

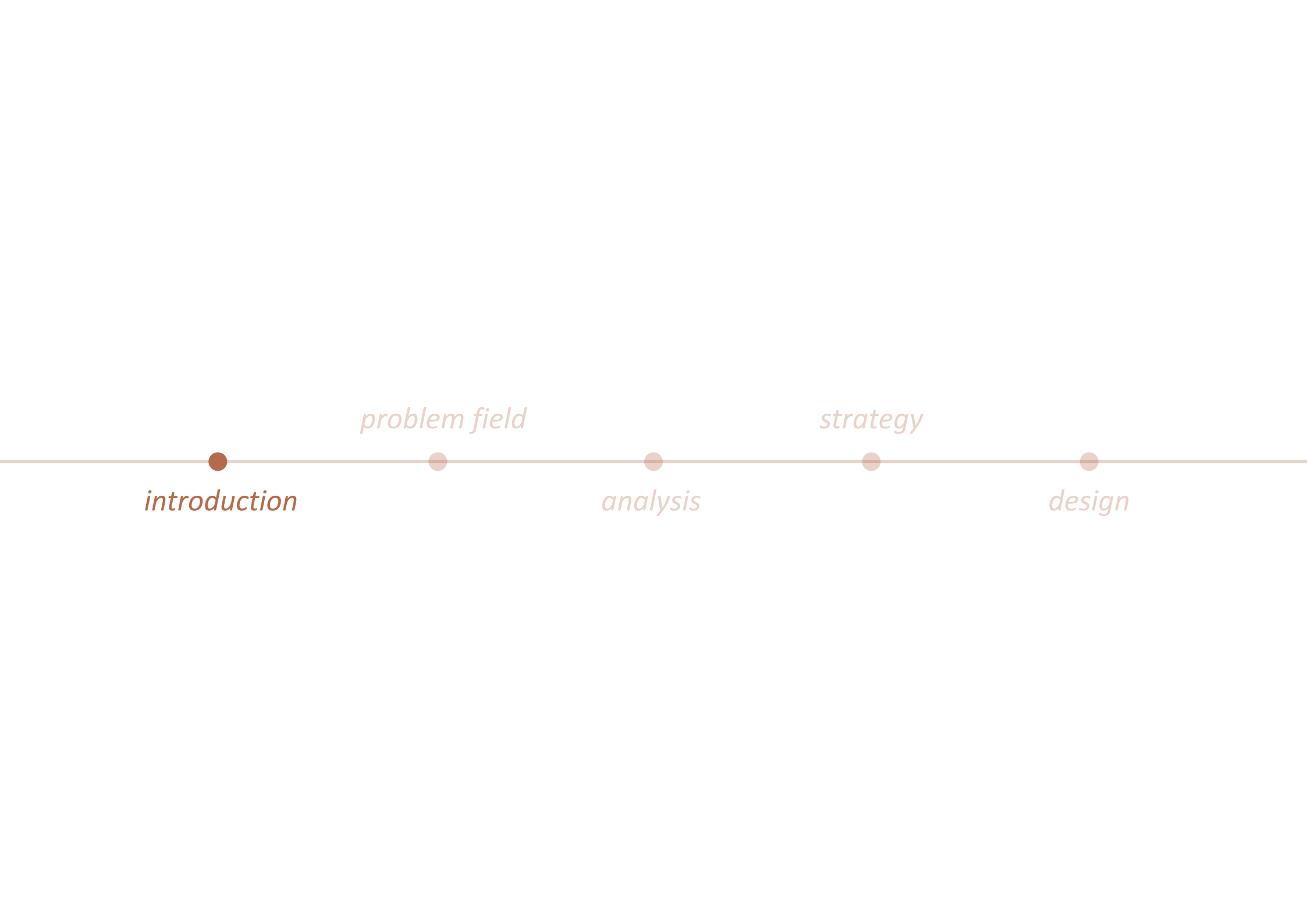
LIVING WITH THE WASTE

Creating a better life image by constructing decentralized waste management in Kampung Kranggan, Semarang

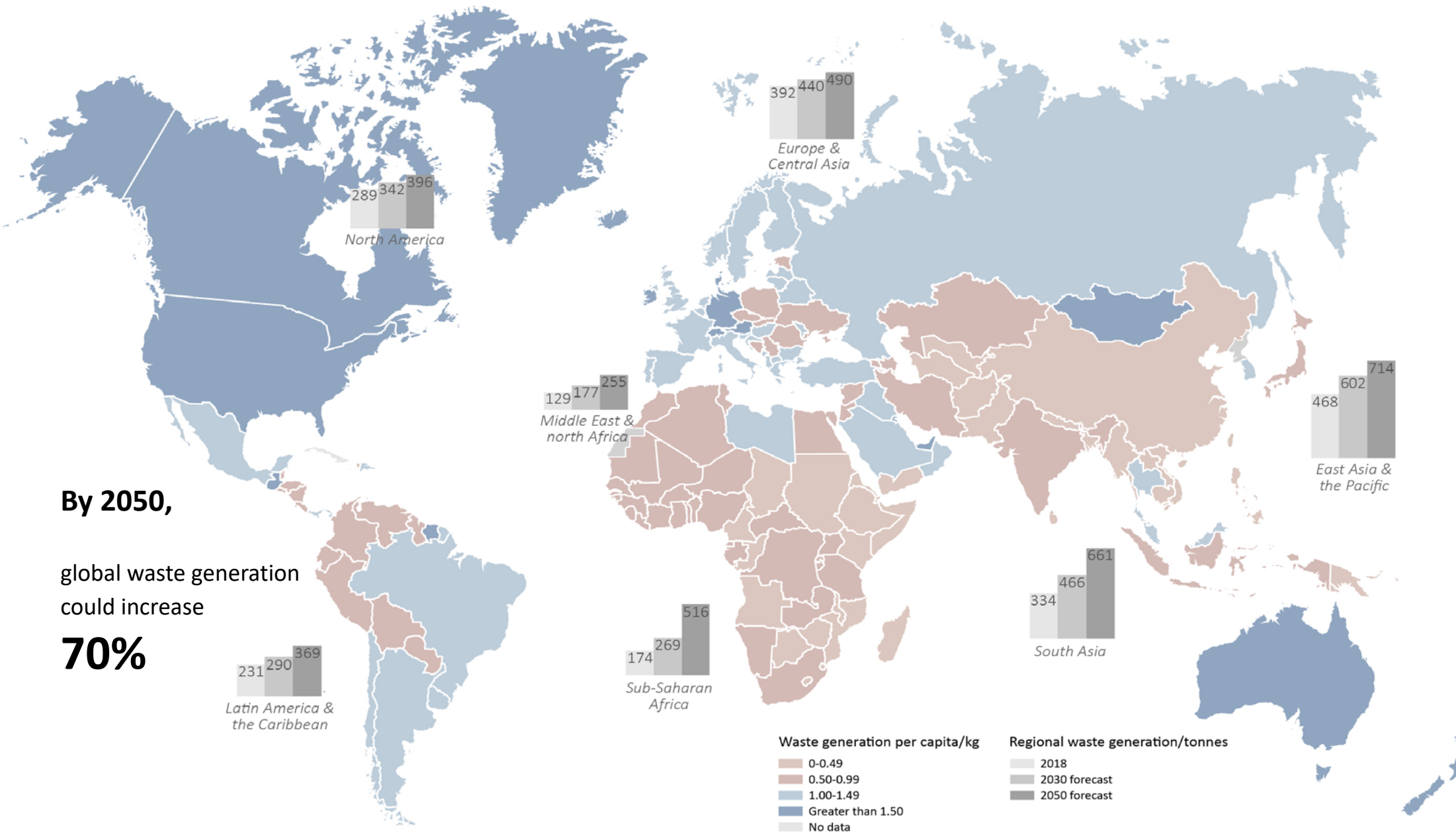
Xuan Liu

Landscape Architecture MSc 2020
Delft University of Technology





By 2050,
global waste generation
could increase
70%



No such thing as waste!

Waste is,

unwanted or **unusable**
materials.



WE ARE THE SAME!



WE ARE THE SAME!



SUMATERA

KALIMANTAN

■ **373.70 km²**
total municipal area

■ **1,288,084**
inhabitants

■ **1200 tons**
daily waste production

■ **1**
landfill

■ **67%**
covered by waste services

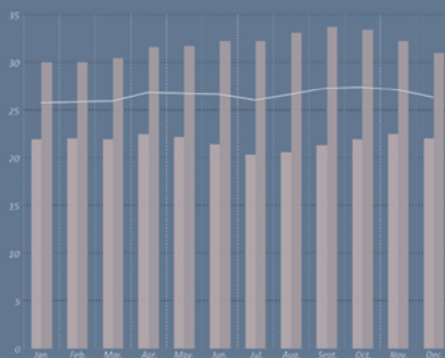
■ **64.57%**
handled waste

Jakarta

SEMARANG

Surabaya

Yogyakarta



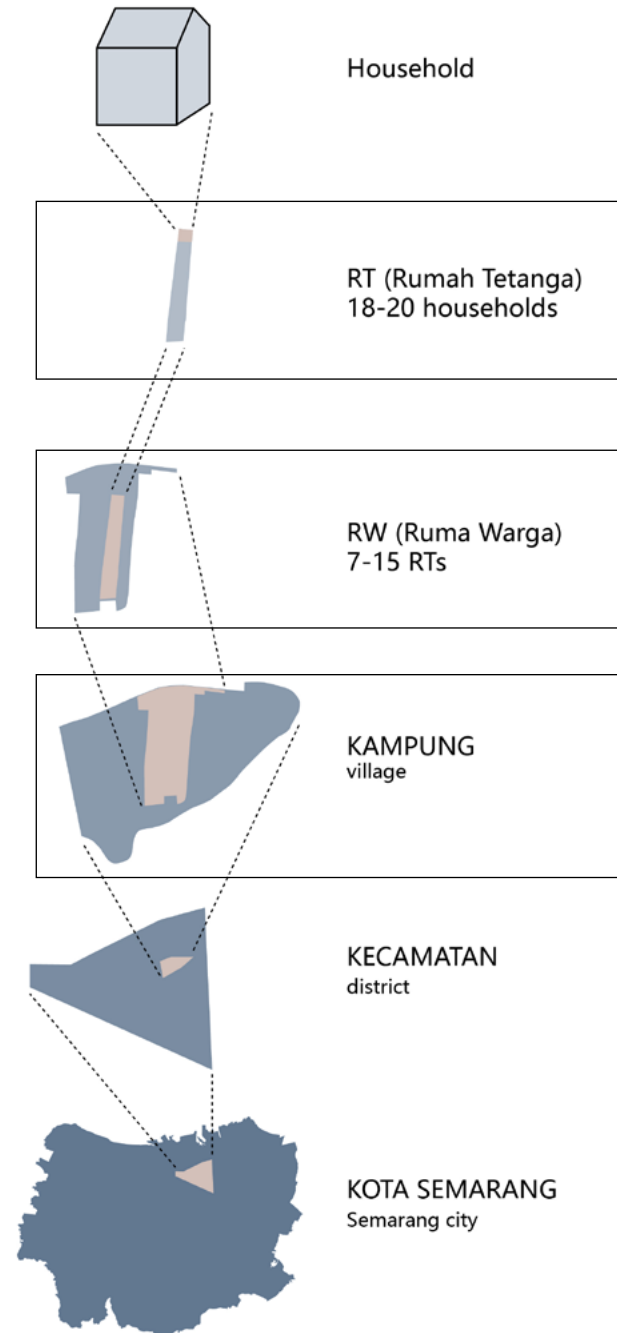
Temperature
Source: climate-data.org

INDONESIA

JAVA ISLAND

Semarang is situated on Java Island, and it is the capital and the largest city of the Central Java Province. The city has 1288085 inhabitants, 424628 households, with a total area of 373.7 km². The only landfill is located at the southwest of Semarang. However, the daily waste production is 1200 tons, which exceeds the capacity of the landfill.

[Introduction]
Social Structure



RT

RW

Kampung

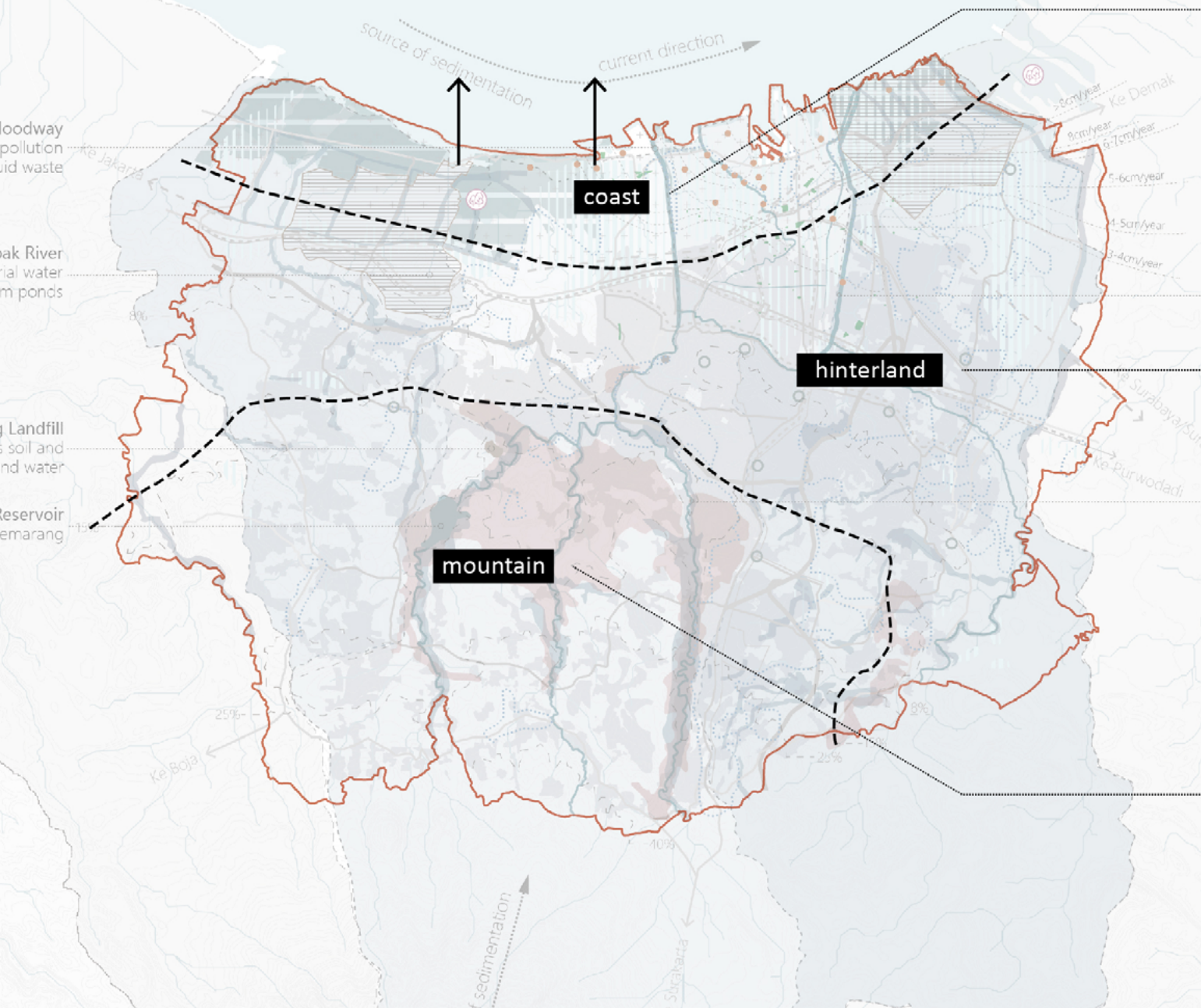
Mutual assistance Collective work



Source: Gotong Royong:Cooperation; steemit.com

[Introduction]

Landscape Structure

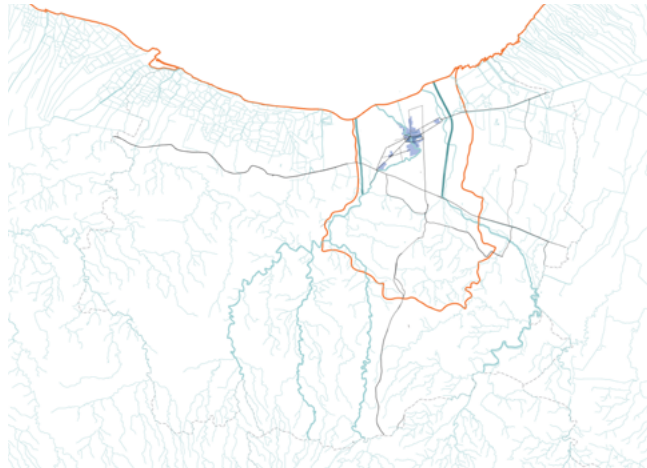


[Introduction]

