REFLOW THE KAMPUNG

An integrated purification system to manage the water and waste flows in the Kampungs in Bandung

P5 Architectural Engineering Graduation Presentatie - Jordy Wilders - January 26th, 2016

CONTENT

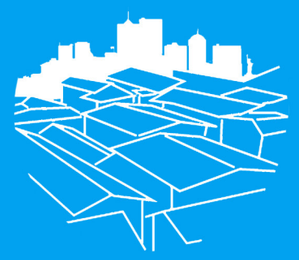
The growth of the earth’s urban population and areas continues as a major demographic trend; it is projected that 70 % of the world’s population will live in urban areas by 2050 (UN Habitat, 2011).

Around 1.2 billion people, or almost one-fifth of the world's population, live in areas of physical scarcity, and 500 million people are approaching this situation (UN-Water, 2007).

In this urban area's one-sixth of the population, live in physical water and 500 million people are approaching this situation.Two-thirds of the world's population could be living under water stressed conditions (UN-Water, 2007).

If we continue dealing with plastic in the same way, there will be in 2050 in terms of weight are more plastic in the sea than fish (WNF, 2016)

CONTEXT



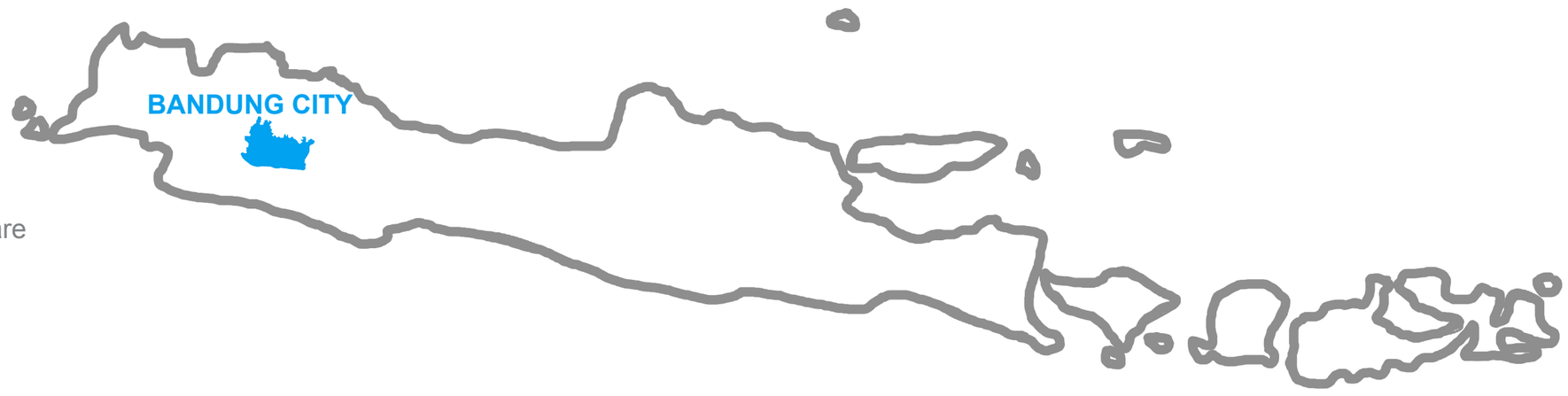
LOCATION

INDONESIA

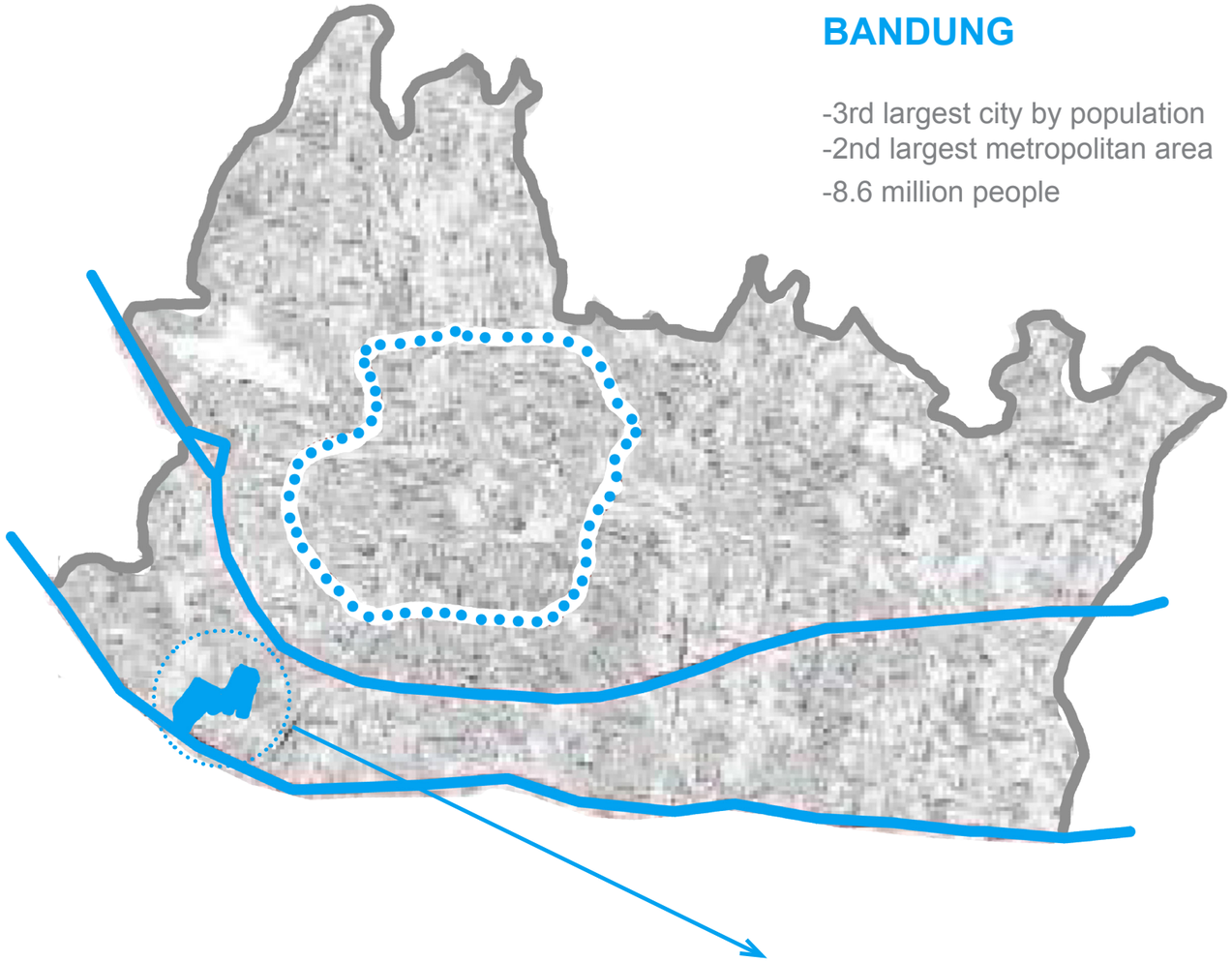
-250 milion people
-more tan 17.000 islands
-Jakarta capital city

JAVA

-Area 132.000 km²
- 143 miljoen people
- In west Java 1.3 million people are employee in the textile industry

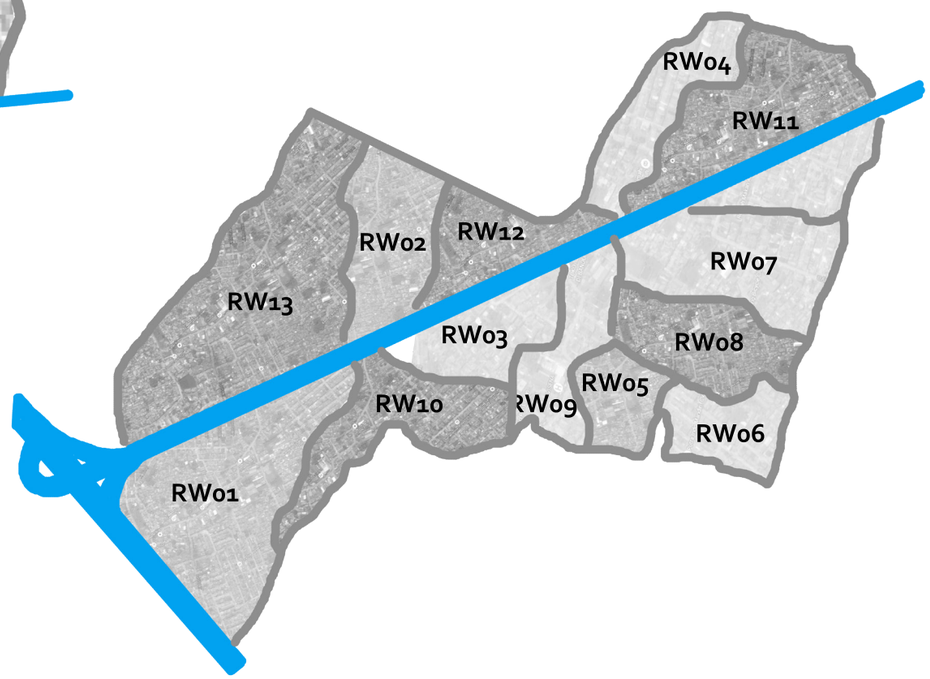


LOCATION



BANDUNG

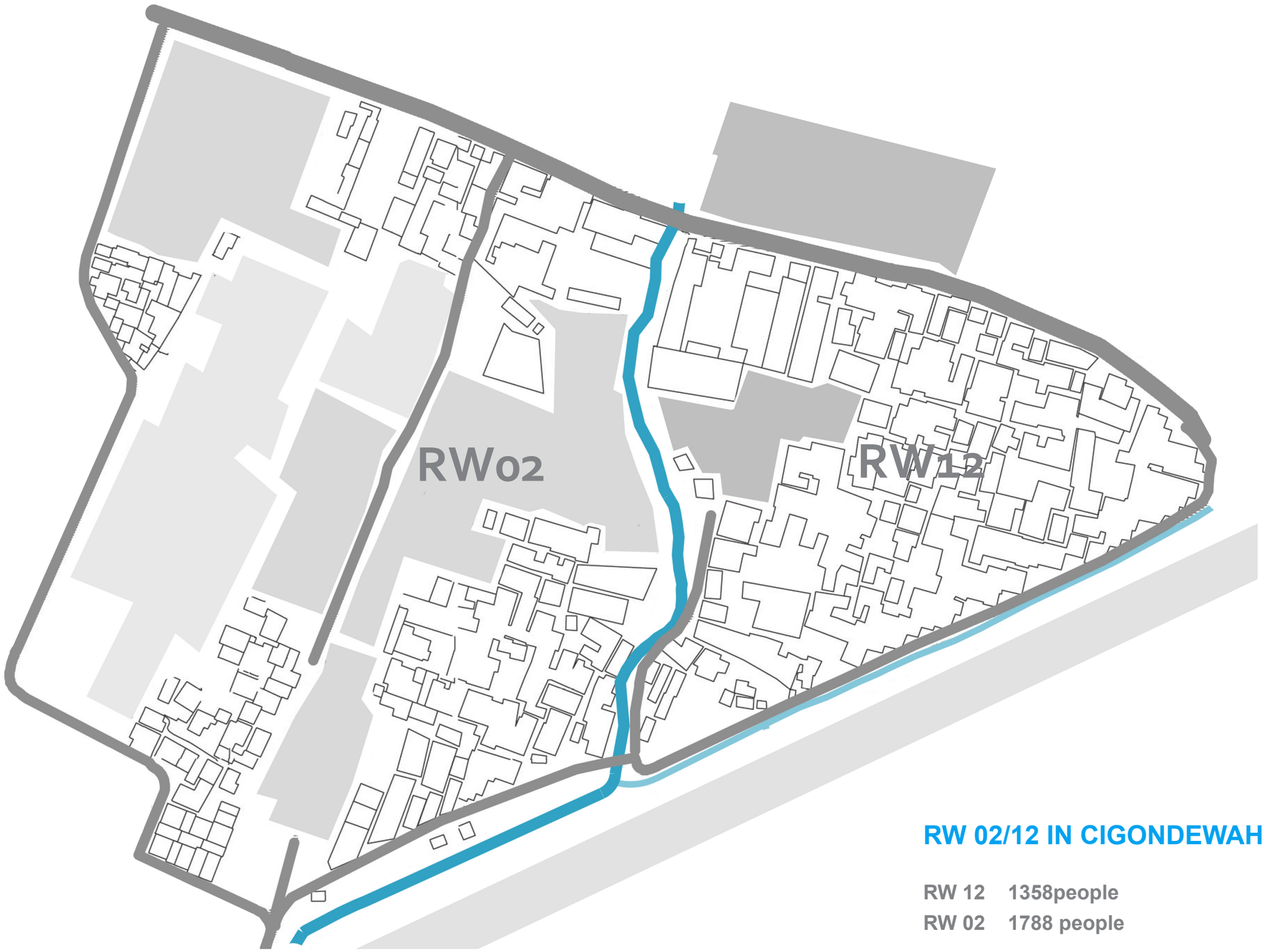
-3rd largest city by population
-2nd largest metropolitan area
-8.6 million people



CIGONDEWAH KALER

-21230 people
-12RW's
-Divide in several RT

LOCATION



RW 02/12 IN CIGONDEWAH

RW 12 1358people
RW 02 1788 people

THE KAMPUNG IS A DISTRICT FOR THE TRADITIONAL INDONESIAN COMMUNTIES WHICH AROSE WHITOUT A PLAN FOR INFRASTRUCTURE AND BUILT ENVIRONMENT (Colombijn, 2010).

