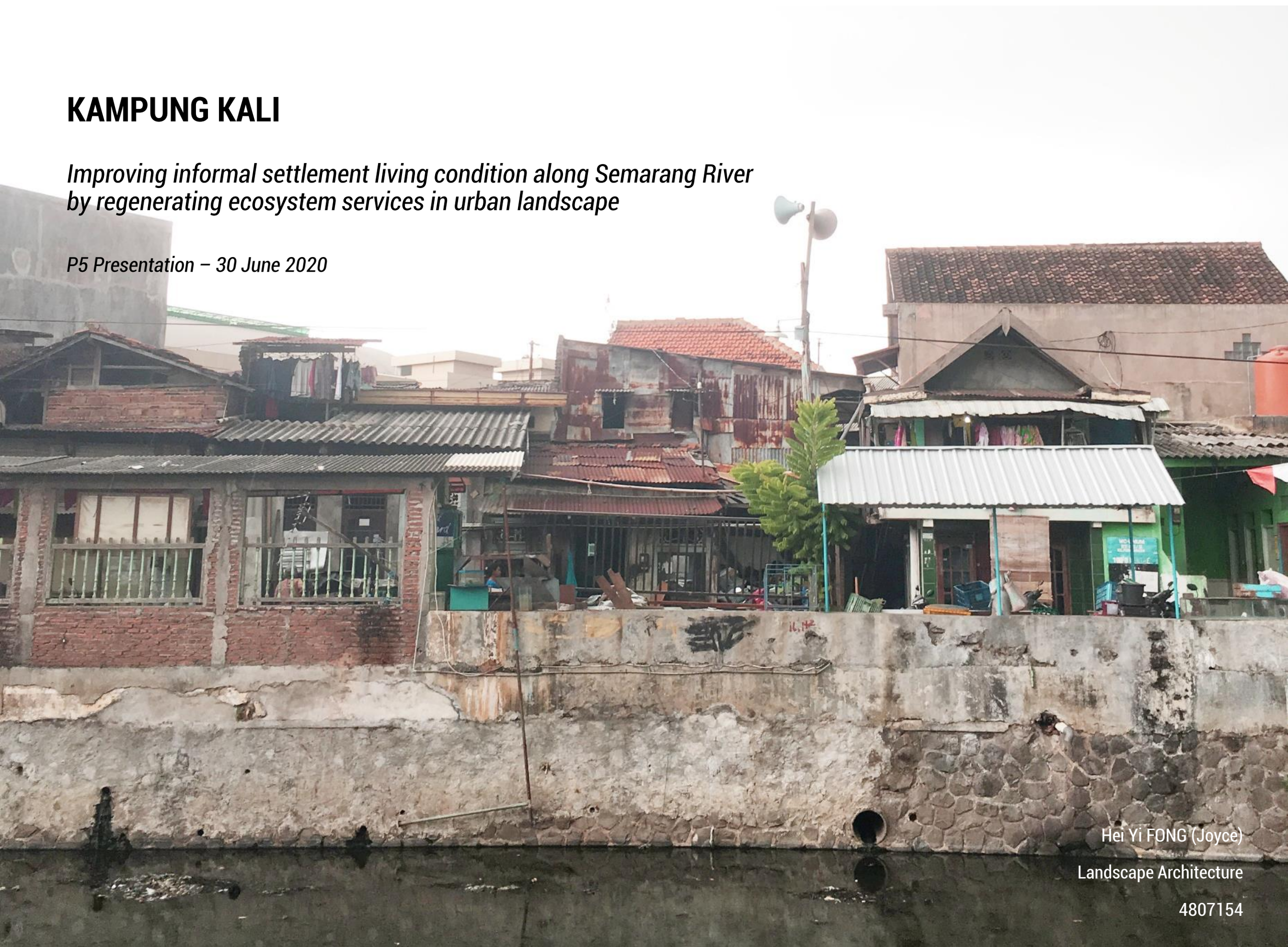
KAMPUNG KALI

Improving informal settlement living condition along Semarang River by regenerating ecosystem services in urban landscape

P5 Presentation – 30 June 2020



Hei Yi FONG (Joyce)

Landscape Architecture

4807154

Definition of *kampung*

- “Village in urban area”
  (Sullivan, 1986)
- “Informal settlement”
  (Dianingrum, Faqih, & Septanti, Development of Kampung Improvement Program in Surabaya, Indonesia, 2017)

Definition of *kampung*

Slum in Dharavi, Mumbai

Image: Observer Research Foundation (2018)

Definition of *kampung*

"Diverse"

Definition of *kampung*

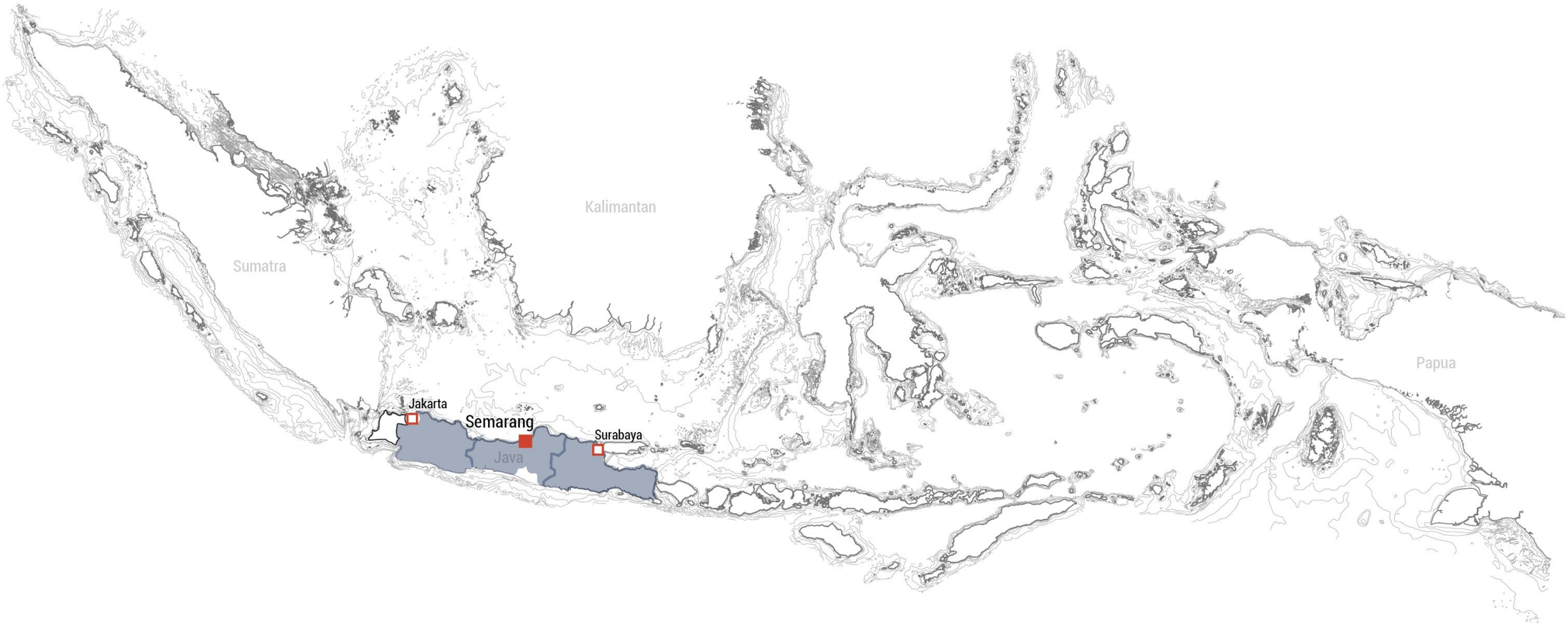
“Self-sufficient”

Definition of *kampung*

“Spontaneous”

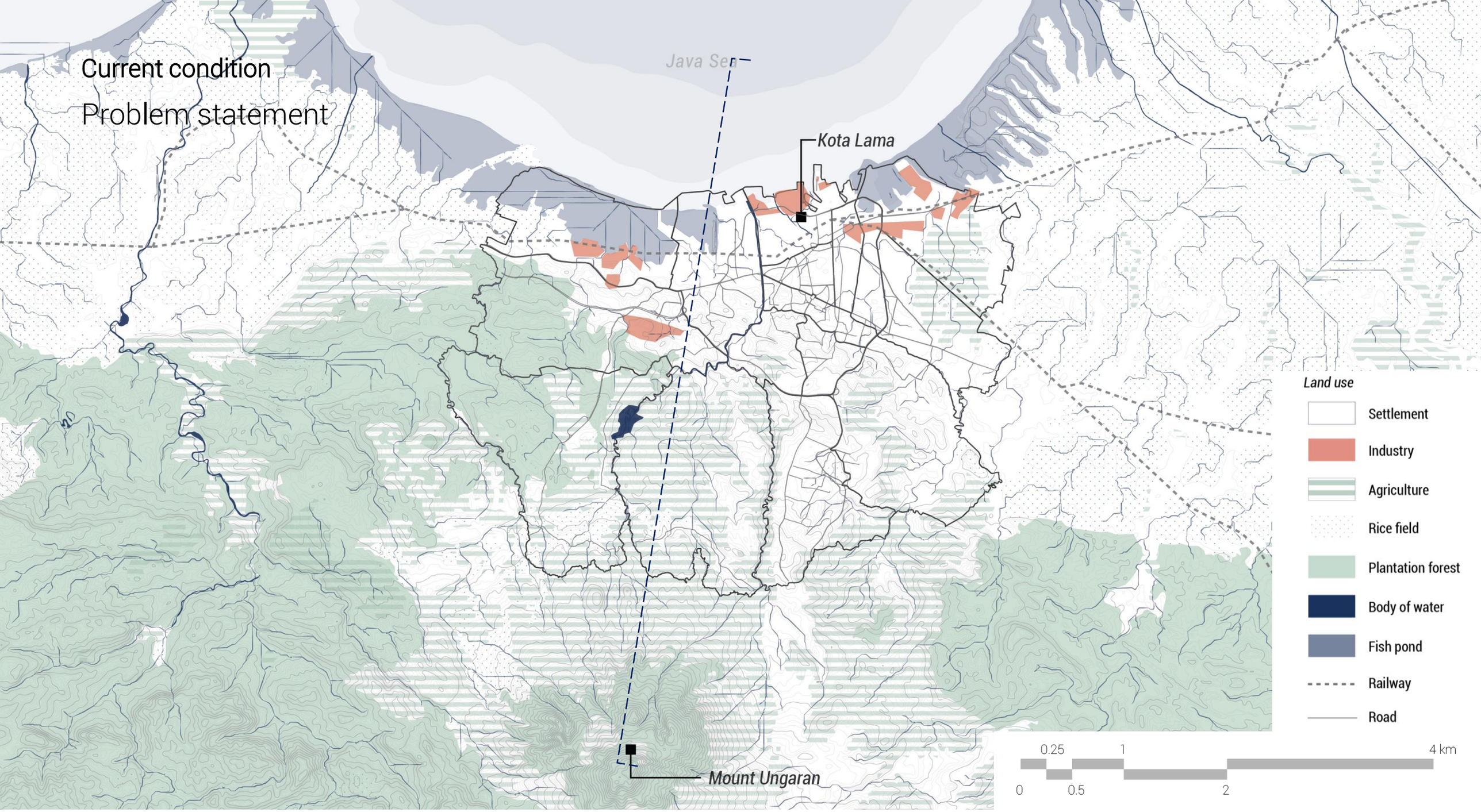
INTRODUCTION

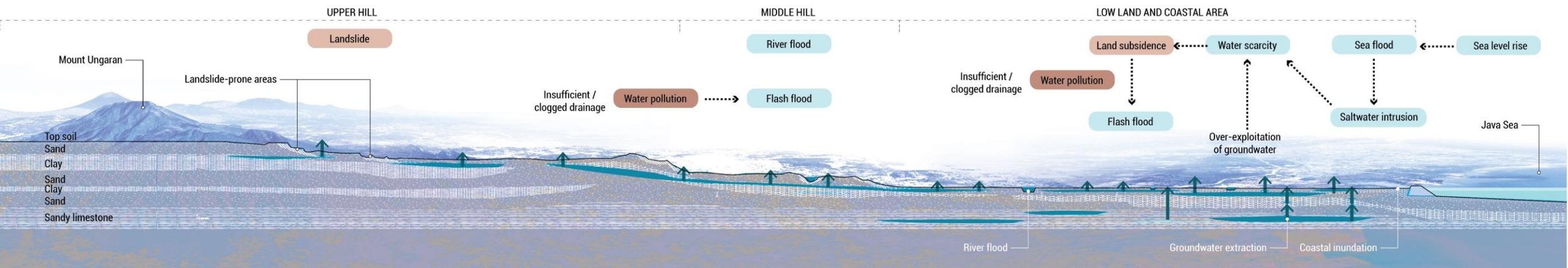
Site location



Current condition

Problem statement





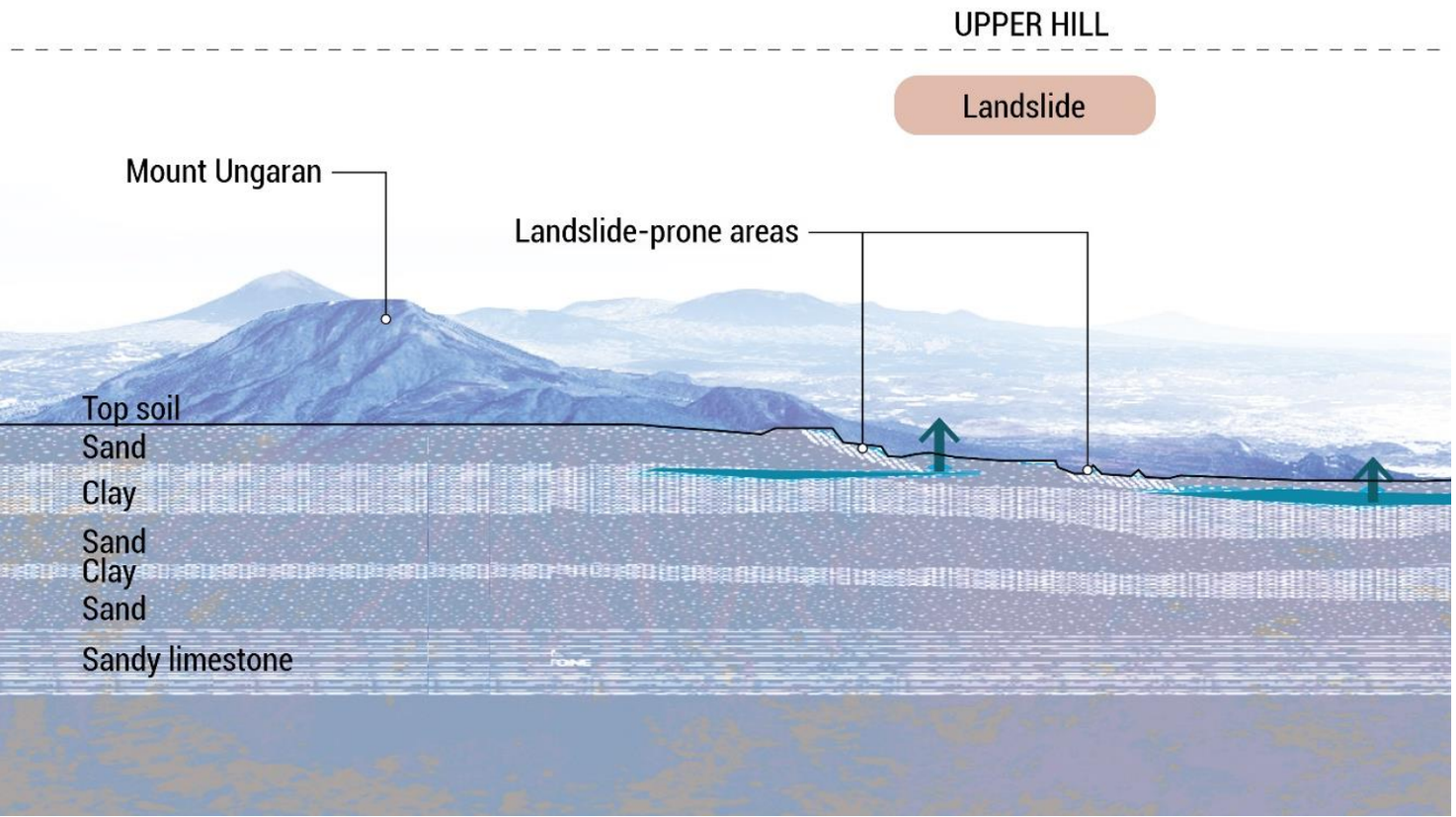
Current condition

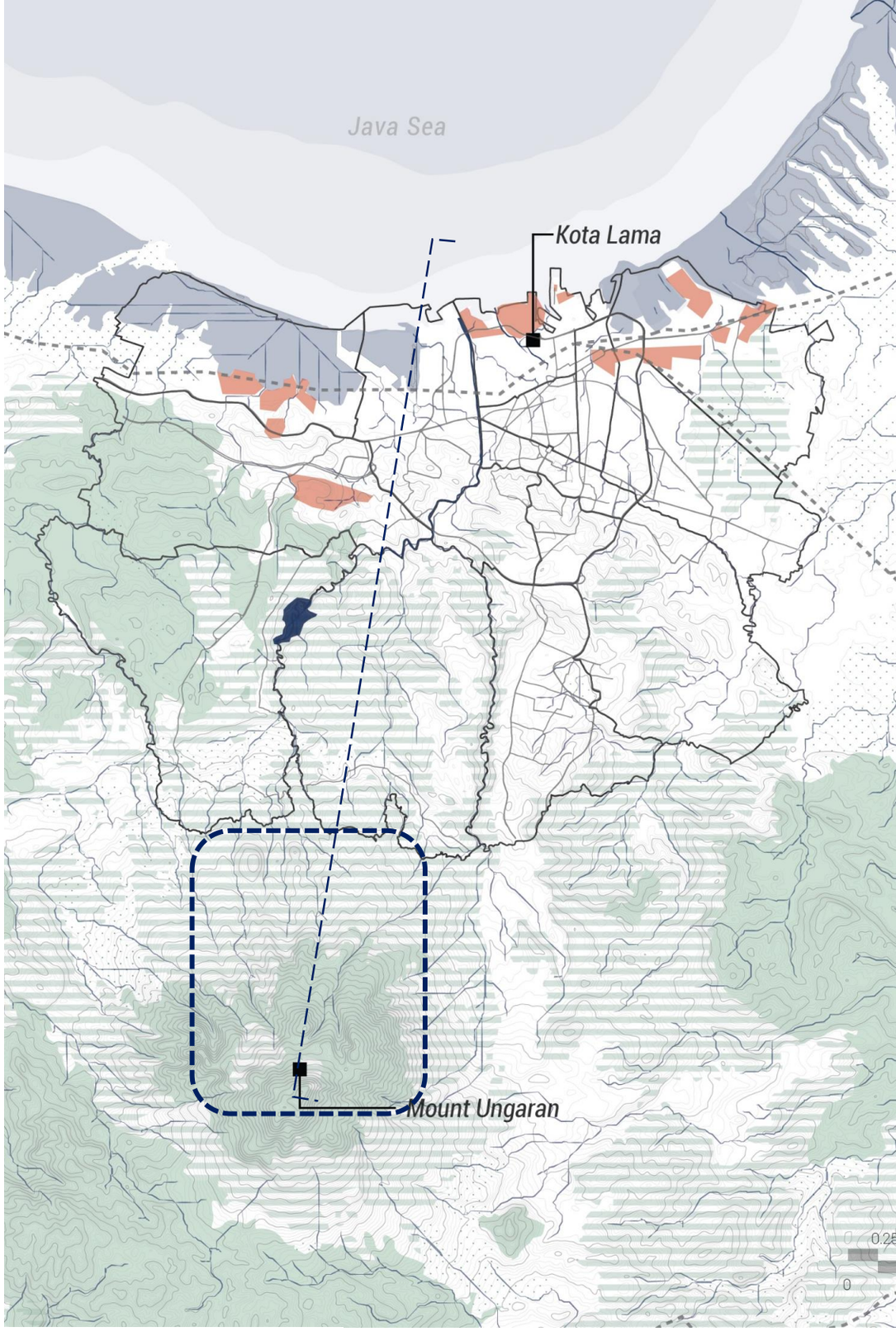
Problem statement

- **Landslide**

  due to environmental degradation in upstream area

Image: AyoSemarang (2019)





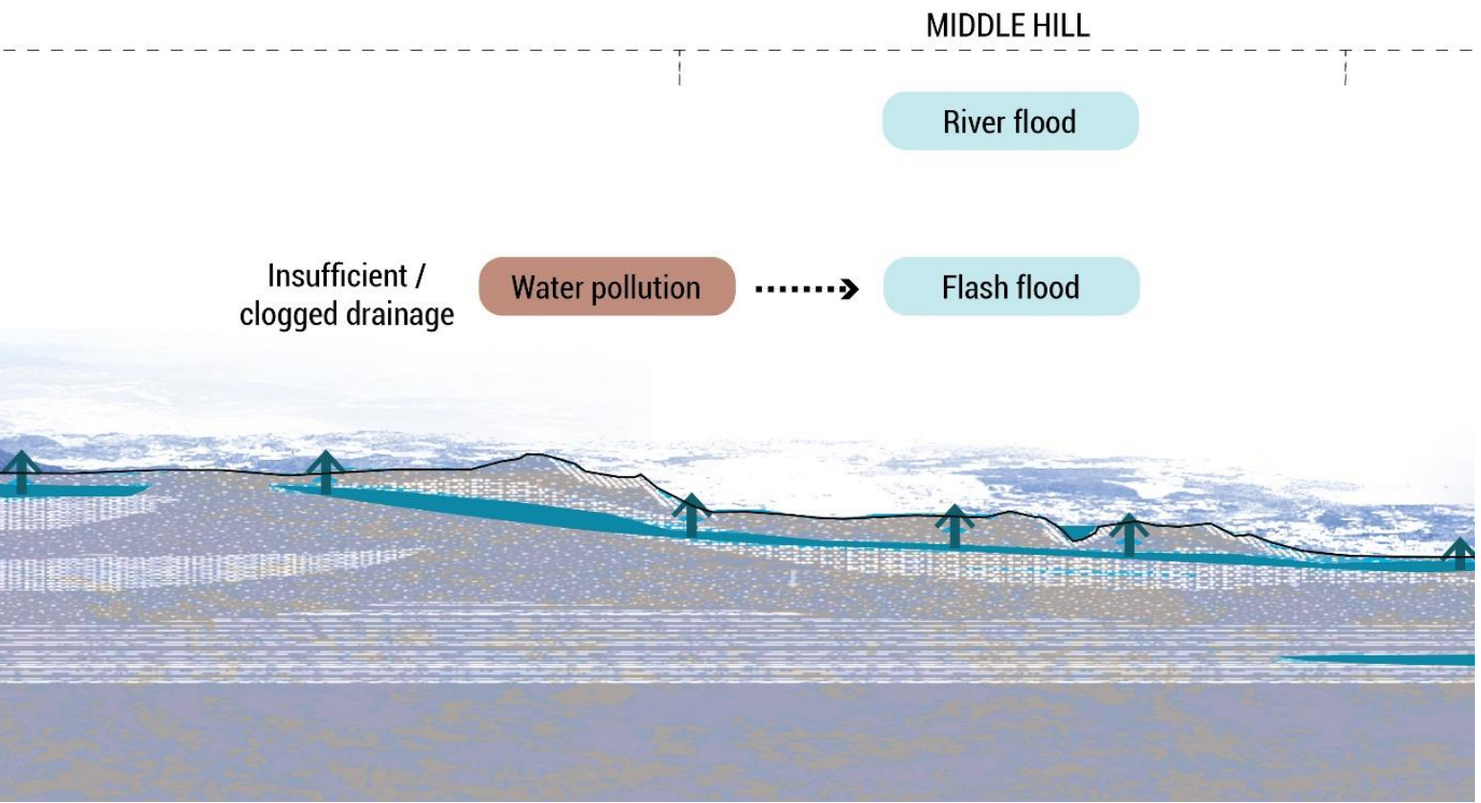
Current condition

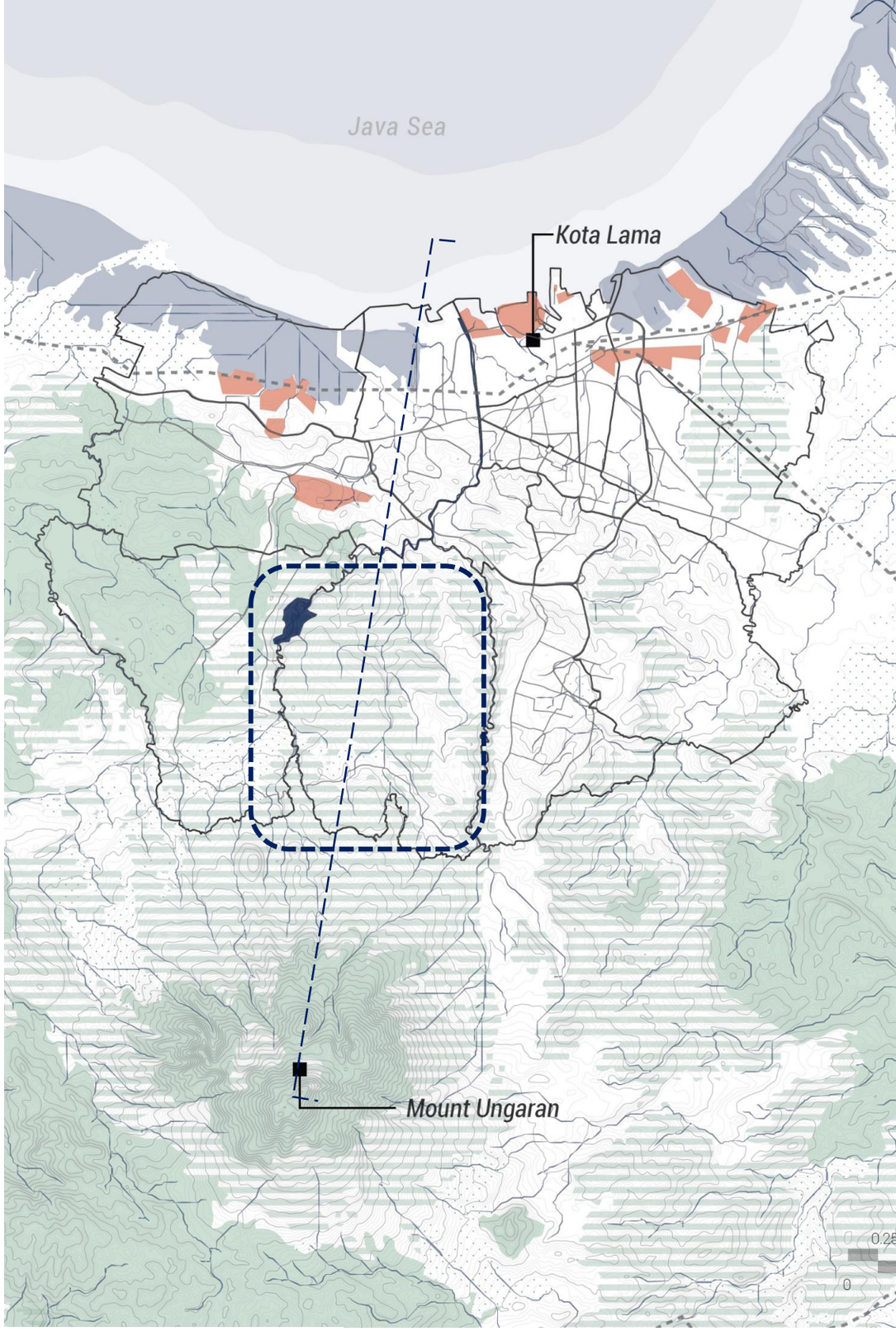
Problem statement

- **Water pollution**

  from agricultural activities

Image: Antara Kalbar (2018)

