Live BY Water

Explore the potential and redefine the role of historic canal system in Guangzhou

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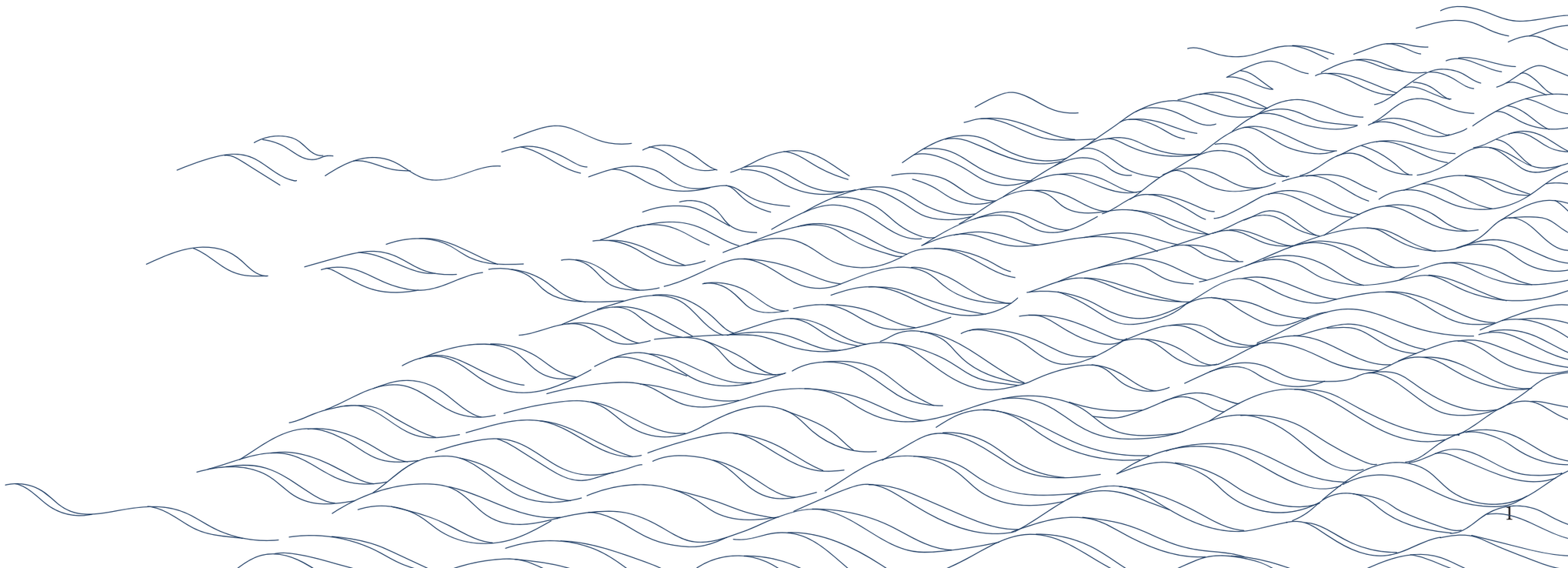

Fascination

Guangzhou

Source: https://shipin520.com/

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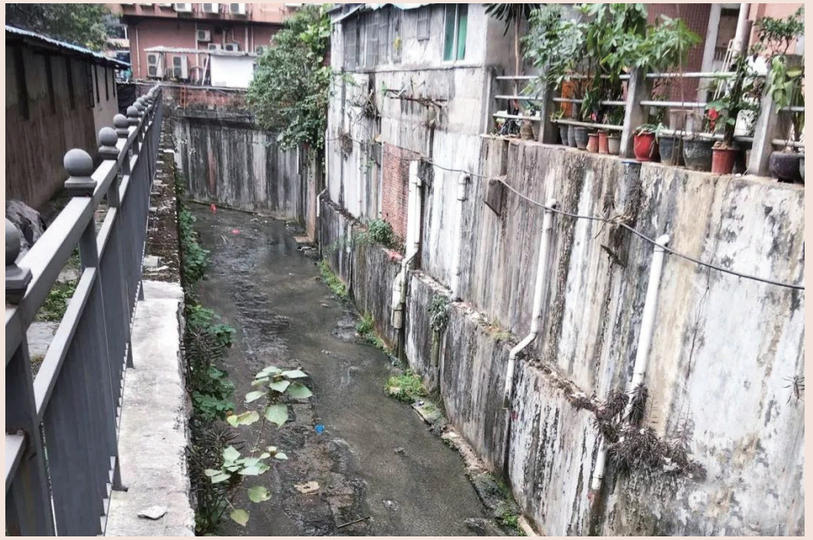
Fascination
Historic Canal

Before
Water Town

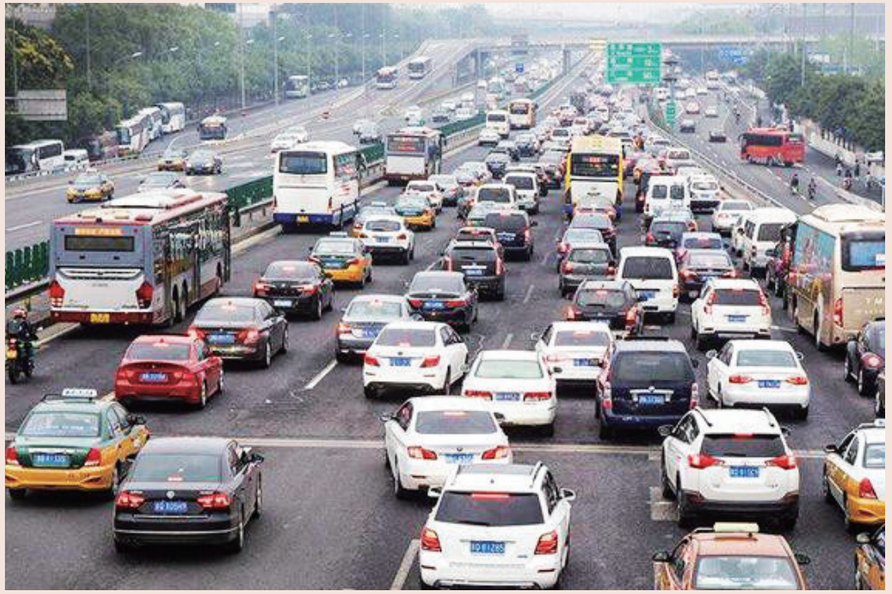
Now
Concrete City

Before
Harmony with Natural Environment



Now
Polluted by Sewage Water

Before
Water Transportation



Now
Road Network

Before
Hotspot of the City

Now
Backside of the City

Before
Interaction with Urban Tissue

Now
Isolated in the City

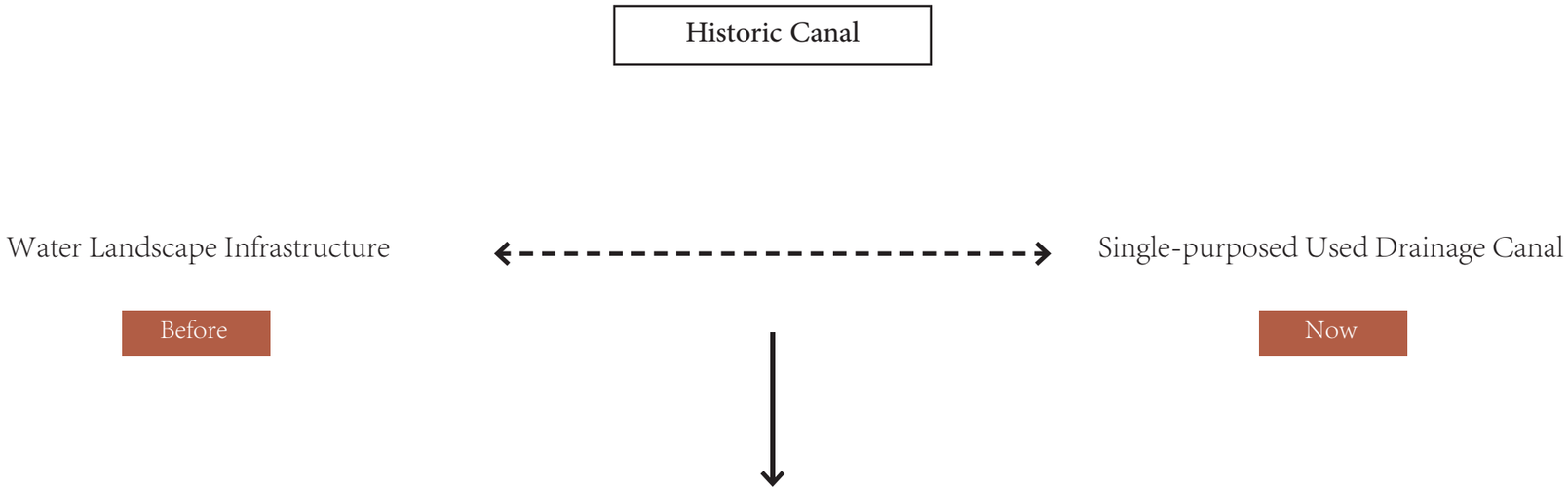
Historic Canal

Water Landscape Infrastructure

Before

Single-purposed Used Drainage Canal

Now



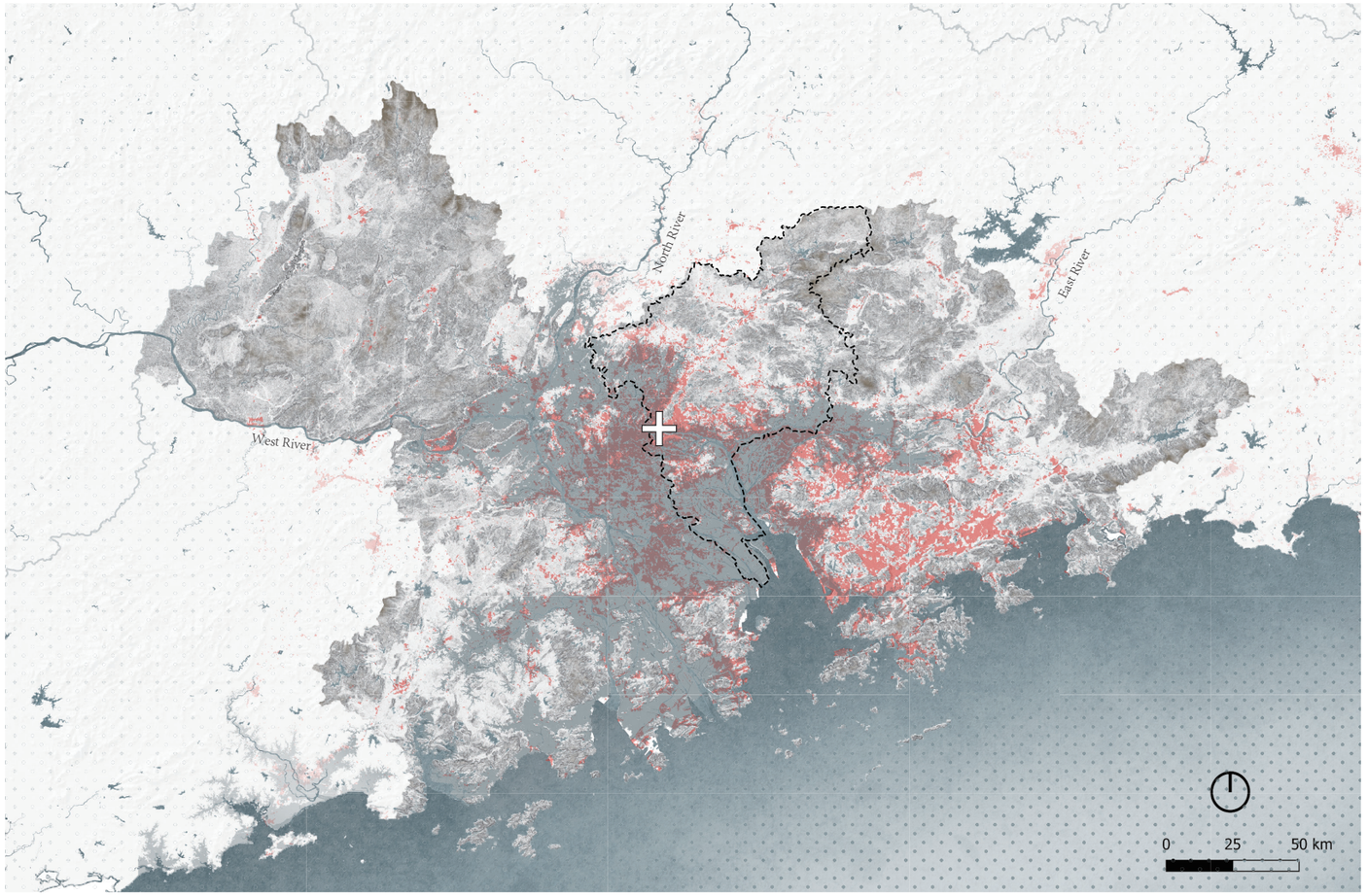
With city development, the potential of the historic canal system in Guangzhou as water landscape infrastructure has been ignored, leading to water pollution in the canals, and the decline and greater risk of flooding in the canal area.

-Analysis-

China

Pearl River Basin

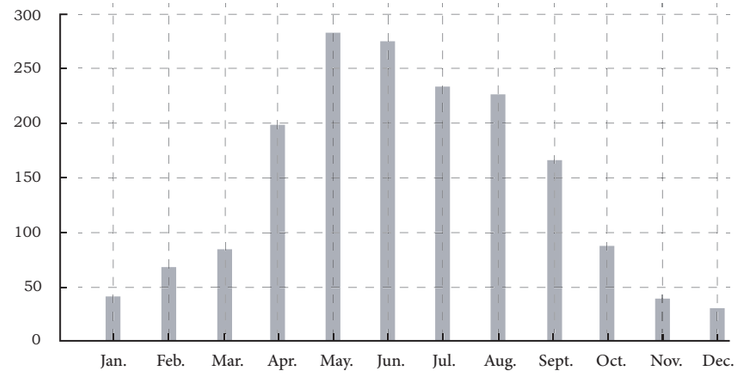
Pearl River Delta



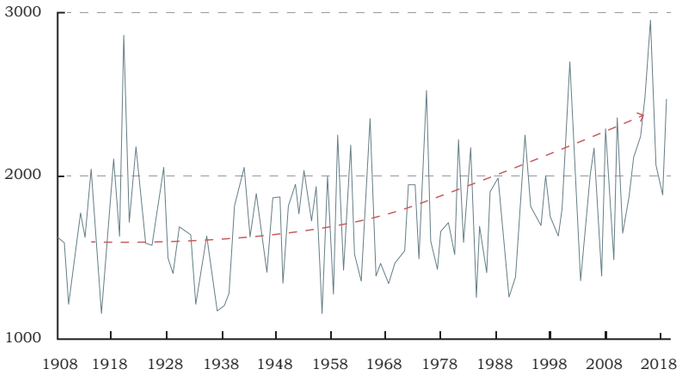
Guangzhou Historic District Flood Prone Area Urban Area Sea Tide

Precipitation

Average Monthly Precipitation (mm)



Annual Precipitation (mm)



Data Source: Weather Spark

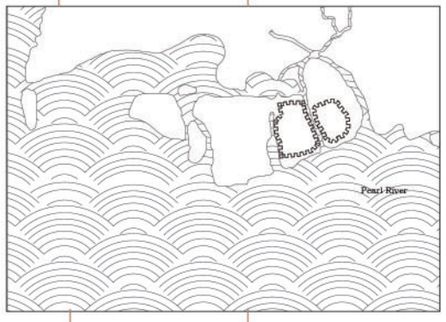
South Yue Country | Han Dynasty | Tang Dynasty | Song Dynasty | Yuan Dynasty | Ming Dynasty | Qing Dynasty

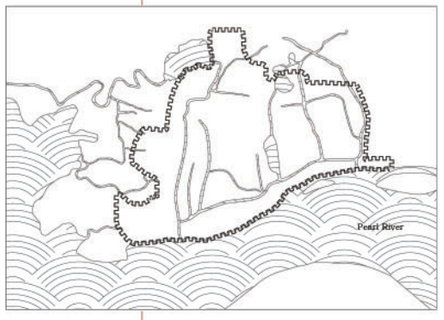
200 BC | 1 BC | 200 | 400 | 600 | 800 | 1000 | 1200 | 1400 | 1600 | 1800

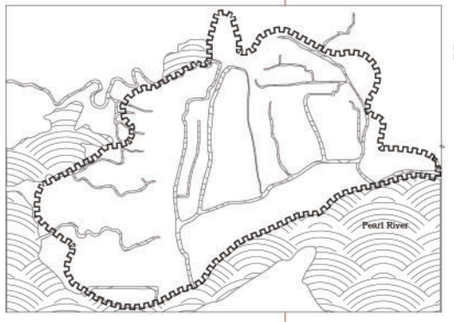
Pearl River Delta

Guangzhou
Waterline

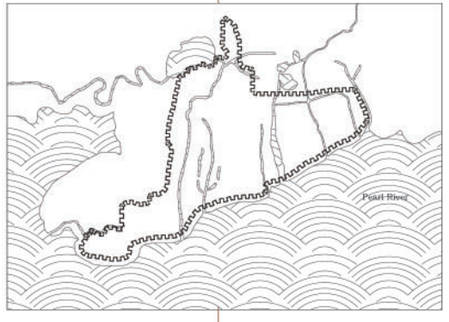
Development of Guangzhou City

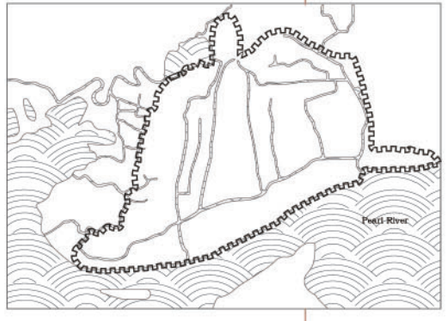






Guangzhou
Waterbody





Development of Canal System

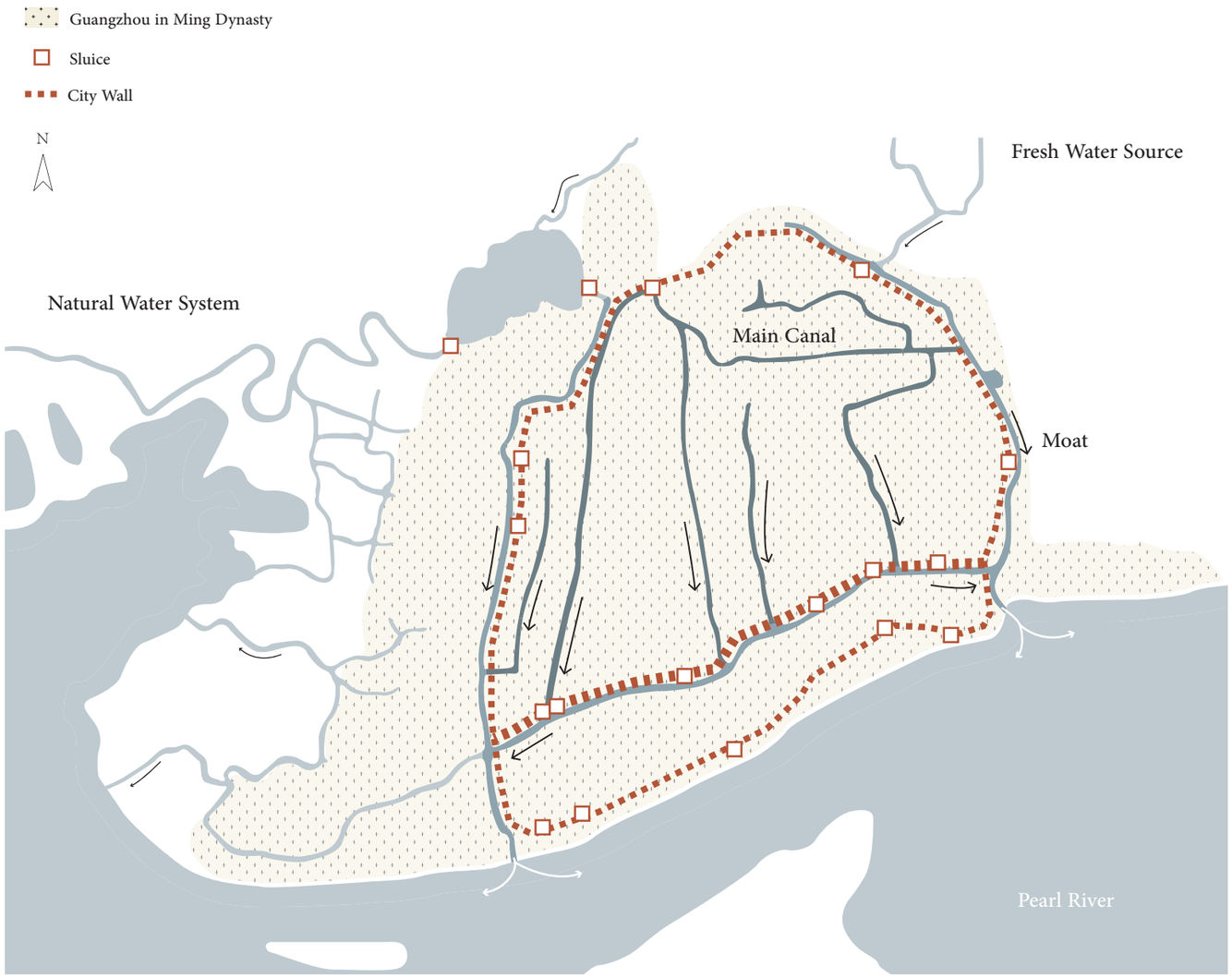
Pravite Garden

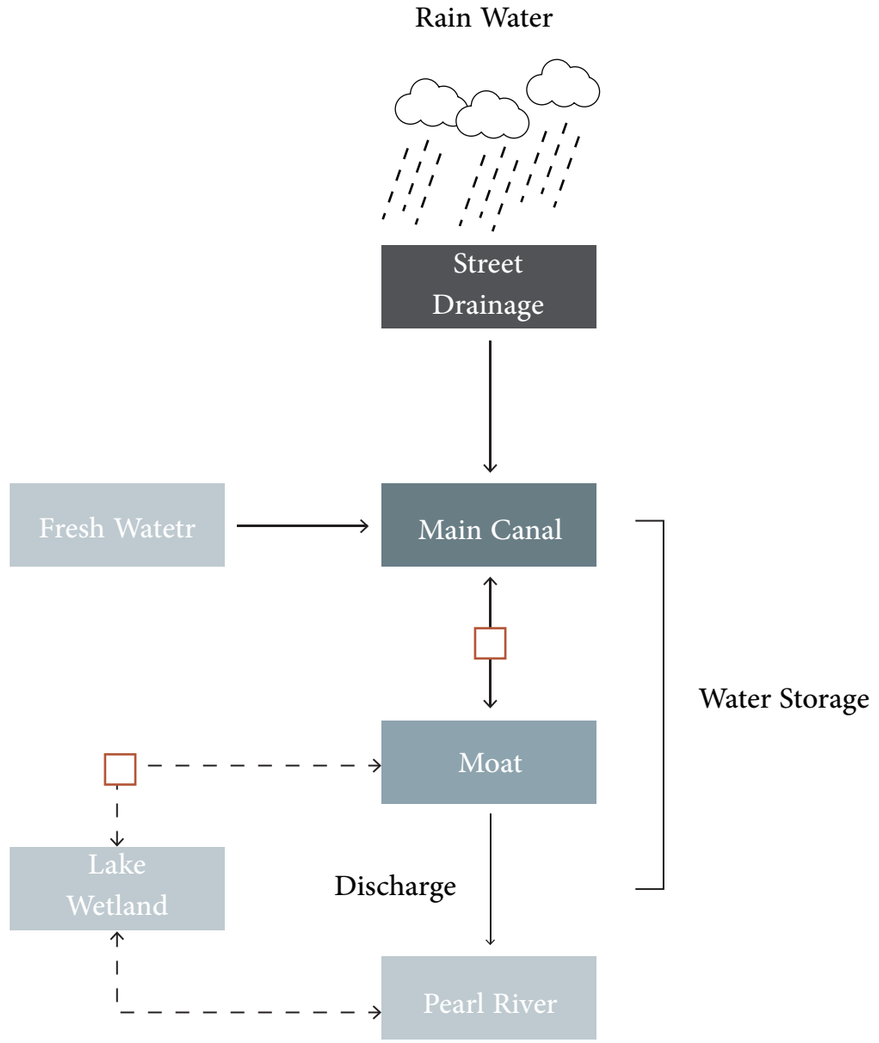
Royal Garden | Public Garden | Public Place | Pollution — Spatial Quality

Fresh Water | ‘Six Canals’ | Blockage — Water Facility

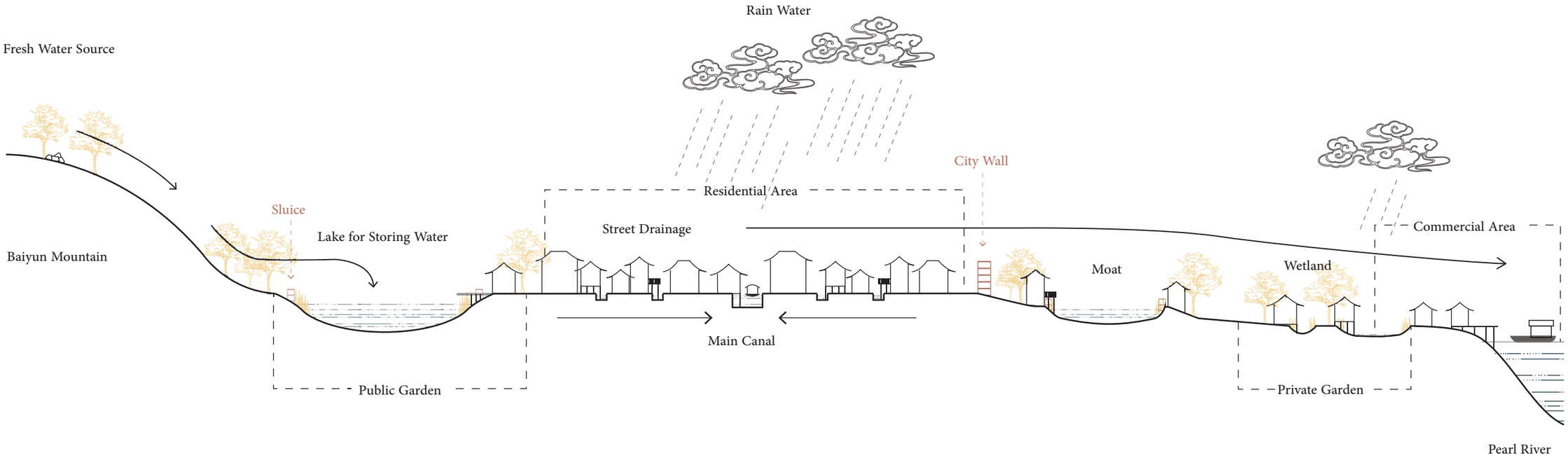
Maritime Silk Road | Port Area | Shrinkage — Transportation

Maritime Silk Road | Ttrade Centre | Maritime Commercial Area | Port City — Economy


Guangzhou in Ming Dynasty
Sluice
City Wall
N
Natural Water System
Fresh Water Source
Main Canal
Moat
Pearl River