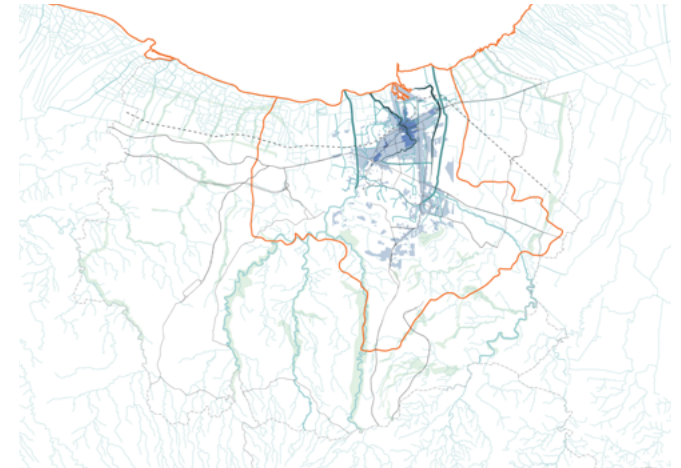
Urbanization



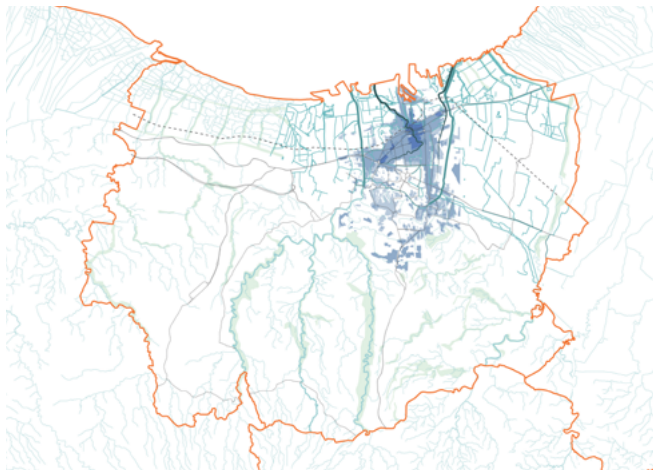
1719



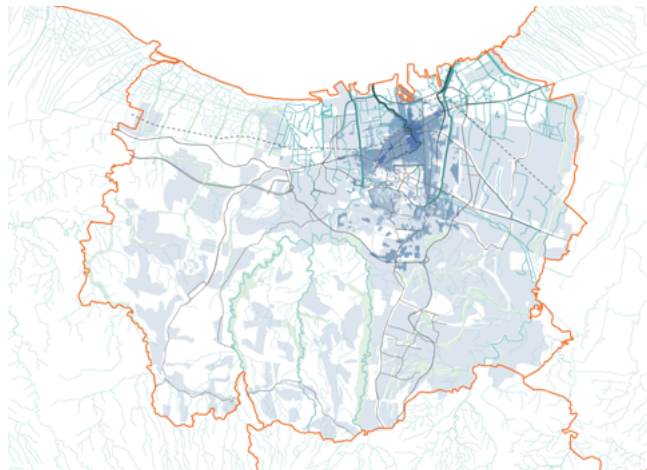
1824



1917



1946

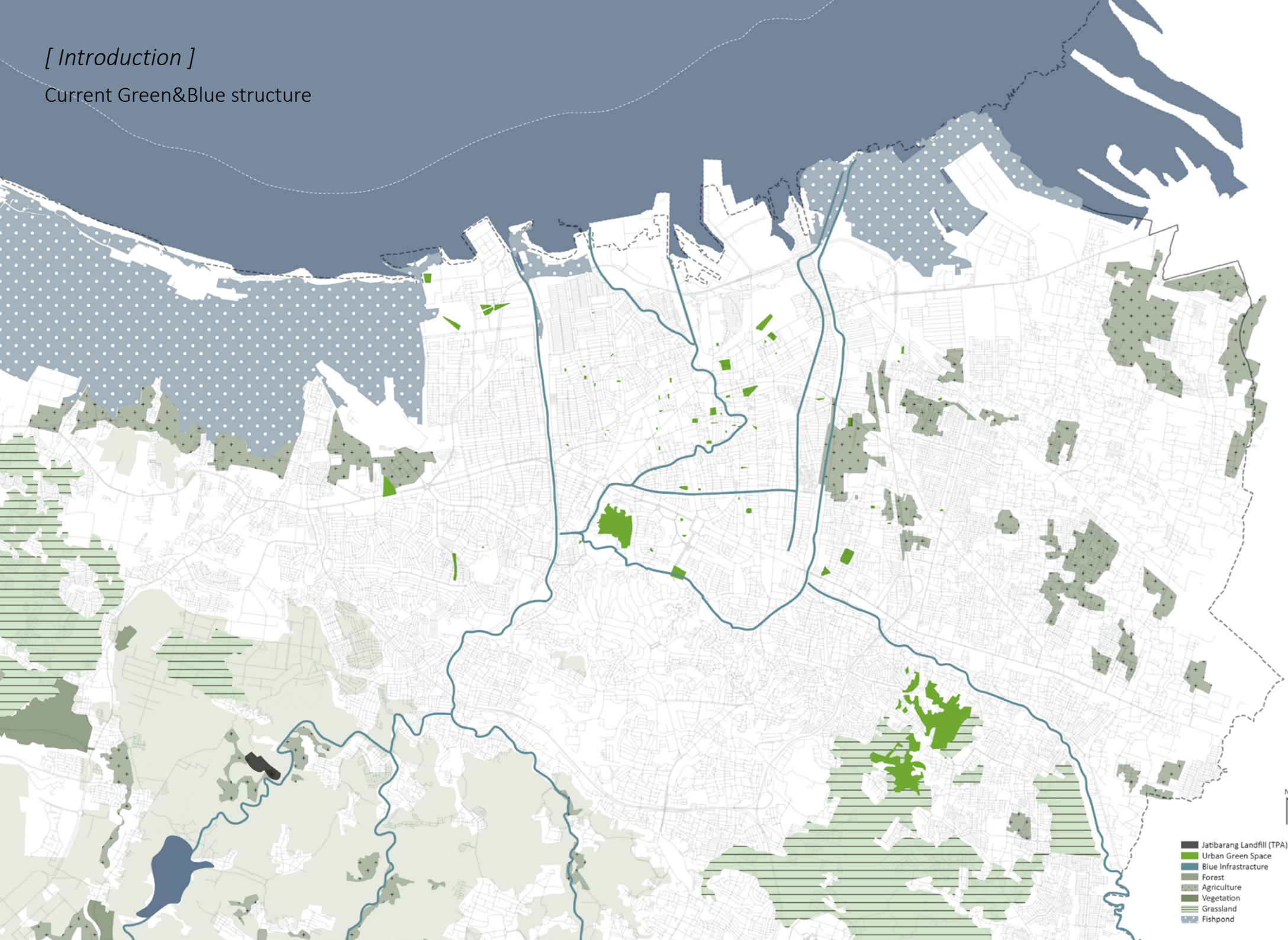


2019

- 1719:
Dutch settlements dominate the urban fabric, and also attracts several ethnic groups to settle nearby.
- 1824:
To deal with flooding, the West and East waterways are built. The city grows rapidly because of the establishment of the Daendels Road.
- 1917:
Semarang grows towards the hinterland. The Dutch government initiates drainage development due to the serious disease like cholera caused by flooding.
- 1946:
Few documentation of the city planning can be found because of the war. Semarang city keeps expanding towards the mountain area.
- 2019:
Semarang city expands horizontally. unorganized expansion causes many problems.

[Introduction]

Current Green&Blue structure



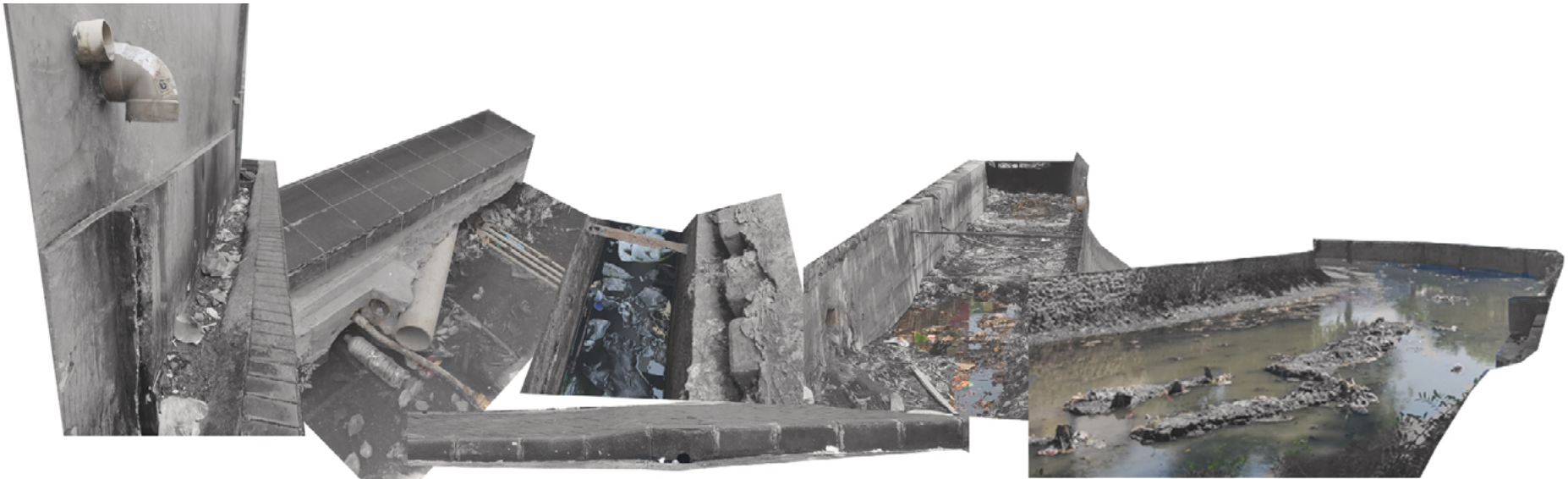
[Introduction]

Waste Infrastructure

solid waste



liquid waste



[Introduction]

Interviews



Paper Shop Owner

- Pecinan resident
- Age: 73

"Every two or three houses share a trash bin, we put the daily waste into it, then supposedly a waste collector should come and collect every two days. But the waste collector usually doesn't show up on time, then the trash will pile up on the streets."



Drinking Water Refill Store Owner

- Bandarharjo resident

"every two days a guy comes to take up the trashes in front of our houses. But, that's it."



Restaurant Owner

- Pecinan resident
- Age: 76

"The residents and visitors sometimes just throw garbage on the streets. Street vendors are even worse, they leave waste everywhere if the manager from RT doesn't pay attention."



Casual Worker

- Bandarharjo resident

"I only know a guy will come and pick up the garbage on the streets."

[Introduction]





INSUFFICIENT WASTE MANAGEMENT

poor infrastructure



limited local participation

INSUFFICIENT WASTE MANAGEMENT

unhygienic environment



LACK OF GREEN SPACE

environment aspect



no space for nature



poor biodiversity



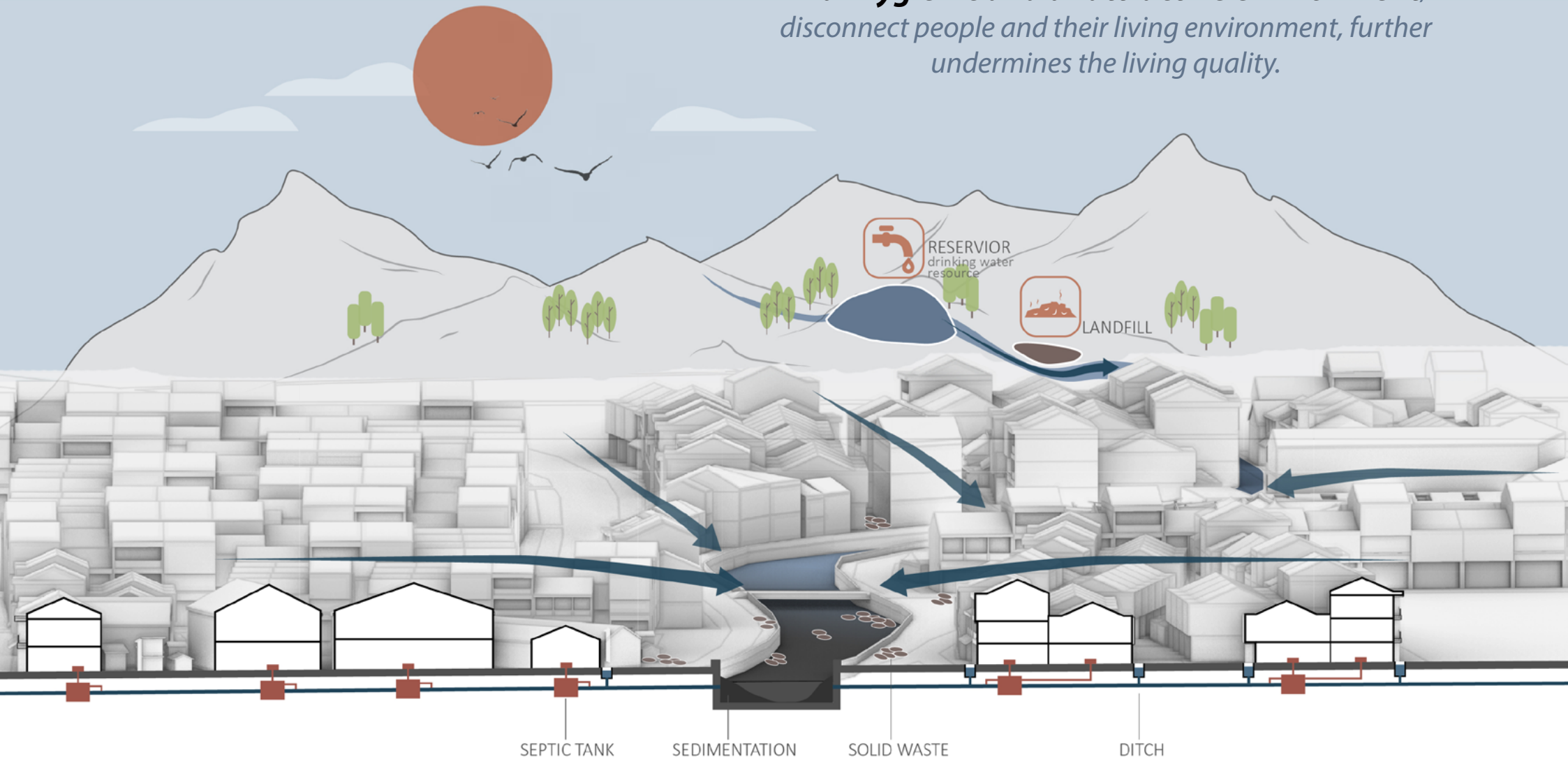
lack of public space



unattractive landscape

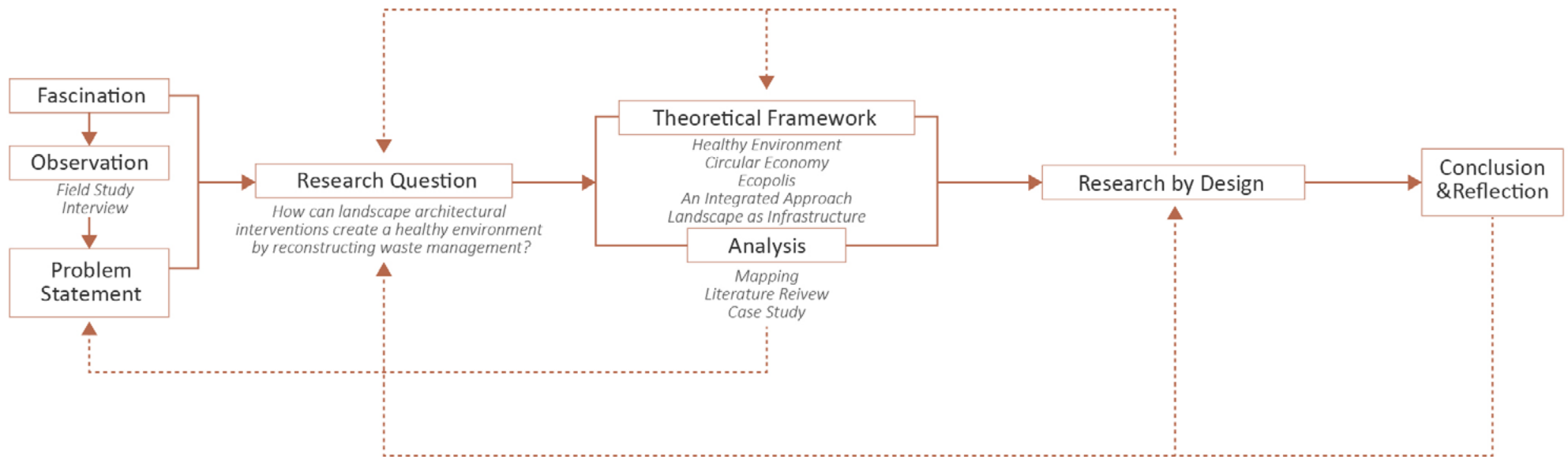
social aspect

Insufficient waste management and **lack of green space** leads to an **unhygienic and unattractive environment**, disconnect people and their living environment, further undermines the living quality.



How can landscape architectural interventions create a healthy environment by reconstructing waste management?

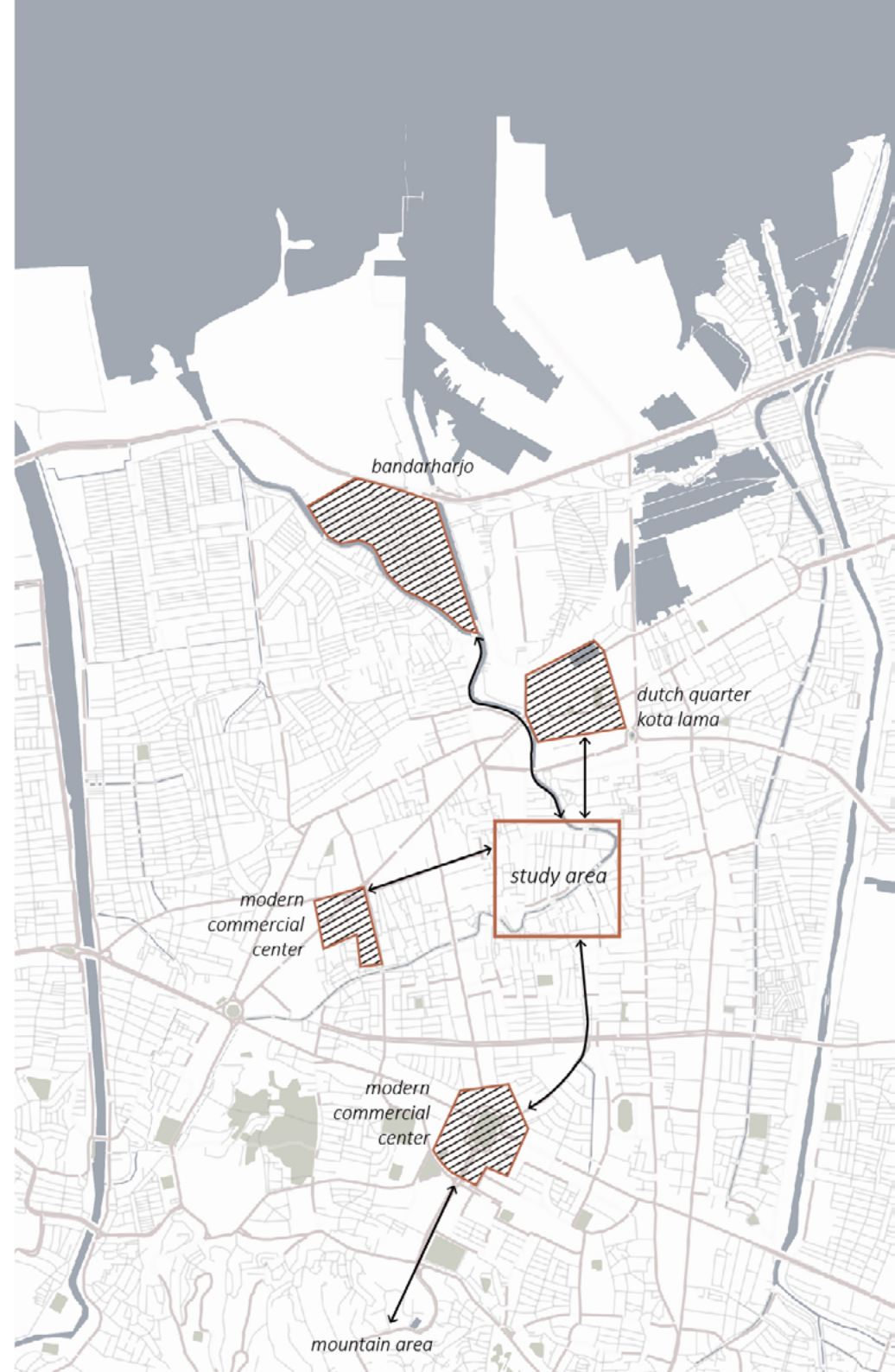
- *What is the existing waste management and environment it creates?*
- *What are the possibilities for future waste management?*
- *What are the principles and strategies to reconstruct a decentralized waste management to create a clean, inviting environment?*
- *How to translate these principles and strategies into a spatial design?*





[Site Introduction]

Location



[Site Introduction]

Location

Kampung Kranggan



[Site Introduction]

Location

Kampung Kranggan

25.25 Ha

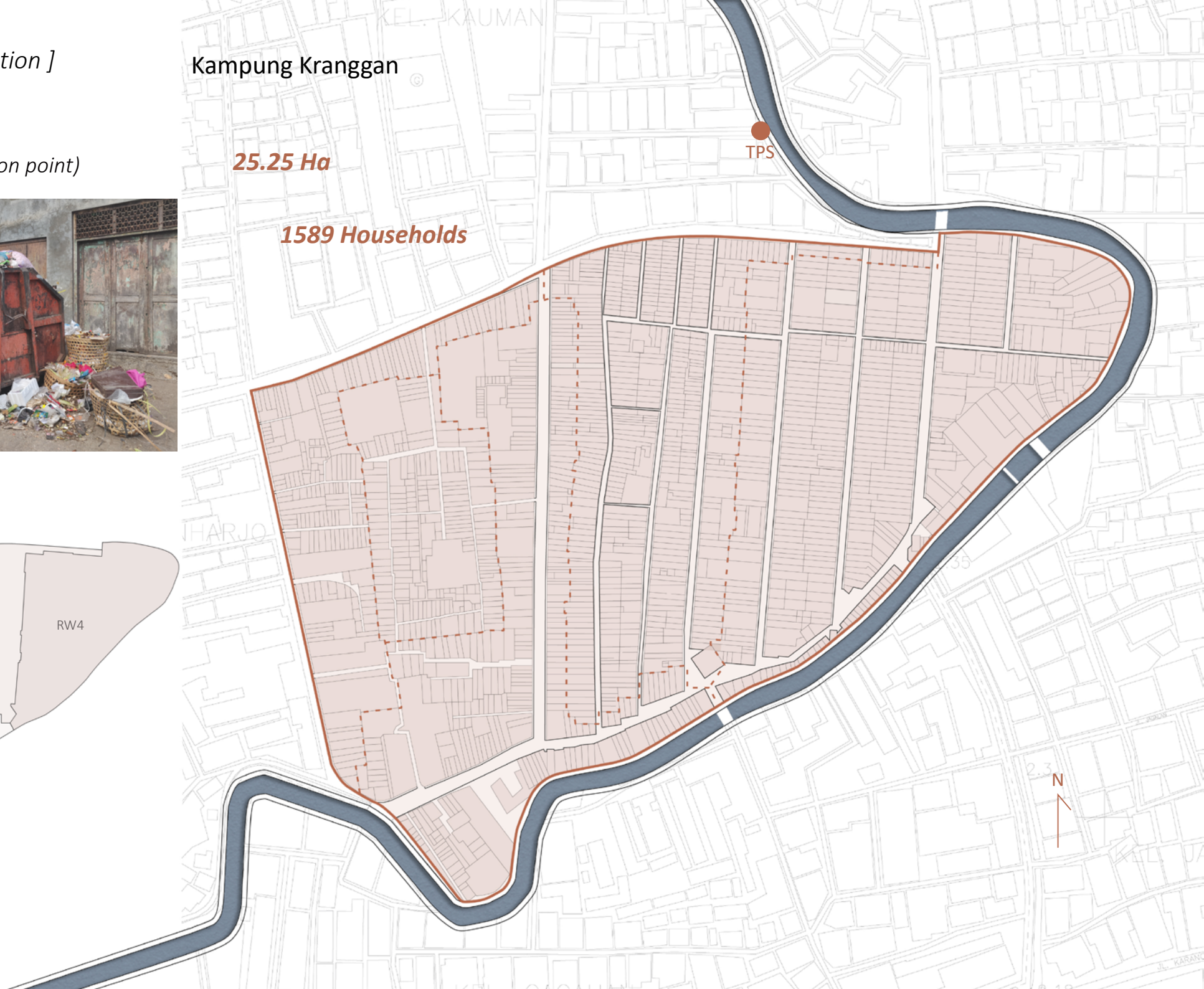
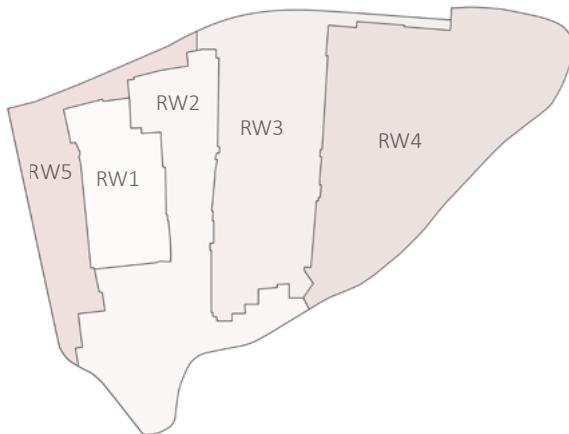
1589 Households