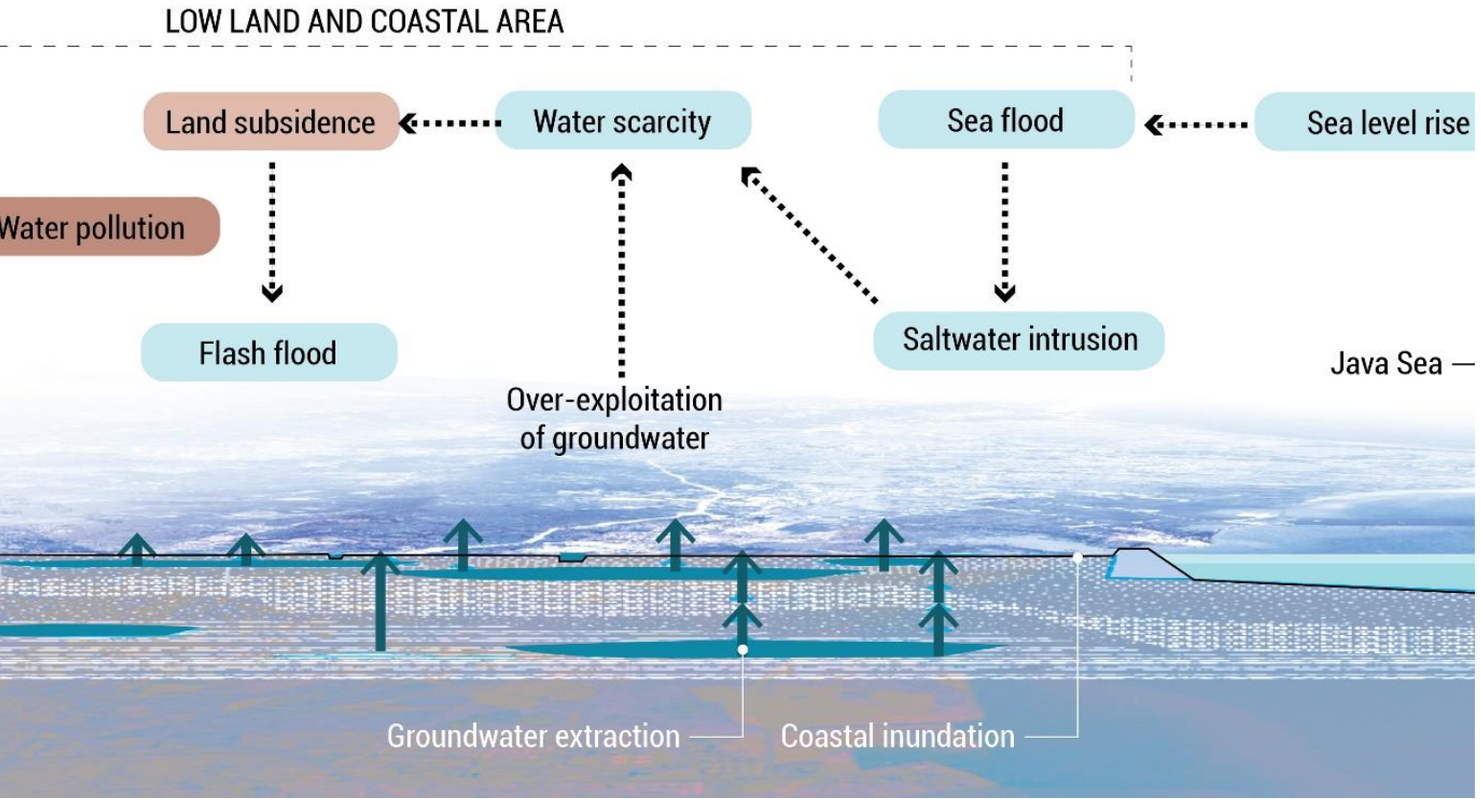


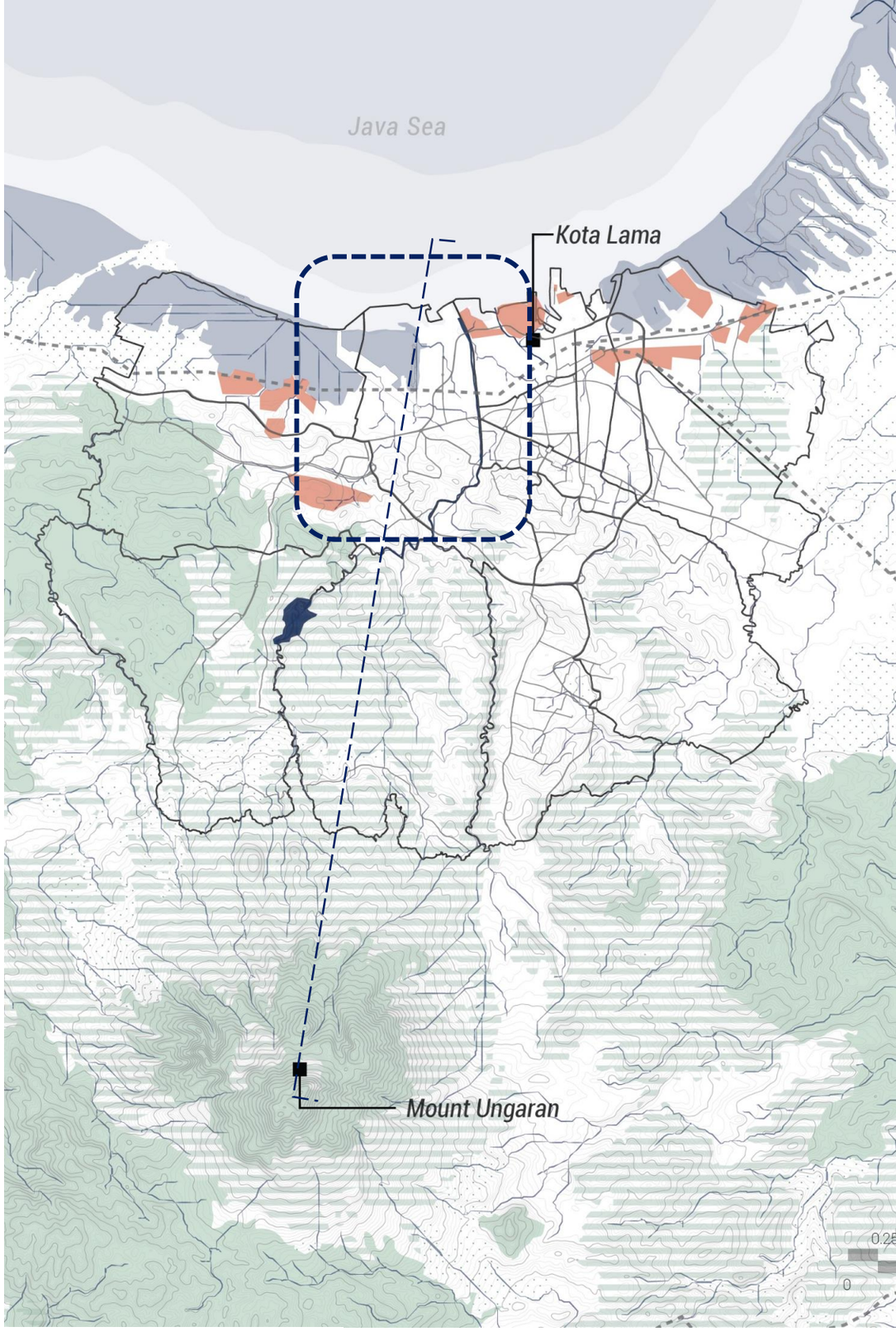


Current condition

Problem statement

- Sea level rise

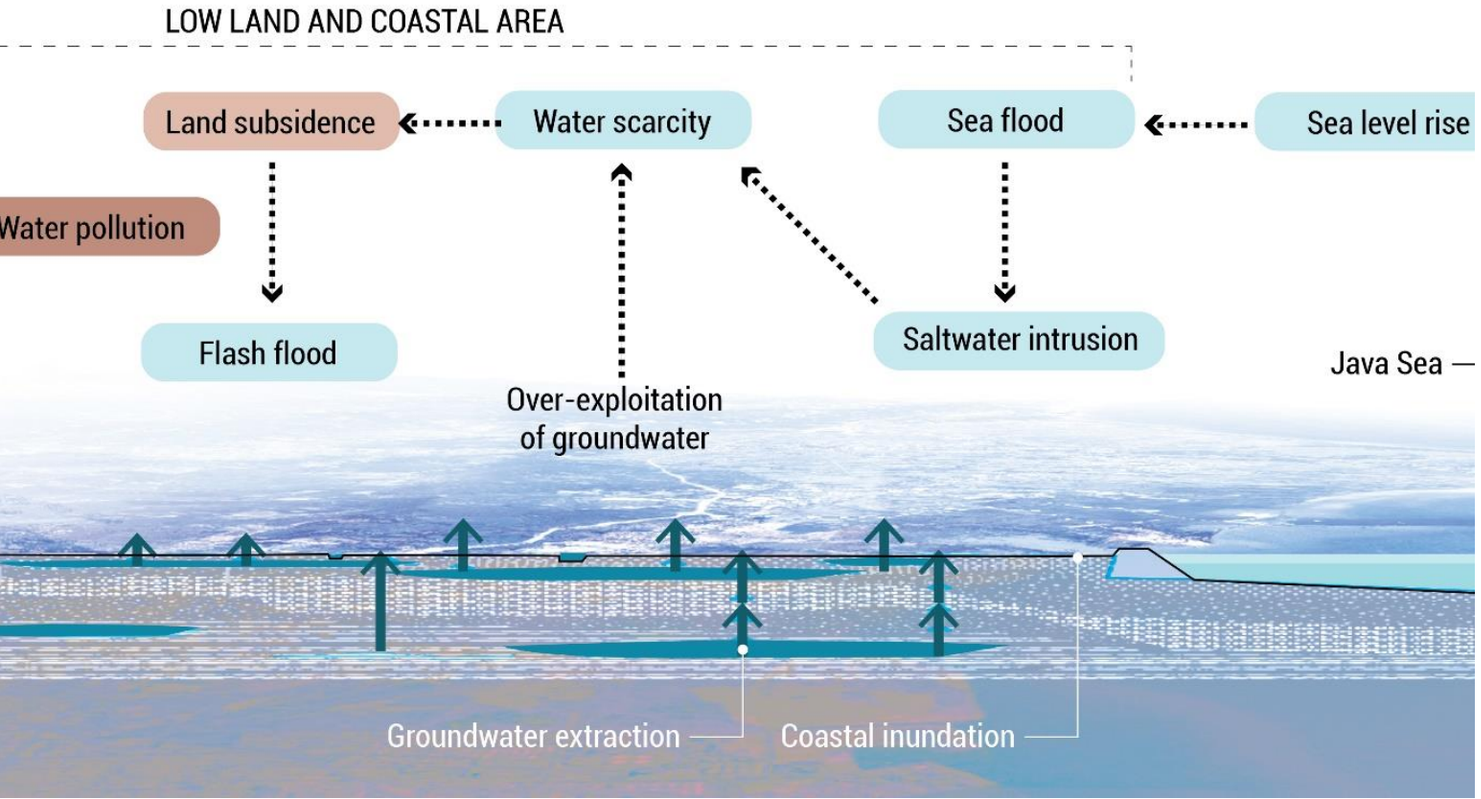


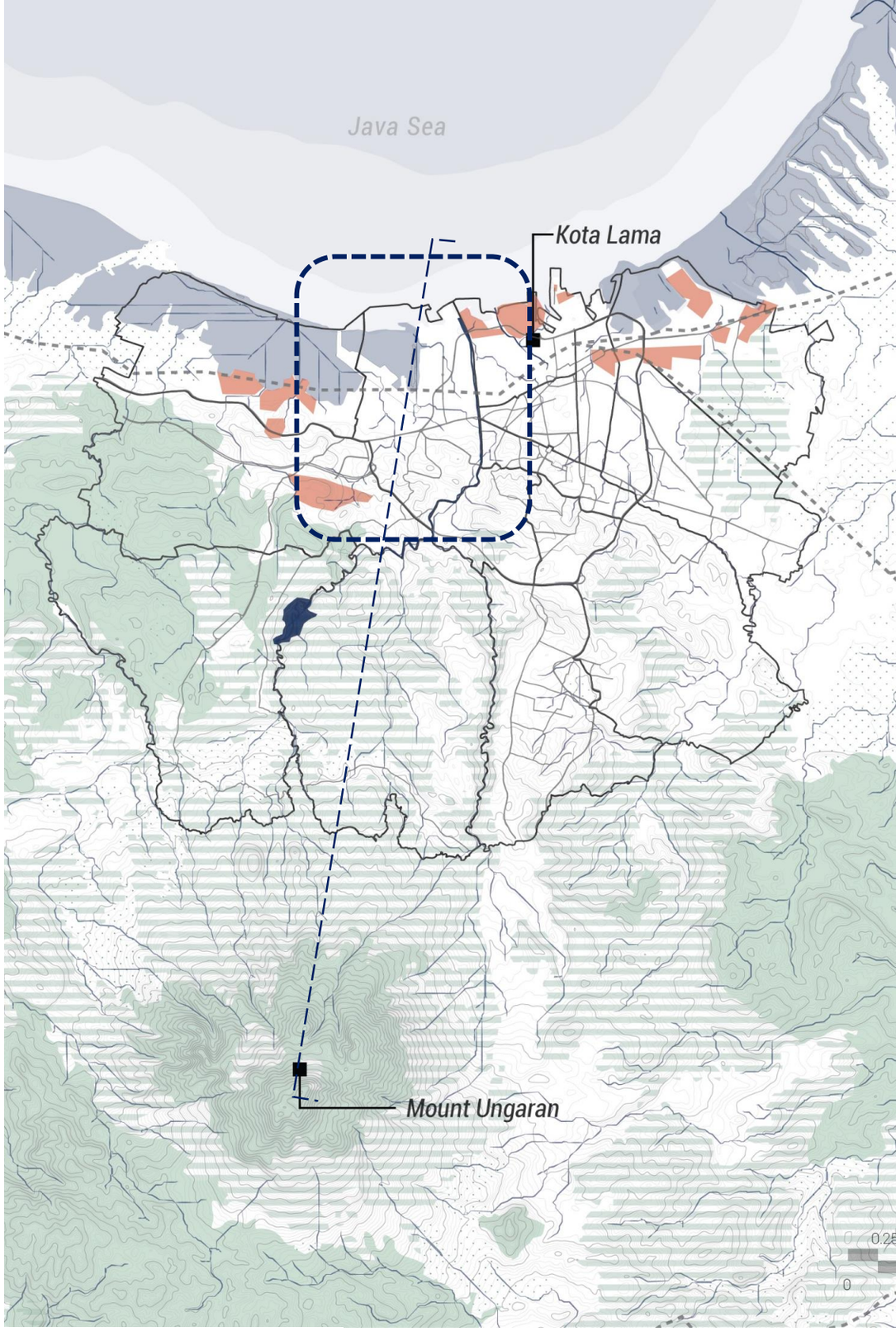


Current condition

Problem statement

- Water scarcity

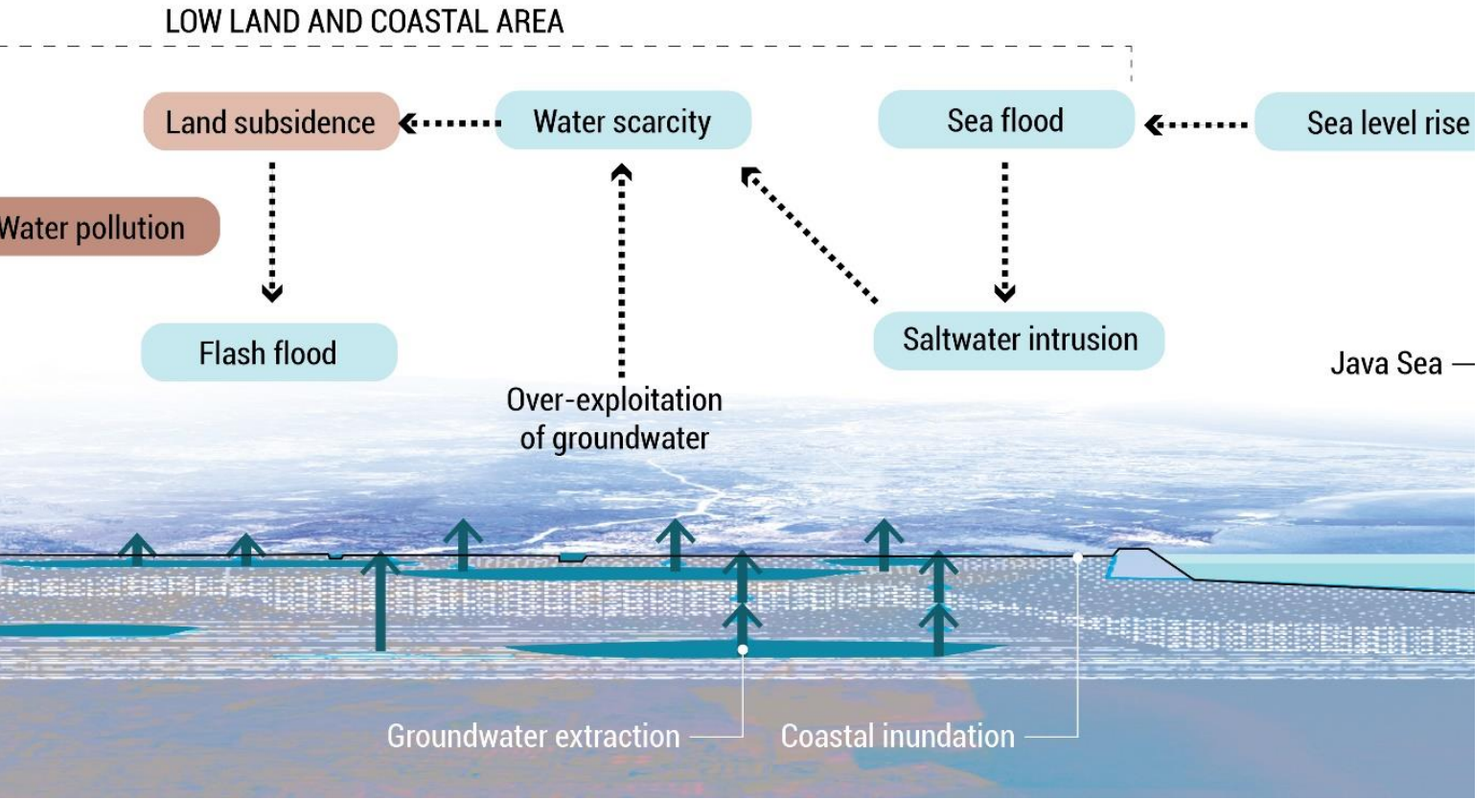


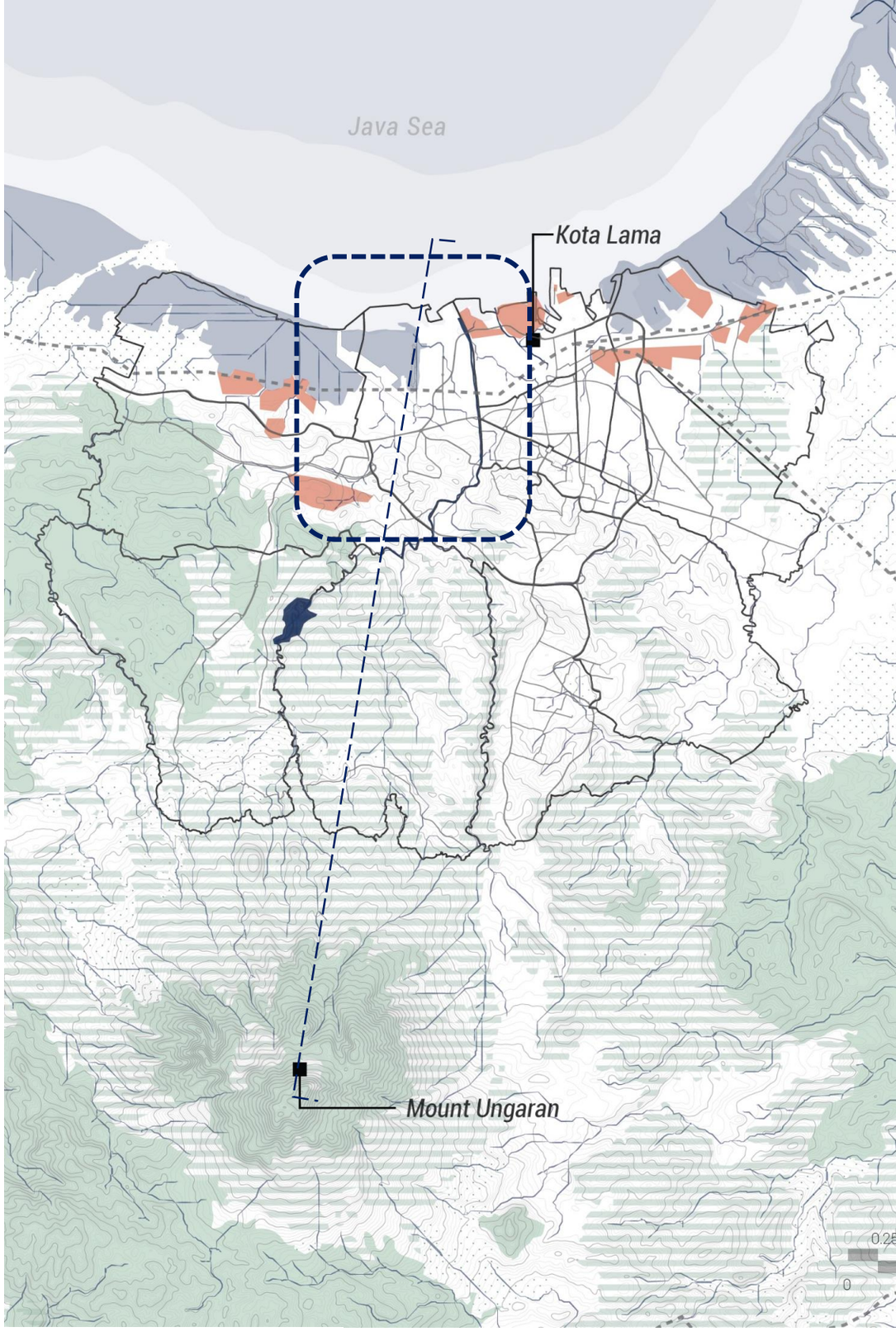


Current condition

Problem statement

- Land subsidence





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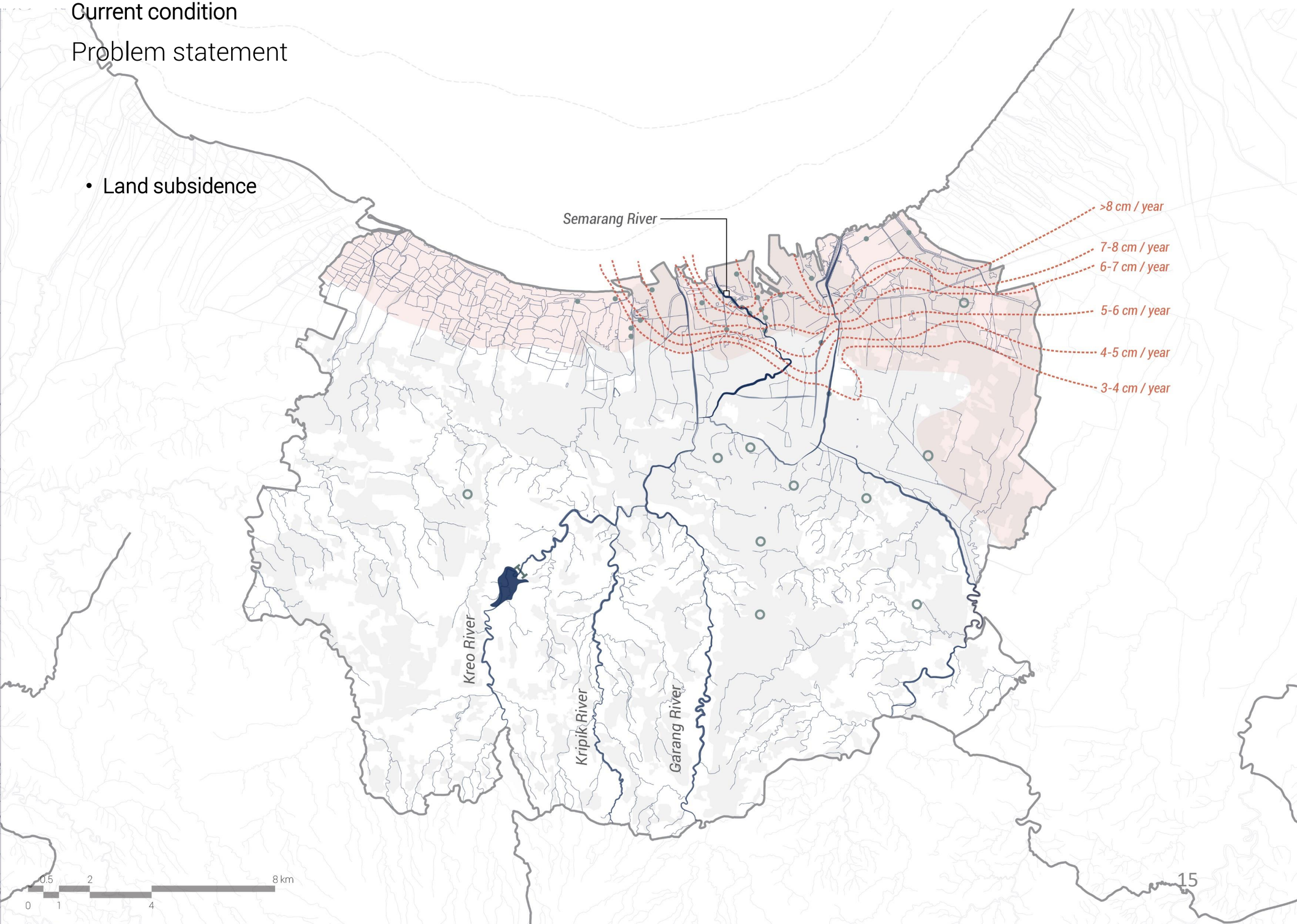
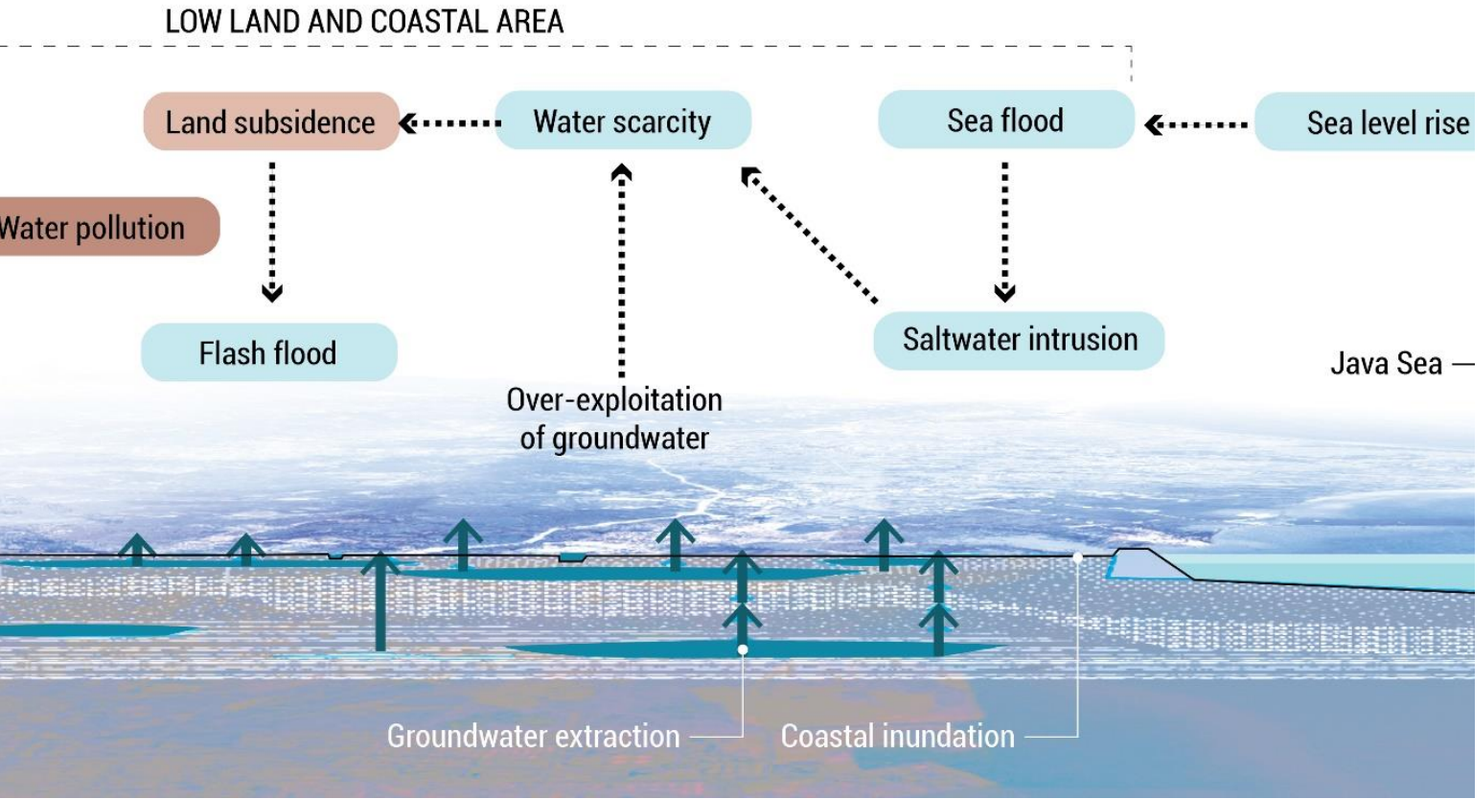
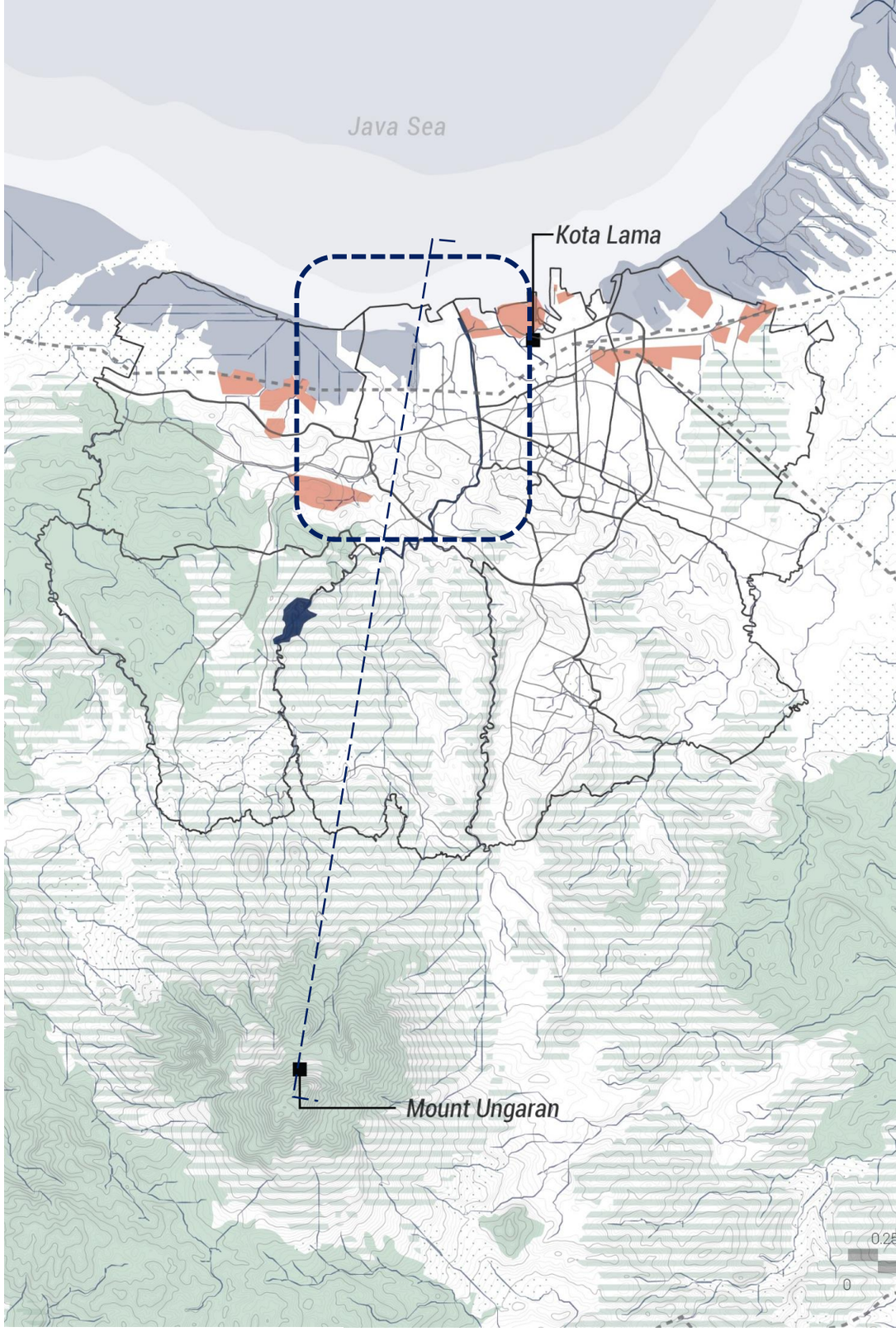


Current condition

Problem statement

- Water pollution

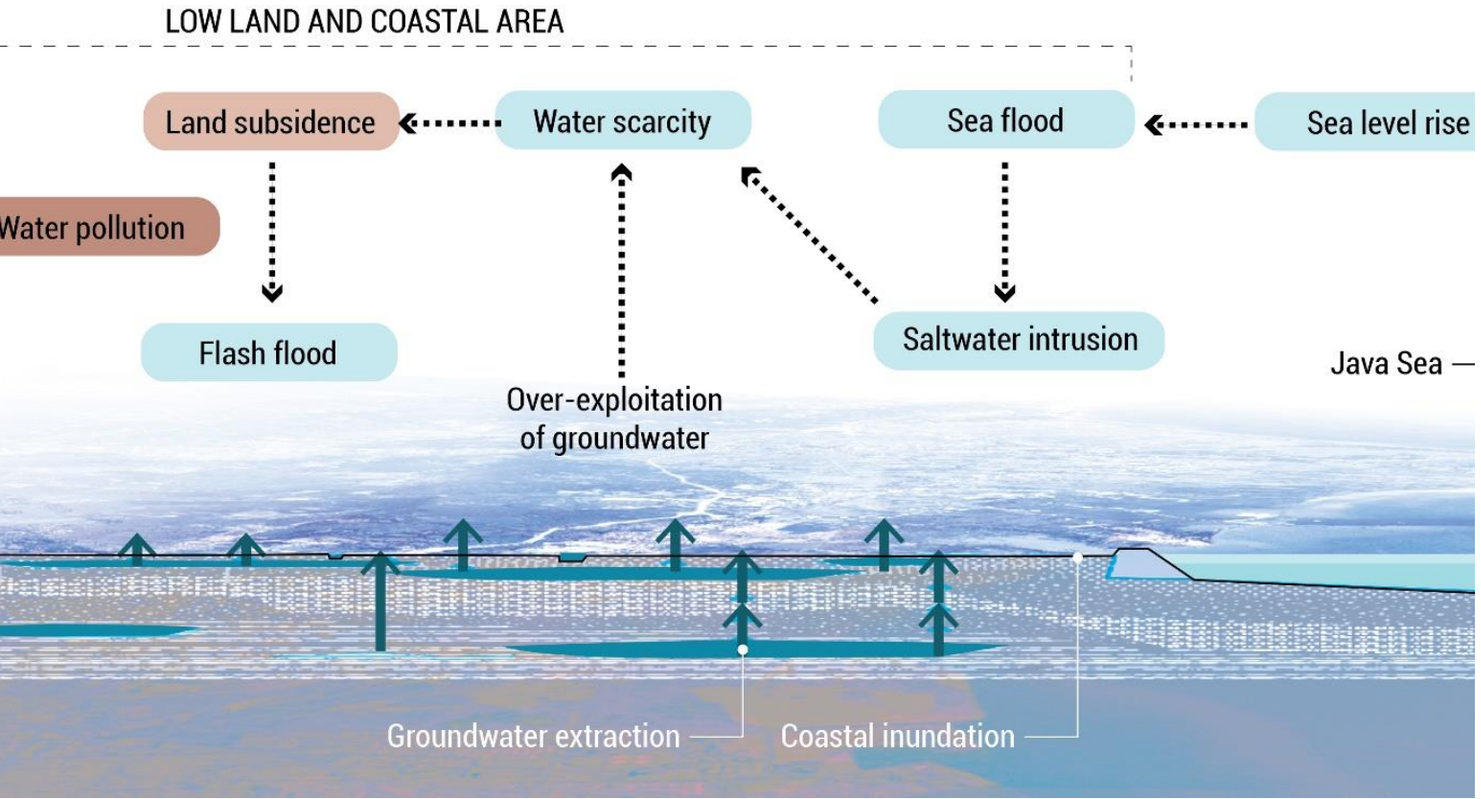


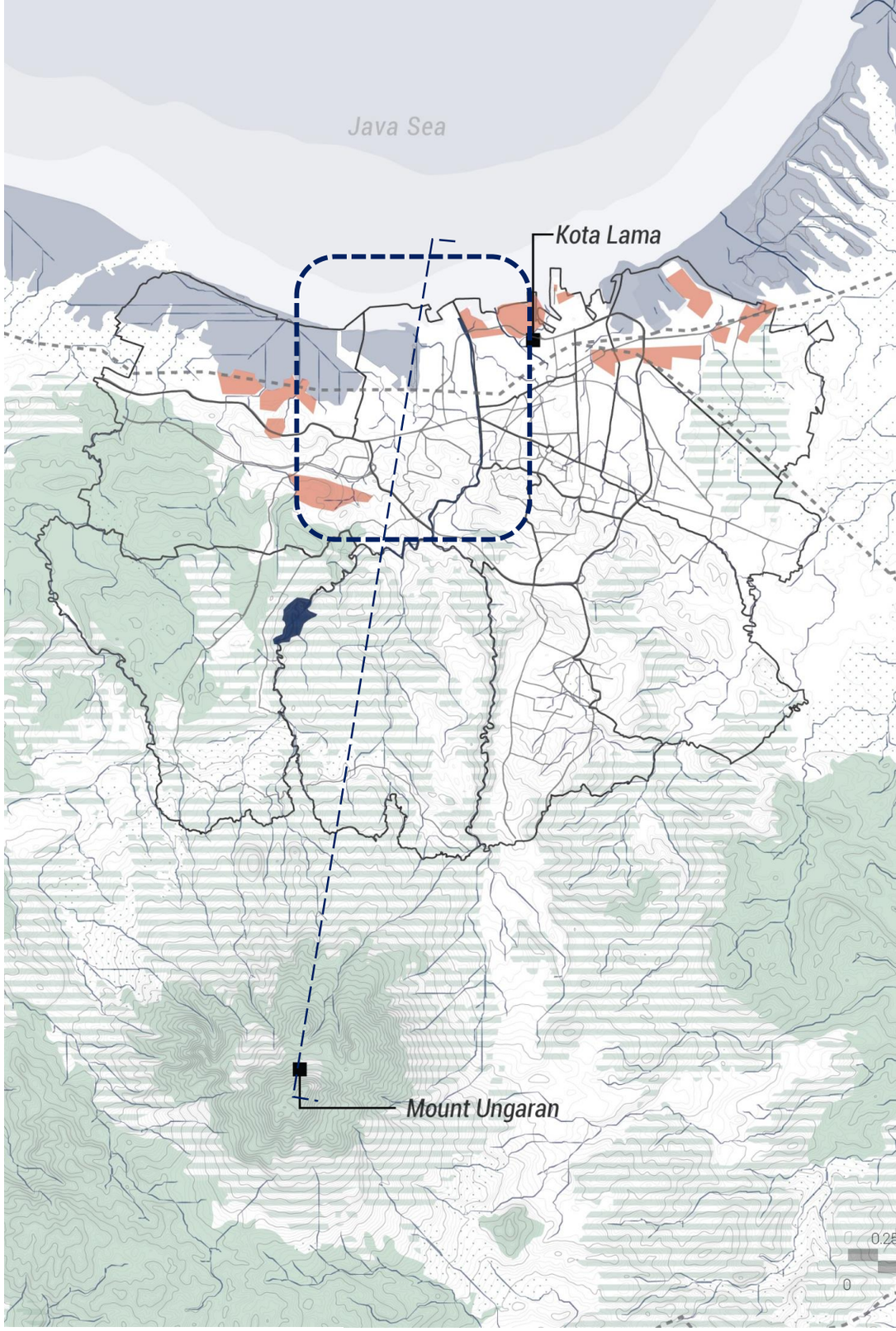


Current condition

Problem statement

- Flash flood





Current condition

Kampung Improvement Programme (KIP)

Kampung Pelangi (Rainbow Village), Semarang

Current condition

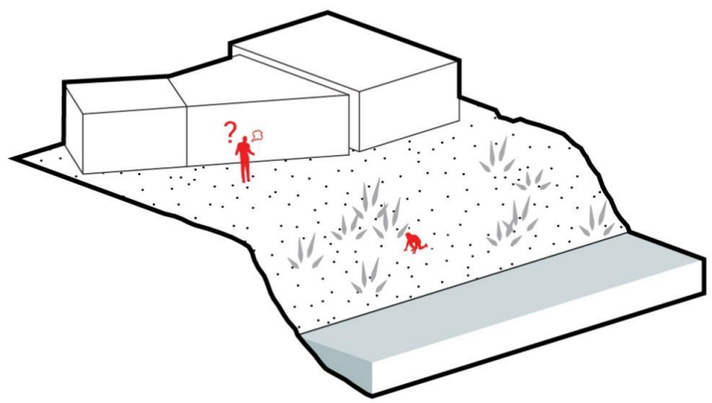
Kampung Improvement Programme (KIP)

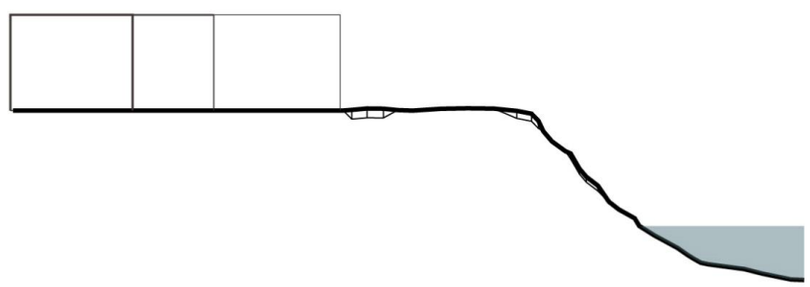
Kampung Pelangi (Rainbow Village), Semarang

Current condition

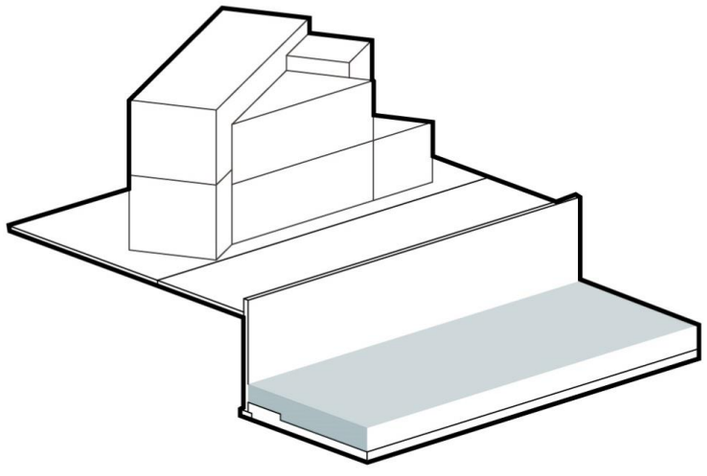
Normalization

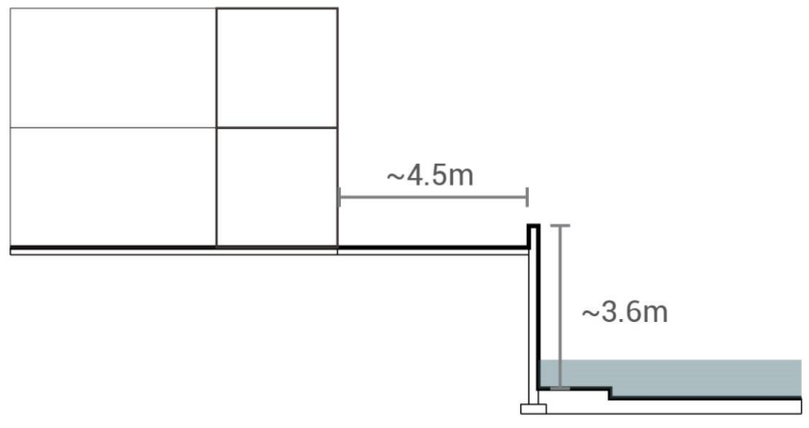
1960s to 1990s –
River banks regarded as hiding spot for criminals and public space for the poor





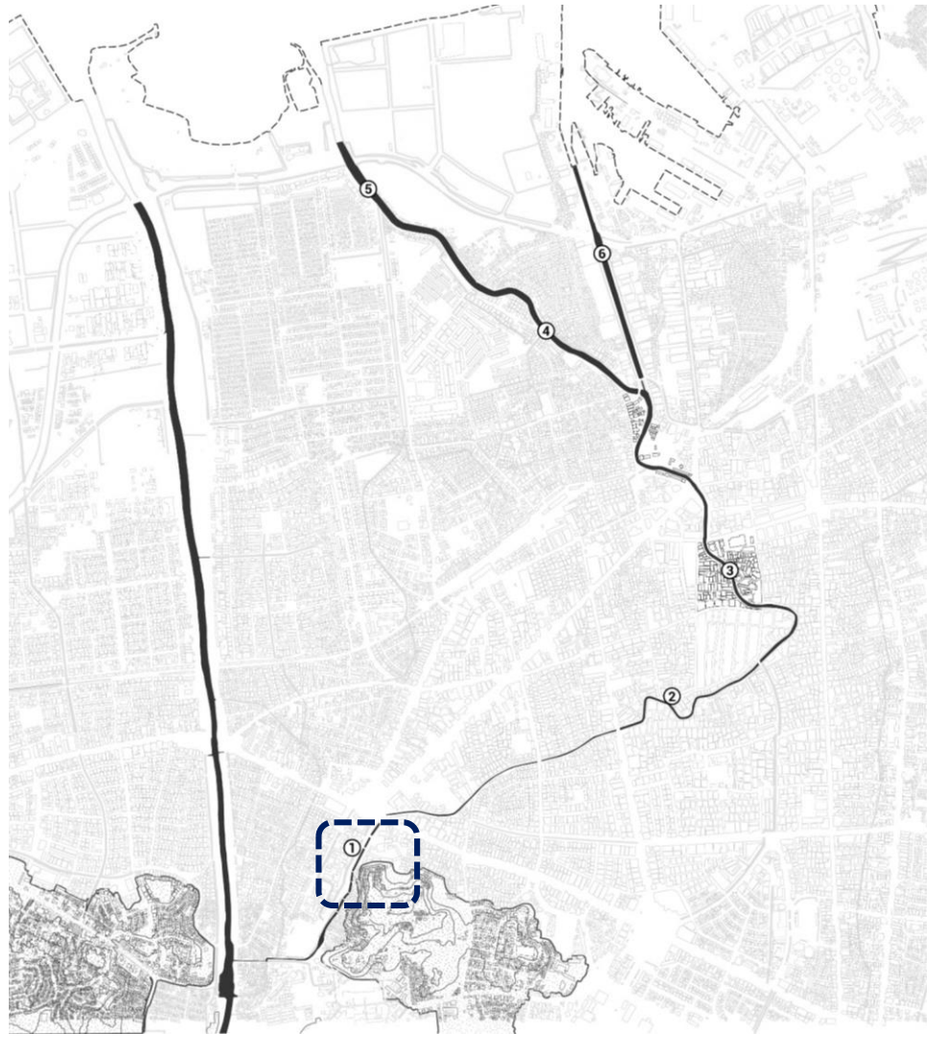
2010 –
Normalized Semarang River





Current condition

Normalization



Revitalization of Semarang River at Jalan Sutomo section (2019)

Current condition

Normalization

Kampung Pleburan

Current condition

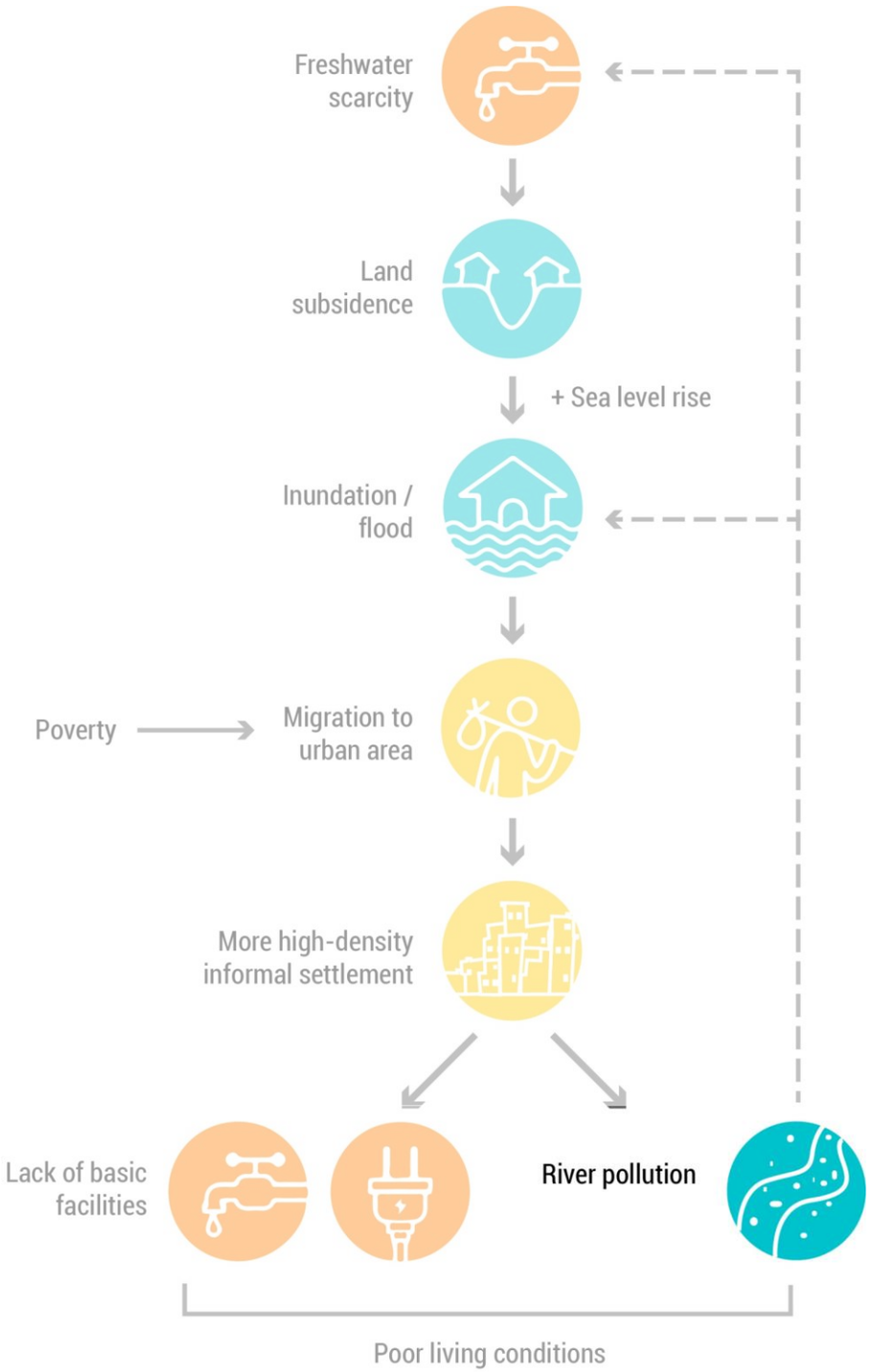
Normalization

Rusun Pekunden (built in 1992)

Current condition

Problem statement

The lack of water infrastructure together with the sea level rise creates a vicious cycle that deteriorates the living qualities of the riverside kampungs, which are considered as part of the problem and are excluded from the urban ecosystem.



Research Question

‘Except informal settlement clearance,
what kinds of spatial interventions for informal settlement upgrading along Semarang River can be designed to :

1. create a condition that facilitates the flows of urban landscape networks in the city; and

2. improve the inhabitants’ **living qualities** with respect to their **living habits**, existing **social fabric** and the relation to their direct surroundings?'

Sub-questions

- What are the relationships between the slums and their direct surroundings?
- How to relate the kampungs to the urban landscape networks in the city?
- How are the public spaces in and around kampungs used? What are the users' habits and behaviours?

THEORETICAL FRAMEWORK

WHY LANDSCAPE?

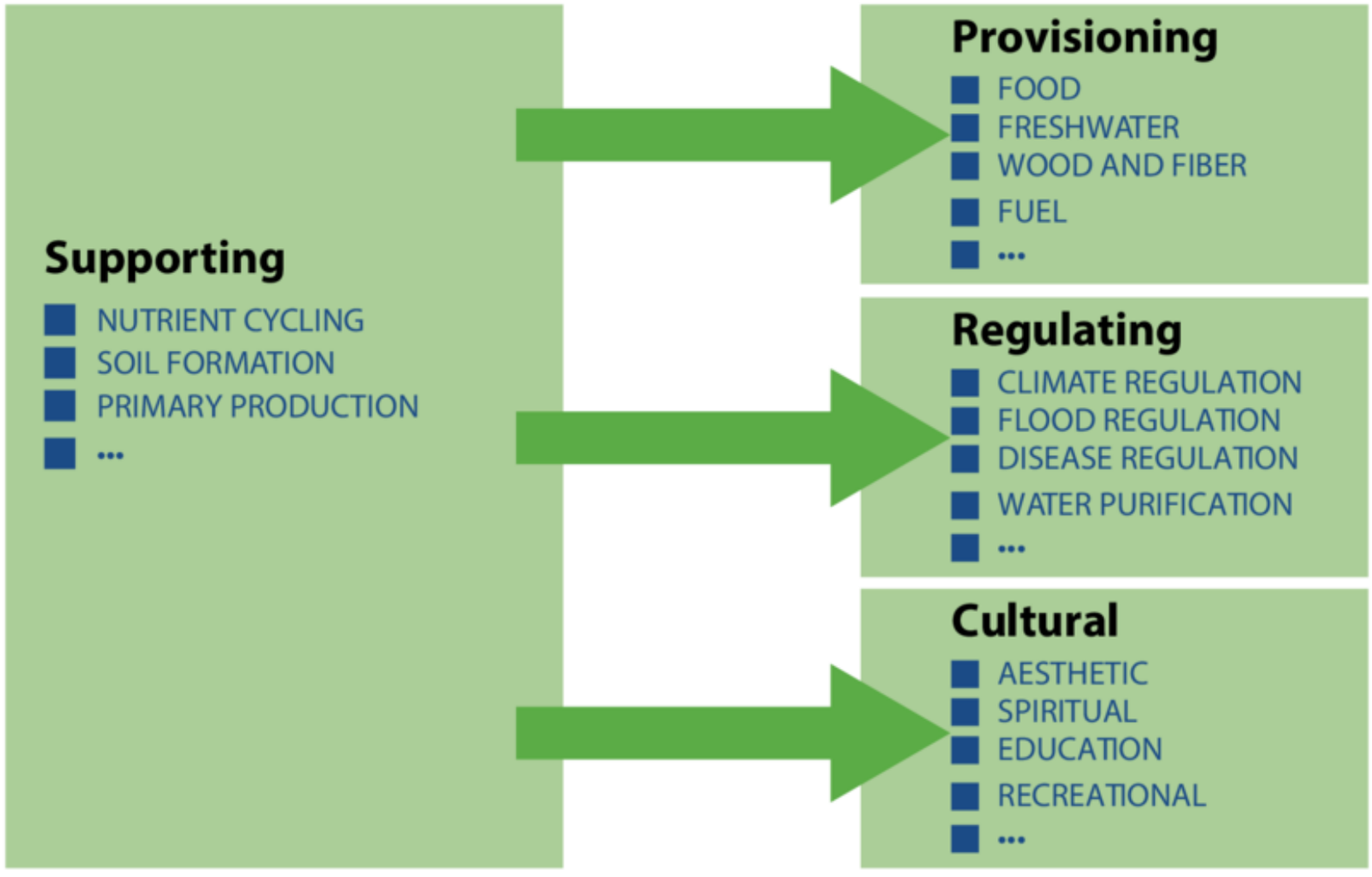
THEORIES – Ecosystem services

"The benefits people obtain from ecosystems."