Rain Water
Street Drainage
Fresh Watetr
Main Canal
Water Storage
Moat
Lake Wetland
Discharge
Pearl River

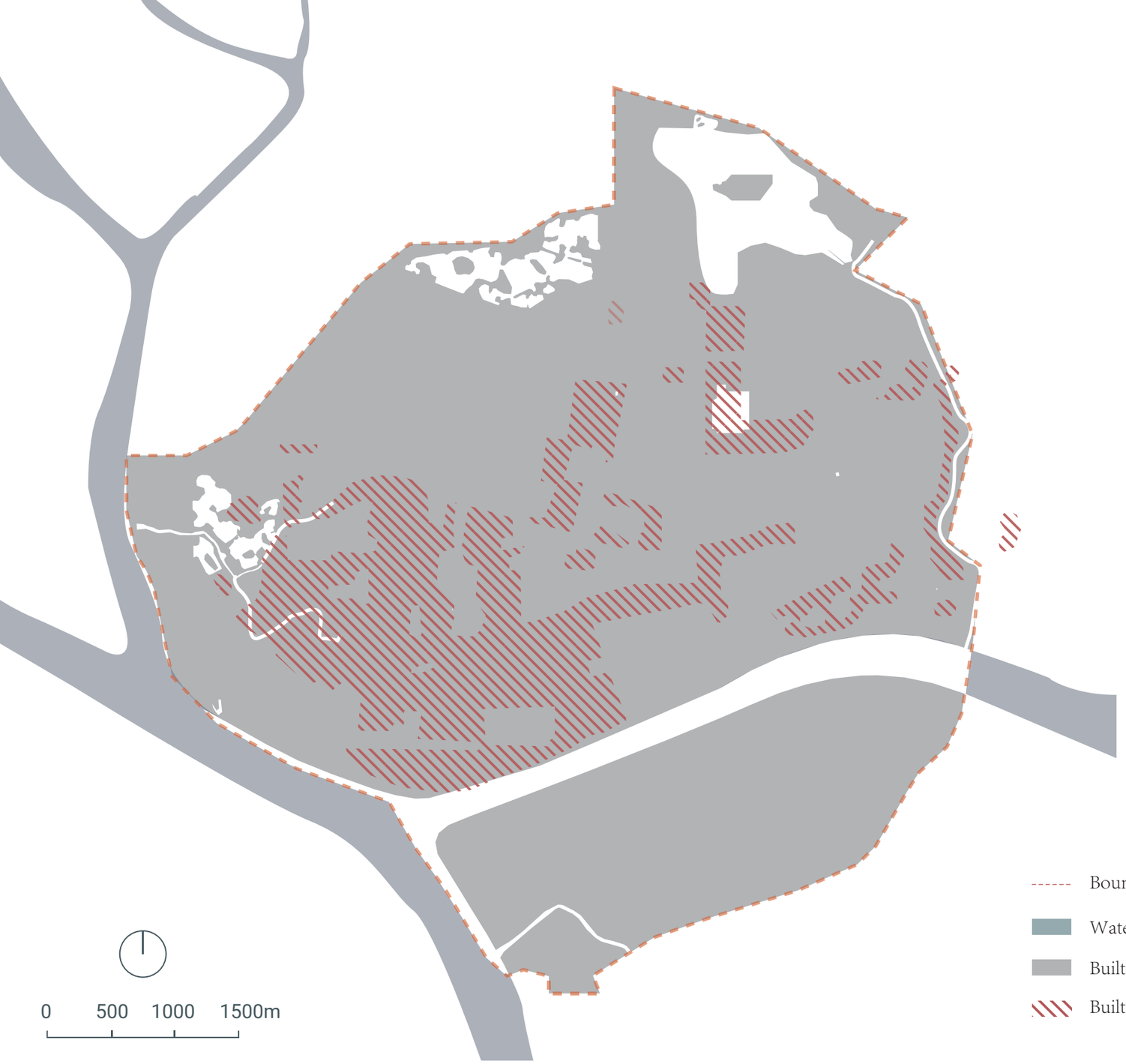
North


Rain Water
Fresh Water Source
City Wall
Residential Area
Sluice
Lake for Storing Water
Street Drainage
Commercial Area
Baiyun Mountain
Moat
Wetland
Main Canal
Public Garden
Private Garden
Pearl River

In history, the canal system in Guangzhou is not only an important water infrastructure, but also the centre of local urban life.

Dragon Boat Festival
by Anonymous person, Qing Dynasty

Source: https://shipin520.com/



Boundary of Historic District

Waterbody

Built-up Area

Built-up Area before 1949

Guangzhou
Population

(in 1949)
1,6 million

(in 2020)
12,7 million

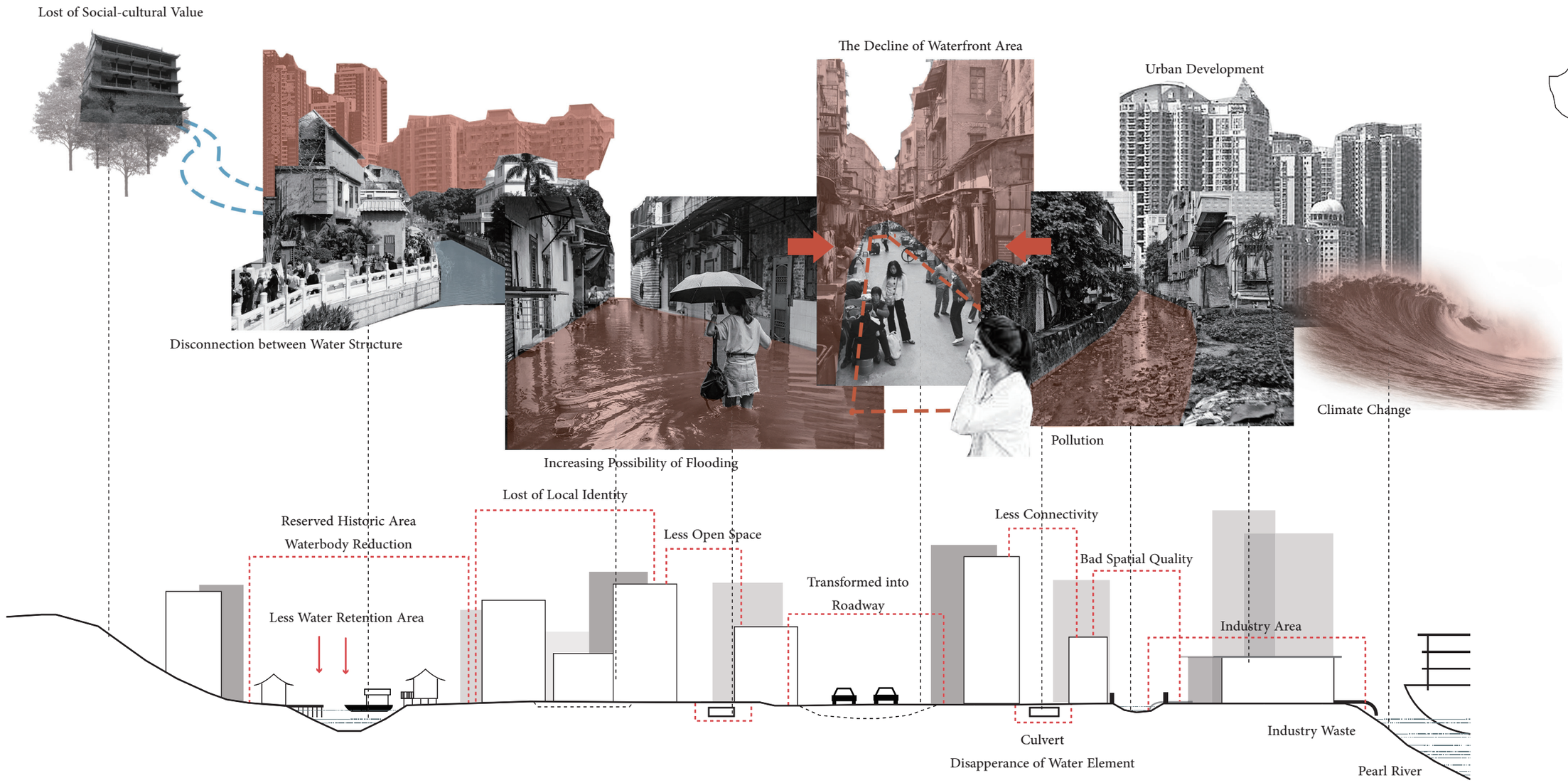
Density (person/sq.km.)

(in 1949)
215,1

(in 2020)
1708,6

Data Source:
National Population Census

Boundary of Historic District
Culvert
Road
Existing Historic Canal
Waterbody in Ming Dynasty
Waterbody in 2020
Waterlogging Spot


Lost of Social-cultural Value
Disconnection between Water Structure
Increasing Possibility of Flooding
The Decline of Waterfront Area
Urban Development
Pollution
Climate Change
Reserved Historic Area
Waterbody Reduction
Less Water Retention Area
Lost of Local Identity
Less Open Space
Transformed into
Roadway
Less Connectivity
Bad Spatial Quality
Industry Area
Culvert
Disapperance of Water Element
Industry Waste
Pearl River

How to redefine the role of the historic canal system in Guangzhou as water landscape infrastructure adapting to future urban development?

-What are the challenges Guangzhou faced with in the rapid urban development as a coastal city?

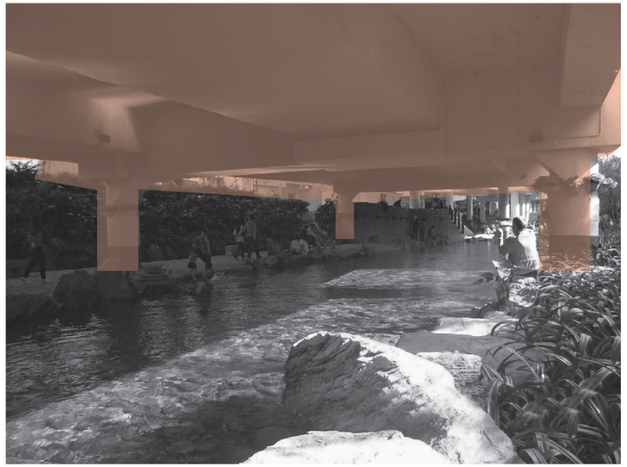
-What can we learn from the history and how can we apply the design principles in history in today’s situation?

-How can the canal system as a landscape infrastructure work with canal area, and what layers and local identity can be added to the urban area?

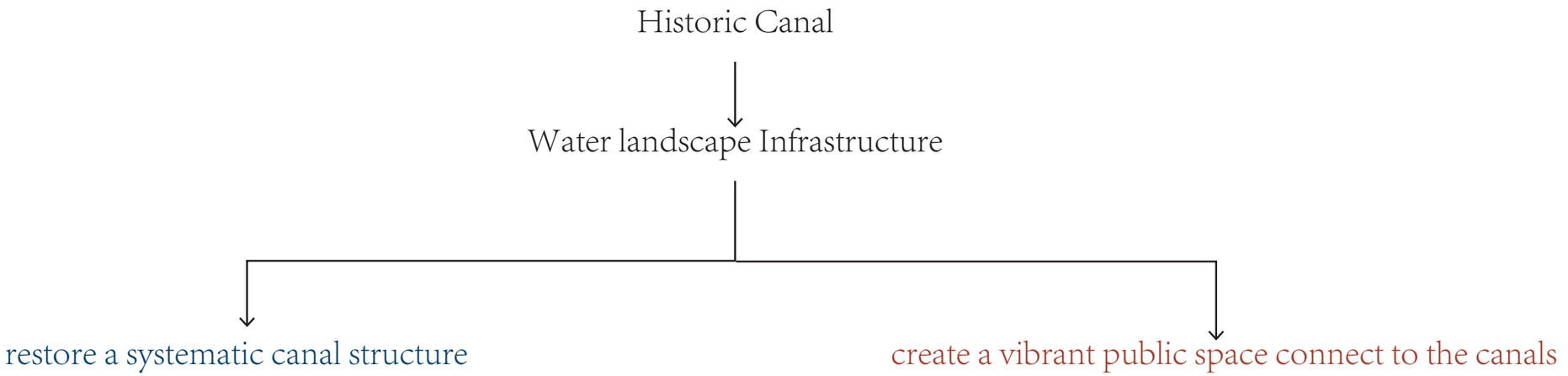
Lychee Bay Canal Renovation Project (2010)

- It does not meet the need of local residents.
- To recreate a scene of a historical water town, actually, some of intervention increase the risk of flooding.

East Moat Renovation Project (2009)



- Because of the disconnection, the public space hardly used.
- It cost a lot of money to pump and purify the water to this canal from the Pearl River..


Historic Canal
Water landscape Infrastructure
restore a systematic canal structure
create a vibrant public space connect to the canals

-Methodology-

Landscape Infrastructure

Flowscapes explores infrastructure as a type of landscape and landscape as a type of infrastructure. The hybridisation of the two concepts seeks to redefine infrastructure beyond its strictly utilitarian definition, while allowing spatial design to gain operative force in territorial transformation processes.
(Nijhuis et al., 2015)

The potential these infrastructure systems have for performing the additional function of shaping architectural and urban form is largely unrealized. [...] They can be designed with a formal clarity that expresses their importance to society, at the same time creating new layers of urban landmarks, spaces, and connections.
(Strang, 1996)

Resilient Landscape

In popular terms, resilience is having the capacity to persist in the face of change, to continue to develop with ever changing environments. Resilience thinking is about how periods of gradual changes interact with abrupt changes, and the capacity of people, communities, societies, cultures to adapt or even transform into new development pathways in the face of dynamic change.
(Folke, C., 2016)

It has developed into an approach for understanding complex adaptive systems and serves as a platform for interdisciplinary and transdisciplinary research with an emphasis on social-ecological systems.
(e.g., Levin et al., 2013)

Learning from History

Landscape architecture is one of the few arts in which history can be created. “Landscape doesn’t have to honor history.” Pillaging an “endless bank of history,” landscape architects play the role of “critical historians.” That being said, these artists of the built environment should “always study history. If they are good, they can then invent their own.”
(John Dixon Hunt, 2011)

Landscape Infrustructure

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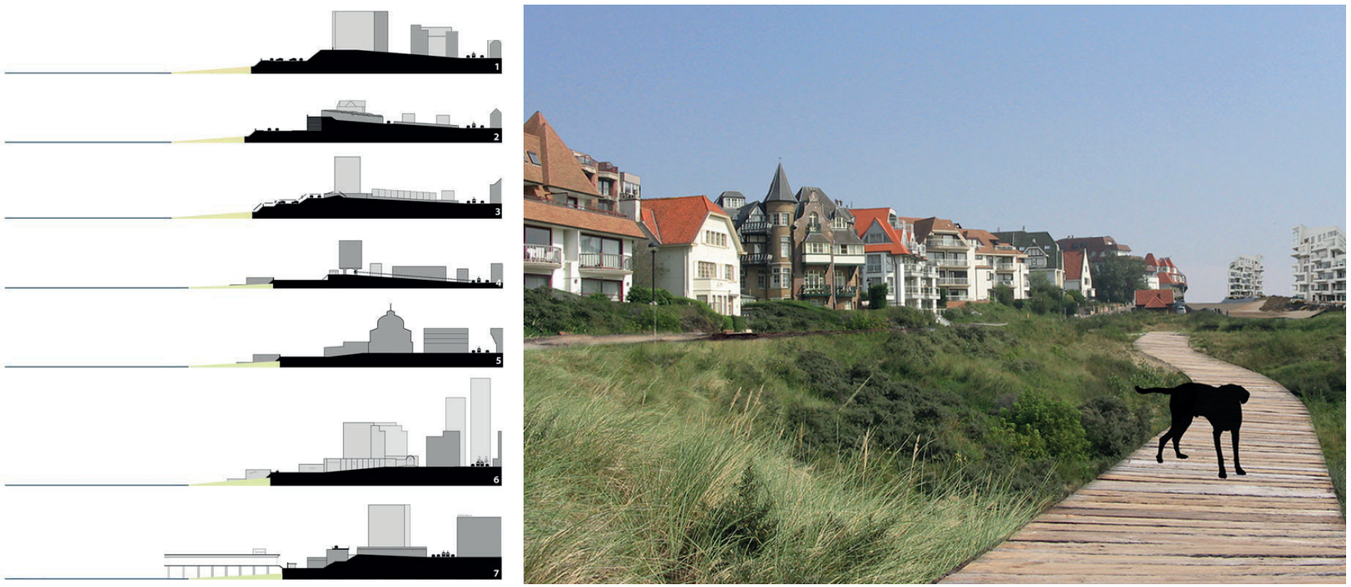

Dutch Delta in Scheveningen
Source: The synergy between flood risk protection and spatial quality in coastal cities, Nillesen, A. (2015).

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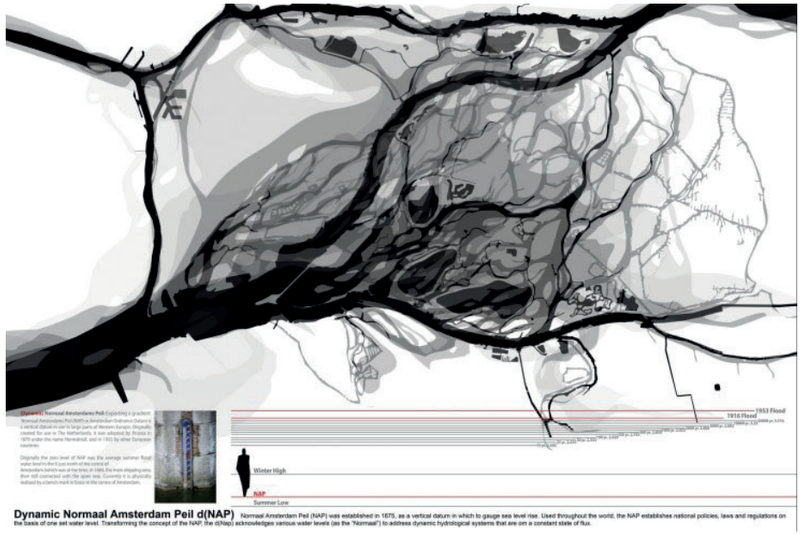

Room for the river
Source:https://worldlandscapearchitect.com/room-for-the-river-nijmegen-the-netherlands-hns-landscape-architects/

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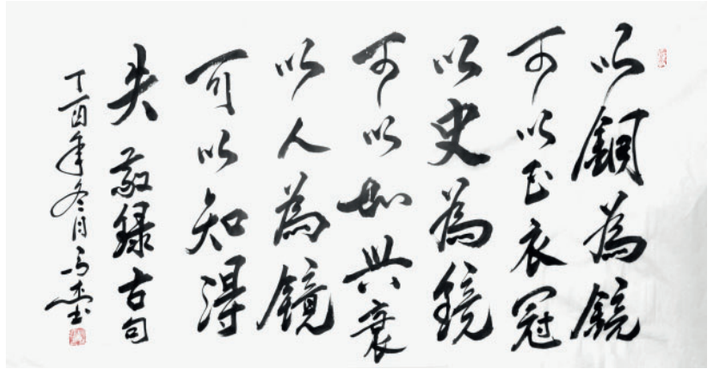
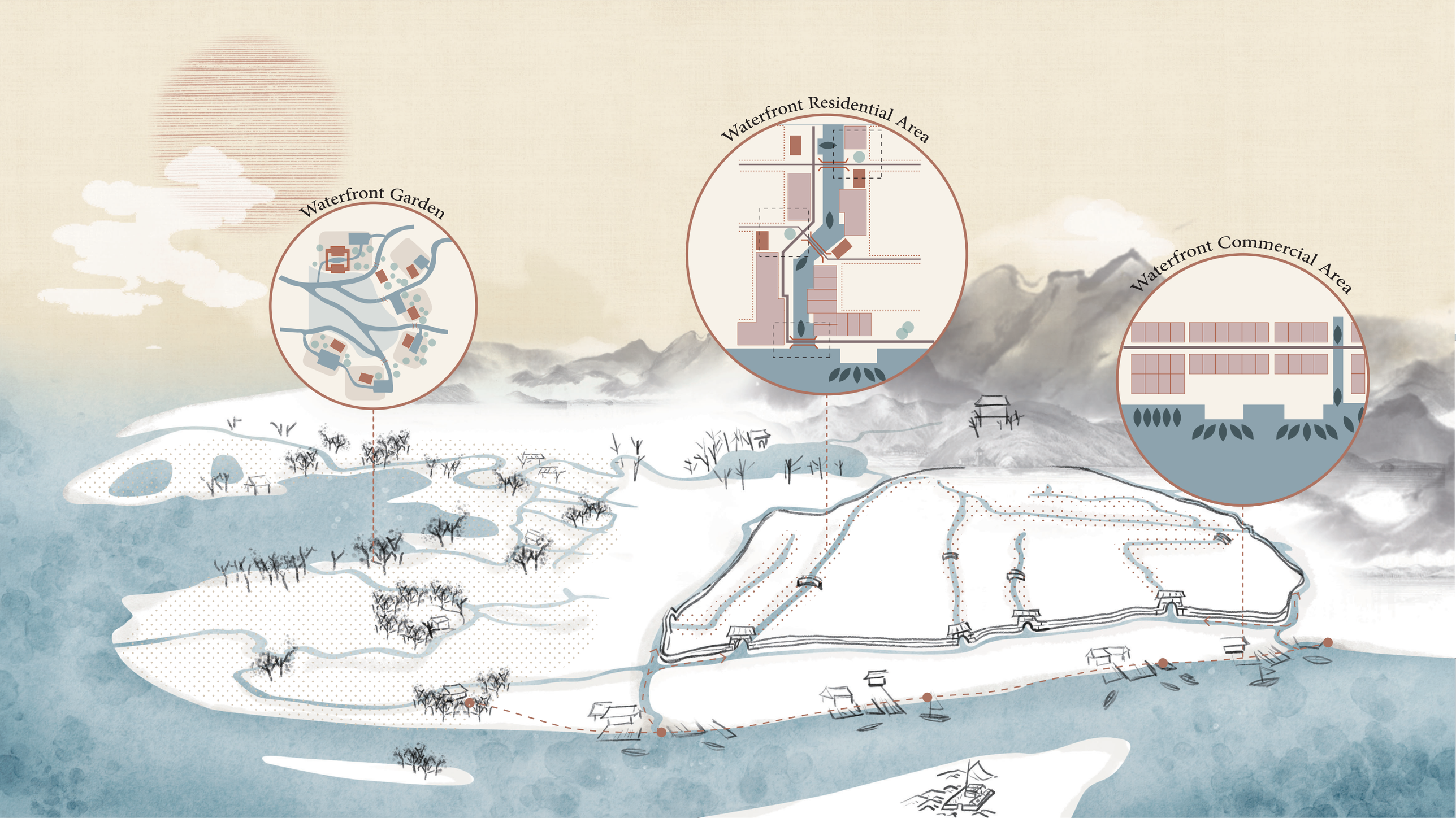
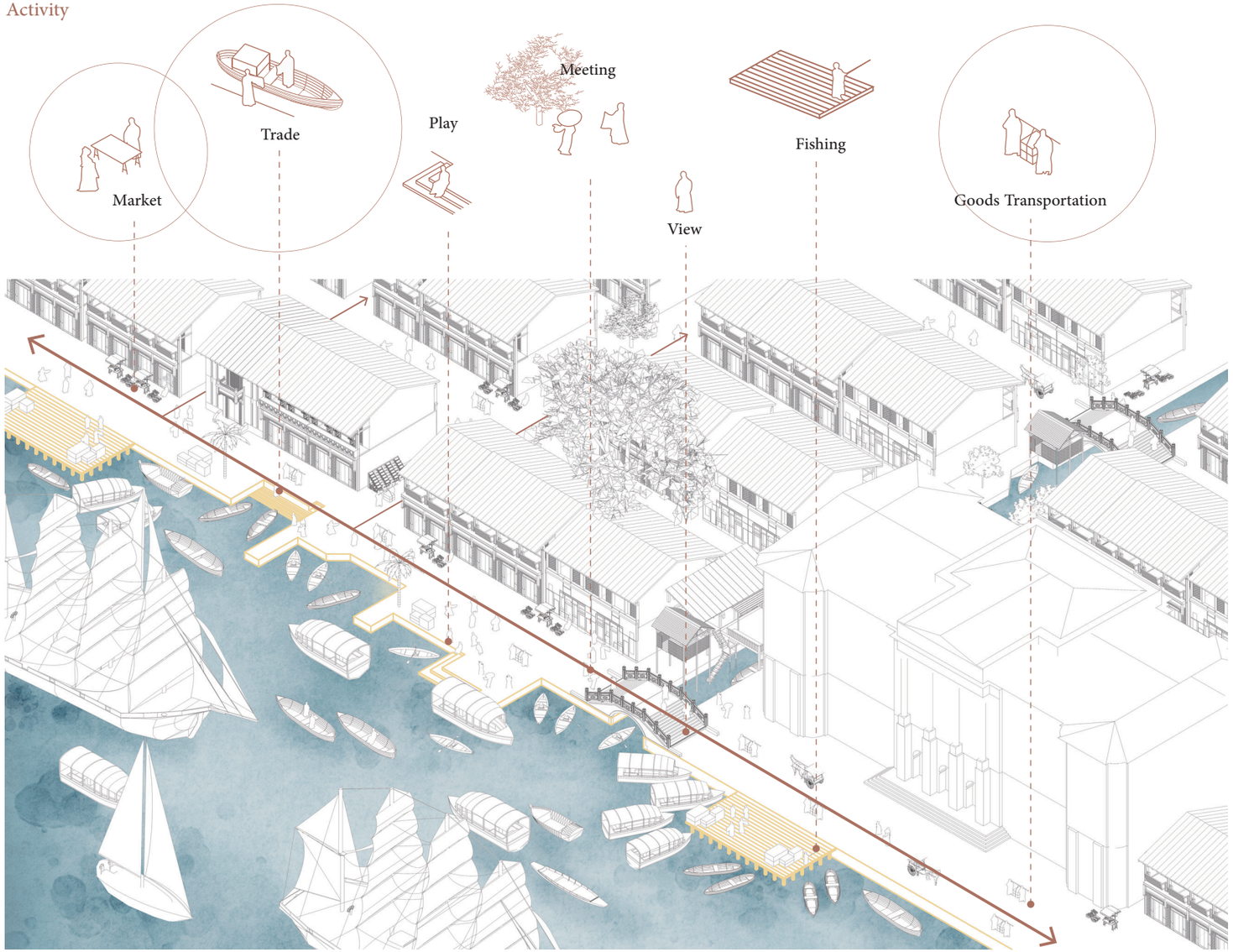


‘Looking into the mirror of history, you will know the rules of prosperity and changes.’