KAMPUNG

KAMPUNG

KAMPUNG

Bandung restrict

8.199.892people

233.565 km2

...m2

-----kg waste

Bandung city

2.575.478 people

167.67 km2

15.000 p/km2

730x10^6 kg/year

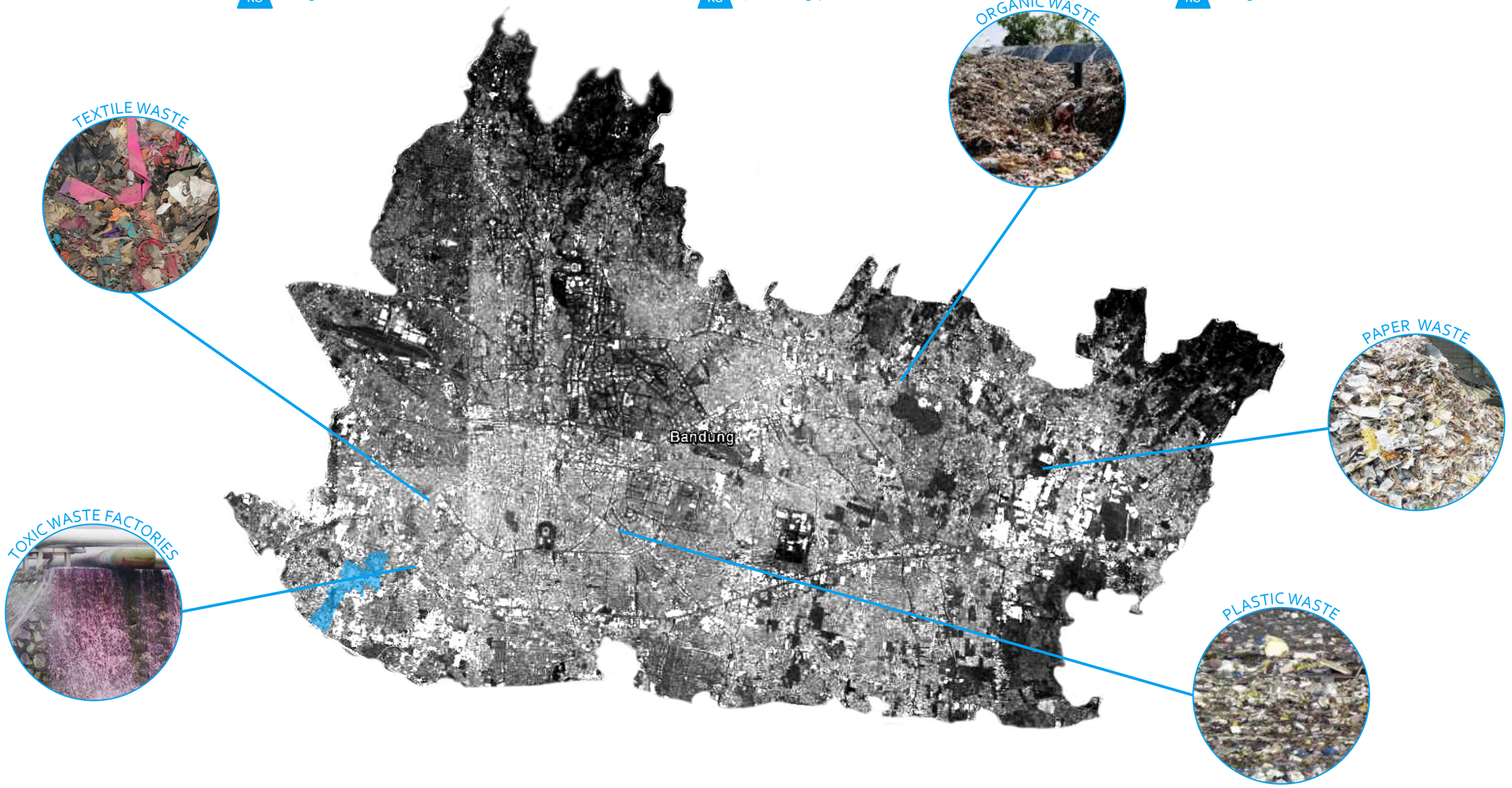
Cigondewah

21. 894 people

...m2

...m2

-----kg waste

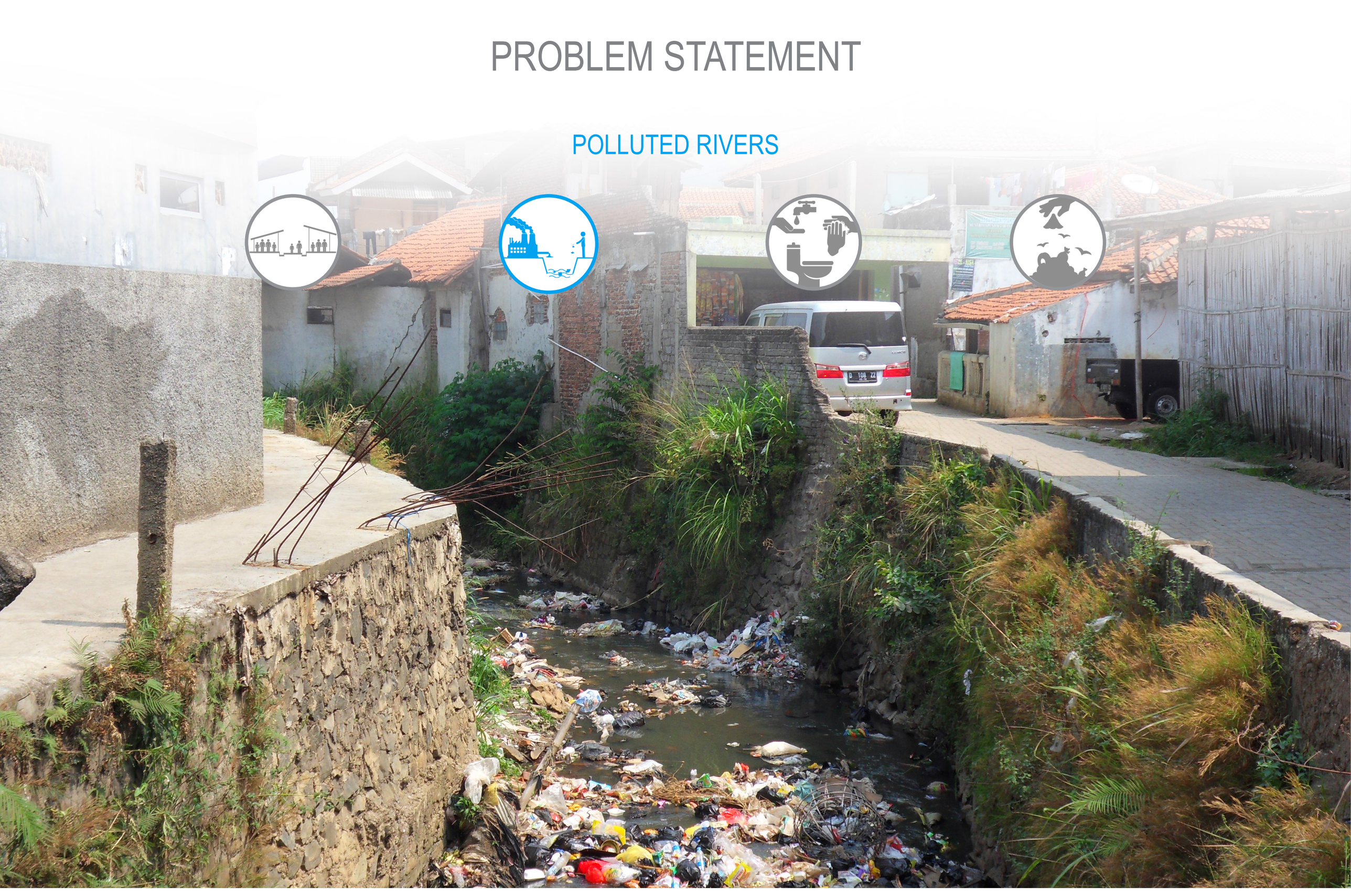


PROBLEM STATEMENT

HIGH DENSITY IN THE KAMPUNG

PROBLEM STATEMENT

POLLUTED RIVERS



PROBLEM STATEMENT

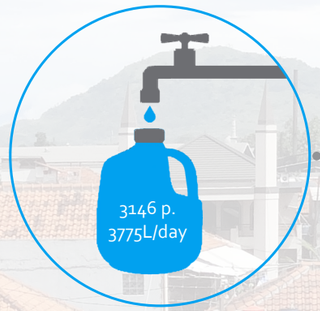
BAD SANITATION

PROBLEM STATEMENT

WASTE DUMPED EVERYWHERE

OBJECTIVE

Lack of drinking water



Water demand

Inadequate sanitation

Adequate sanitation

DESIGN

Existing waste flow

Recycle waste

DESIGN QUESTION

HOW CAN A **COMMUNITY BUILDING** IN THE KAMPUNG REFLOW THE **WATER** AND **WASTE CYCLES** TO **IMPROVE** THE LIVING QUALITIES FOR THE RESIDENTS IN BANDUNG, INDONESIA?

RESEARCH

TECNICAL RESEARCH QUESTION

HOW TO IMPROVE THE WATER QUALITY IN THE KAMPUNG BY MANAGING ALL THE **WATER FLOWS** WITH A **PURIFICATION** SYSTEM WHERE **WASTE** MANAGEMENT IS **INTEGRATED?**

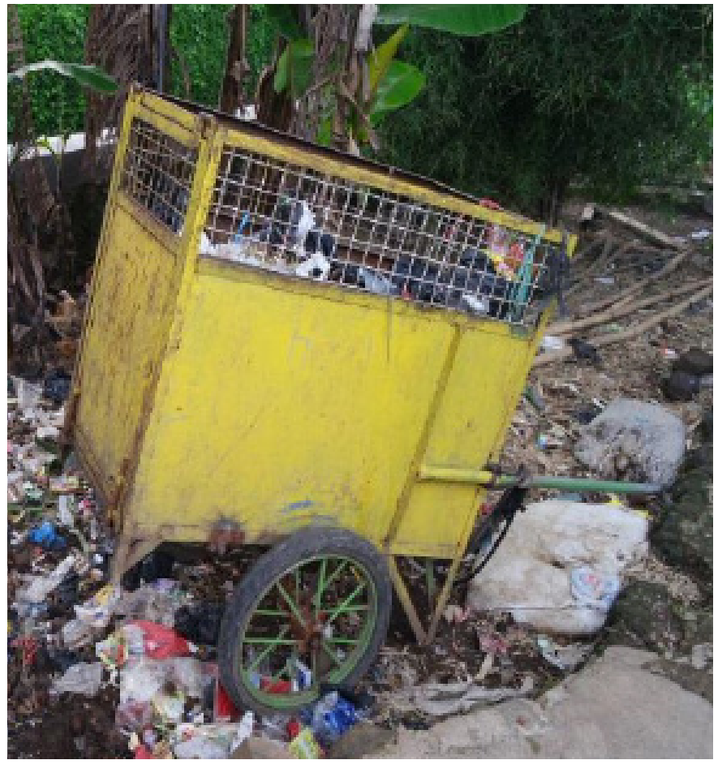
FIELD RESEARCH

FIELD RESEARCH

WATER FLOWS

FIELD RESEARCH

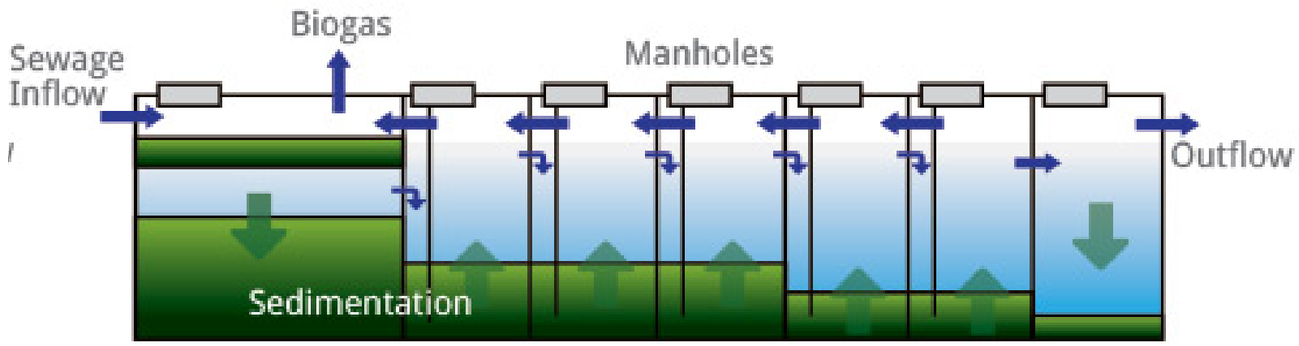
WASTE FLOWS



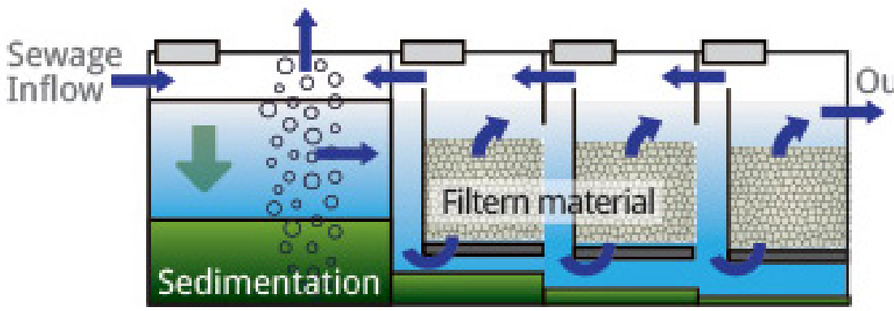
CASE STUDIES

WATER PURIFICATION SYSTEMS

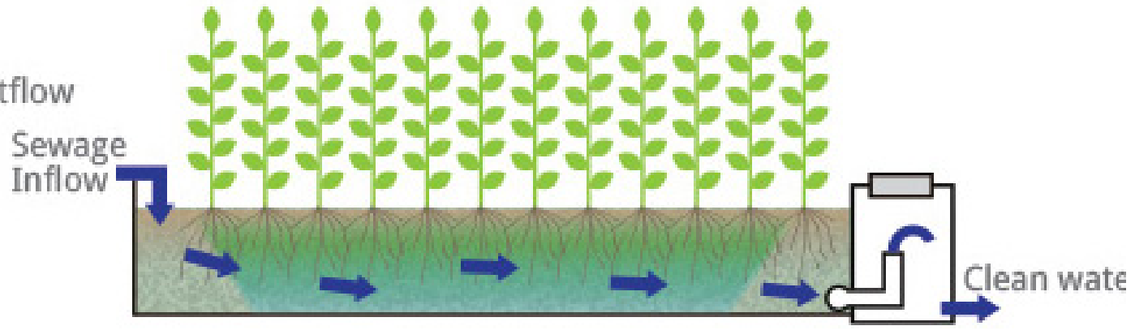
1. ANAEROBIC BAFFLES REACTOR



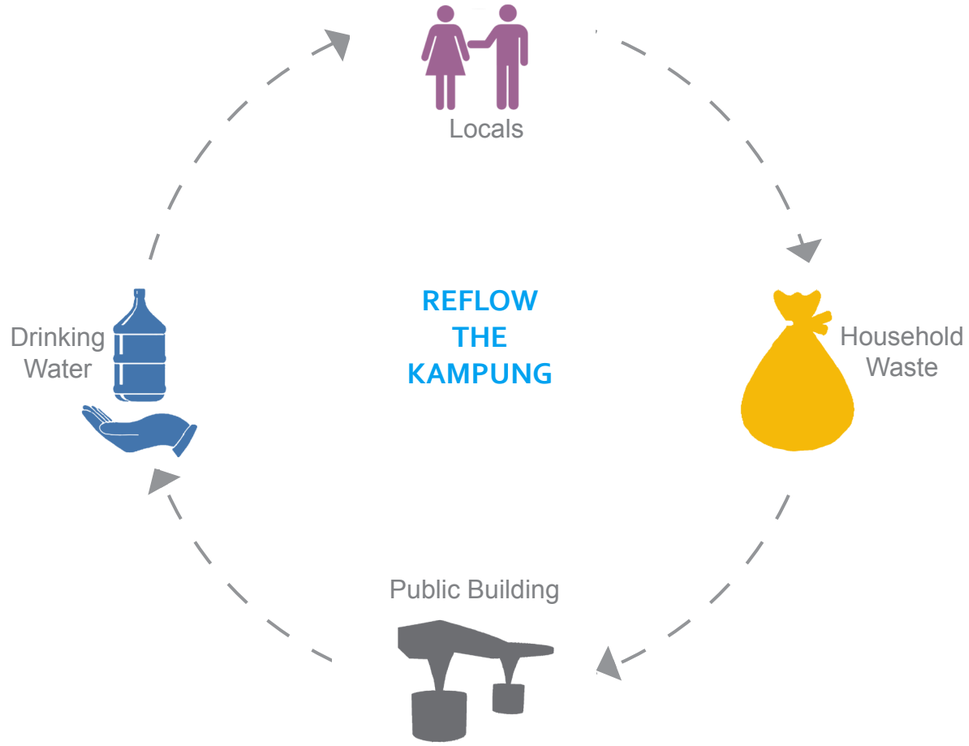
2. ANAEROBIC FILTER



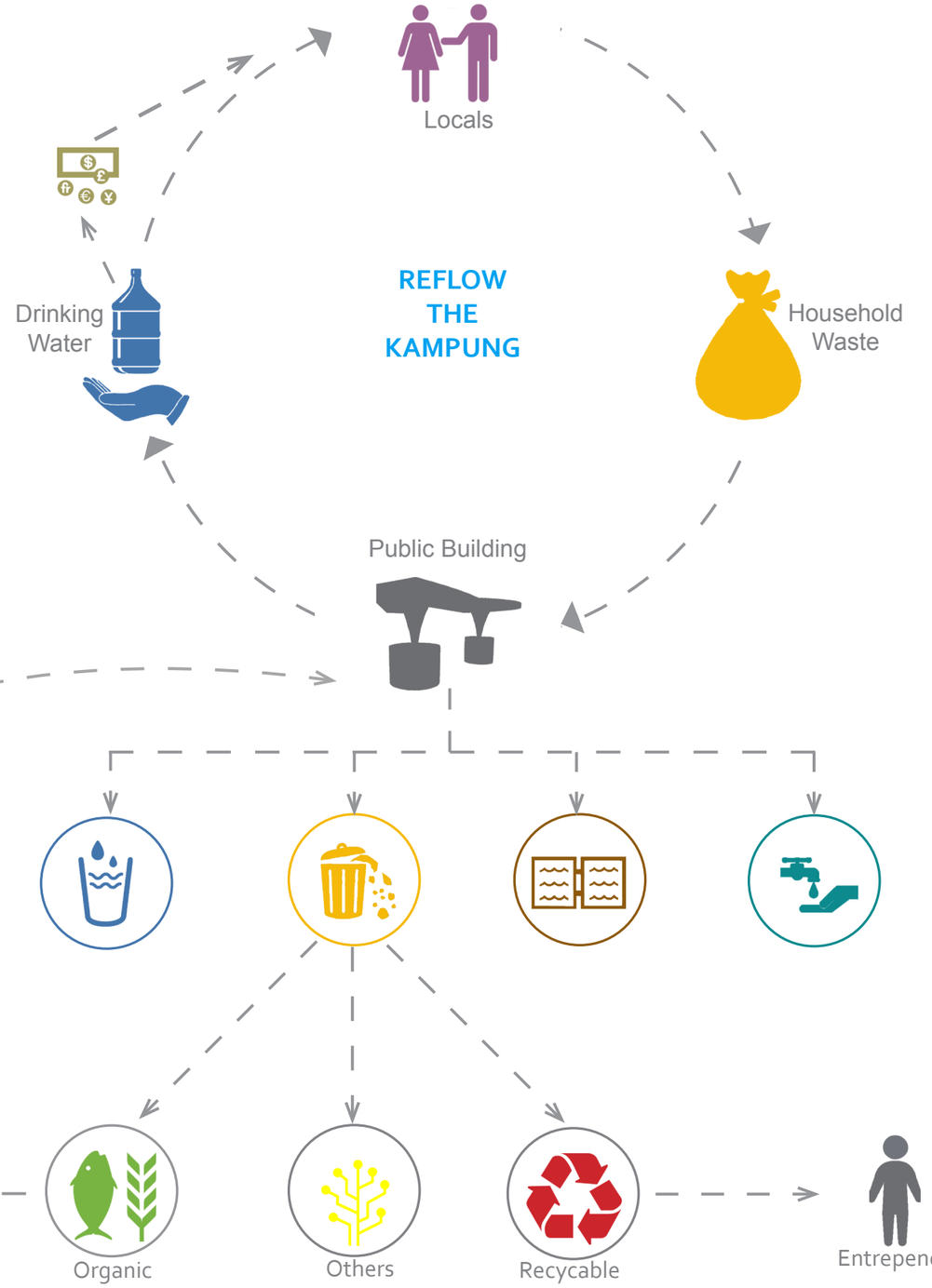
3. PLANT FILTER / FISH POND



FLOW PRINCIPAL



FLOW PRINCIPAL



PROGRAM

DRINKWATER

Rainwater collection

2500mm/year
6,85mm/day
1,2L drinking water * 3146 people= 3775L /day
Roof 3775/6,85= **550m2**