(Millennium Ecosystem Assessment, 2016)

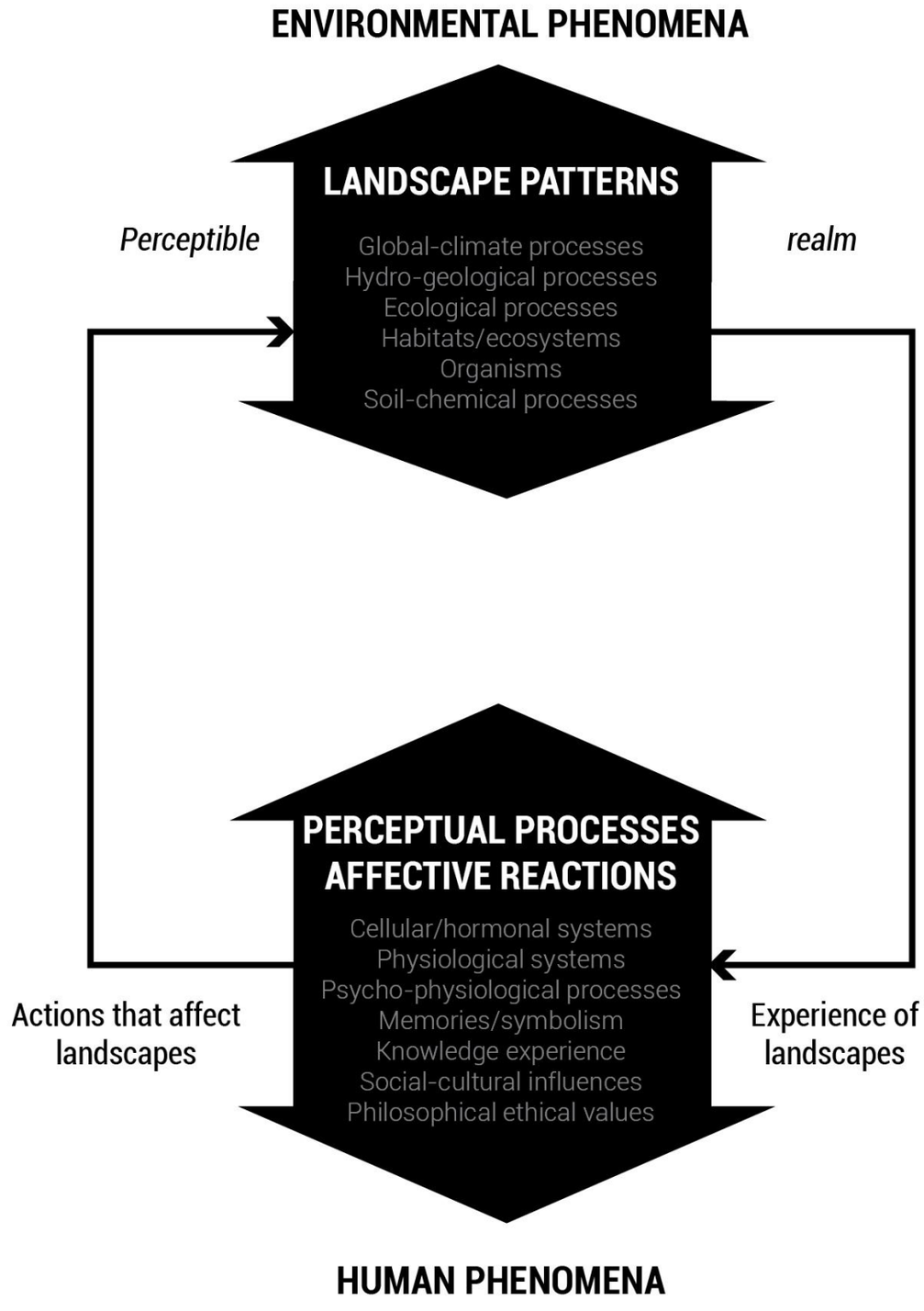
"...are the aspects of ecosystems utilized (actively or passively) to produce human well-being."

(Fisher, Turner, & Morling, 2009)



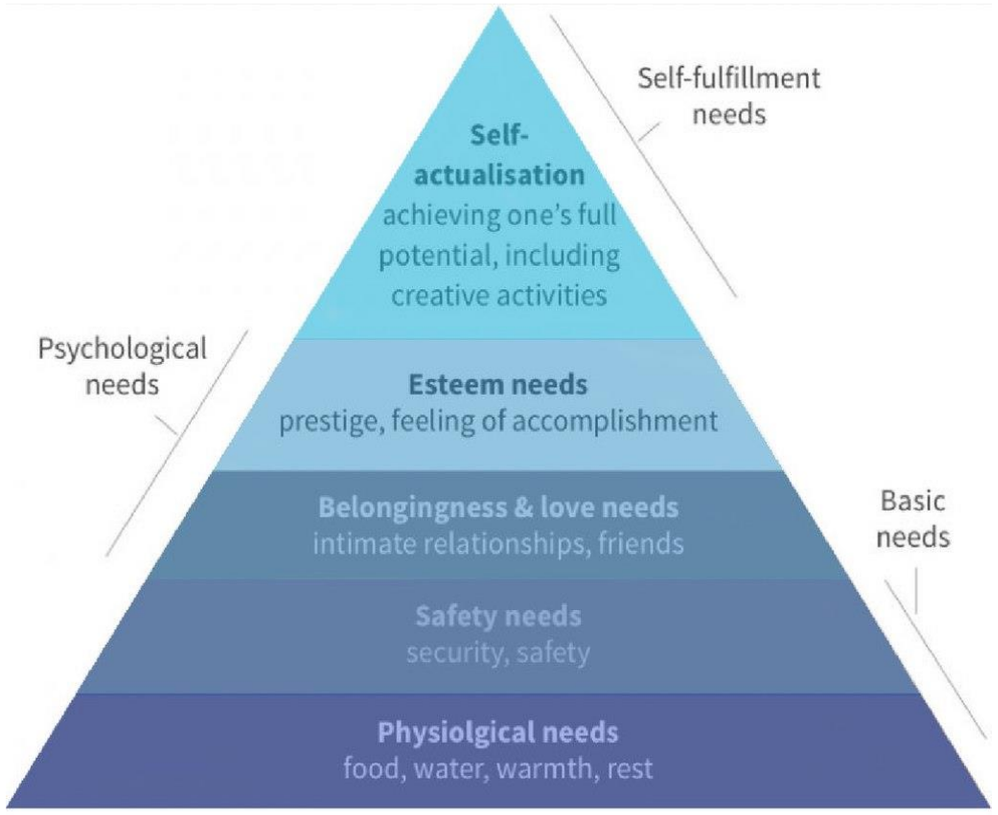
THEORIES – Ecosystem services

- Relationship between landscape aesthetics and ecology
- How human actions can affect ecological functions beyond our "*perceptible realm*" (where landscape patterns are perceived and experienced by human)
- Landscape aesthetic experiences are relatively direct perceptual experience
- Human values + Ecological goals



Redrawn from Gobster, Nassauer, Daniel, & Fry (2007)

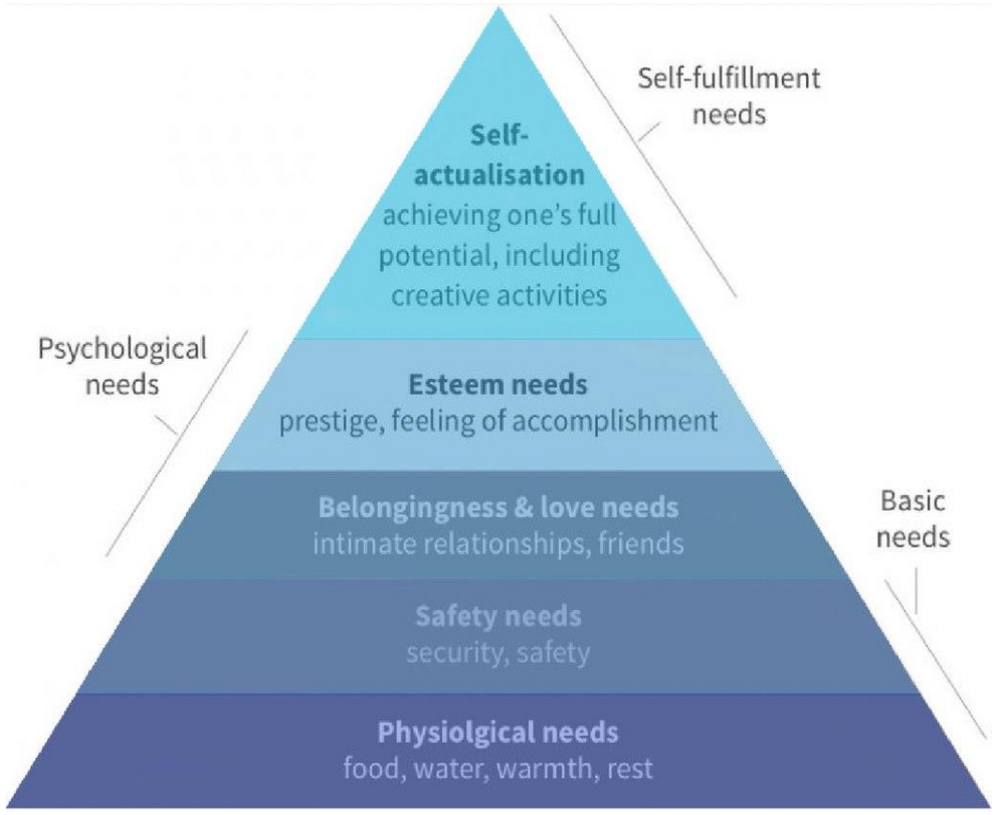
THEORIES – Maslow's hierarchy of needs

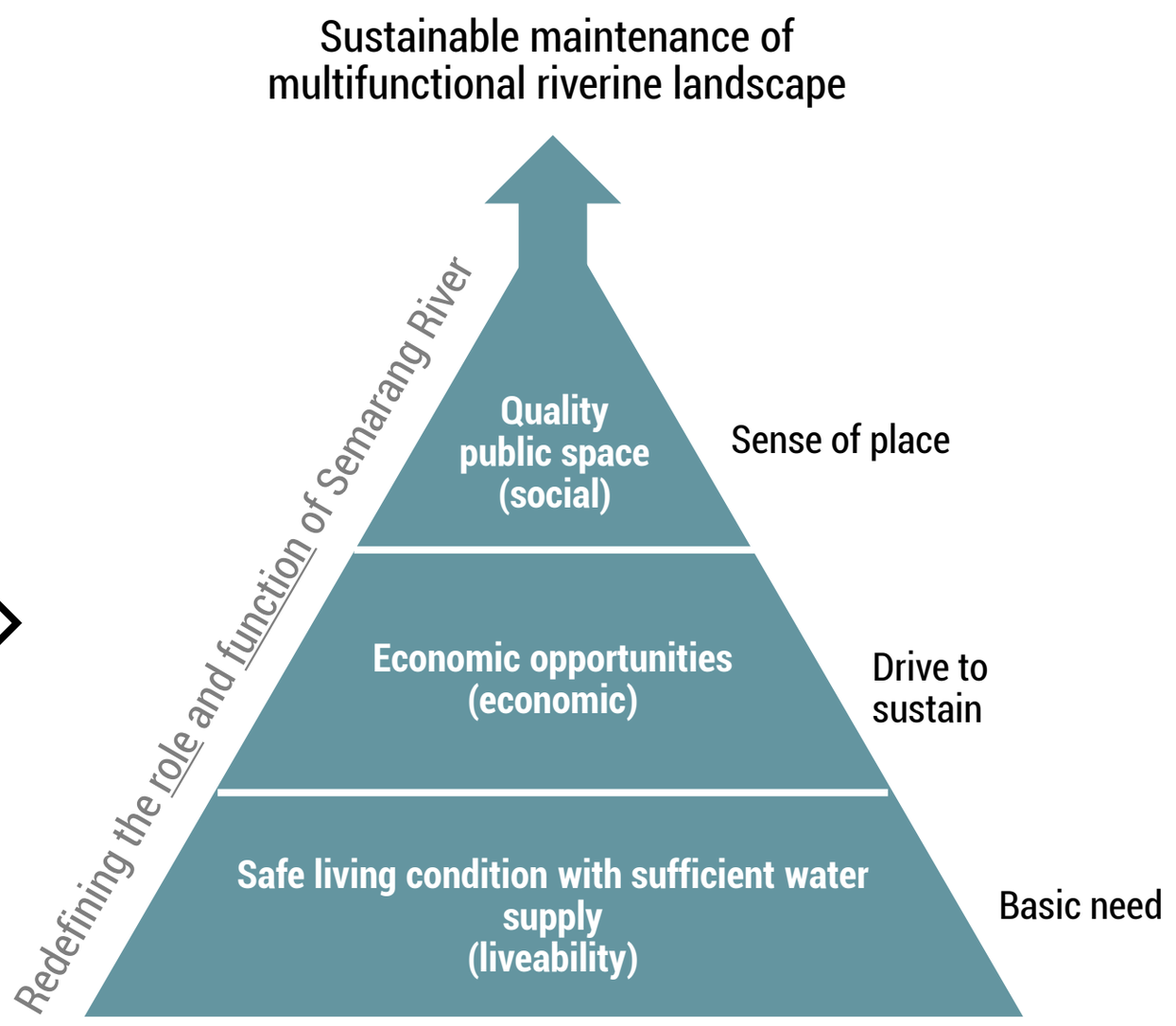


THEORIES – Maslow's hierarchy of needs

HYPOTHESIS

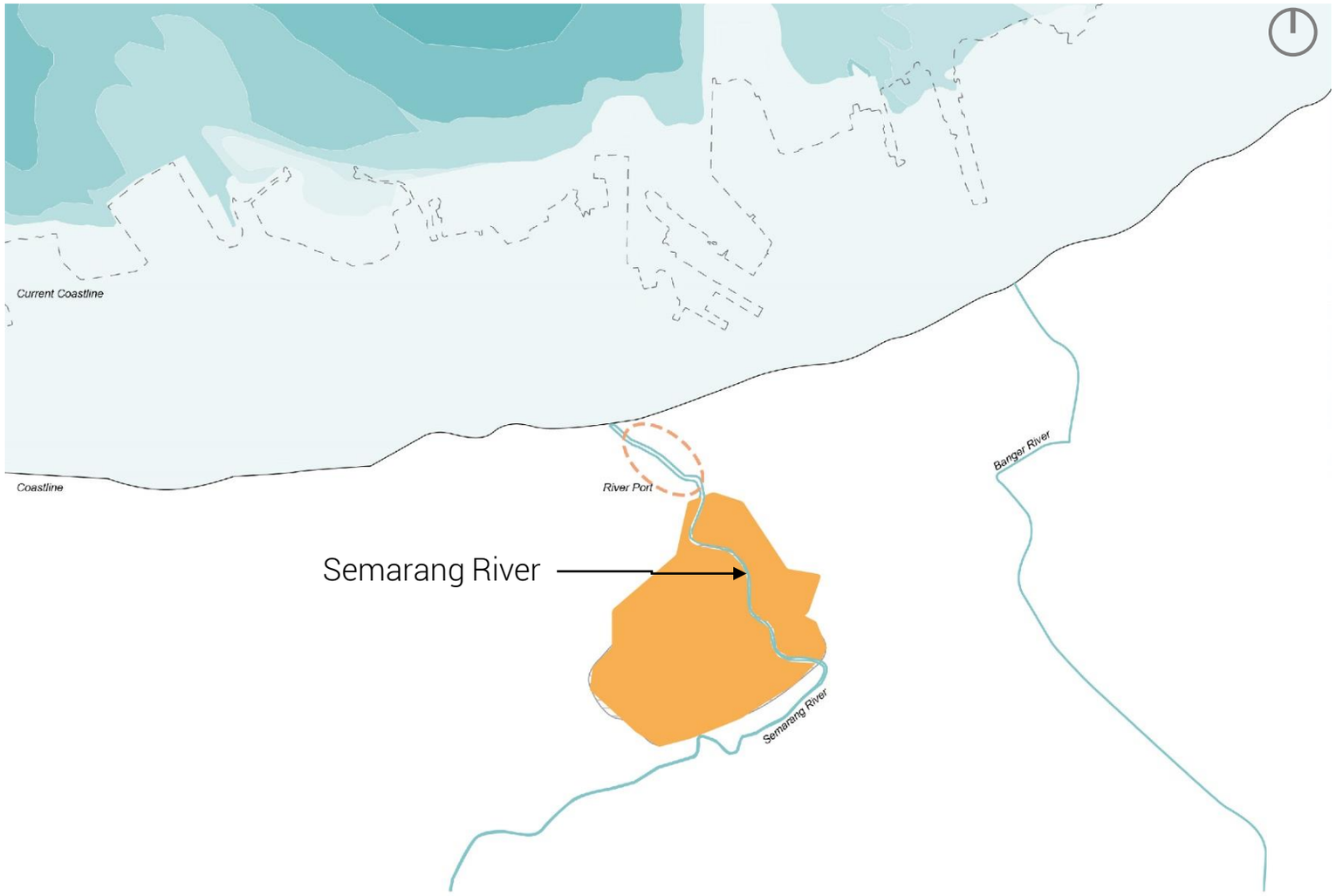
The riverine urban kampung living condition along Semarang River could be improved by <u>redefining the **role** and **function** of the River</u>



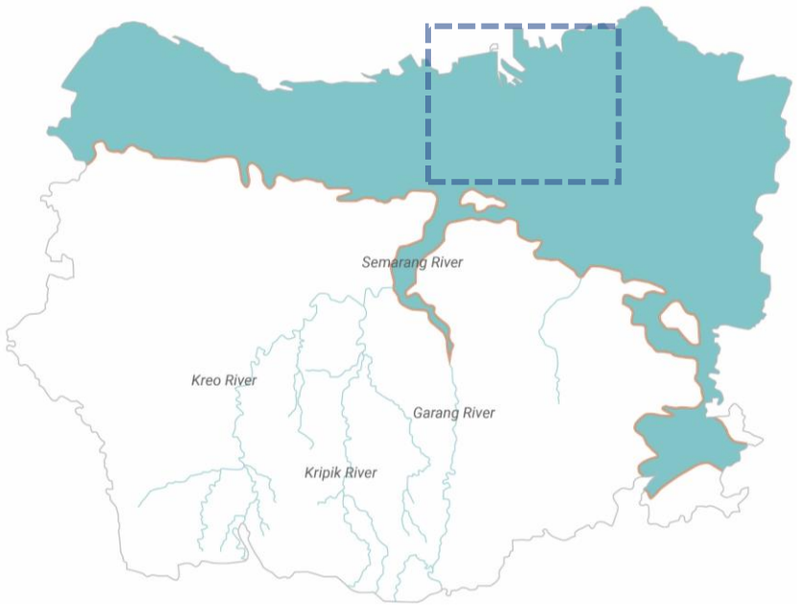


ANALYSIS

Transformation of Semarang River

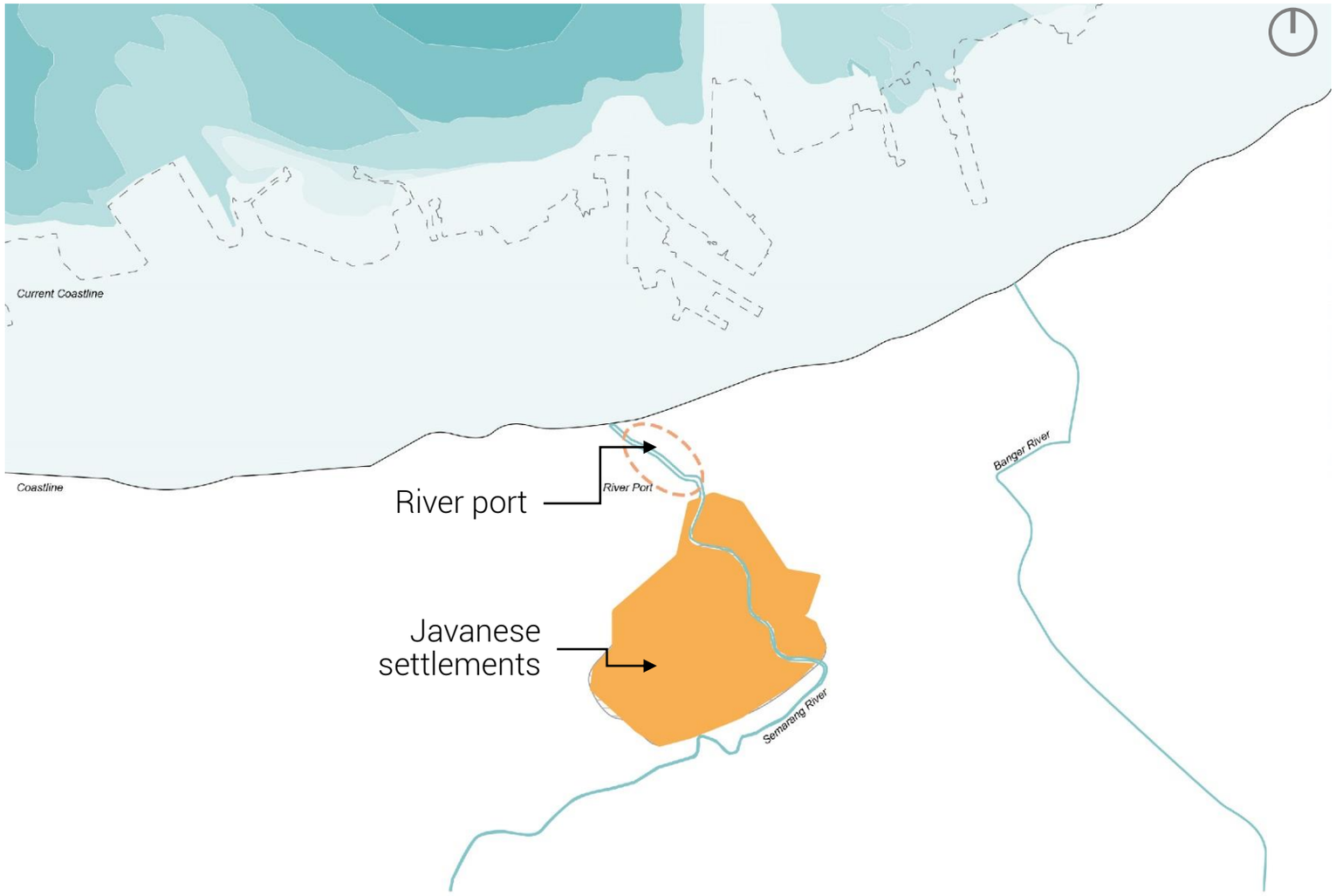


1406 – The first port in Semarang was built



10th century

Transformation of Semarang River



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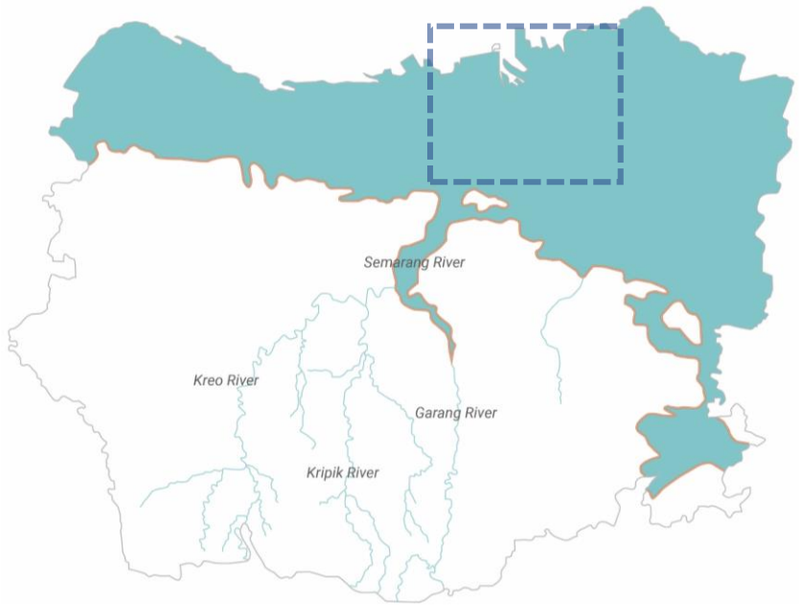
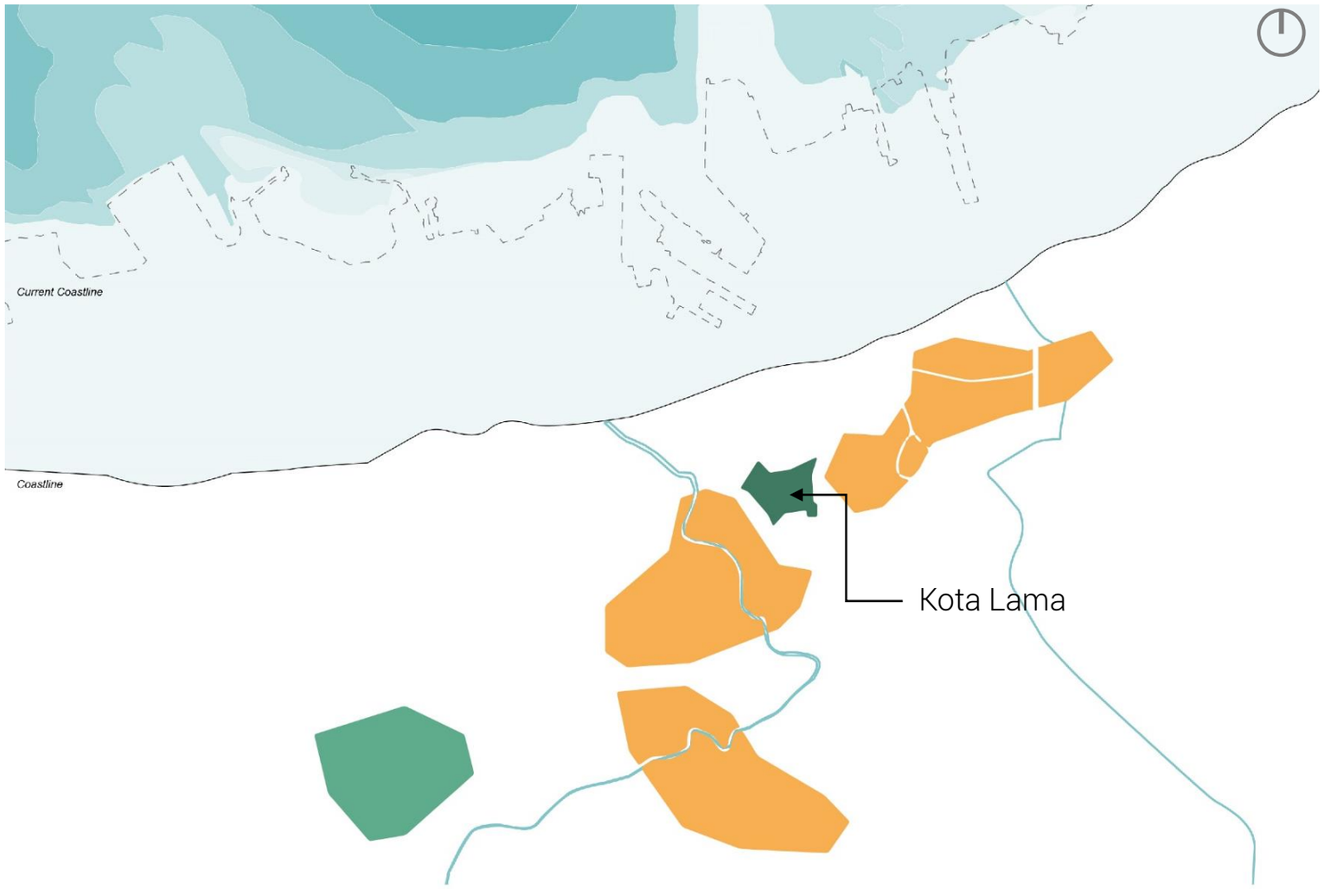
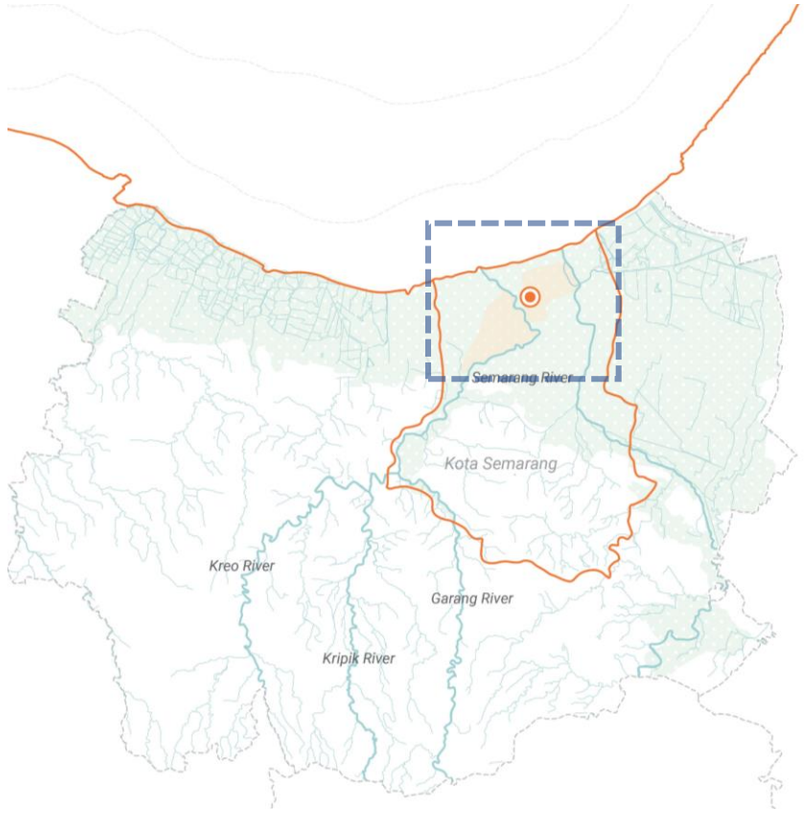


10th century

Transformation of Semarang River



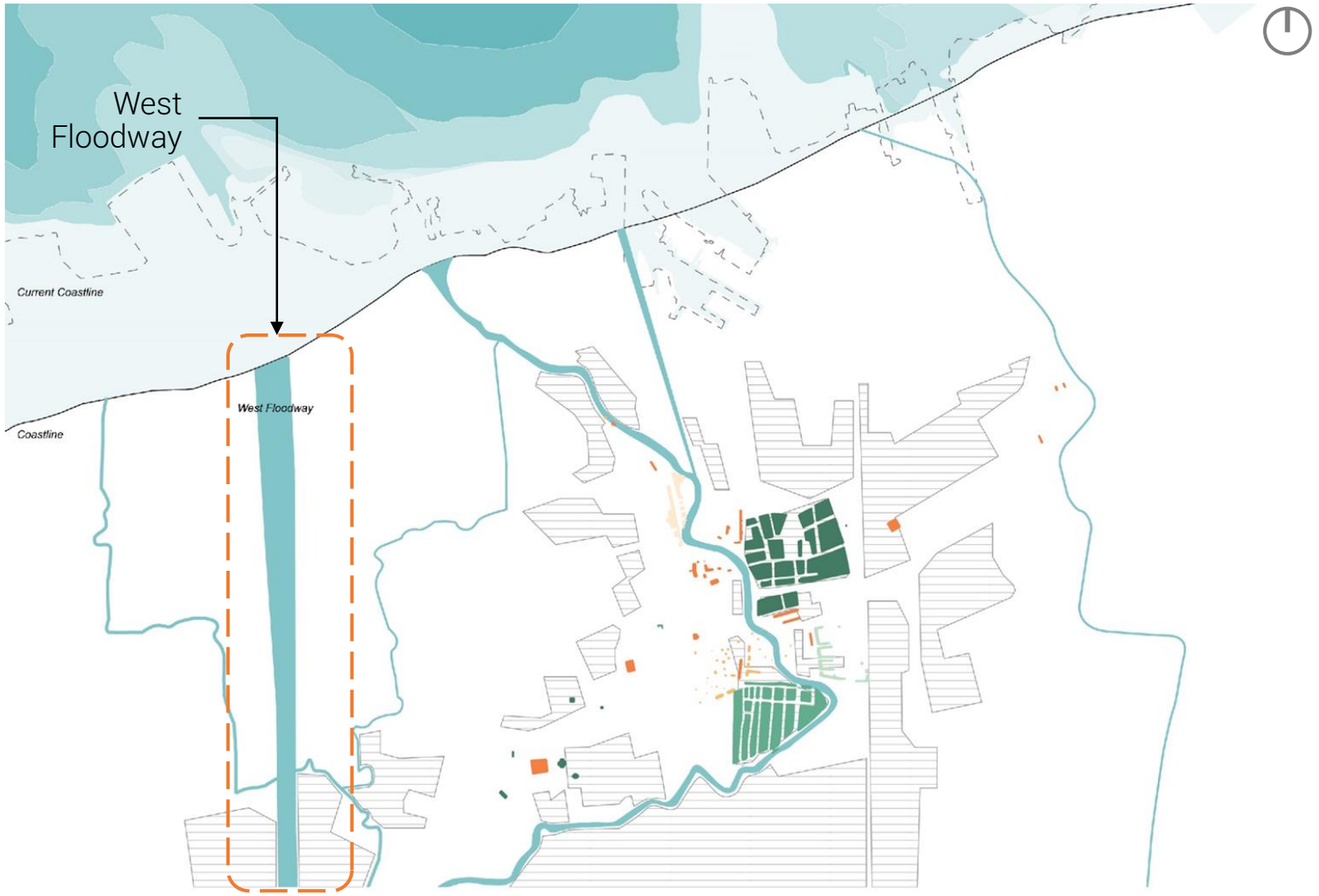
1650 – Ethnic settlements development around river port



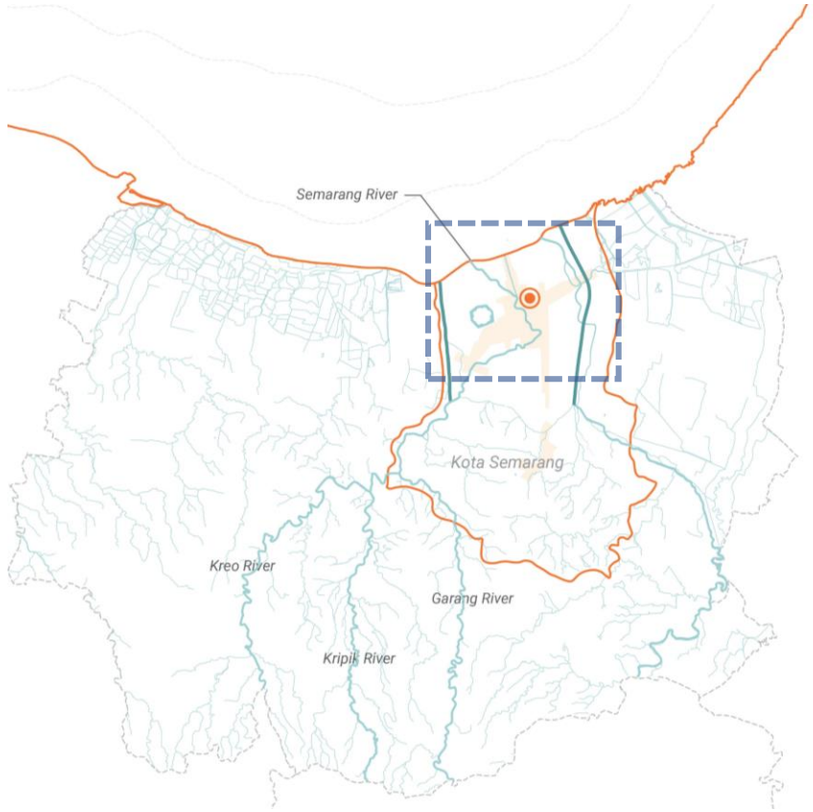
1600

Dutch Area
Chinese Area
Javanese Area

Transformation of Semarang River



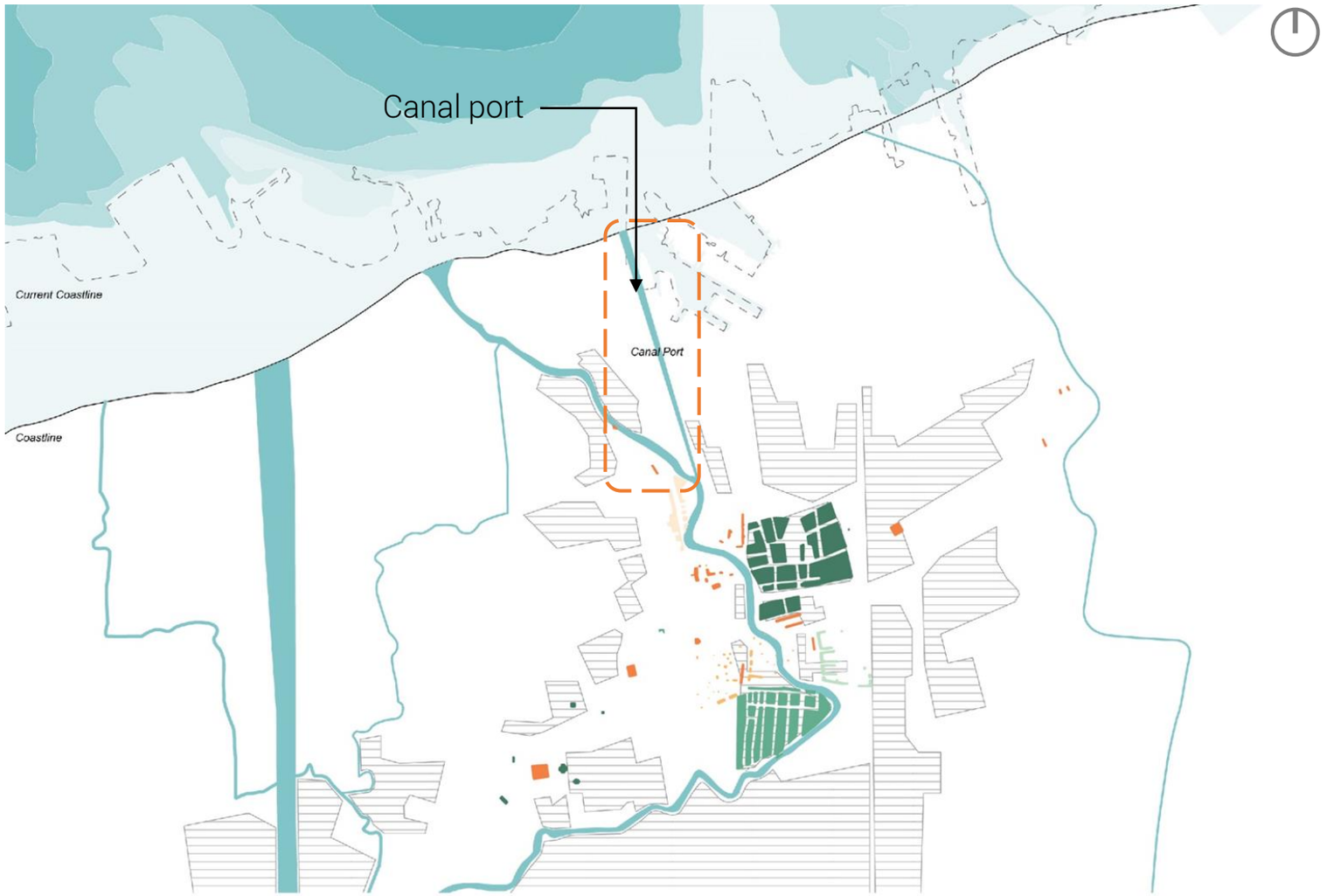
1850 – West Floodway was built



1900

Dutch Area
Chinese Area
Javanese Area
Muslim Area
Melayu Area

Transformation of Semarang River



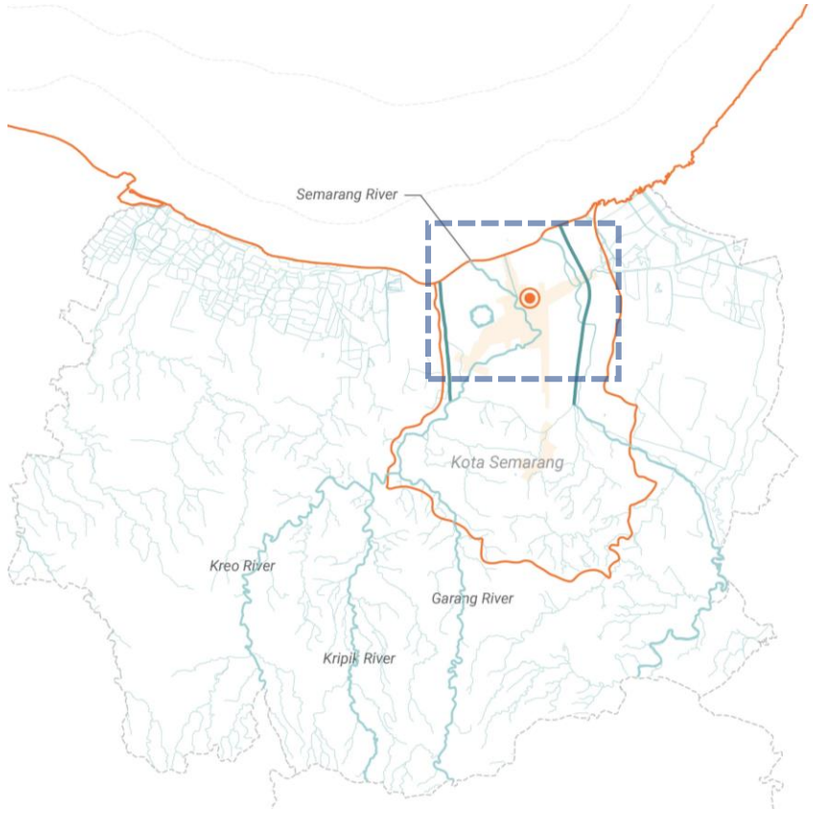
1854 – A new canal port was built

Canal port (1880)