-- Tang Taizong, ‘Jiu Tang Shu’


Waterfront Garden
Waterfront Residential Area
Waterfront Commercial Area

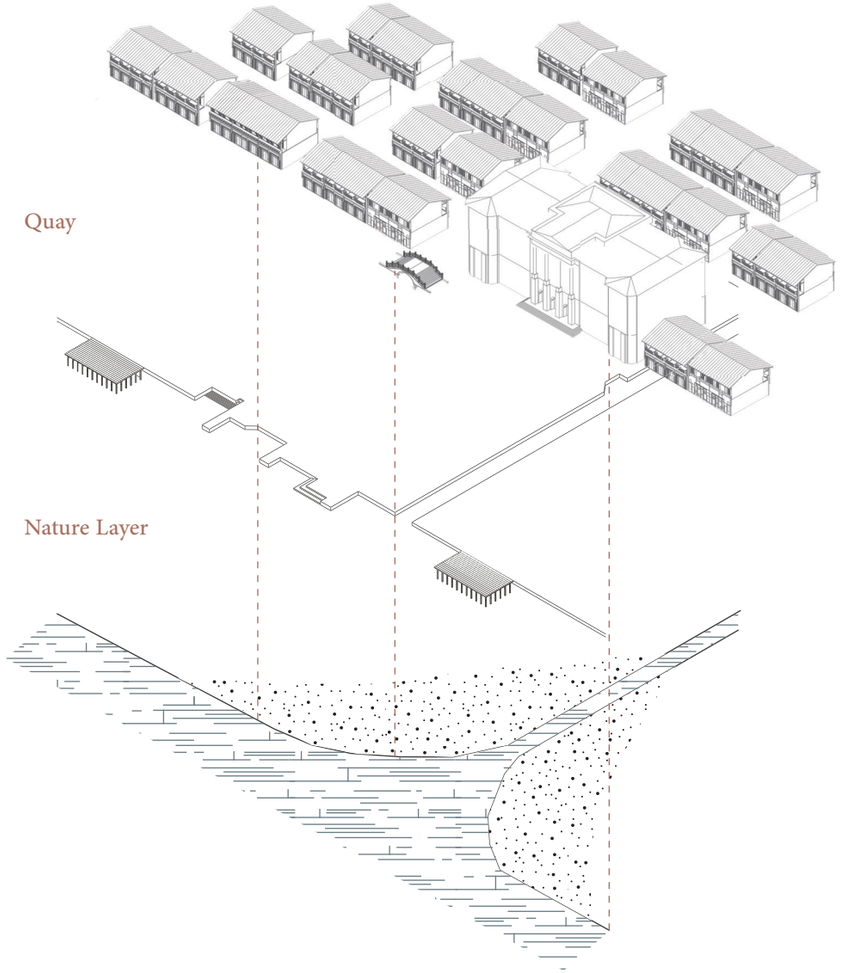
Activity



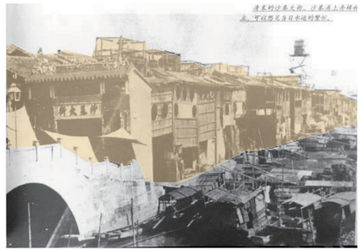
Urban Layer

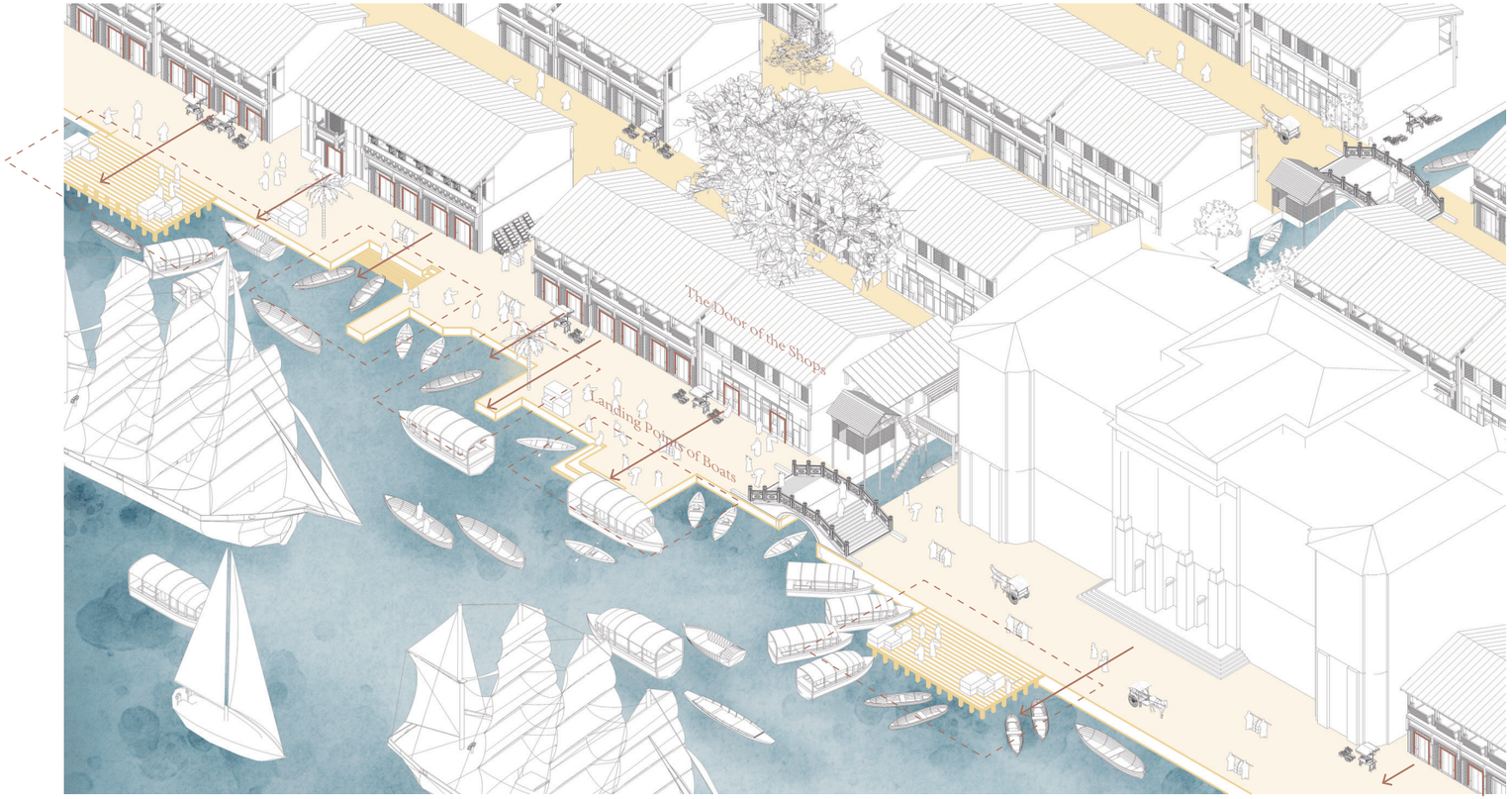
Quay

Nature Layer

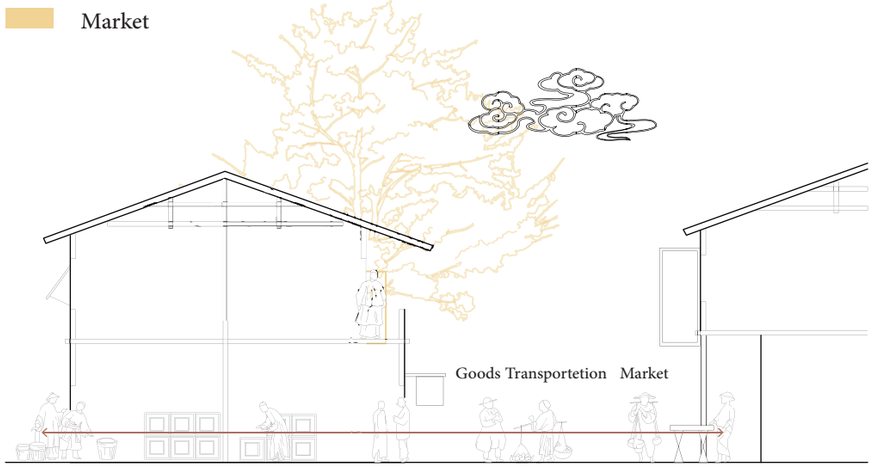


Places of trade activities and culture exchange





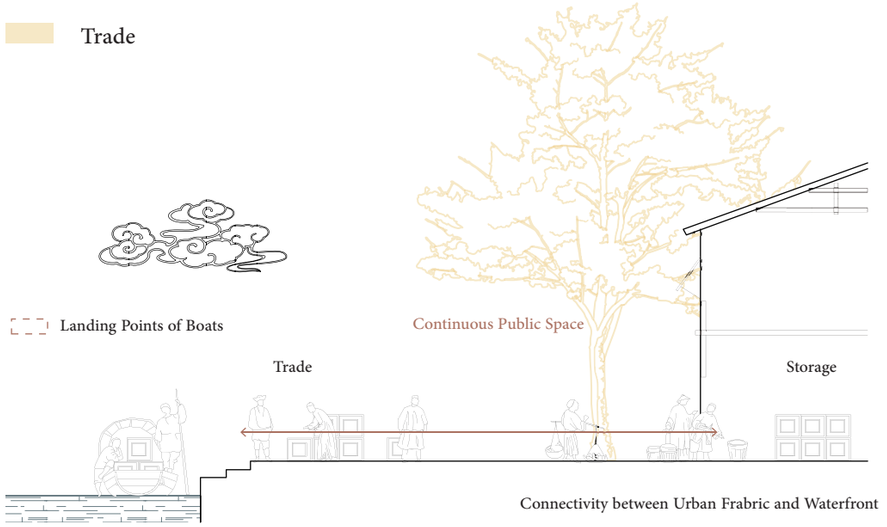
Market



Continuous Public Space

Markets connected to Commercial Buildings

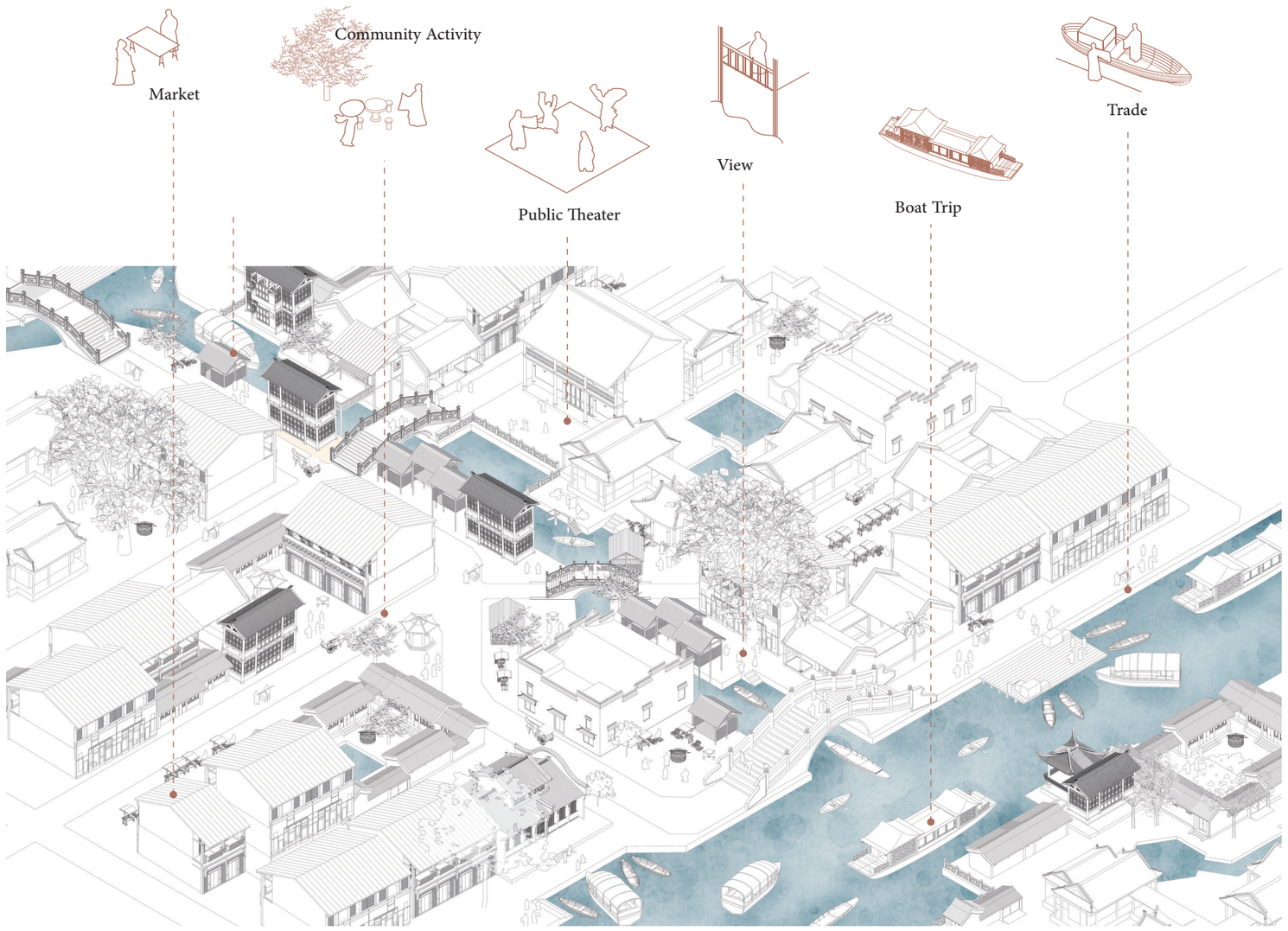
Trade

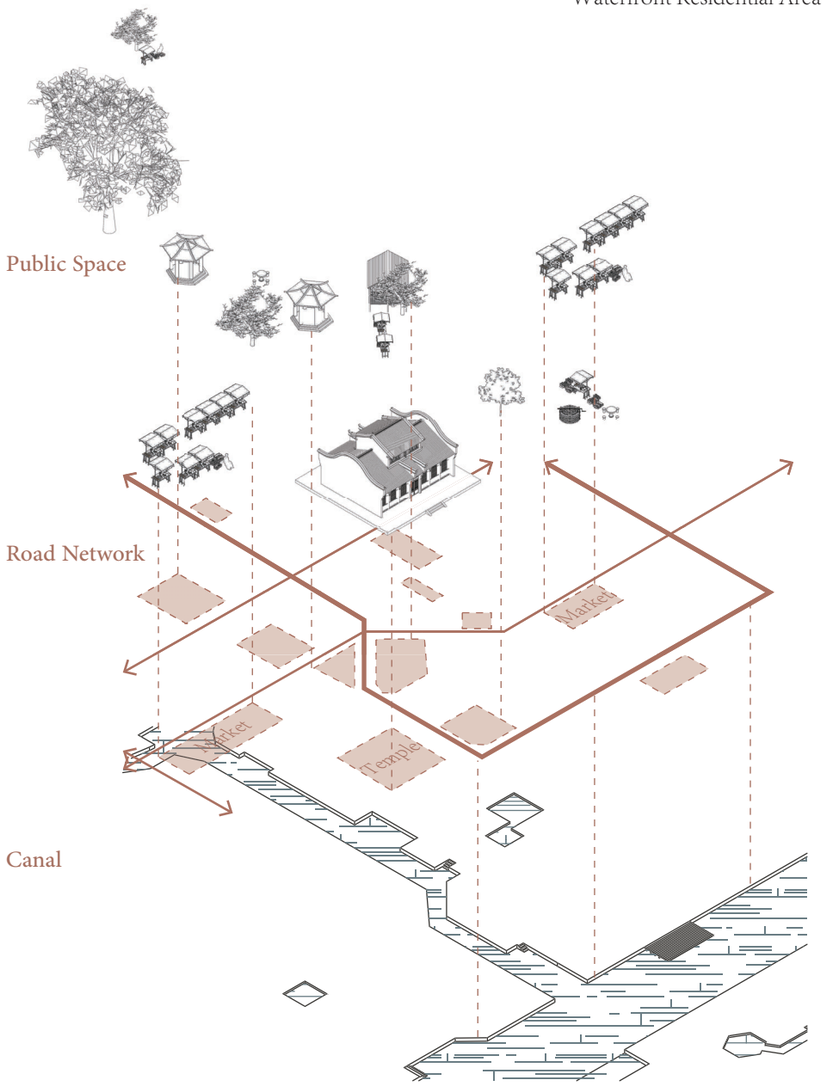


Connectivity between Urban Frabric and Waterfront

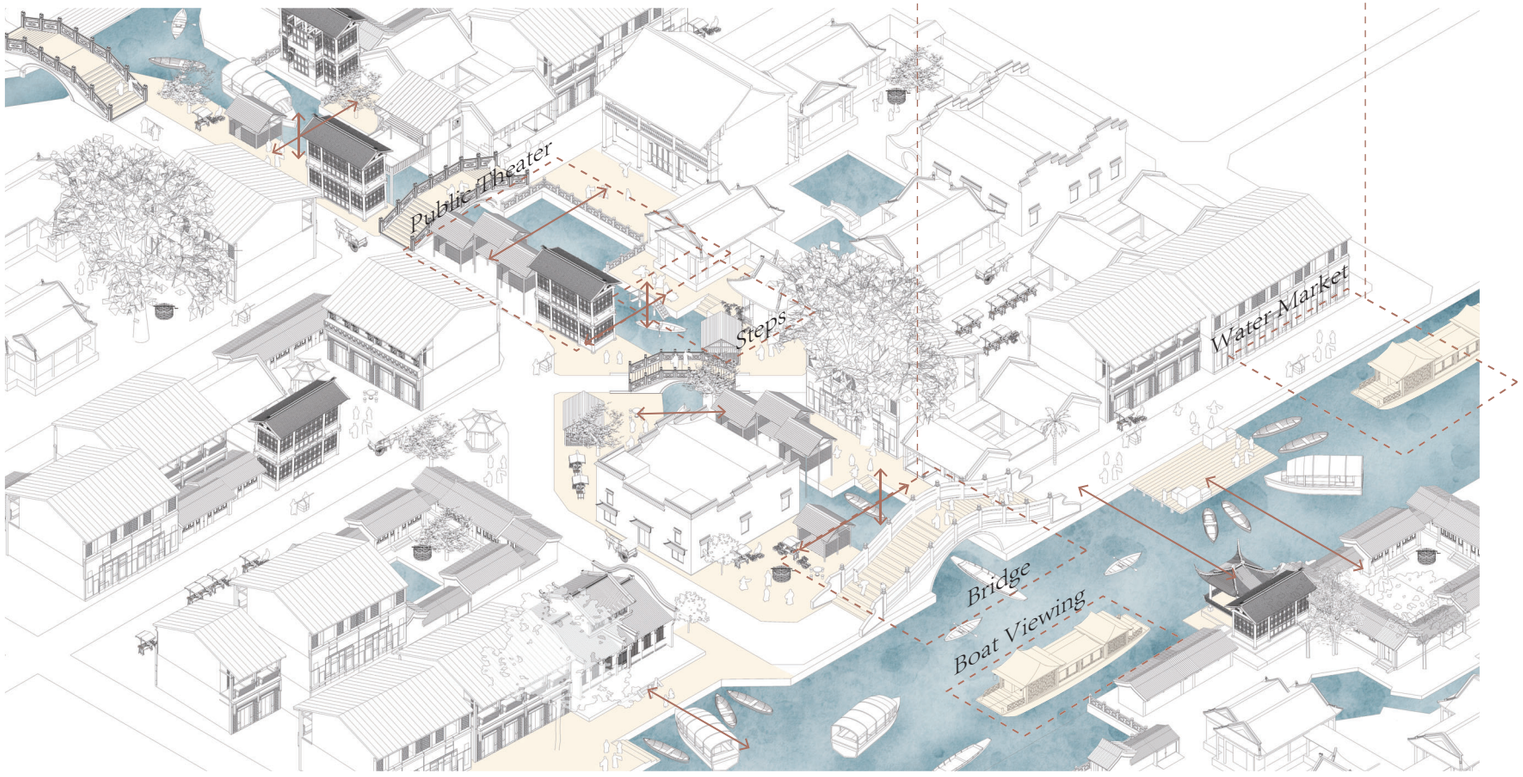
Various interaction and multiple layers of connectivity between canal and built-environment

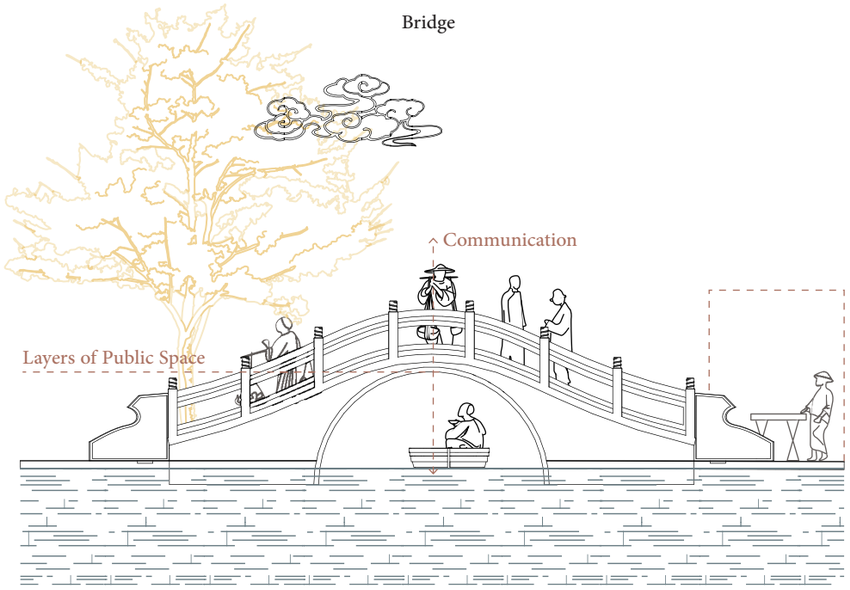
Activity

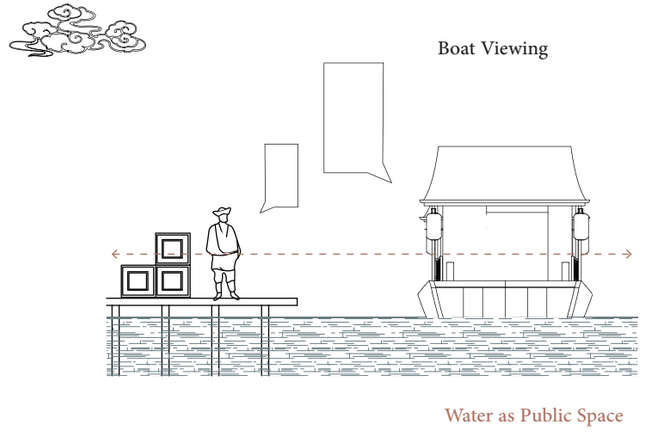




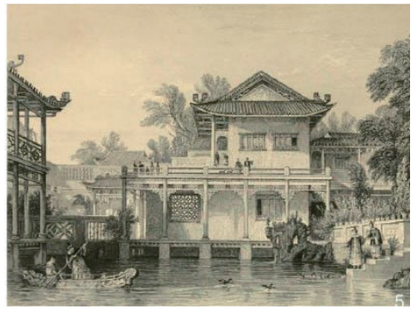
Various interaction and multiple layers of connectivity between canal and built-environment