Drinkingwater filter

-Filtering 3775L/day
-3,8m3/day
-2,5m x 2m = **5m2**
-height 2m
-retention time 24hours

Distribute

In gallons 5L or 10L
Distrubion/collection space
12m2

SANITATION

SHOWER

-showers for max. 1890 people
-4 showers men/4 women
-total space= **14m2**

WASHING BINS

-maximum 1890 residents
-washing bins men5, women 5
-totaal **18m2**
-area cobined with showers

TOILETS

-Toilets for 1260 people
-10 toilets:
5men, 5women
-total **20m2**

WATER COLLECTION

-water collection for 1week
-closed system
-54m3 = 54.000L
-**18m2**

WATER TREATMENT

TRASH SKIMMER

-Trashs skimmer for all the river water
-mechine **7 meters** long
-width of the river

ANAEROBIC TREATMENT

Baffled reactor 138m3/day
-4,6m x 10m
-retention time 24 hours
Anaerobic filter
-**42m2** (6m x 7m)
-retention time

PLANT/FISH POND

Planted gravel filter
-depth 10-45cm above grond
-15m x 21m = **315m2**
Fish pond
-depth 1meter
-10m x 14m = **140m2**

HOUSEHOLD WASTE

WASTE COLLECTION POINT

-colection area for the household waste.
-**20m2** needed
-It will inmideatly be processed and bring to the waste separtion

WASTE SEPARTION

-waste separte in three categories: organic, recycables and others.
-Storage space.
-18m2 for all catagroies
-total **54m2**

