structure



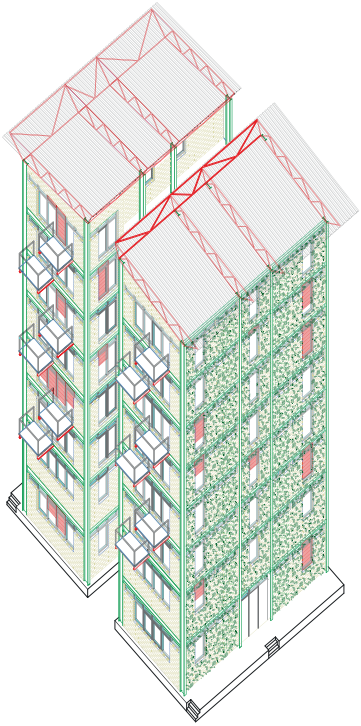
floor steel structure



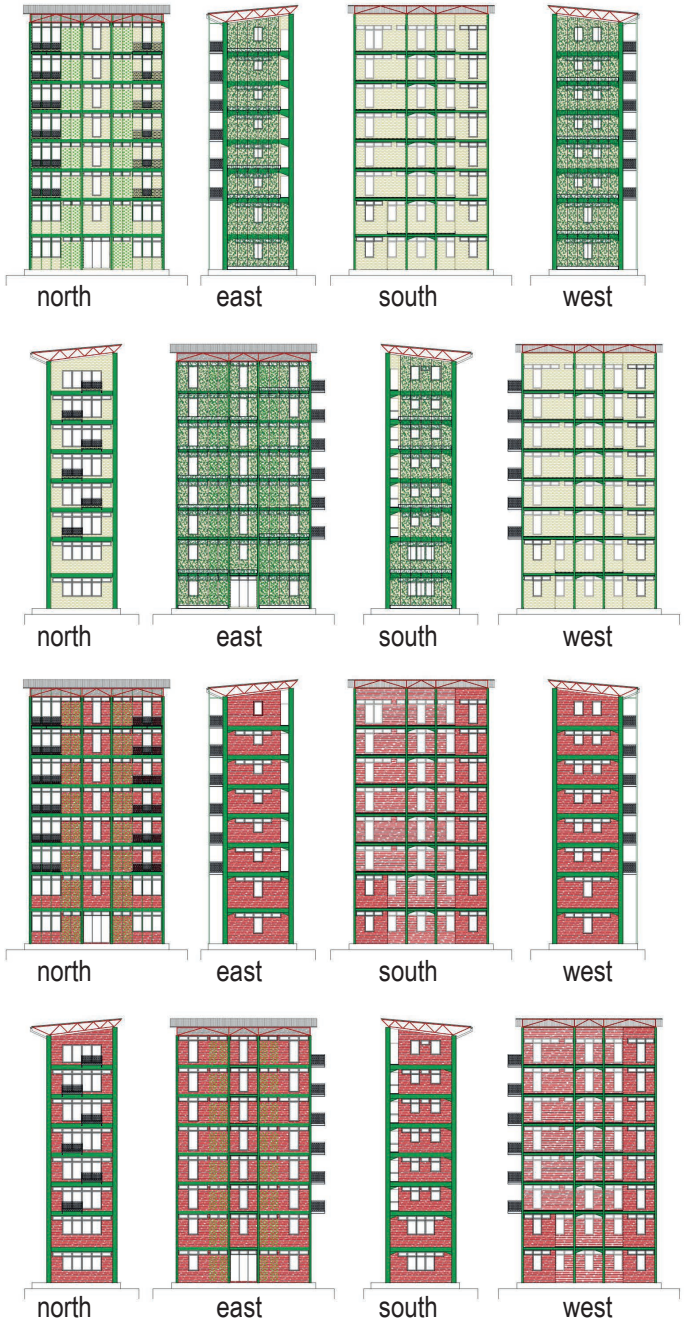