TPS

TPS (waste collection point)



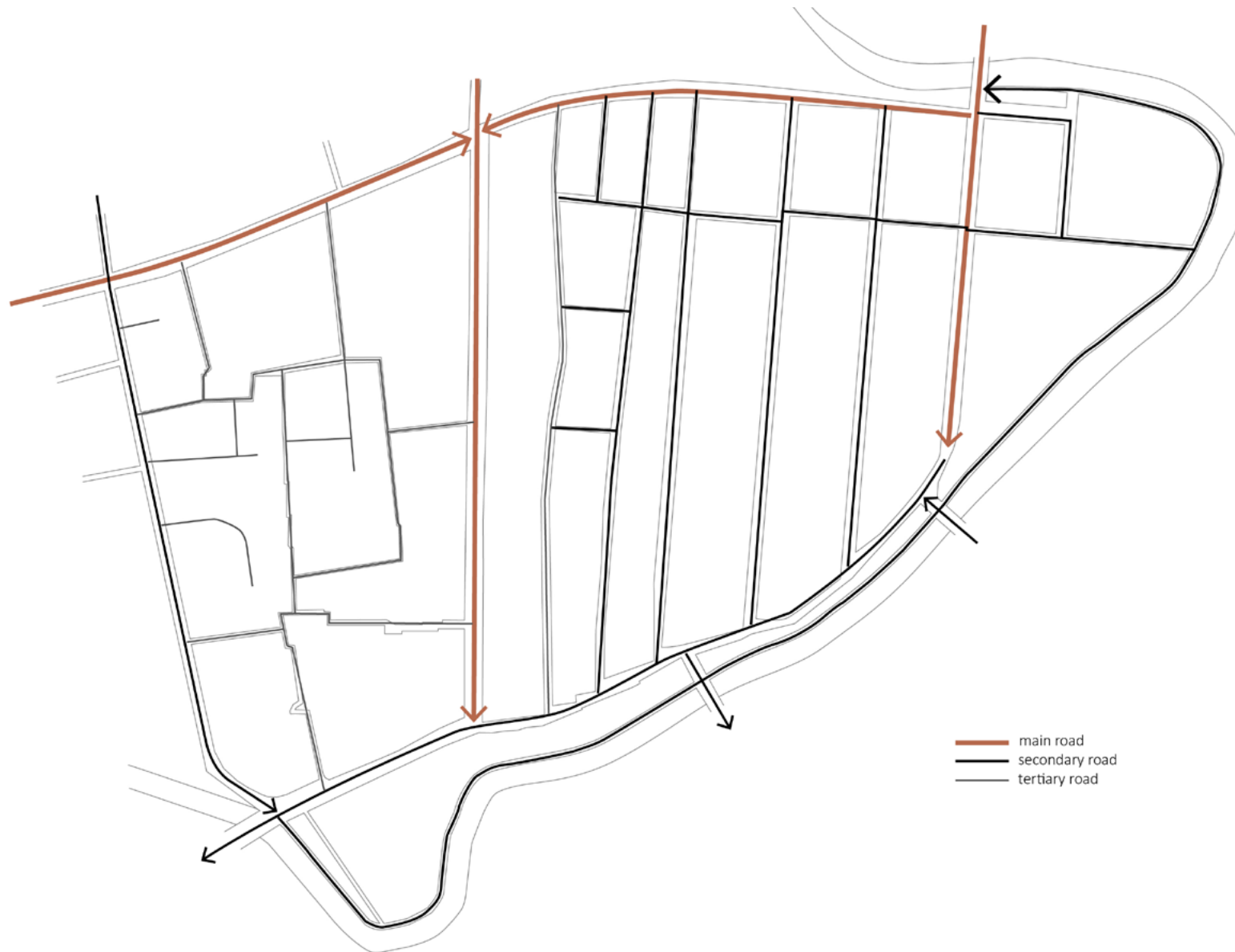
RW boundary



[Site Analysis]

Accessibility

introduction problem field analysis strategy design

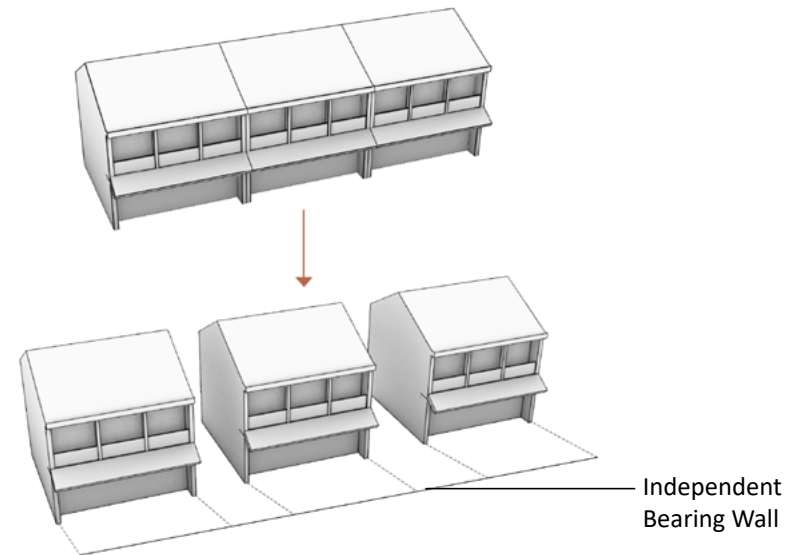
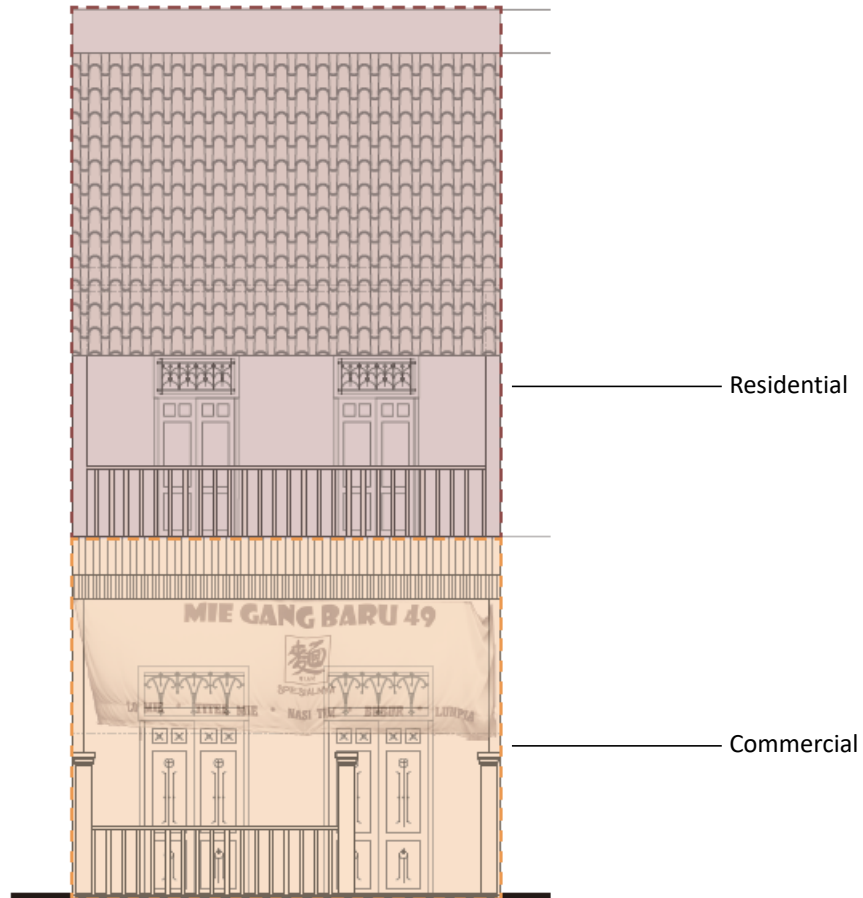


[Site Analysis]

Street Profile



Shophouse



[Site Analysis]

Building Condition & Heritage Value



Street Facade



[Site Analysis]

Temples



1. Siu Hok Bio



2. Tek Hay Bio



3. Ling Hok Bio



4. Tong Pek Bio



5. Hoo Hok Bio



6. Kong Tik Soe



[Site Analysis]

Waterfront Typology



[Site Analysis]

Waterfront Typology



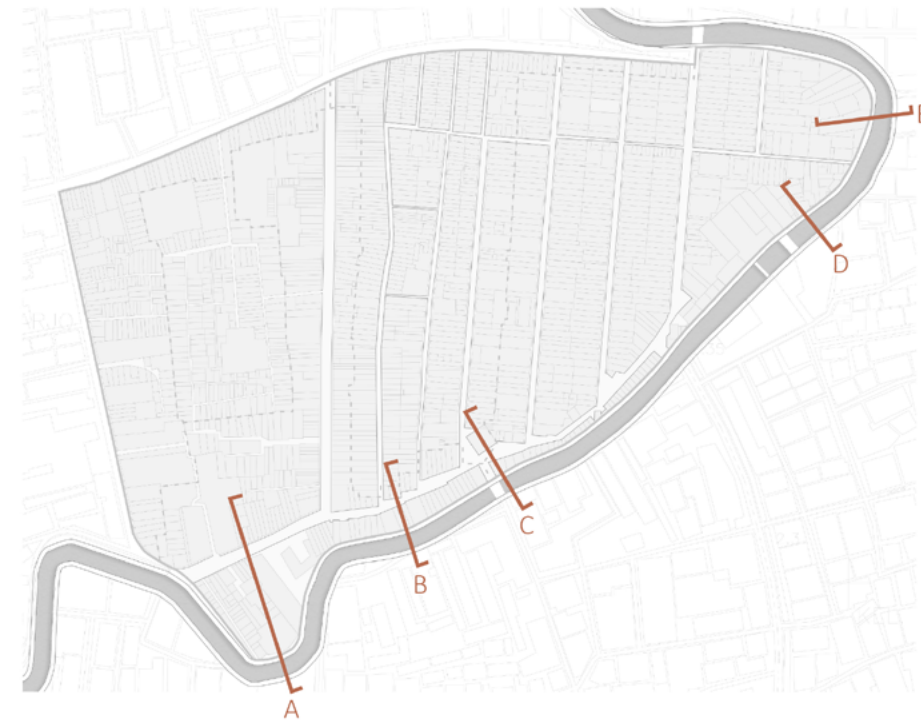
[Site Analysis]

Waterfront Typology

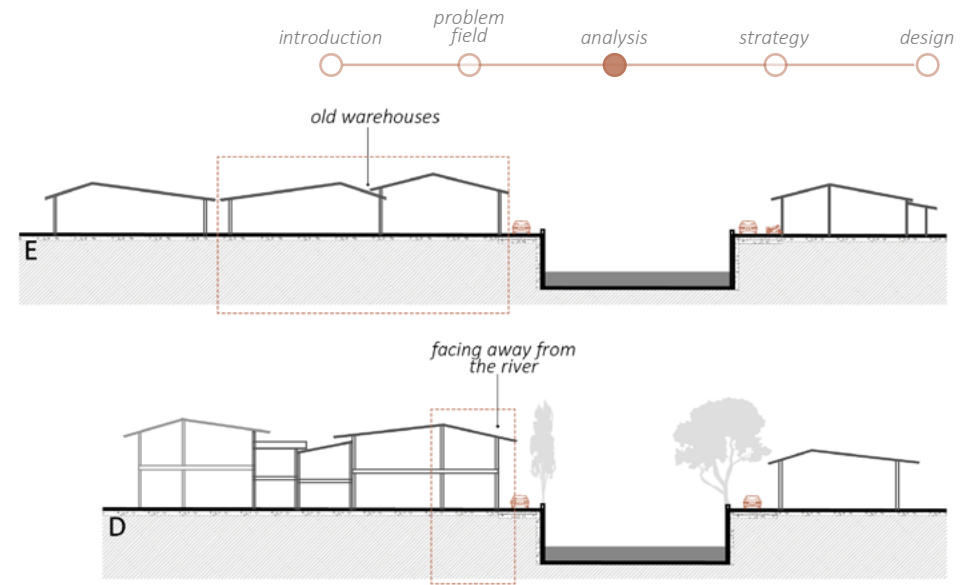
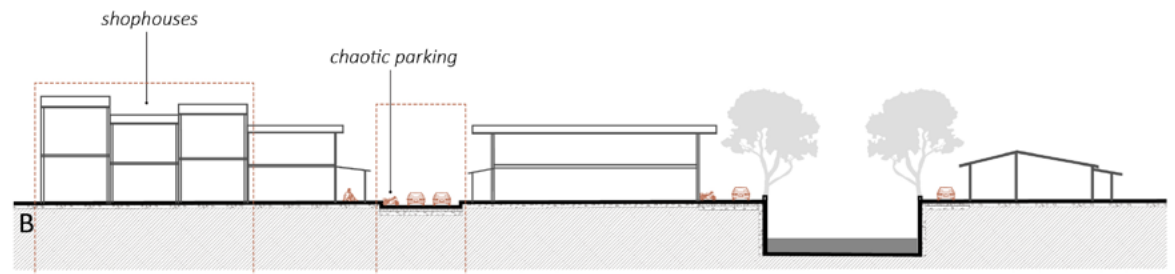
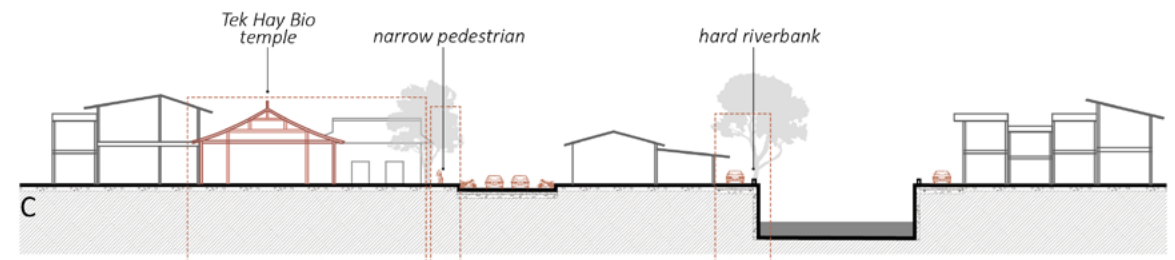
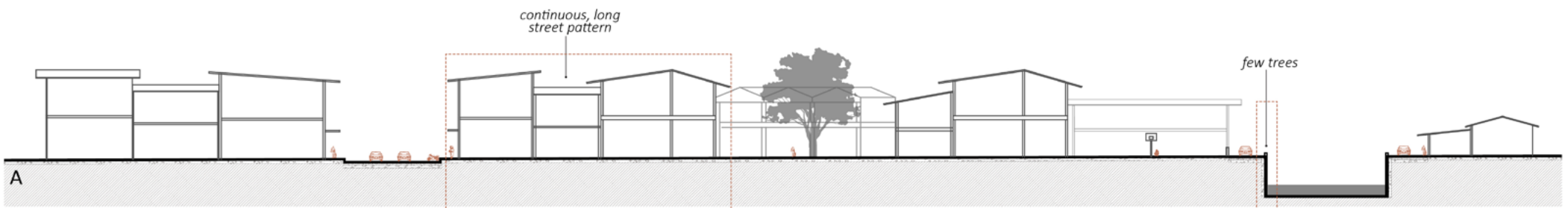


[Site Analysis]

Waterfront Typology

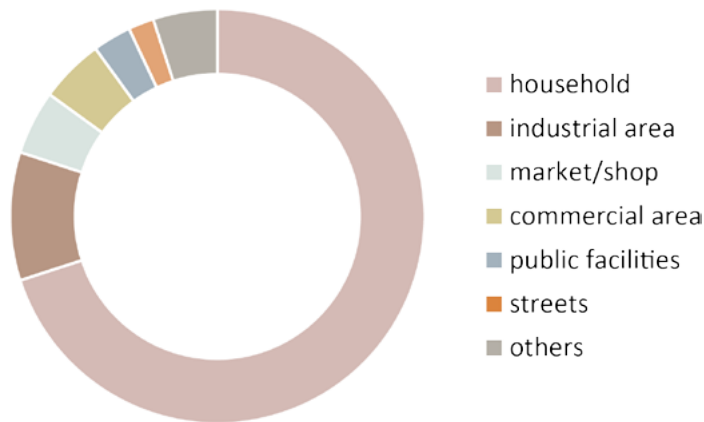


0 10 20m



introduction problem field analysis strategy design

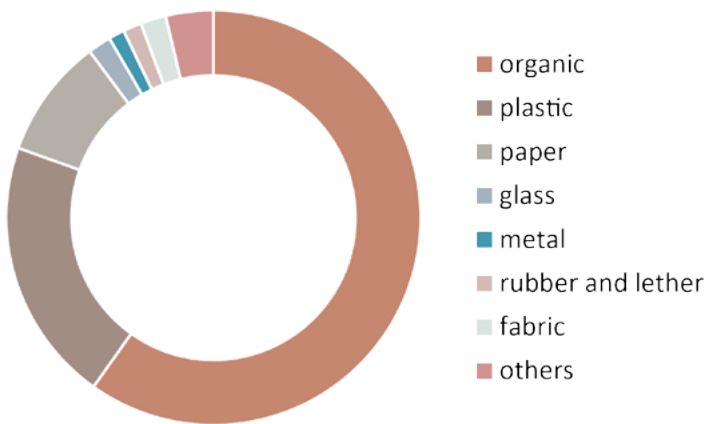
waste sources



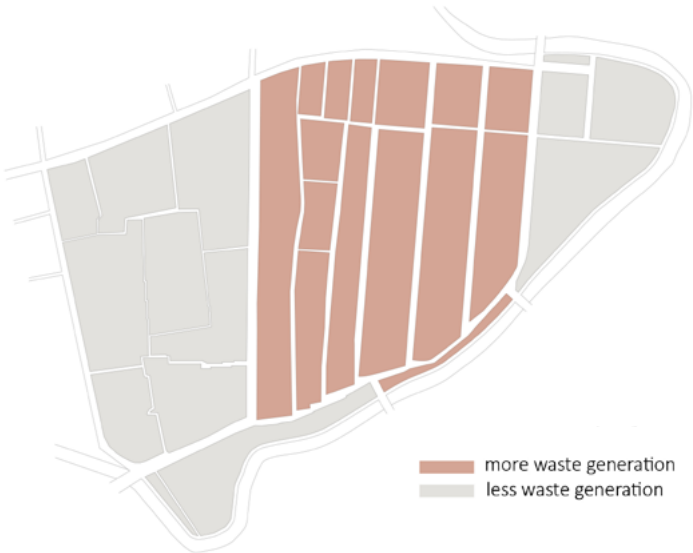
land use



waste composition

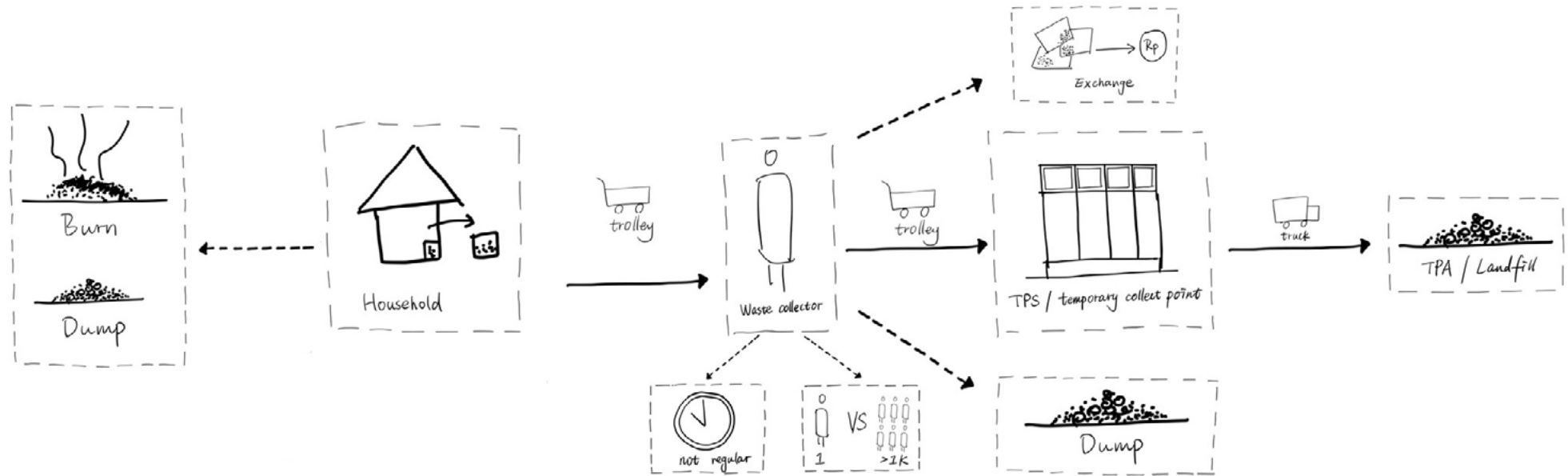


waste generation



[Site Analysis]