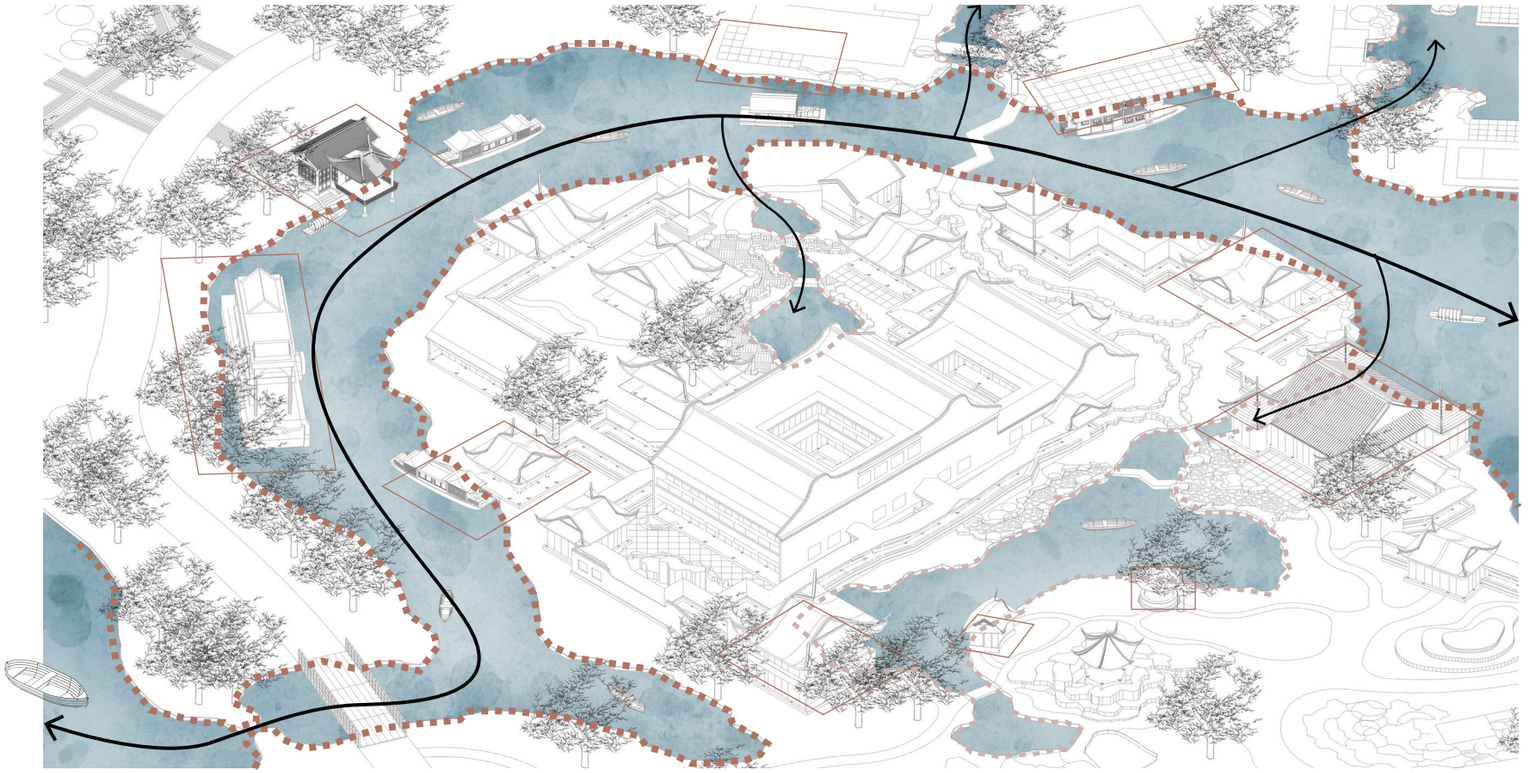






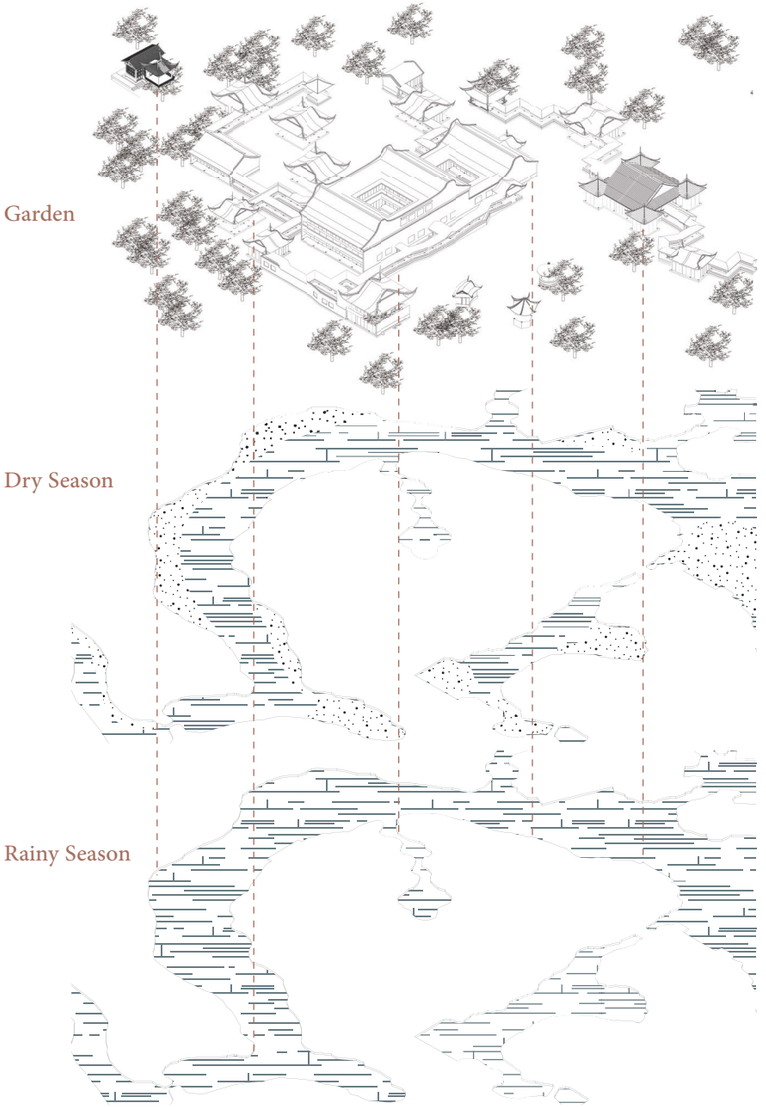
Harmony of built-environment and nature



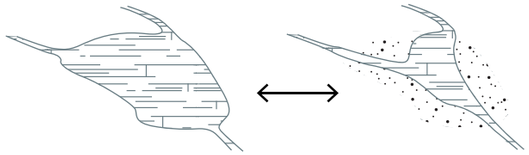


Landscape Types

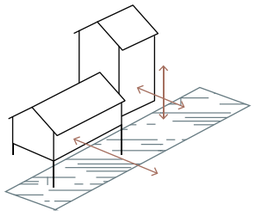
Waterfront Garden



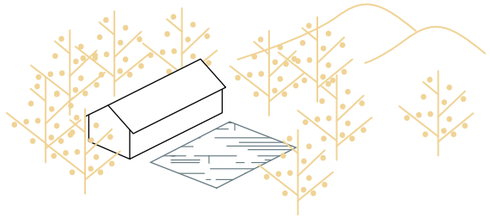
Landscape



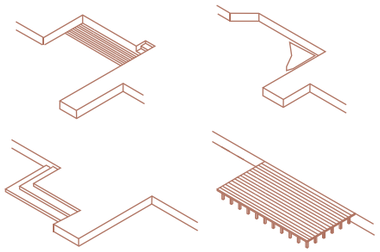
Dynamic Waterscape



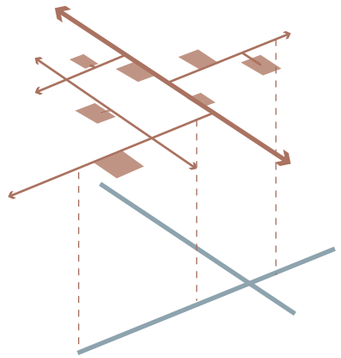
Interaction with Built-environment



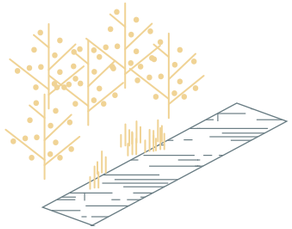
Harmony with Natural Environment



Diverse Interface



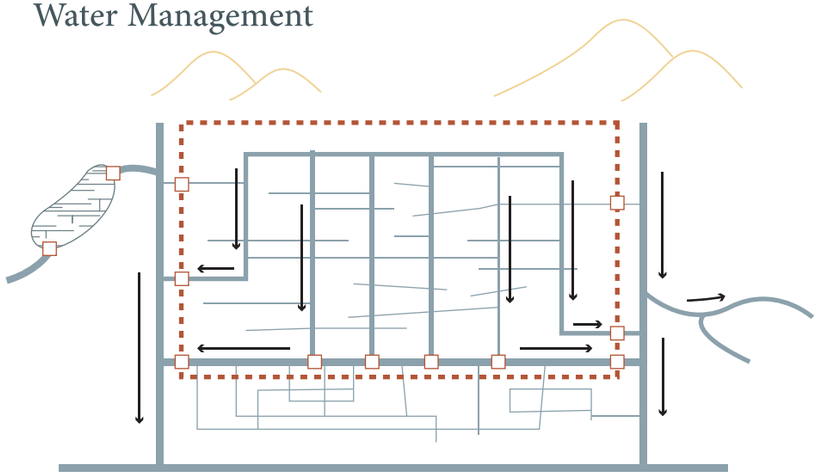
Connectivity of Public Space



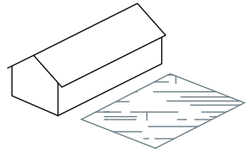
Use of Native Plants

Water as Public Space

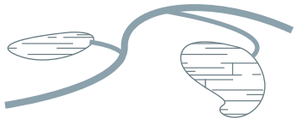
Water Management



Sysmetic Water Network



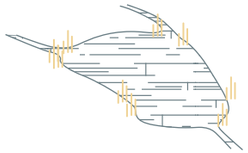
Artificial Pond



Wetland

Retention Pond

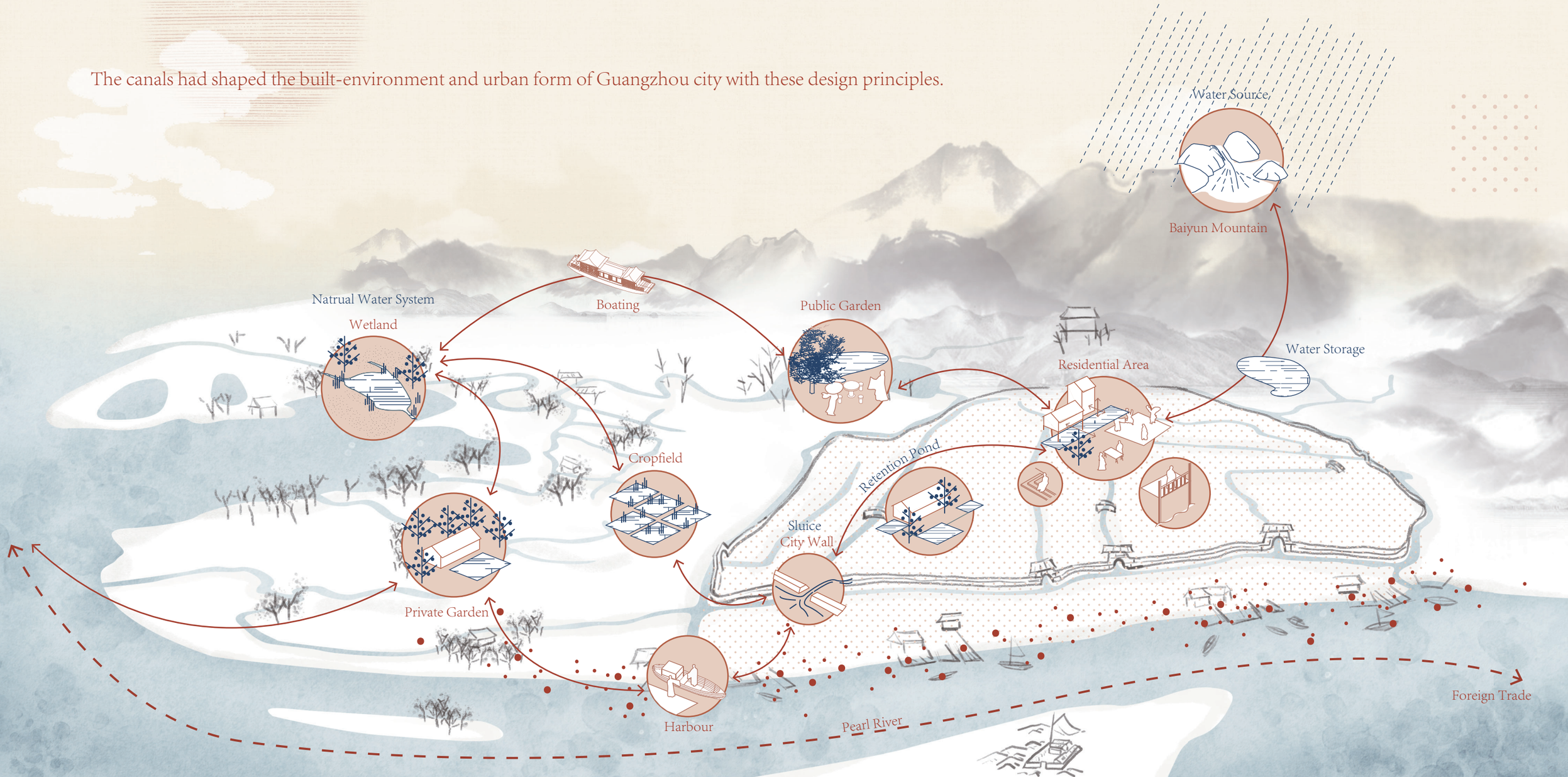
Combined with Garden



Aquatic Plants

Water Purification System

The canals had shaped the built-environment and urban form of Guangzhou city with these design principles.



-Design Exploration-

Relevent Case Study and Theories Exploration

Landscape Infrustructure

Flowscapes explores infrastructure as a type of landscape and landscape as a type of infrastructure. The hybridisation of the two concepts seeks to redefine infrastructure beyond its strictly utilitarian definition, while allowing spatial design to gain operative force in territorial transformation processes.
(Nijhuis et al., 2015)

The potential these infrastructure systems have for performing the additional function of shaping architectural and urban form is largely unrealized. [...] They can be designed with a formal clarity that expresses their importance to society, at the same time creating new layers of urban landmarks, spaces, and connections.
(Strang, 1996)

Resilient Landscape

In popular terms, resilience is having the capacity to persist in the face of change, to continue to develop with ever changing environments. Resilience thinking is about how periods of gradual changes interact with abrupt changes, and the capacity of people, communities, societies, cultures to adapt or even transform into new development pathways in the face of dynamic change.
(Folke, C., 2016)

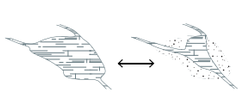
It has developed into an approach for understanding complex adaptive systems and serves as a platform for interdisciplinary and transdisciplinary research with an emphasis on social-ecological systems.
(e.g., Levin et al., 2013)

Learning from History

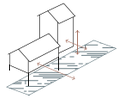
Landscape architecture is one of the few arts in which history can be created. "Landscape doesn't have to honor history." Pillaging an "endless bank of history," landscape architects play the role of "critical historians." That being said, these artists of the built environment should "always study history. If they are good, they can then invent their own."
(John Dixon Hunt, 2011)

Design Principles in History

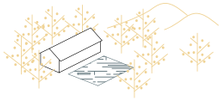
Landscape



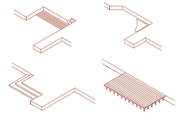
Dynamic Waterscape



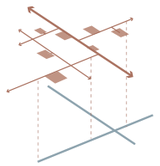
Interaction with Built-environment



Harmony with Natural Environment



Diverse Interface

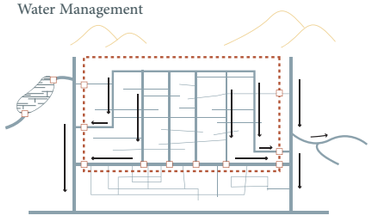


Connectivity of Public Space

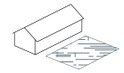
Use of Native Plants

Water as Public Space

Water Management



Sysmetic Water Network



Artificial Pond

Wetland

Retention Pond

Combined with Garden

Aquatic Plants

Water Purification System

New Element → Adapt ← Traditional Element

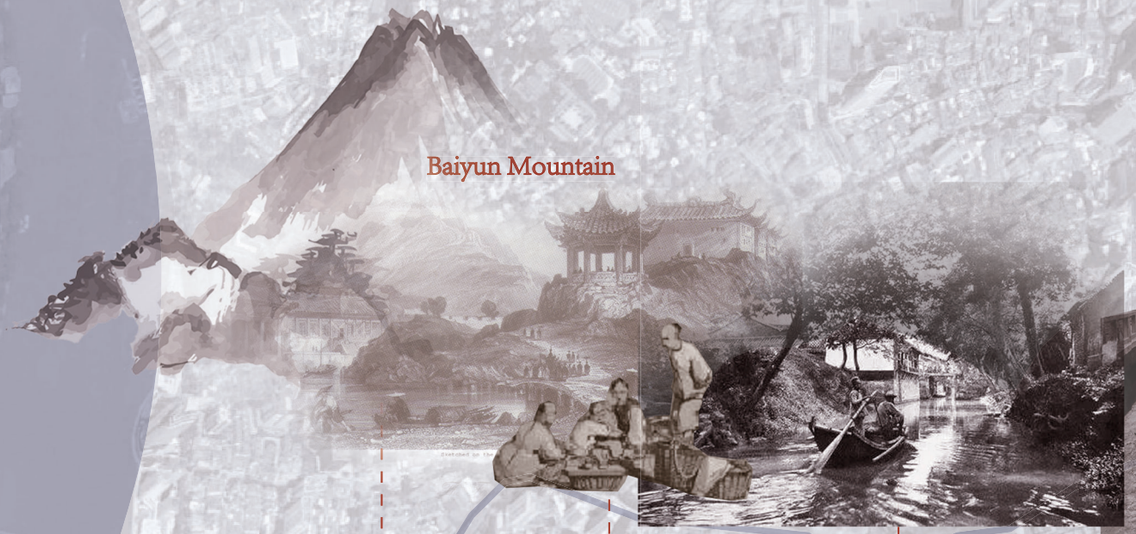
↓

East Moat

N

East Moat
in history

Baiyun Mountain



- protect the city
- provide fresh water
- main waterway

- Lack of public facilities and places
- Some old houses along the route are in disrepair
- Seriously affect the urban landscape

East Moat Highway

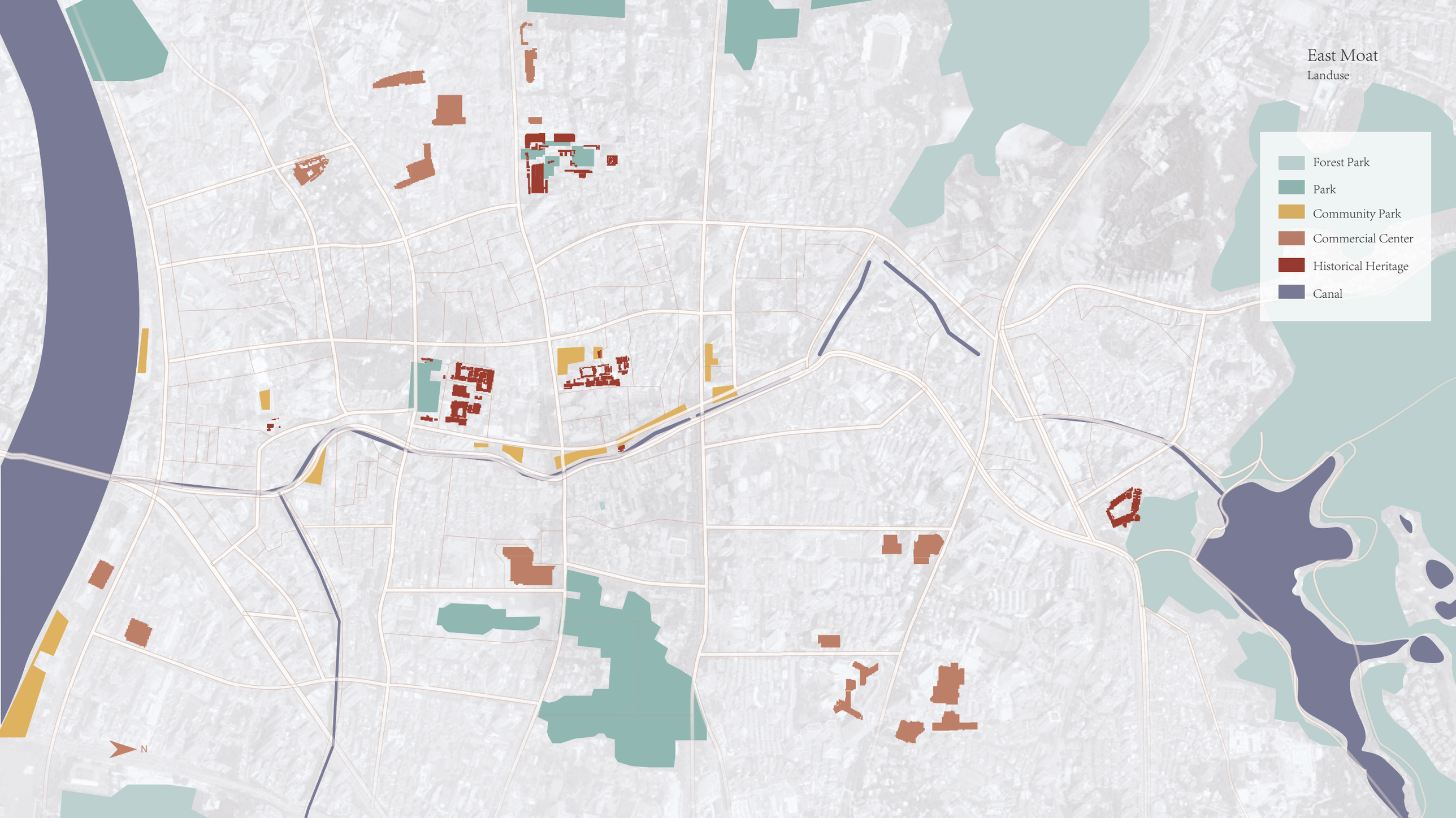
Origin — Ming Dynasty — Qing Dynasty — 1970 — 1993 — 2010 — 2020

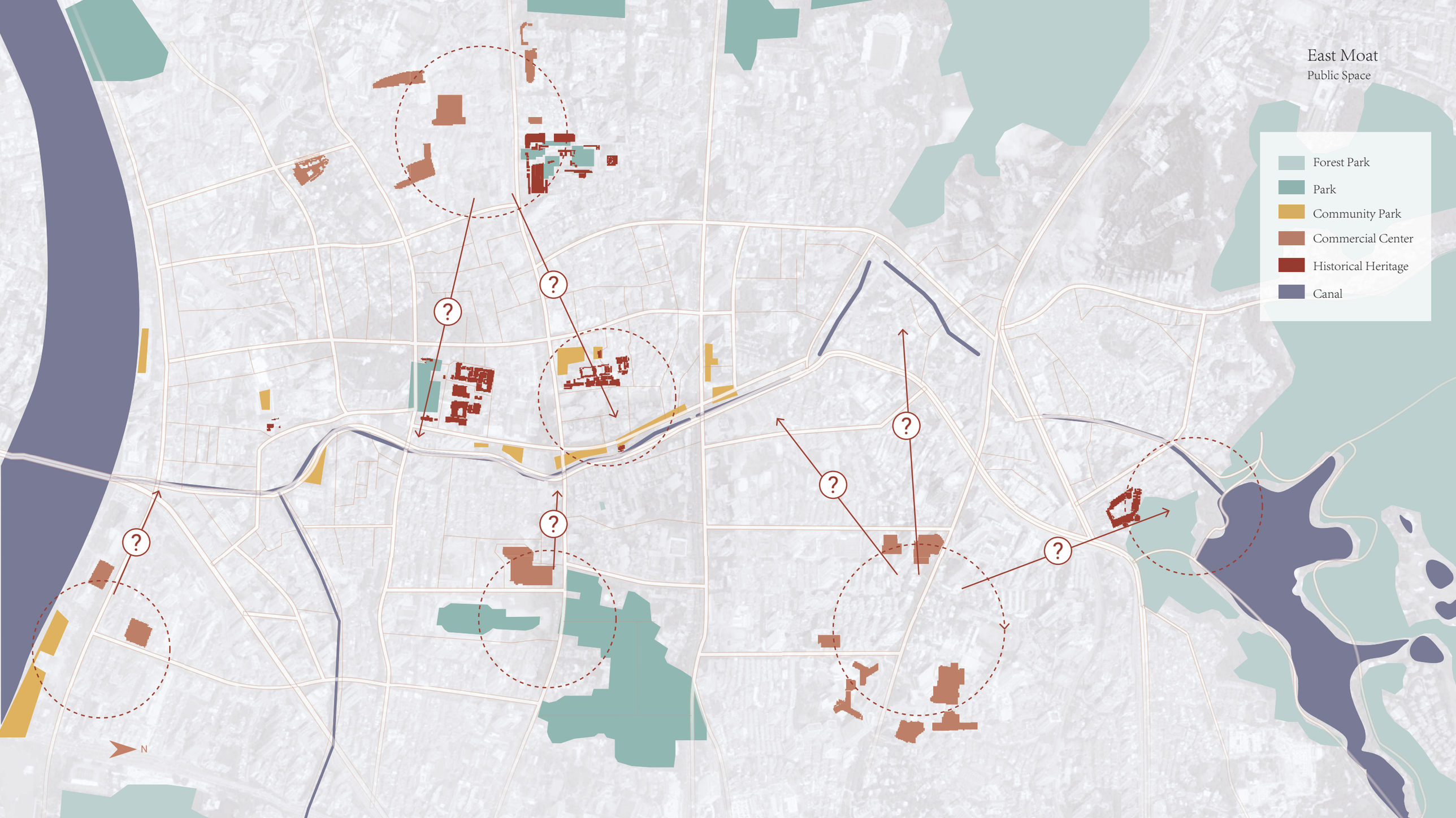
Constructed as Moat

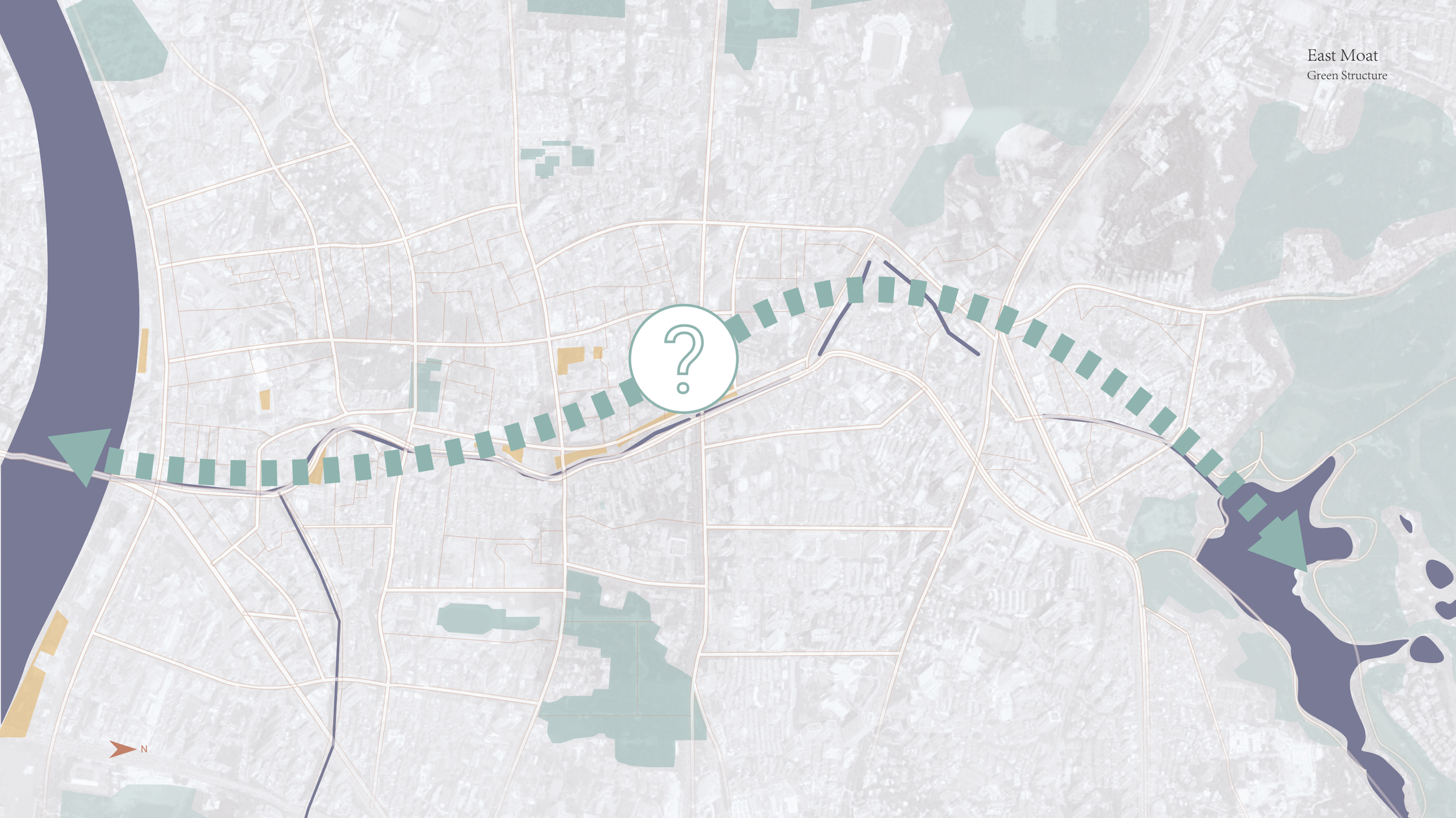
Restoration Project

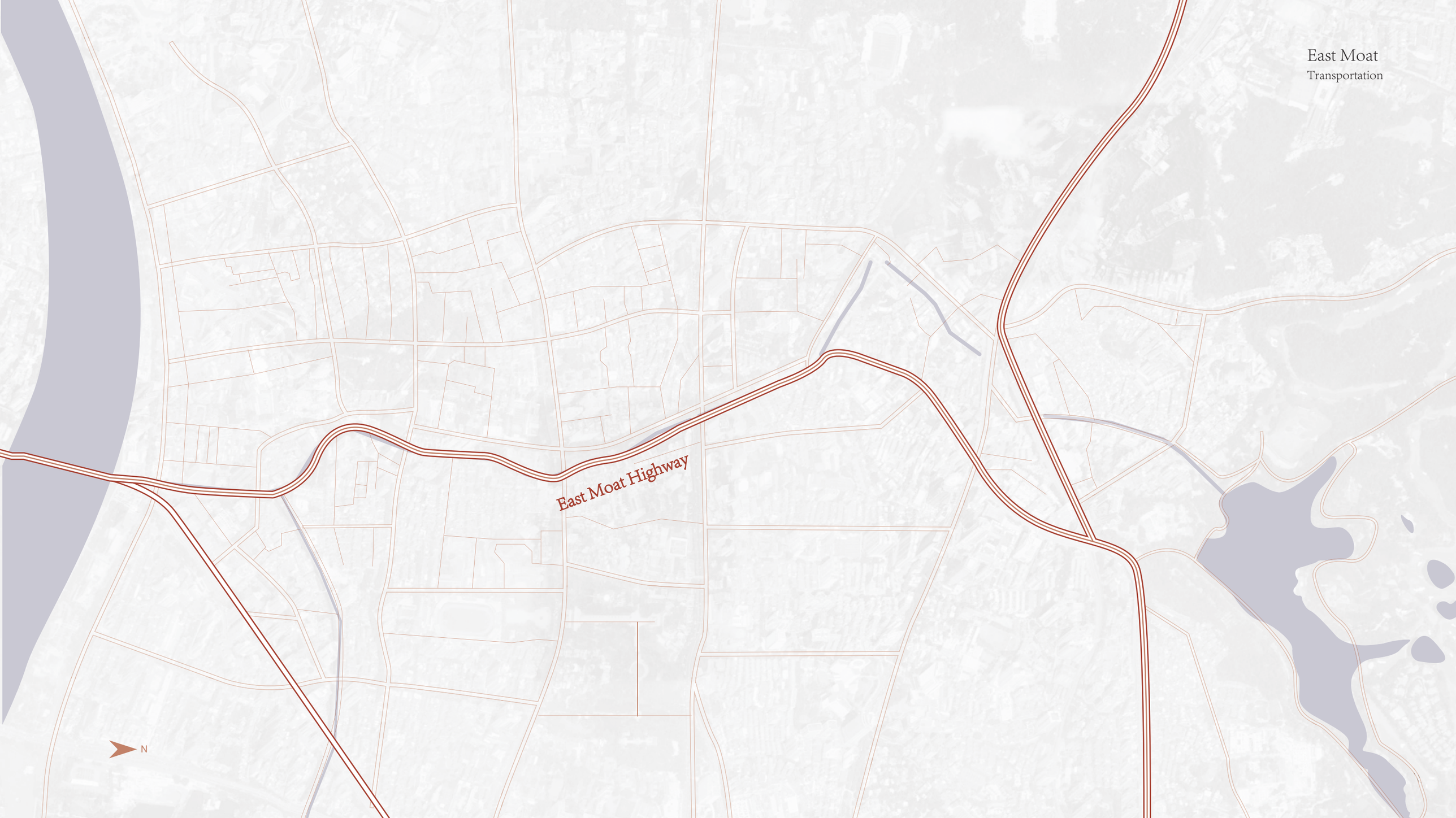
N

East Moat
Water Syatem
Renovated Part
Unrenovated Part
Garbage
Waste Water
Water Storage
Xinhepu Canal
N
Sewage interceptor pipe
Culvert
Pump Station
Flood Gate
Sluice
Waste Water from Restaurant
Residential Area
Polluted Water
Flood Threatened Area