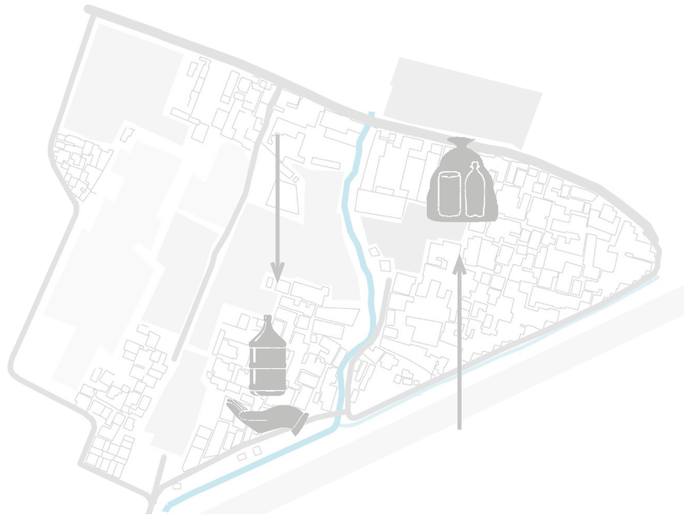
BIOGAS REACTOR

-organic waste=772kg/day
-300kg/m3
-total **18m3**

DESIGN

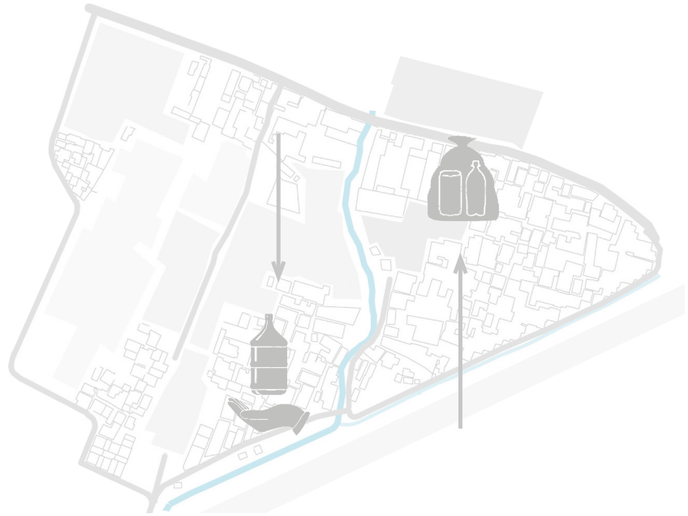
CONCEPT

RAINWATER COLLECTION

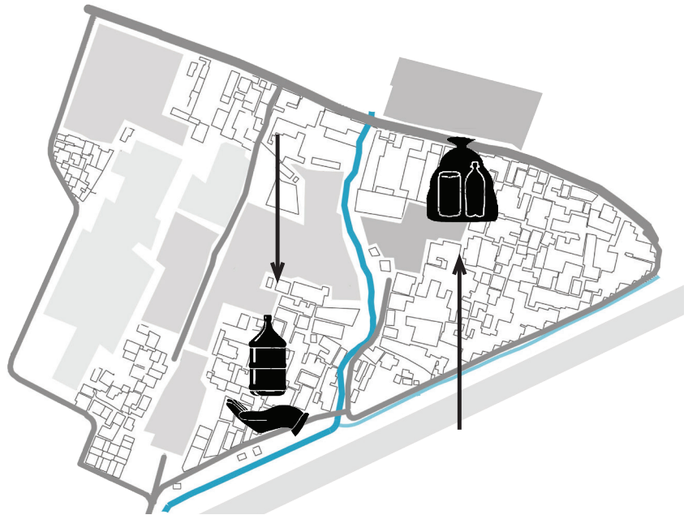


CONCEPT

CENTRAL WATER POINT

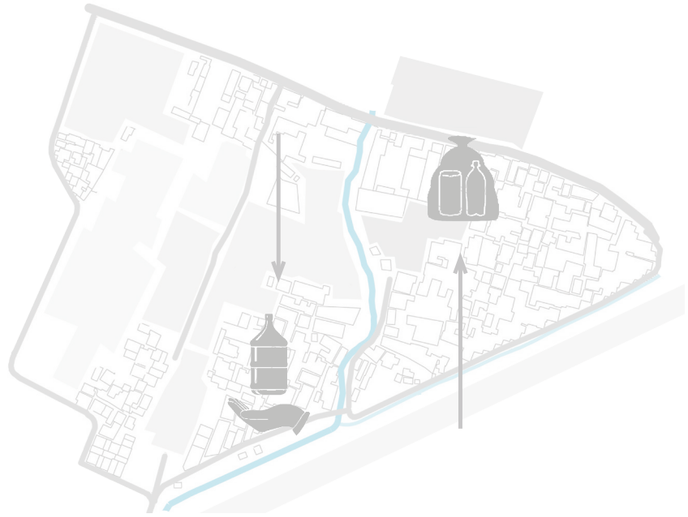


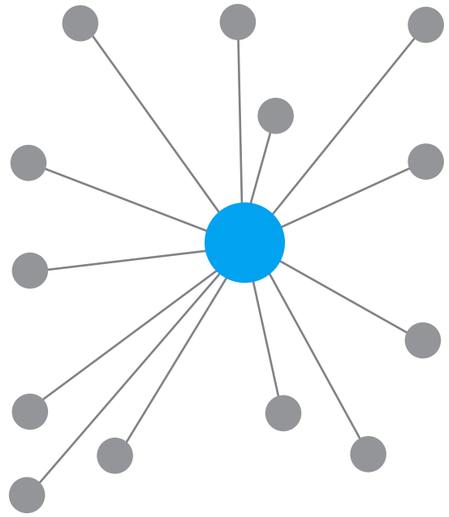
CONCEPT



CLEAN WATER IN / WASTE OUT

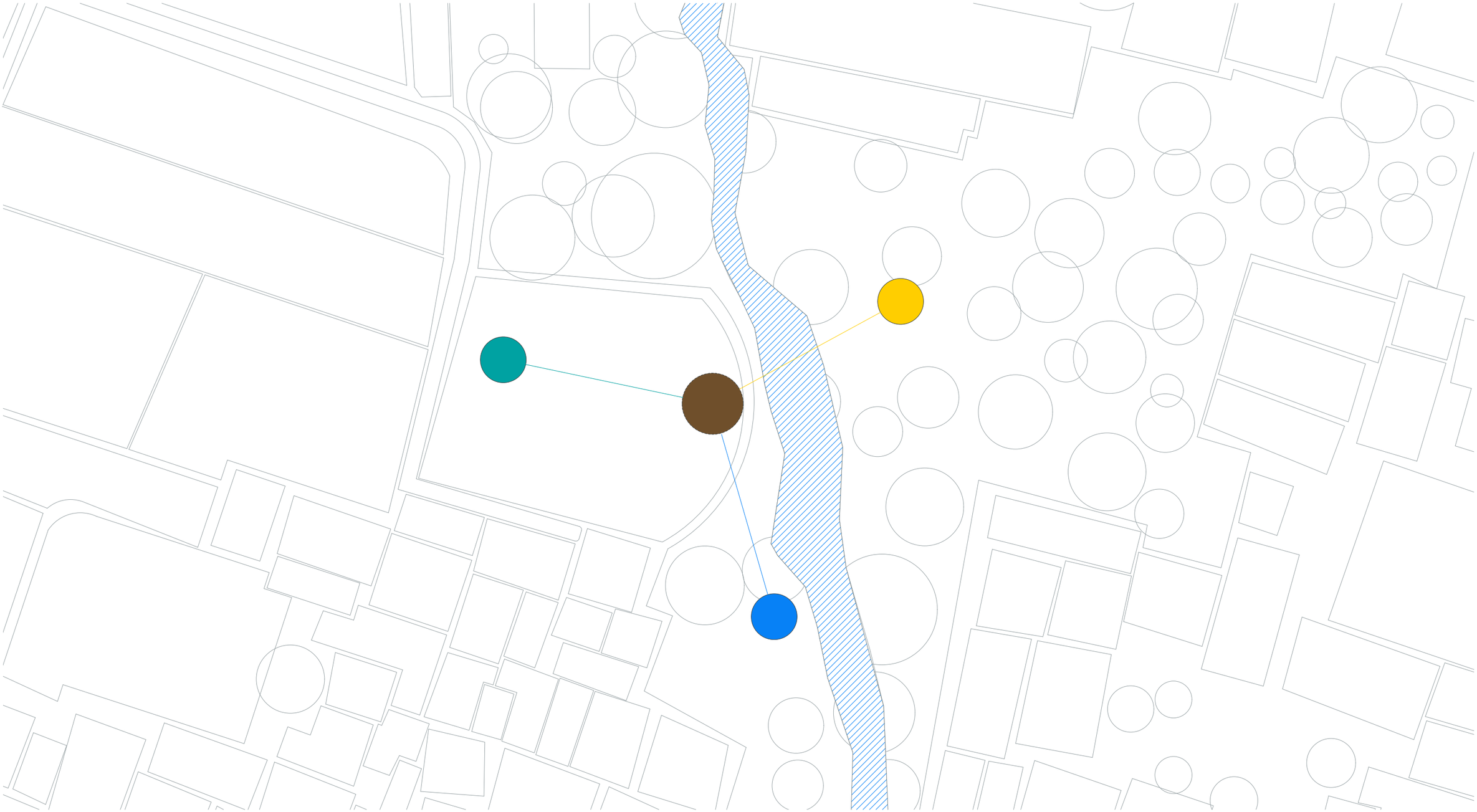
CONCEPT



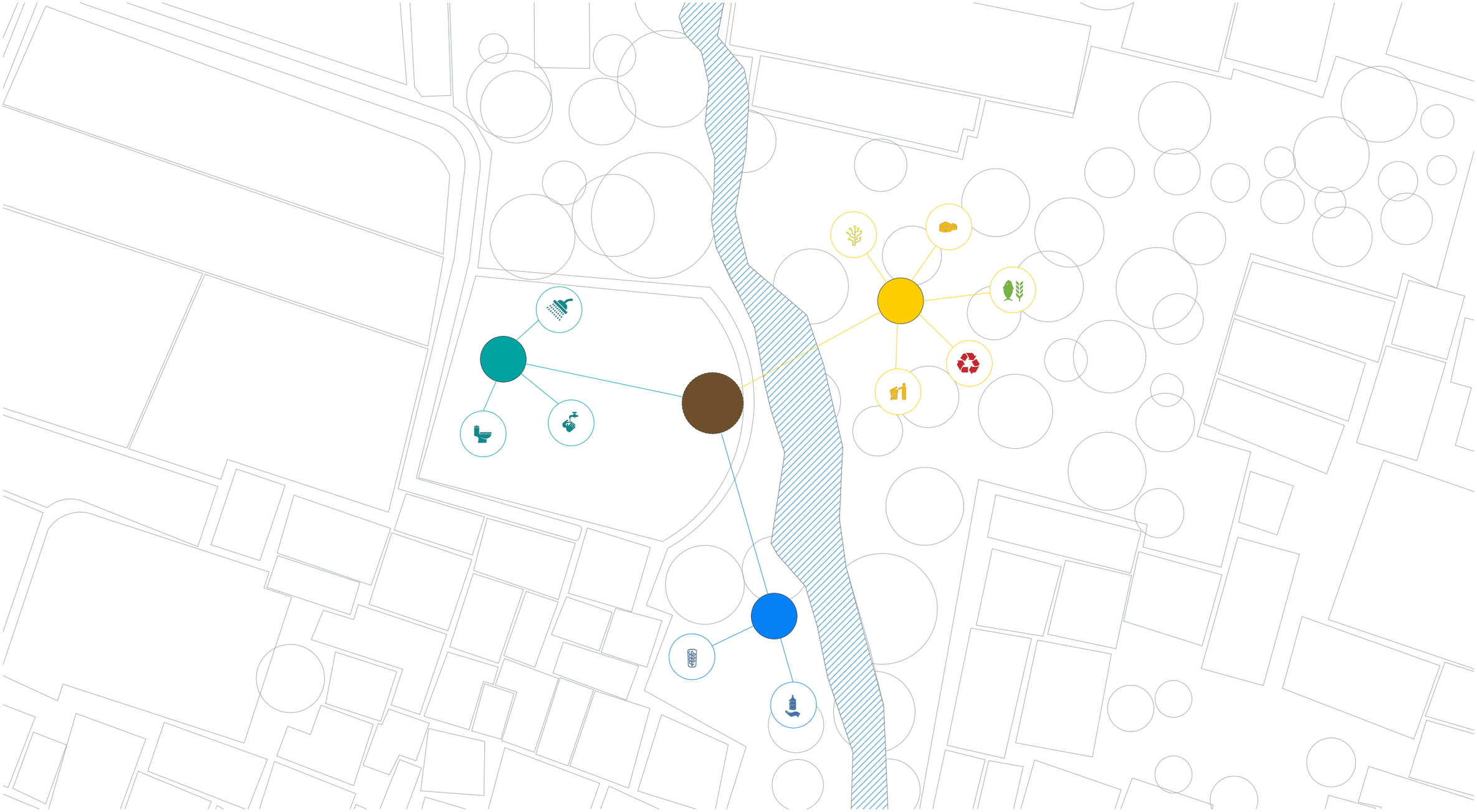


CENTRAL POINT

CONCEPT



CONCEPT



LANDSCAPE PLAN

LANDSCAPE PLAN

LANDSCAPE PLAN

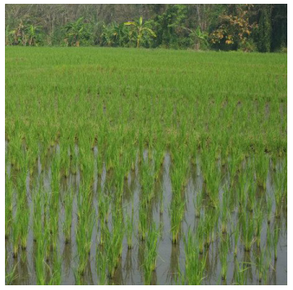
PLANTS AS AN ARCHITECTURAL ELEMENT

LANDSCAPE PLAN

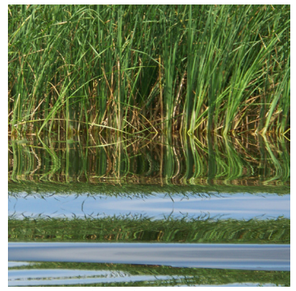
LANDSCAPE PLAN

TYPE OF WATER PLANTS

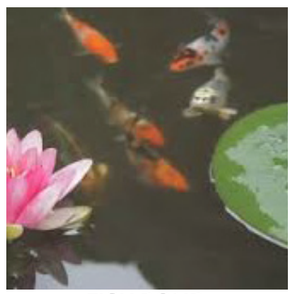
ACORUS CALAMUS FILTER



RICE FIELD FILTER



REED FILTER



FISH POND

PLANTS FOR WATER TREATMENT

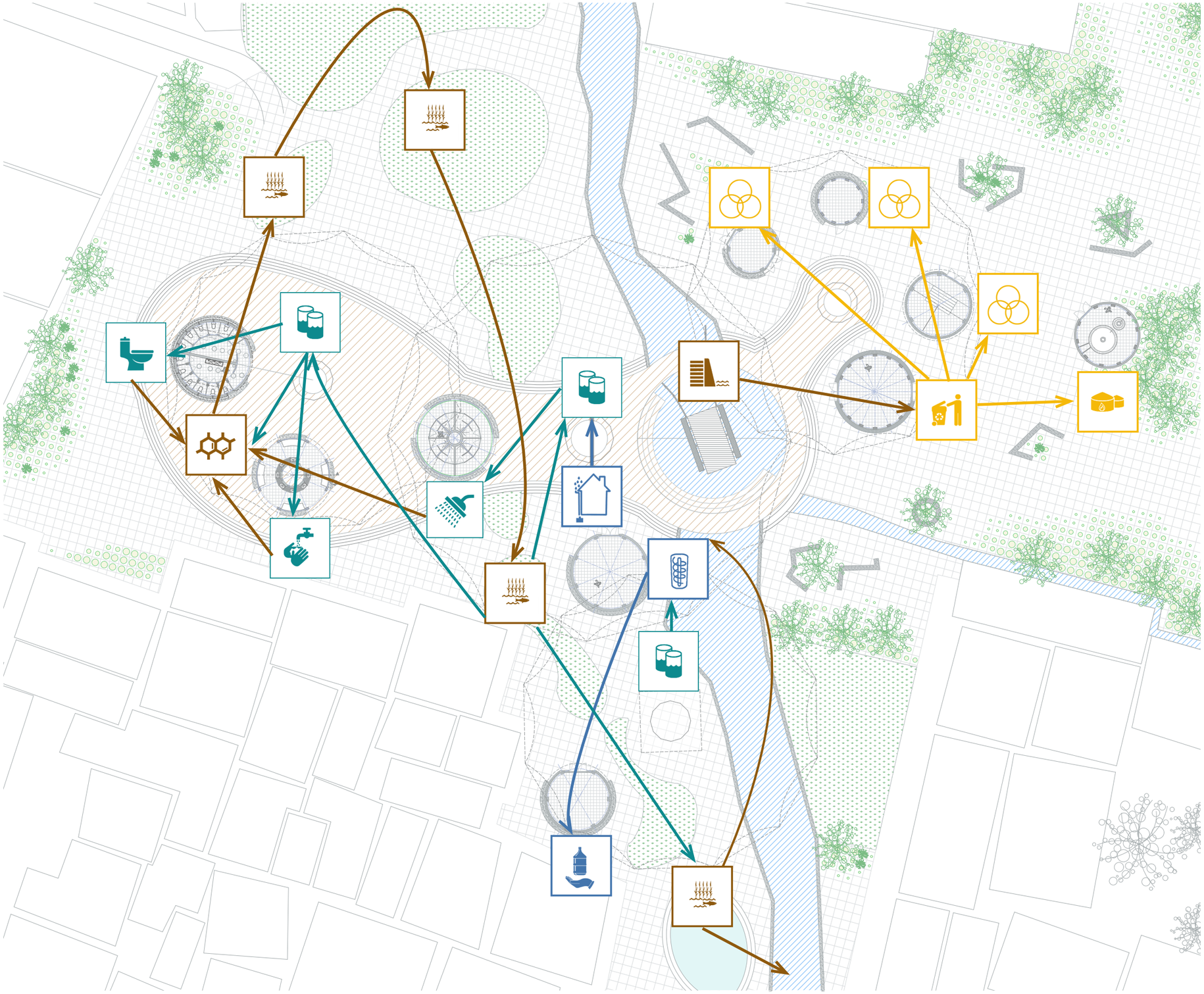
PLANT FILTER

ANAEROBIC TREATMENT

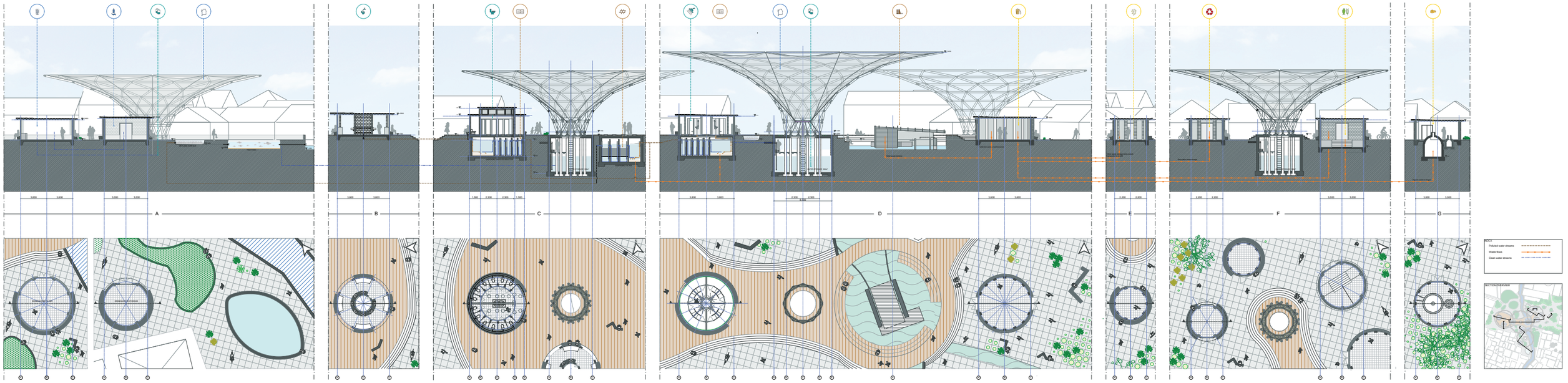
ANAEROBIC TREATMENT

FISH POND

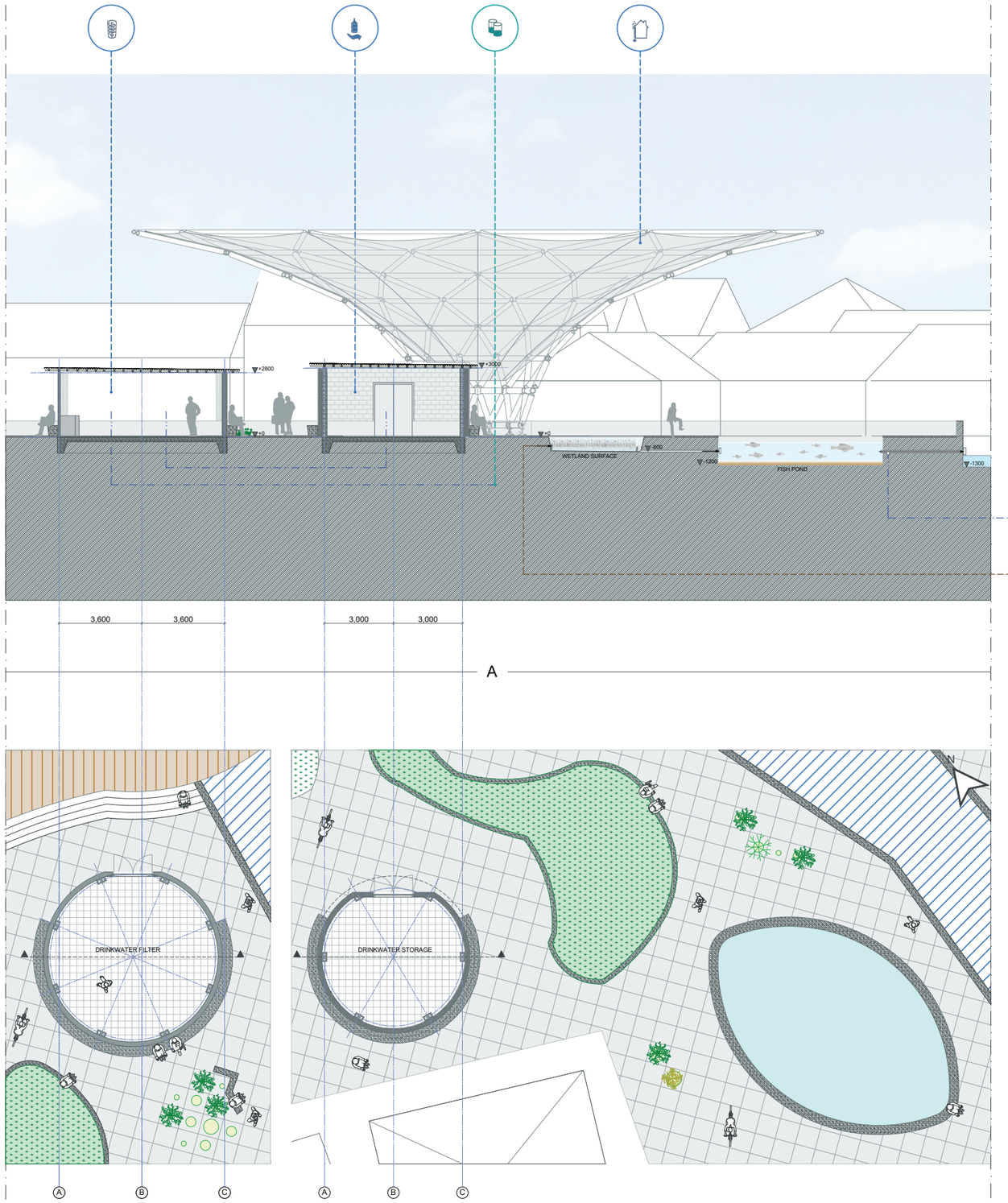
FLOW SCHEME



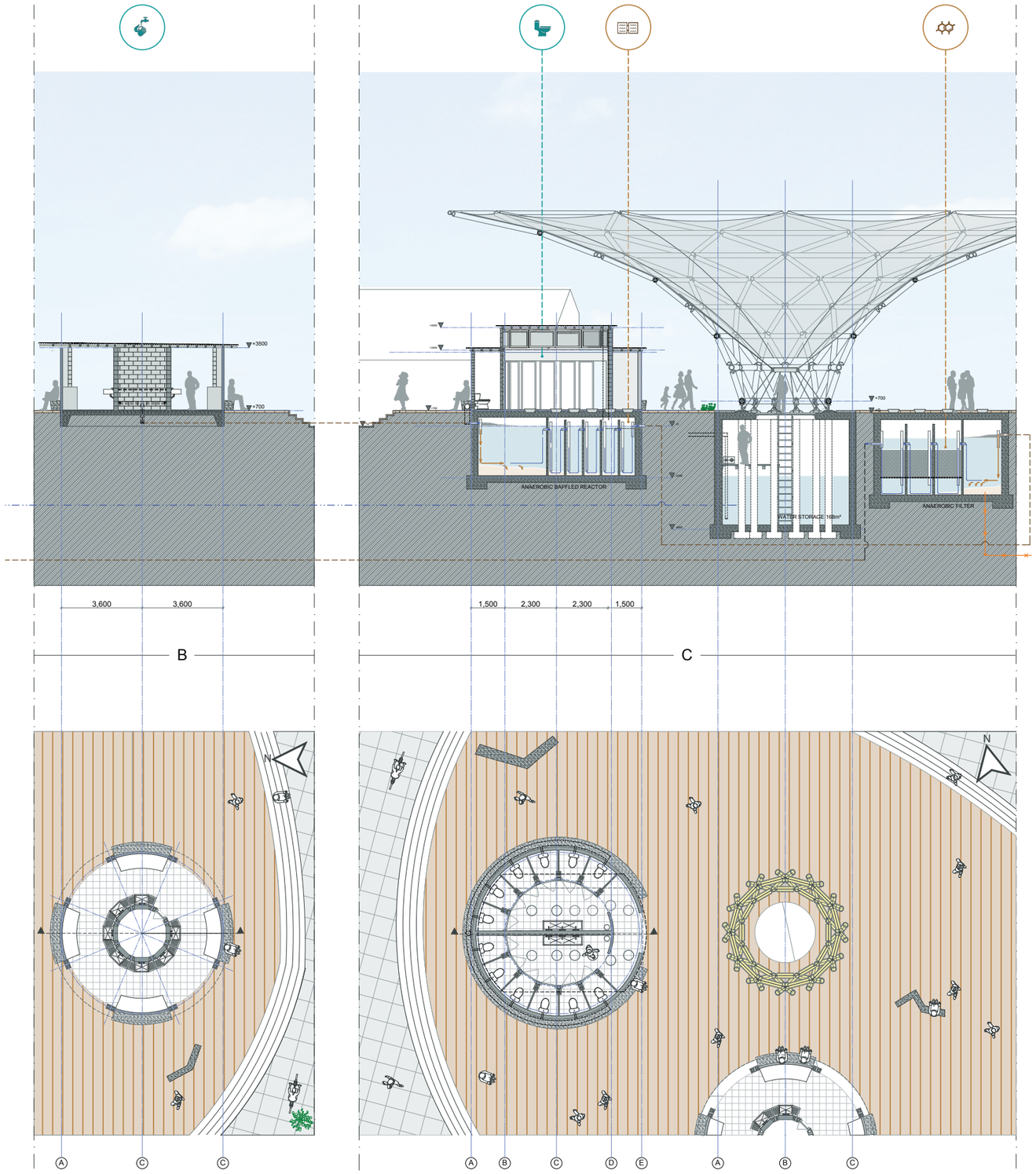
FLOW SCHEME


A
B
C
D
E
F
G
Polluted water streams
Waste flows
Clean water streams

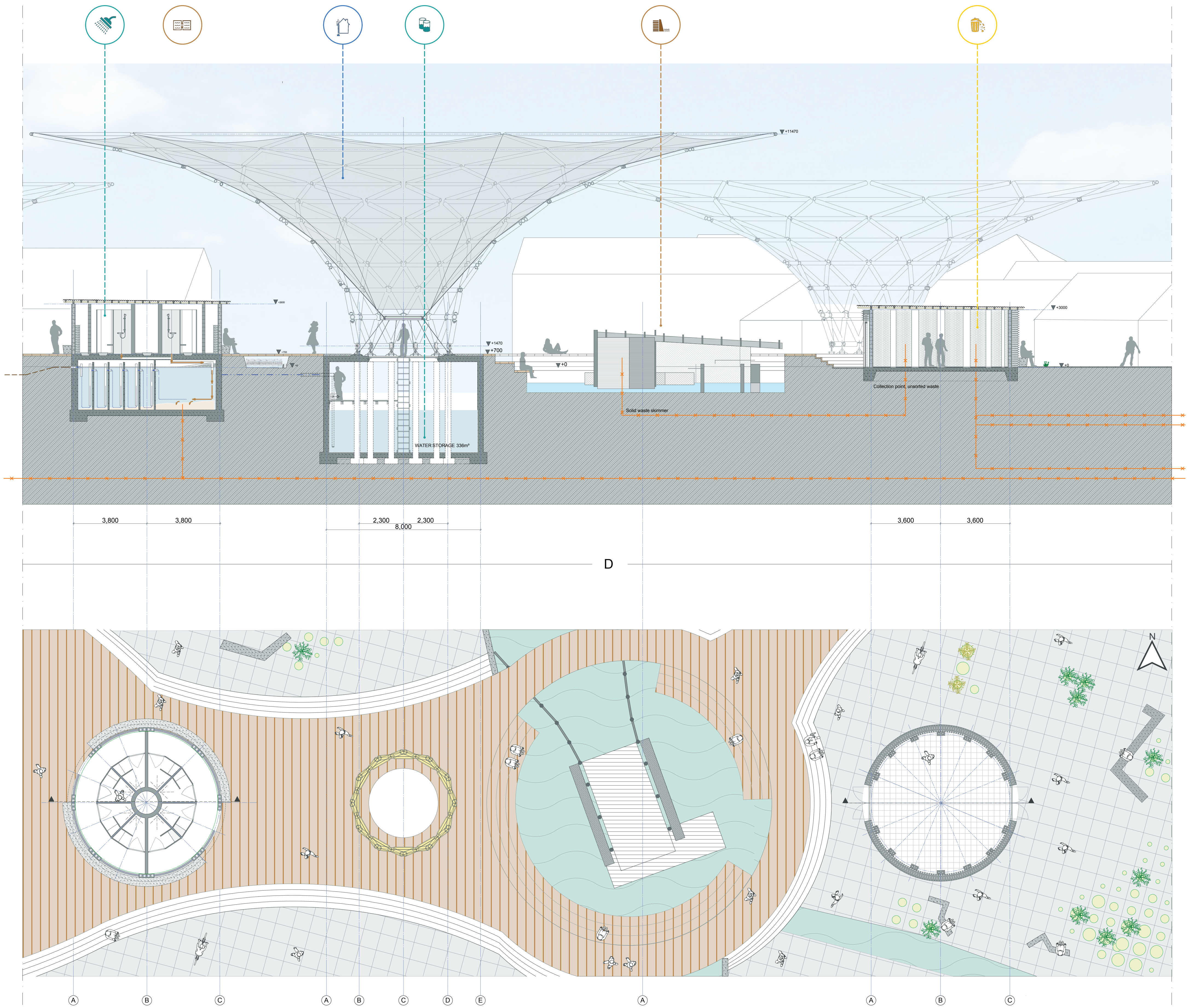
FLOW SCHEME


+2800
+3000
+0
-50
-900
-1250
-1300
WETLAND SURFACE
FISH POND
3,600
3,600
3,000
3,000
A
DRINKWATER FILTER
DRINKWATER STORAGE
N
A
B
C
A
B
C