metal deck flooring



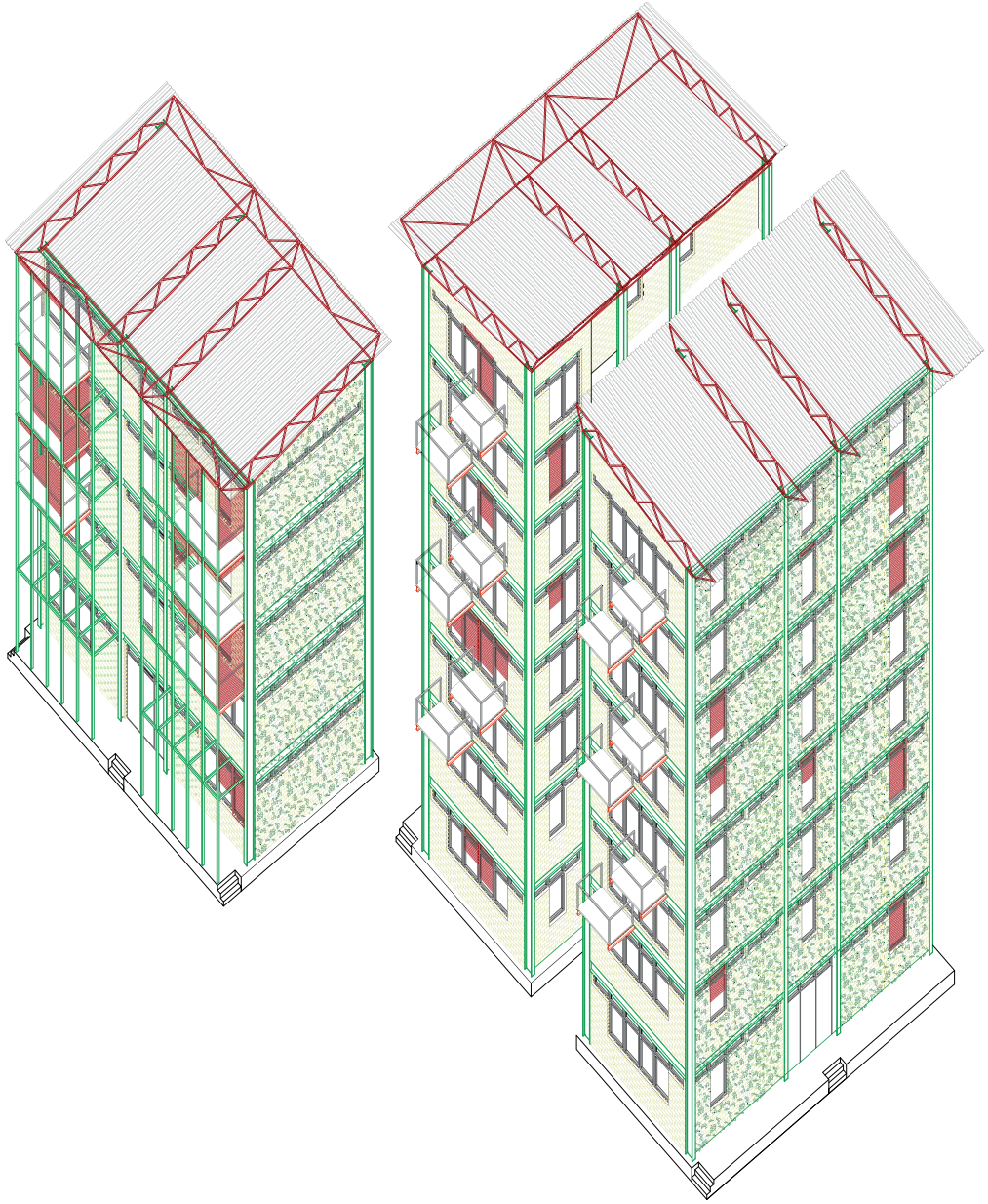
exterior and interior walls