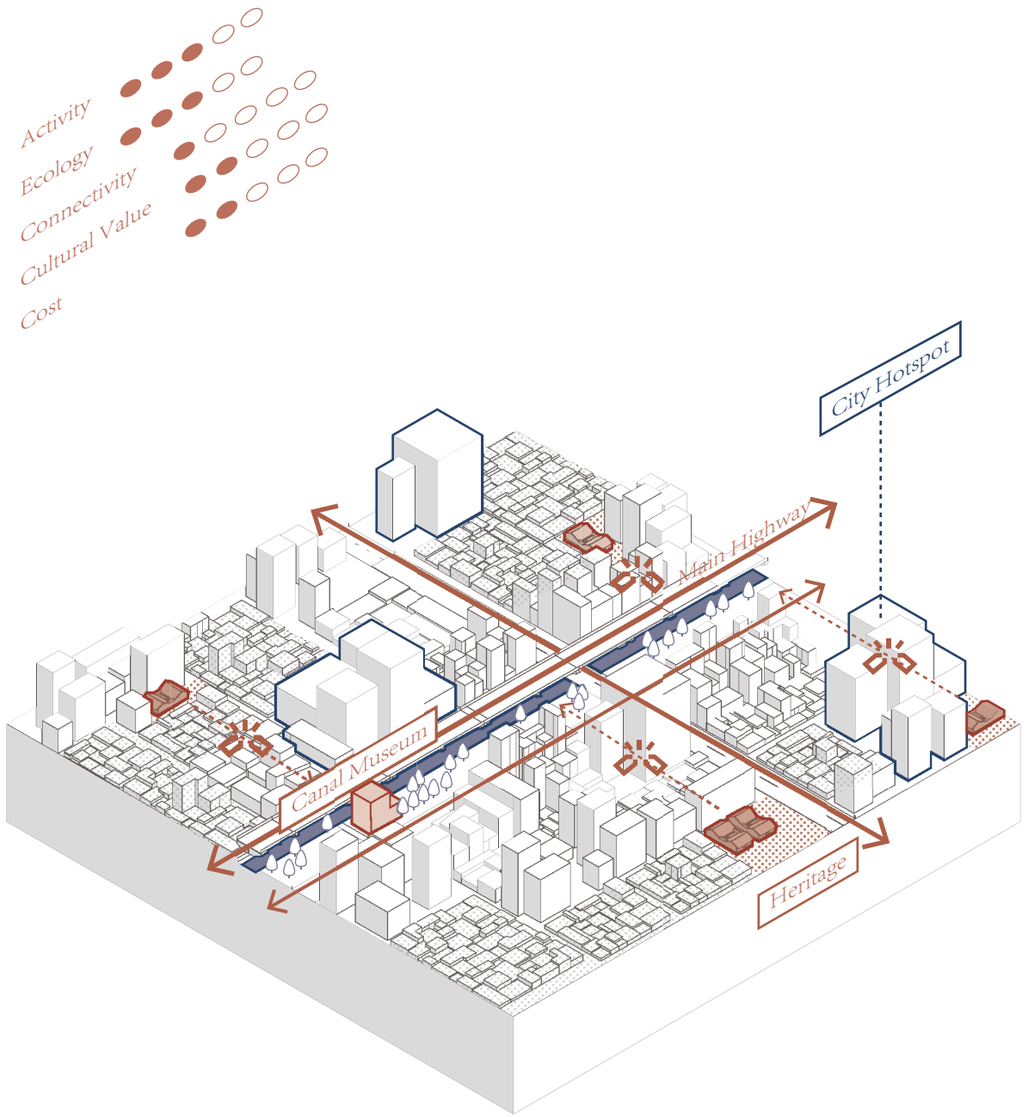

East Moat
Landuse
Forest Park
Park
Community Park
Commercial Center
Historical Heritage
Canal
N


East Moat
Public Space
Forest Park
Park
Community Park
Commercial Center
Historical Heritage
Canal
?
?
?
?
?
?
N

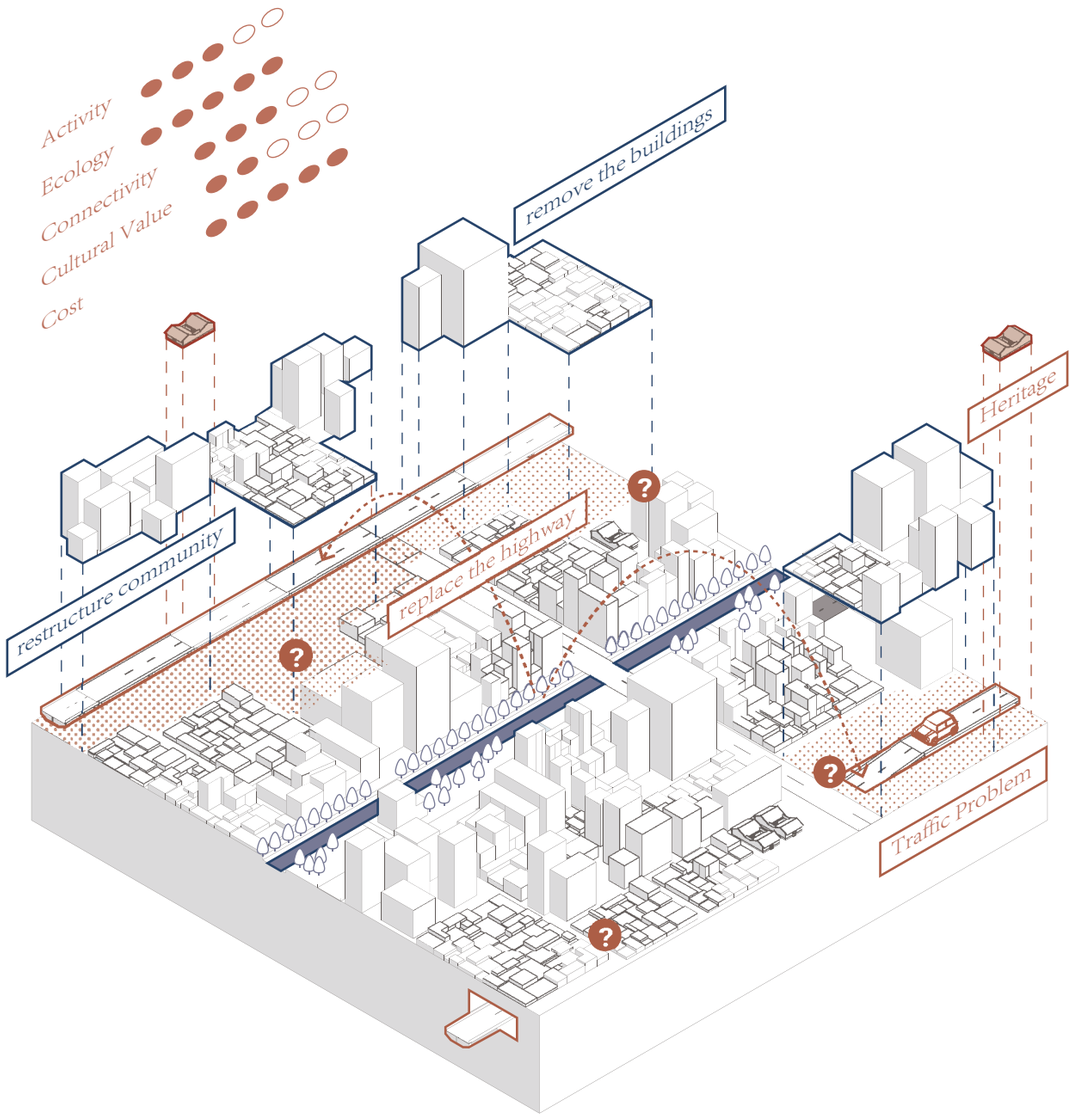

East Moat
Green Structure
?
N


East Moat
Transportation
East Moat Highway
N

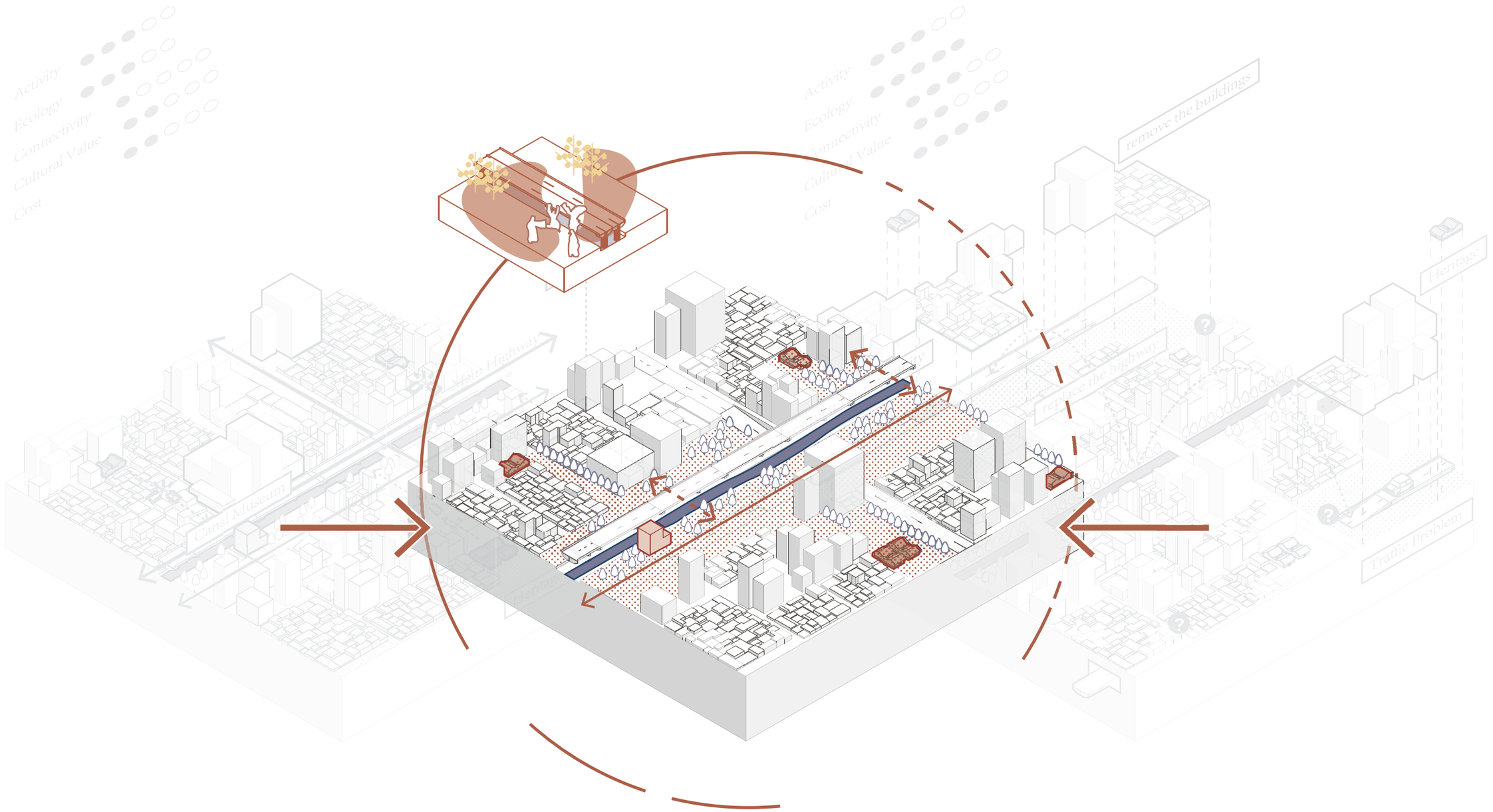
East Moat
Highway



Option - Keep the Highway



Option - Replace the Highway


Activity
Ecology
Connectivity
Cultural Value
Cost
Main Highway
Canal Museum
remove the buildings
replace the highway
Heritage
Traffic Problem

Water Issue

Seasonal flooding caused by rainstorm, poor construction of water system and city development

Lack of a circular water system (rain-water collection, water purification and disposal)

Public Space Issue

Public Space

A main high-rise road was constructed above the canal

Inadequate public facilities around. (green area, visiting route and open space)

The corssing main roads and highway make the experience through the canal discontinuous

Connectivity

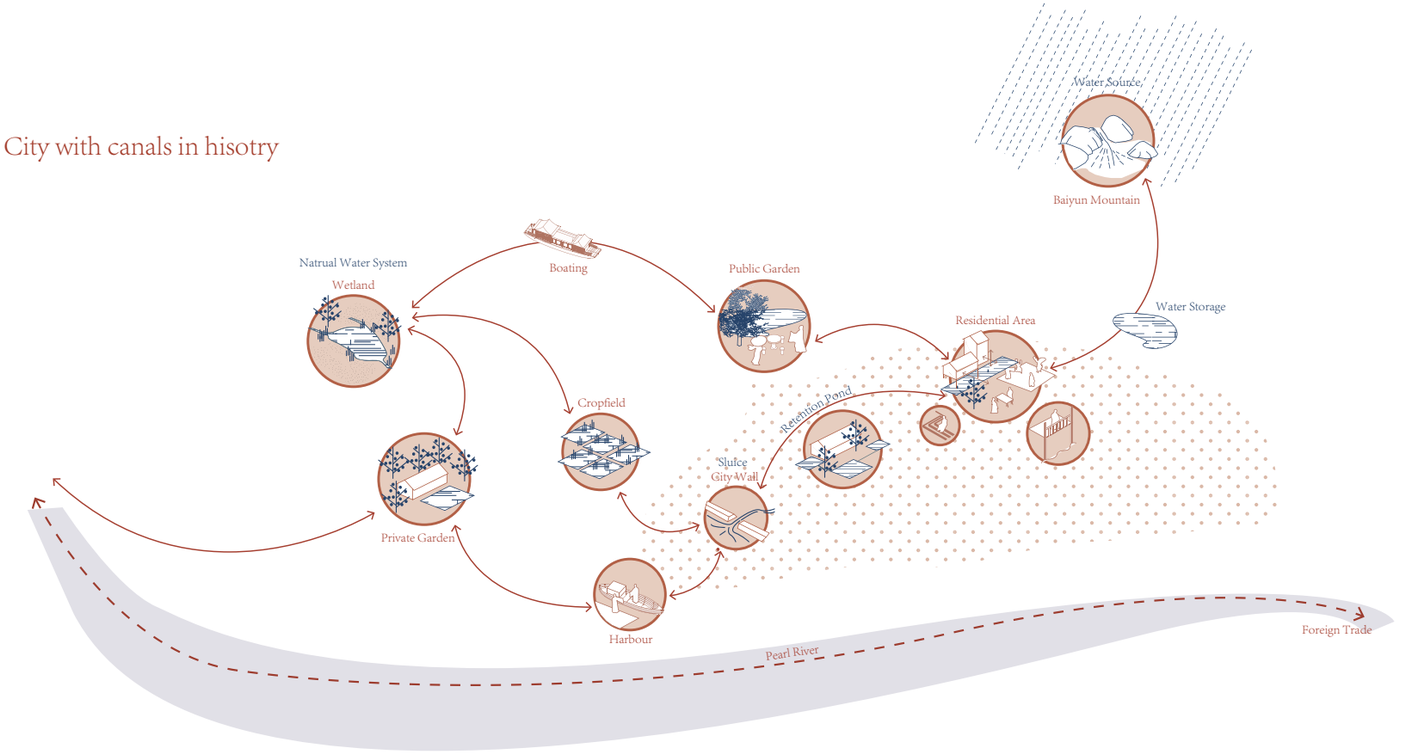
Physically and visually disconnected with surrounding residential area

Social-cultural Value

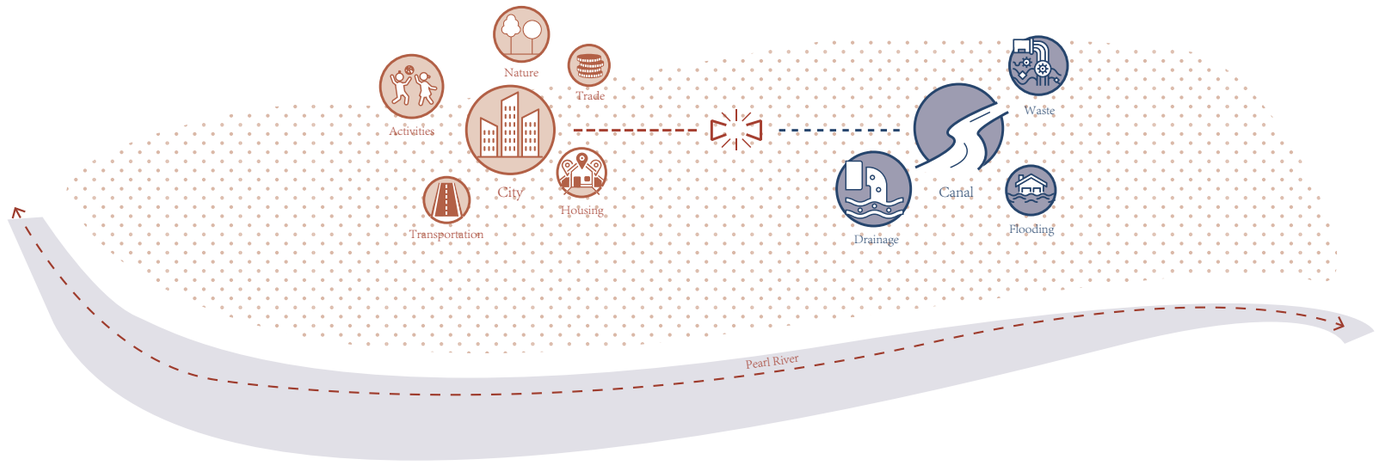
Loss of local identity as a waterfront area

Some historical residential area along the canal are in disrepair, and its cultural value is unrealized

City with canals in hisotry



City with canals now



POTENTIAL

- East Moat is the last existing historical moat in Guangzhou.
- East Moat is an important part of the water system in Guangzhou historic inner-city.
- East Moat connects the core green area of Guangzhou and Pearl River in north-south direction.
- Reorient the city towards the canals again, and revitalize the canal area.

ASSIGNMENTS

Improve Spacial Quality

Create A New Green-blue Structure

Rediscover the historical and cultural value

New Water Landscape Infrastructure

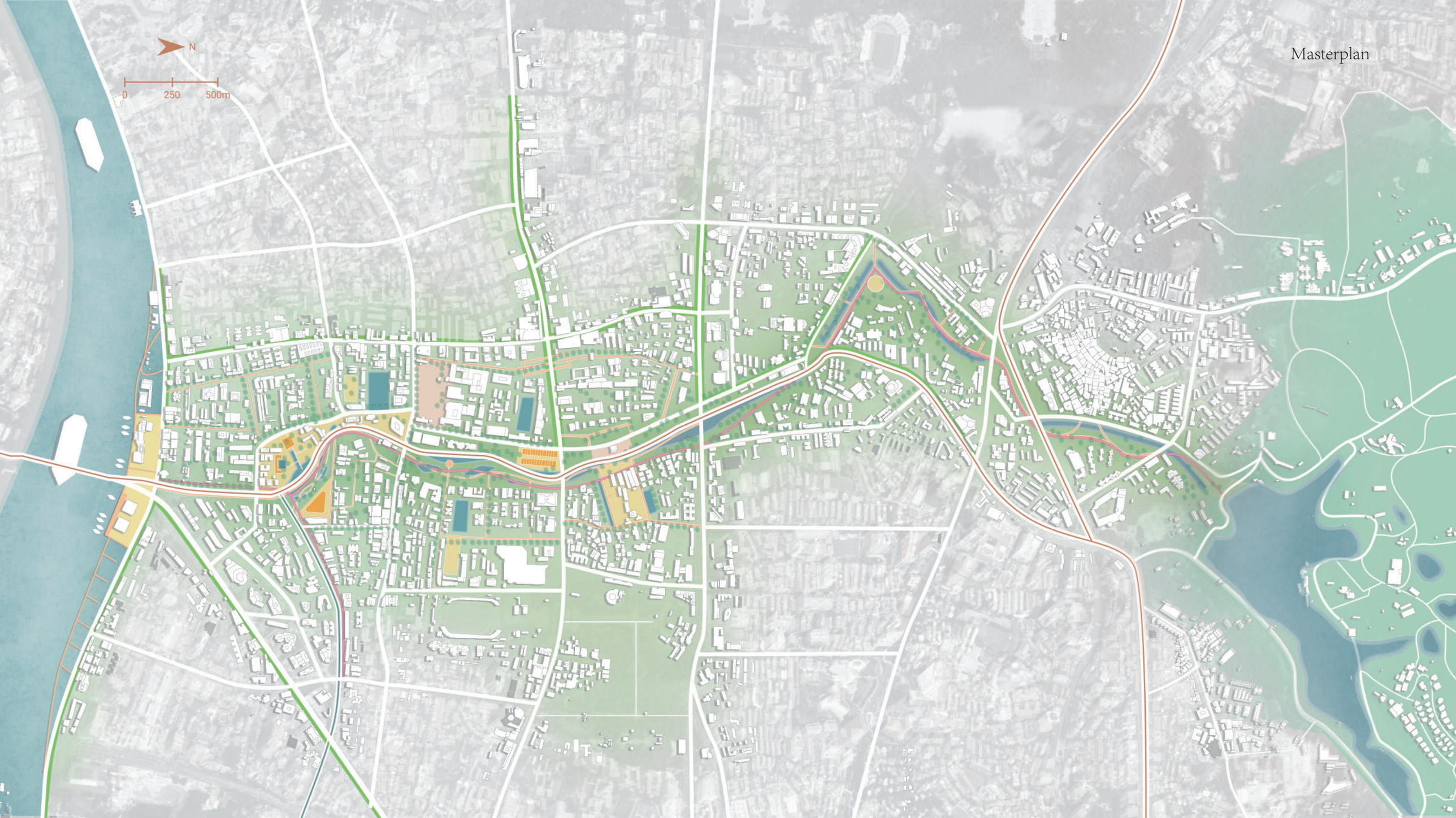
- In history -

- Current situation -

- Design goal -

Based on the historical study, the goal is to design an urban landscape infrastructure and solve water and public space issues.