FLOW SCHEME

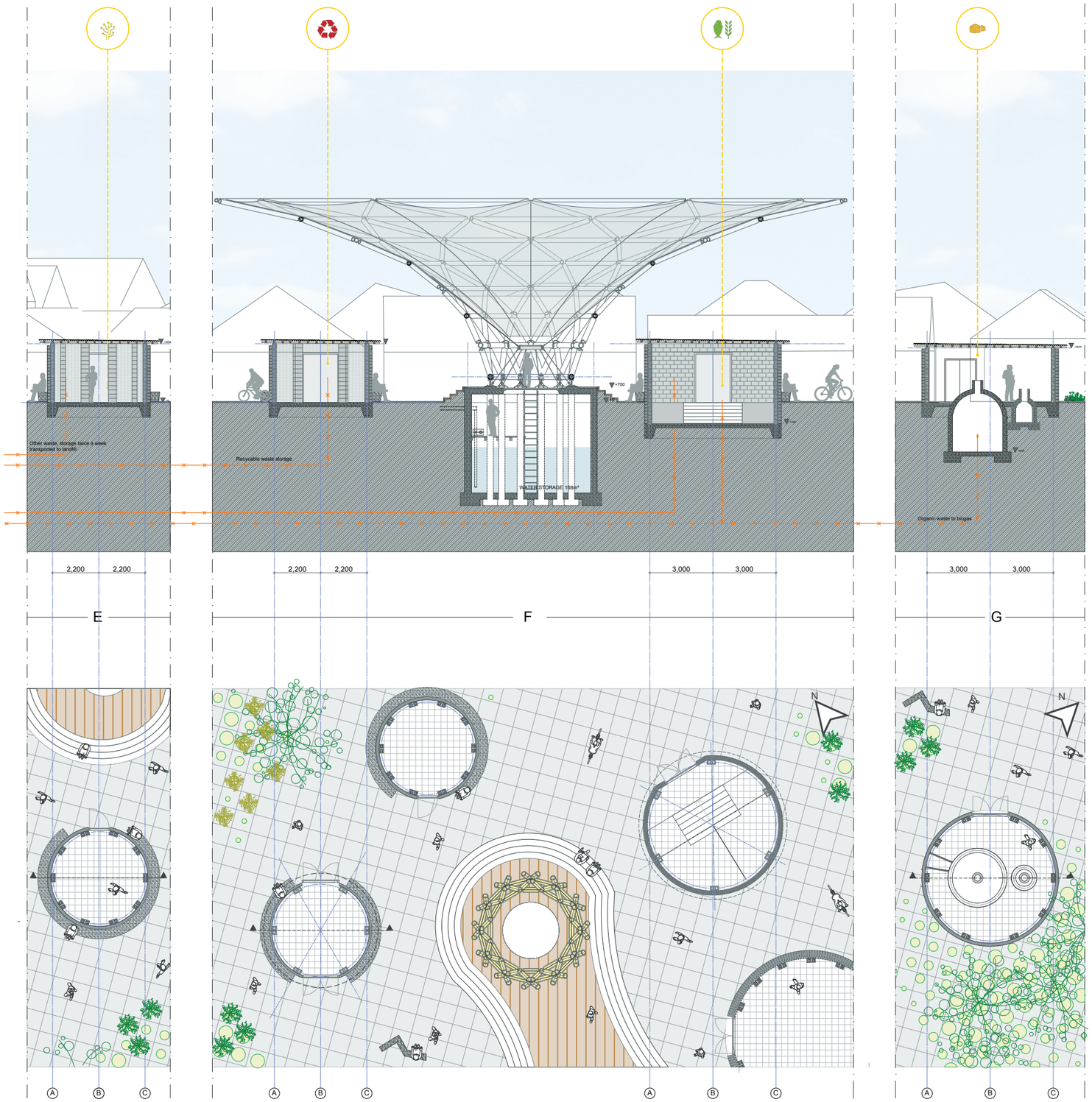

+3500
+700
ANAEROBIC BAFFLED REACTOR
WATER STORAGE 168m³
ANAEROBIC FILTER
3,600
3,600
1,500
2,300
2,300
1,500
B
C
N
A
C
C
A
B
C
D
E
A
B
C

FLOW SCHEME

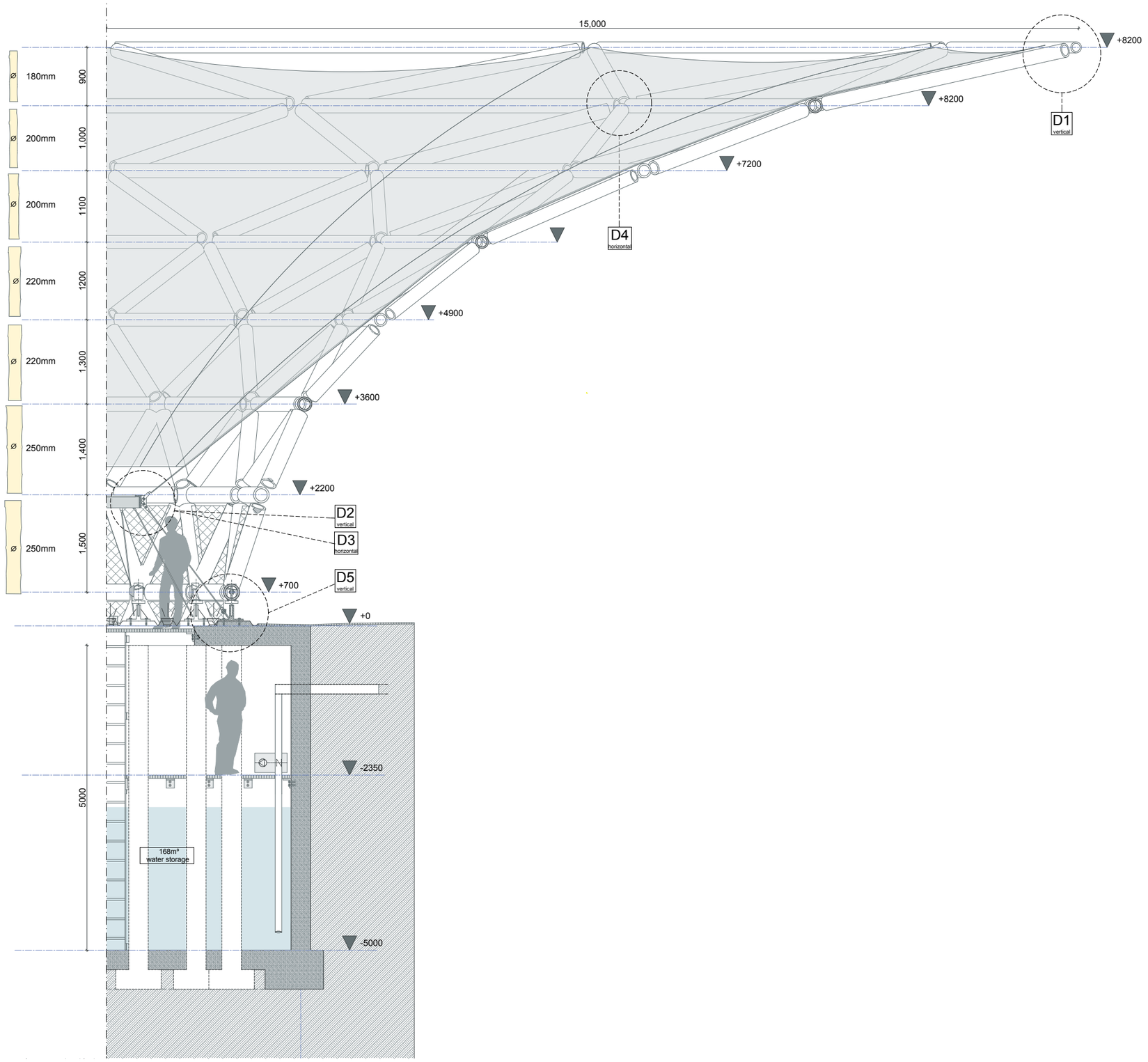


+11470
+1470
+700
+0
+3000
WATER STORAGE 336m³
Solid waste skimmer
Collection point, unsorted waste
3,800
3,800
2,300
2,300
8,000
3,600
3,600
D
N
A
B
C
A
B
C
D
E
A
A
B
C

FLOW SCHEME

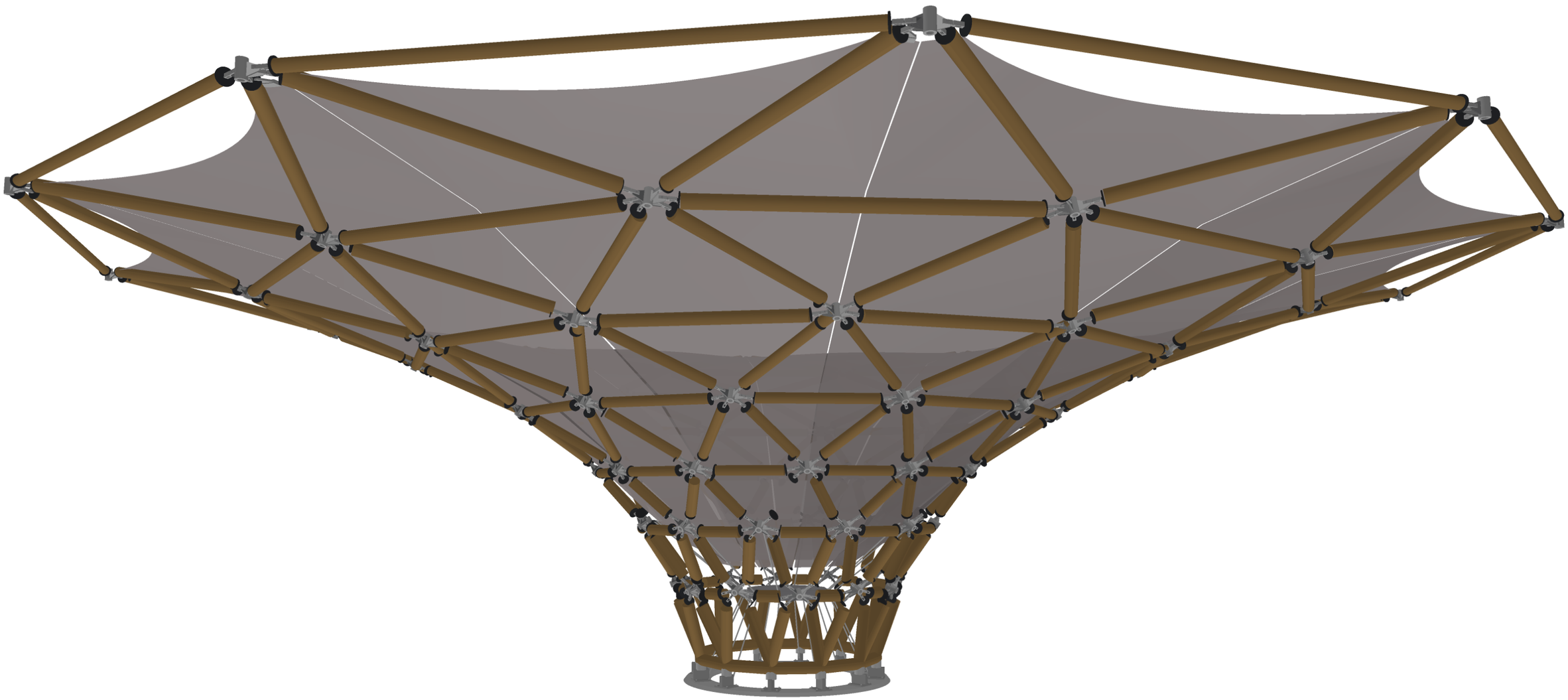

Other waste, storage twice 6 week transported to landfill
Recyclable waste storage
WATERSTORAGE 168m³
Organic waste to biogas
+700
2,200
2,200
3,000
3,000
E
F
G
A
B
C
N

ROOF


15,000
+8200
+8200
D1
vertical
+7200
D4
horizontal
+4900
+3600
+2200
D2
vertical
D3
horizontal
D5
vertical
+700
+0
-2350
-5000
168m³
water storage
ø 180mm
900
ø 200mm
1,000
ø 200mm
1100
ø 220mm
1200
ø 220mm
1,300
ø 250mm
1,400
ø 250mm
1,500
5000