Solid Waste



household

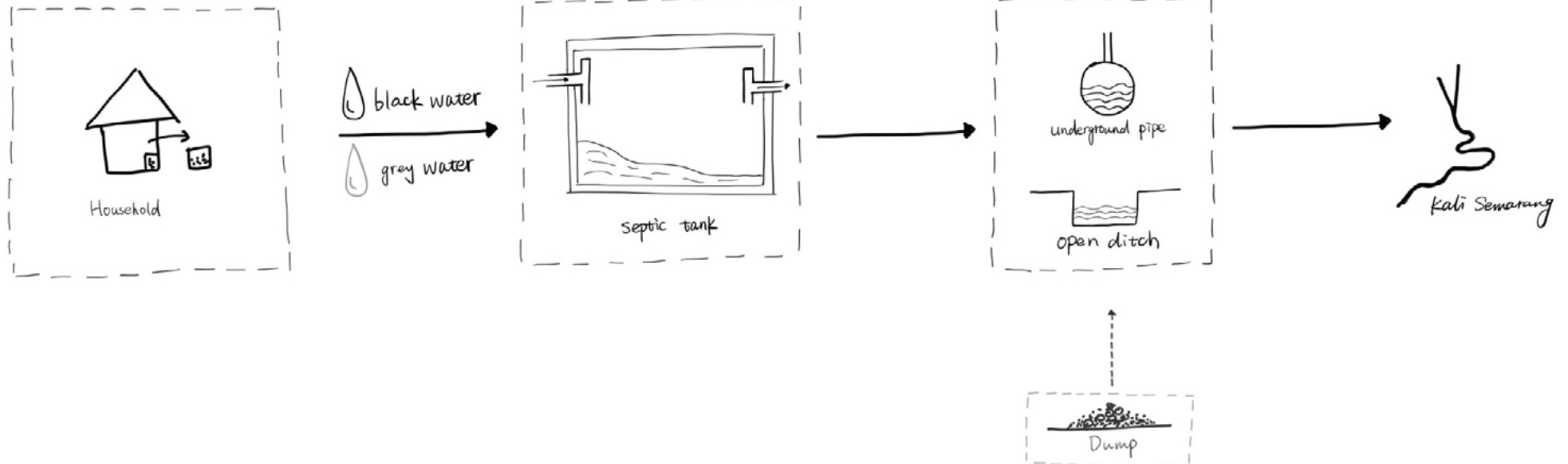
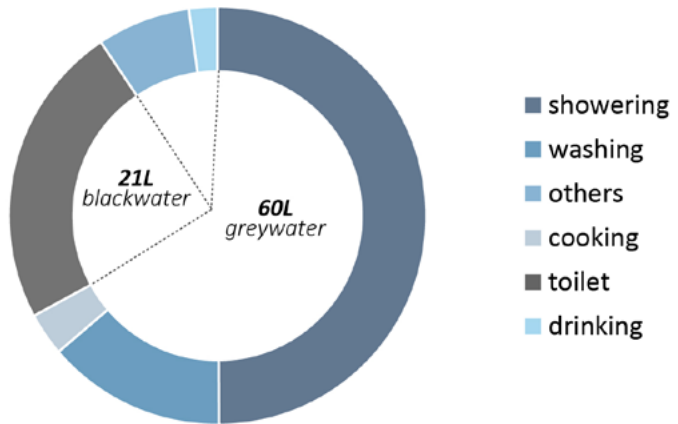
kampung

city

[Site Analysis]

Liquid Waste

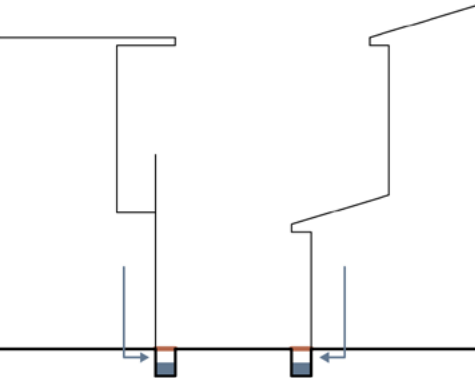
wastewater generation (L/p/day)



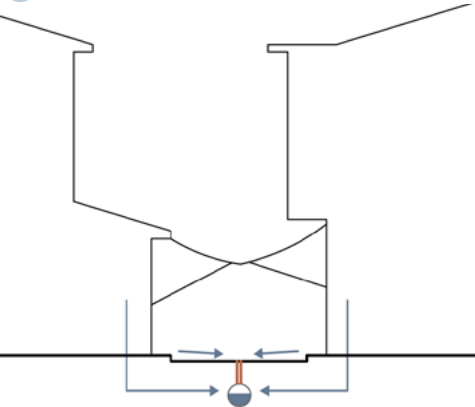
[Site Analysis]

Liquid Waste- Combined Sewer

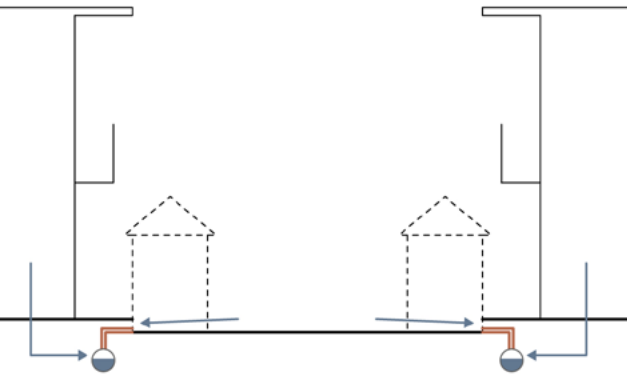
● Typology 1



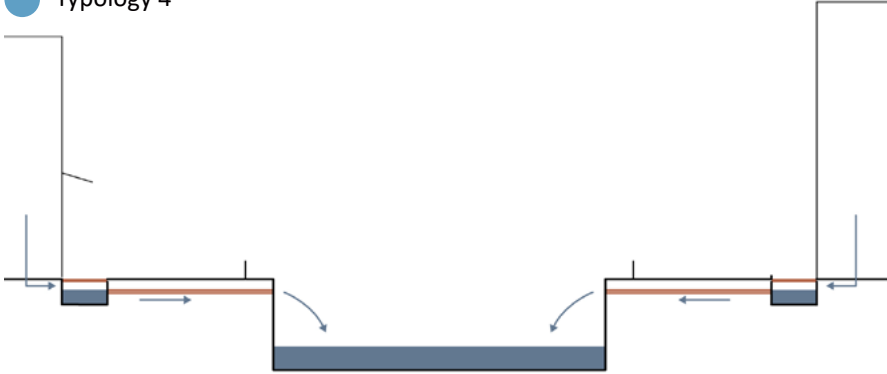
● Typology 2



● Typology 3



● Typology 4



[Site Analysis]

Liquid Waste- Combined Sewer



● Typology 1



● Typology 2



● Typology 3



● Typology 4



[Site Analysis]

Liquid Waste- Topography



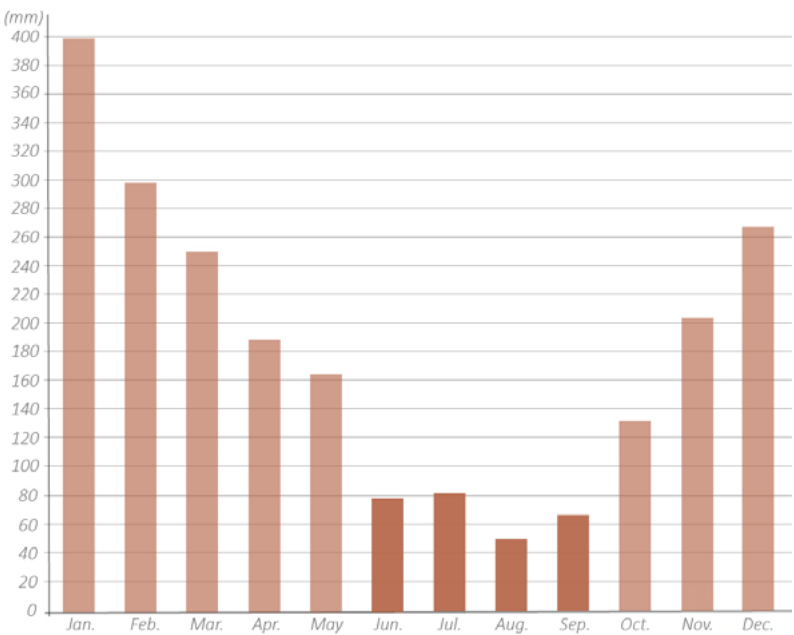
Section 1



Section 2

Liquid Waste- Water level

Semarang annual rainfall



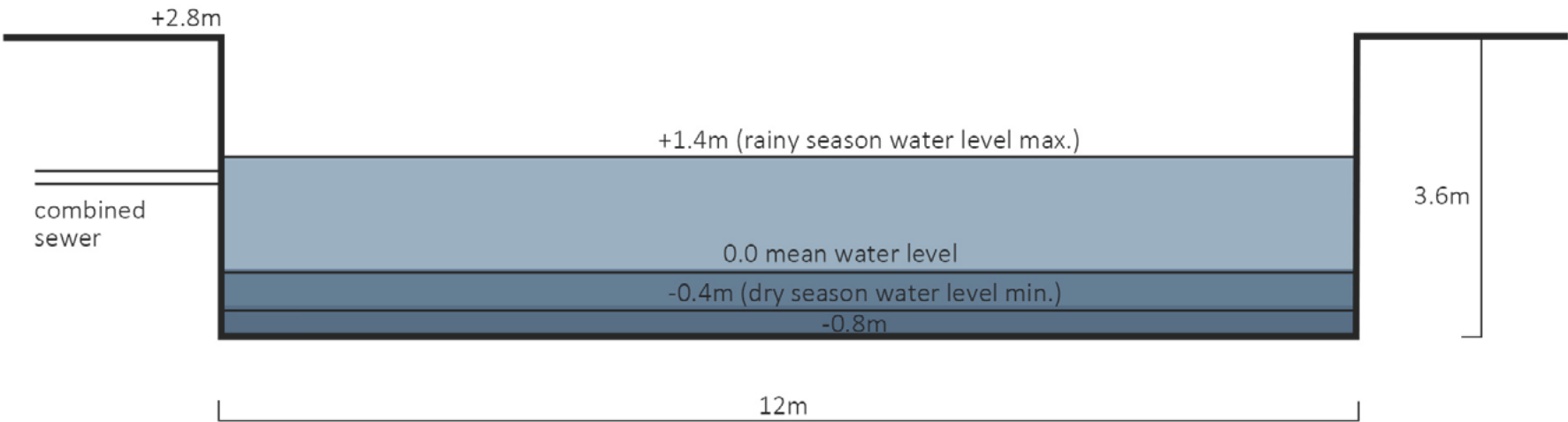
Water levels near Semarang at its source are also **less than half** of normal and water shortages have become severe with even rivers drying up. **news from Sept. 2019 (dry season)**

三宝垄东、西区防洪运河沉积物令人忧虑

【本報訊】三宝垄东、西区防洪运河沉积物堆积严重，导致运河淤塞，排水不畅，甚至出现水漫金山的情况。据当地居民反映，运河沉积物堆积如山，不仅影响了运河的排水功能，还对周边的环境和居民生活造成了严重影响。当地政府和相关部门已经采取行动，组织人员进行清理，但效果并不明显。居民们表示，他们已经习惯了这种状况，但希望政府能够采取更有效的措施，解决这一问题。

the water on the street is more than half meters high **news from Feb., 2015 (rainy season) indicates the drainage overflow**

Water Level Estimation



[Site Analysis]

Liquid Waste- PDAM Pipe Network



[Site Analysis]

Existing Green Space & Trees



introduction problem field analysis strategy design



[Site Analysis]

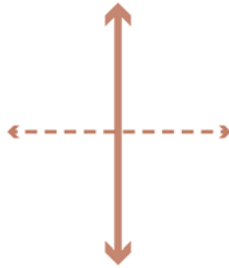
Empty Space & Abandoned/Broken Buildings