Dutch Area
Chinese Area
Javanese Area
Muslim Area
Melayu Area

Transformation of Semarang River

1894 – East Floodway was built

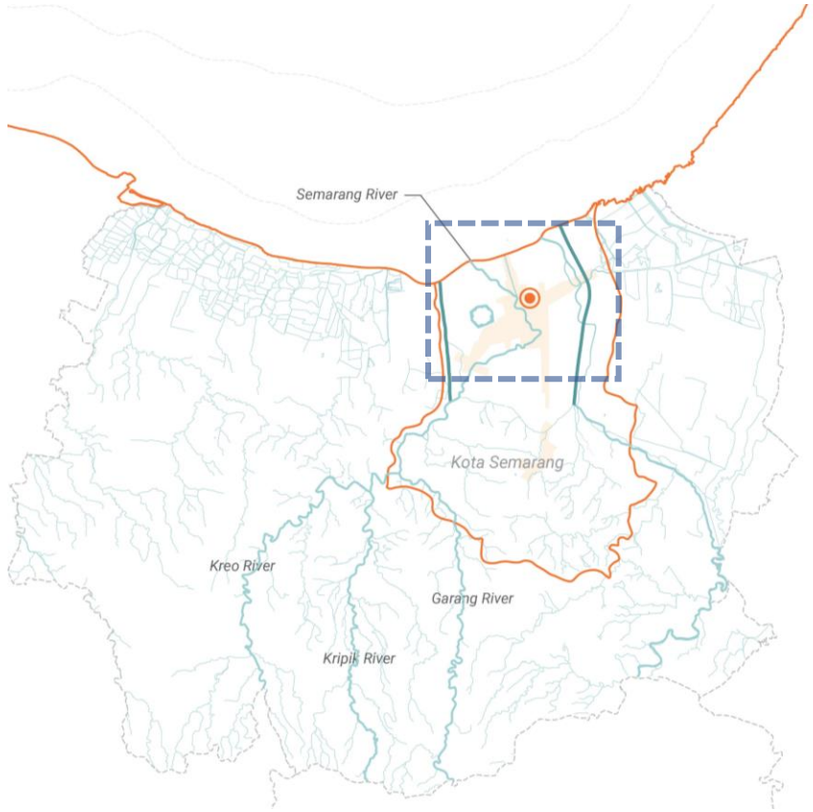


1900

East Floodway

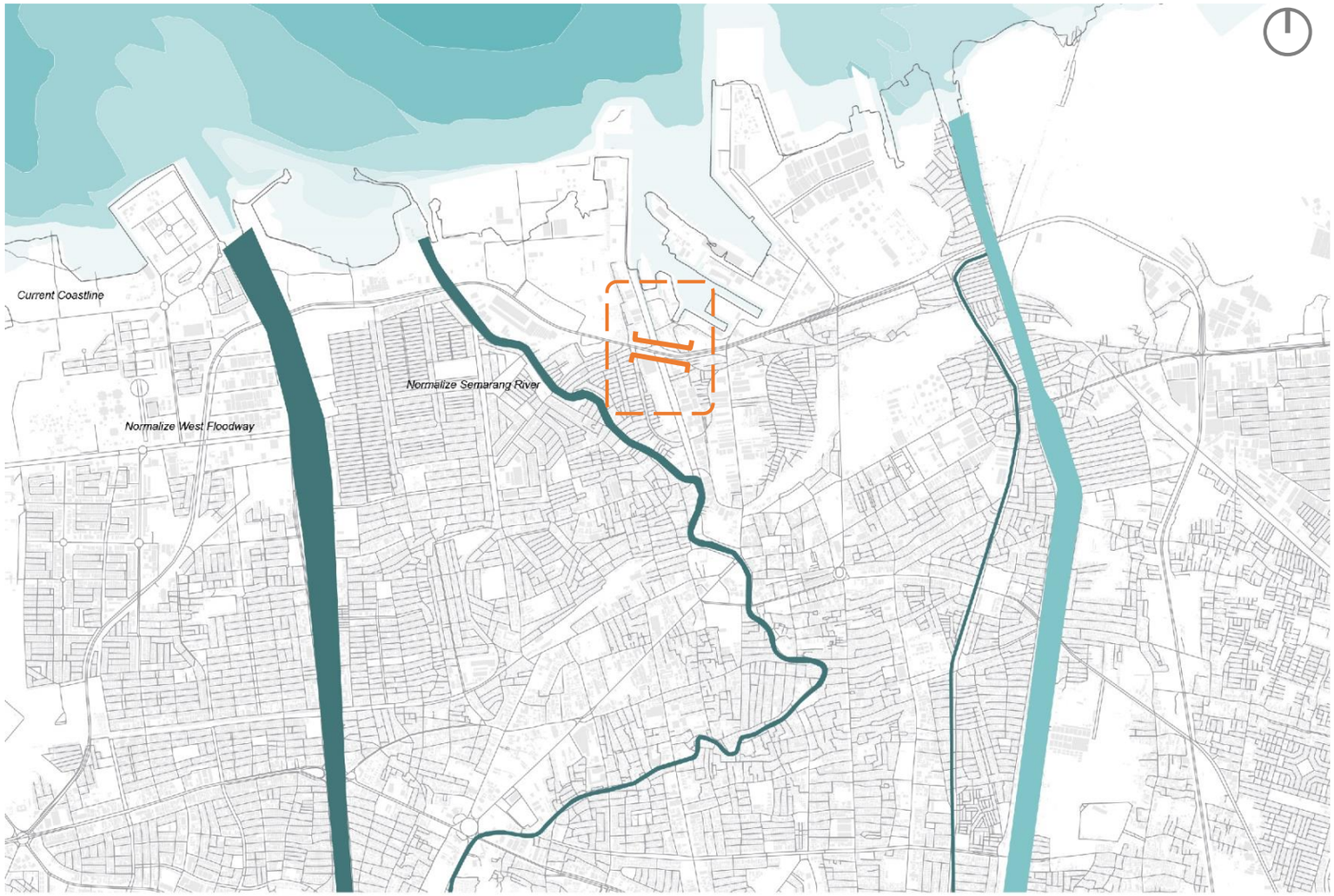
Transformation of Semarang River

1924 – Tanjung Mas Port was built



1900

Transformation of Semarang River

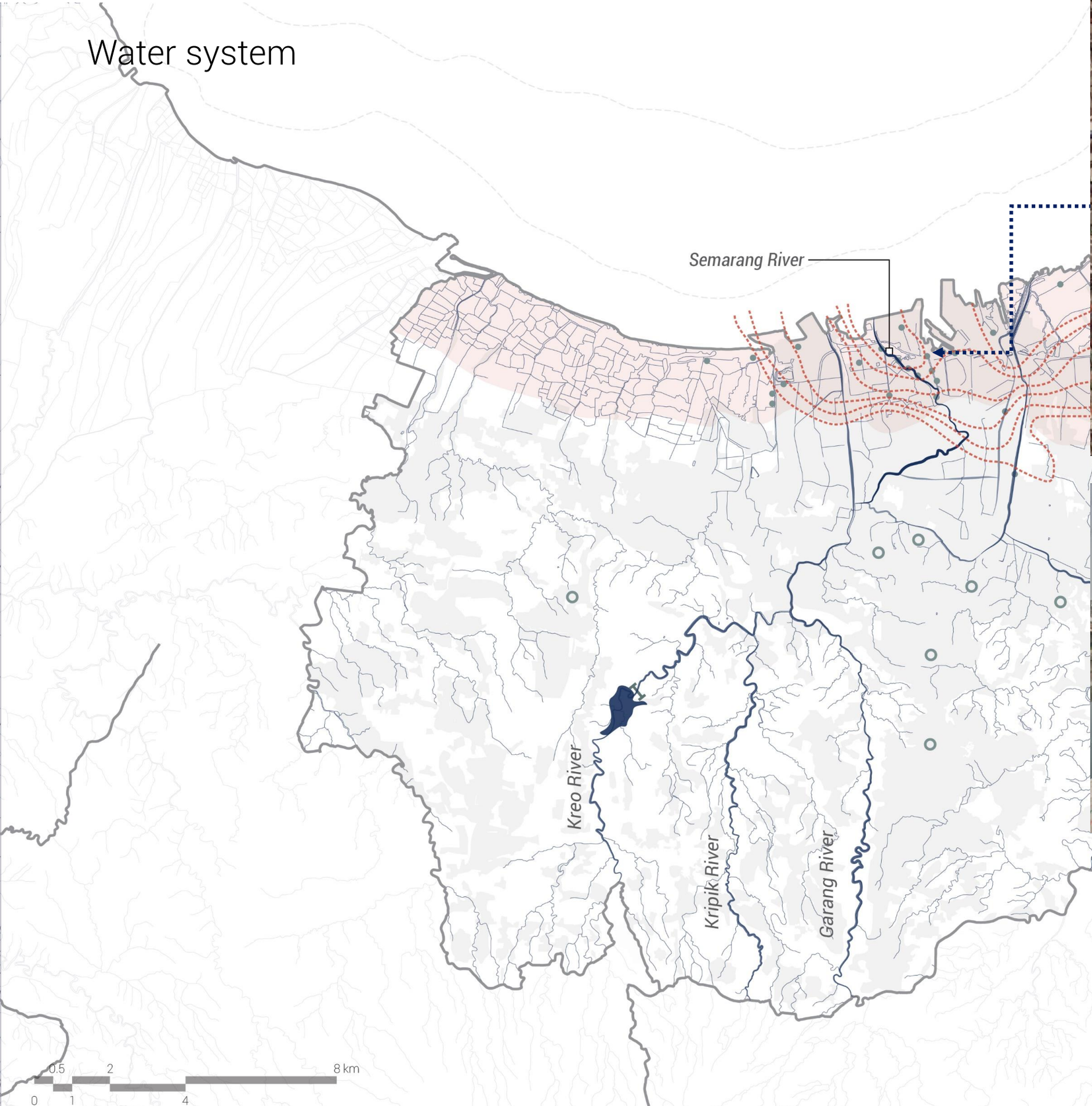


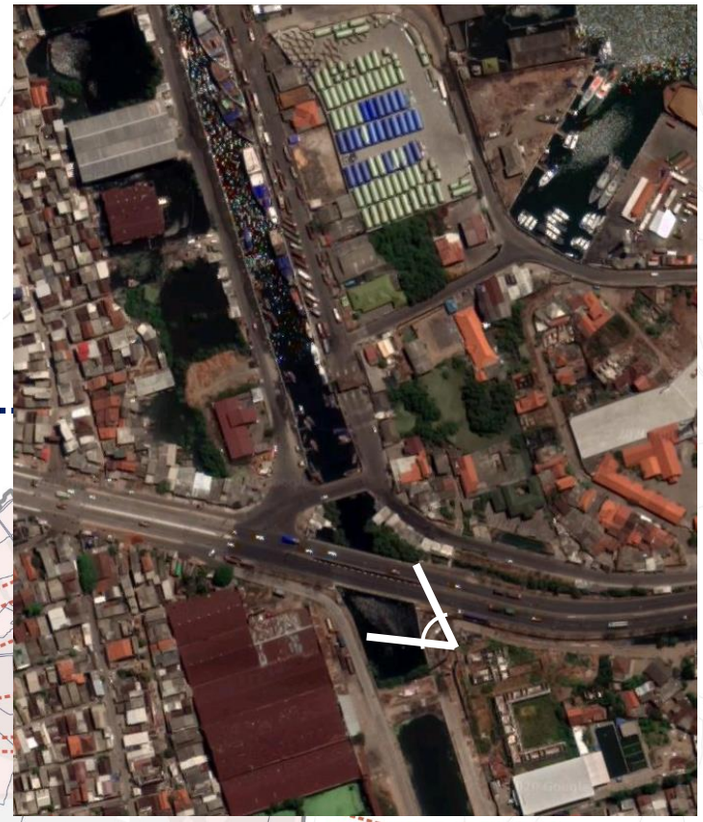
Presence – Flood wall built at the mouth of Semarang River

Transformation of Semarang River

Presence – Flood wall built at the mouth of Semarang River

Water system

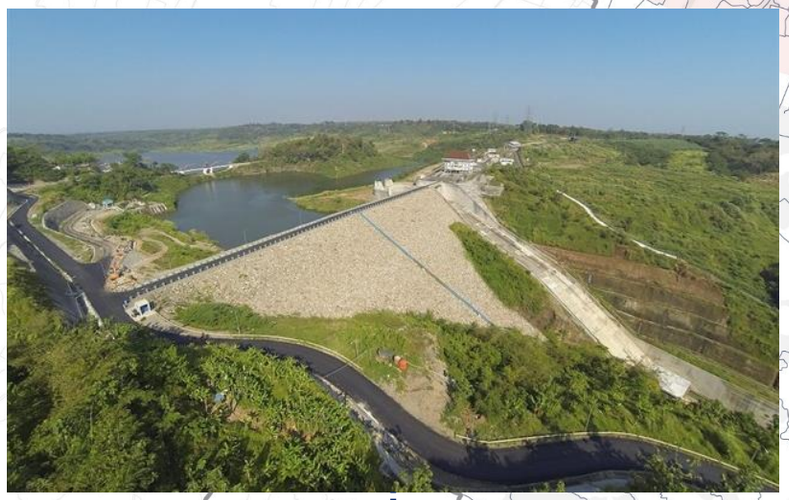




3-4 cm / year

Water system

Jembatan Dam

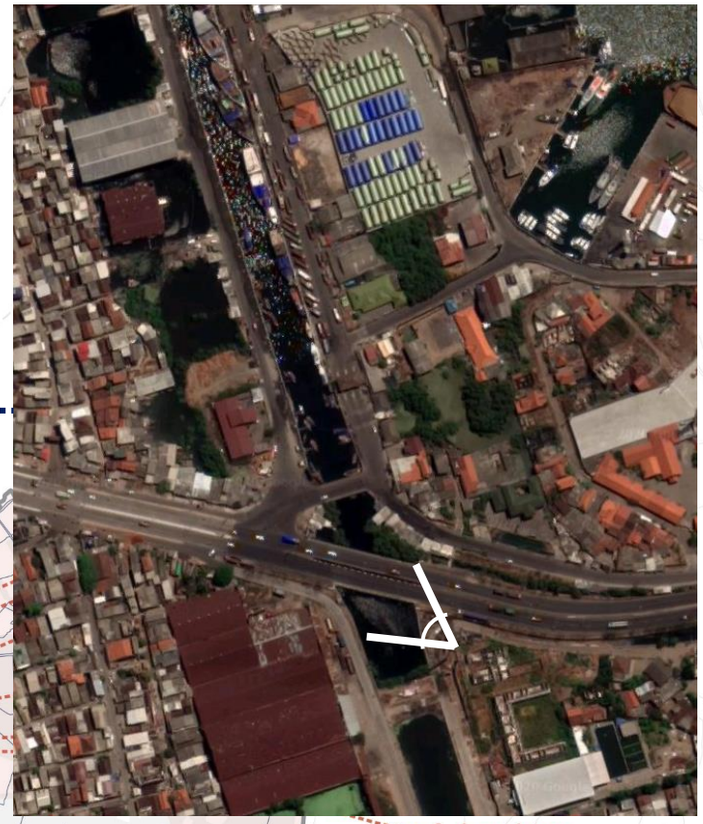


Semarang River

Kreo River

Kripik River

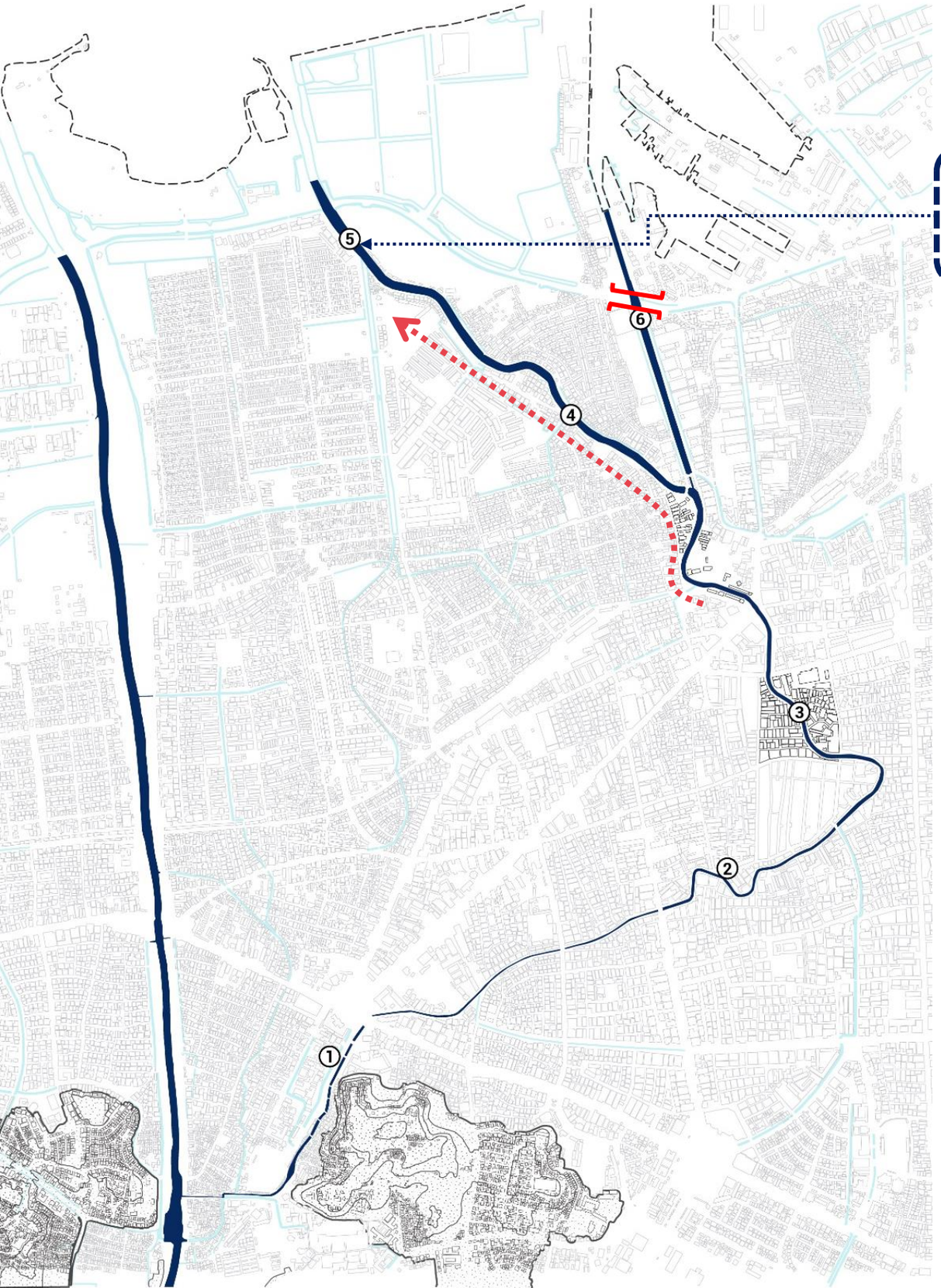
Garang River

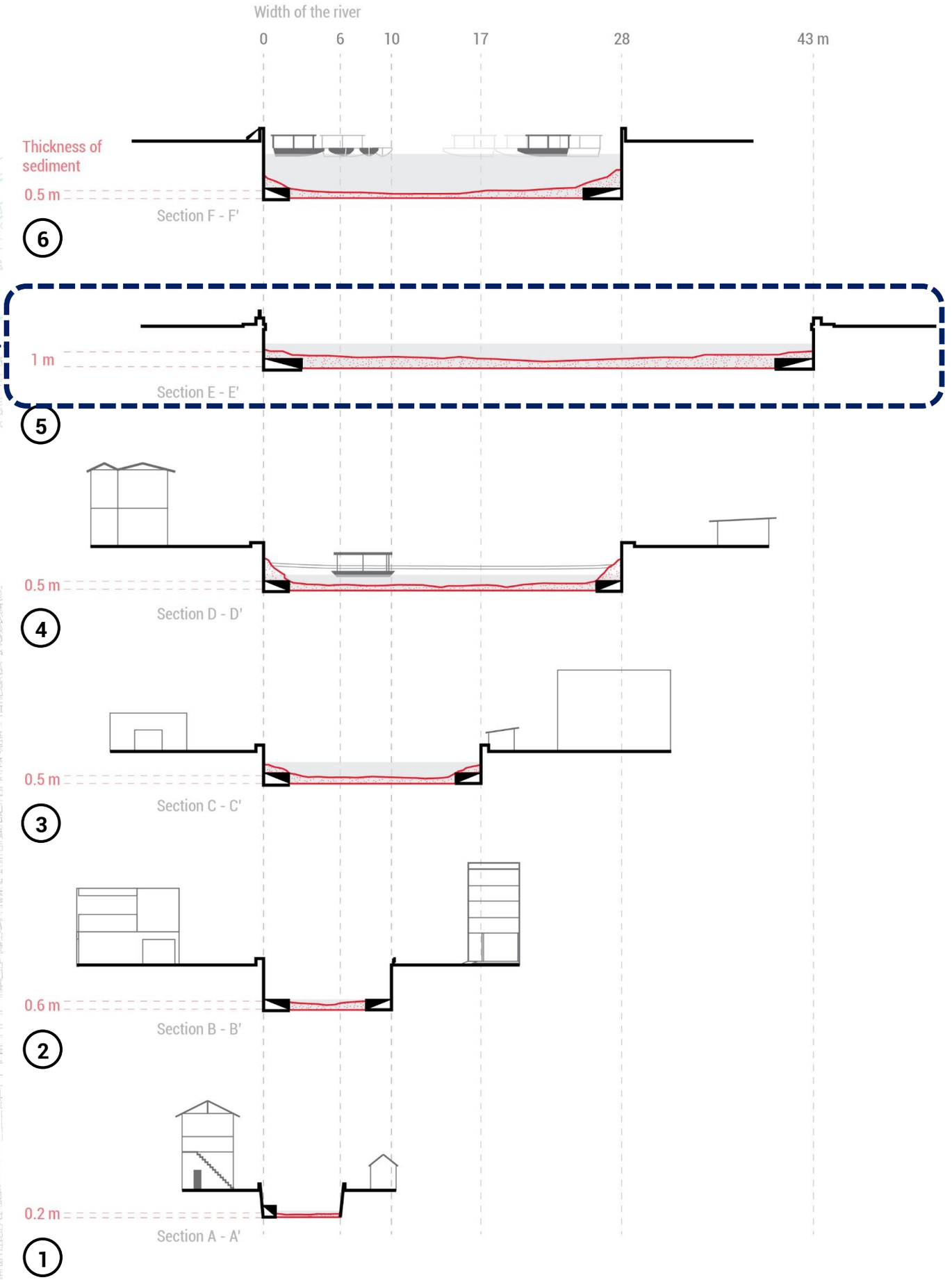


3-4 cm / year

0 0.5 1 2 4 8 km

Sedimentation

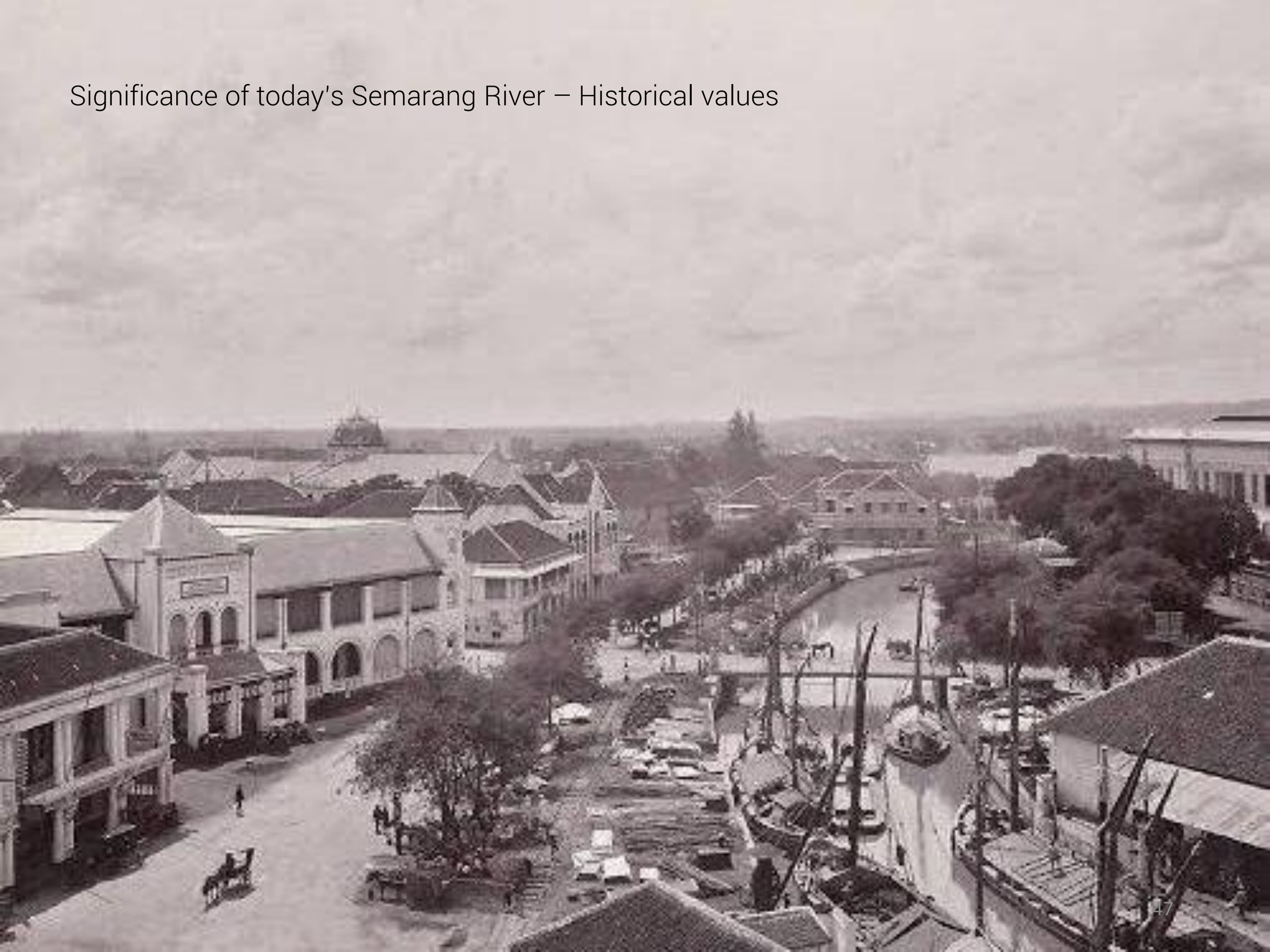




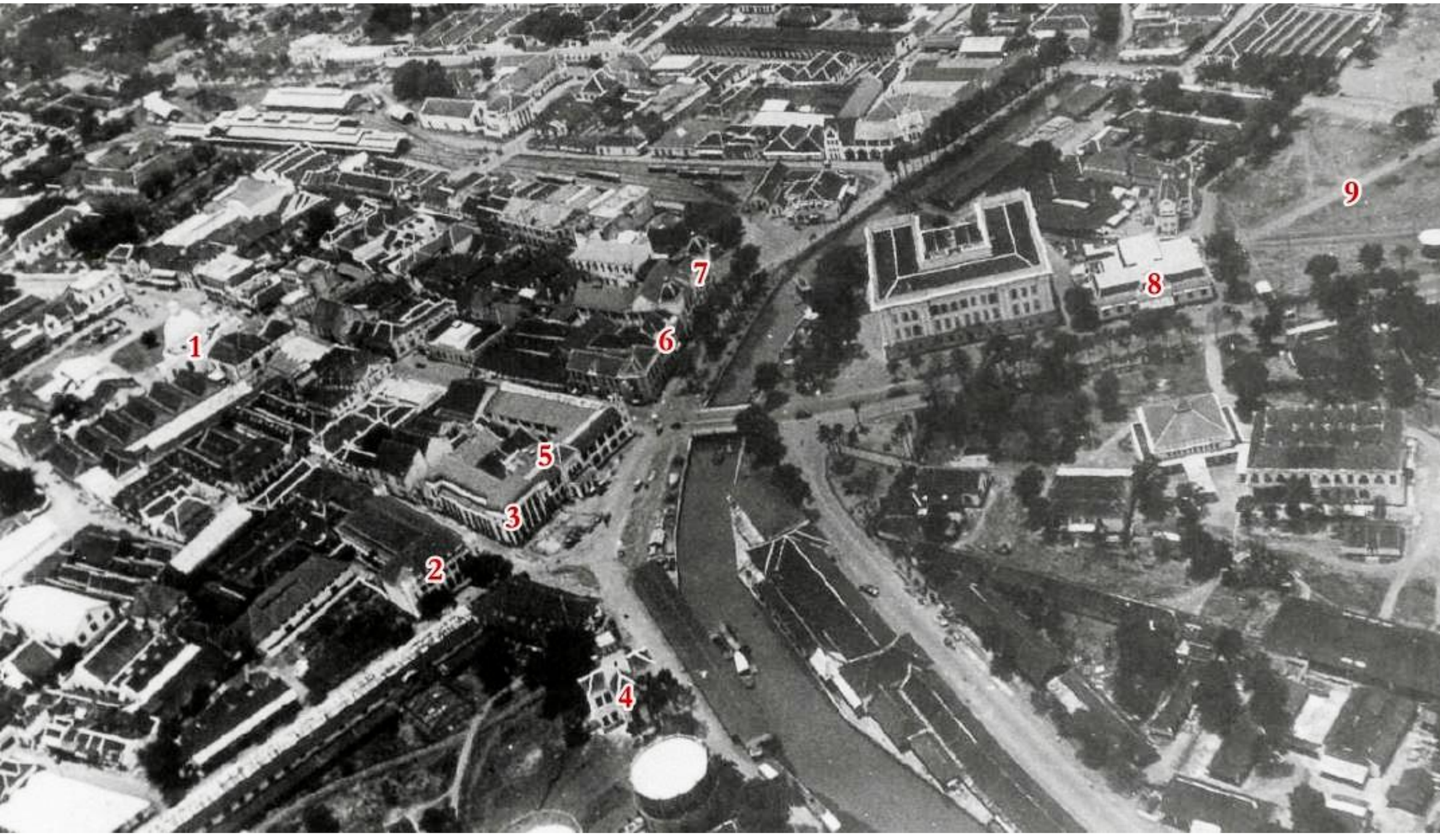
Transformation of Semarang River

Presence – Semarang River used as a sewer

Significance of today's Semarang River – Historical values



Significance of today's Semarang River – Historical values



Significance of today's Semarang River – Spatial aspect

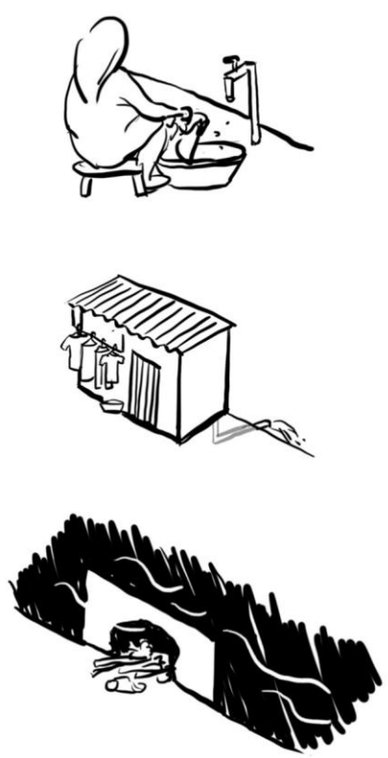
Significance of today's Semarang River – Socio-cultural aspect

Significance of today's Semarang River – Socio-cultural aspect

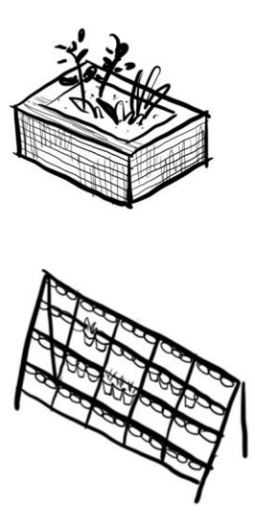
Significance of today's Semarang River – Socio-cultural aspect

Production

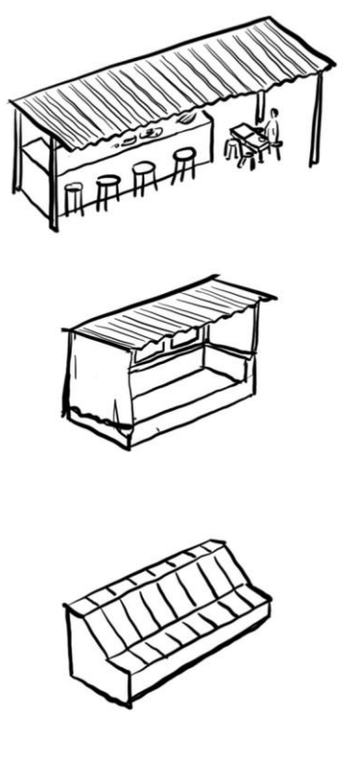
Water-related



Greening



Social / leisure

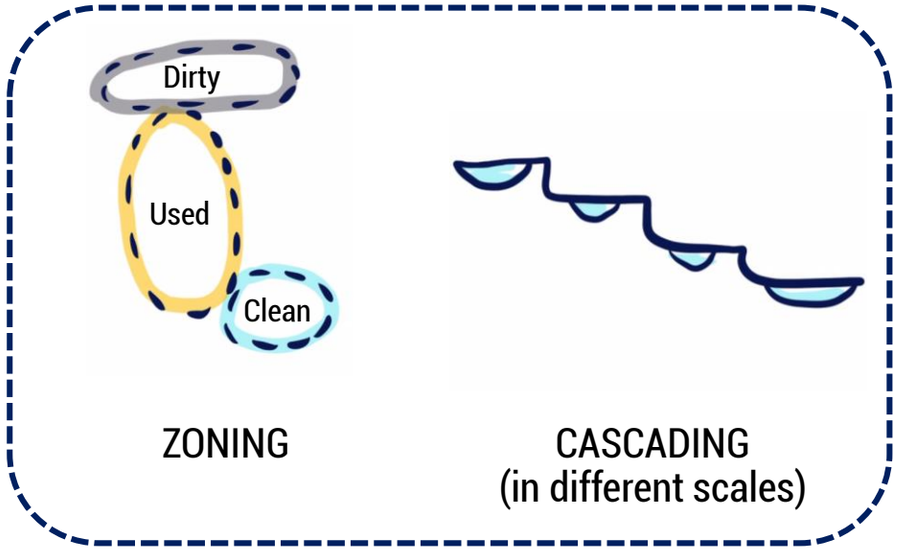


DESIGN PRINCIPLES

Precedent

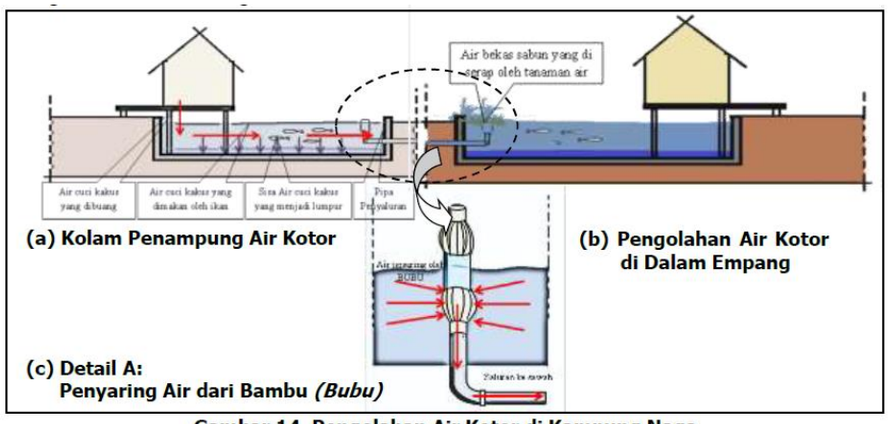
Kampung Naga

Kampung Naga

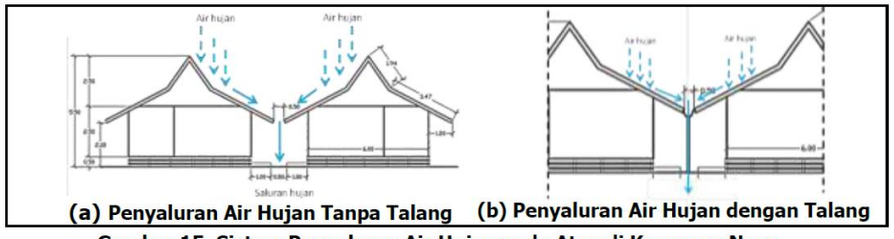


Tabel 1. Pembagian Lahan di Kampung Naga

No	Pembagian Lahan	Foto	Keterangan
1	Area Suci	 (a)	Zona kampung yang termasuk Area Suci adalah (a) hutan larangan yang dianggap suci dan selalu dijaga
2	Area Dalam	 (a) (b) (c)	Area Dalam terdiri dari (a) rumah tinggal, (b) mesjid, (c) *balai patemon*
3	Area Luar	 (a) (b) (c) (d) (e) (f)	Area Luar merupakan area perairan yang terdiri dari (a) jamban untuk mandi, (b) pacilingan untuk buang air, (c) pancuran untuk tempat mencuci, (d) empang, (e) sawah, (f) kandang kambing



Gambar 14. Pengolahan Air Kotor di Kampung Naga

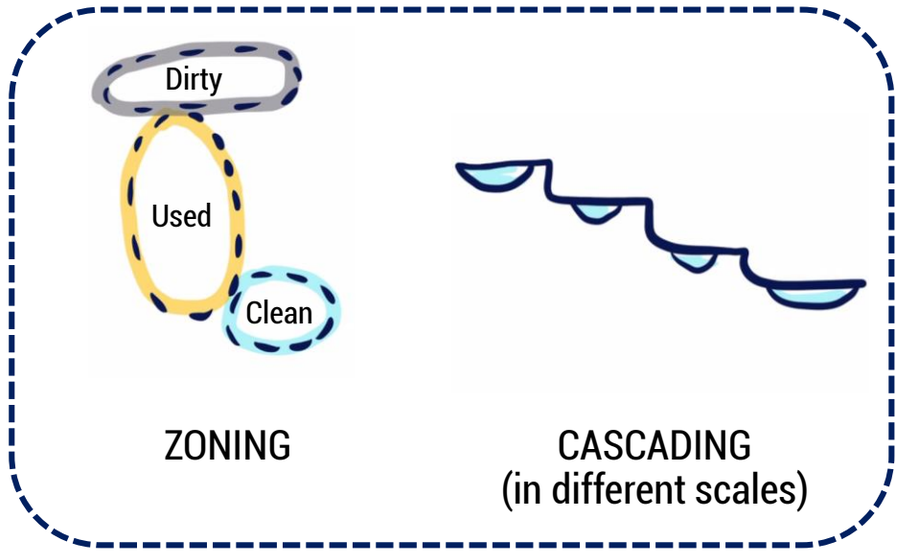


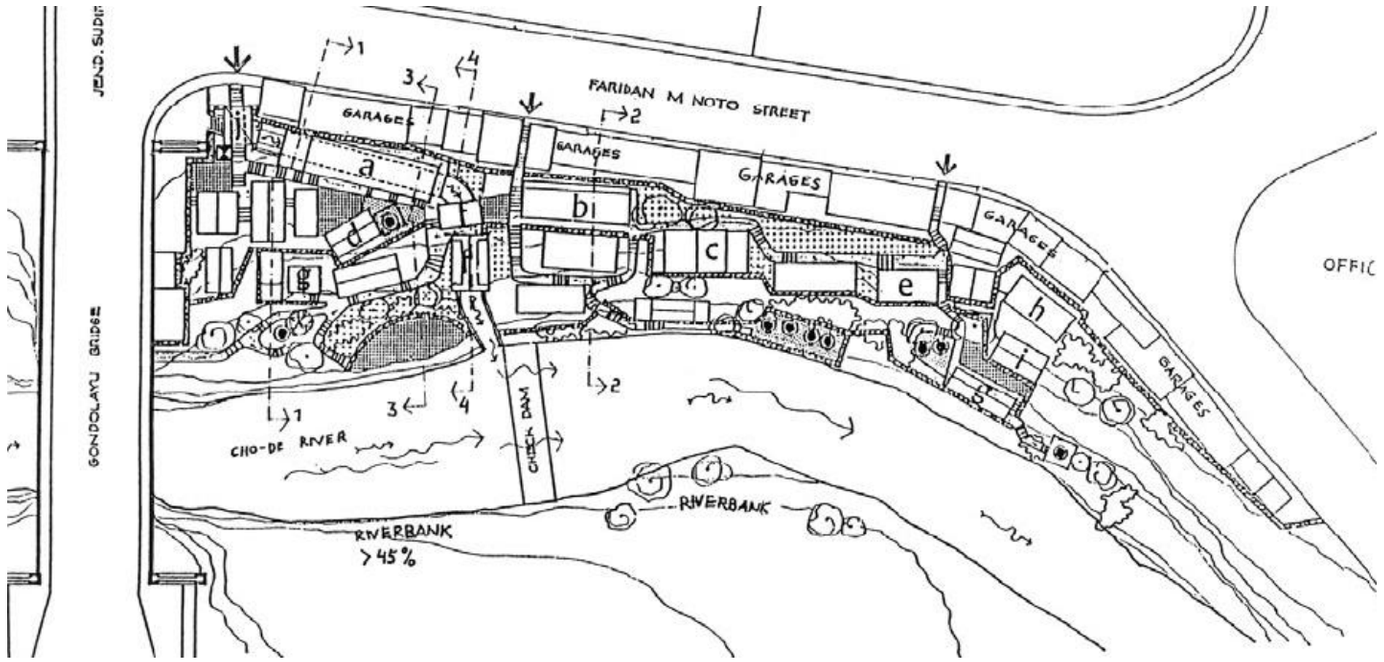
Gambar 15. Sistem Penyaluran Air Hujan pada Atap di Kampung Naga