Masterplan



Masterplan

Water

N

Downstream

Due to the deep water level and poor water quality, choose aquatic plants with a longer growth period and strong dephosphorization and deoxidation functions

Hymenocallis Spciosa

Thalia geniculata

Pistia stratiotes

Nymphaea alba

Upstream

To reduce the damage to water quality caused by the rare elements remaining in the old canal

Kandelia candel

Ceratophyllum demersum

Bruguiera gym noihiza

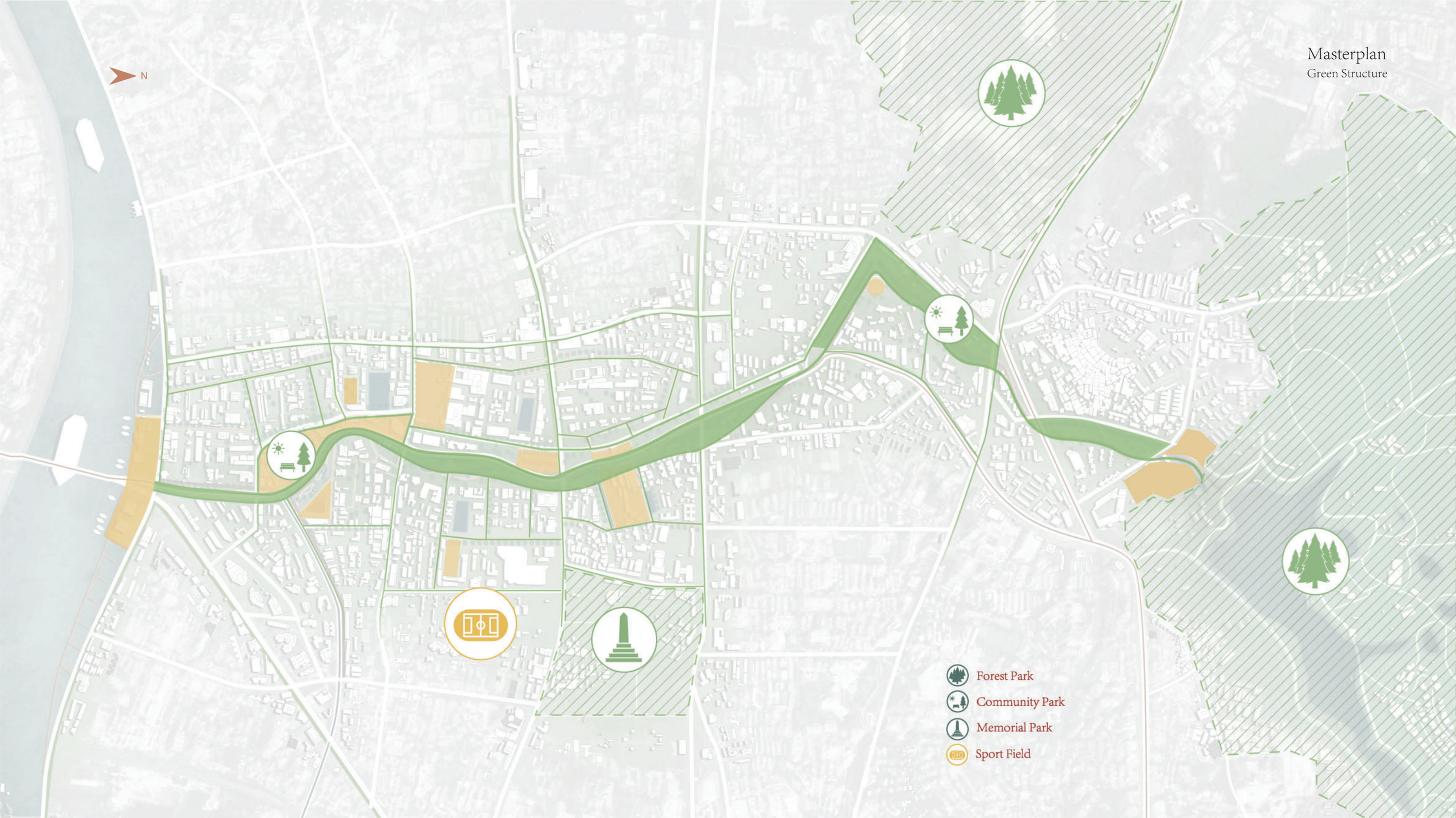
Build permeable filtration facilities near the river to further treat the sewage after aerobic treatment, so that the water quality can reach the standard

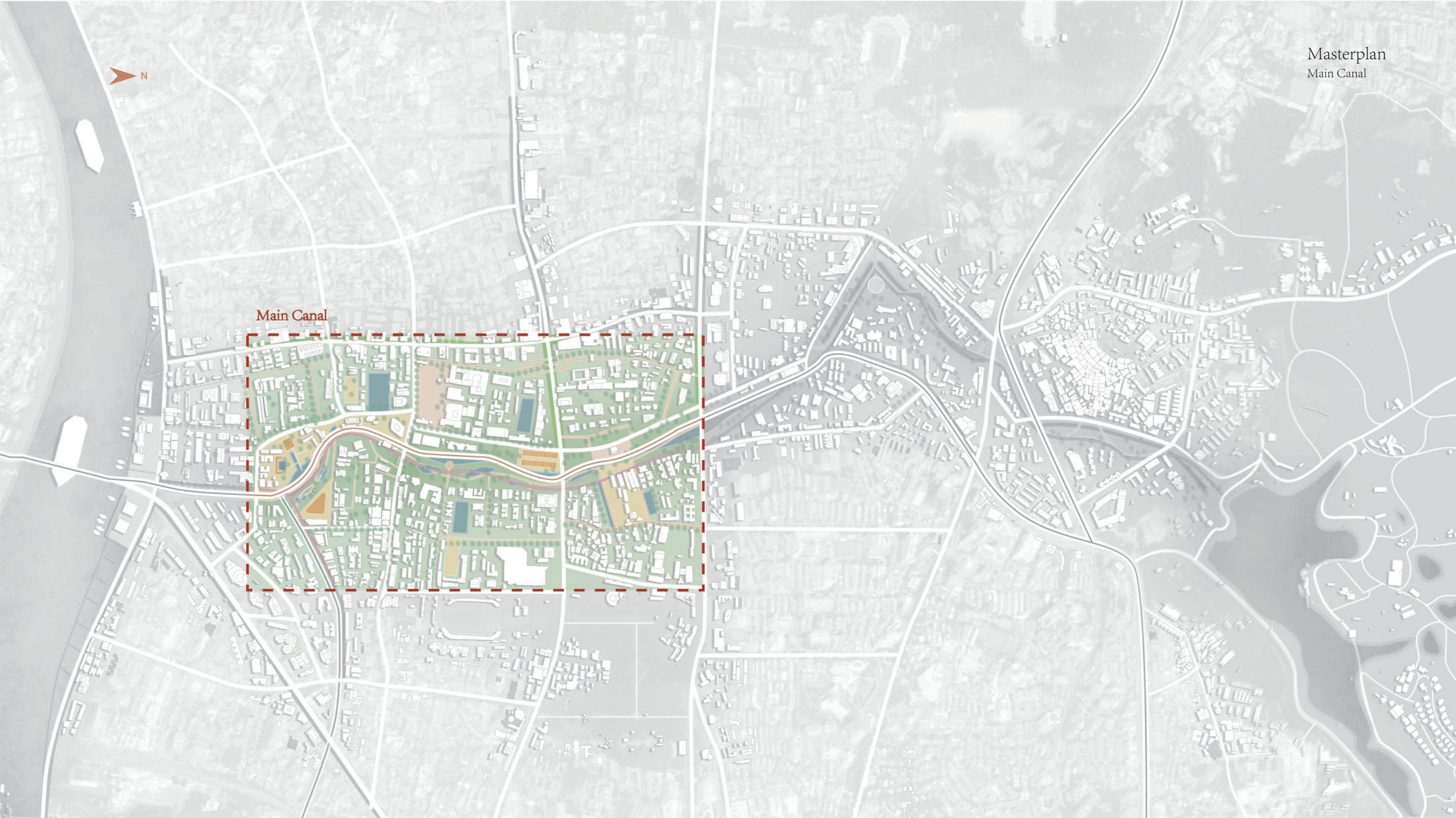
Porous area to increase the drain surface

Availability of pond with the ability to hold water

Masterplan

Green Structure





Masterplan

Main Canal

Main Canal
Interface

Memorial Museum

Shopping Mall

Memorial Museum

Memorial Hall

Memorial Hall

Memorial Museum

Xinhepu Canal

Stadium

Shopping Mall

Memorial Park

Residential Area

N

Main Canal
Interface

Old Neighborhood

Car Road

Parking Area

Temporary Housing

Crossing Point

Green Area

Main Road

Community Park

Apartment Complex

Bridge

Walking Path

Highway

N

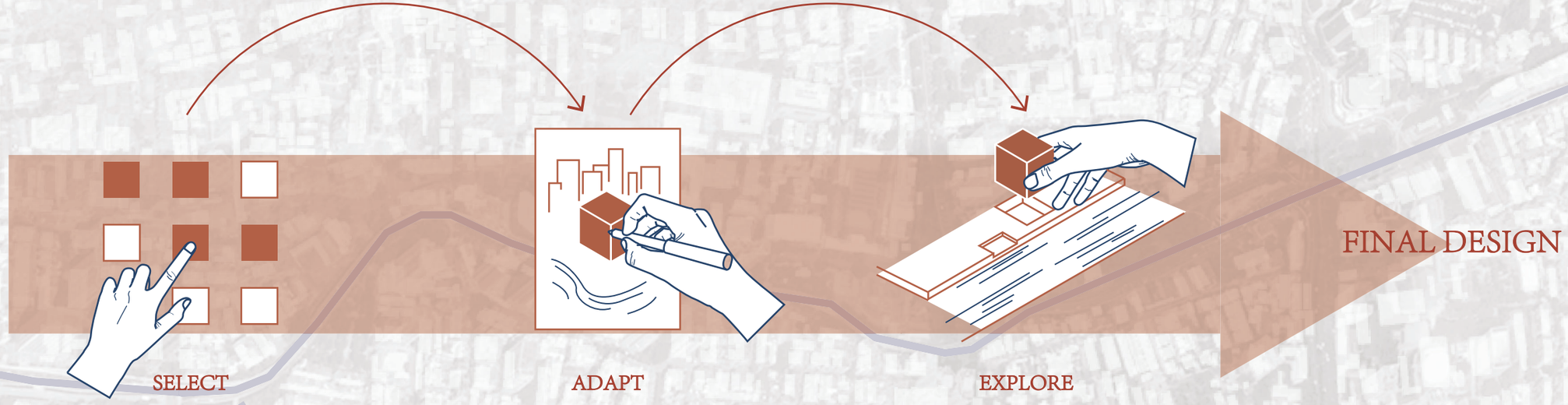
Car Way

Hard Boundary

Soft Boundary

Bridge

Main Canal
Local Scale
SITE-RESIDENTIAL AREA
01
02
03
04
SITE-CROSSING POINT
05
06
SITE-THE END PART
07
N



- Design Principles

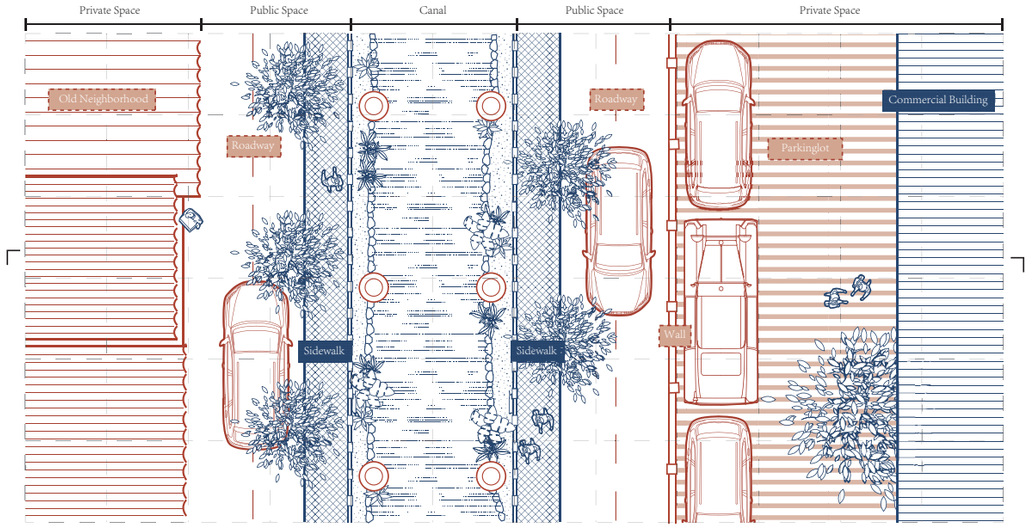
- Sections
- Specific Sites

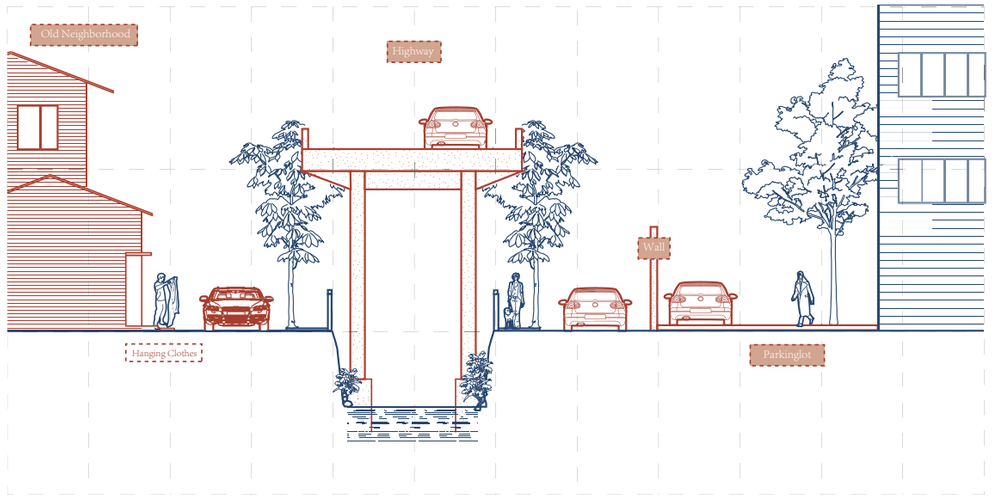
- Design Possibilities

Main Canal
Local Scale
SITE-RESIDENTIAL AREA
01
02
N

01

Old Neighbourhood | Commercial Building





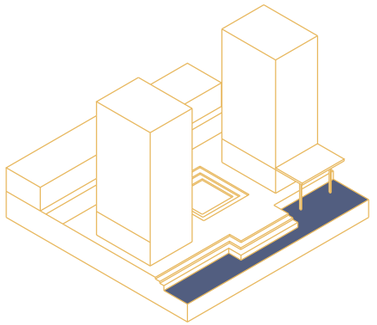
- The entries of the old housing
- Bad condition of old buildings
- Lives in traditional neighborhood

- Backside of the office building
- Wall and parking lot

01

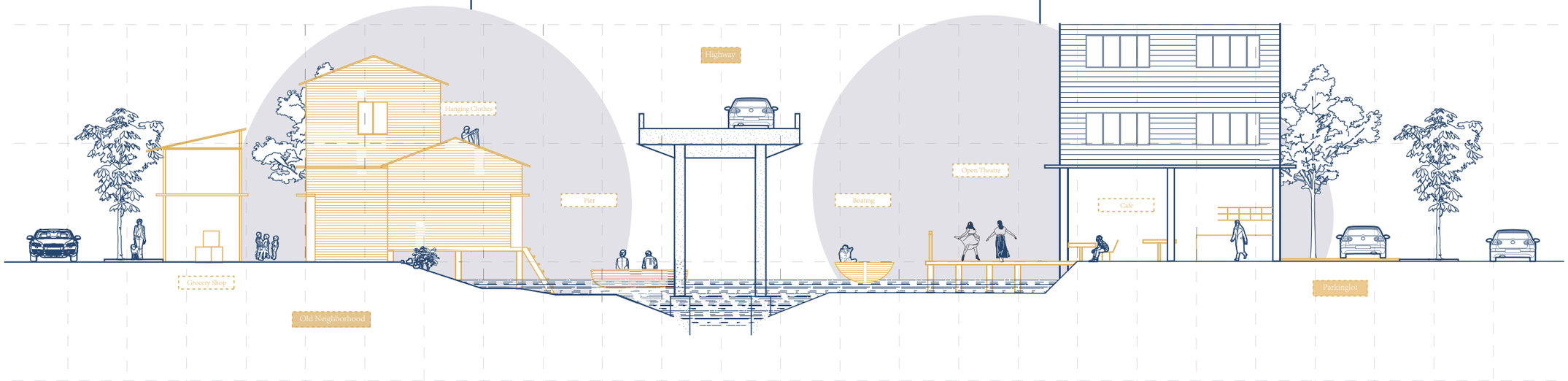
Old Neighbourhood | Commercial Building

- Harmony with Natural Environment
- Dynamic Waterscape



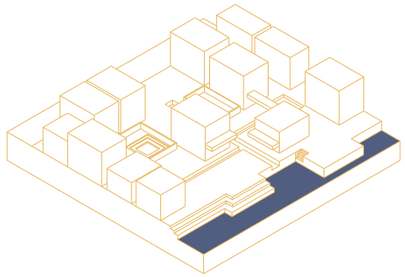
- Diverse Intersurface

- Retention Pond
- Interaction with Built-environment



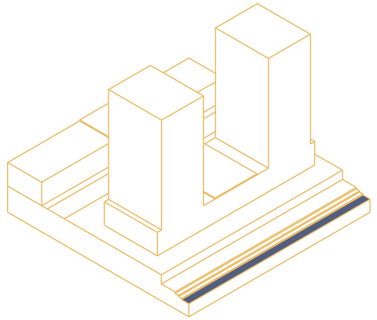
01

Old Neighbourhood | Commercial Building



- Connectivity of Public Space
- Diverse Intersurface
- Water as Public Space

- Retention Pond
- Dynamic Waterscape



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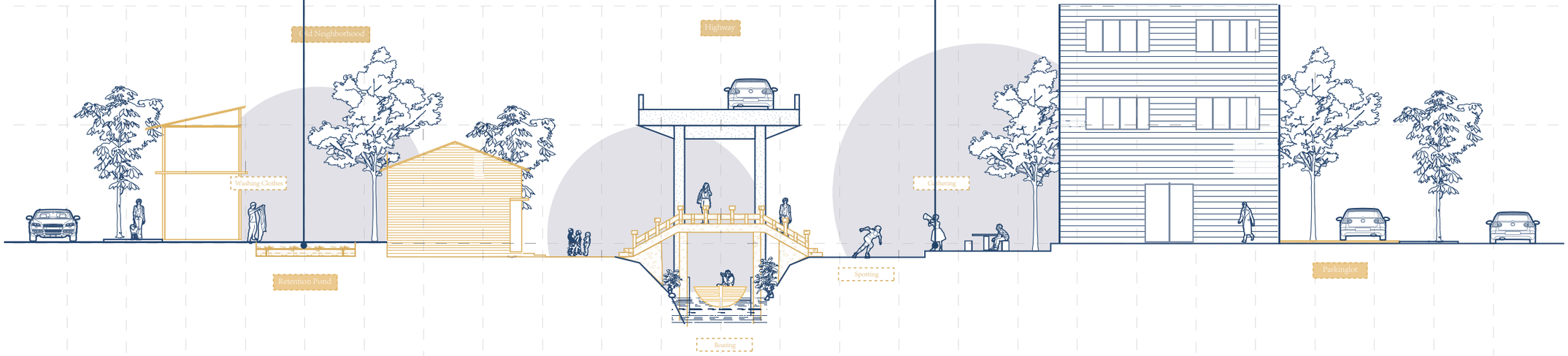
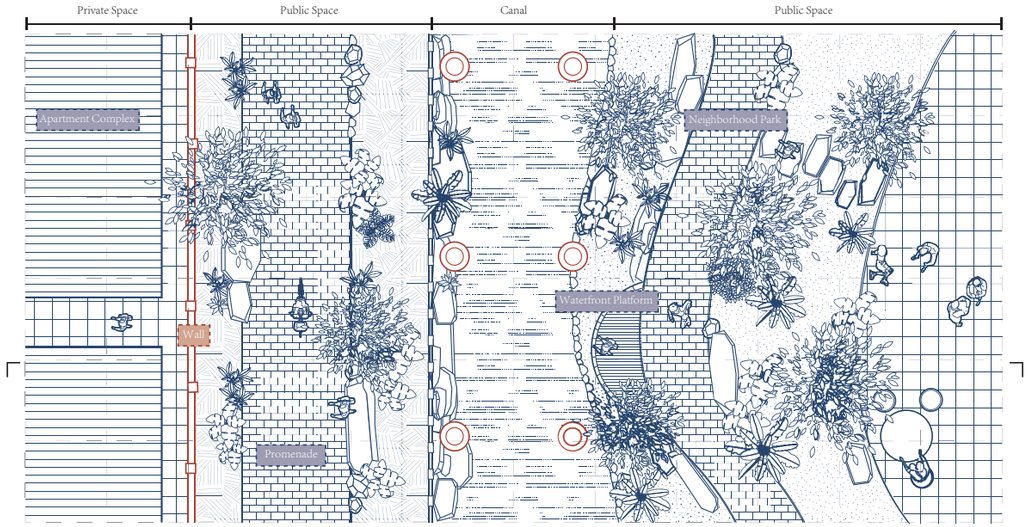
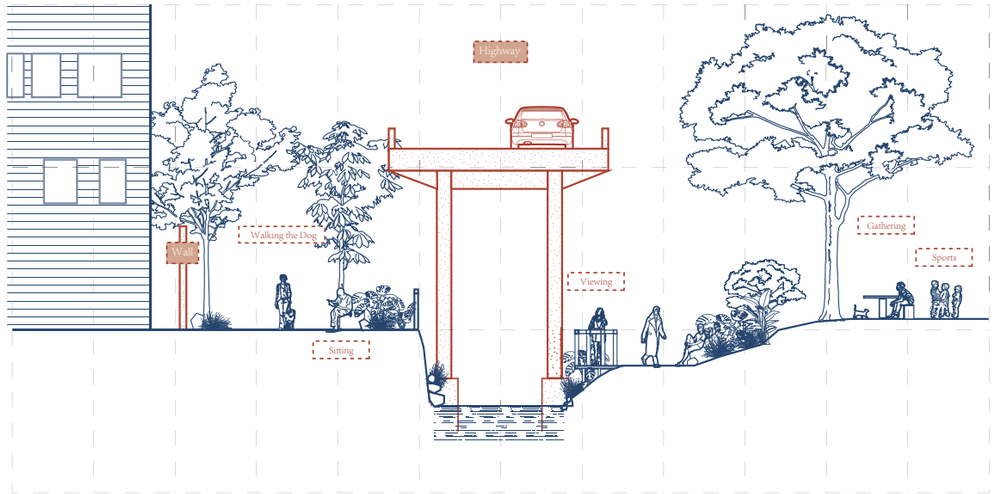


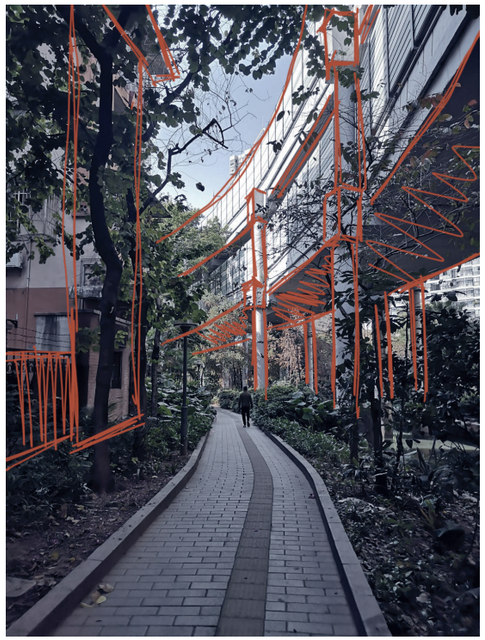
02

Apartment Complex | Community Park





- The path is well designed
- Sitting spots for people to stop and rest
- Still disconnected by the wall



- Nice transition area between the park and the canal
- There is multifunctional area and well used

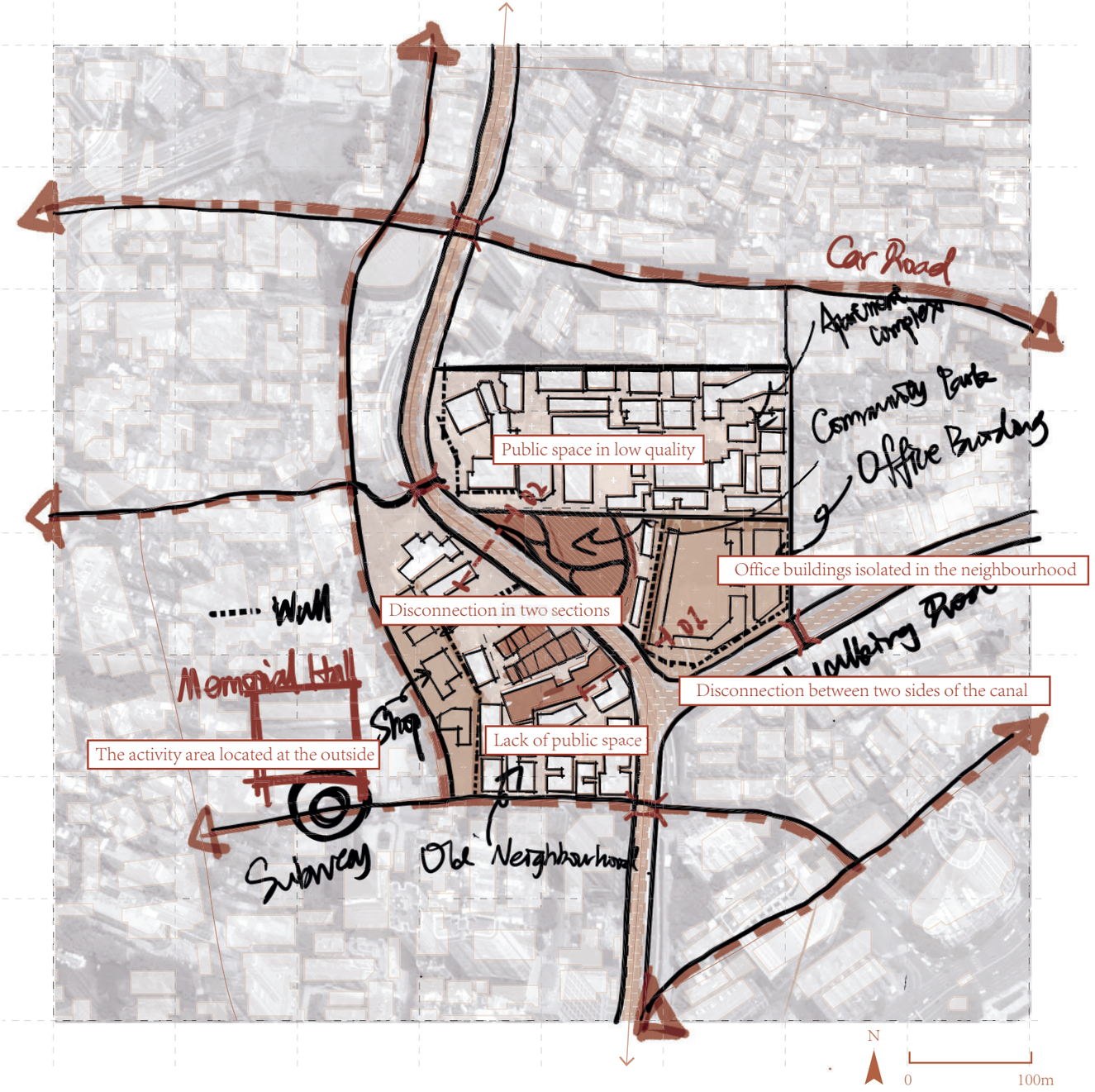
02

Apartment Complex | Community Park

Main Canal
Site - Residential Area
SITE-RESIDENTIAL AREA
01
02
N

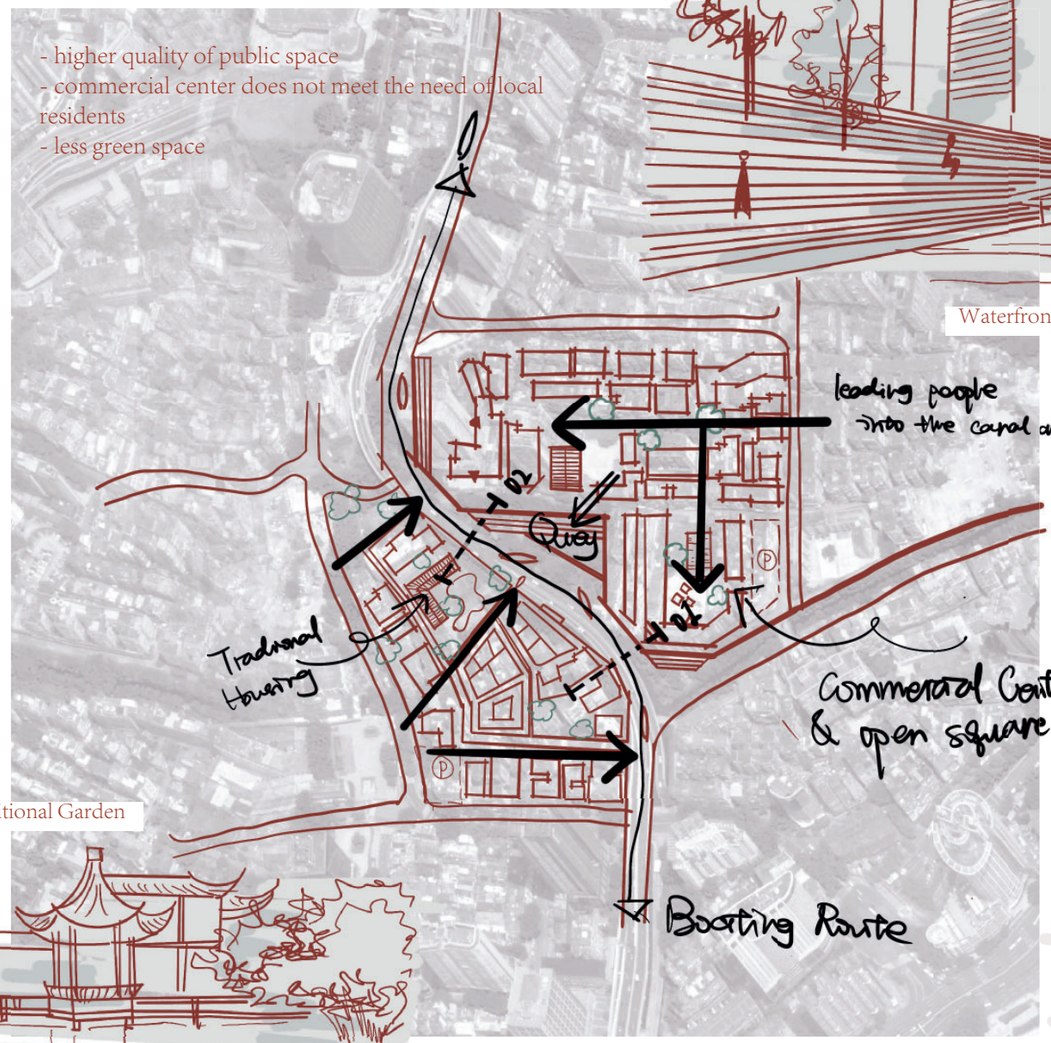
Site - Residential Area

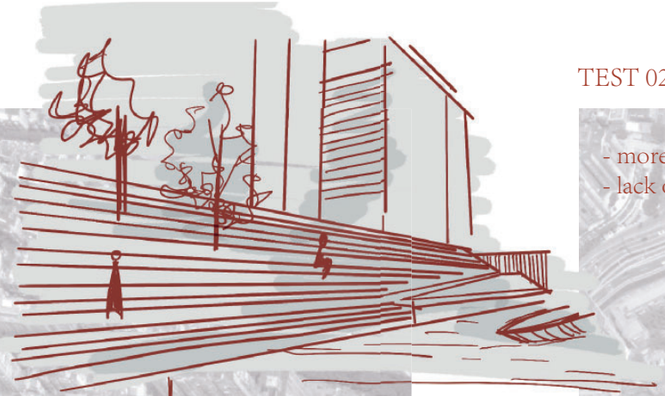
Challenge



TEST 01

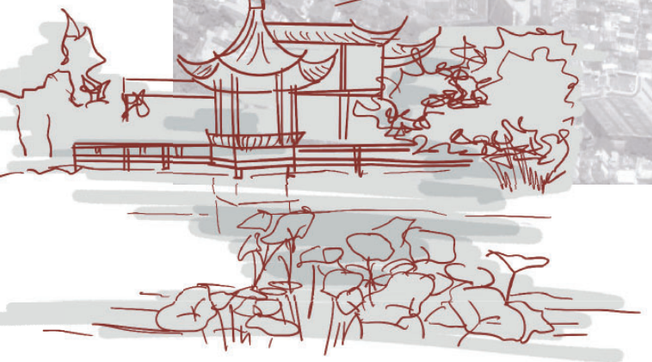
- higher quality of public space
- commercial center does not meet the need of local residents
- less green space