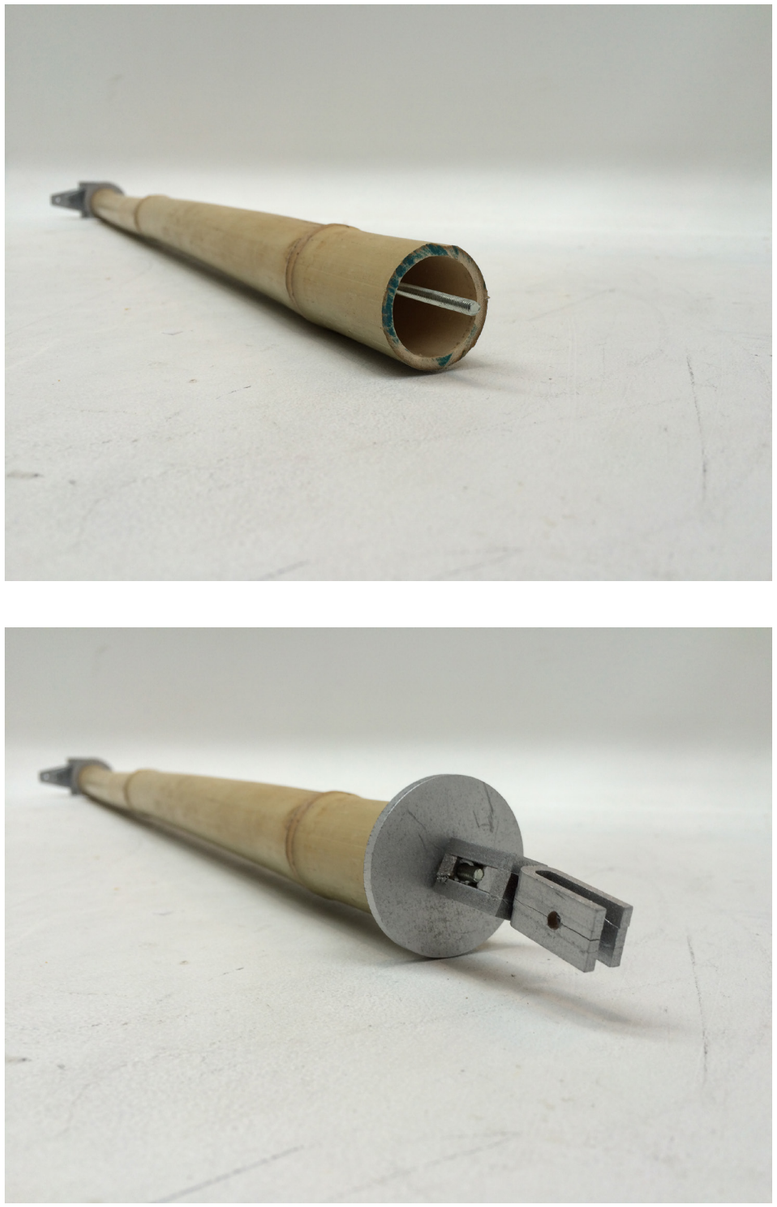
ROOF

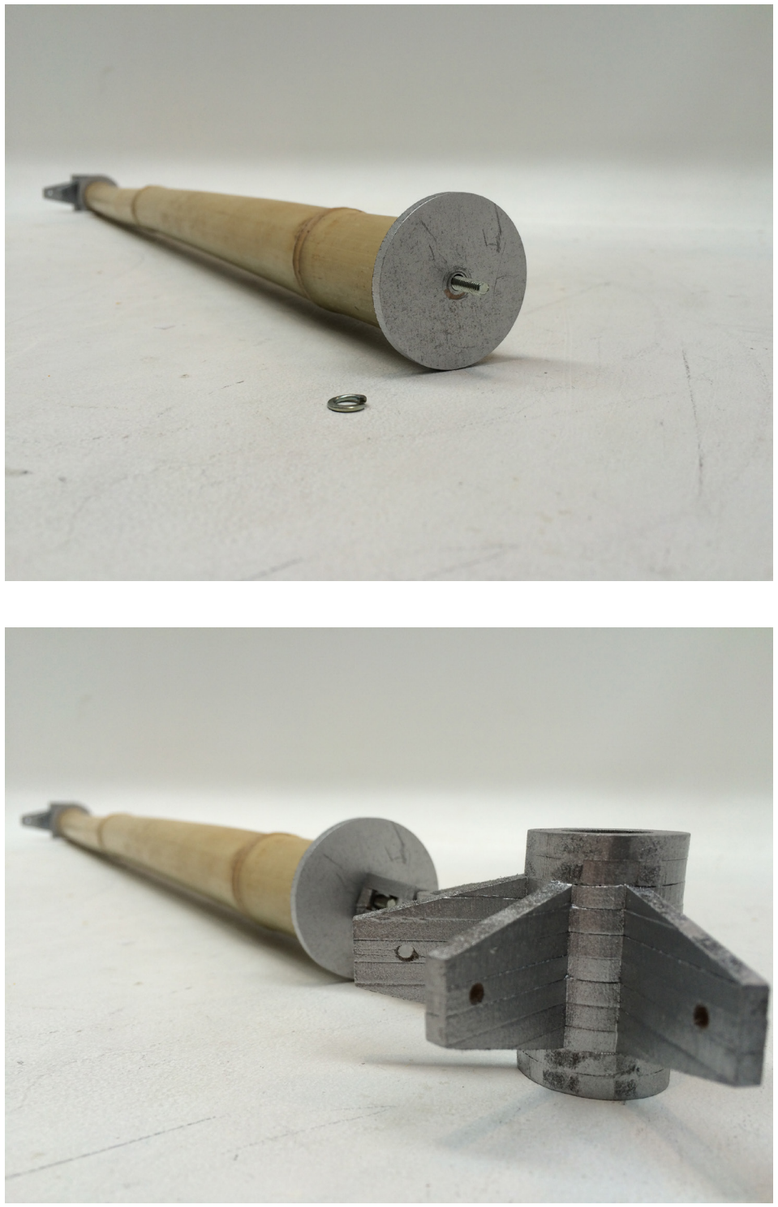
DETAIL BAMBOO NODE

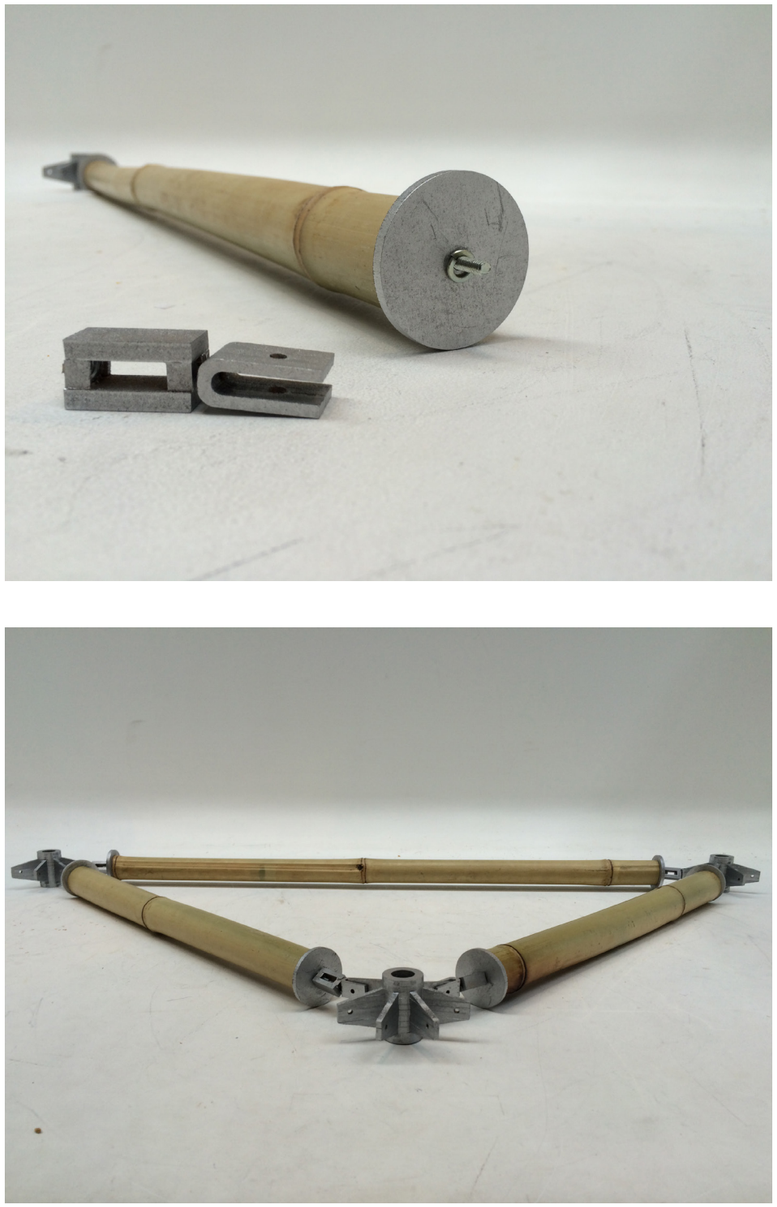


ROOF

DETAIL BAMBOO NODE

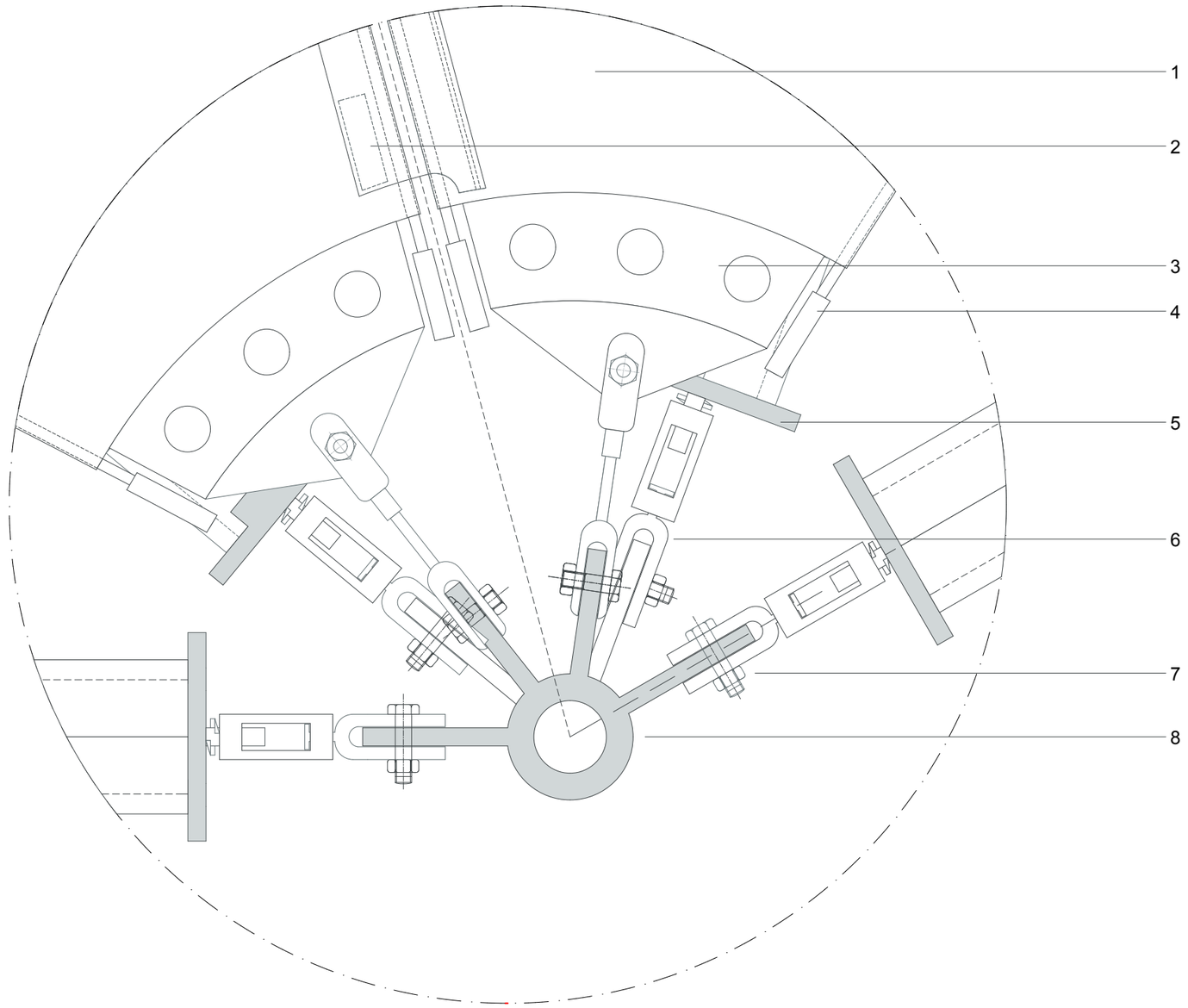






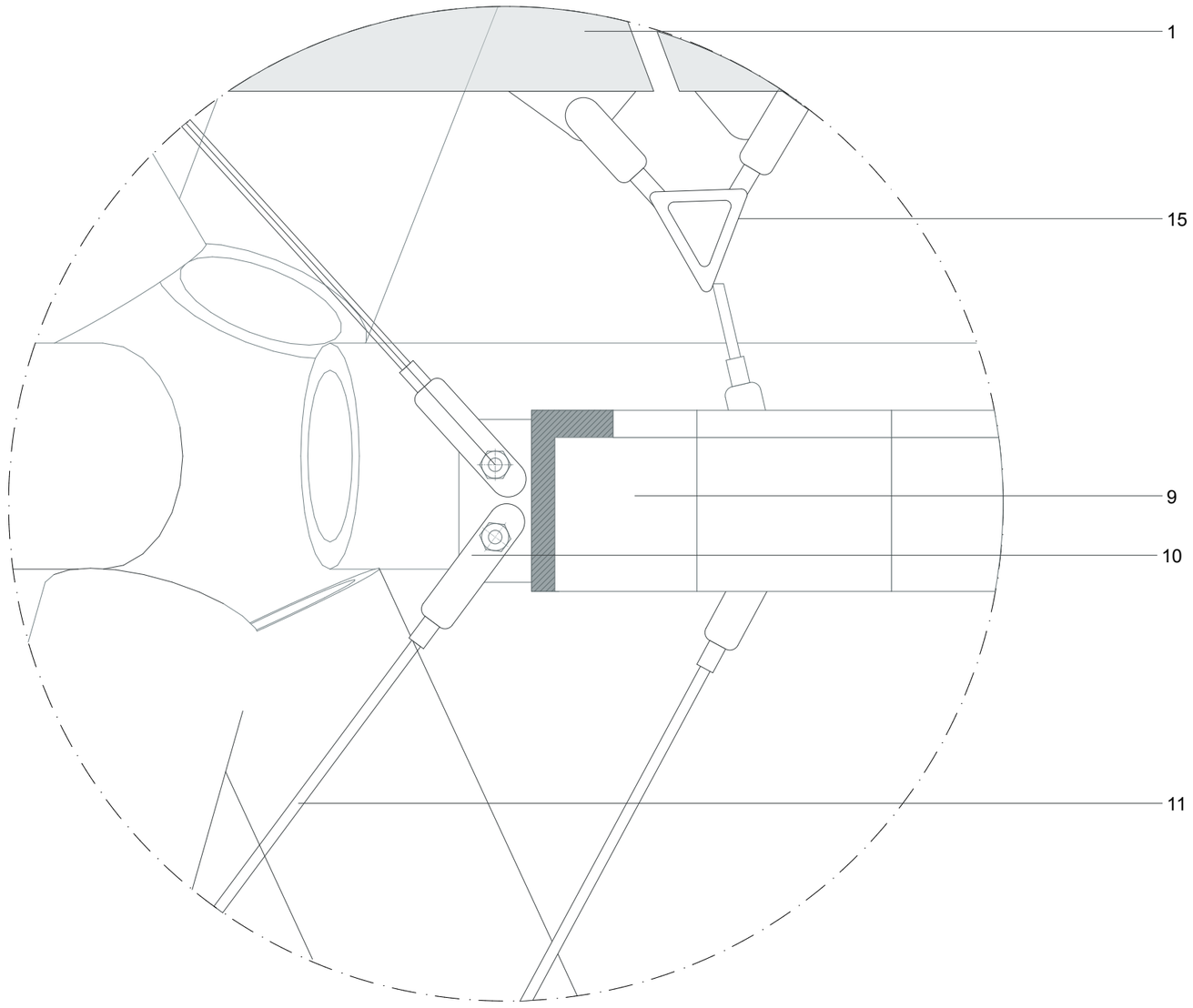
ROOF

DETAIL TOP CONSTRUCTION, BAMBOO / MEMBRANE



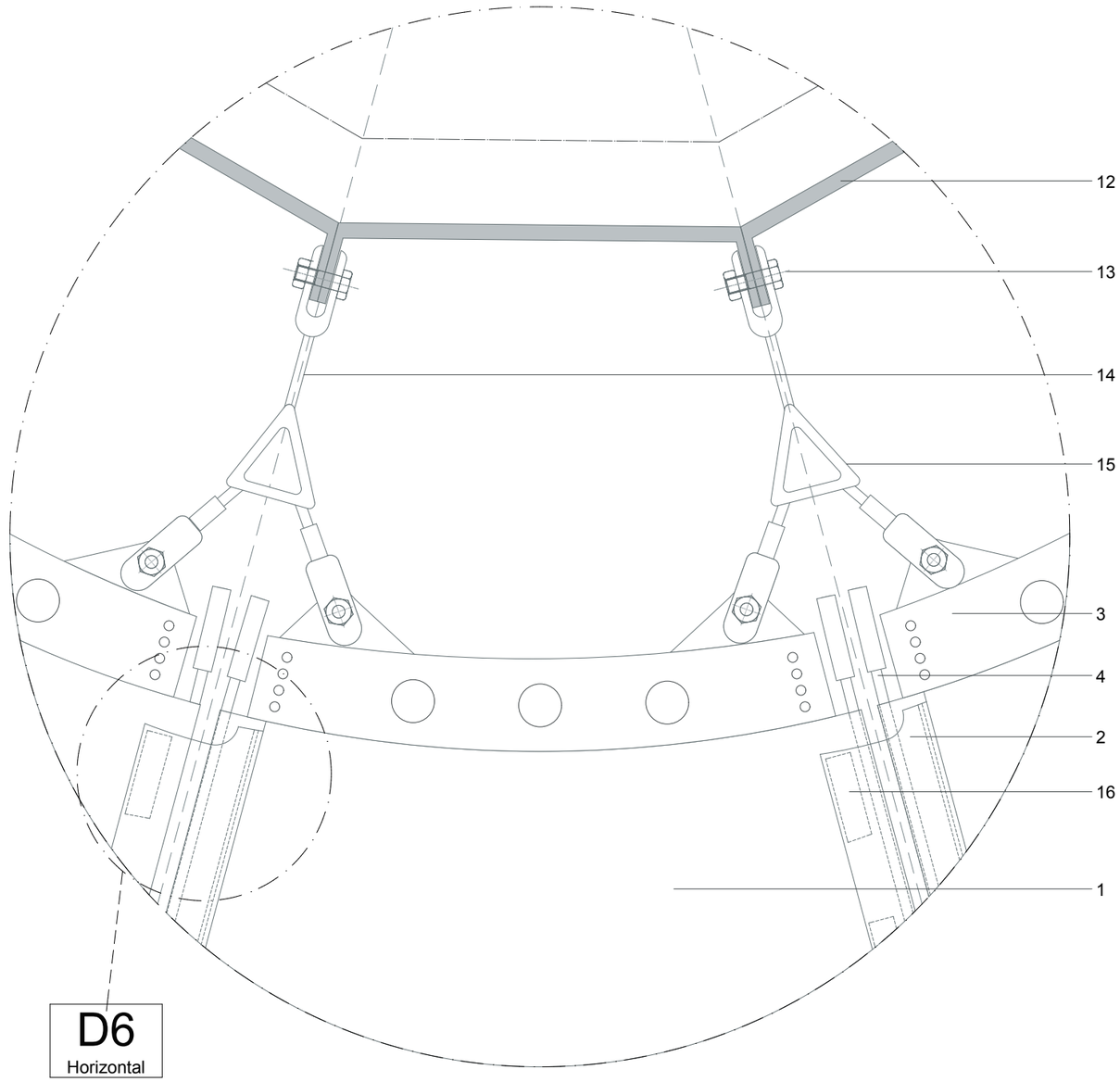
ROOF

DETAIL STEEL RING

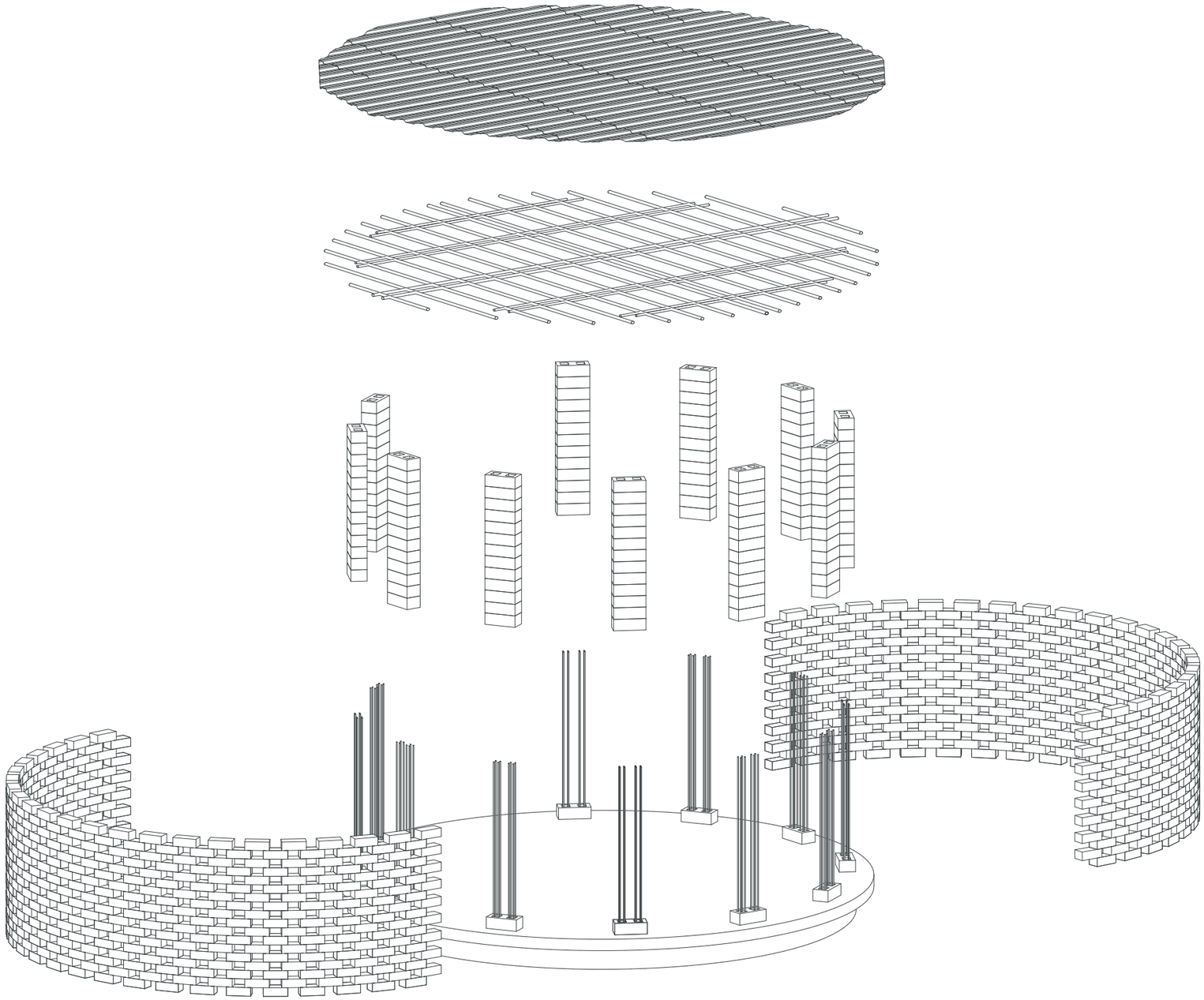


ROOF