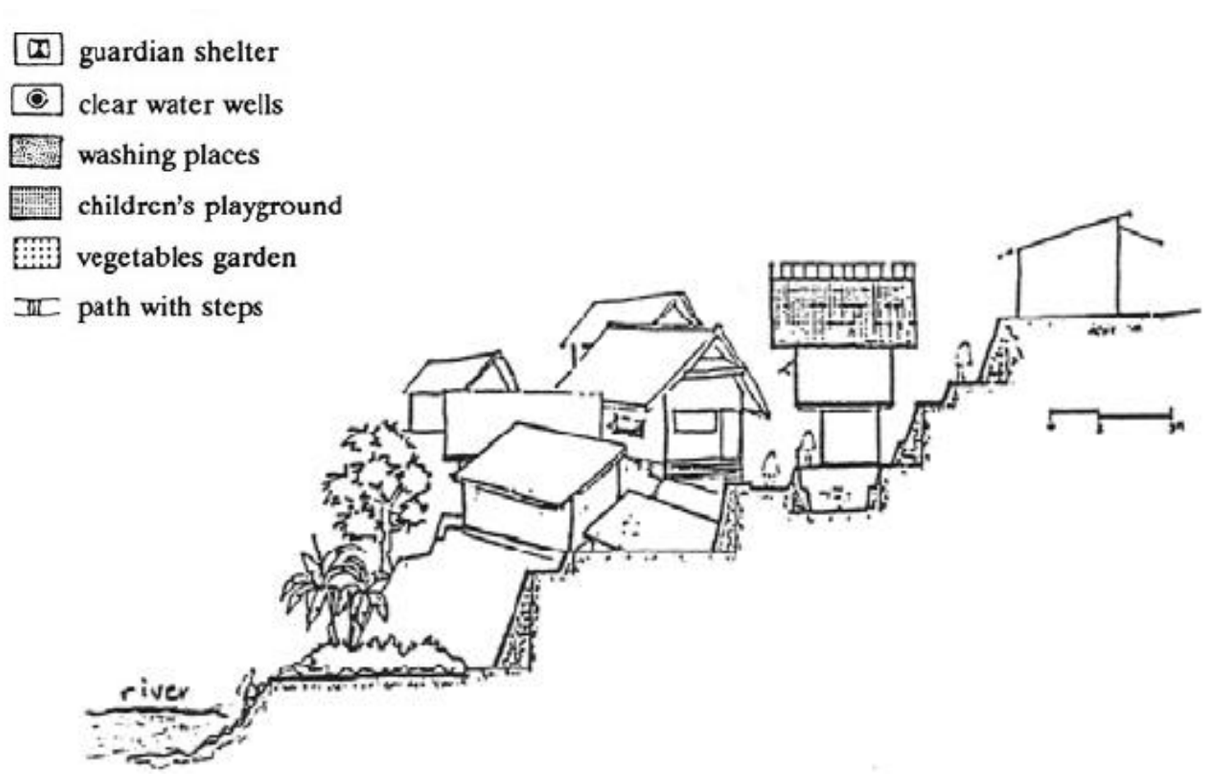
Precedent

Kampung Kali Cho-de

Kampung Kali Chode



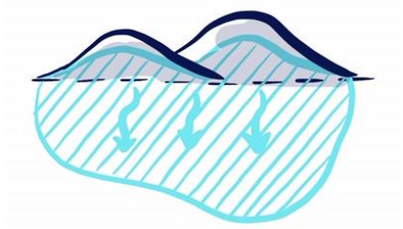




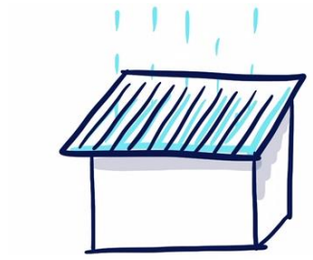
Design principle

Proposed flow

CAPTURE



Infiltration



Rooftop

Retention pond

STORAGE

Water tank

Well

Retention pond

SOURCE

Bottled water

Groundwater

CLEANSE

Biofilter

Fish pond

DISCHARGED TO THE RIVER

Wastewater

USE

Irrigation

Laundry

Bath house

Lavatory

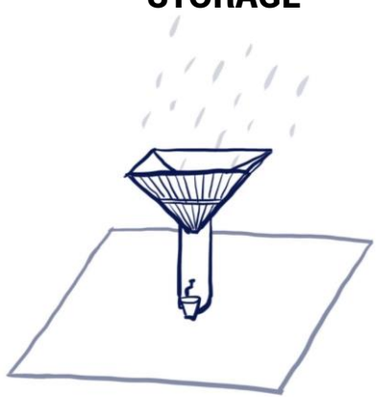
Design principle

Programme

CAPTURE

Bamboo forest

STORAGE

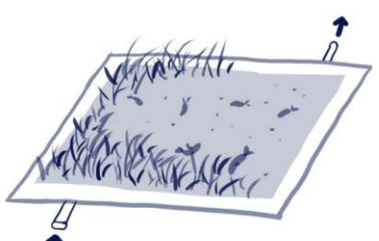


Rainwater harvest and water point

USE

Farm / Herb garden

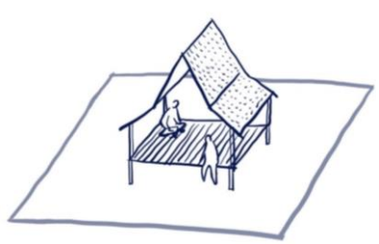
CLEANSE



Wastewater purification pond

+

SOCIAL



Communal space

DESIGN IMPLEMENTATION

1. High-density riverside kampungs

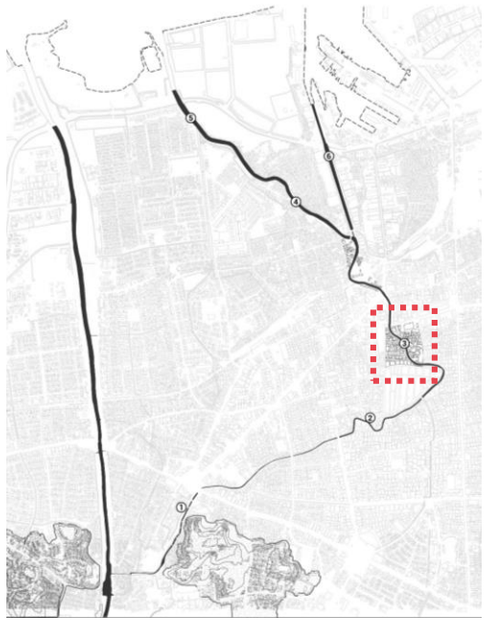
Location

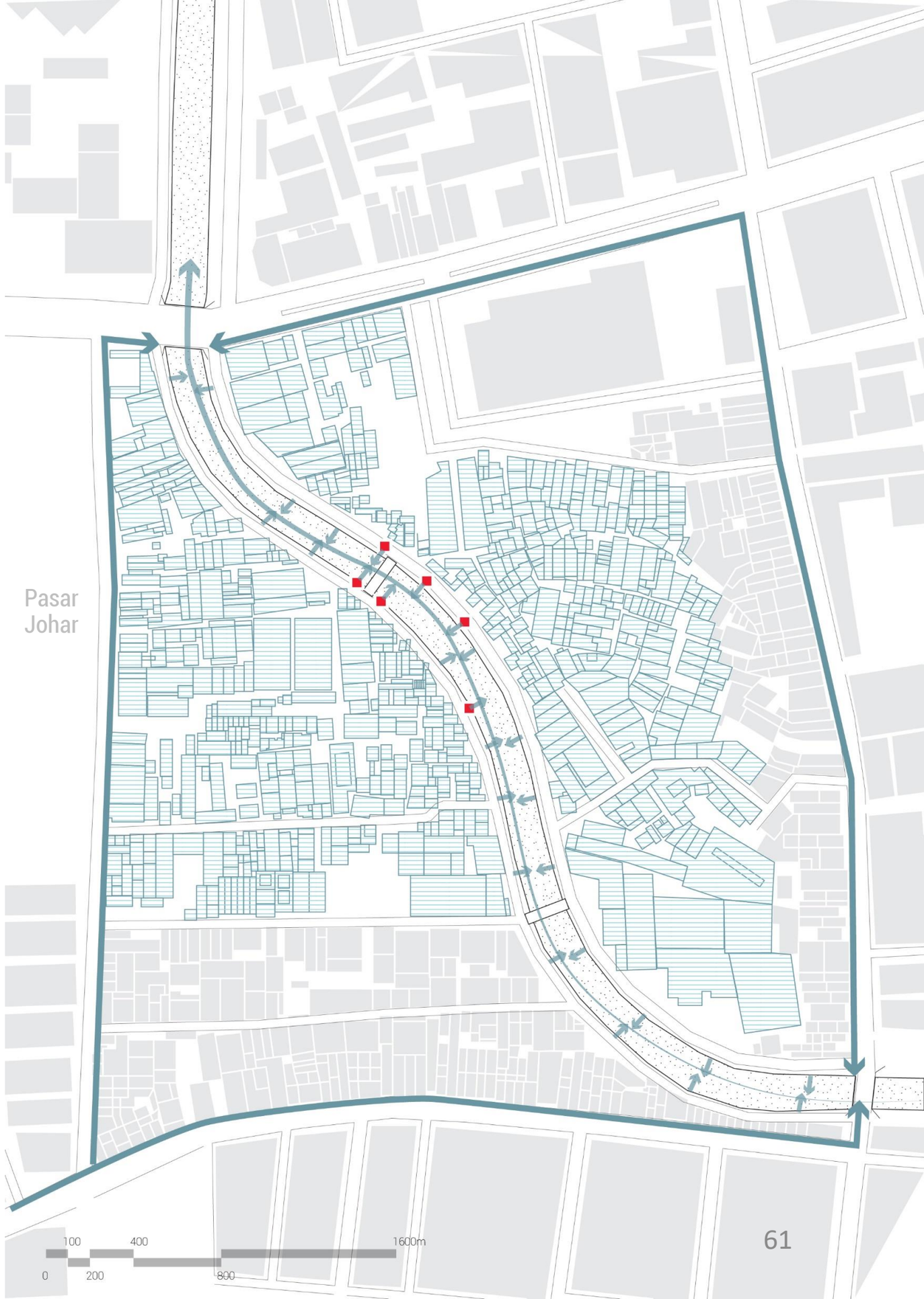
1. High-density riverside kampungs

Location

1. High-density riverside kampungs

Current flow





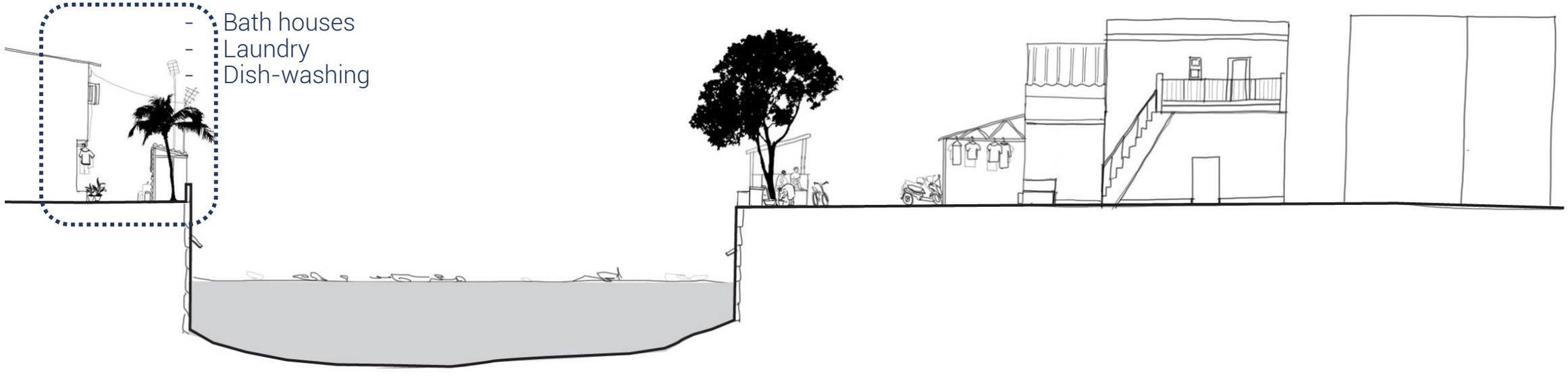
Existing

- Water point
- Drainage
- River flow

1. High-density riverside kampungs

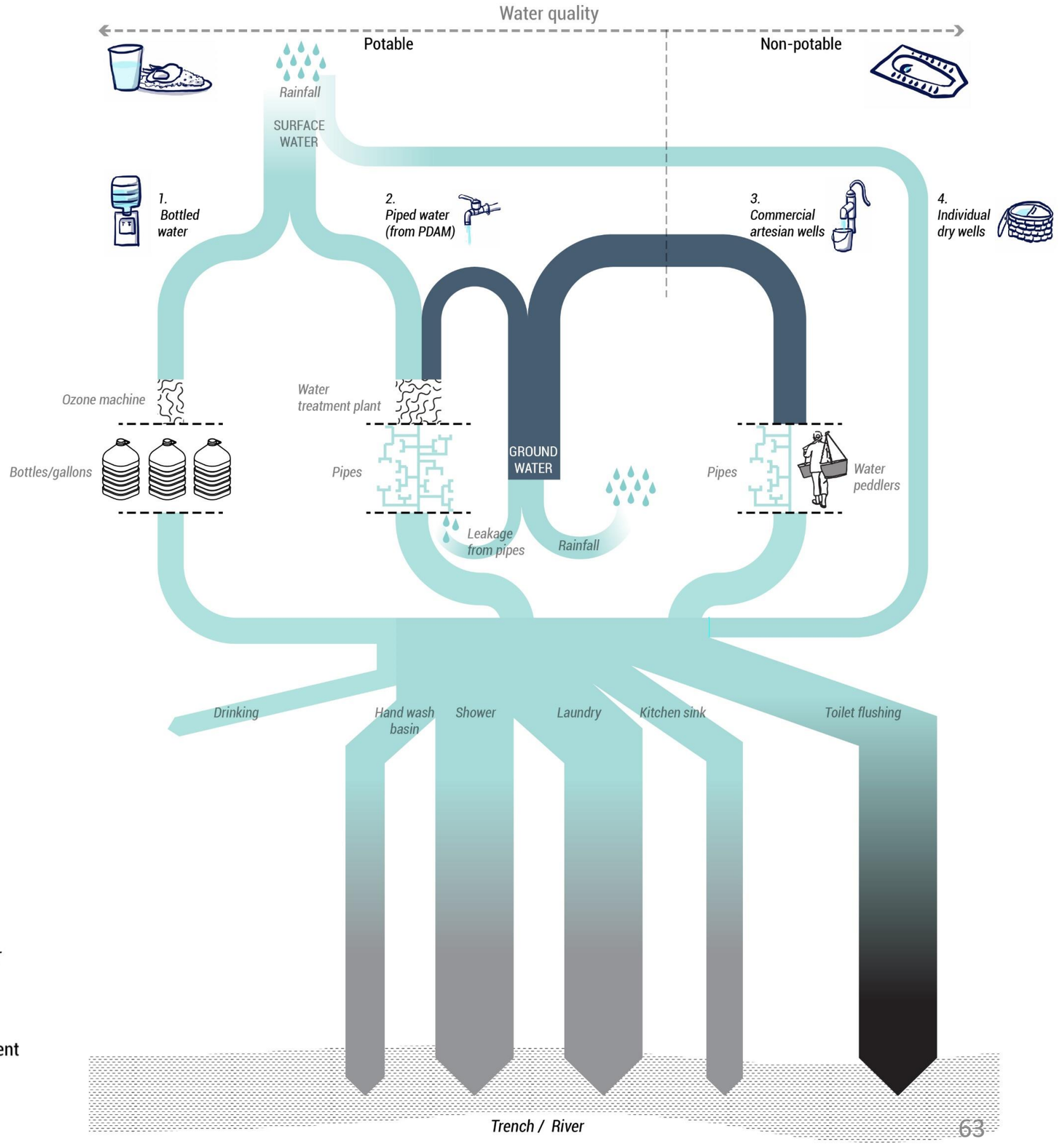
Current flow

- Bath houses
- Laundry
- Dish-washing



1. High-density riverside kampungs

Current flow



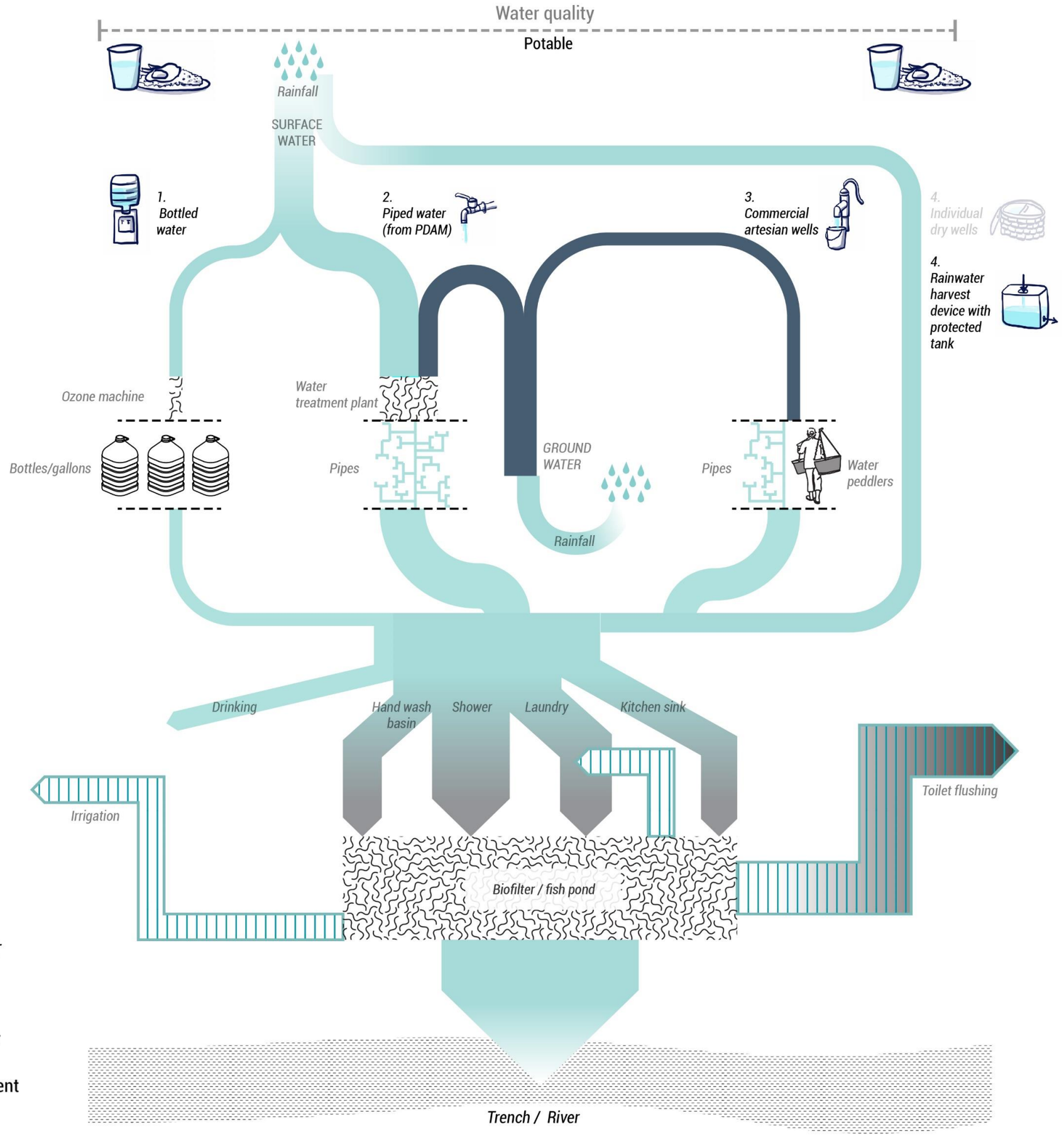
Surface water

Groundwater

Water treatment

1. High-density riverside kampu

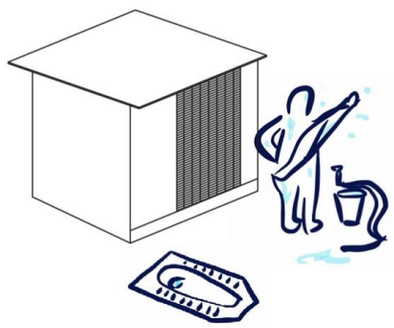
Proposed flow



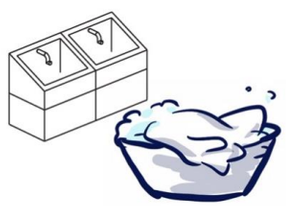
1. High-density riverside kampungs

Landscape pattern

Source of wastewater

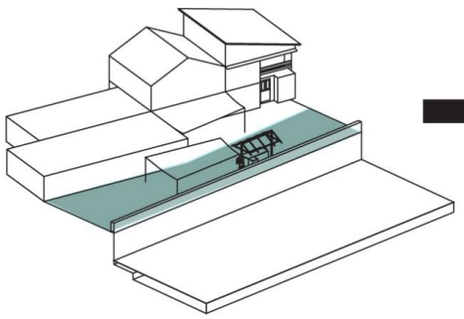


Shower or lavatory
(blackwater)

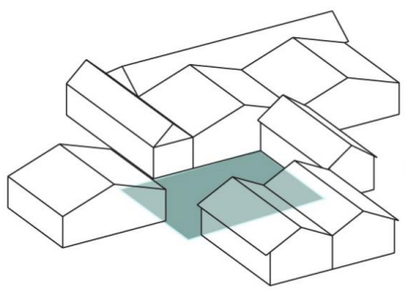


Laundry, washing
(grey water)

Spatial condition

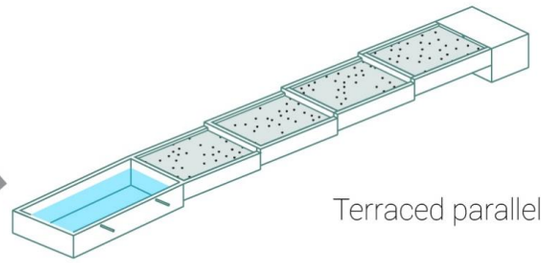


River edge

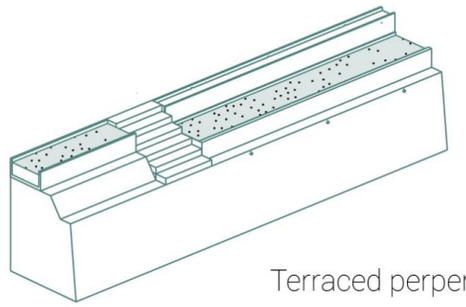


In between buildings

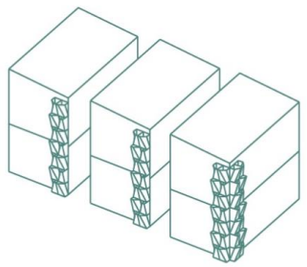
Design typology



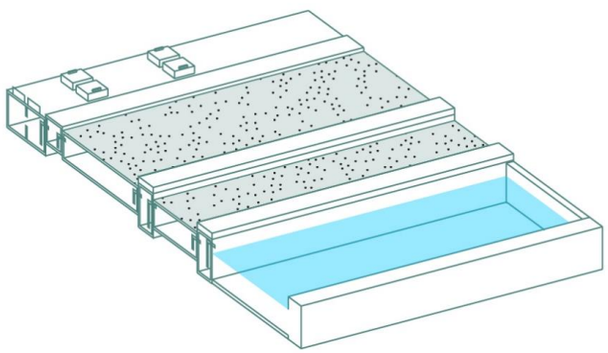
Terraced parallel to river edge



Terraced perpendicular to river edge



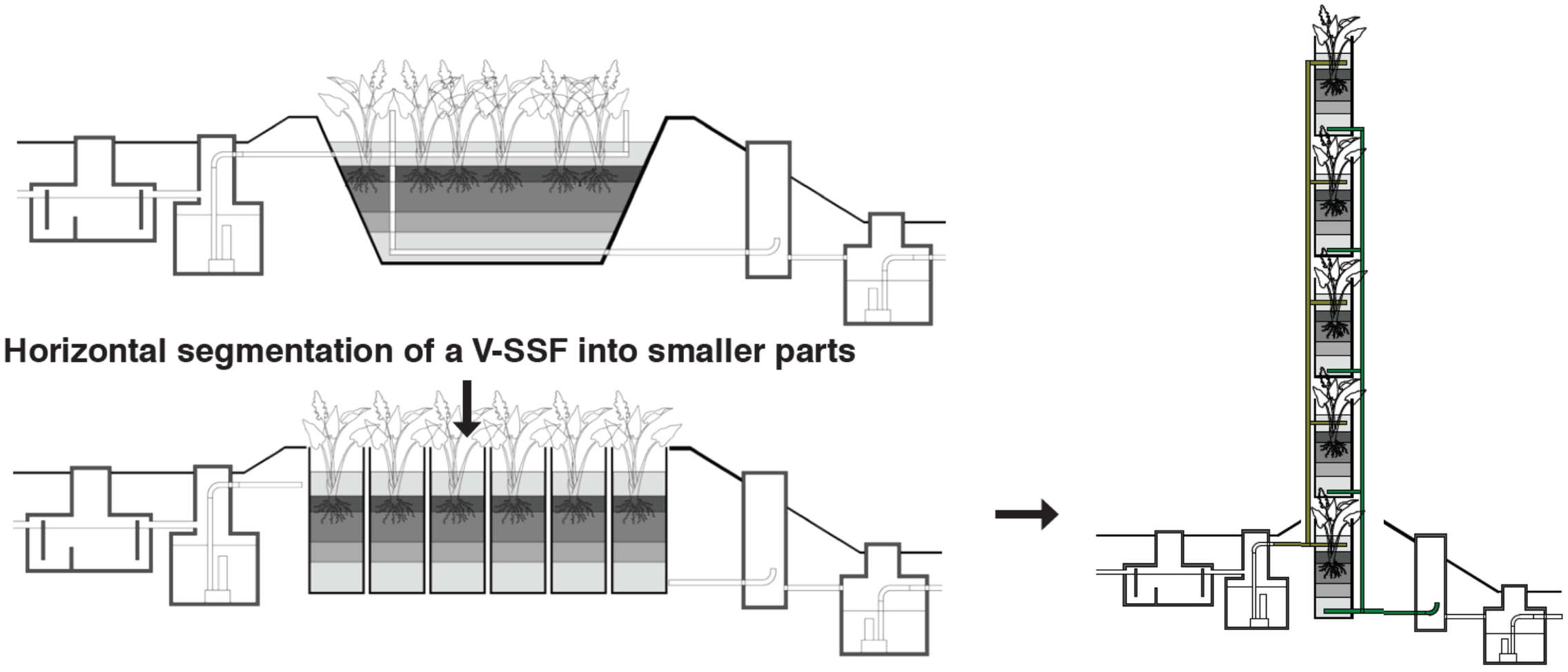
Vertical constructed "wetland"



Constructed wetland with aquaponics

1. High-density riverside kampungs

Landscape pattern

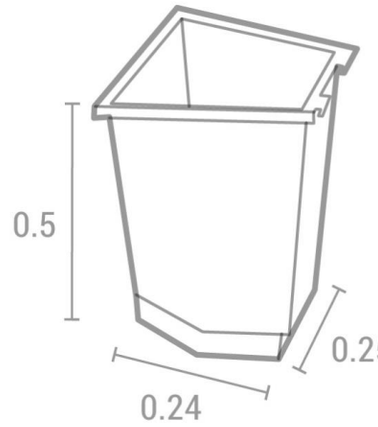


Credit: Panos Sakkas

1. High-density riverside kampungs

Landscape pattern

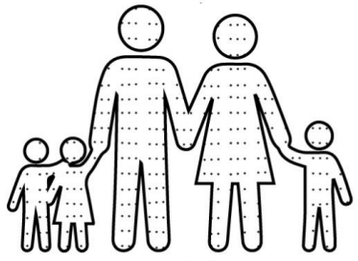
Device typology from ***Sakkas (2012)***:



Volume = 0.03 m^3

Capacity of treating water:
88 litre/day

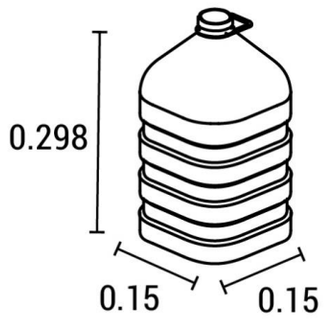
5-person
household



Hand wash basin
Shower
Kitchen sink
Laundry

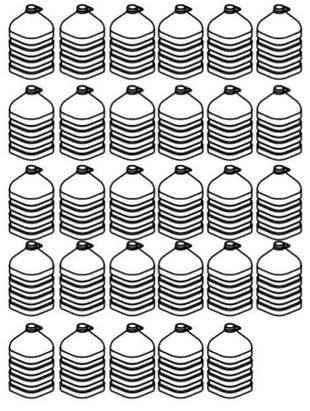
425 litre
of wastewater produced

Device made of typical 5-litre water bottle:



Volume = 0.005 m^3

Capacity of treating water:
14.67 litre/day

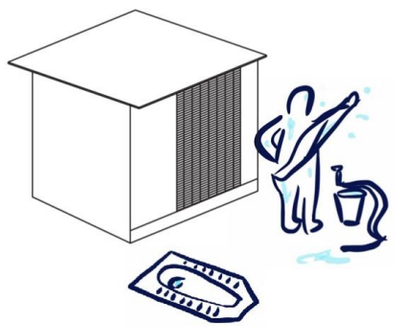


29 planters
needed for a 5-person household

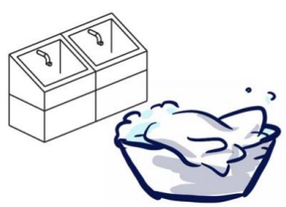
1. High-density riverside kampungs

Landscape pattern

Source of wastewater

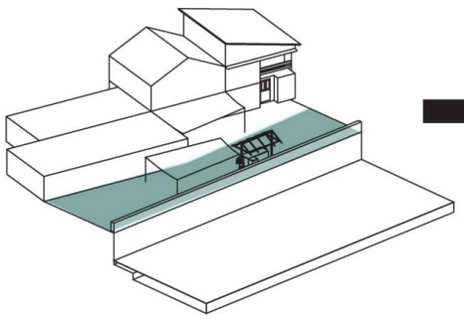


Shower or lavatory
(blackwater)

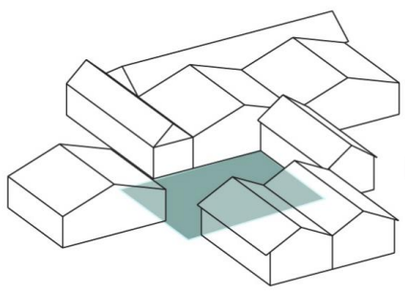


Laundry, washing
(grey water)

Spatial condition

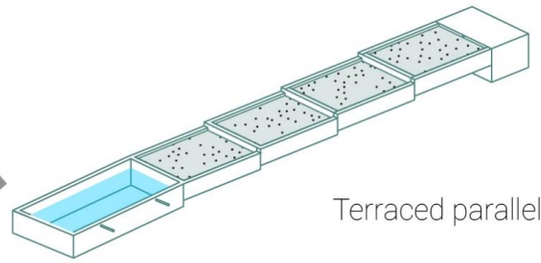


River edge

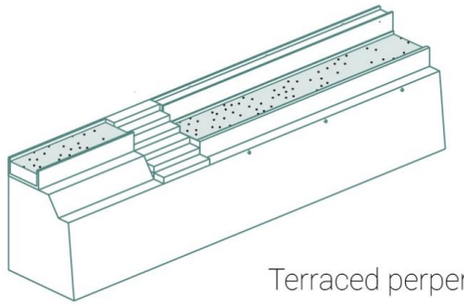


In between buildings

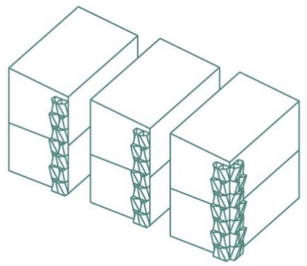
Design typology



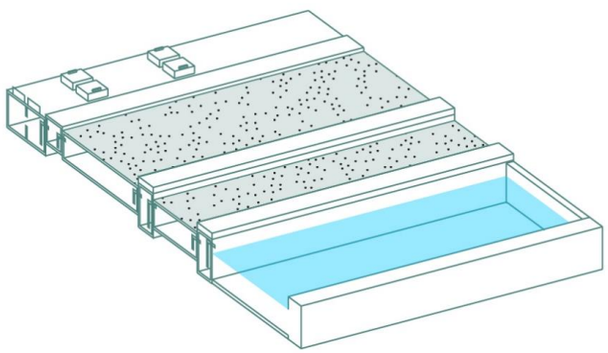
Terraced parallel to river edge



Terraced perpendicular to river edge



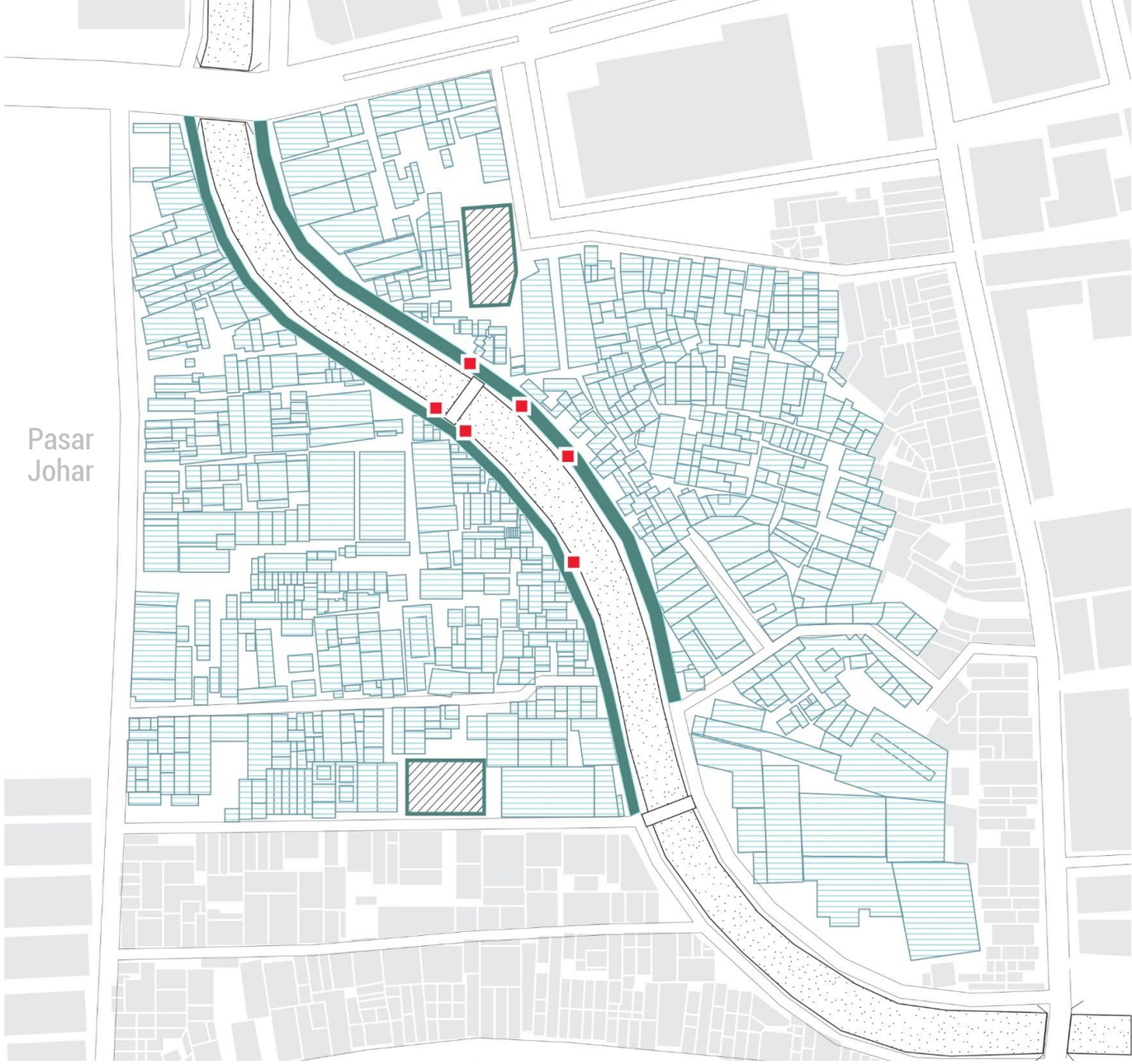
Vertical constructed "wetland"



Constructed wetland with aquaponics

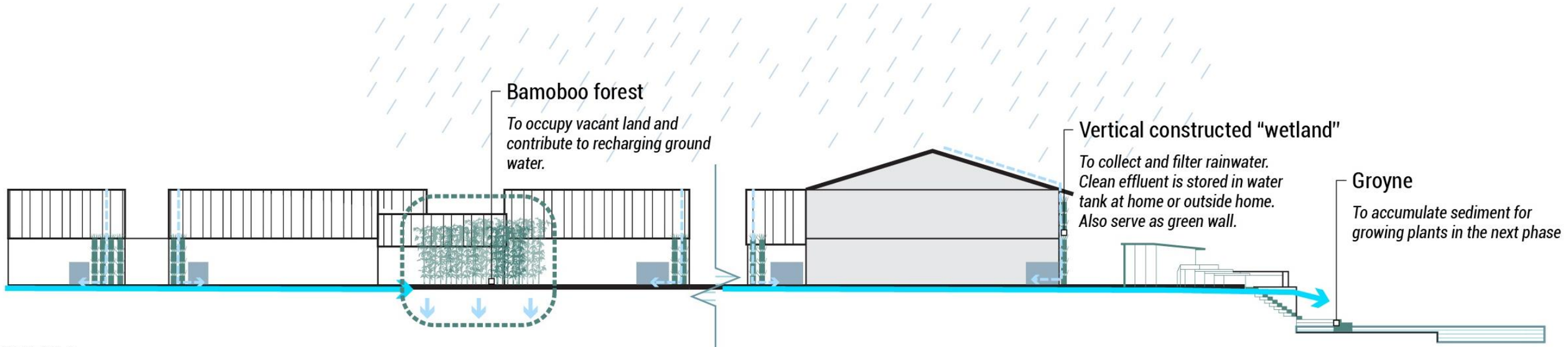
1. High-density riverside kampungs

Phase 1



Proposed

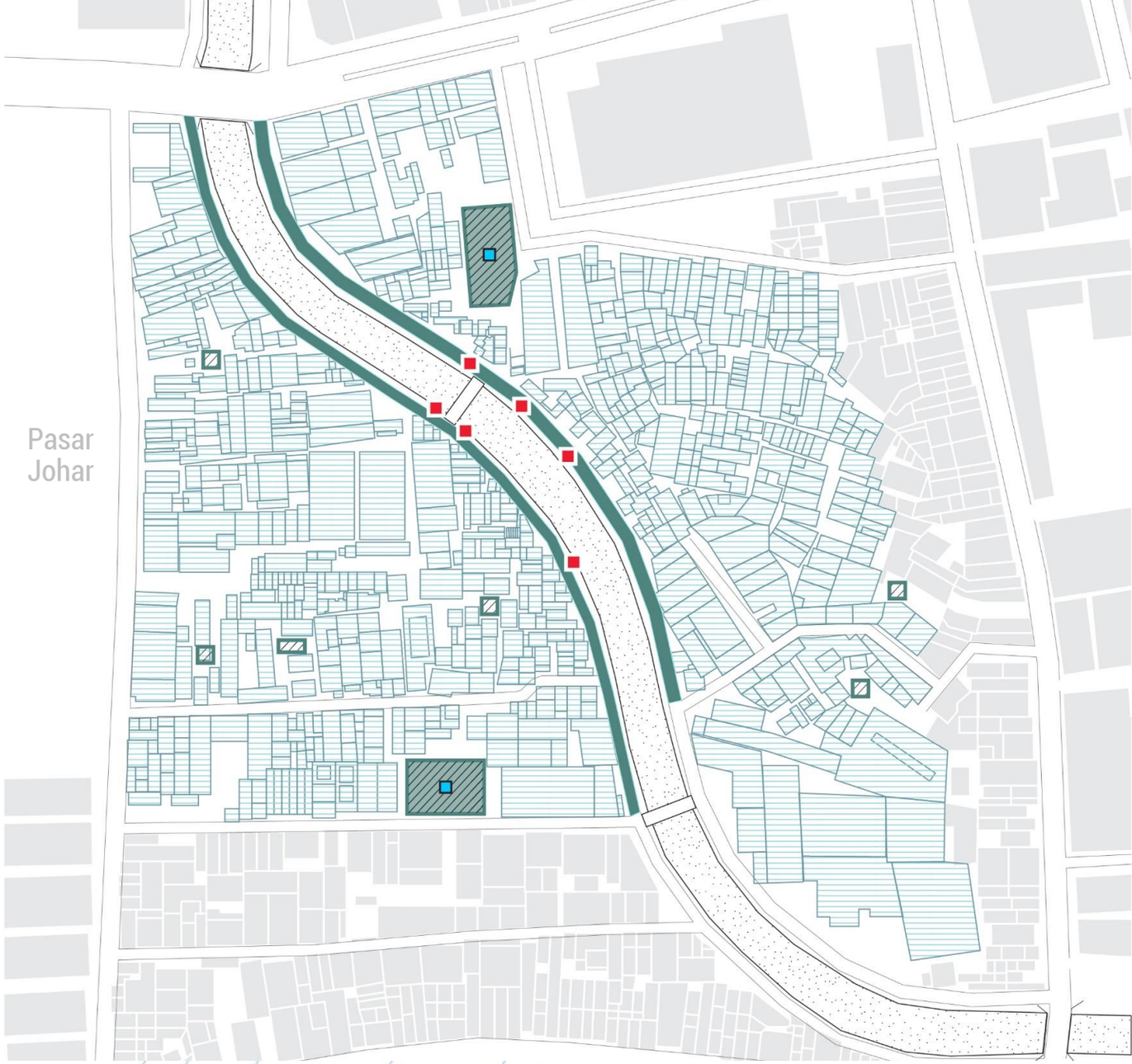
- Drainage flow
- Bamboo forest (phase 1)
- Rainwater harvest and communal space (phase 2)
- Wastewater purification (phase 3)
- Rainwater harvest structure and new water point (phase 3)
- Rainwater harvest from roof



PHASE 1

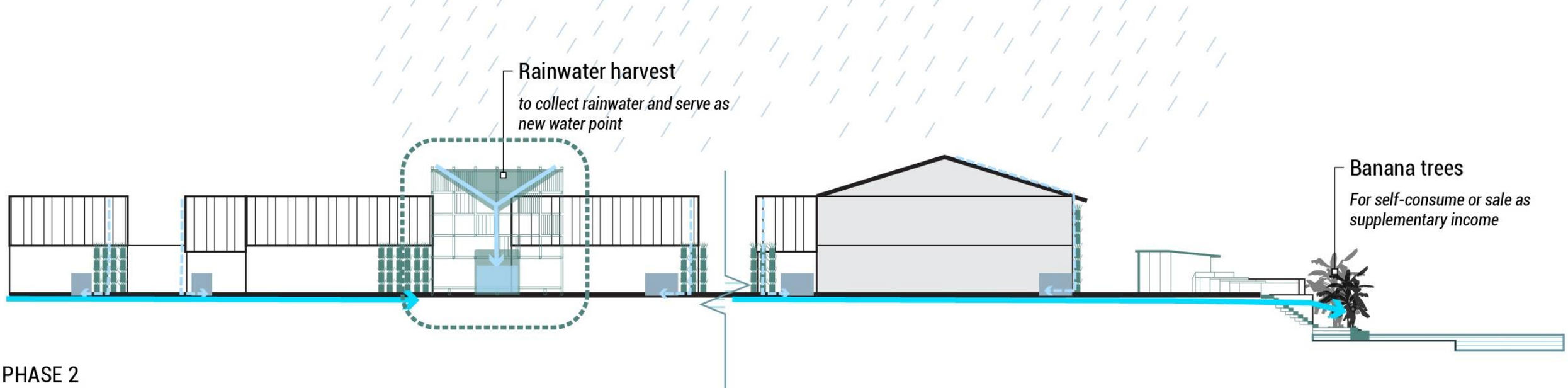
1. High-density riverside kampungs

Phase 2



Proposed

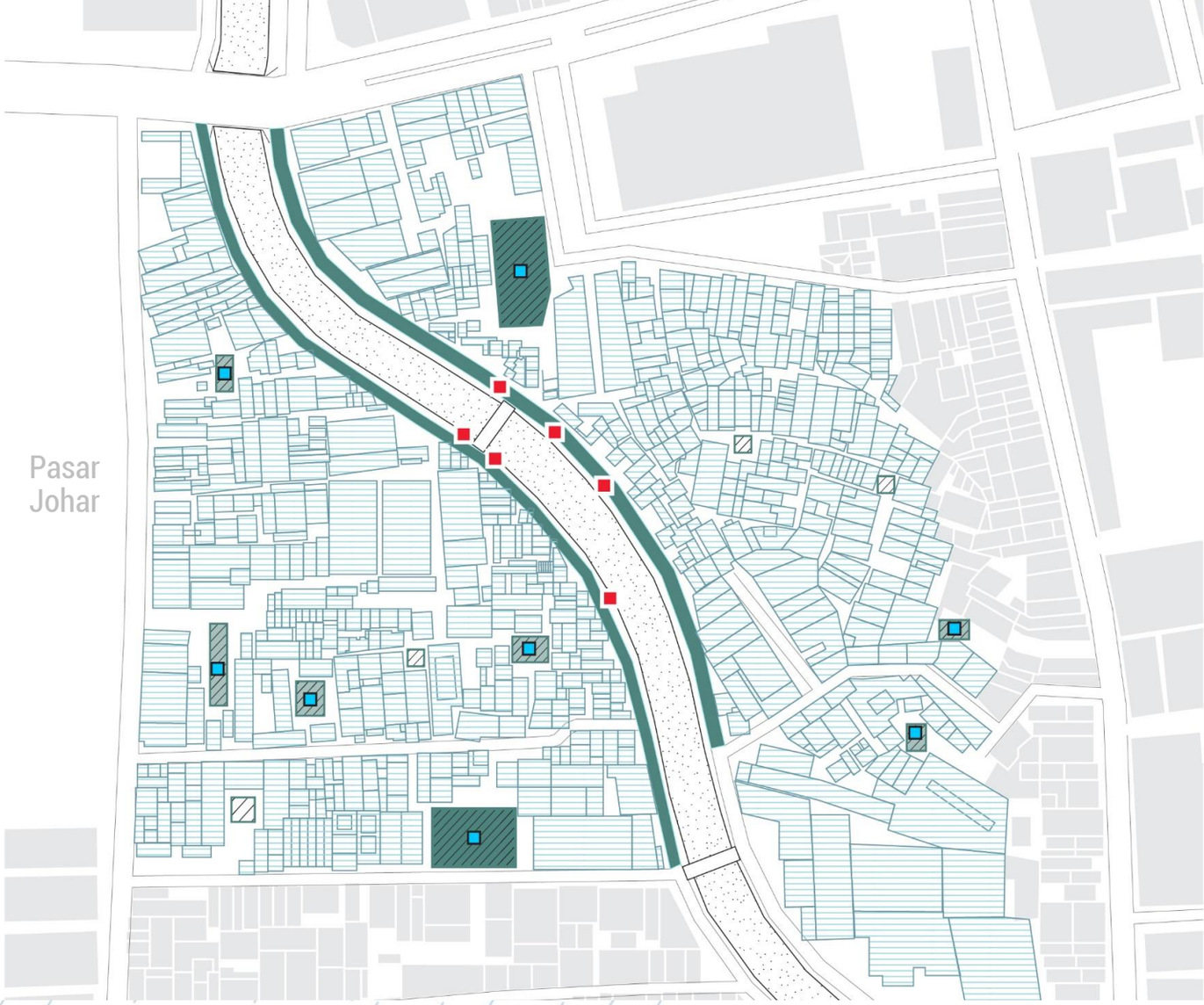
- Drainage flow
- Bamboo forest (phase 1)
- Rainwater harvest and communal space (phase 2)
- Wastewater purification (phase 3)
- Rainwater harvest structure and new water point (phase 3)
- Rainwater harvest from roof