dense urban tissue



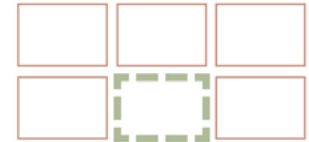
weak West to East connection



insufficient waste management



lack of high quality green space





MAKOKO Urban Design Toolbox

decentralized waste management with socio-economic benefits



Weishanhu Wetland Park

constructed wetland water purification



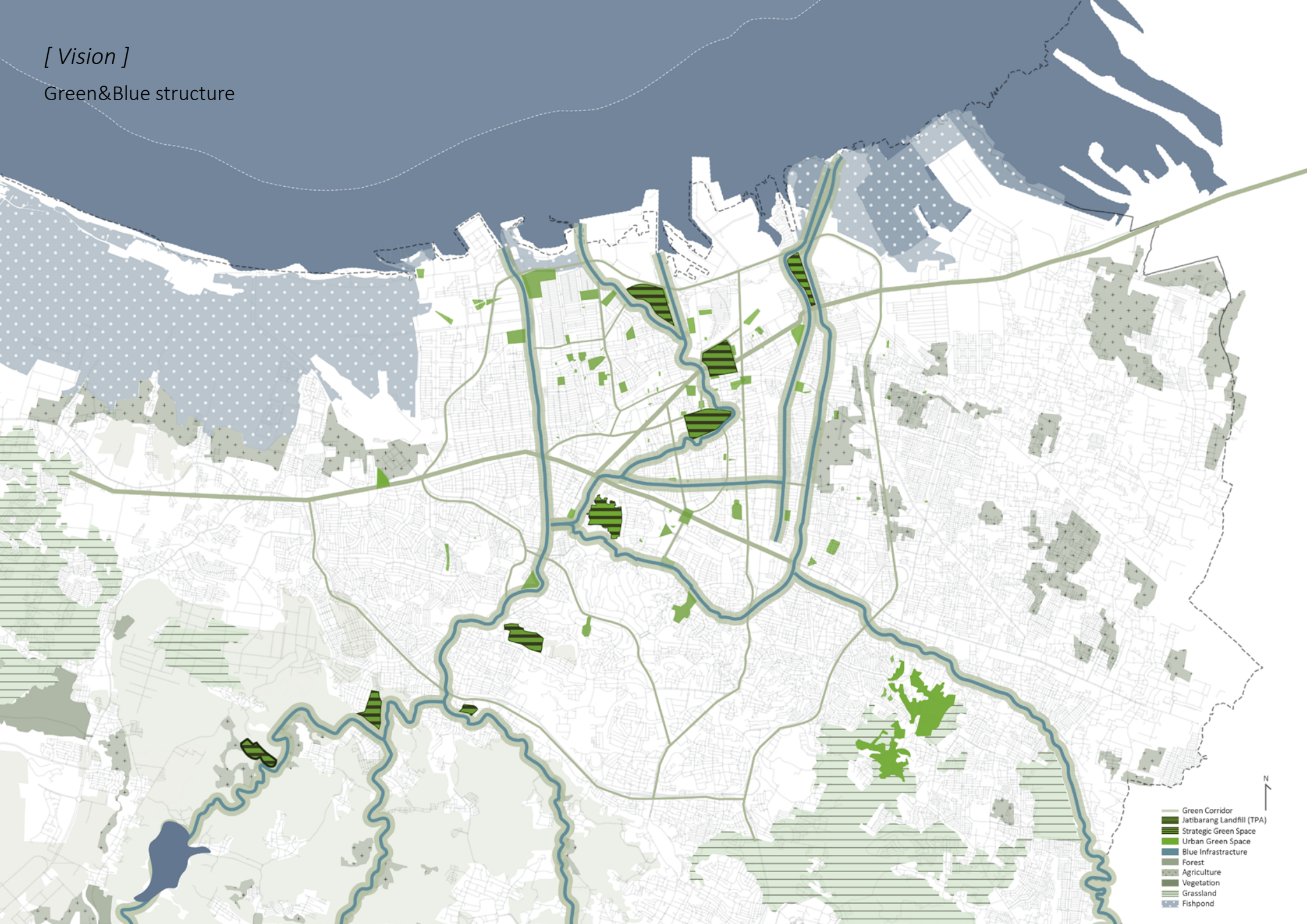
UP+S Rain Garden

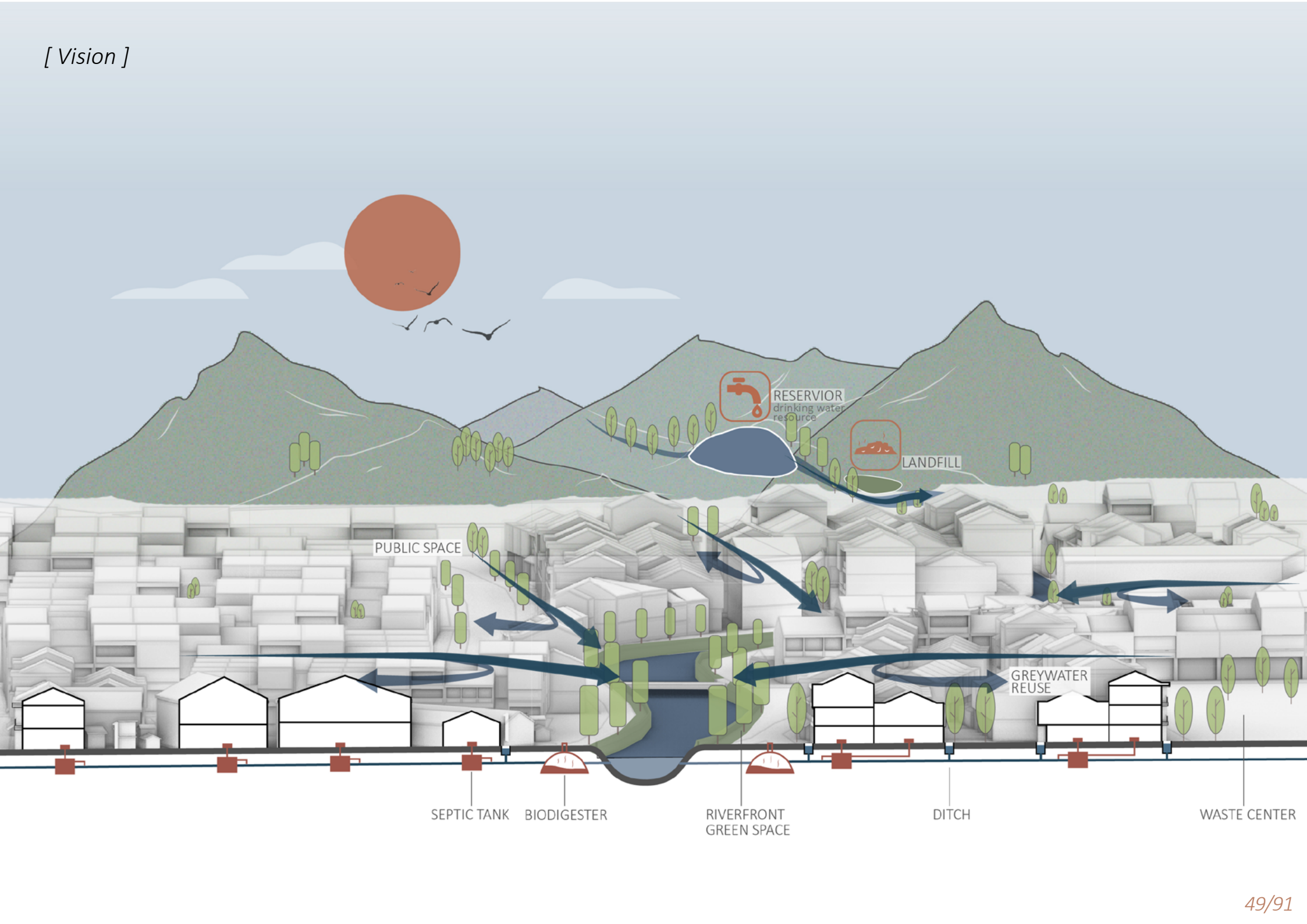
low-cost rainwater harvesting



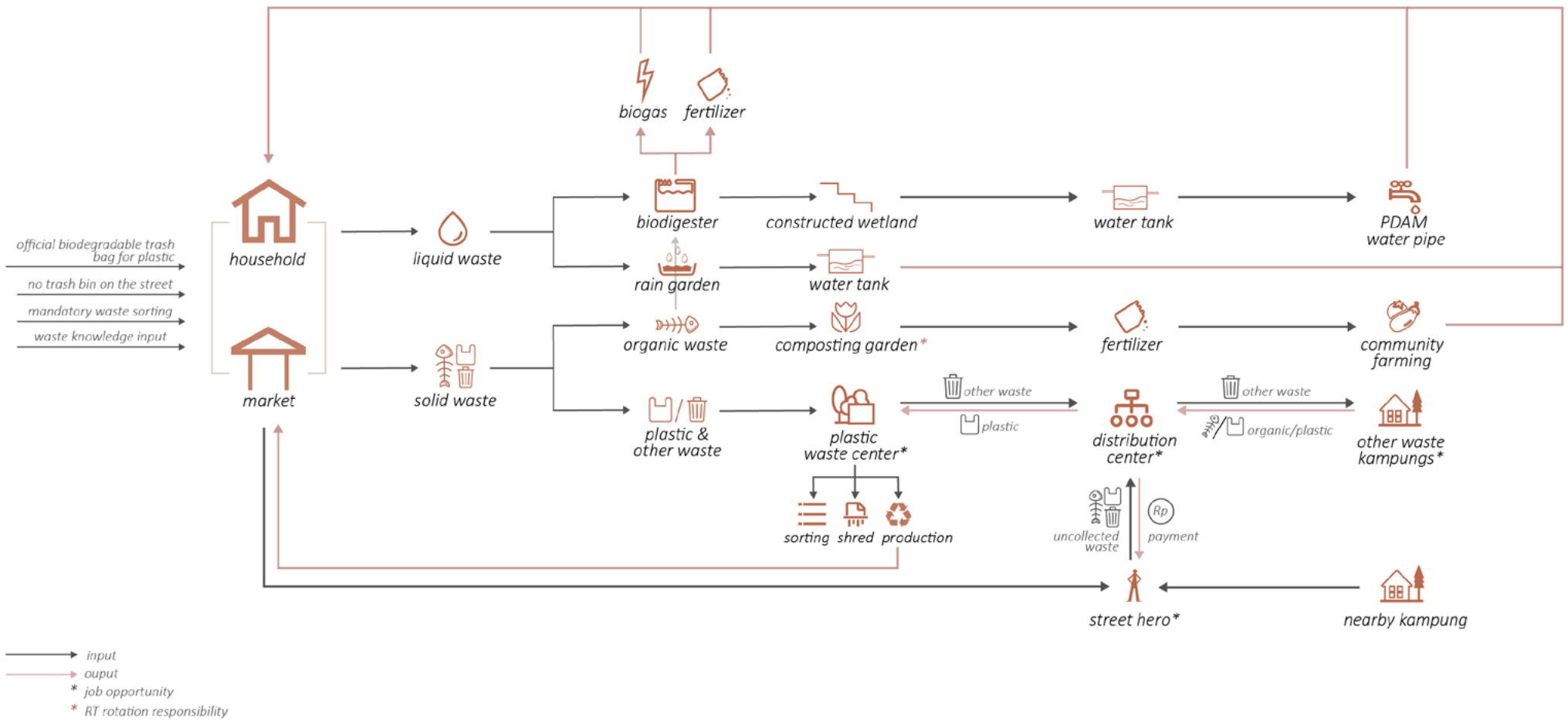
[Vision]

Green&Blue structure

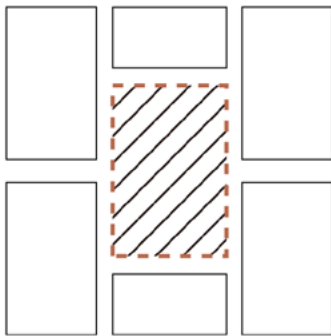




[Proposed Waste Flow]

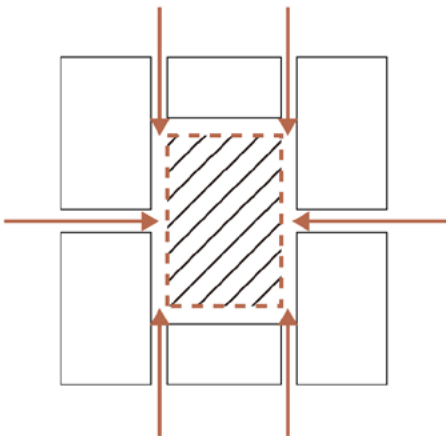


PROVIDE



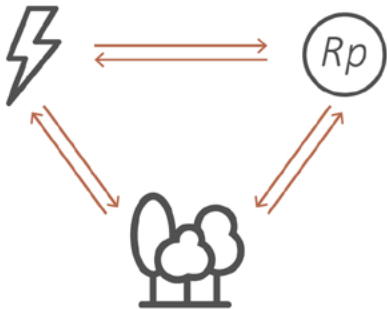
Provide space for waste management

CONNECT



Connect people with waste infrastructure

INTEGRATE



Establish new waste flow and healthy environment

[0. Present]



[1. Provide]
Placemaking



[1. Provide]

Relocate



7.5%
118 demolished buildings

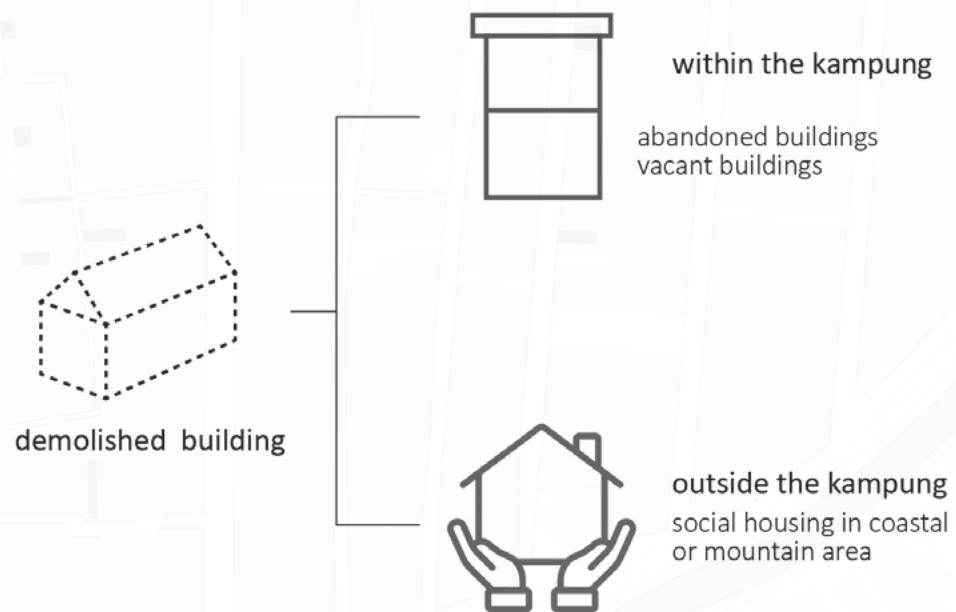


new buildings

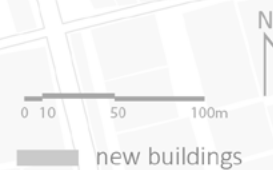
[1. Provide]

Relocate

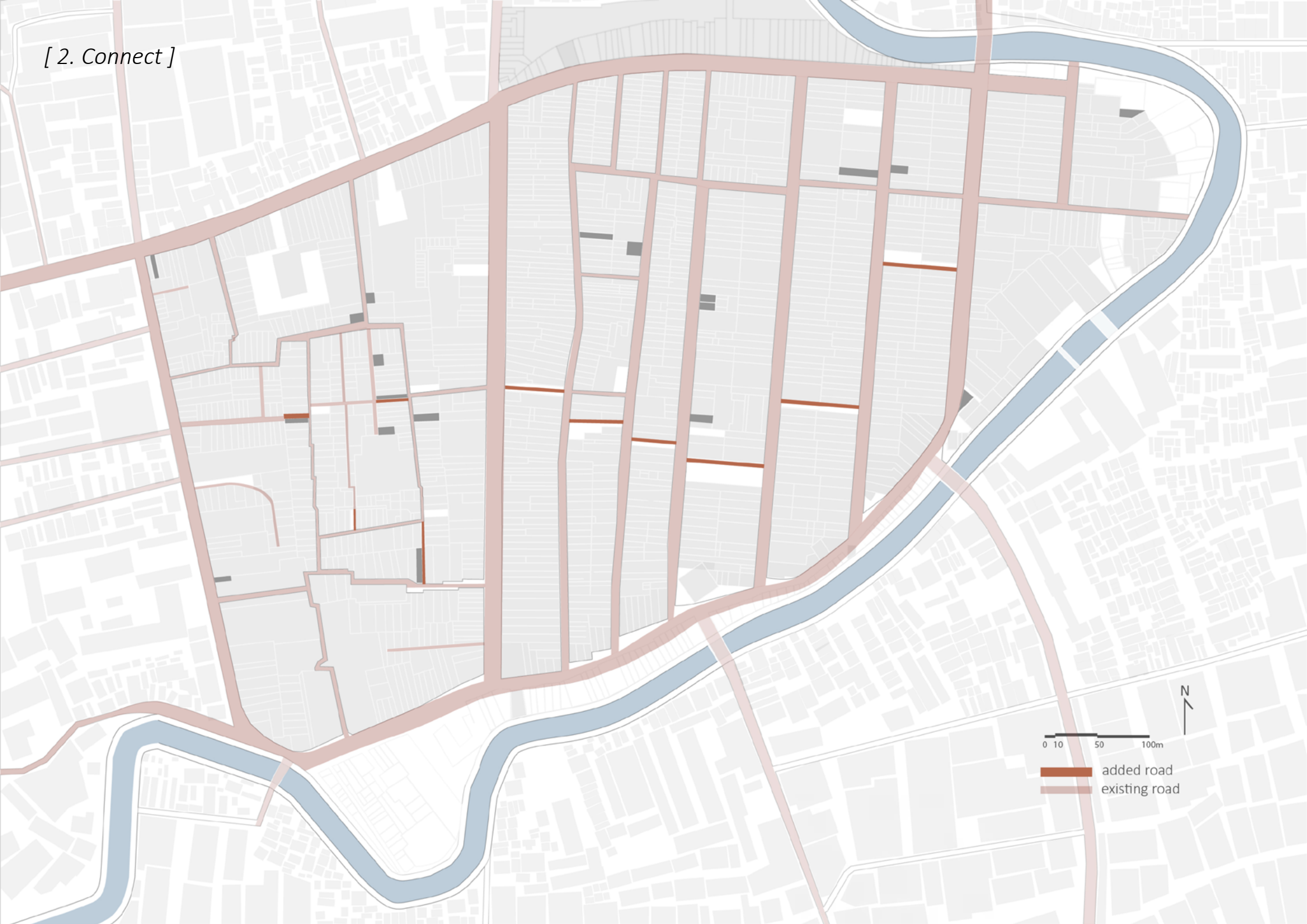
introduction problem field analysis strategy design



7.5%
118 demolished buildings



[2. Connect]



0 10 50 100m

added road
existing road

[3. Integrate]

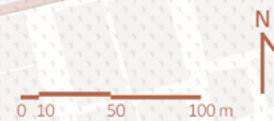




[Masterplan]



Detailed Design



- 1. temple
- 2. composting garden
- 3. waste distribution center
- 4. plastic waste center
- 5. kampung square
- 6. water terrace
- 7. wetland park

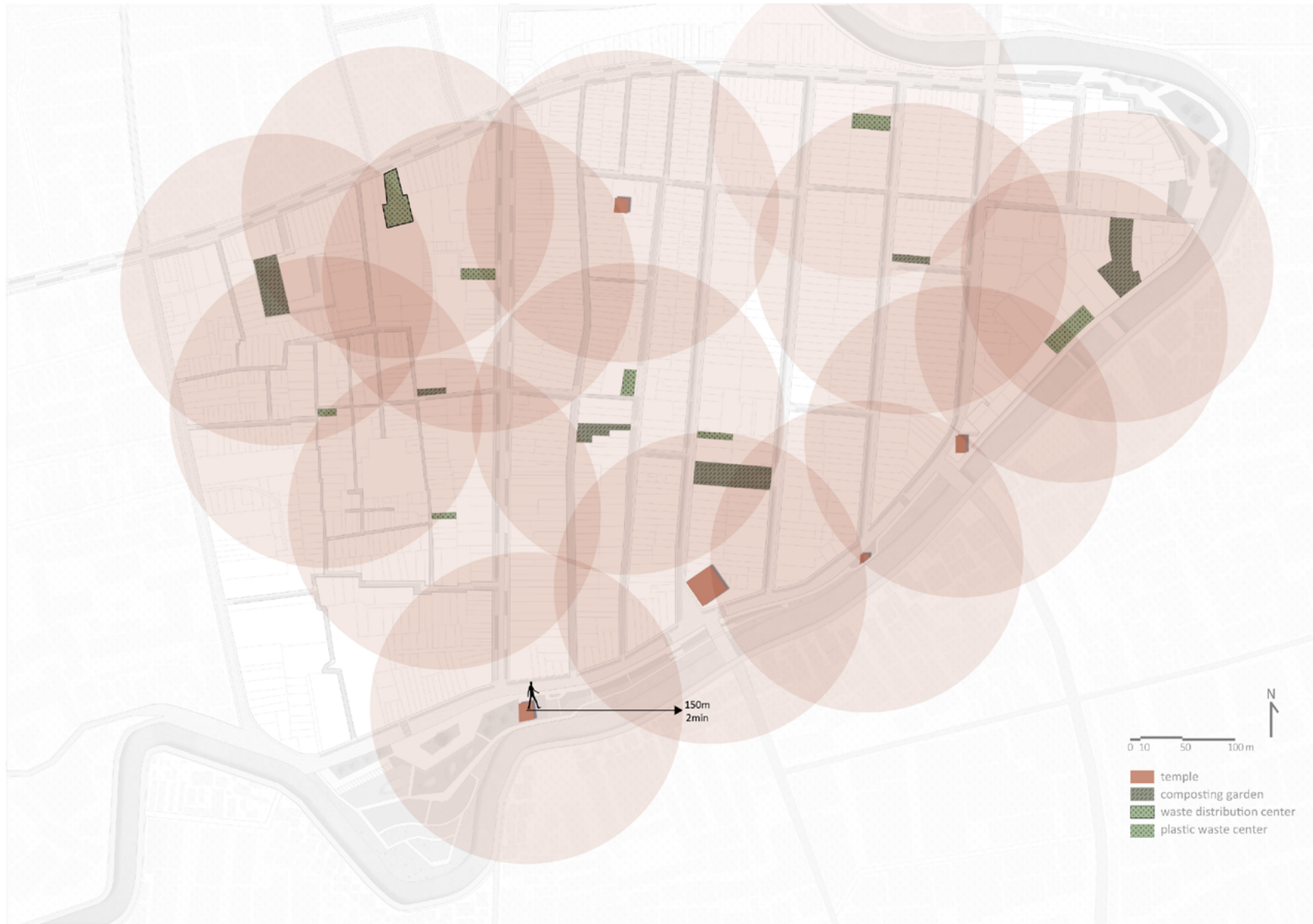
[Overall System]

Solid Waste



[Overall System]

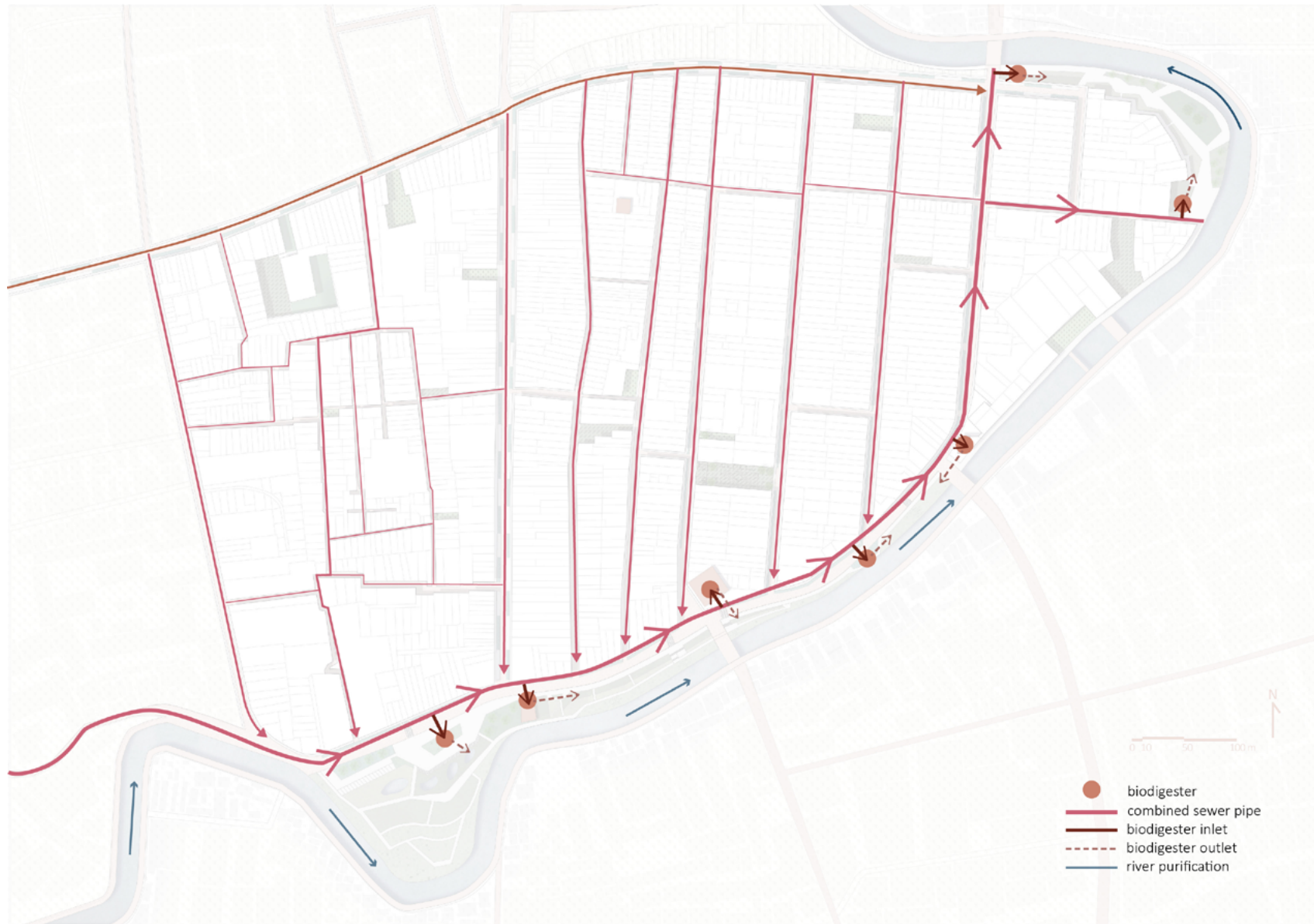
Solid Waste Infrastructure Access



[Overall System]