Waterfront Platform

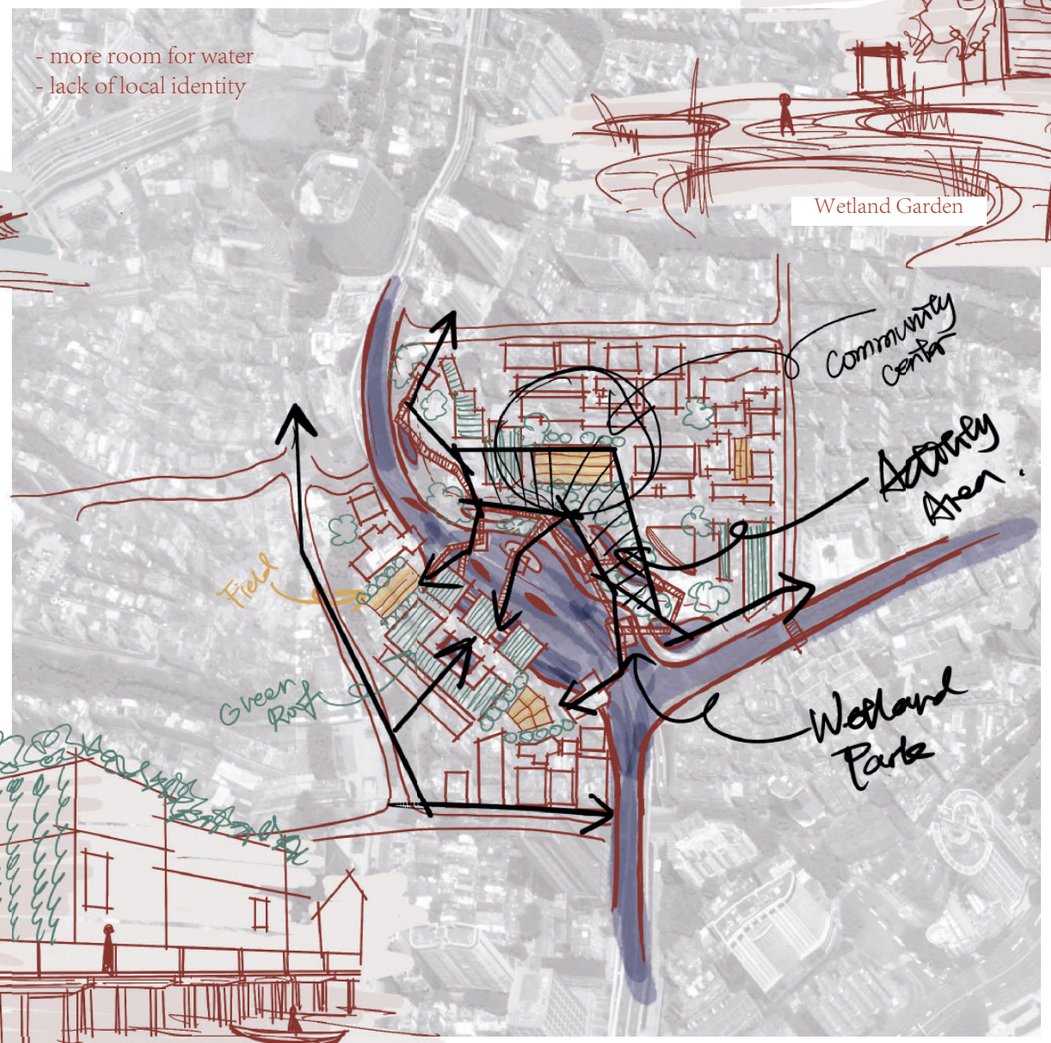
Traditional Garden



N 0 100m

TEST 02

- more room for water
- lack of local identity



Wetland Garden

Flood-adapted Apartment

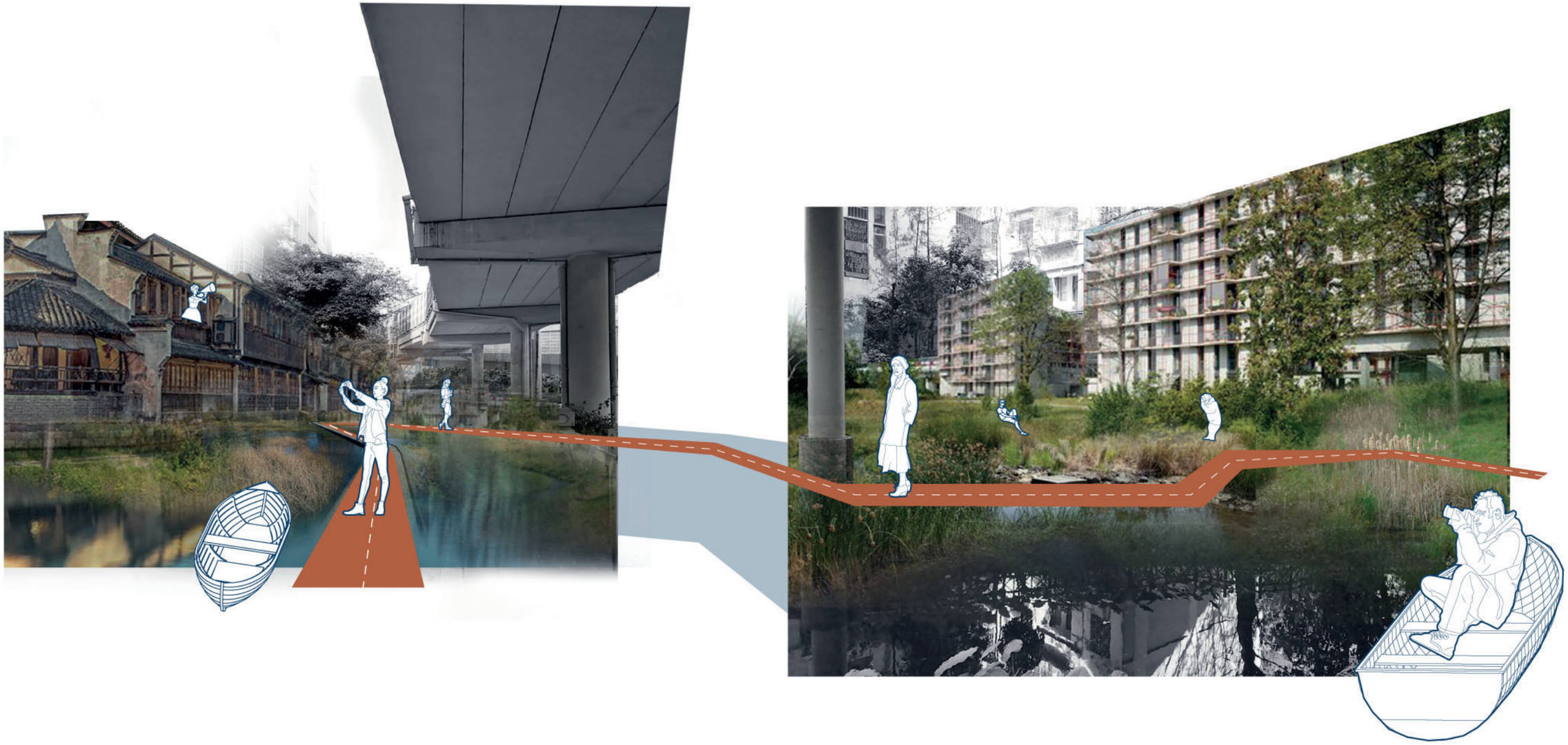
N 0 100m

Neighbourhood
green structure
Traditional Housing
Cycle Route
Wetland Park
Boating Route
N
0
100m

宏光玻璃

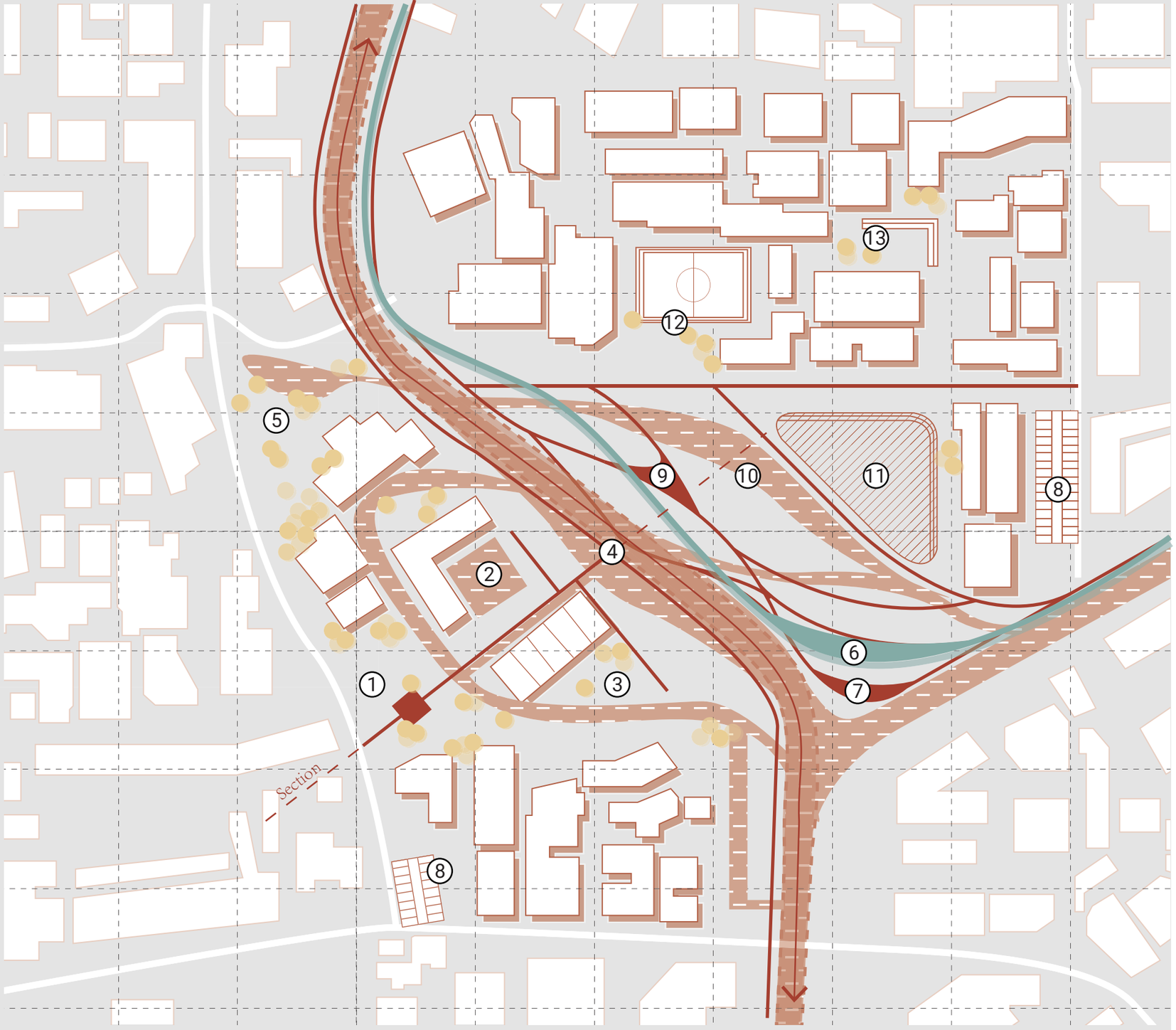
Site - Residential Area

Final Concept



Site - Residential Area

Plan



1. Central Plaza
2. Water Square
3. Market
4. Waterfront Platform
5. Retention Pond
6. Cycleway
7. Viewing Platform
8. Parking Lot
9. Wetland Park
10. Dynamic Waterscape
11. Wooden Plaza
12. Sports Field
13. Public Theatre

N

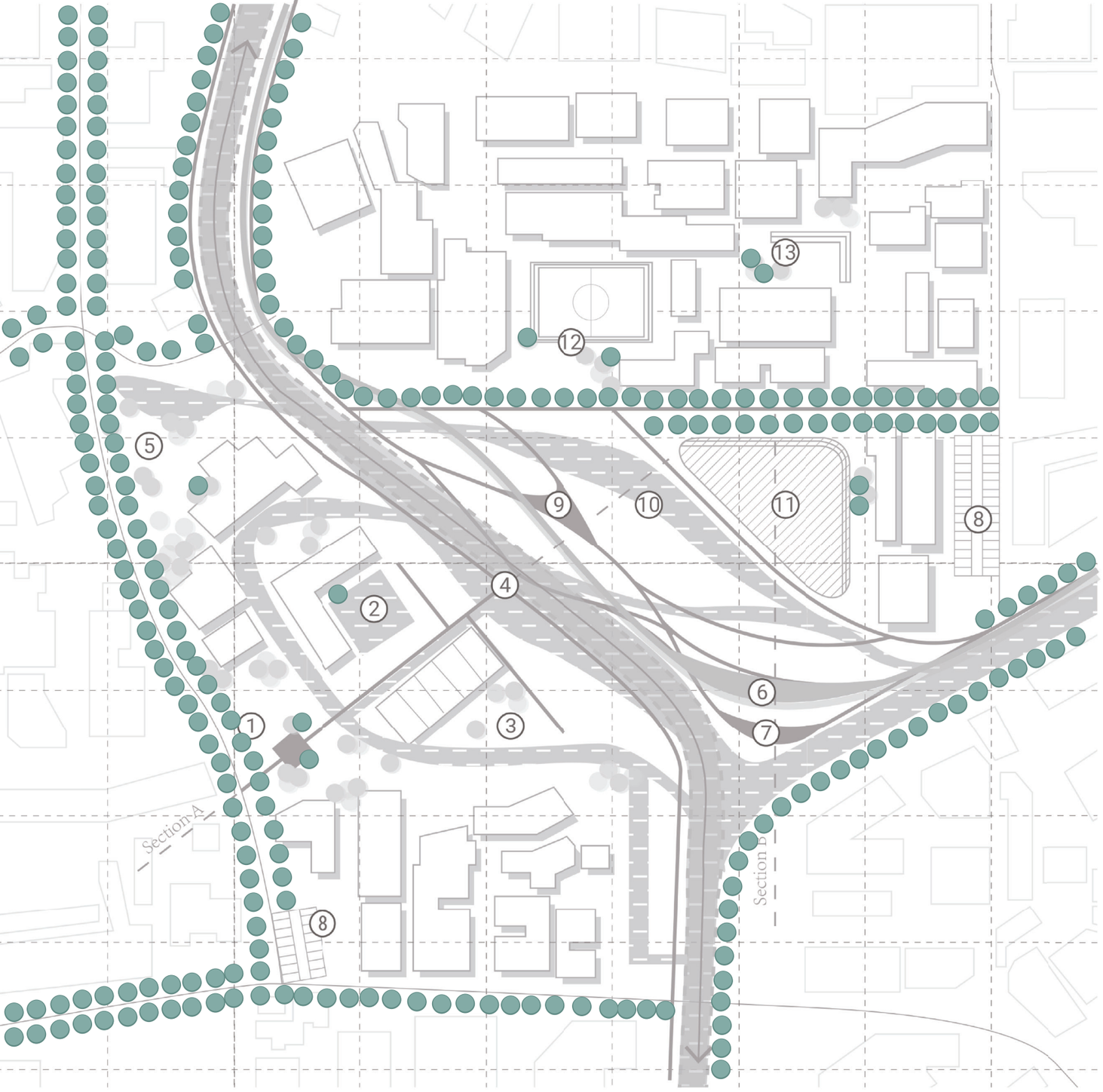
50m

Site - Residential Area

Water

Street Drainage

Temparory Storage



Site - Residential Area

Planting Design

Street Trees

Magnolia grandiflora
Height: 20.00 - 30.00 m

Cinnanomum camphor a
Height: 30.00 - 40.00 m

Bombax malabaricum
Height: 10.00 - 25.00 m

Salix babylonica
Height: 10.00 - 18.00 m

Cinnanomum camphor a
Height: 8.00 - 20.00 m

Osmanthus fragrans
Height: 15.00 - 25.00 m

Woody Aquatic Plants

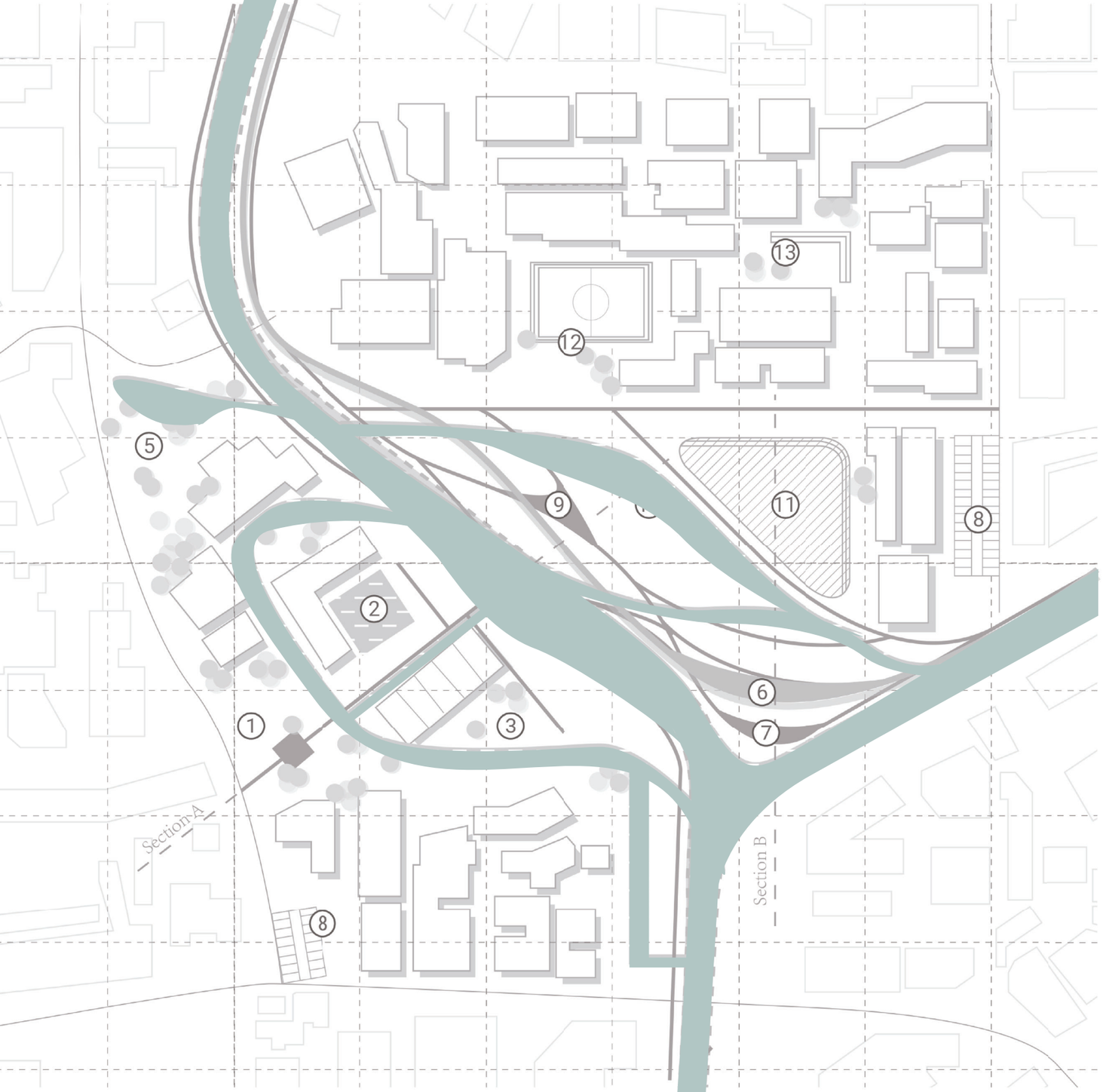
Taxodium distichum
Height: 10.00 - 40.00 m

Taxodium ascendens
Height: 10.00 - 25.00 m

Bruguiera gym noihiza
Height: 5.00 - 10.00 m

Kandelia candel
Height: 5.00 - 10.00 m

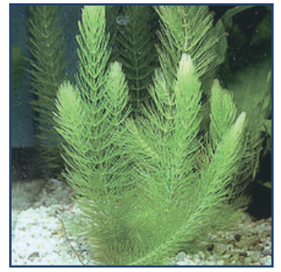
Aegiceras corniculatum
Height: 1.50 - 4.00 m