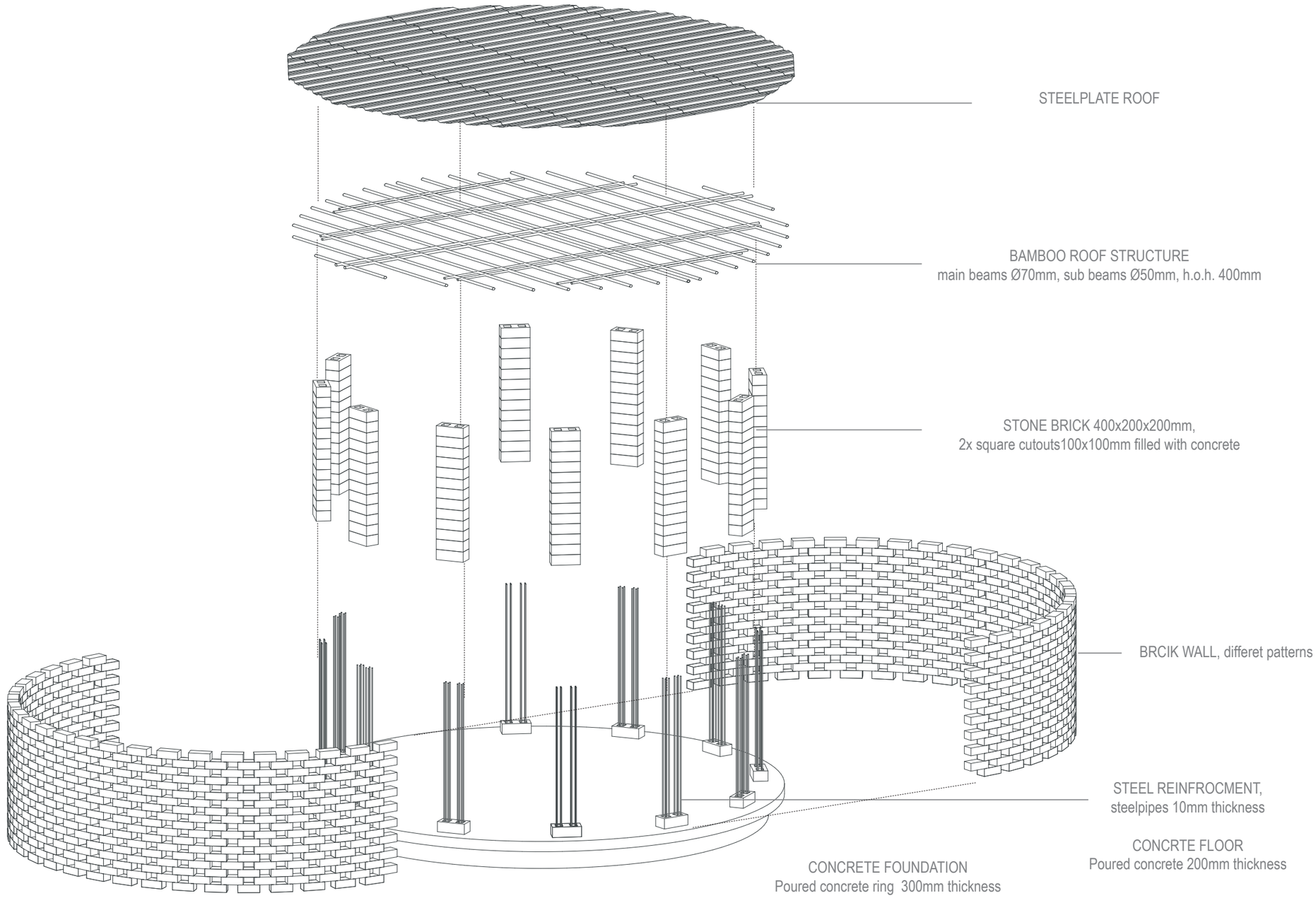
DETAIL MEMBRANE BOTTOM



MODULES

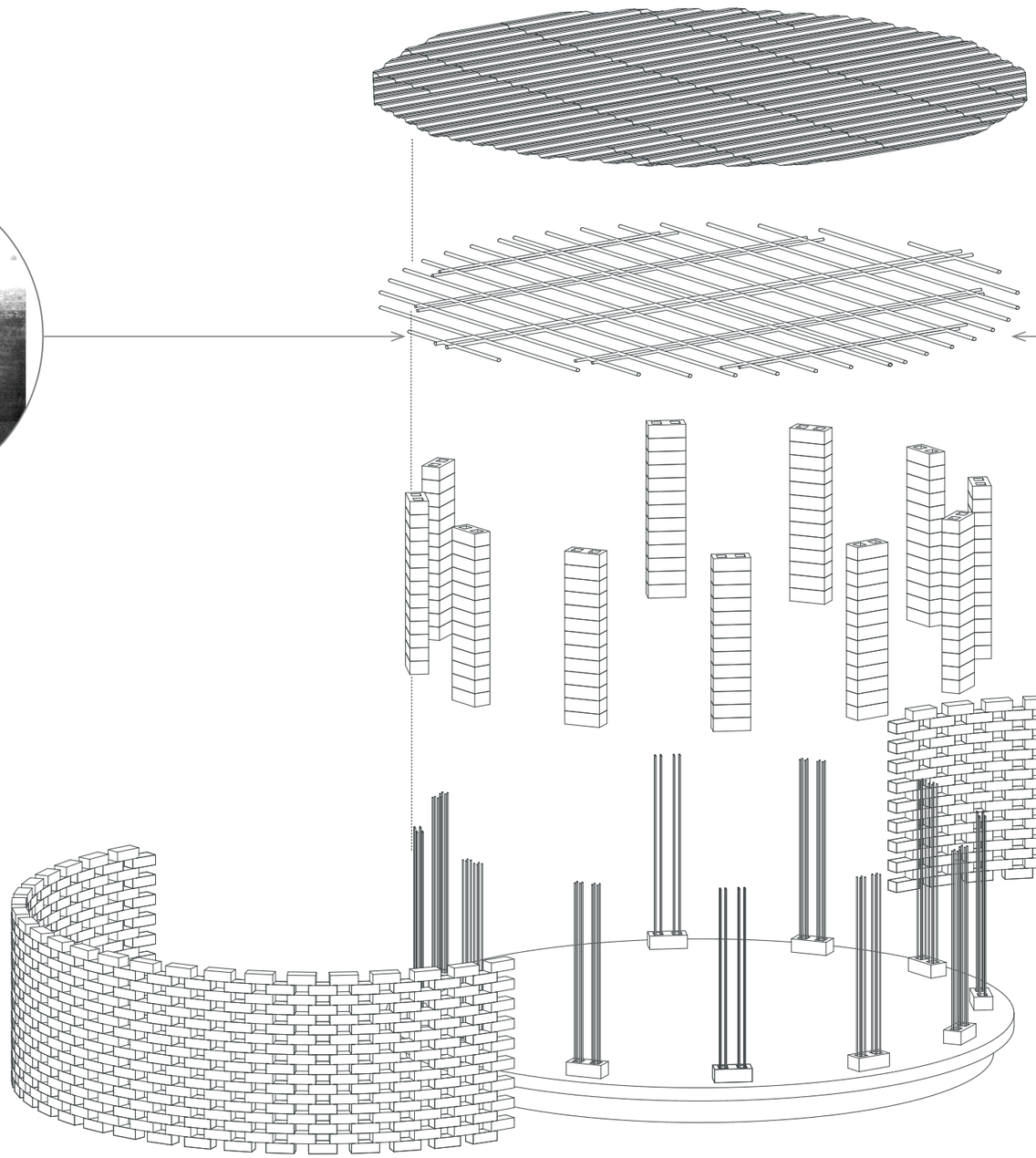


MODULES


STEELPLATE ROOF
BAMBOO ROOF STRUCTURE
main beams Ø70mm, sub beams Ø50mm, h.o.h. 400mm
STONE BRICK 400x200x200mm,
2x square cutouts100x100mm filled with concrete
BRCIK WALL, differet patterns
STEEL REINFROCMENT,
steelpipes 10mm thickness
CONCRTE FLOOR
Poured concrete 200mm thickness
CONCRETE FOUNDATION
Poured concrete ring 300mm thickness