PHASE 2

1. High-density riverside kampungs

Phase 3



Proposed

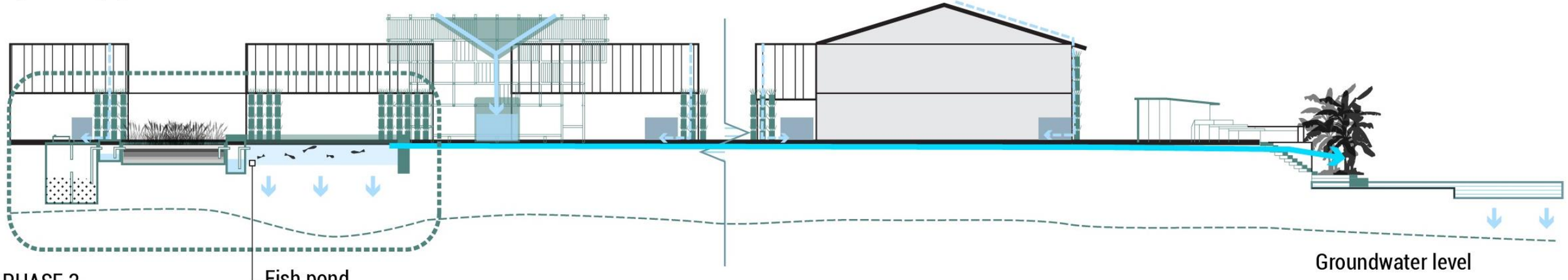
- Drainage flow
- Bamboo forest (phase 1)
- Rainwater harvest and communal space (phase 2)
- Wastewater purification (phase 3)
- Rainwater harvest structure and new water point (phase 3)
- Rainwater harvest from roof

Wastewater purification

Composed of septic tank, reed bed and fish pond with aquaponics

Expanded communal space

The communal space can be expanded with cut-down bamboos



PHASE 3

Fish pond

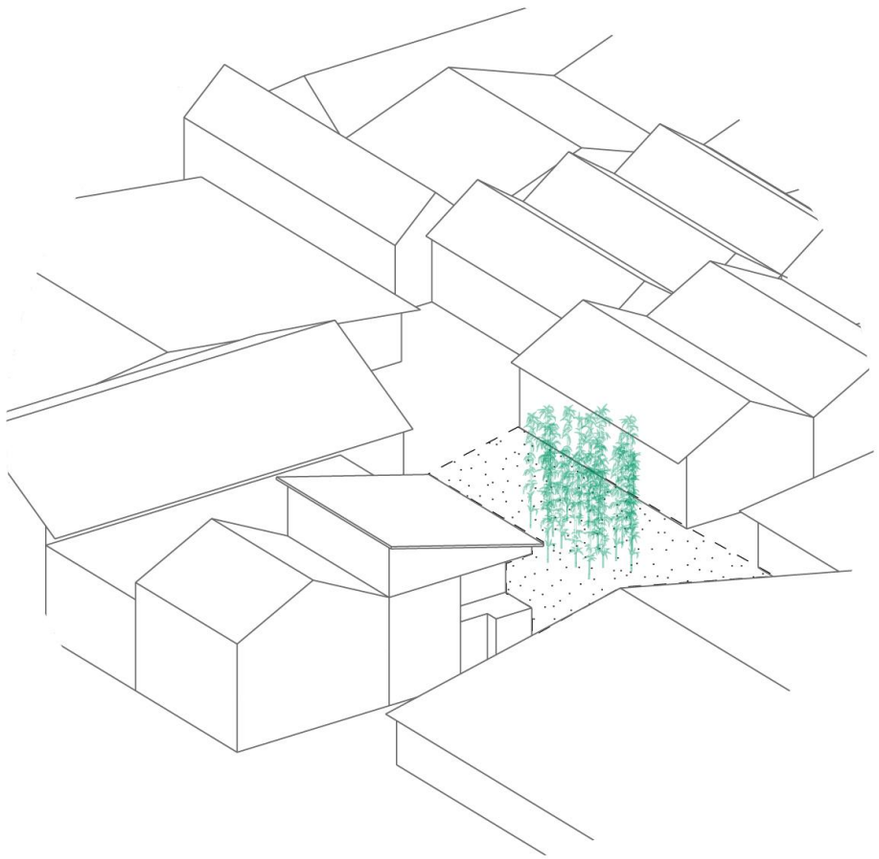
Retention of water allows infiltration to recharge ground water

Groundwater level

about 3 metres below the ground

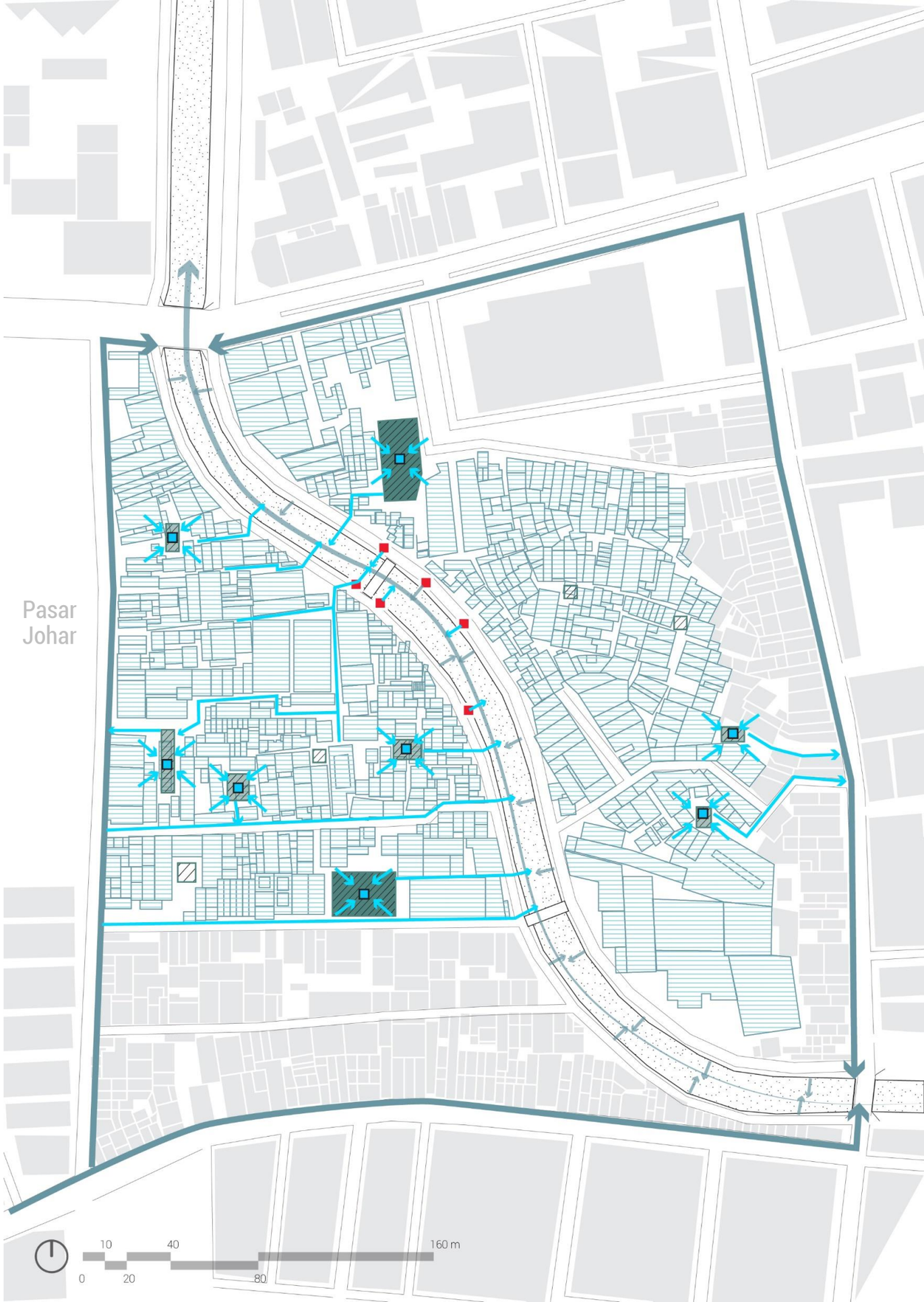
1. High-density riverside kampungs

Proposed flow



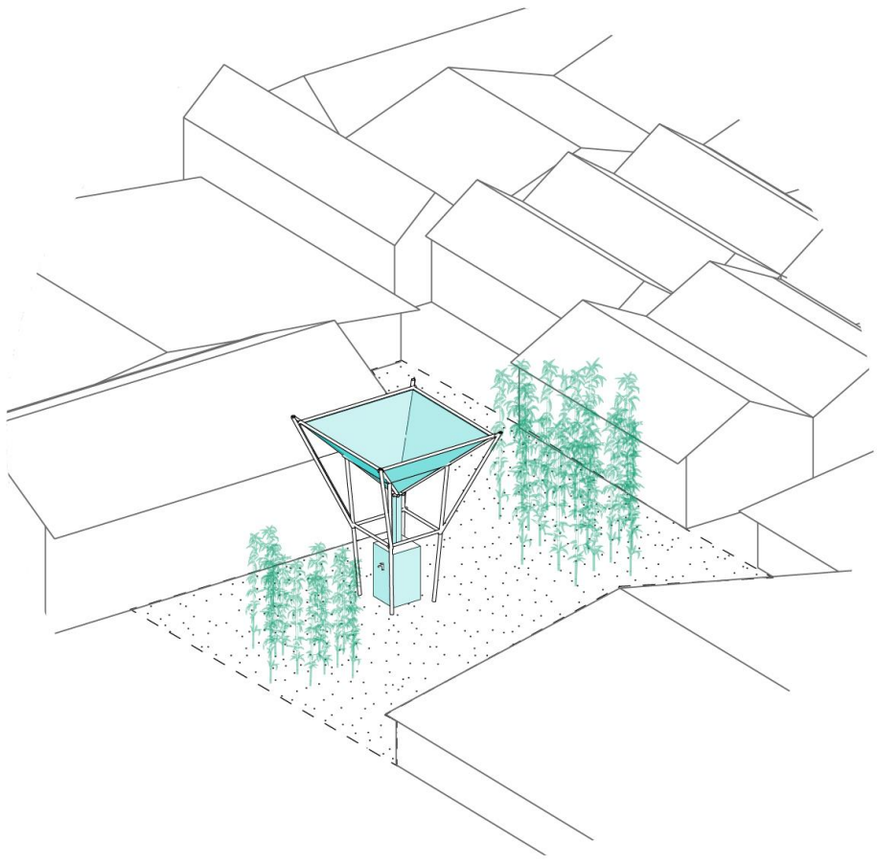
Proposed

- Drainage flow
- Bamboo forest (phase 1)
- Rainwater harvest and communal space (phase 2)
- Wastewater purification (phase 3)
- Rainwater harvest structure and new water point (phase 3)
- Rainwater harvest from roof



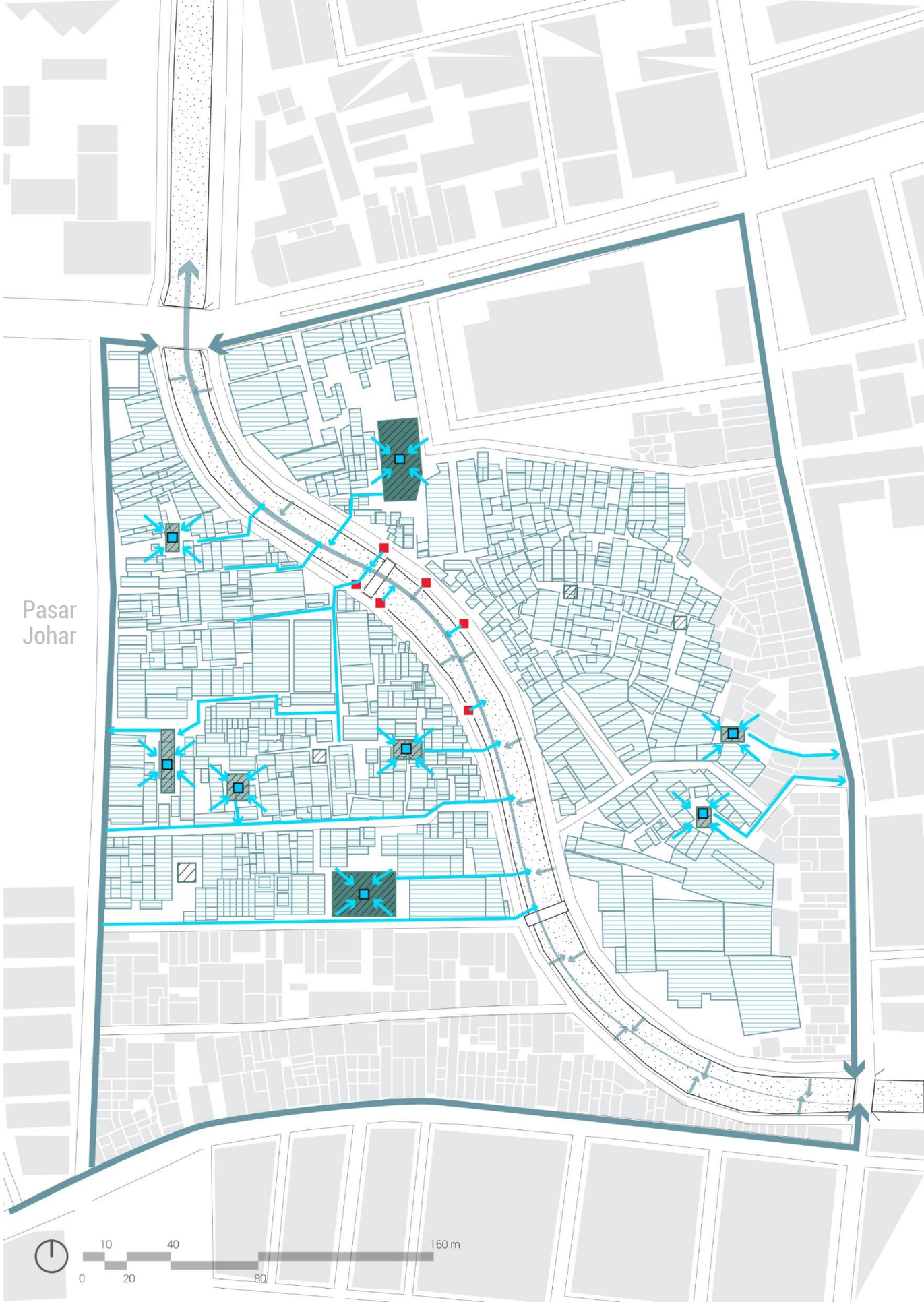
1. High-density riverside kampungs

Proposed flow



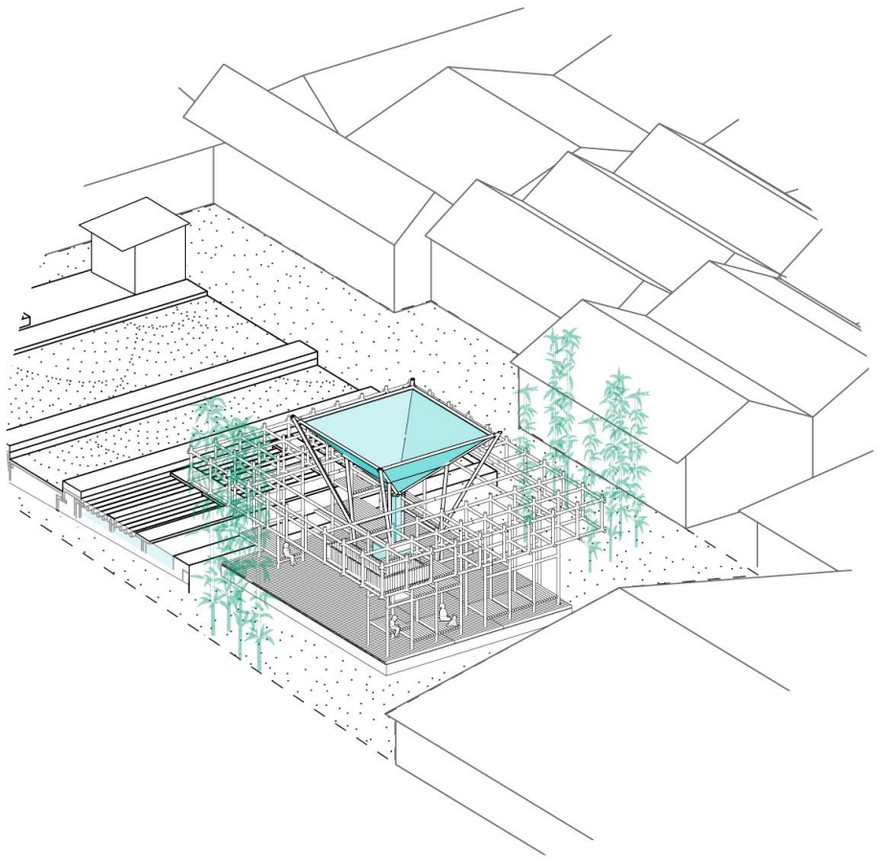
Proposed

- Drainage flow
- Bamboo forest (phase 1)
- Rainwater harvest and communal space (phase 2)
- Wastewater purification (phase 3)
- Rainwater harvest structure and new water point (phase 3)
- Rainwater harvest from roof



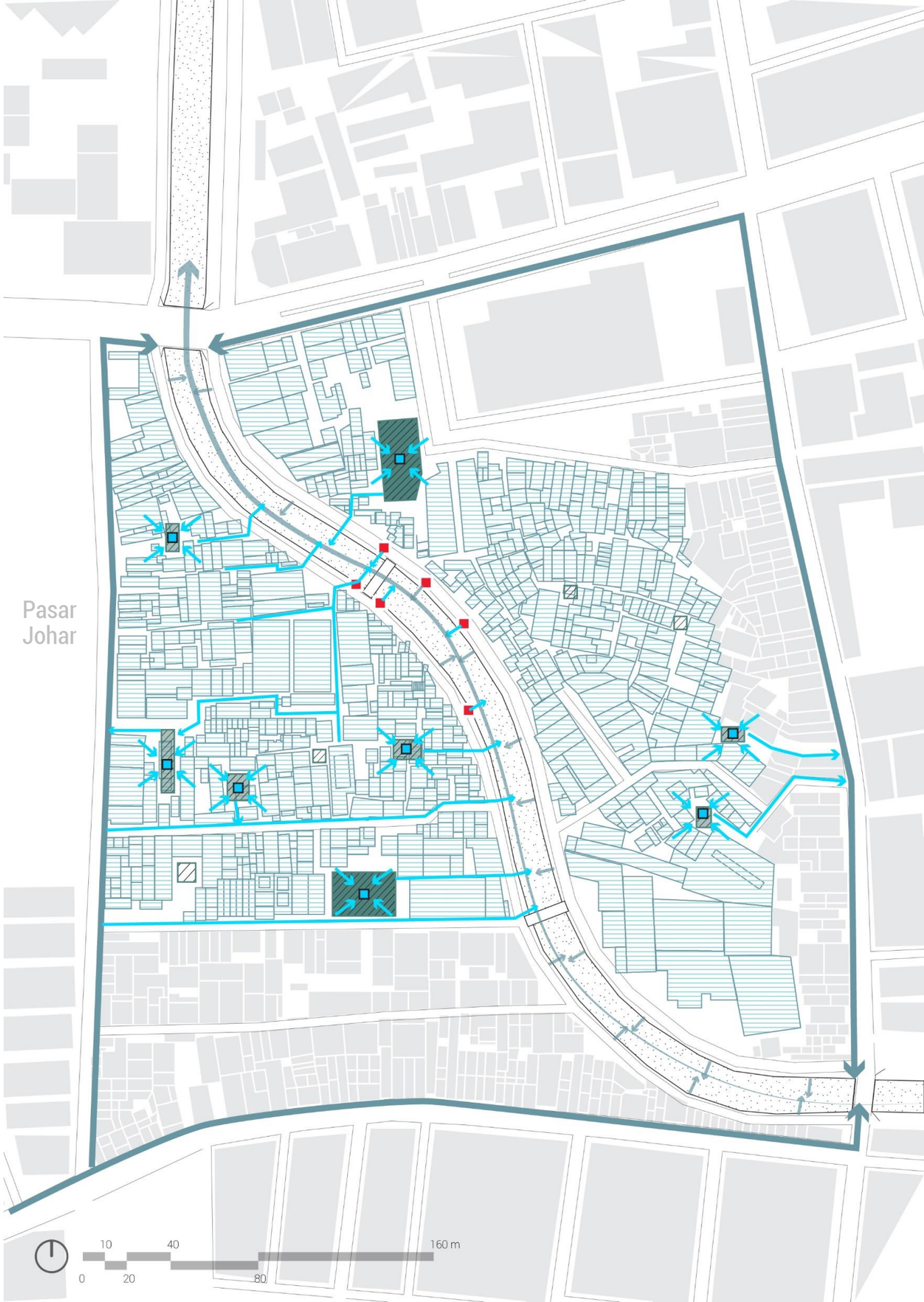
1. High-density riverside kampungs

Proposed flow



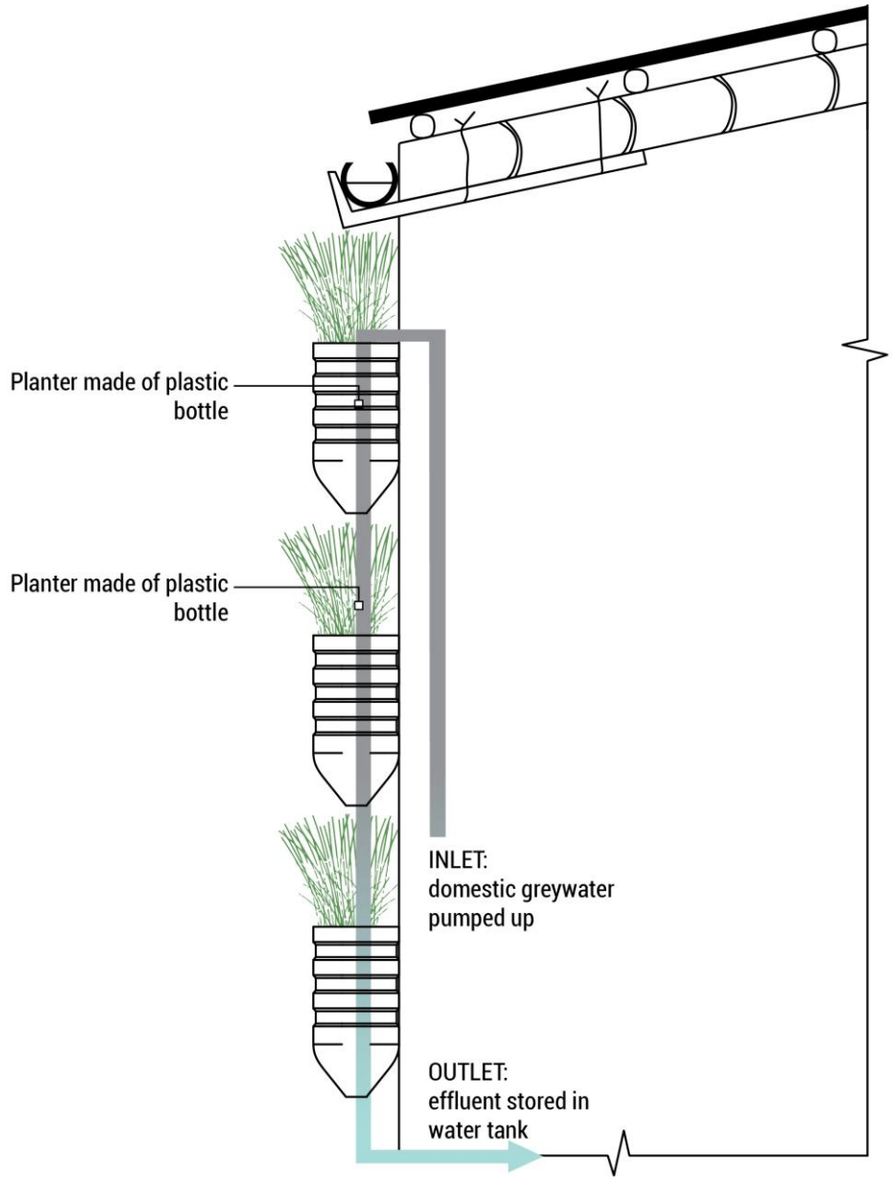
Proposed

- Drainage flow
- Bamboo forest (phase 1)
- Rainwater harvest and communal space (phase 2)
- Wastewater purification (phase 3)
- Rainwater harvest structure and new water point (phase 3)
- Rainwater harvest from roof



1. High-density riverside kampungs

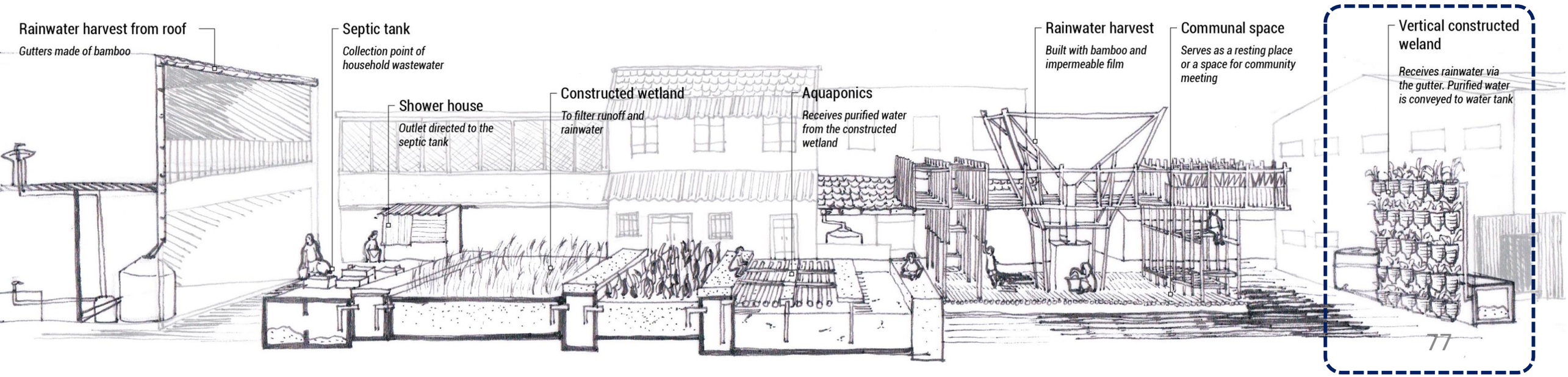
Proposed flow



Eriocaulon zollingerianum

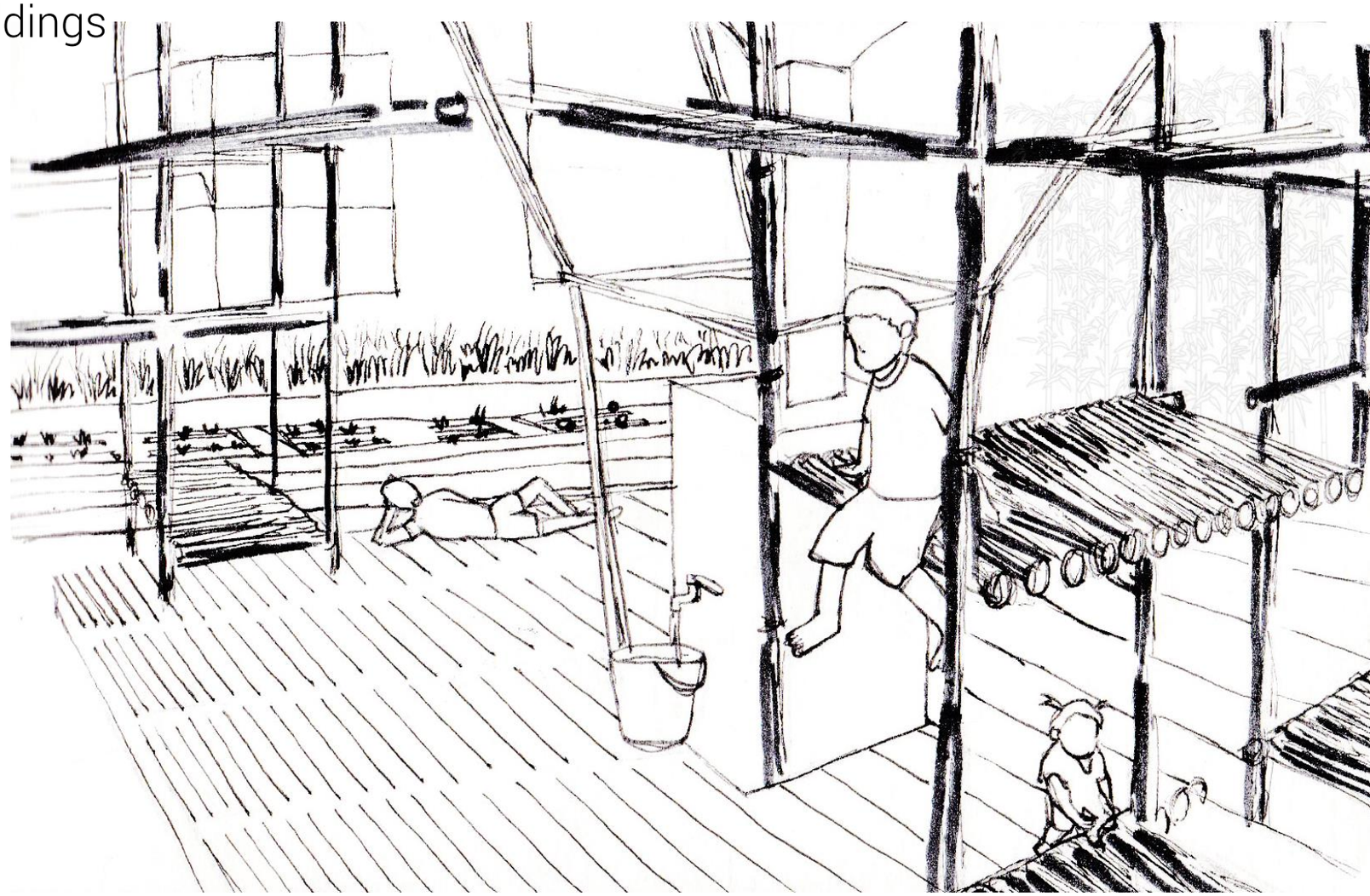
Hanguana malayana

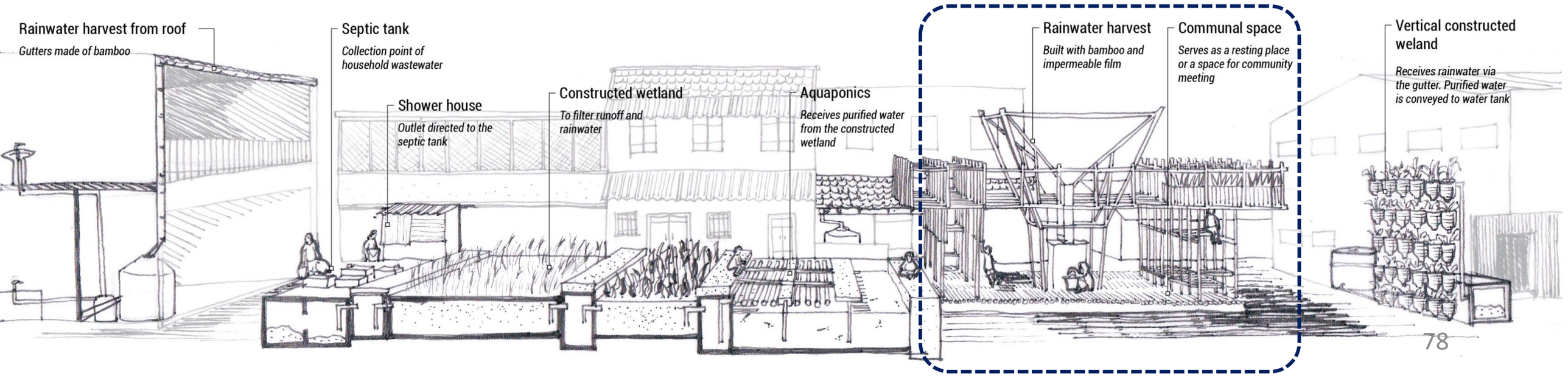
Philydrum lanuginosum



1. High-density riverside kampungs

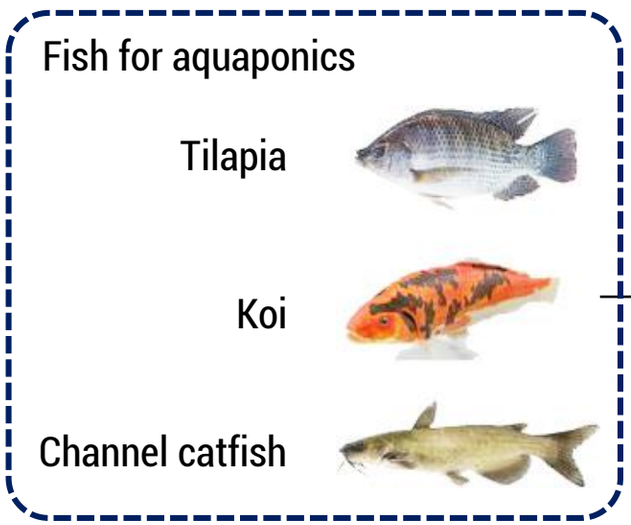
Productive landscape in between buildings