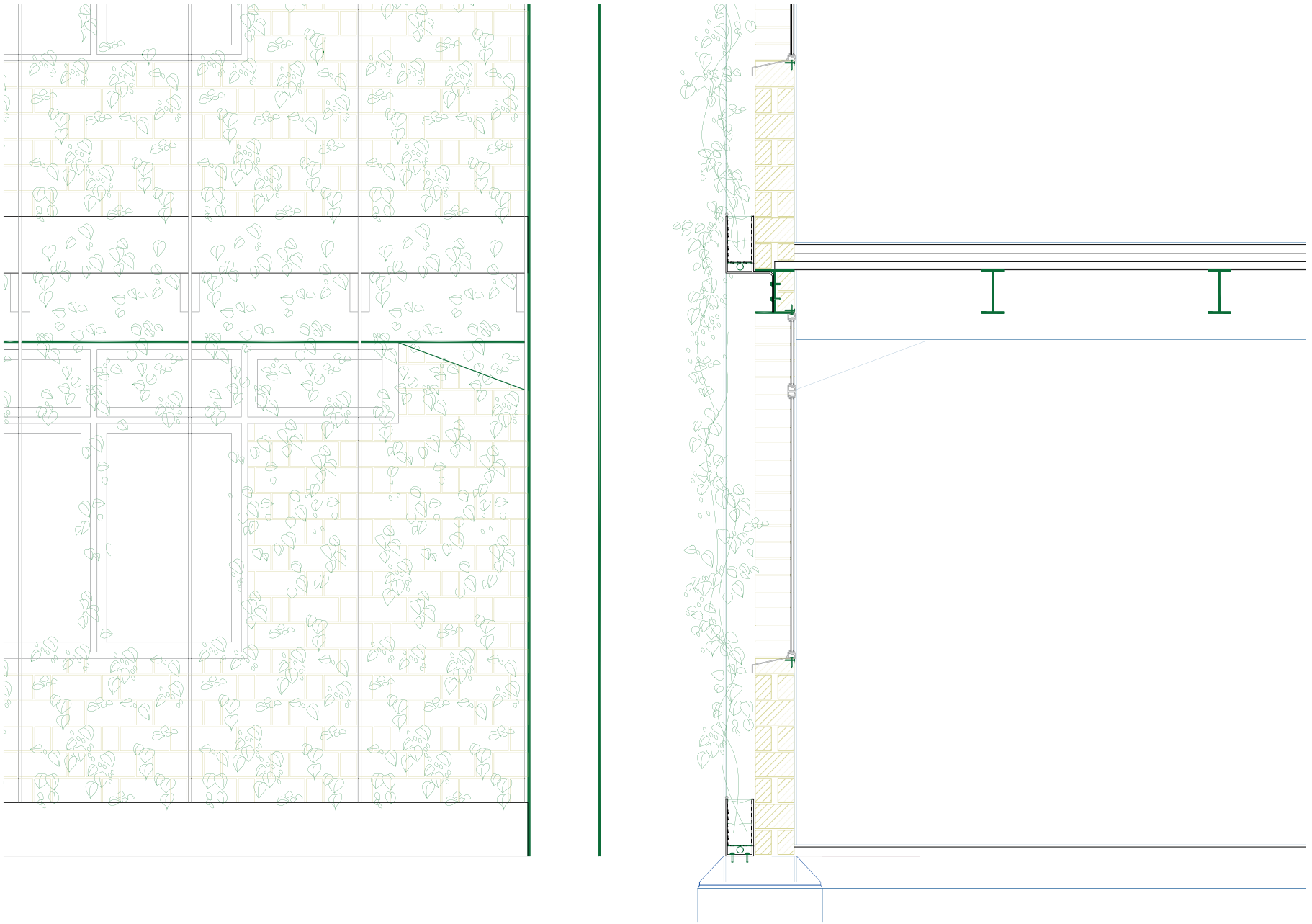


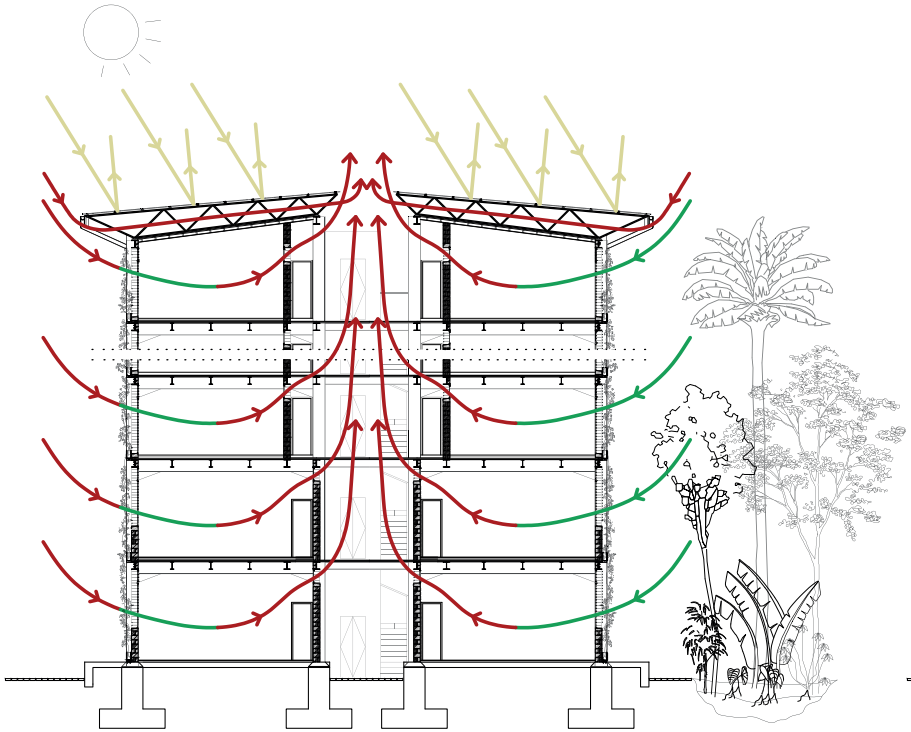
steel truss and polycarbonate roof