Liquid Waste- Household Wastewater

introduction problem field analysis strategy design



[Overall System]

Liquid Waste- Rainwater

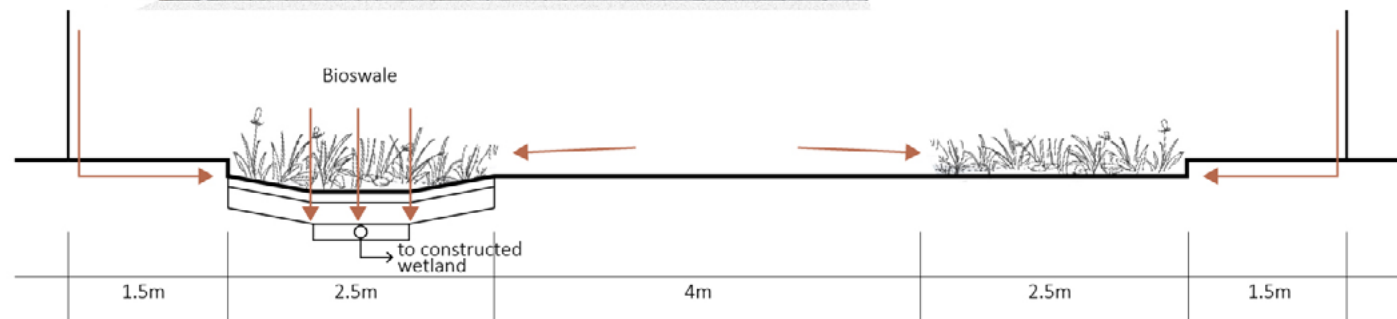
introduction problem field analysis strategy design



[Overall System]

Street Typology- Main Road

Before

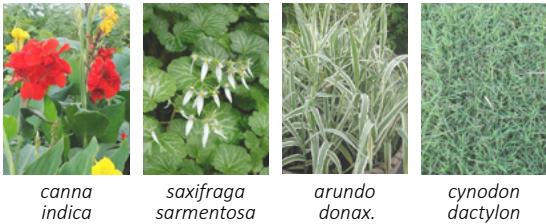
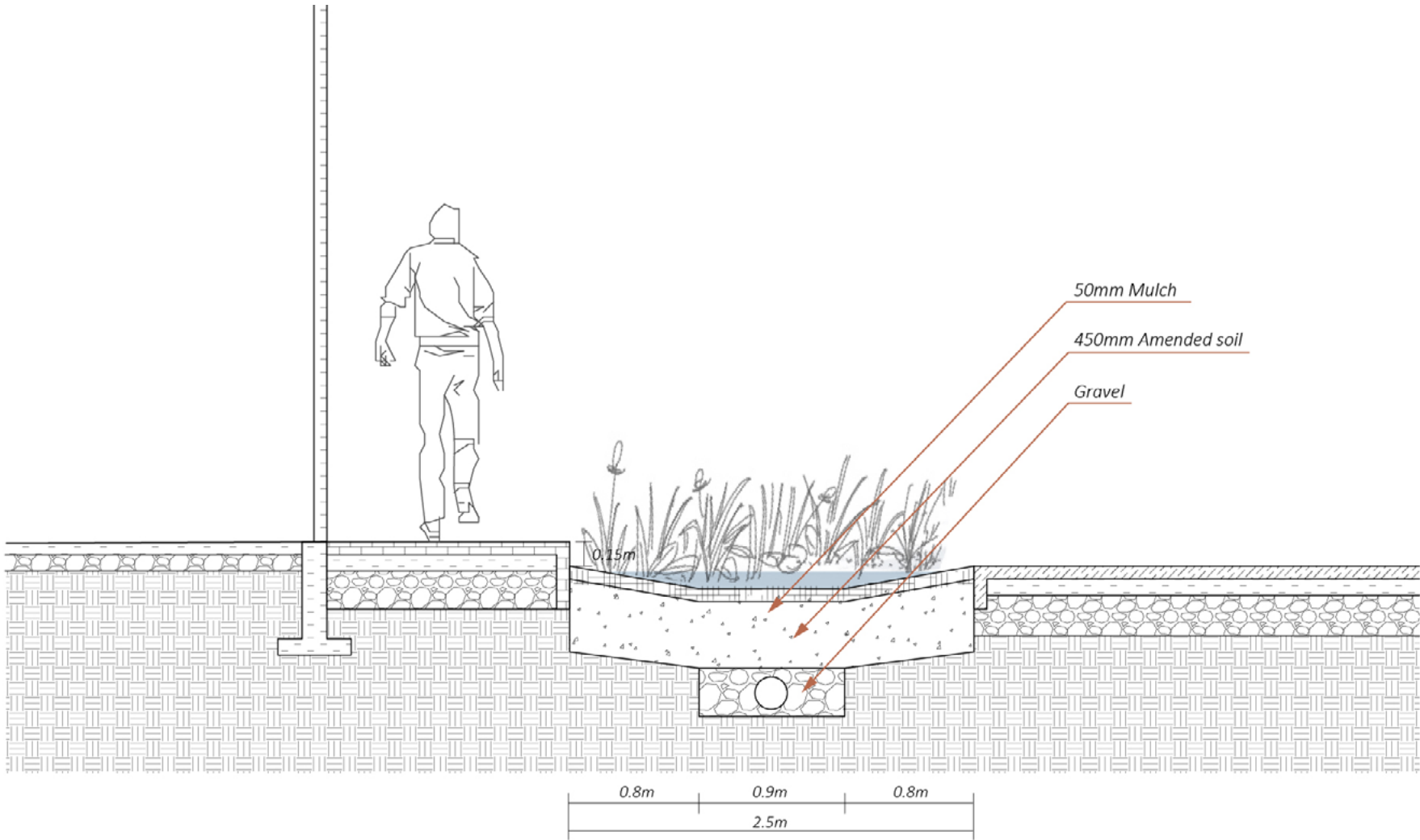


[Overall System]

Street Typology- Main Road



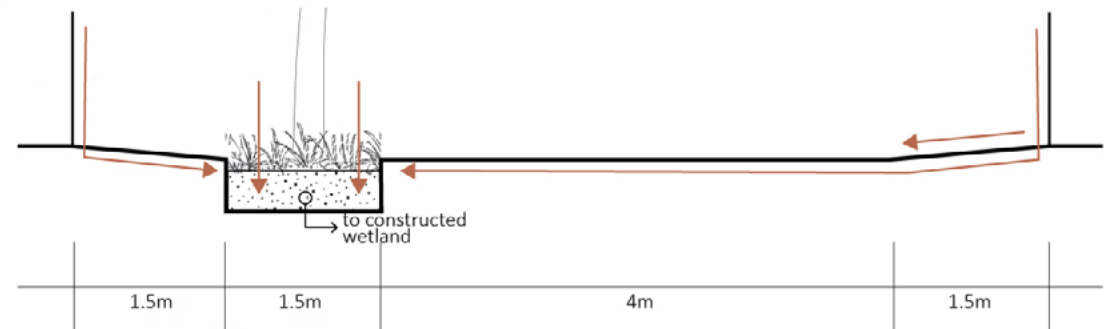
[Overall System]
Bioswale Section - 1:100



[Overall System]

Street Typology- Secondary Road

Before



[Overall System]

Street Typology- Tertiary Road

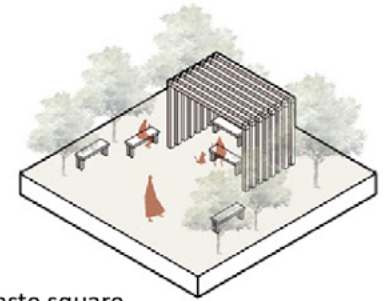
Before



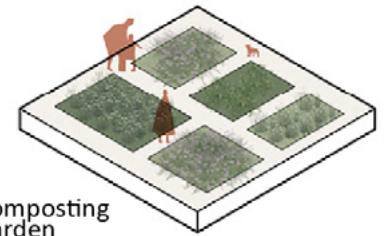
[Overall System]

Green Space

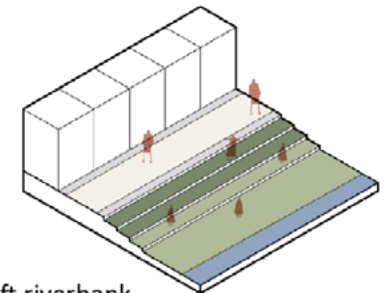
introduction problem field analysis strategy design



● waste square



● composting garden



● soft riverbank

[Detailed Design]

Plastic Waste Center

Composting Garden

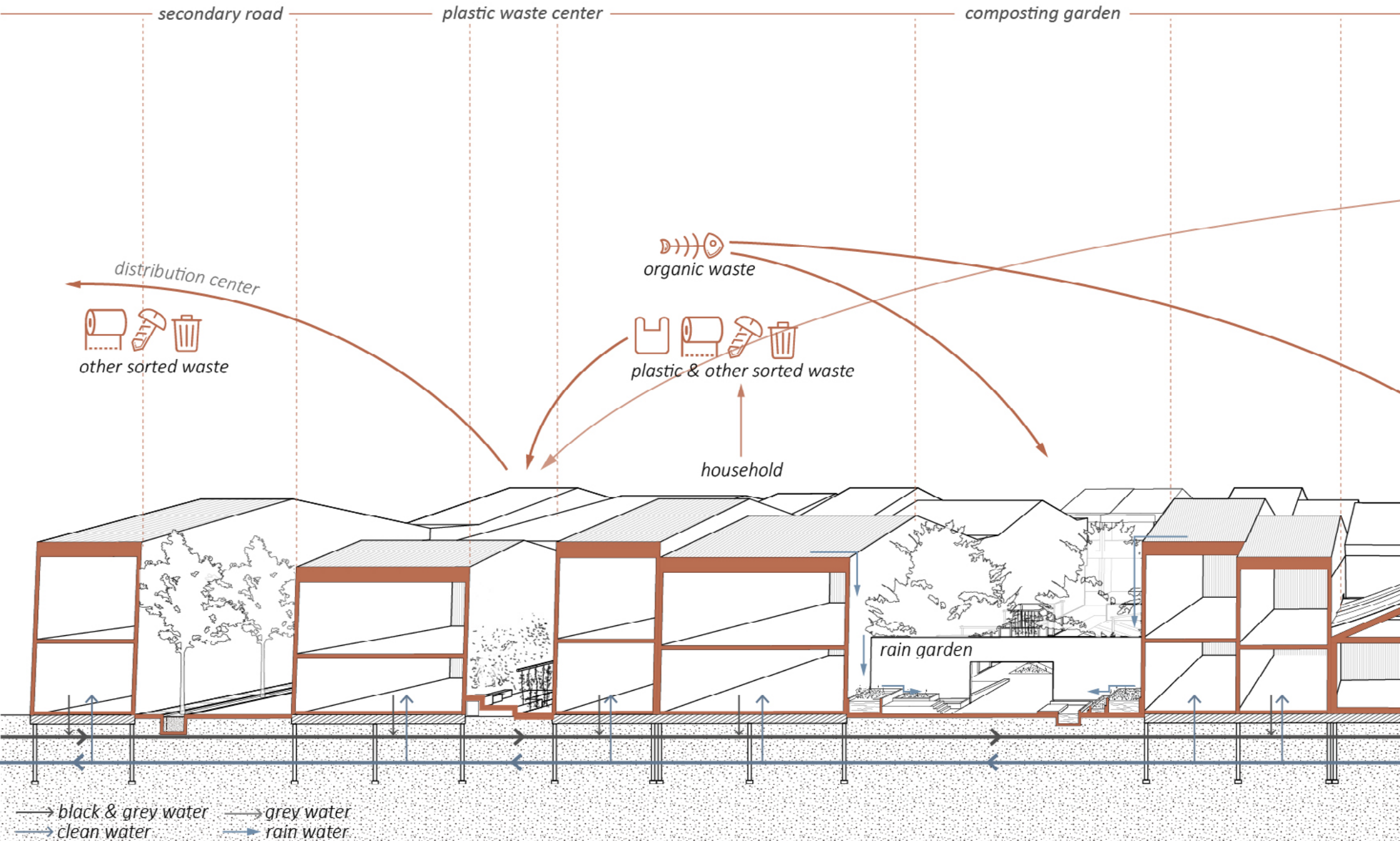
Temple

Water Terrace



[Detailed Design]

introduction problem field analysis strategy design



[Detailed Design]