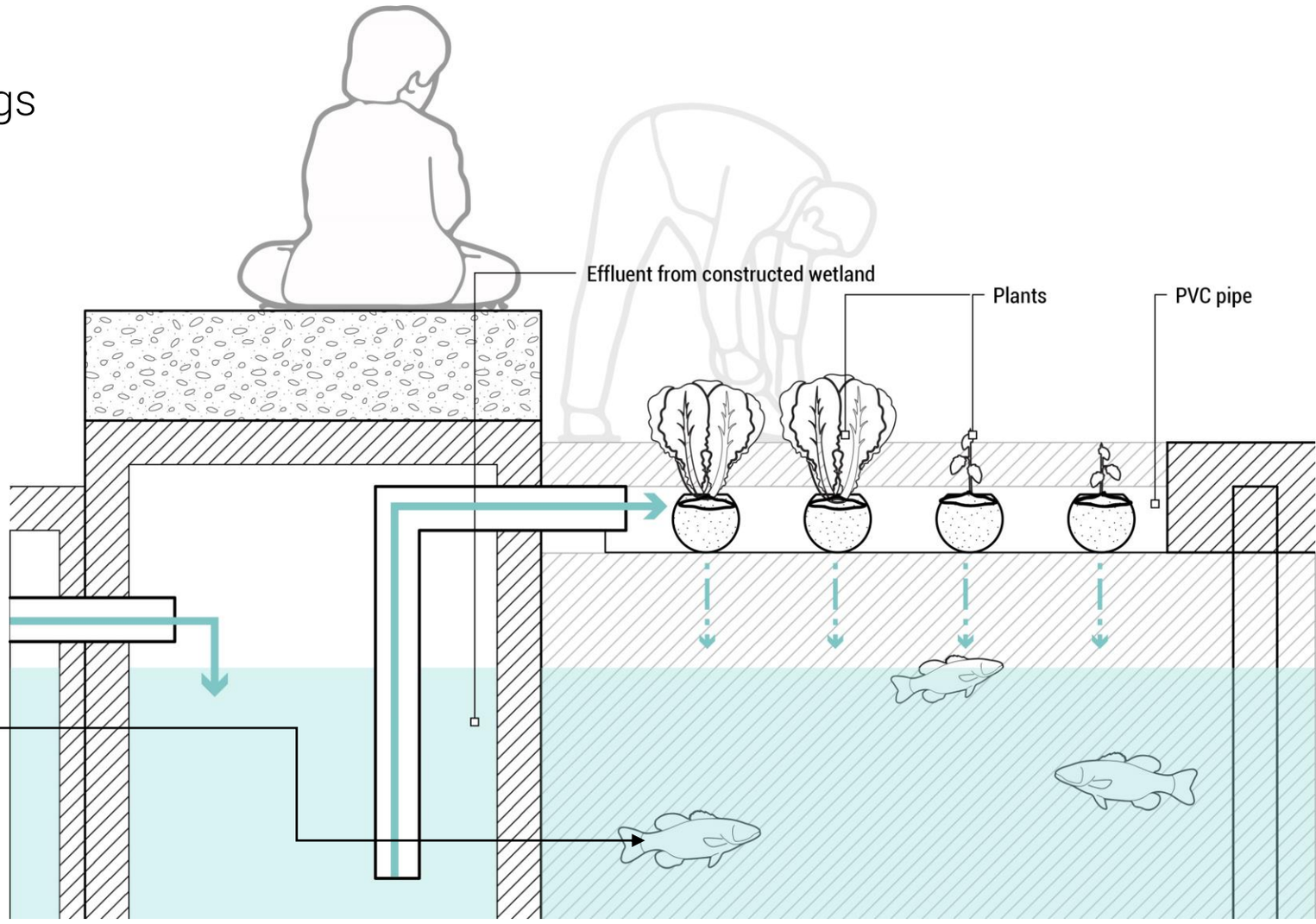


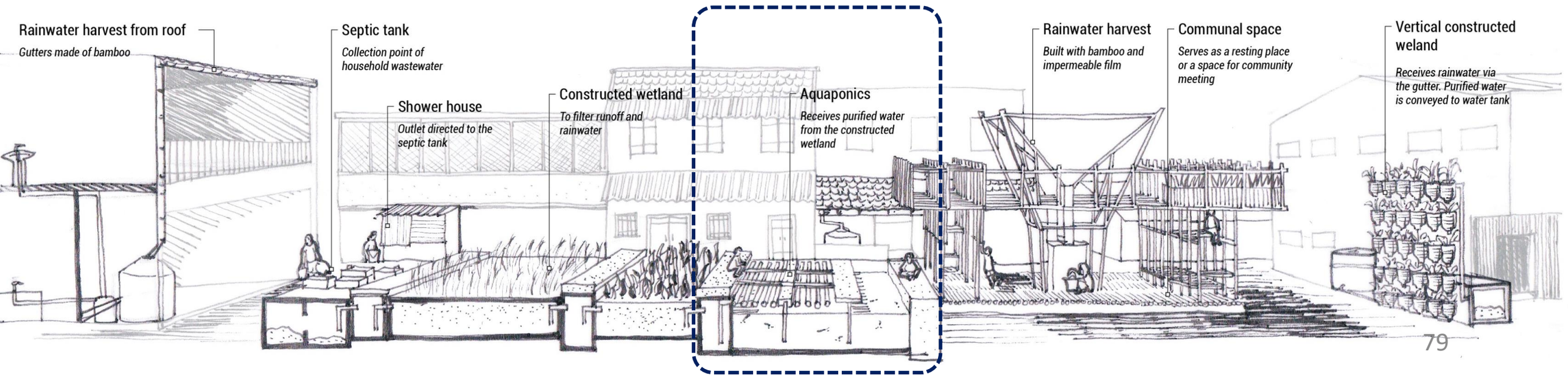


1. High-density riverside kampungs

Productive landscape in between buildings

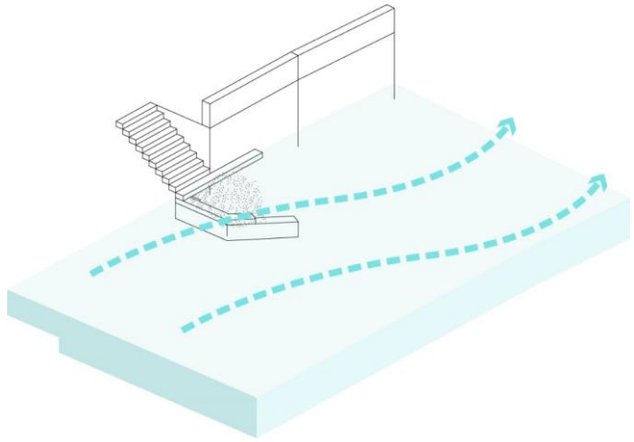


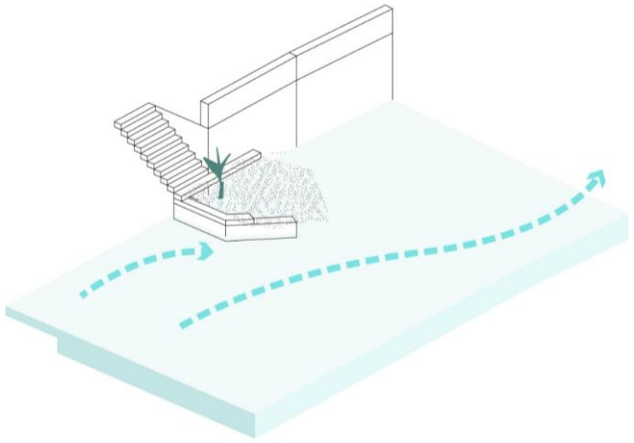


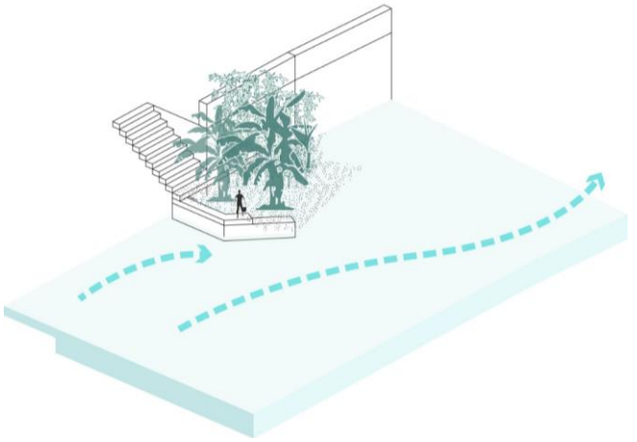


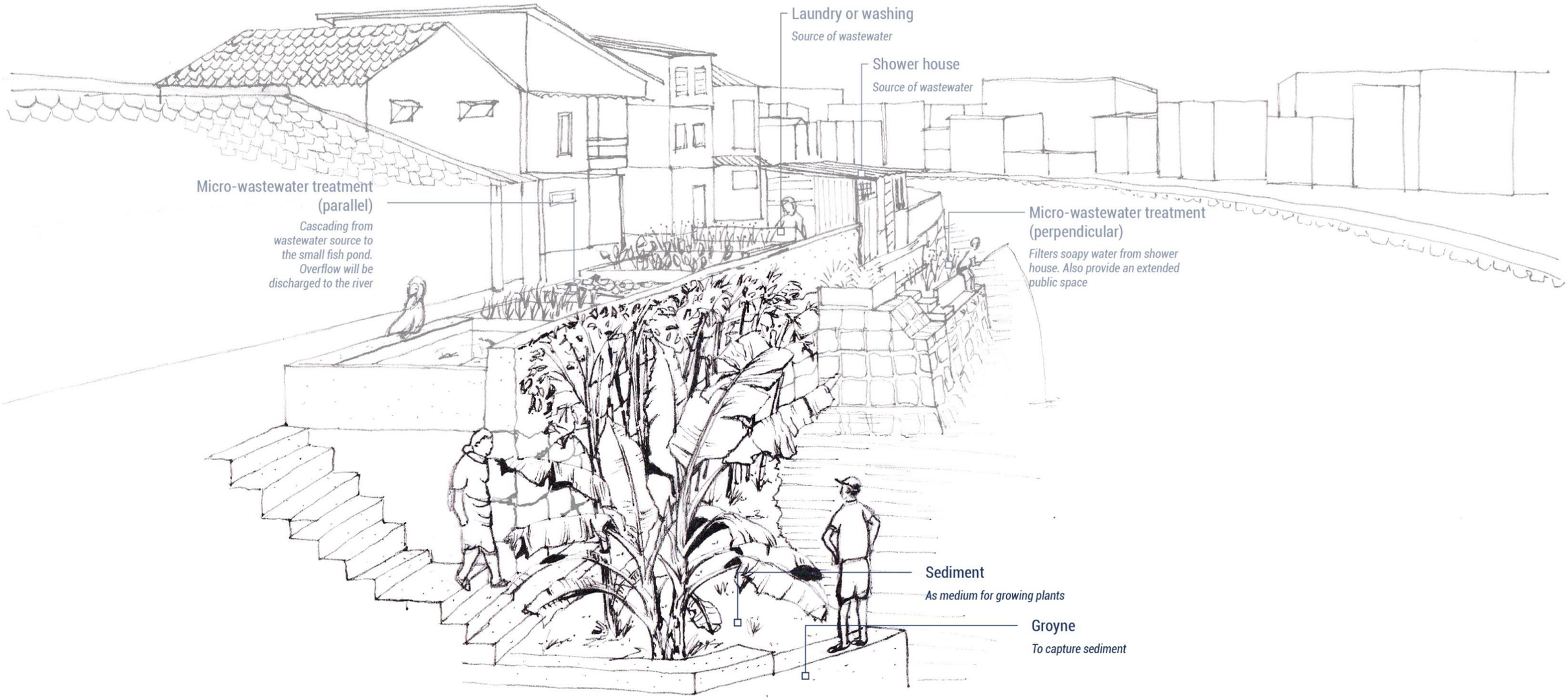
1. High-density riverside kampungs

Productive landscape at river edge



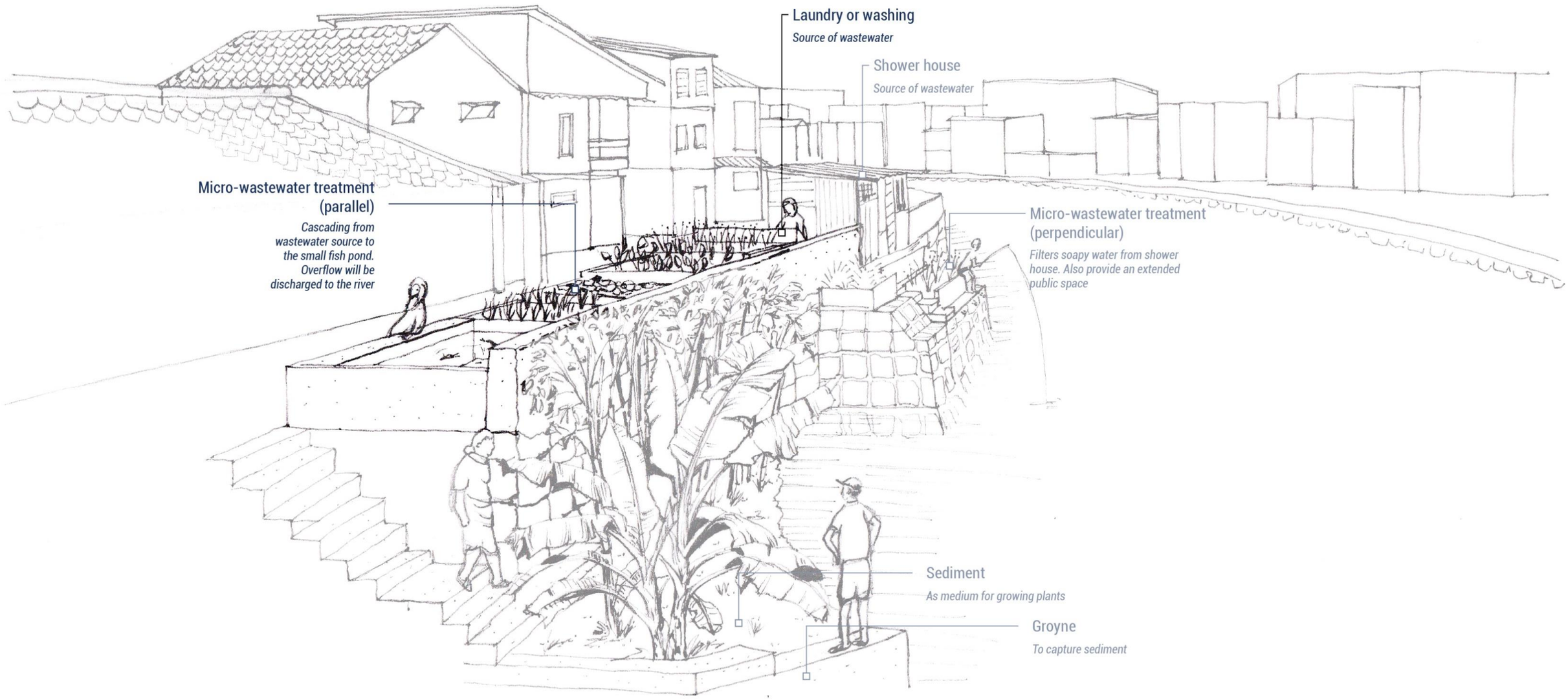






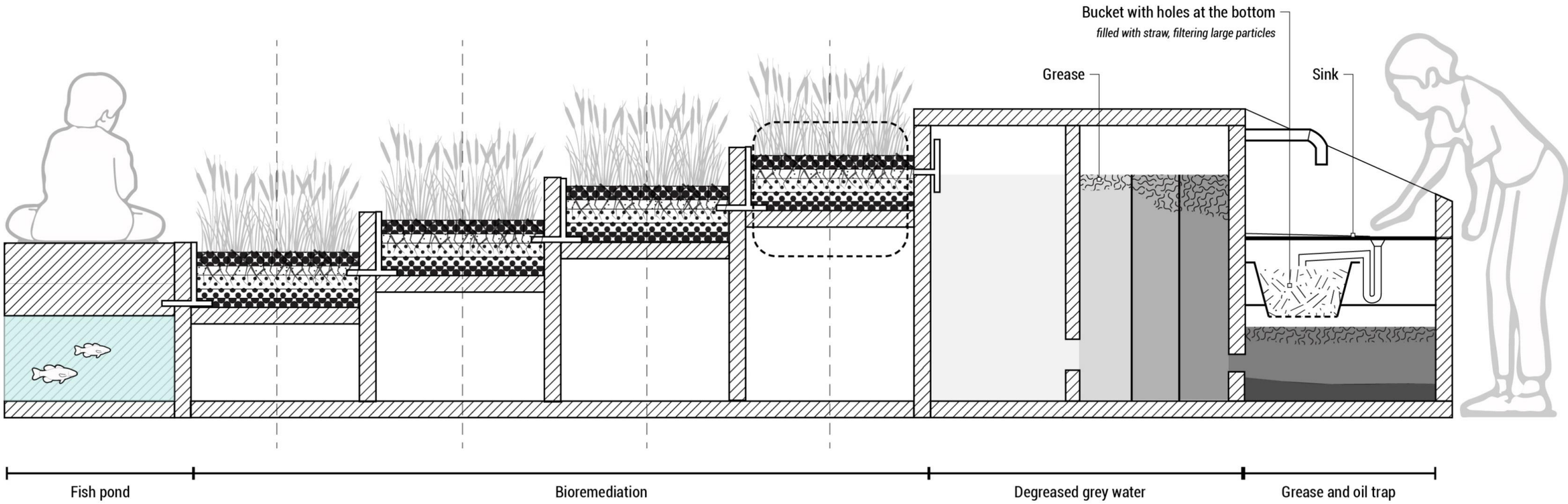
1. High-density riverside kampungs

Micro-wastewater treatment (parallel to river edge)



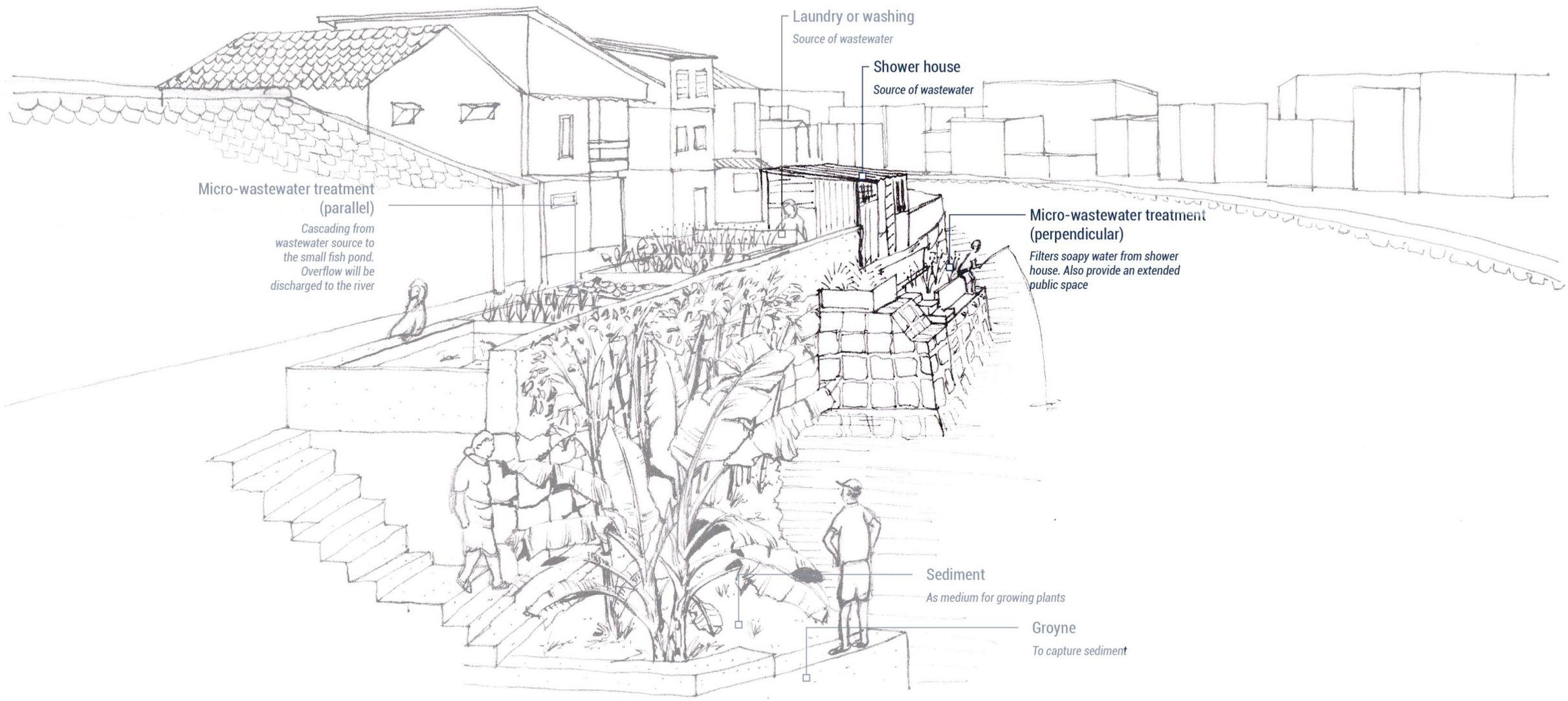
1. High-density riverside kampungs

Detailed section of micro-wastewater treatment (parallel to river edge)



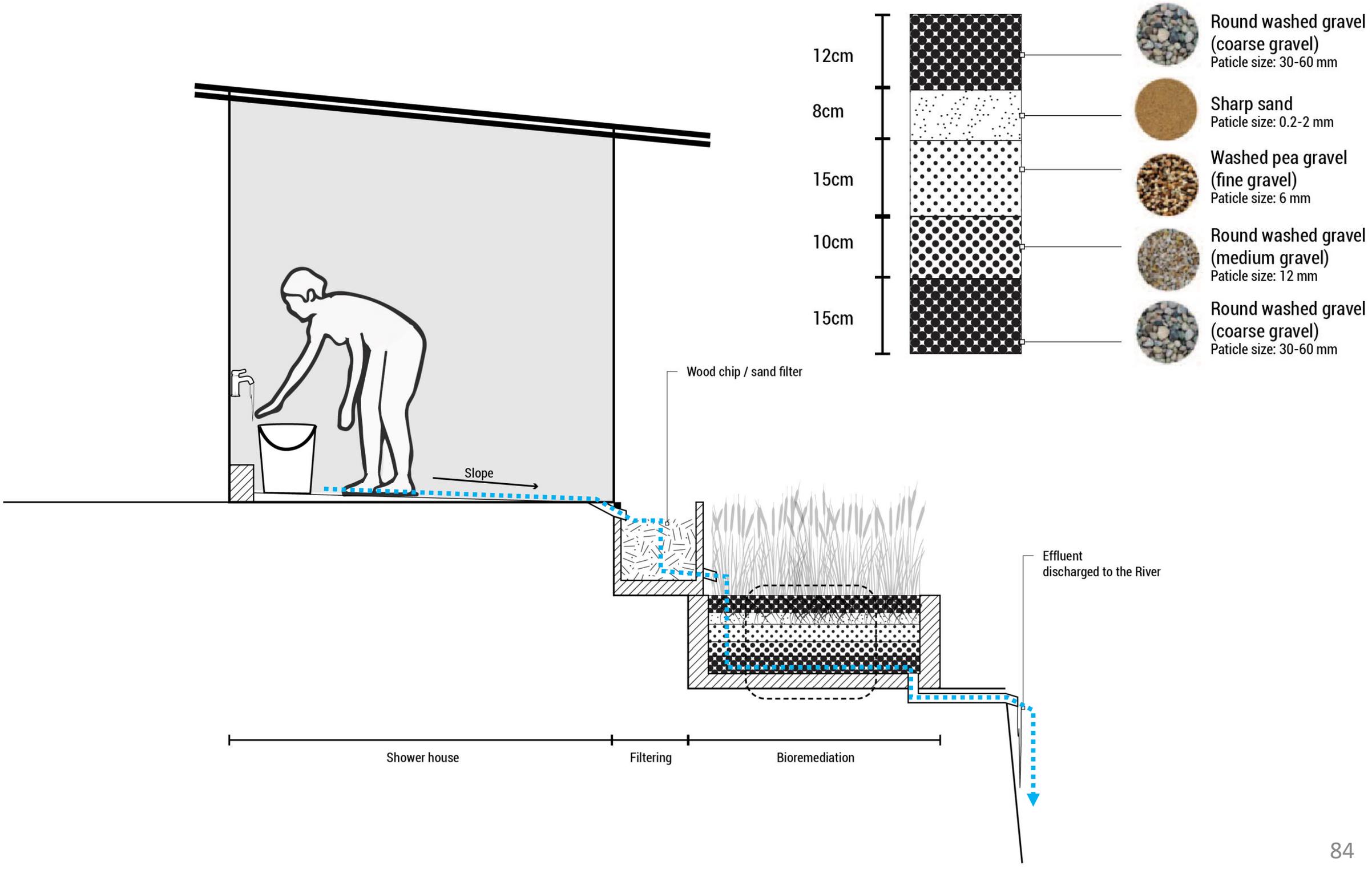
1. High-density riverside kampungs

Micro-wastewater treatment (perpendicular to river edge)



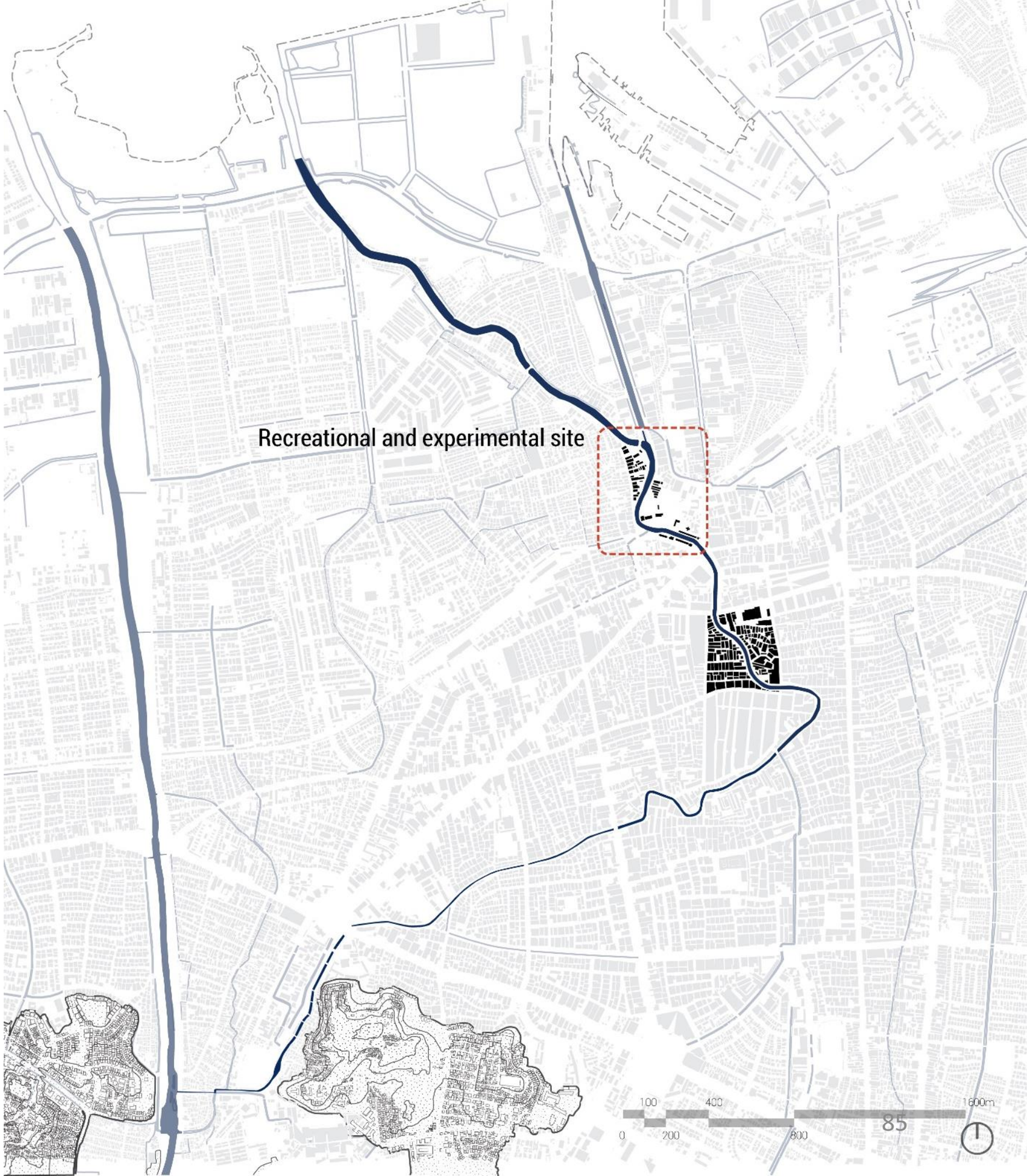
1. High-density riverside kampungs

Detailed section of micro-wastewater treatment (perpendicular to river edge)