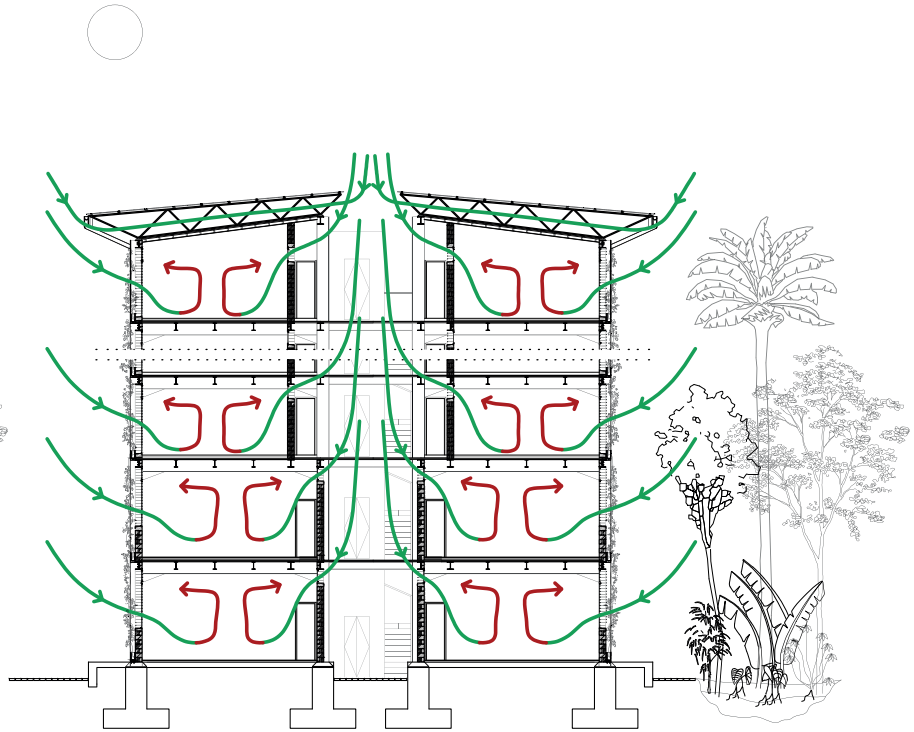

north
east
south
west
north
east
south
west
north
east
south
west
north
east
south
west