introduction problem field analysis strategy design

Tek Hay Bio temple

main road

water terrace

nearby kampung

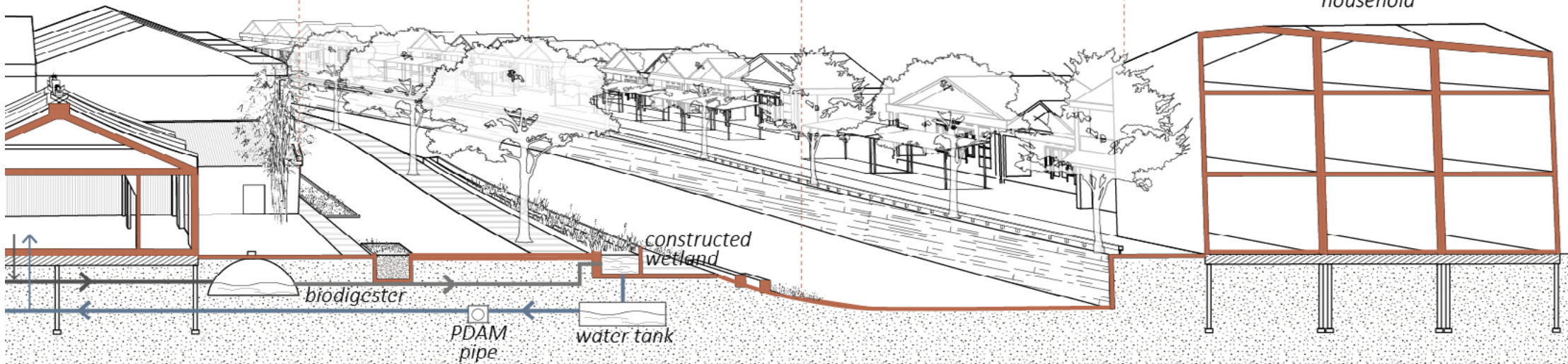


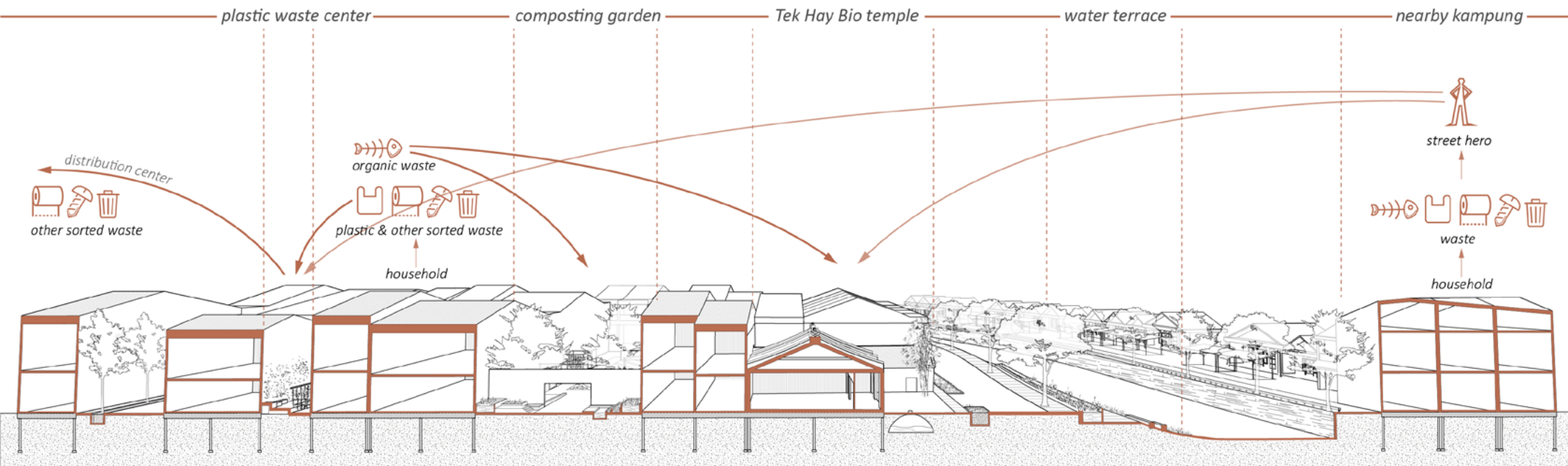
street hero

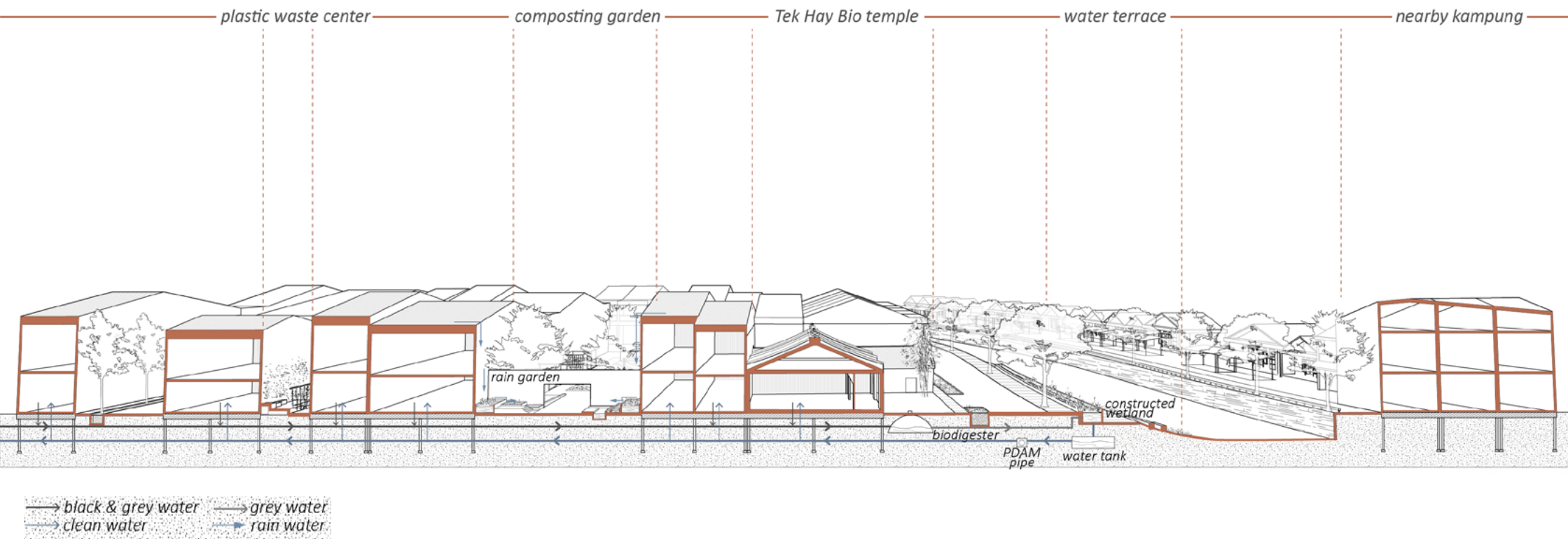


waste

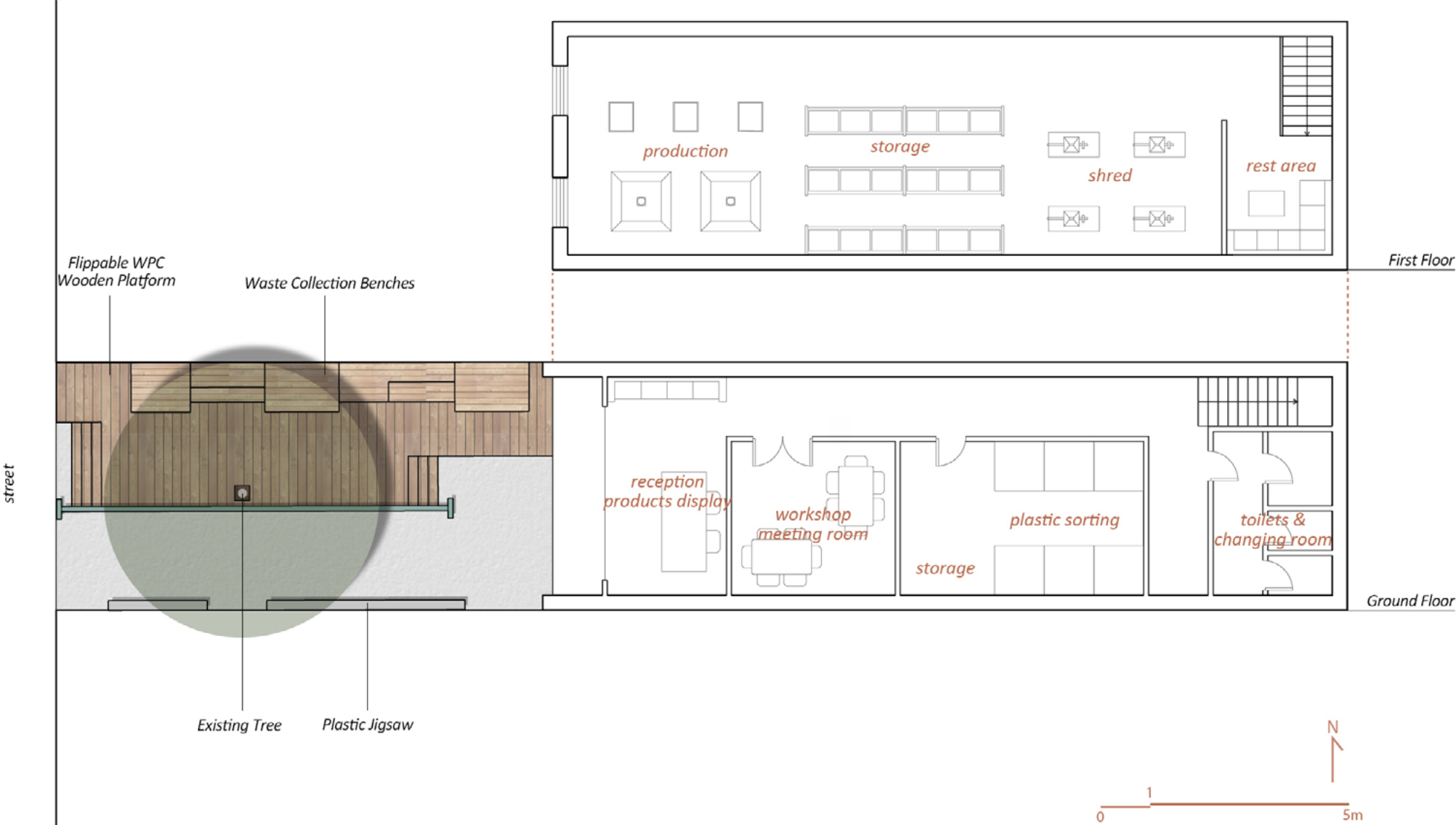
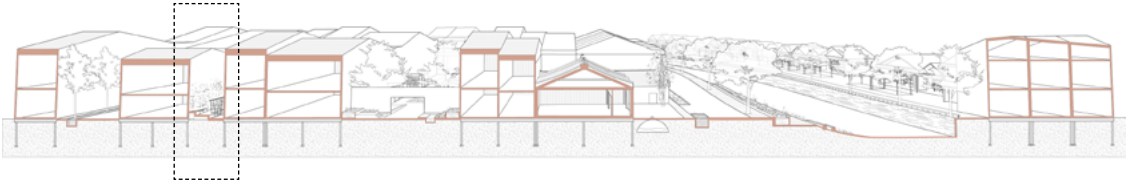
household







[Plastic Waste Center]



[Plastic Waste Center]

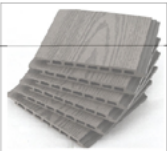
introduction problem field analysis strategy design



WPC platform existing tree

plastic jigsaw

[Plastic Waste Center]



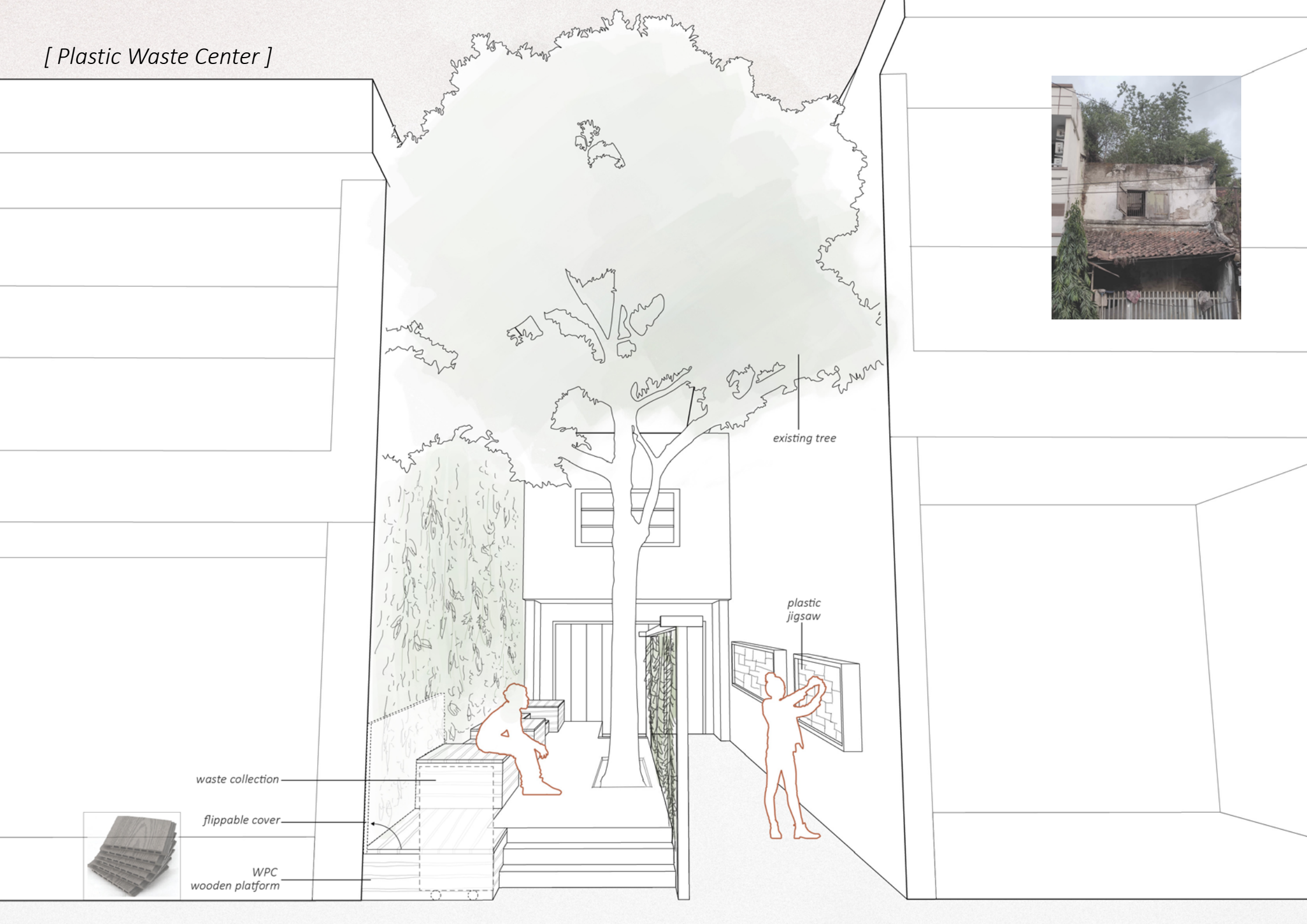
waste collection

flippable cover

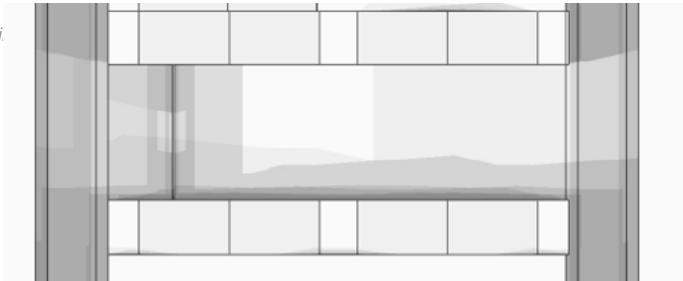
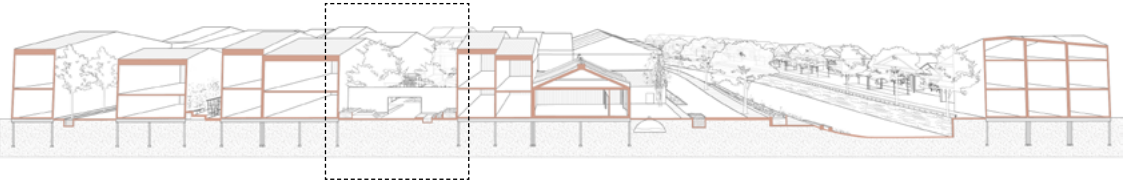
WPC
wooden platform

existing tree

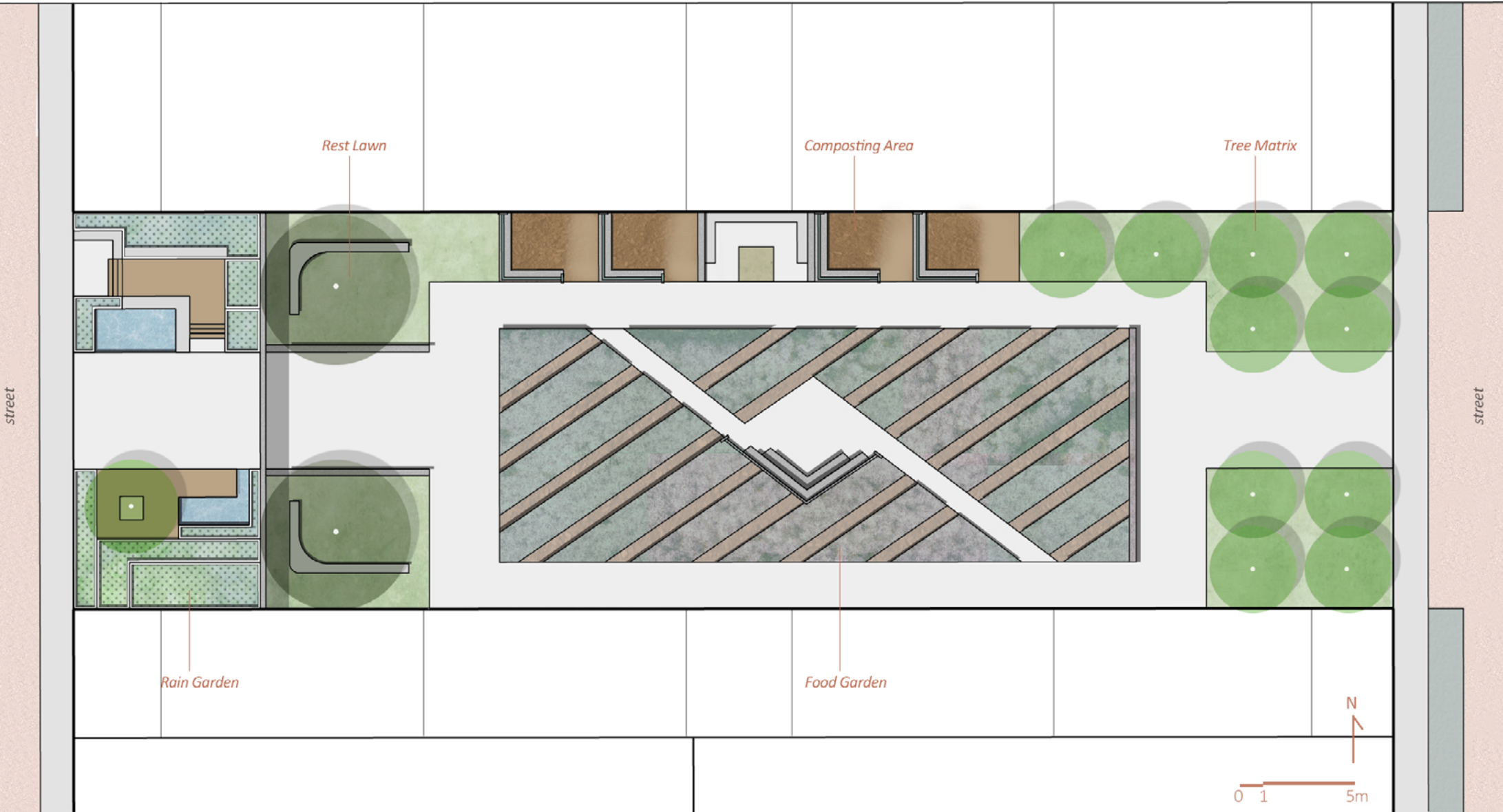
plastic
jigsaw



[Composting Garden]



sunshine analysis



[Composting Garden]

Rain Garden

introduction problem field analysis strategy design



weathering steel

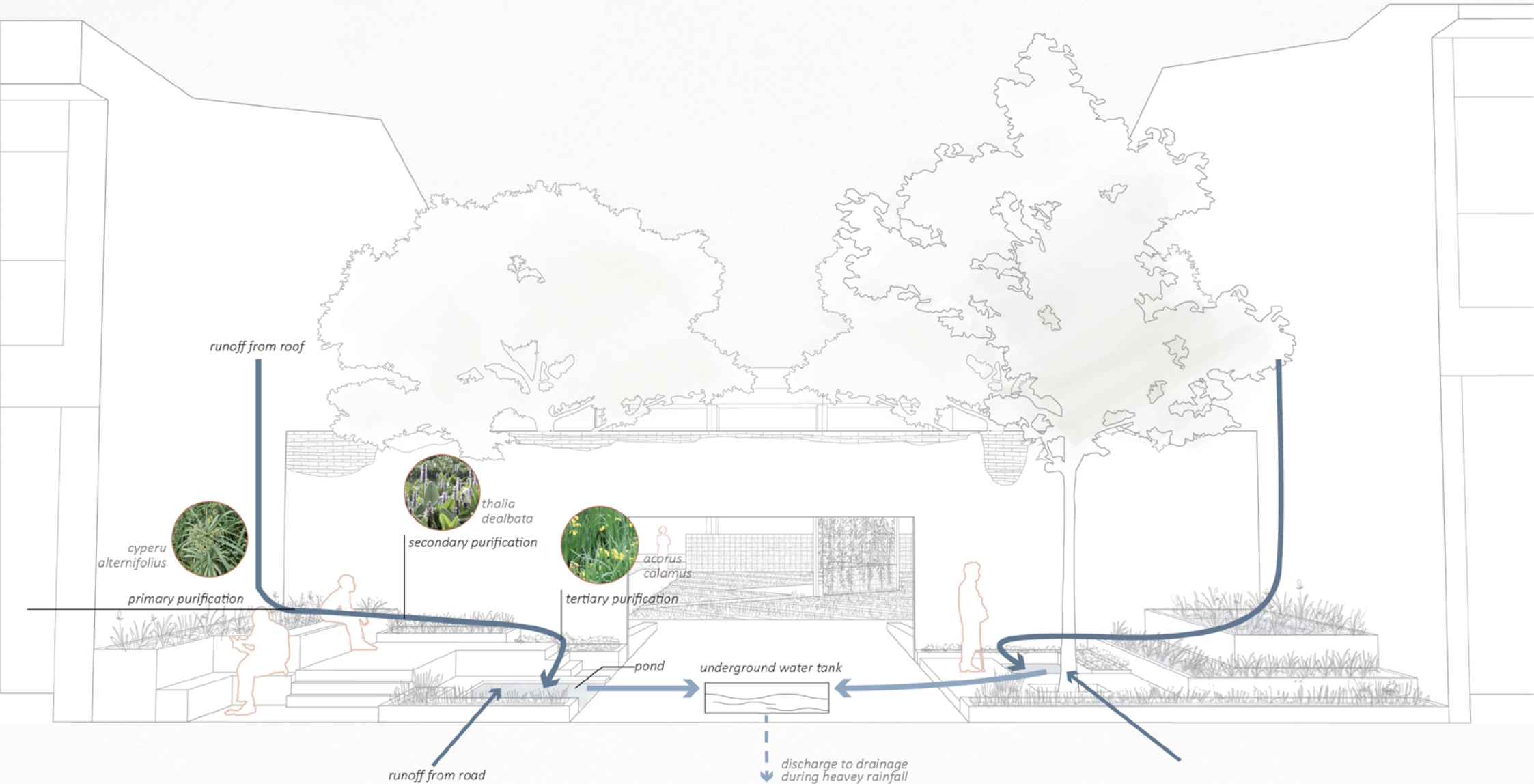
existing tree

existing wall

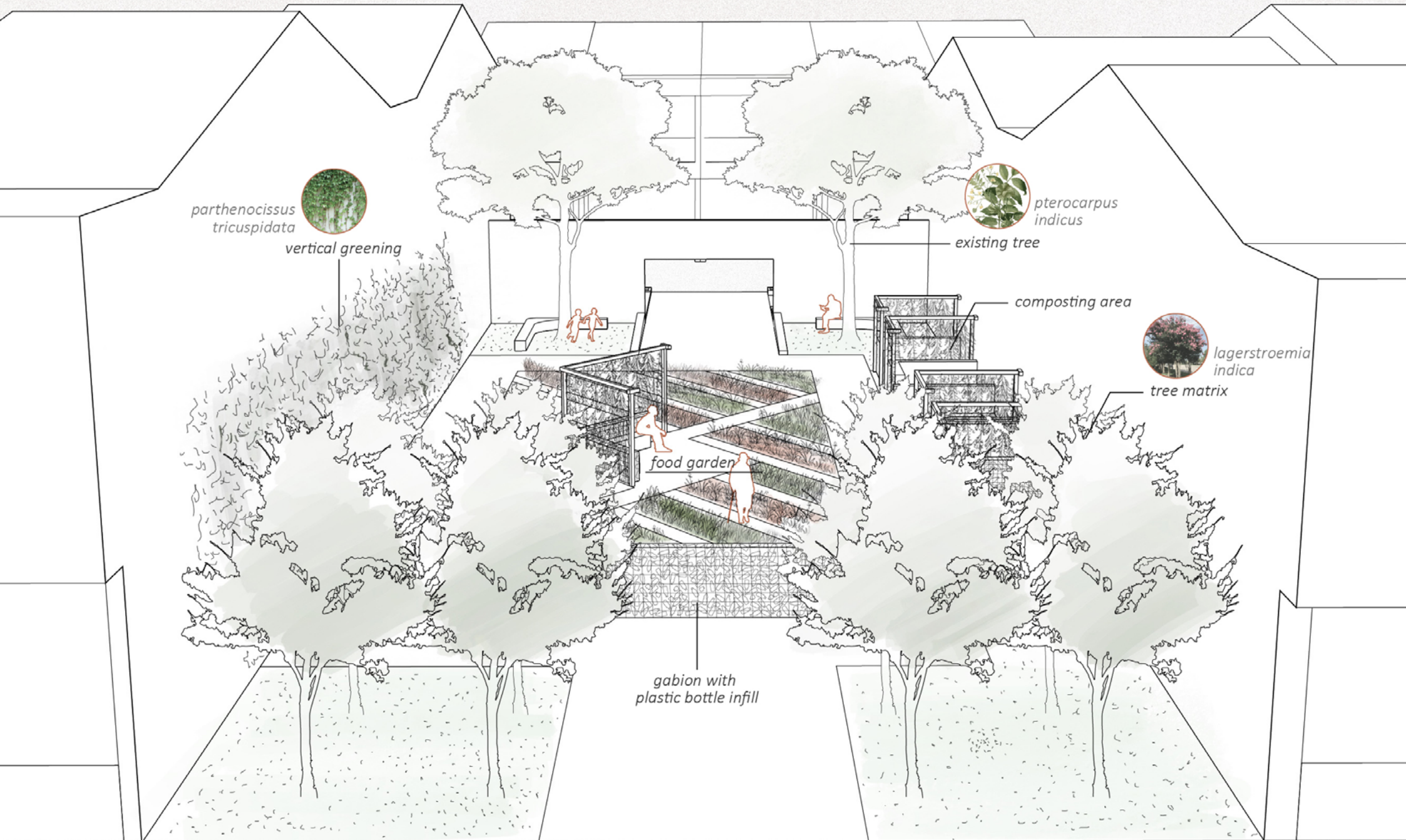
FRP grating existing tree

[Composting Garden]