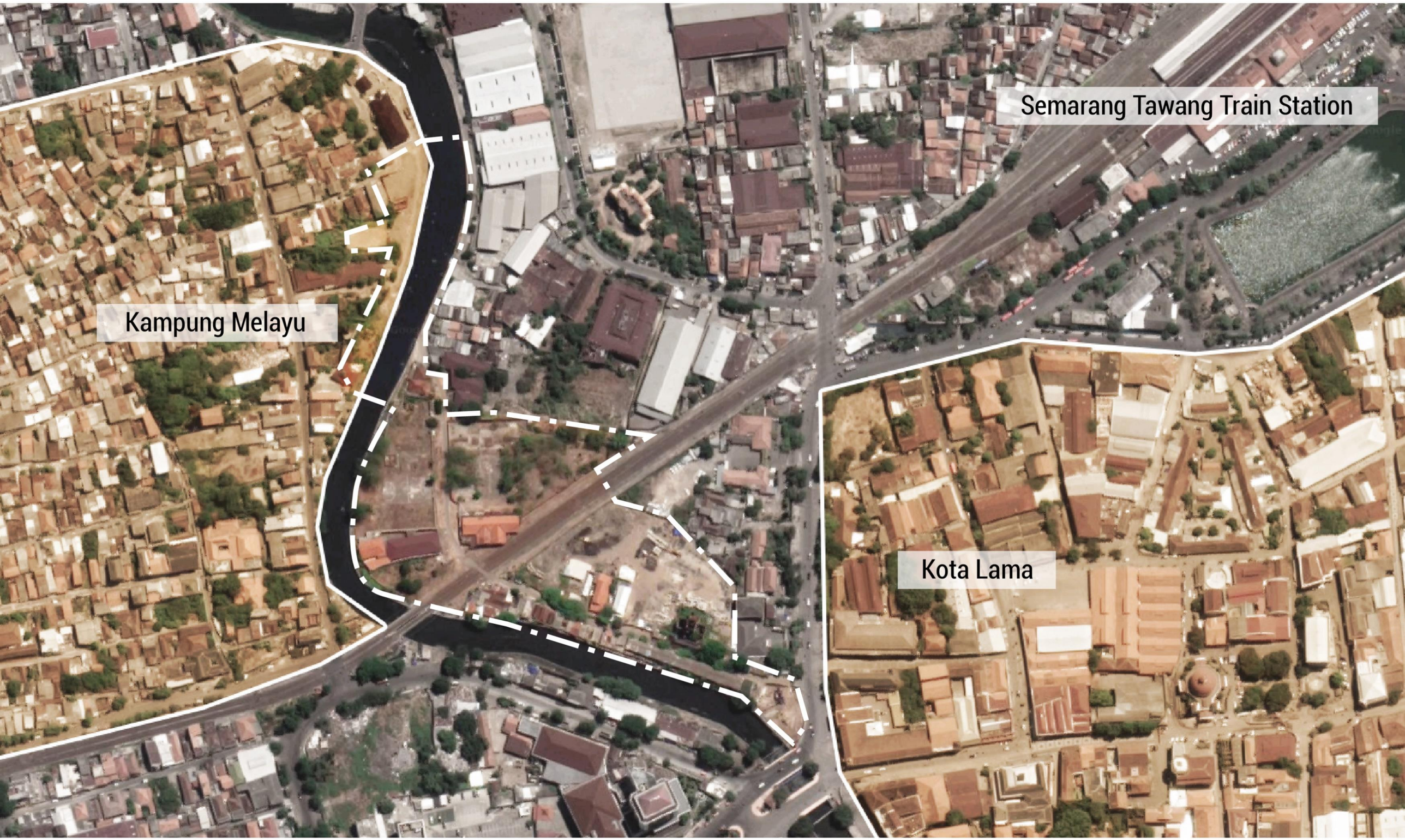
2. Recreational and experimental site

Location



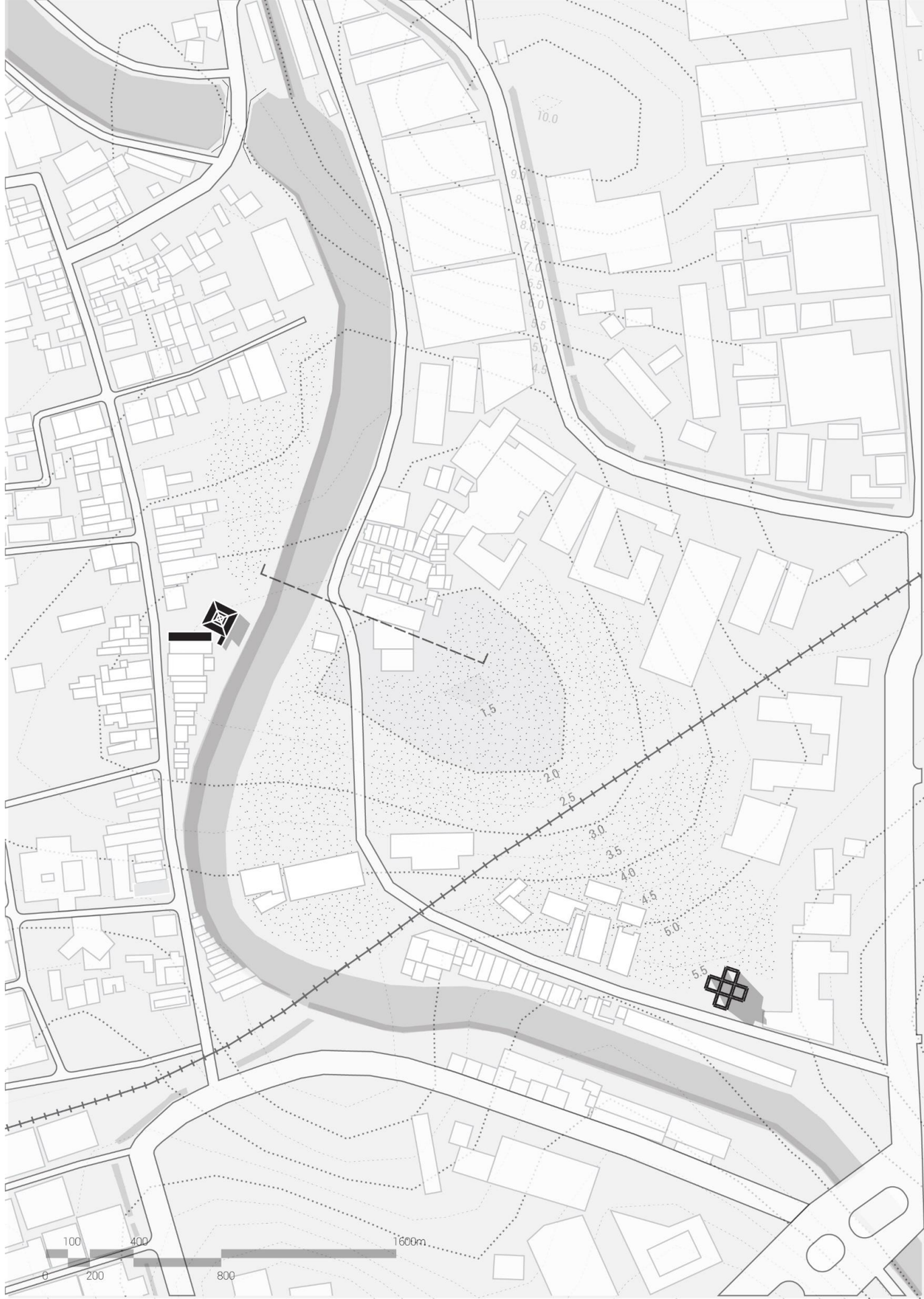
1. High-density riverside kampungs

Location



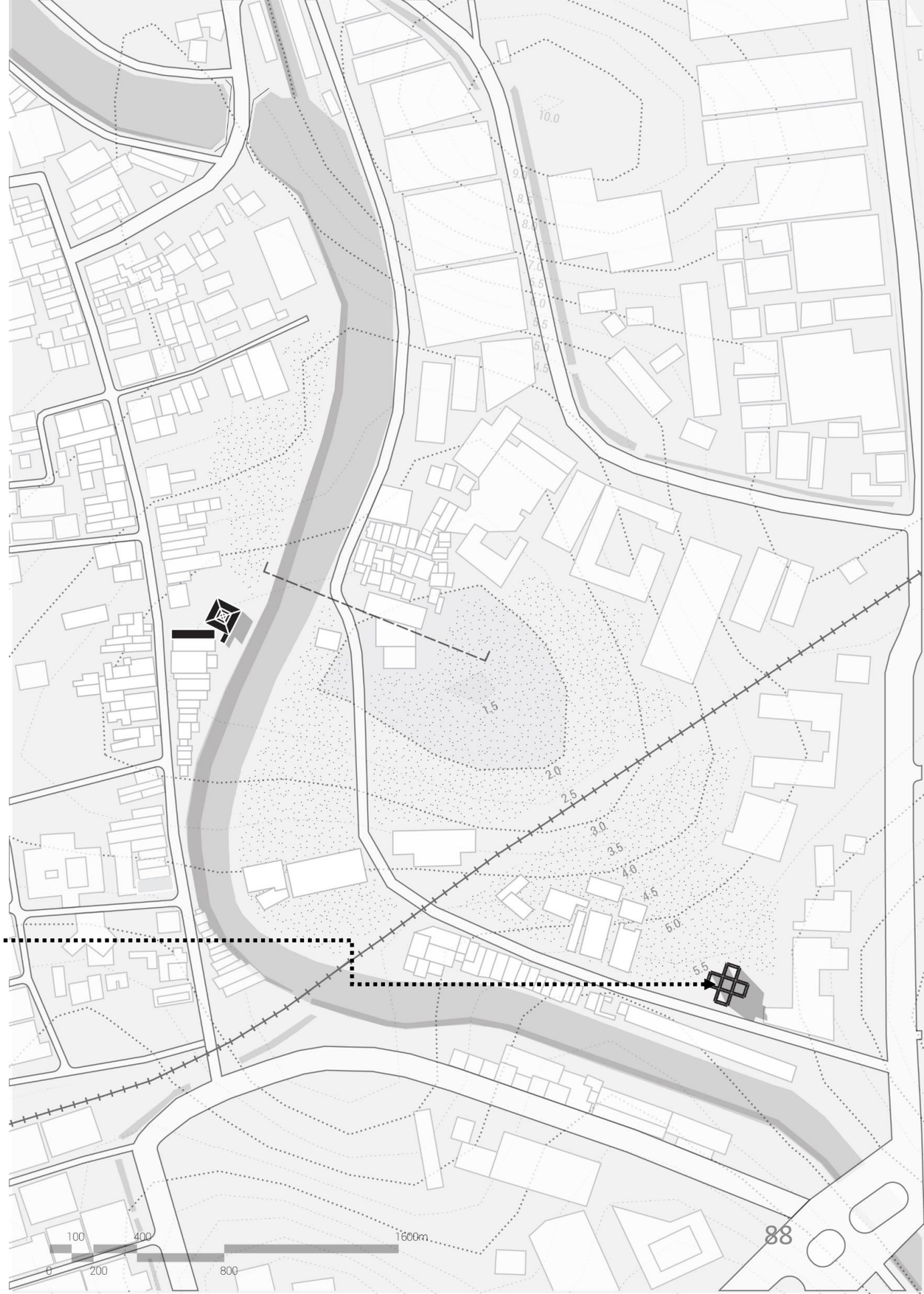
2. Recreational and experimental site

Location



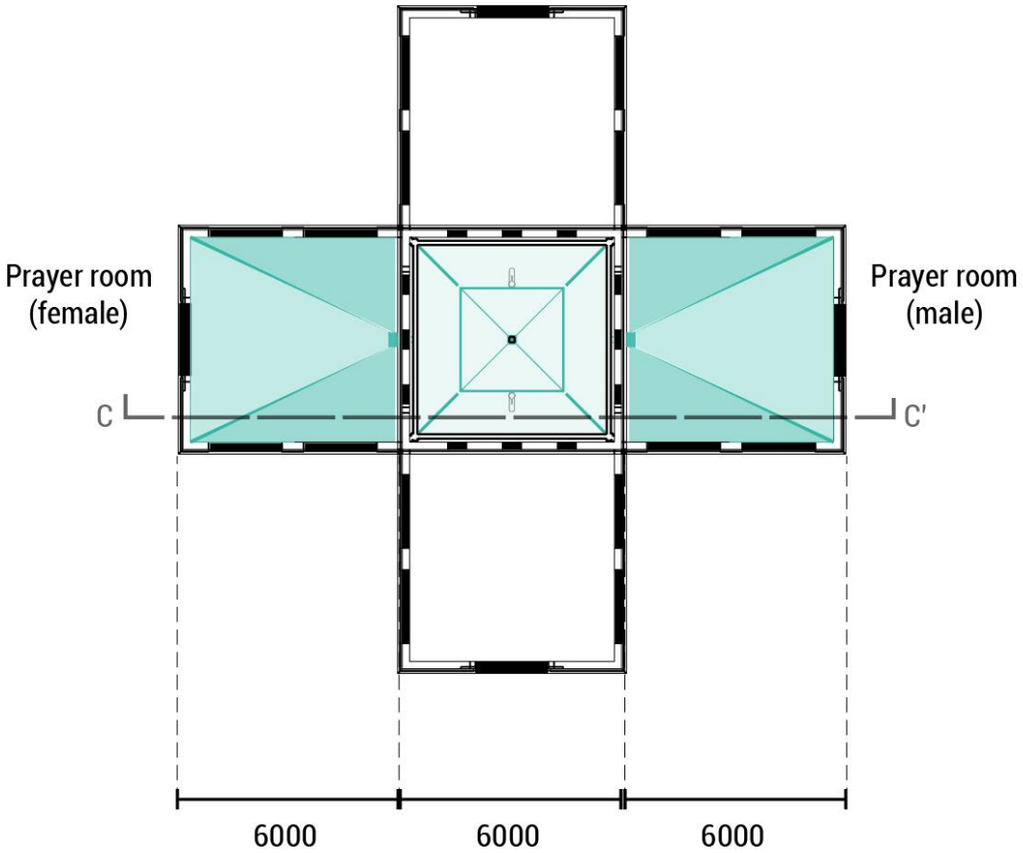
2. Recreational and experimental site

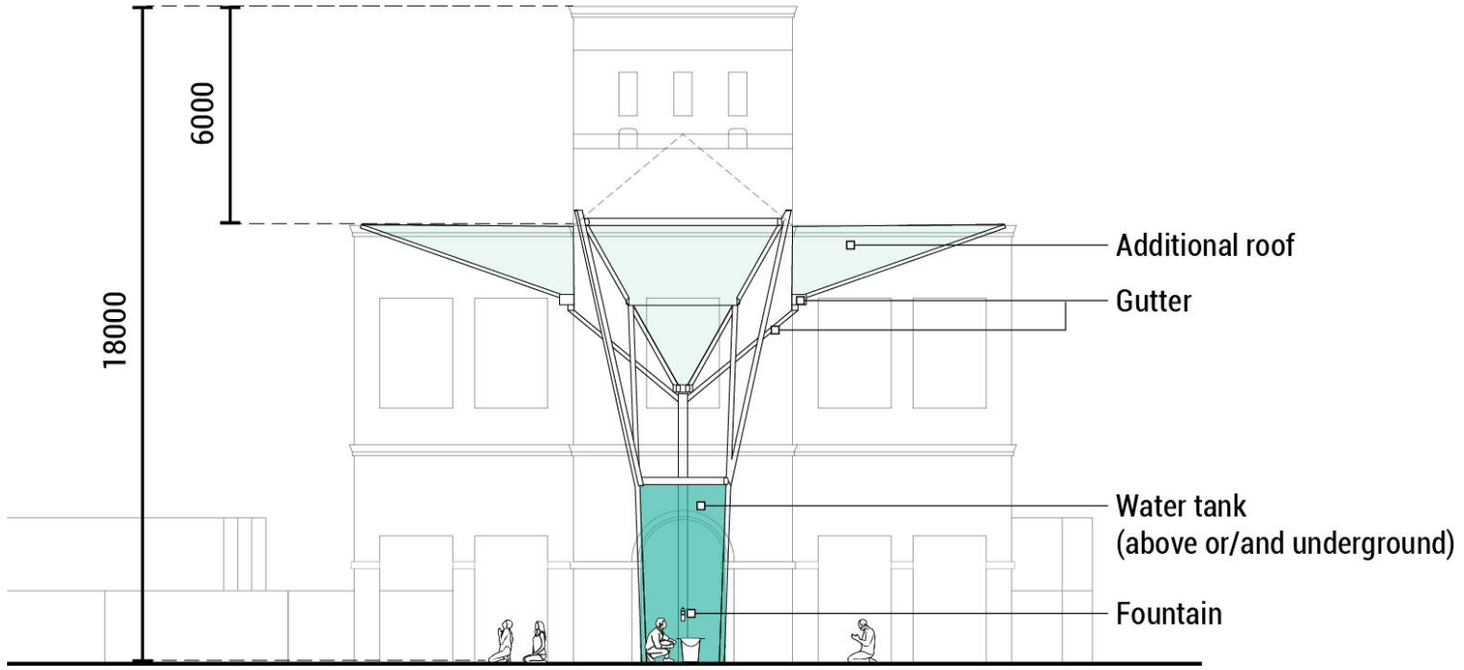
De Uitkijk in kampung



2. Recreational and experimental site

De Uitkijk in kampung



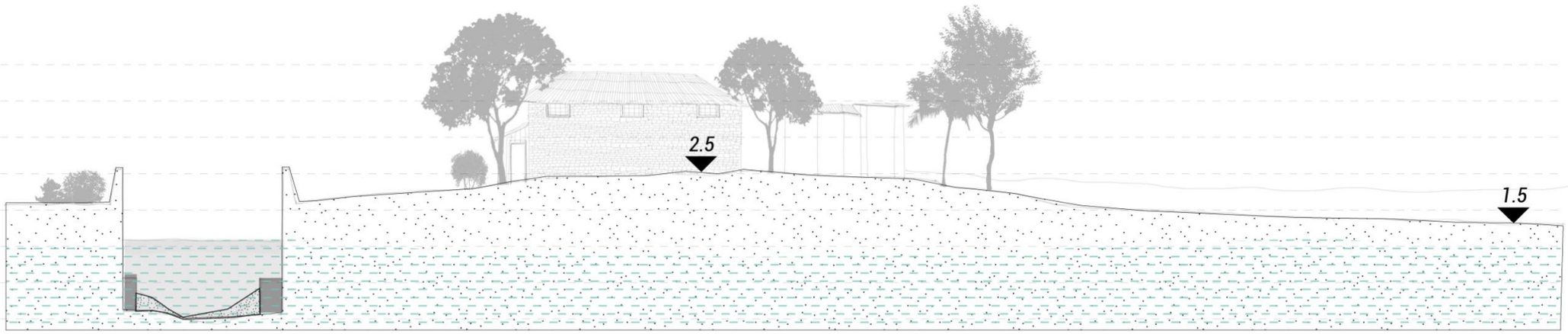


2. Recreational and experimental site

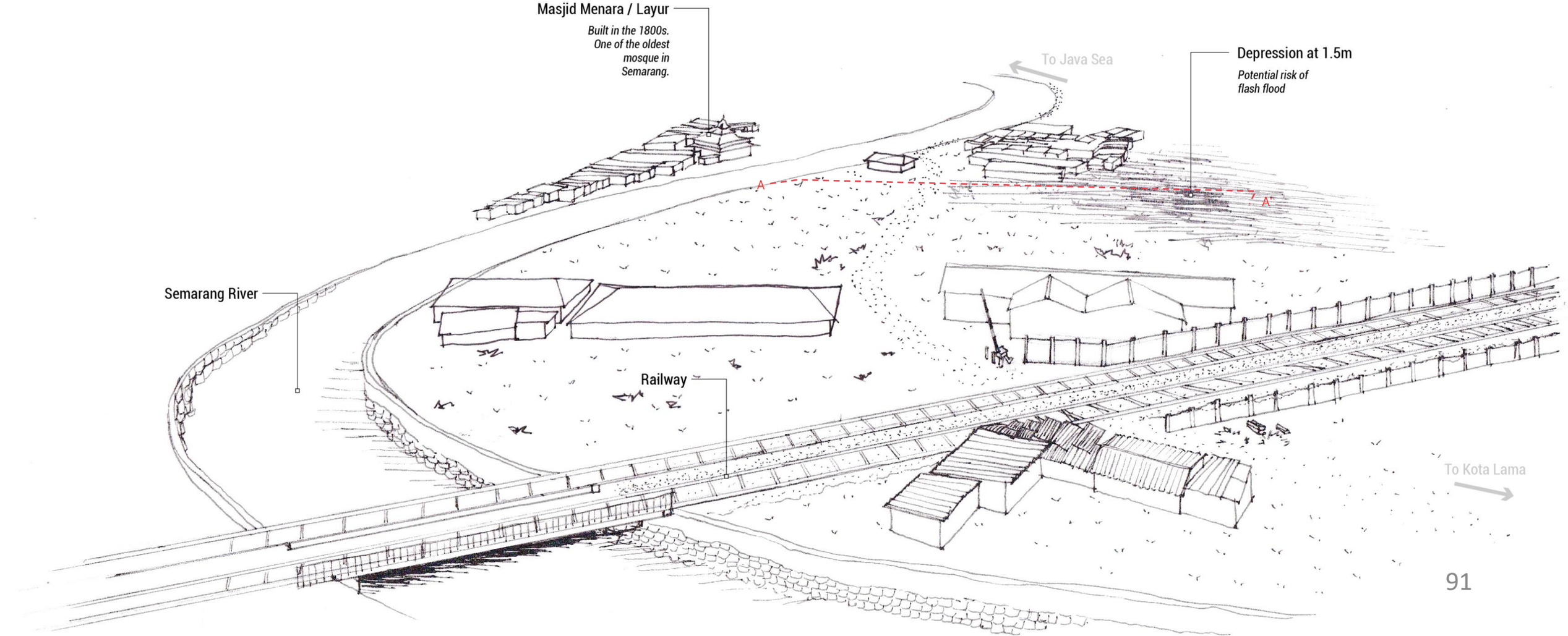
De Uitkijk in kampung

2. Recreational and experimental site

Current condition

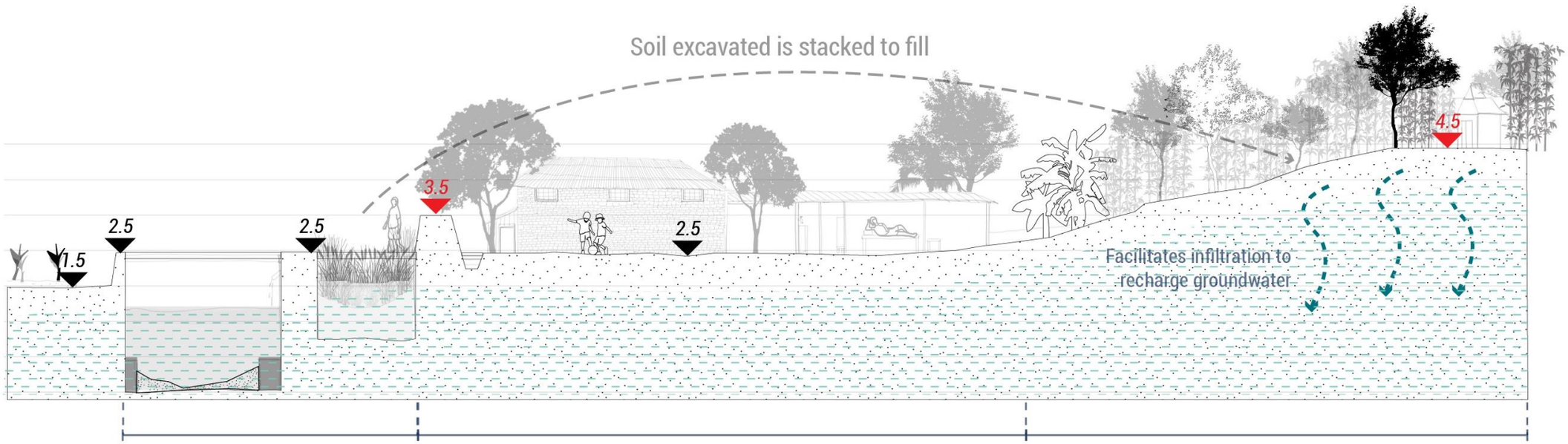


Section A-A

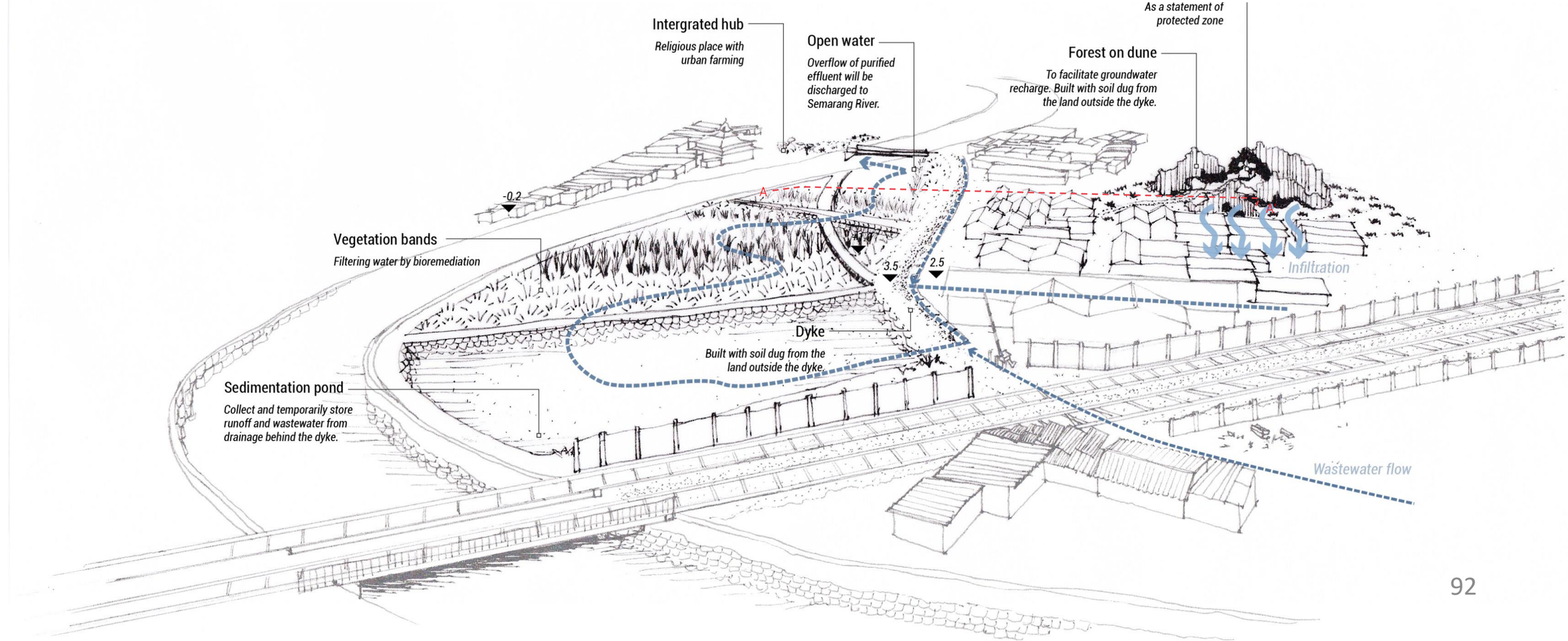


2. Recreational and experimental site

Proposed river park and new kampung

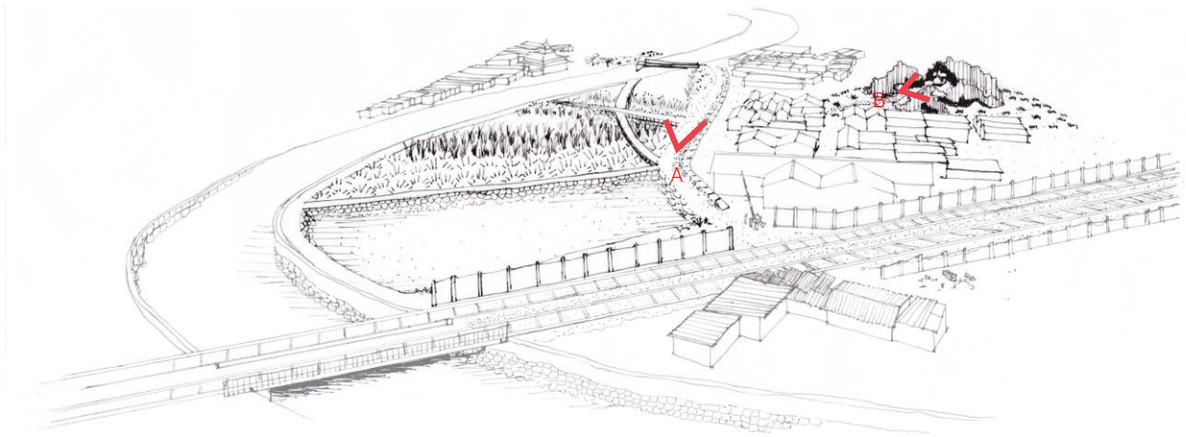


Section A-A



2. Recreational and experimental site

Proposed river park and new kampung

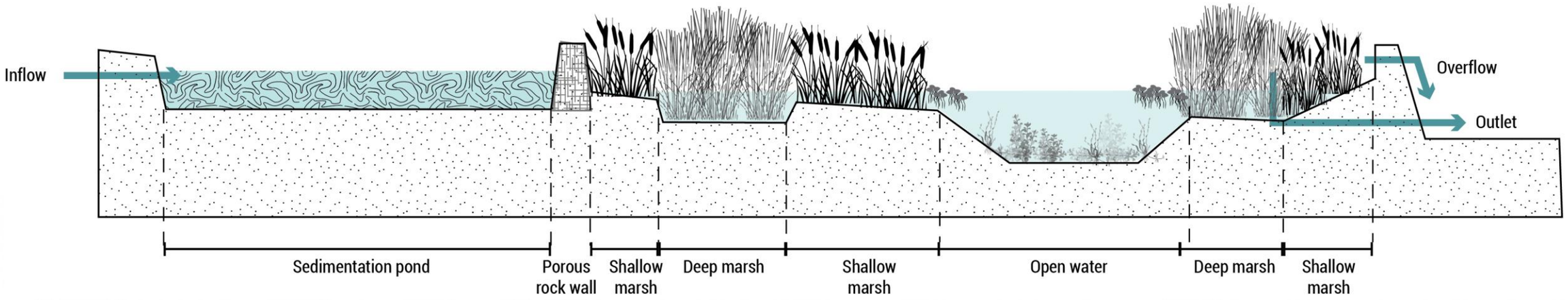


View A – On the dyke

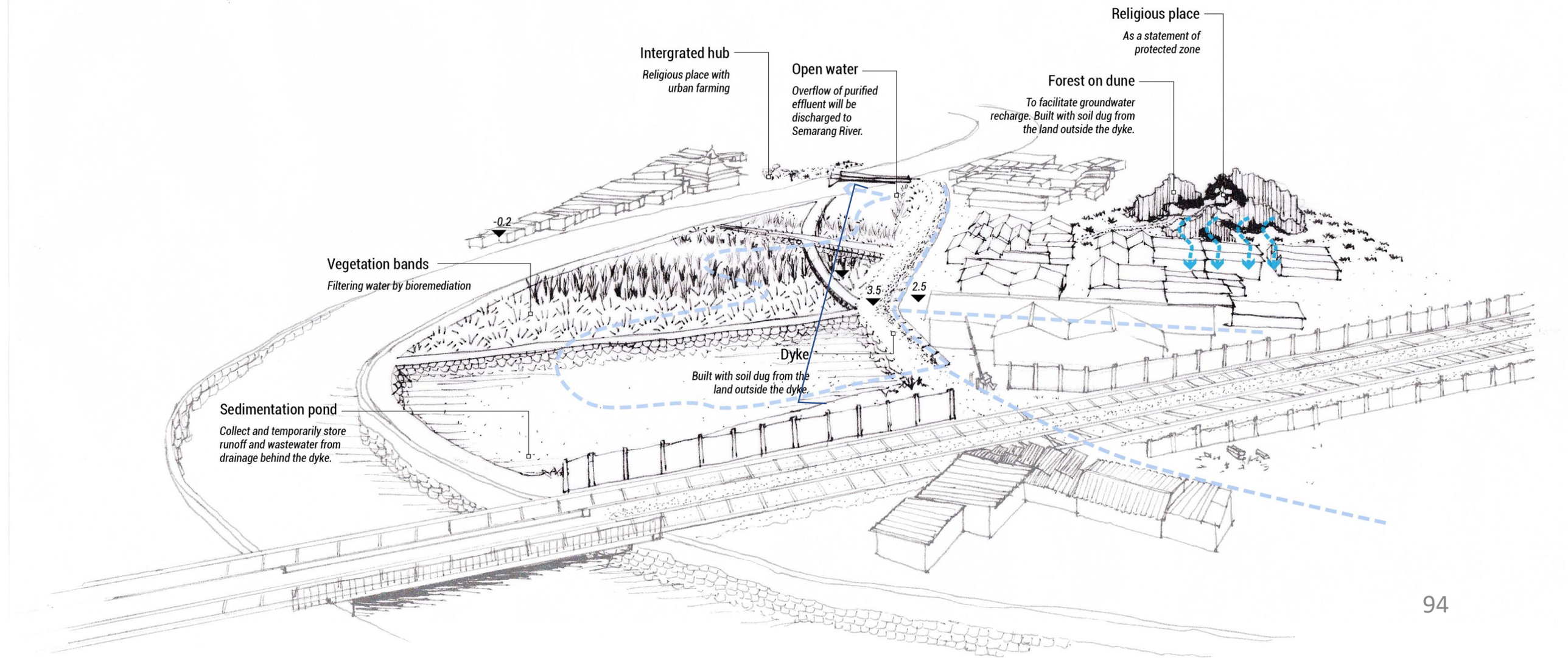
View B– On the way to the top of the hill

2. Recreational and experimental site

Proposed river park and new kampung



Section B-B – Typical section of constructed wetland in River Park

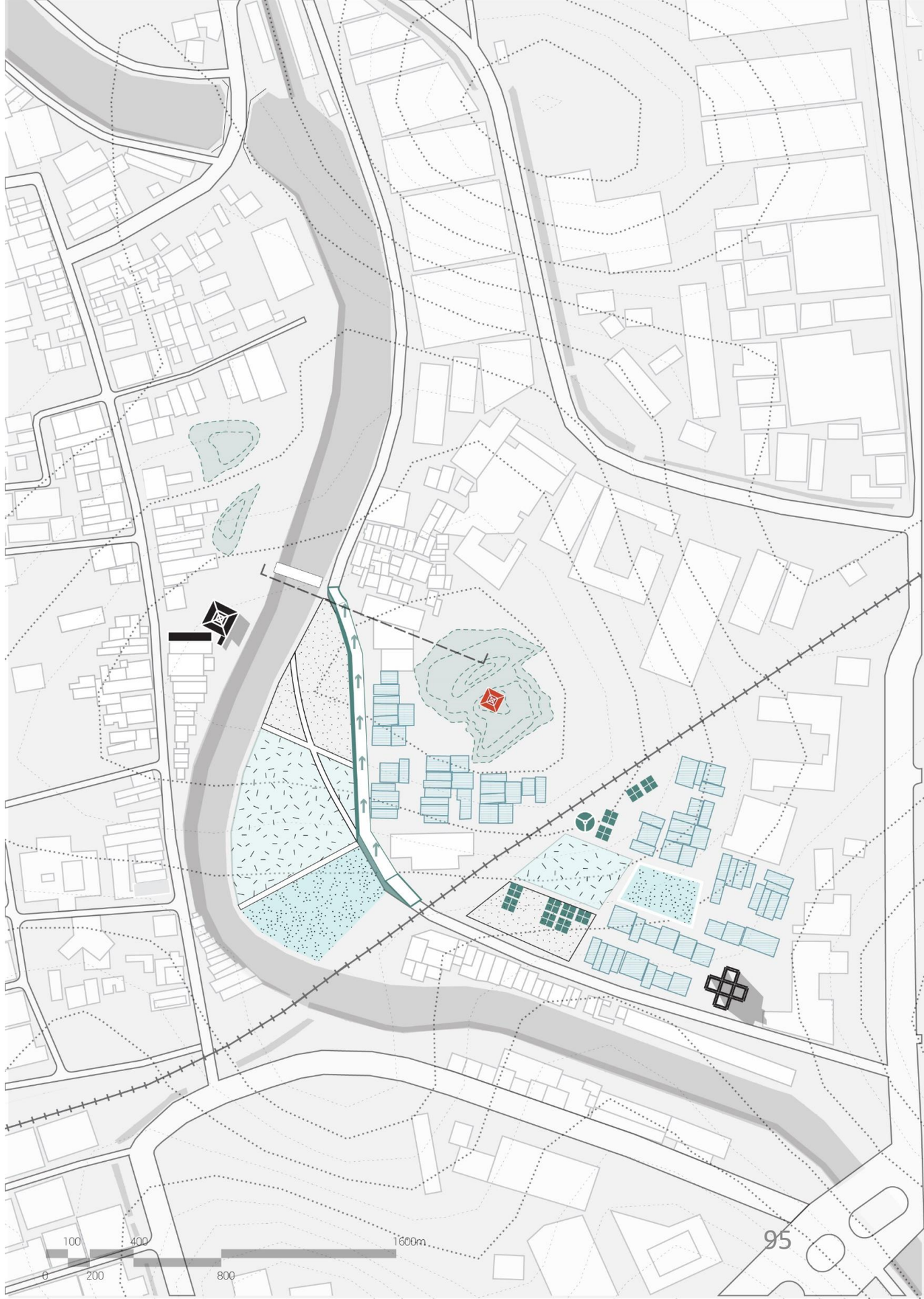


2. Recreational and experimental site

Option 1 – Separated flows

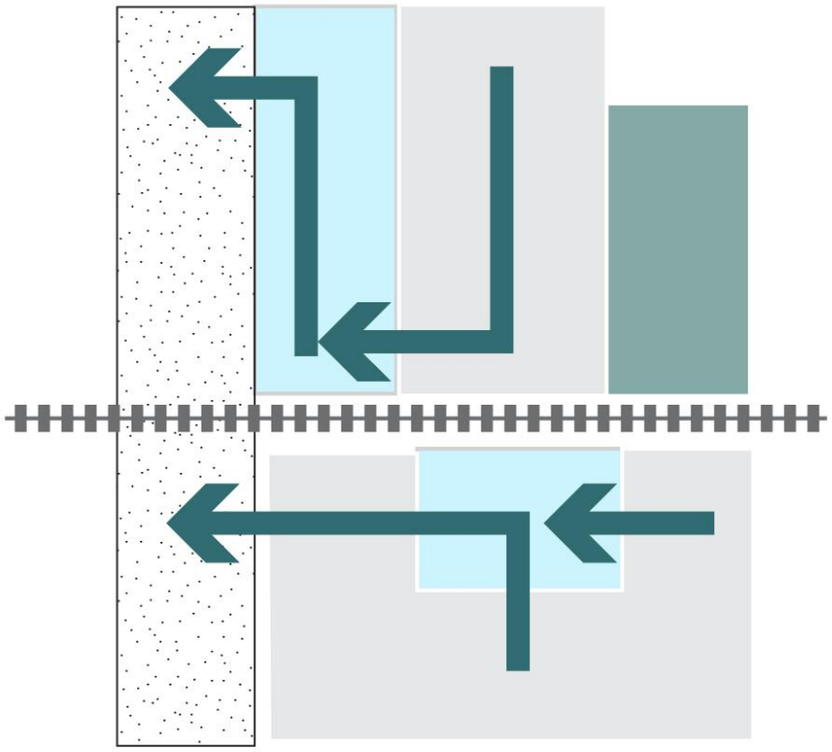
Proposed

- Drainage flow
- Flow of water treatment
- Overflow
- Sedimentation pond
- Reed bed
- Retention pond for purified effluent
- New water point
- New houses with rainwater harvest from roof
- Garden / aquaponics
- Biogas digester plant



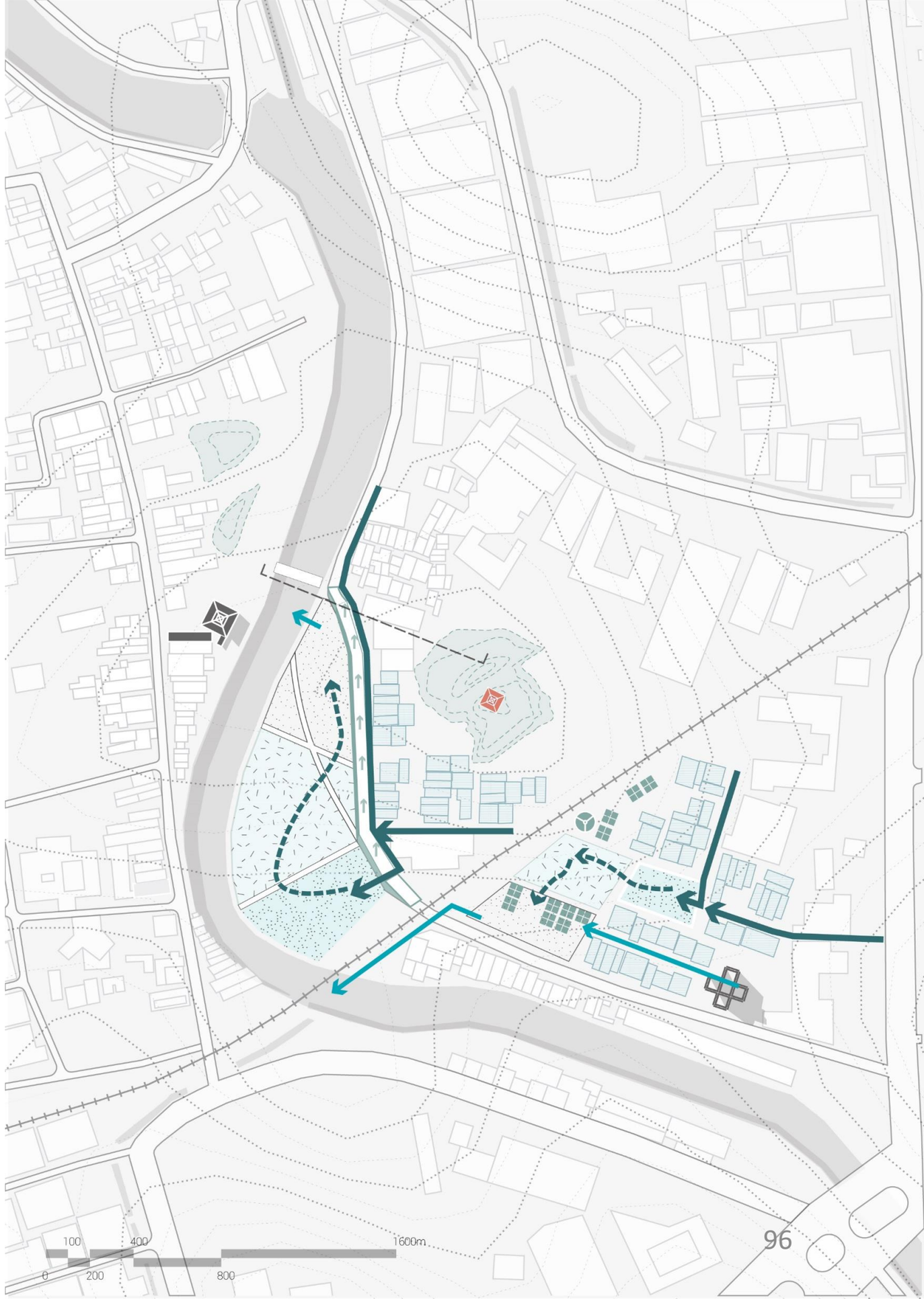
2. Recreational and experimental site

Option 1 – Separated flows



Option 1 - Separated flows

- Protected area (forest on dune)
- Inner area (water-use)
- Outer area (wastewater treatment)
- Semarang River
- Sewage / water flow
- Railway

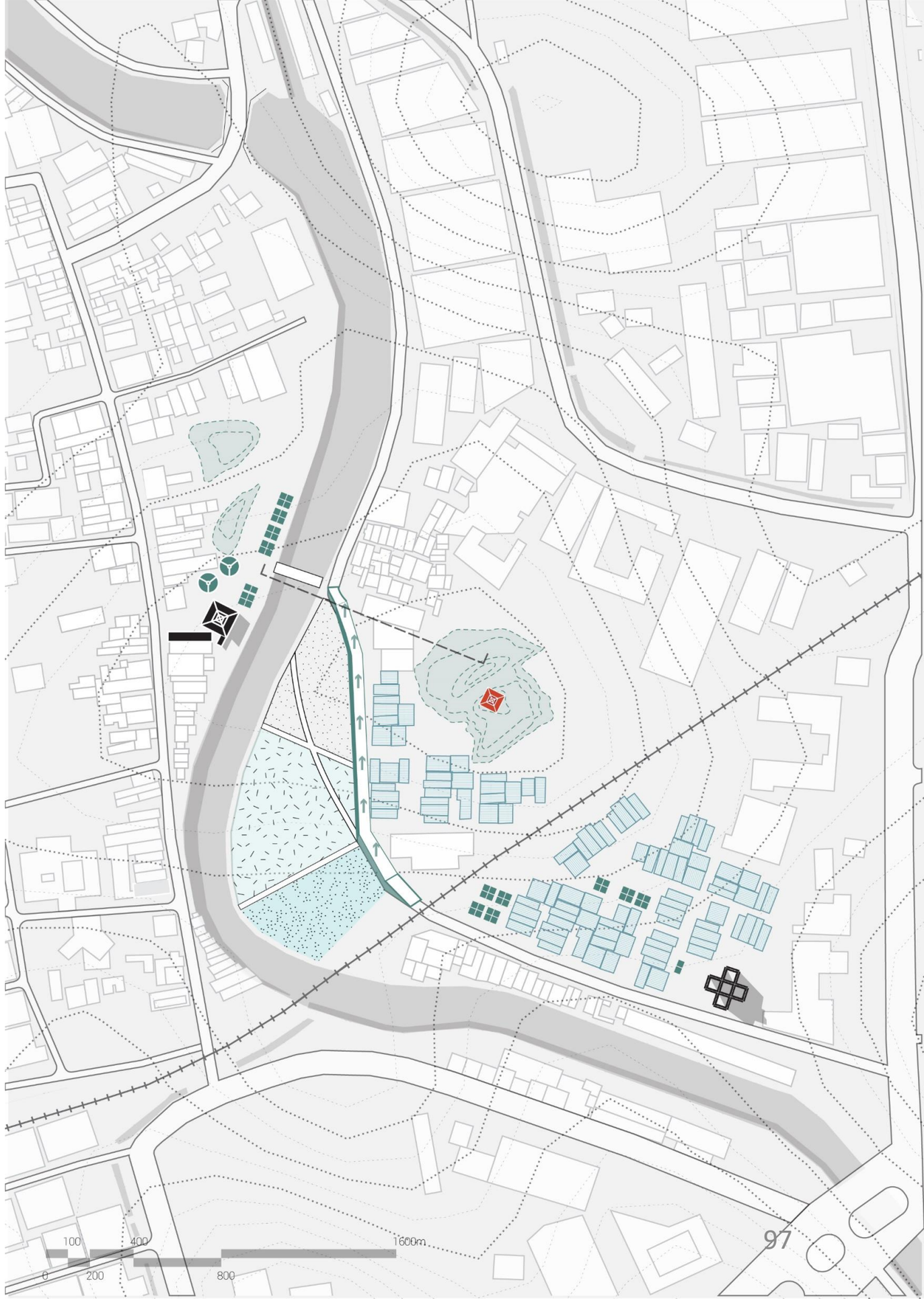


2. Recreational and experimental site

Option 2 – Integrated flow

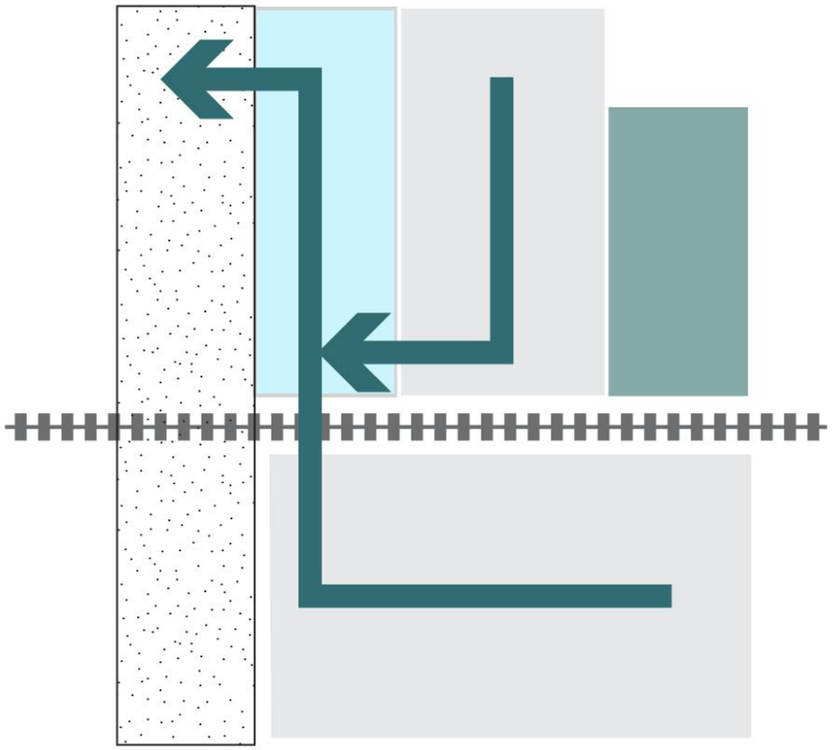
Proposed

- Drainage flow
- Flow of water treatment
- Overflow
- Sedimentation pond
- Reed bed
- Retention pond for purified effluent
- New water point
- New houses with rainwater harvest from roof
- Garden / aquaponics
- Biogas digester plant



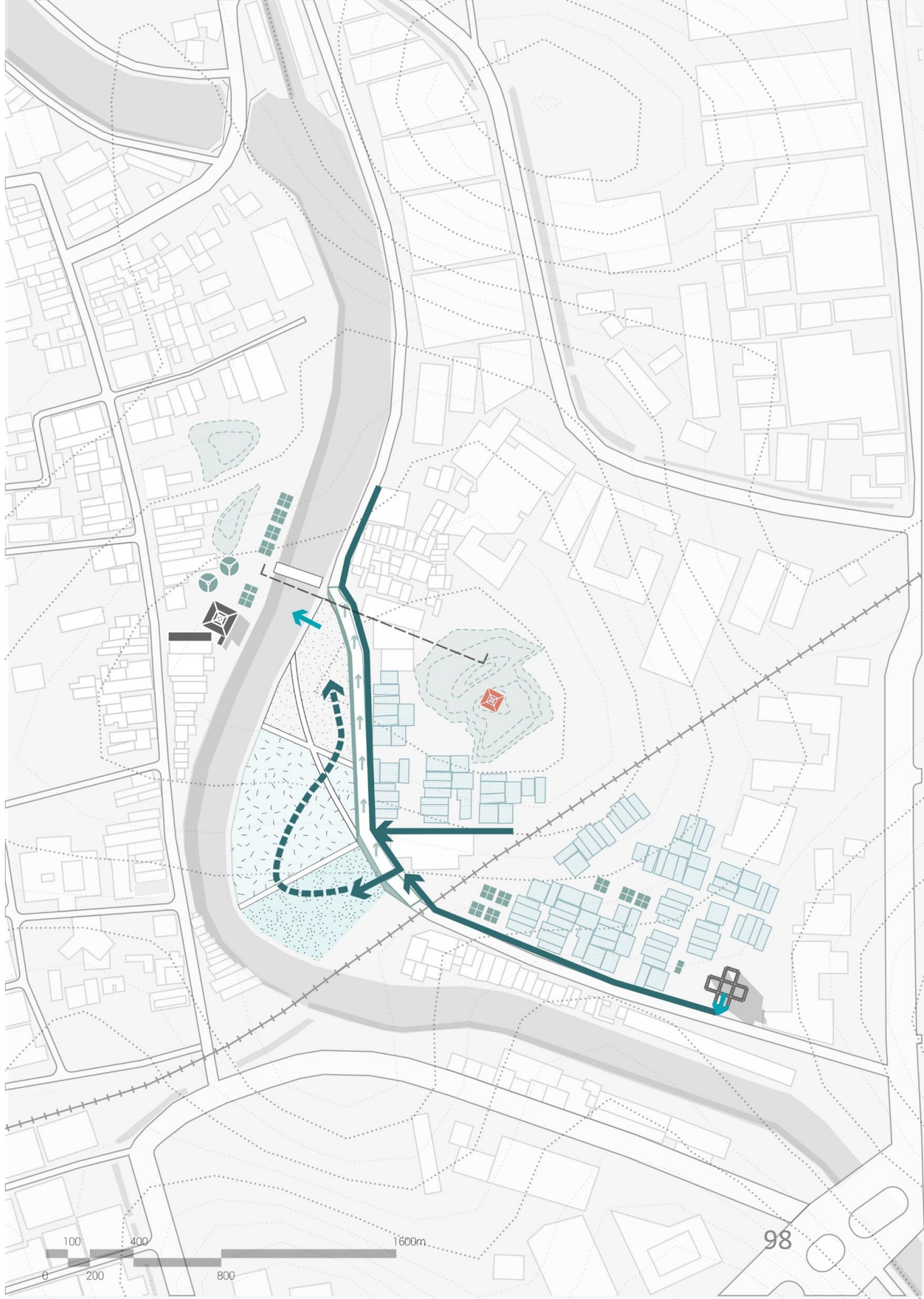
2. Recreational and experimental site

Option 2 – Integrated flow



Option 2 - Integrated flow at River Park

- Protected area (forest on dune)
- Inner area (water-use)
- Outer area (wastewater treatment)
- Semarang River
- Sewage / water flow
- Railway



DISCUSSION AND CONCLUSION

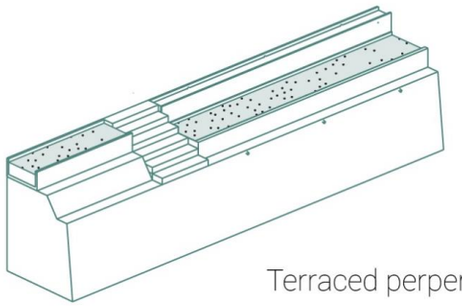
Discussion and conclusion

Q1:
How to create a condition that facilitates the flows of urban landscape networks in the city?

- Interventions in different scales to involve different stakeholders

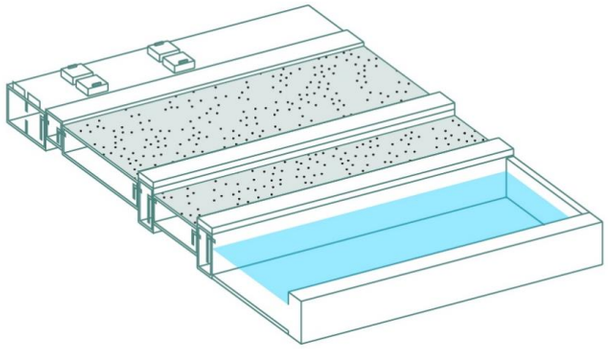
  - Villagers
  - Community leaders
  - The government

City

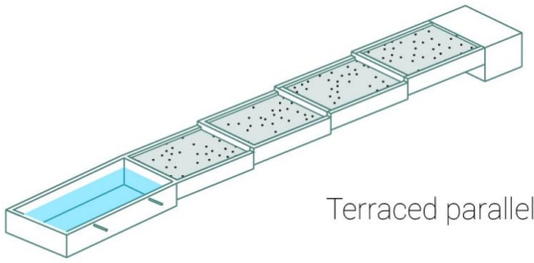


Terraced perpendicular to river edge

Kampung

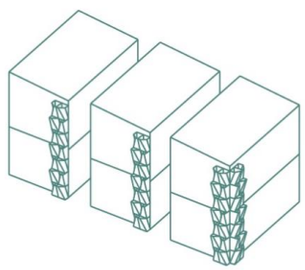


Constructed wetland with aquaponics



Terraced parallel to river edge

Household



Vertical constructed "wetland"

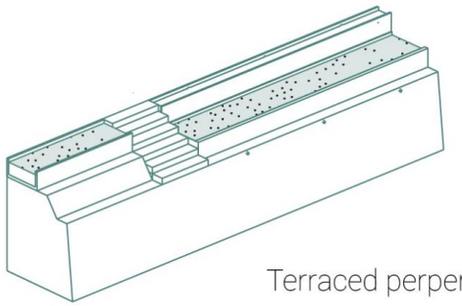
Discussion and conclusion

Q2:
How to improve the inhabitants' **living qualities** with respect to their **living habits**, existing **social fabric** and the relation to their direct surroundings?'

- To make landscape architecture vernacular

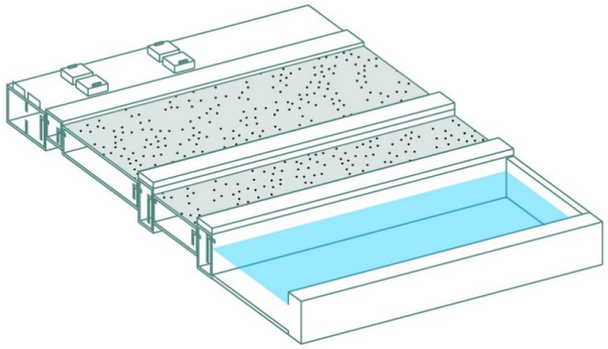
  - Materials
  - Maintenance
  - Substantial and evident results

City

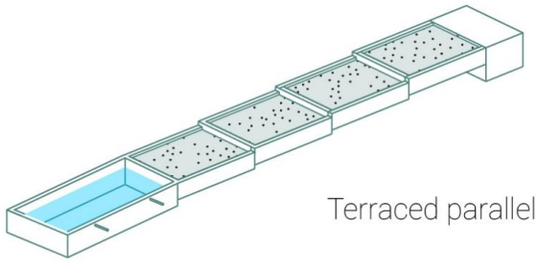


Terraced perpendicular to river edge

Kampung

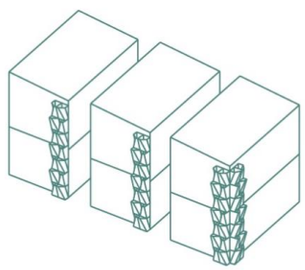


Constructed wetland with aquaponics



Terraced parallel to river edge

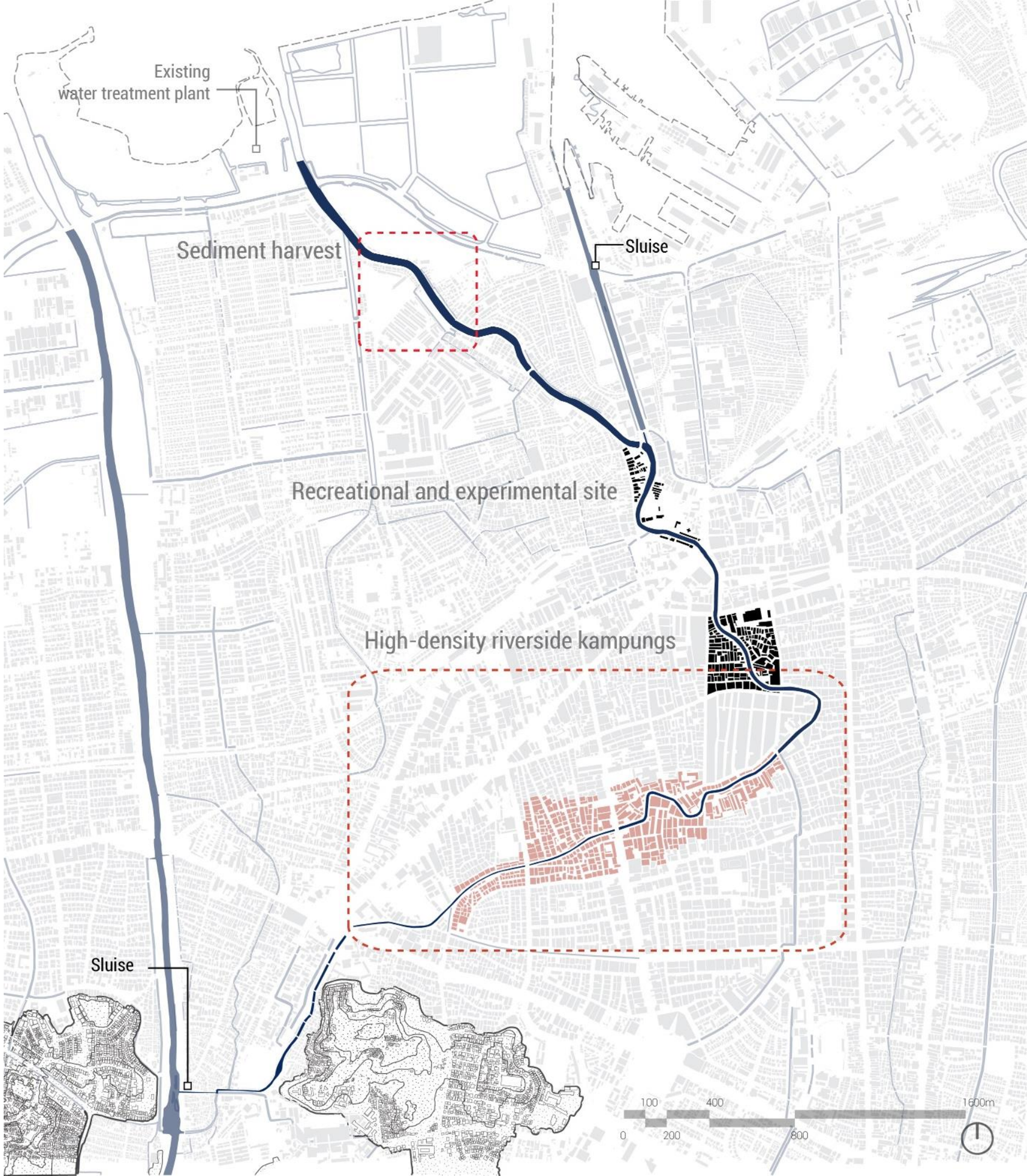
Household



Vertical constructed "wetland"

Discussion and conclusion

- The effectiveness and sustainability of the design highly depends on the **collective behaviours** and awareness of the users (i.e. villagers).



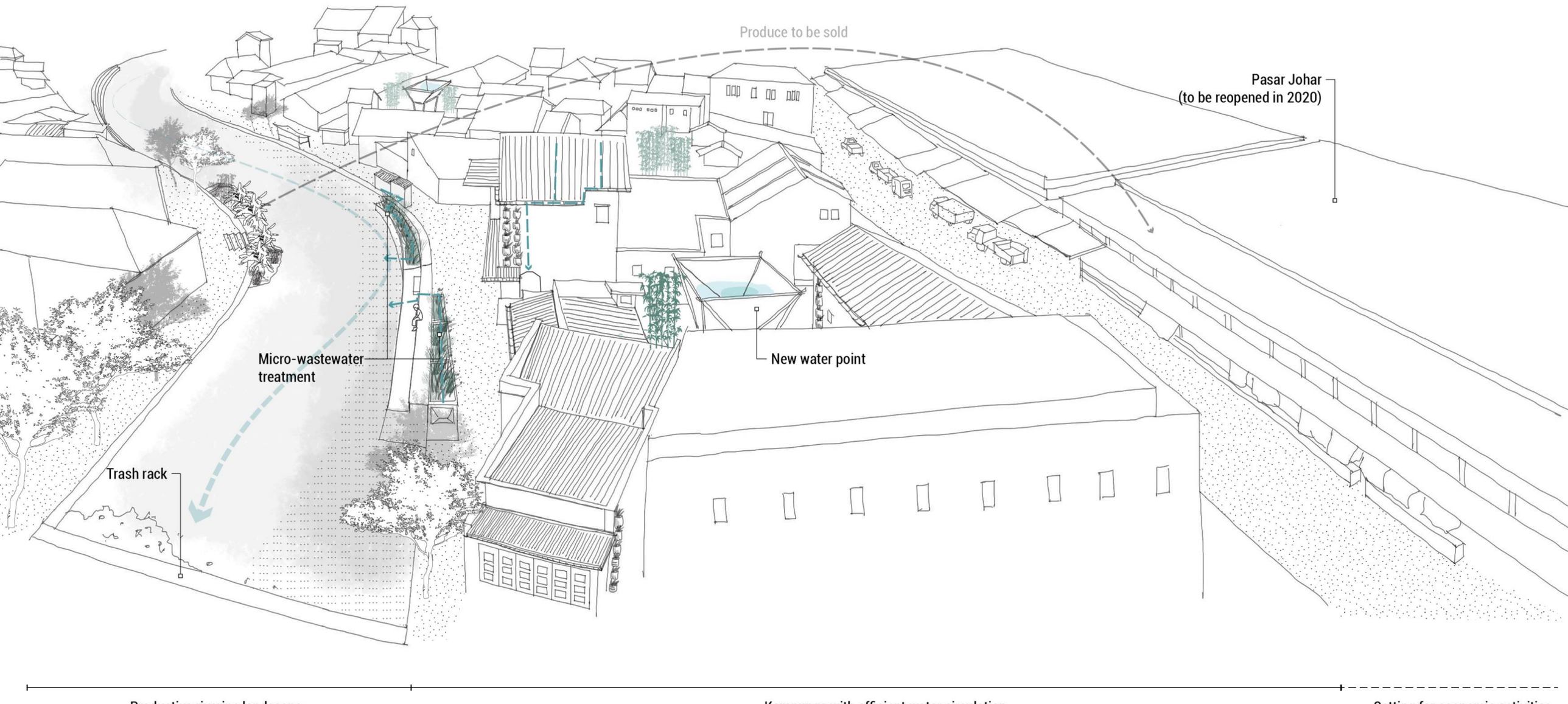
Discussion and conclusion

- Purchasing points, management working space, and production education
- Showcase of urban permaculture
- Place to administrate and manage urban permaculture in kampungs

Urban Permaculture Co-Operative Office
By *Ananta Vania Iswardhani*

Discussion and conclusion

- Meeting physical, economic and societal needs



Discussion and conclusion

- Capacity and efficiency of the interventions
  (in different scenarios)
- Durability of materials