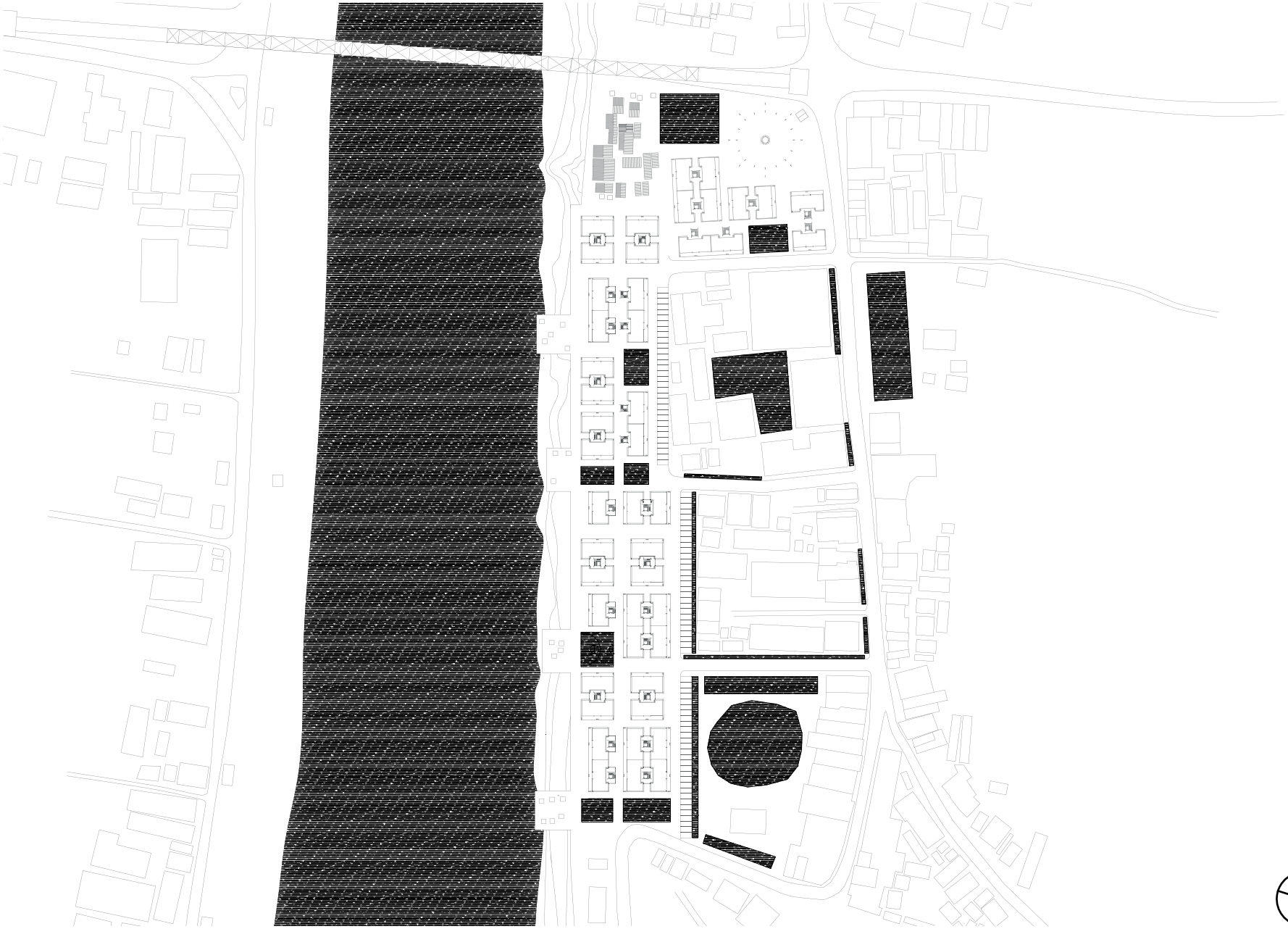
sun-shading



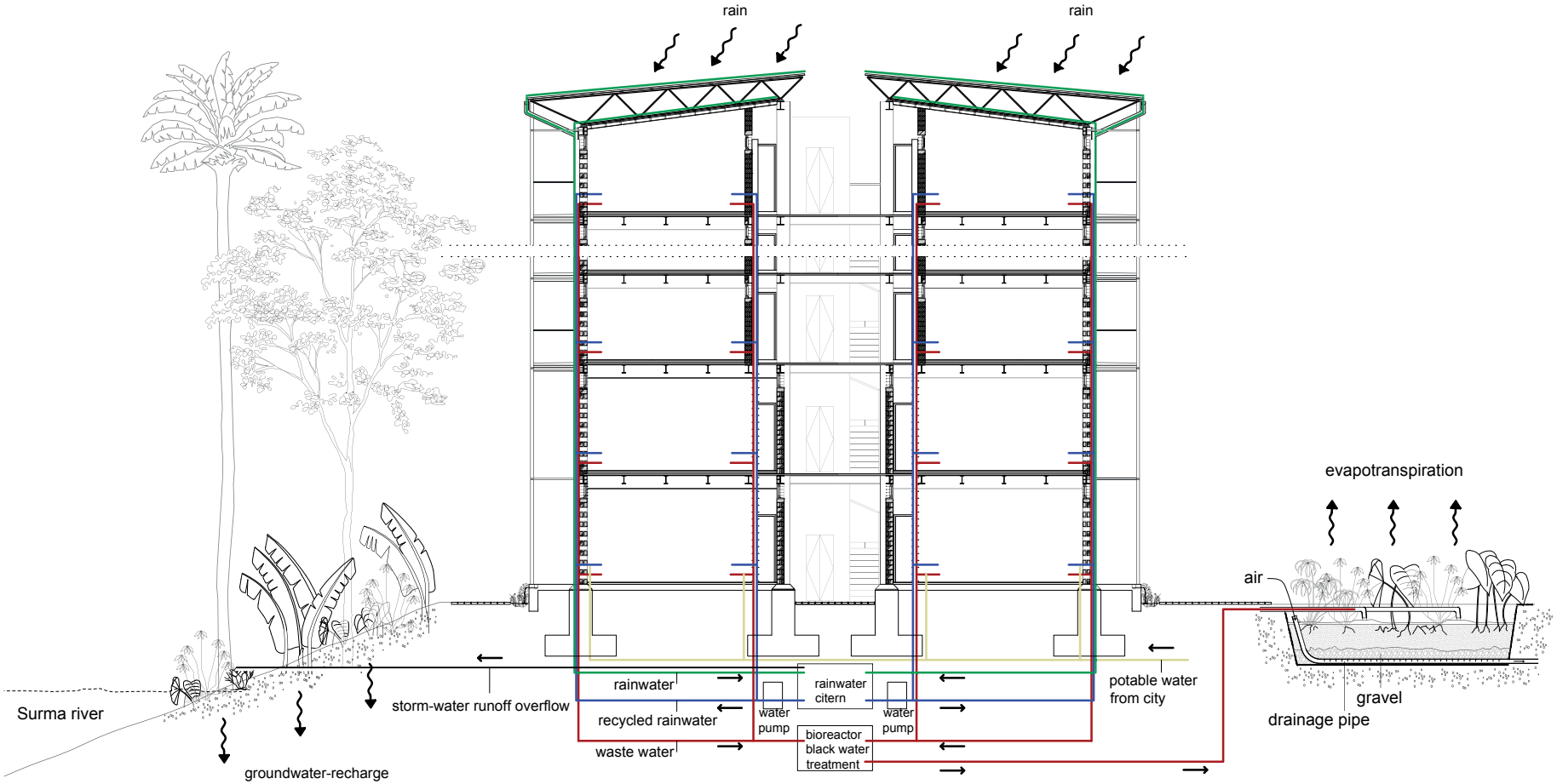




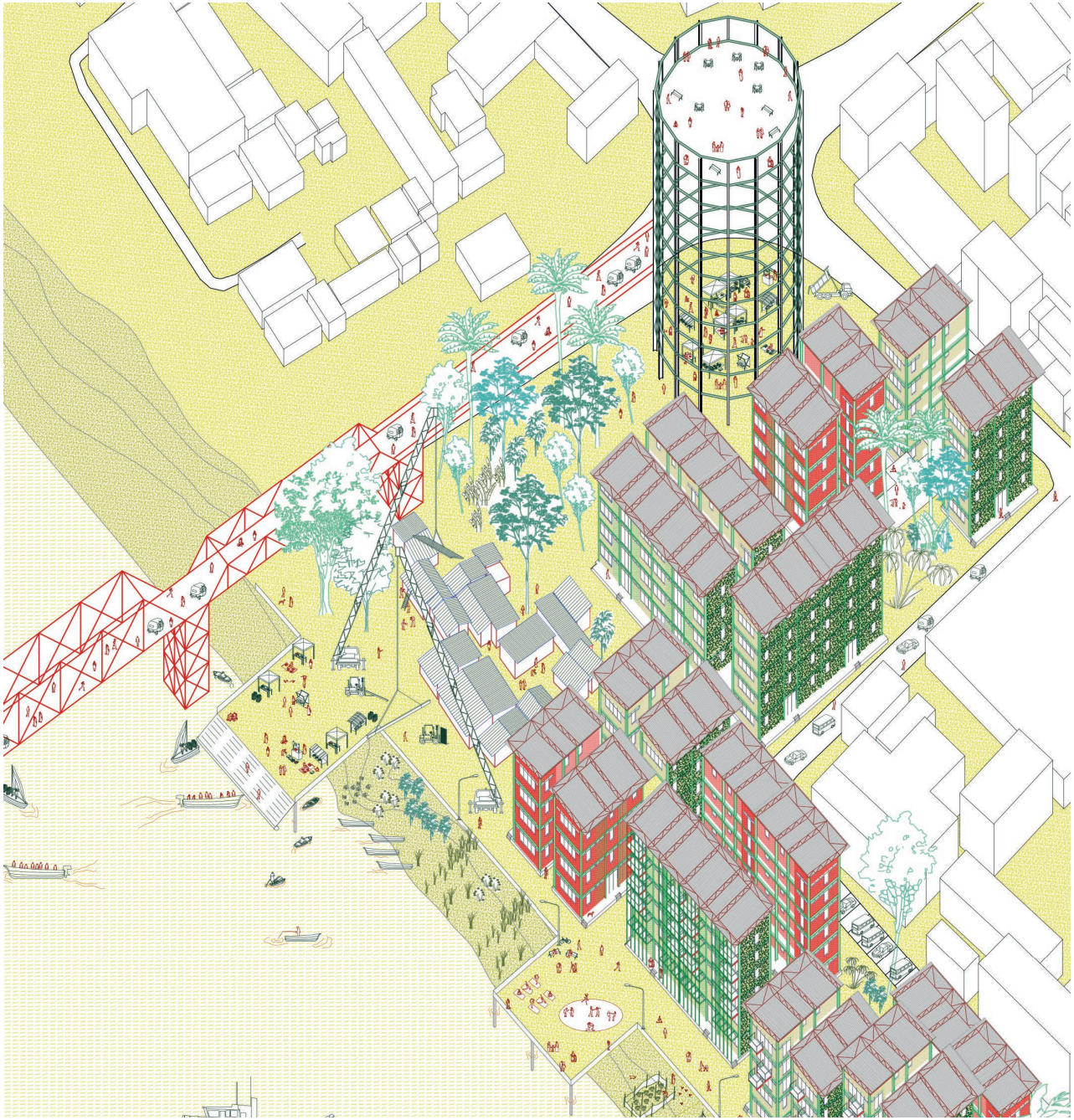