Rain Garden



[Composting Garden]



[Composting Garden]

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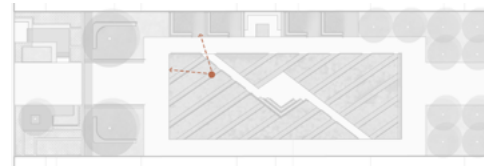
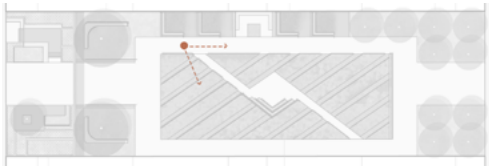


imprinted brick made by locals

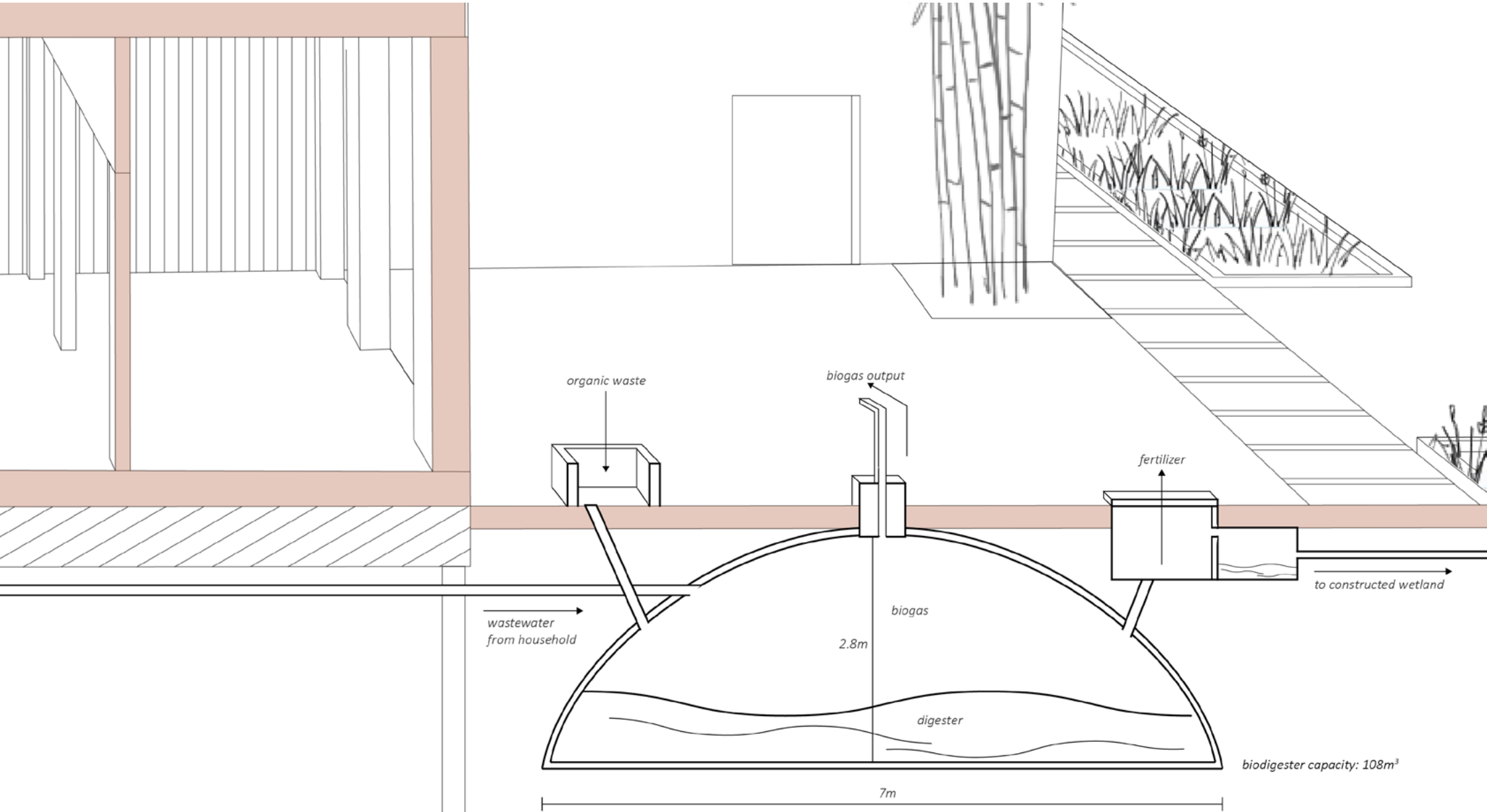
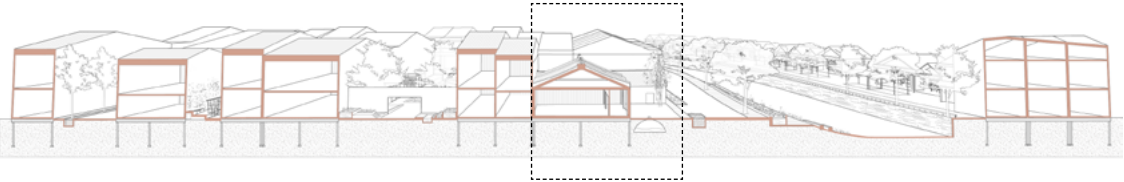
plastic wall

[Composting Garden]

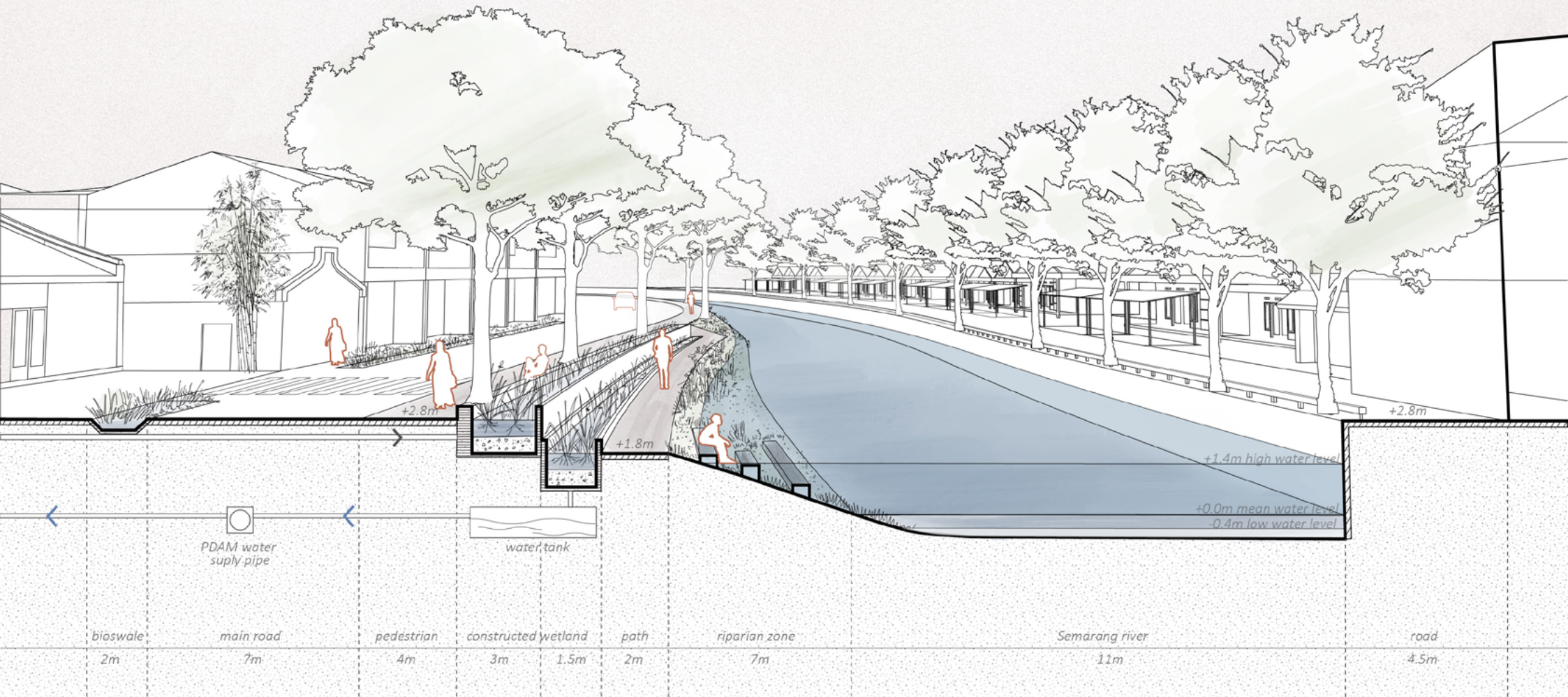
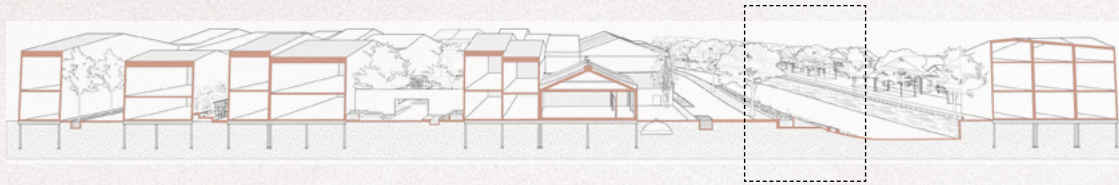
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[Tek Hay Bio Temple - biodigester]



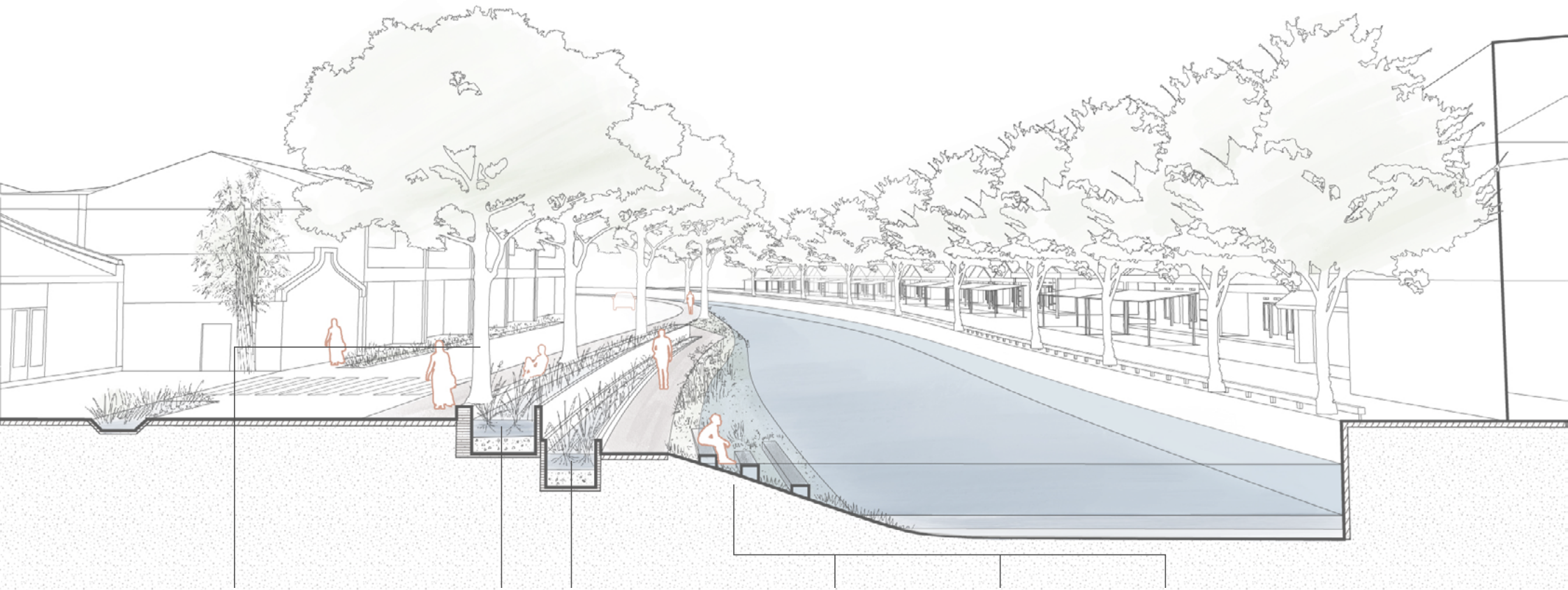
[Water Terrace]



[Water Terrace]

Planting Scheme

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magnolia grandiflora



lythrum salicaria L.



sagittaria trifolia



vetiveria zizanioides



iris tectorum



eichhornia crassipes

[Water Terrace]

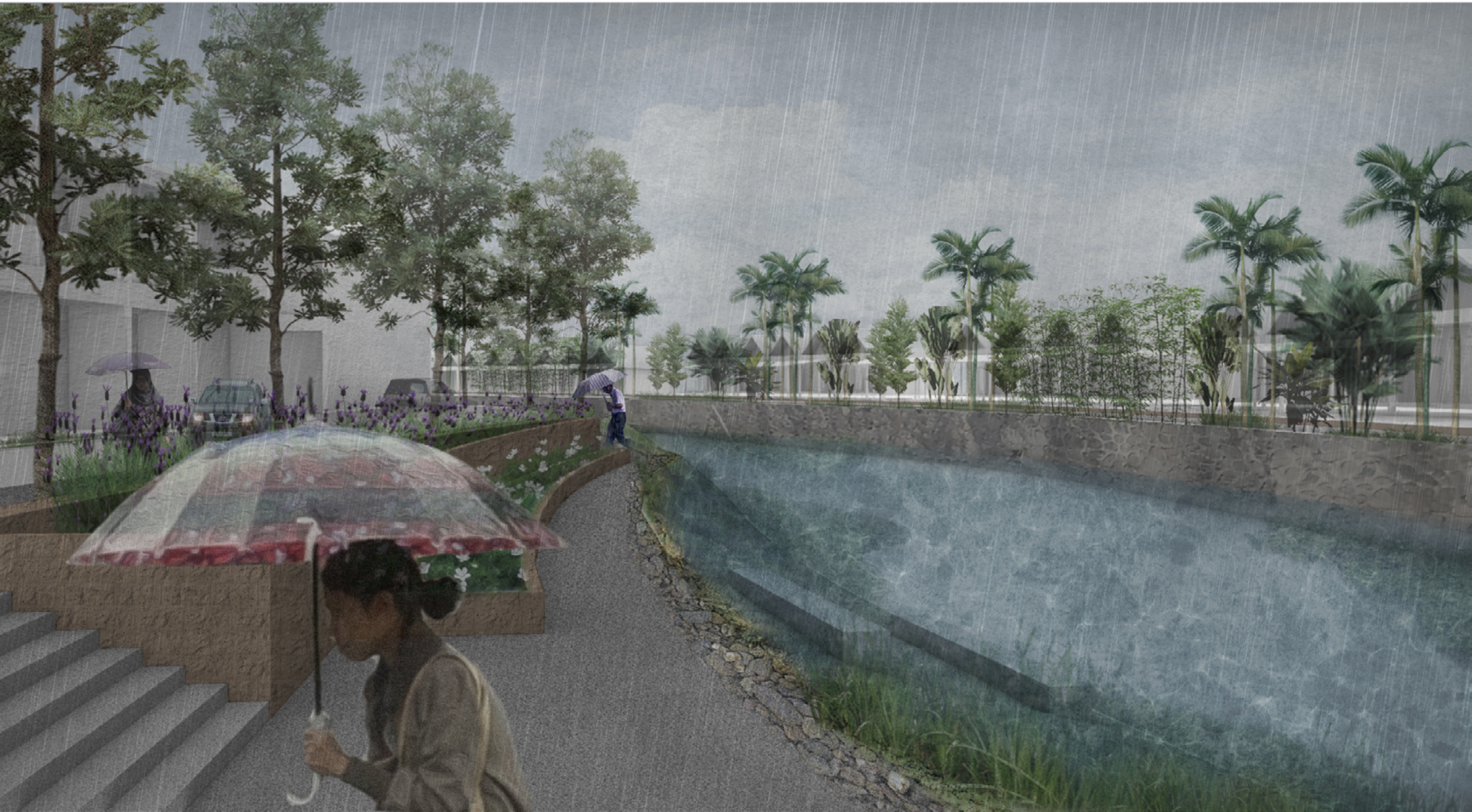
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constructed wetland

permeable pavement

soft riverbank



[Project Phasing]



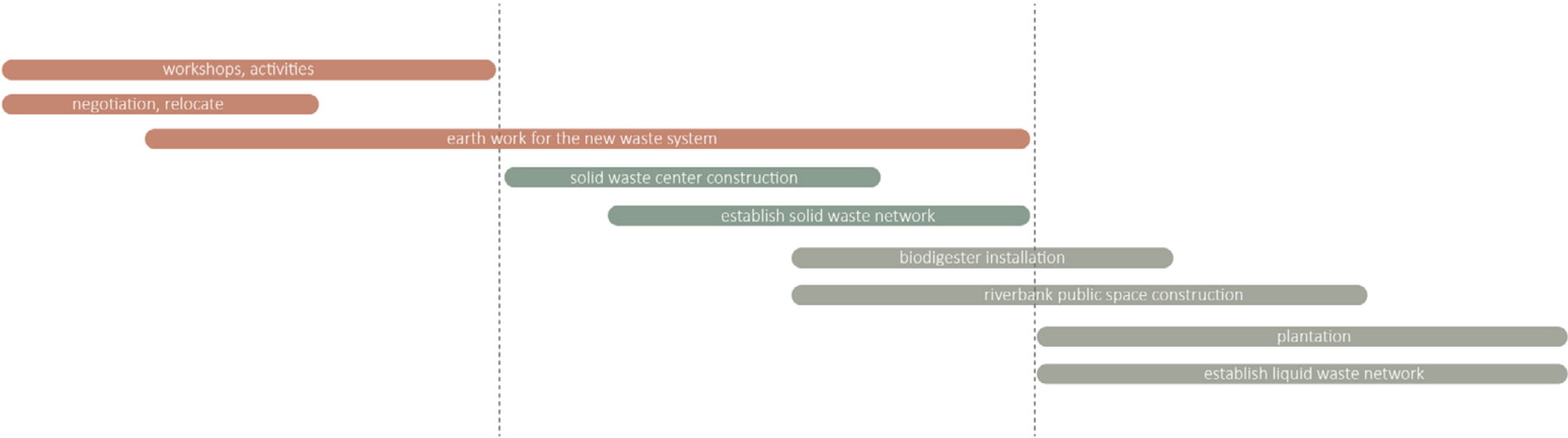
Stage 1 (1-3 years)
placemaking & knowledge broadcasting



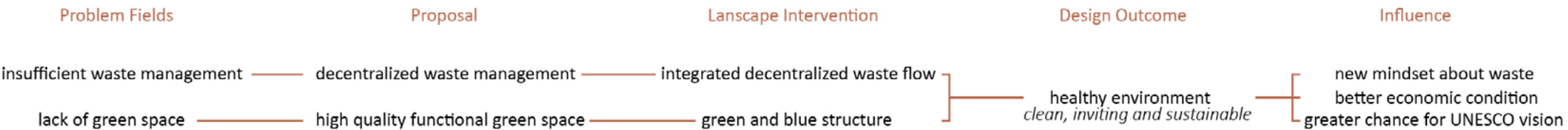
Stage 2 (3-5 years)
fulfill solid waste network



Stage 3 (3-5 years)
fulfill liquid waste network



[Conclusion & Reflection]





Terima Kasih
Thanks For Listening