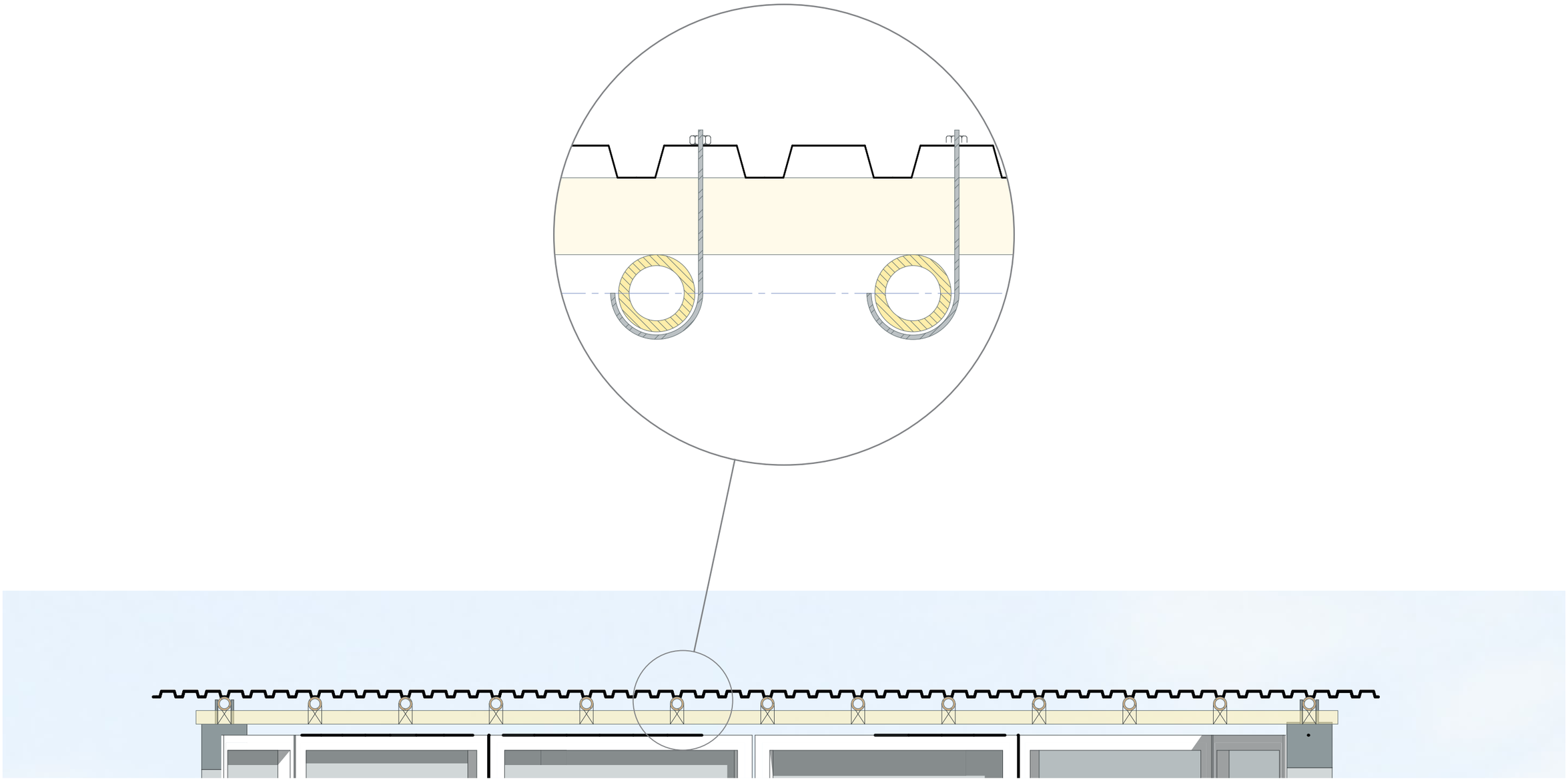
MODULES

BAMBOO HEMP ROPE



BAMBOO SISAL ROPE

MODULES

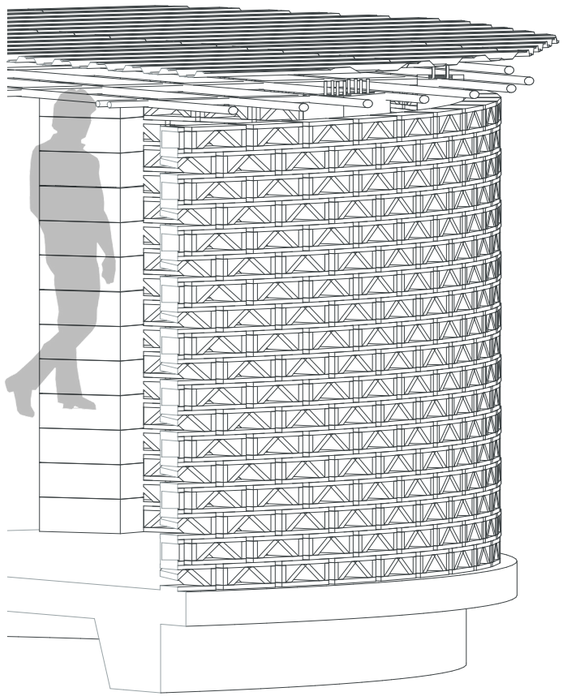


MODULES

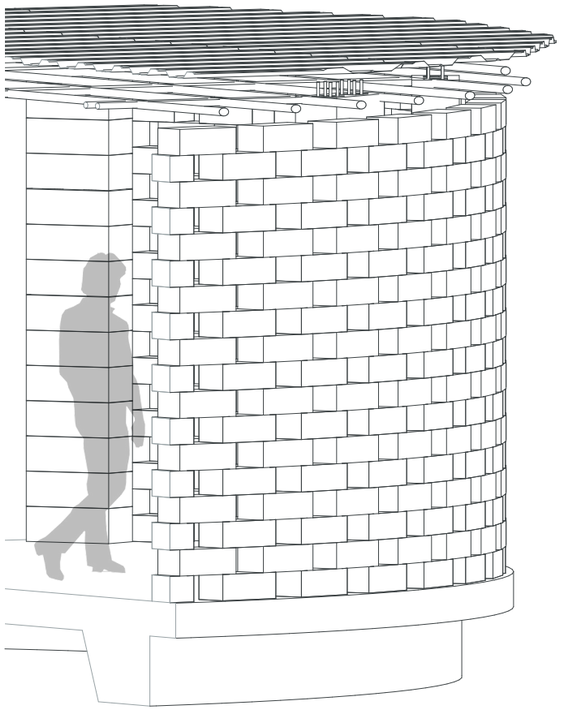
- BRICKS REFER TO FORMAL INDUSTRY IN THE RW02/12 KAMPUNG

- BRICKS OUT OF REUSED MATERIALS

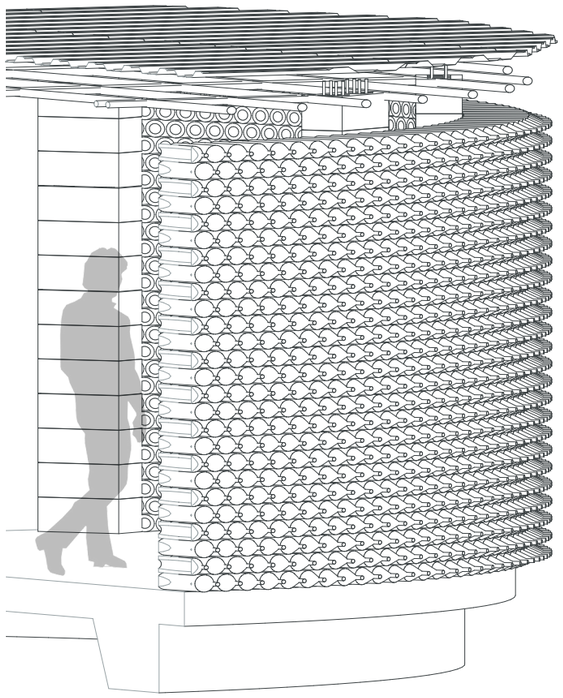
- BRICK PATTERNES GIVES EACH MODULE OWN IDENTITY



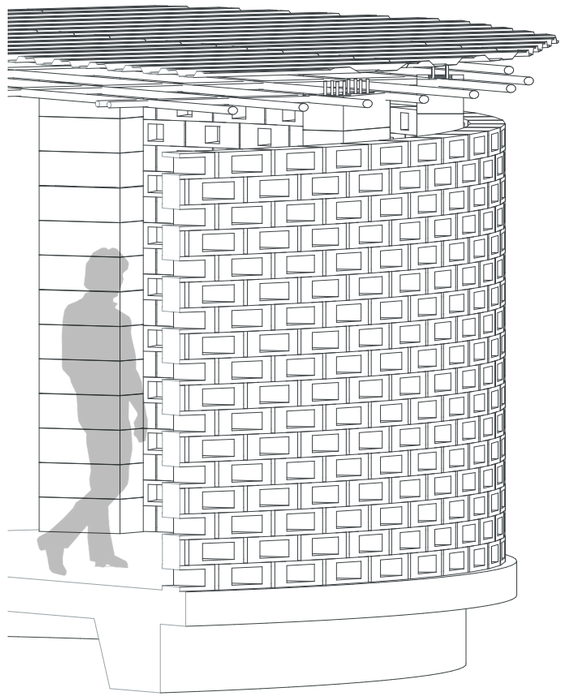
STONE PATTERN
sanitation facilities



PRESSED WASTE BRICKS
waste facilities

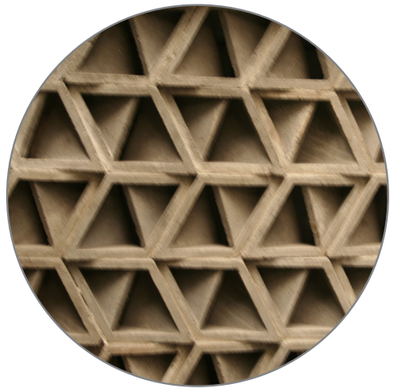


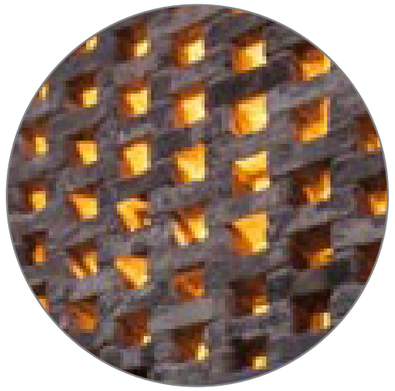
PLASTIC BOTTLES IN CEMENT WALL
waste facilities

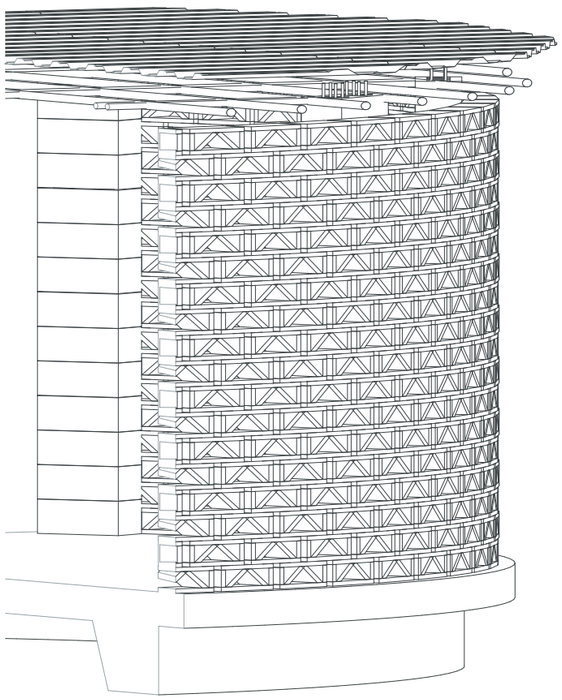


STONE PATTERN
drinking water facilities

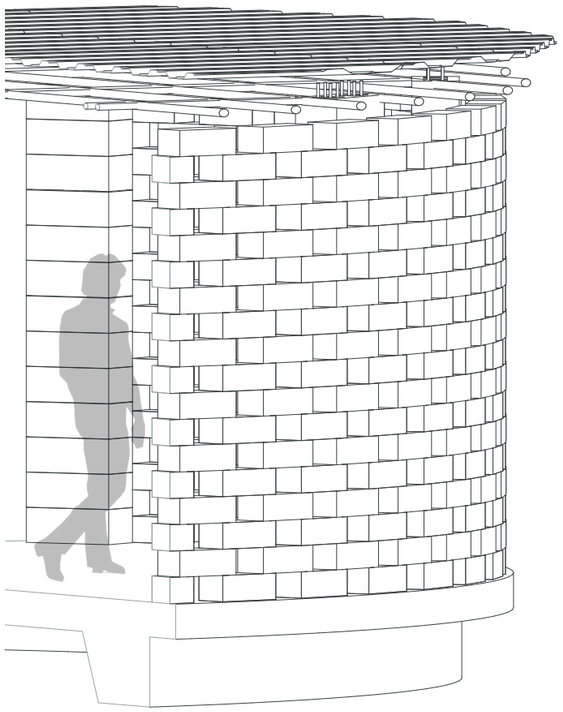
MODULES



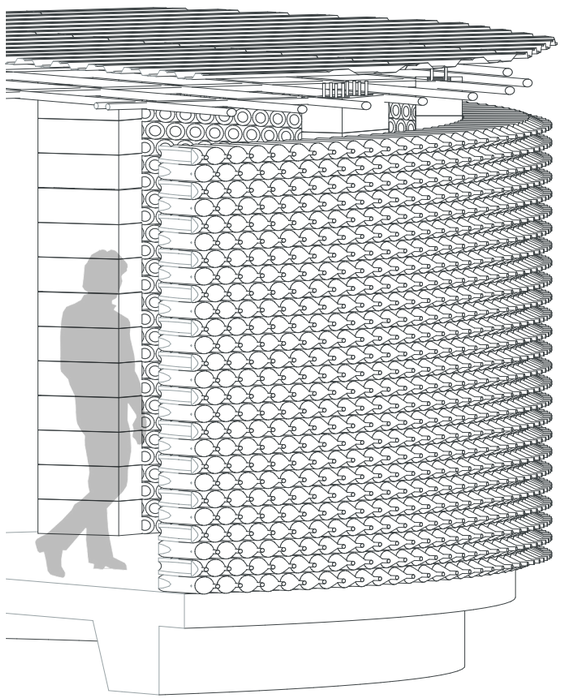




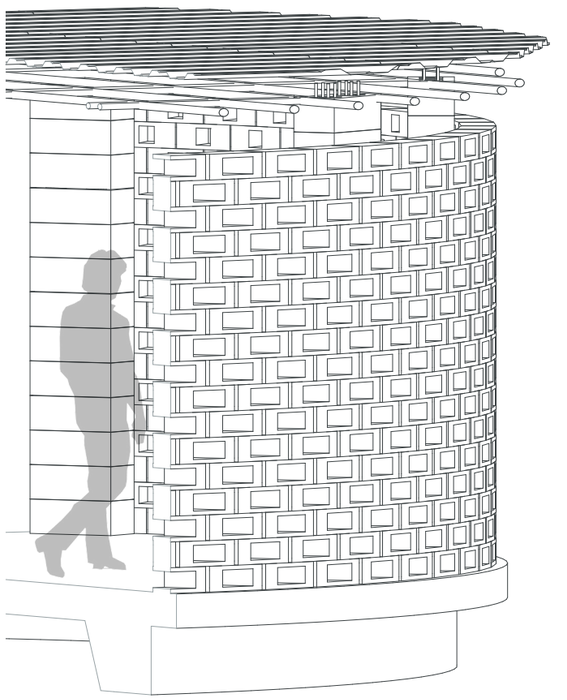
STONE PATTERN
sanitation facilities



PRESSED WASTE BRICKS
waste facilities



PLASTIC BOTTLES IN CEMENT WALL
waste facilities



STONE PATTERN
drinking water facilities

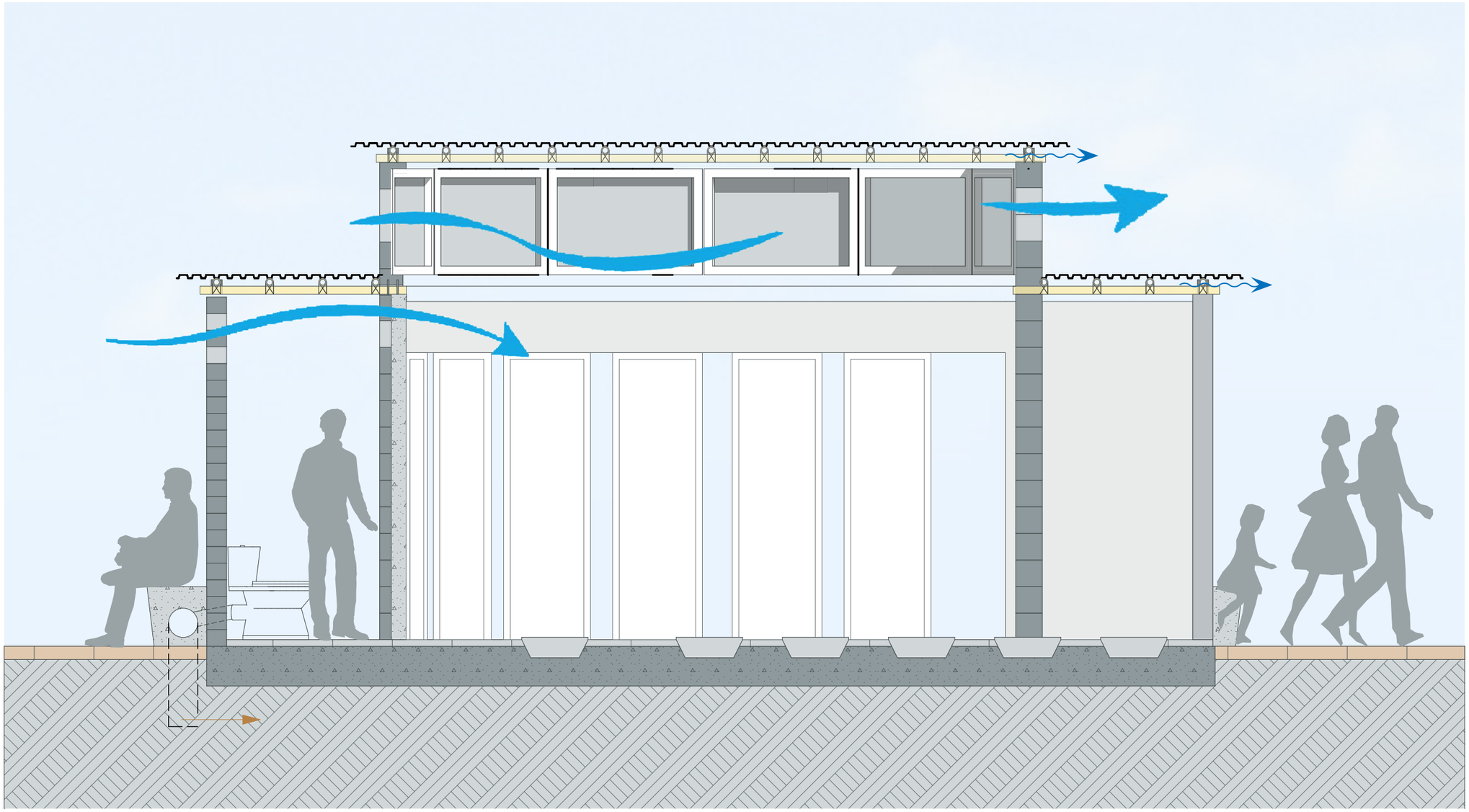
MODULES

- CLIMATE DESIGN MODULES

- NATURAL VENTILATION

- OPEN BRICK PATTERN

- WINDOWS

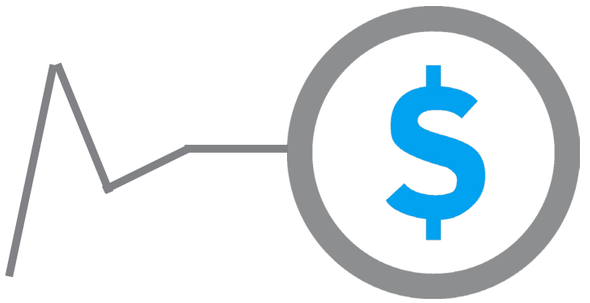


CONCLUSION

BENEFITS

REPLICABLE

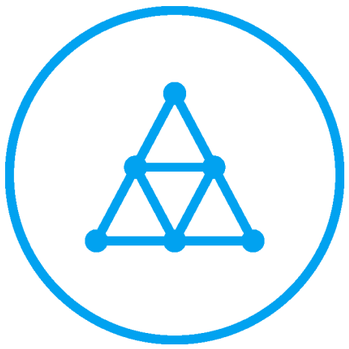
WATER DEMAND



SAME COSTS

MANAGED BY COMMUNITY

BUILD BY COMMUNITY



CLOSED WATERFLOW

COMPETITION

THANK YOUR FOR YOUR ATTENTION!

QUESTIONS?