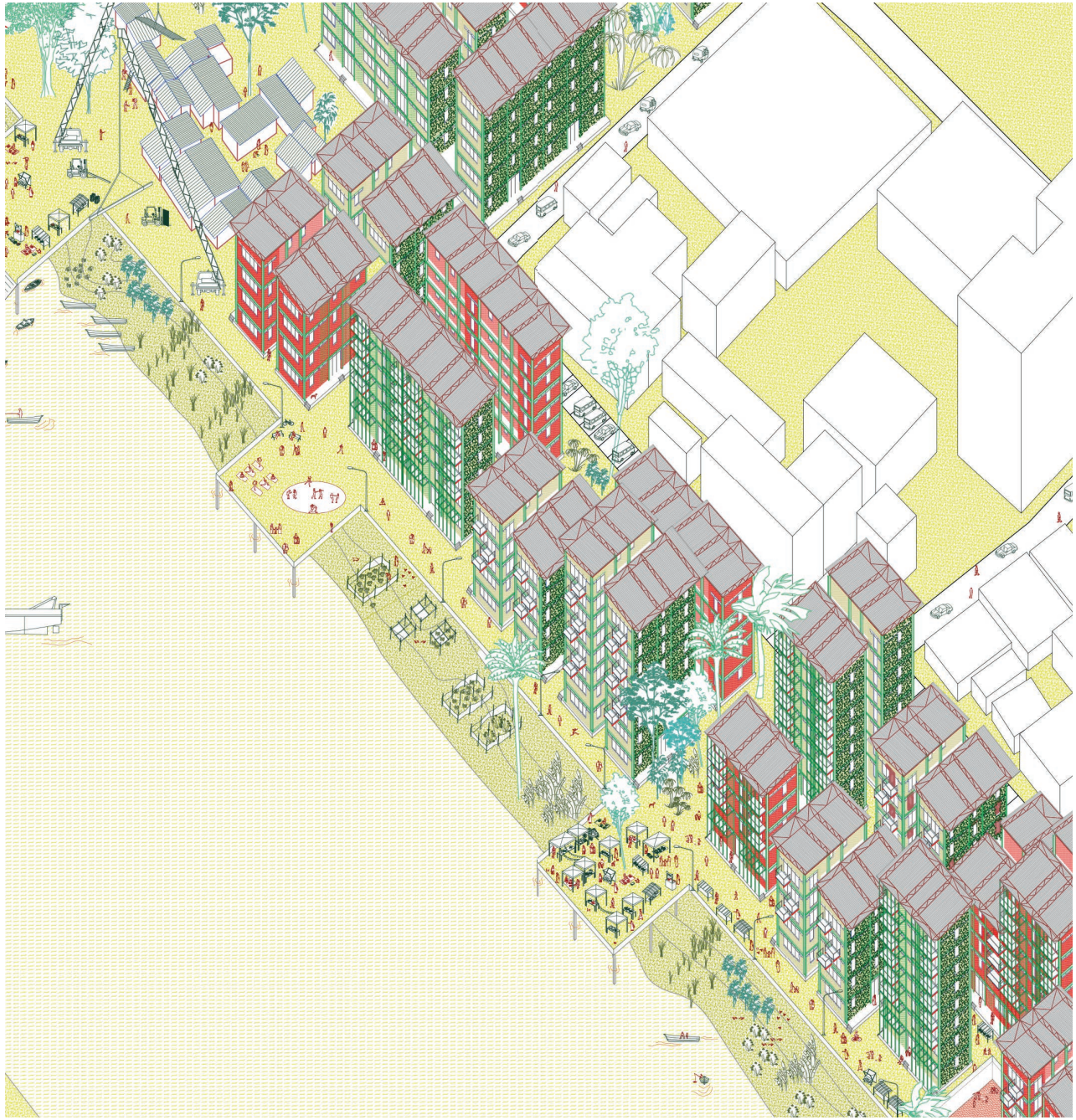

Surma river
porous riverbank
rain garden
permeable paving
structured wetland
swale
sport court water storage
bioretention pond


rain
rain
evapotranspiration
air
gravel
drainage pipe
Surma river
storm-water runoff overflow
groundwater-recharge
rainwater
recycled rainwater
waste water
water pump
rainwater citern
water pump
bioreactor black water treatment
potable water from city

Axonometric view



Axonometric view



Axonometric view

Axonometric view