Herbaceous Aquatic Plants

Nelumbo nucifera
- Emergent Plants

Nymphaea alba
- Floating Plants

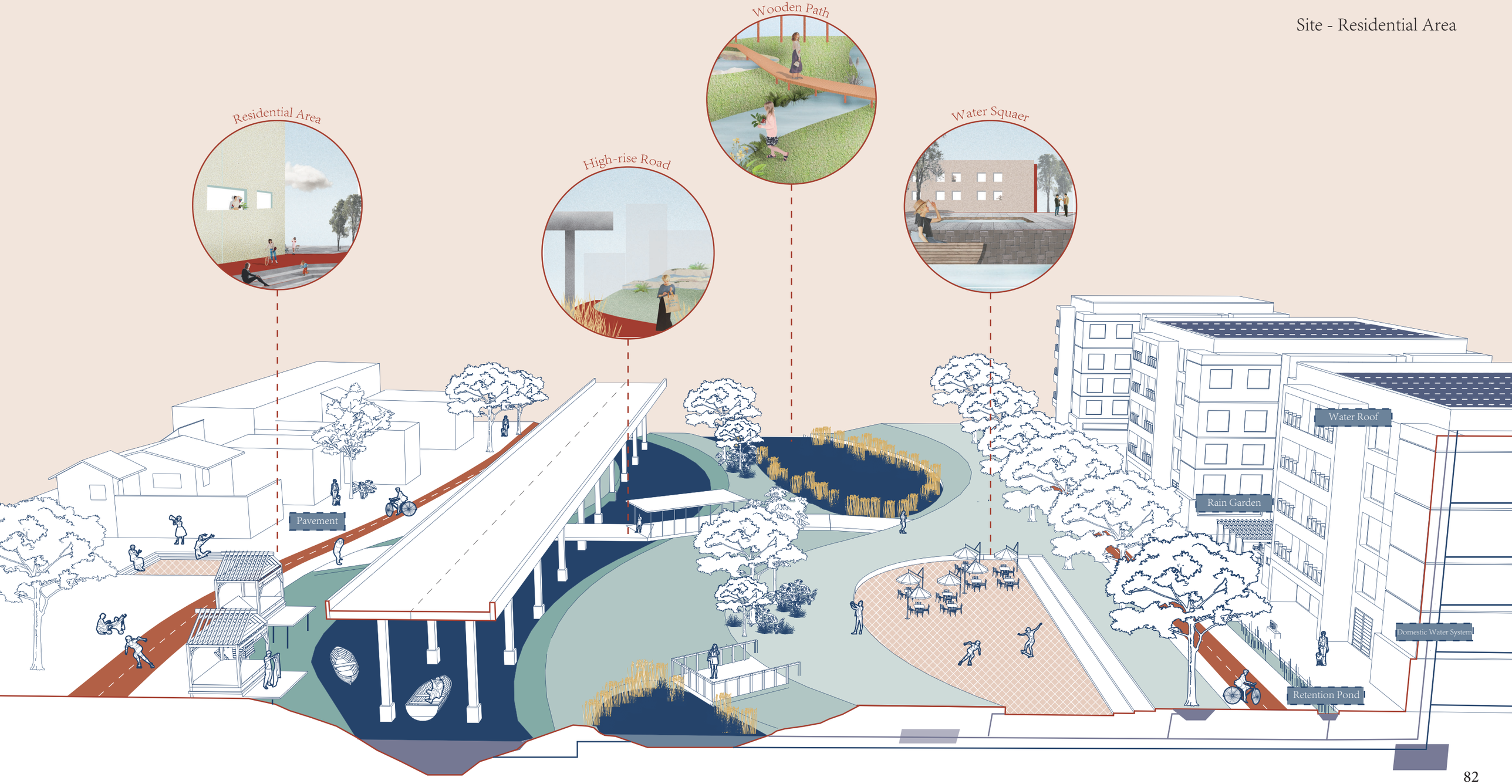


Ceratophy llumdemersum
- Submersed Plants

Thalia dealbata
- Emergent Plants

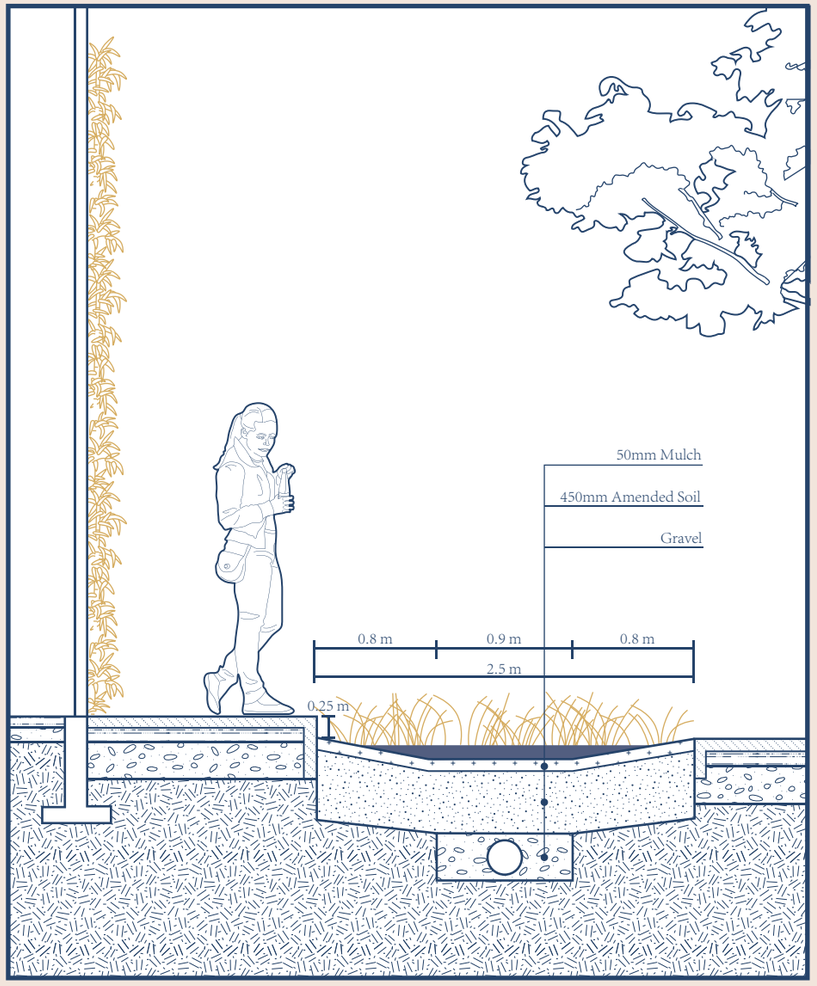
Hymenocallis Spciosa
- Emergent Plants

Pistia stratiotes
- Floating Plants


Residential Area
High-rise Road
Wooden Path
Water Squaer
Pavement
Water Roof
Rain Garden
Domestic Water System
Retention Pond

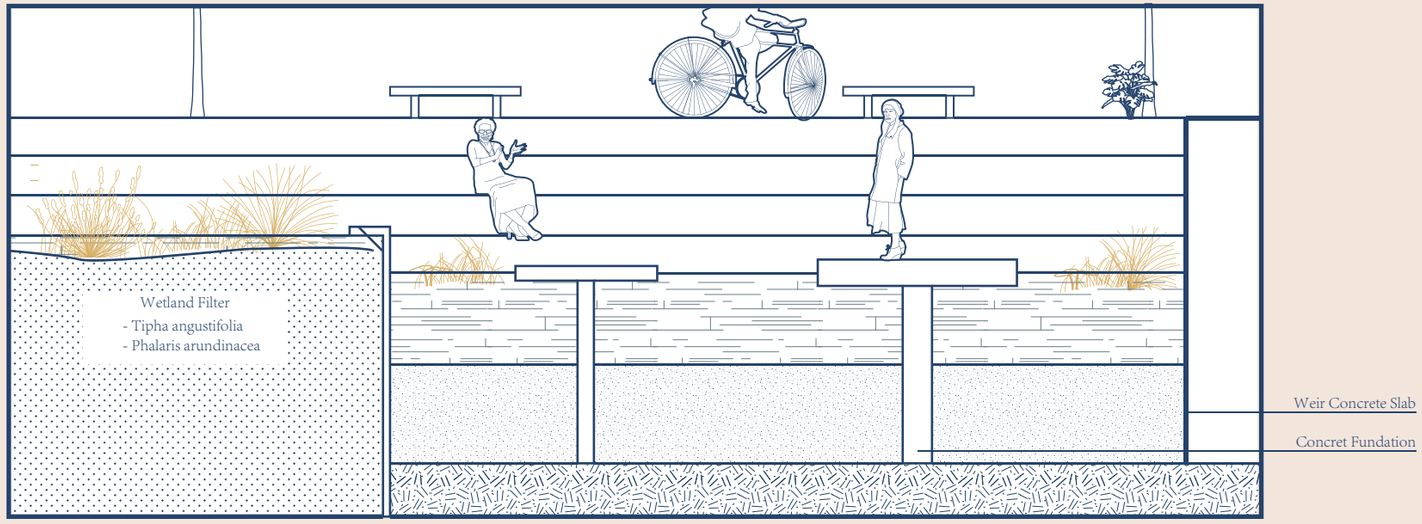
Site - Residential Area

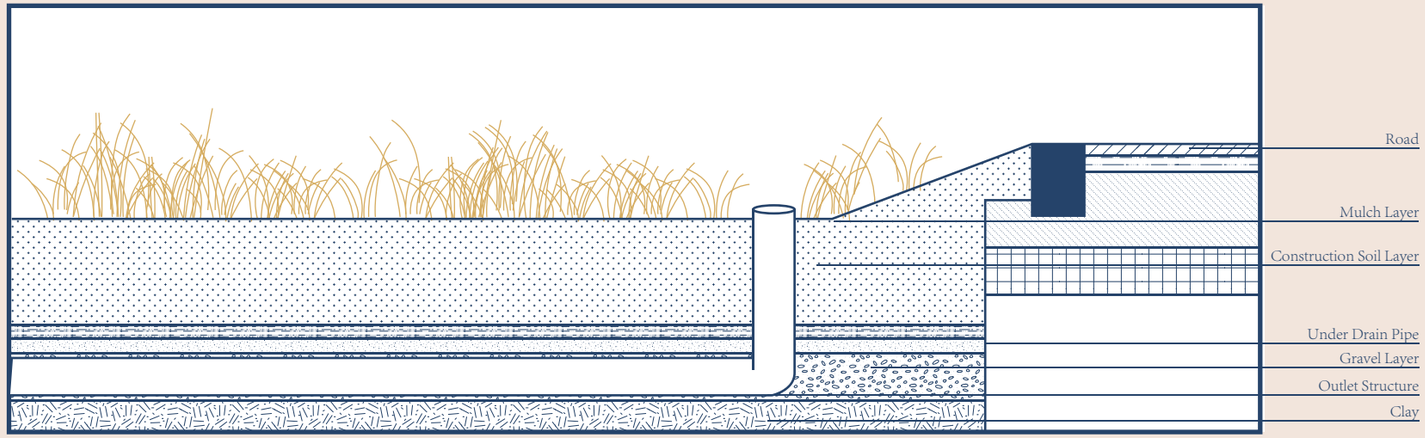
Technical Details



Retention Pond

Water Square



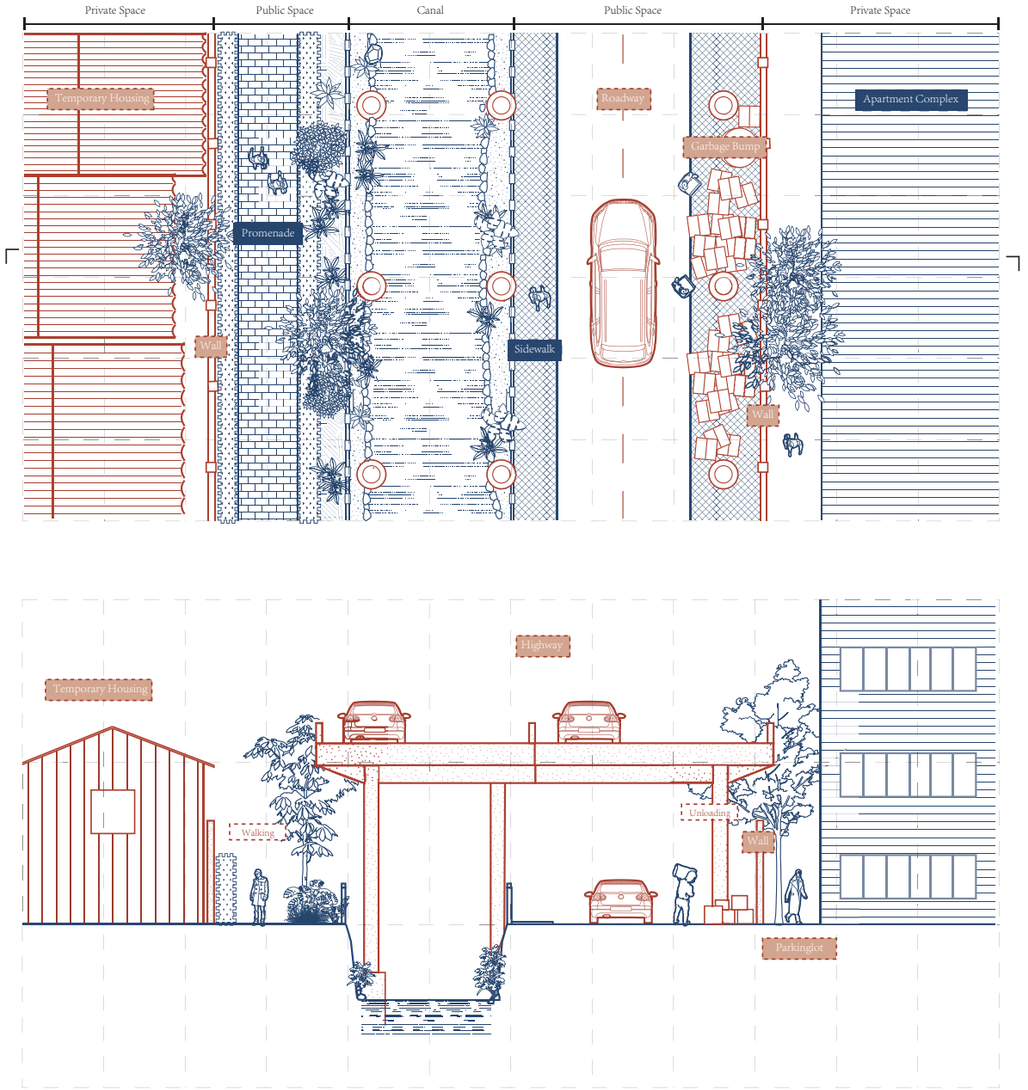


Grass Field

Main Canal
Local Scale
SITE-CROSSING POINT
05
N

05

Temporary Housing | Residential Area



- A narrow and dark path, make people feel unsafe

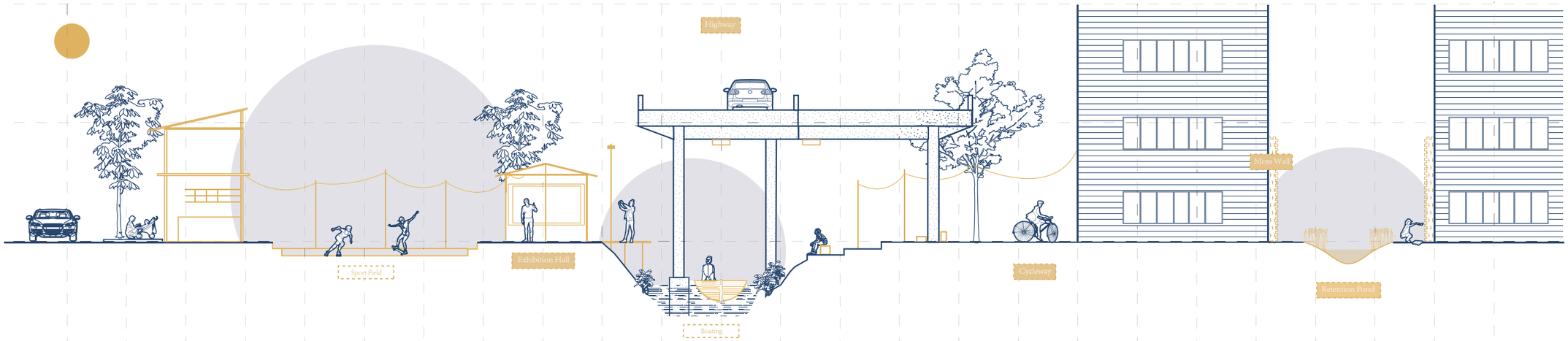
- The facade of the temporary housing in bad condition, and block the sight into the canal

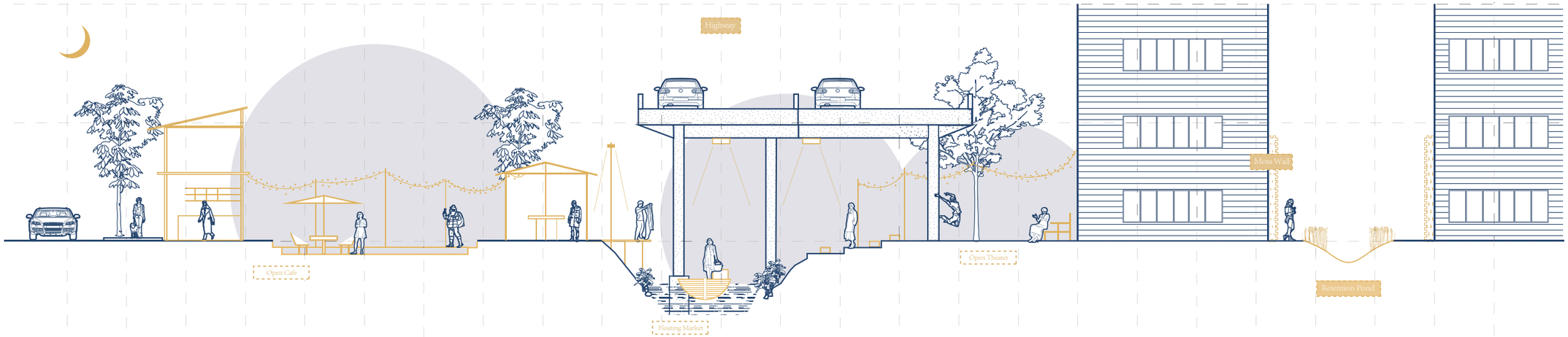
- Dark and messy area under the highway

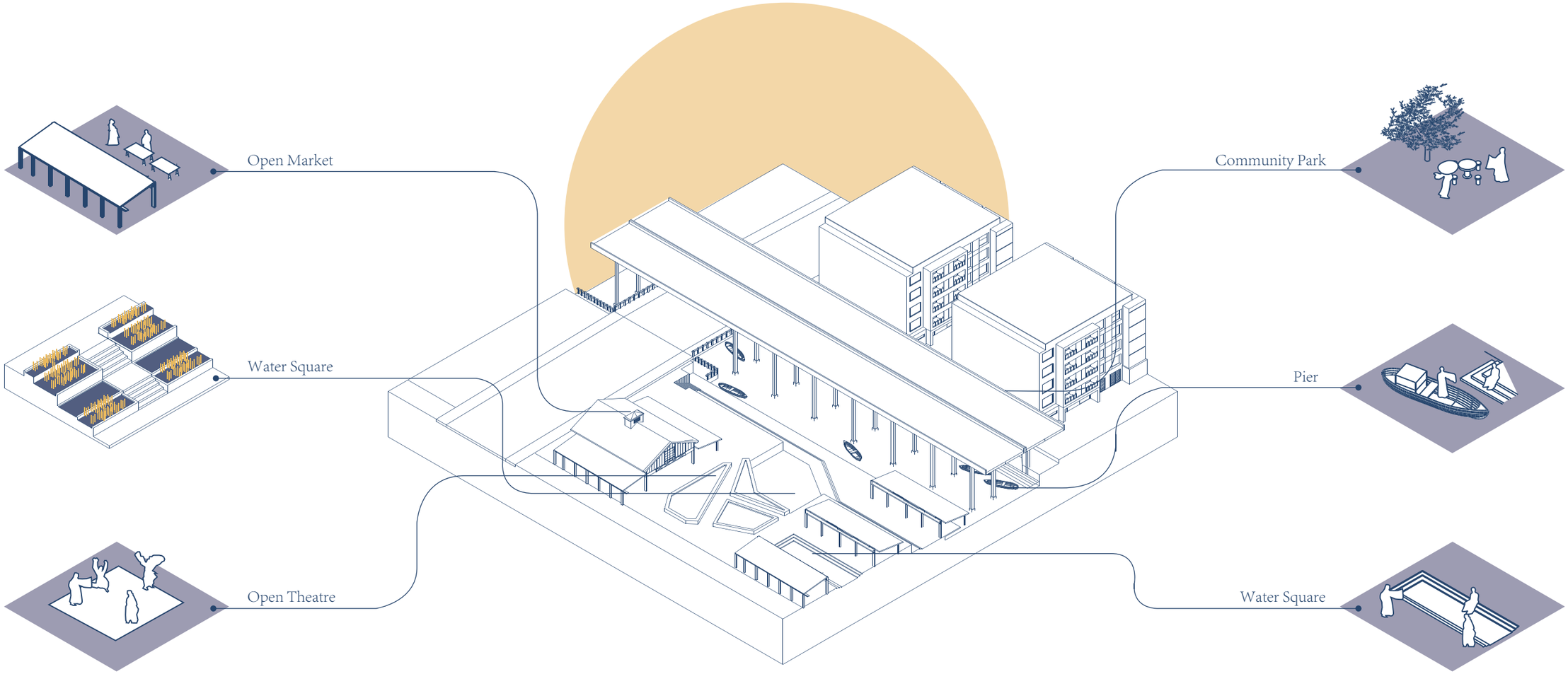
- Garbage bump at the backside of the apartment complex

05

Temporary Housing | Residential Area

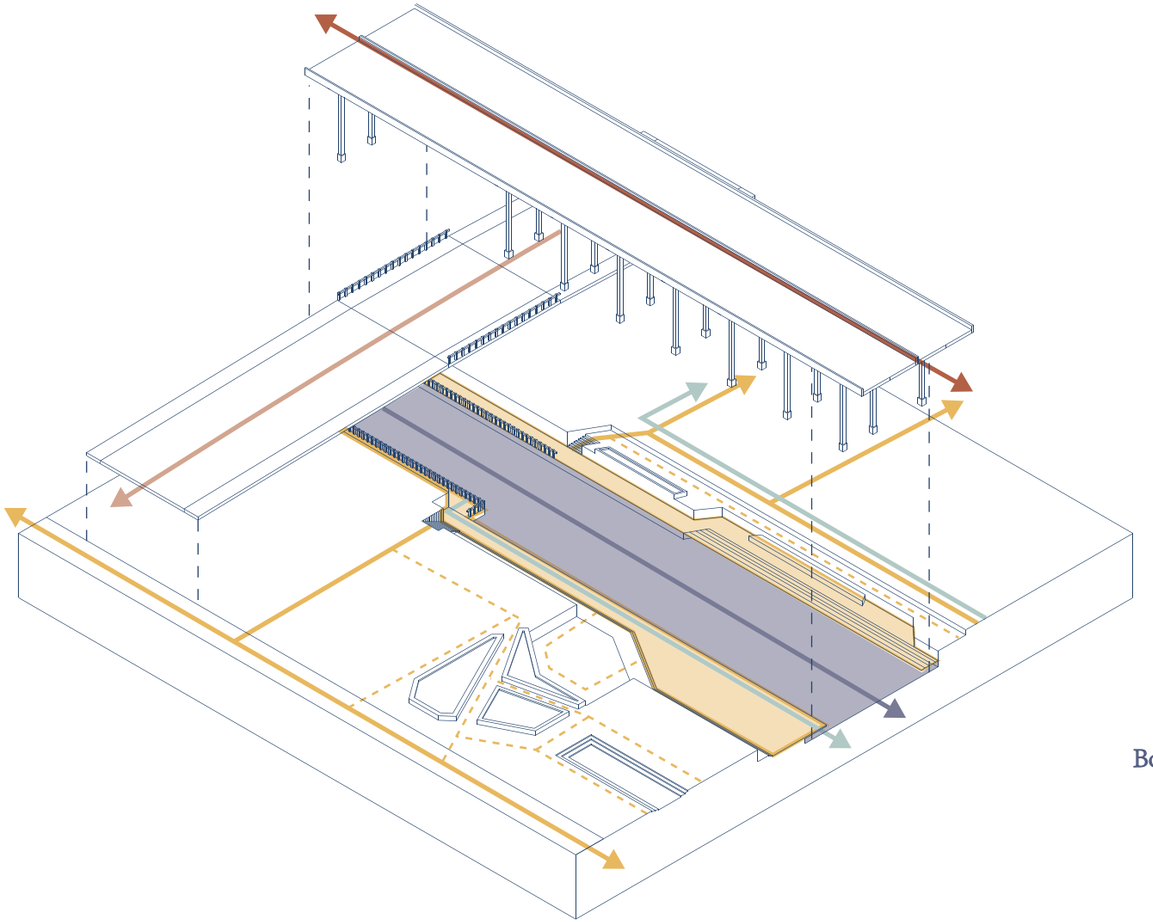





Open Market
Water Square
Open Theatre
Community Park
Pier
Water Square

Walking Route

Car Road



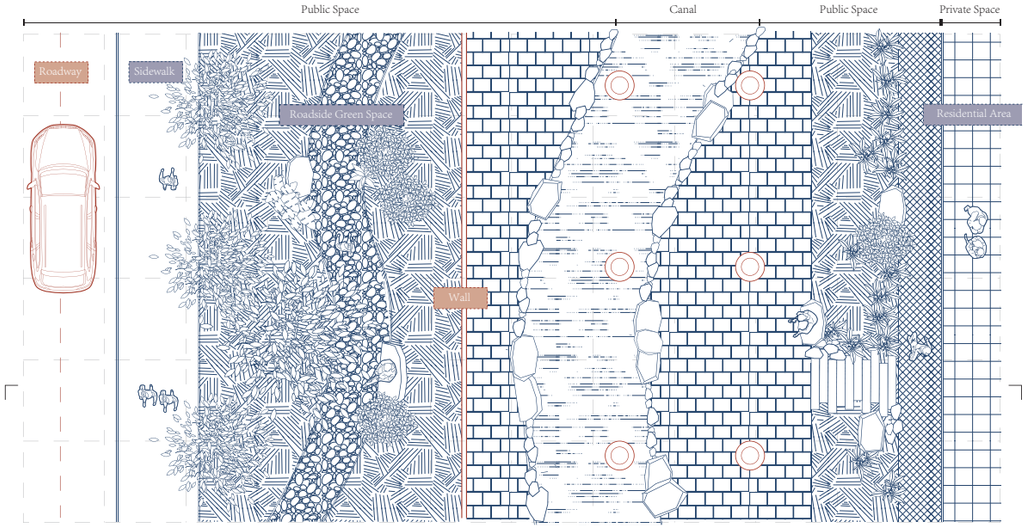
Cycling Route

Boating Route

Main Canal
Local Scale
SITE-THE END PART
07
N

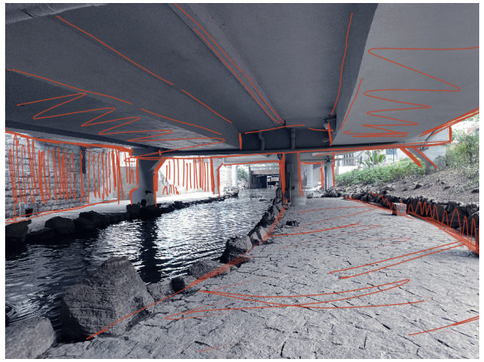
07

Roadside Green Space | Residential Area



- The waterfront area is barely used because of the height of the highway.

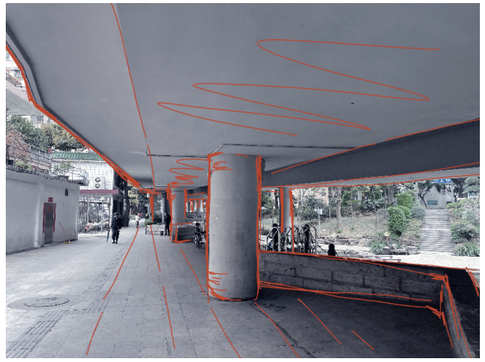
- dark and make people feel unsafe

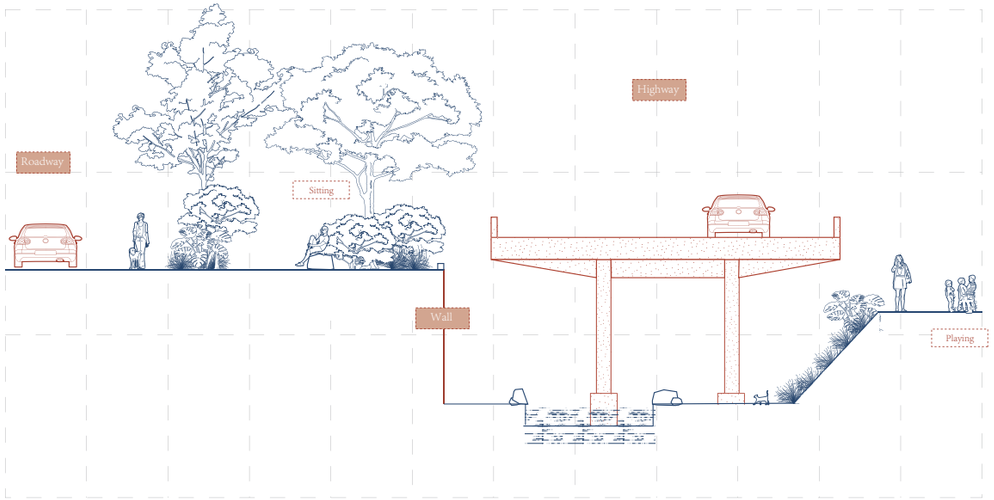


- A side with concret wall, have no transition into the surrouding area.

- ugly facade

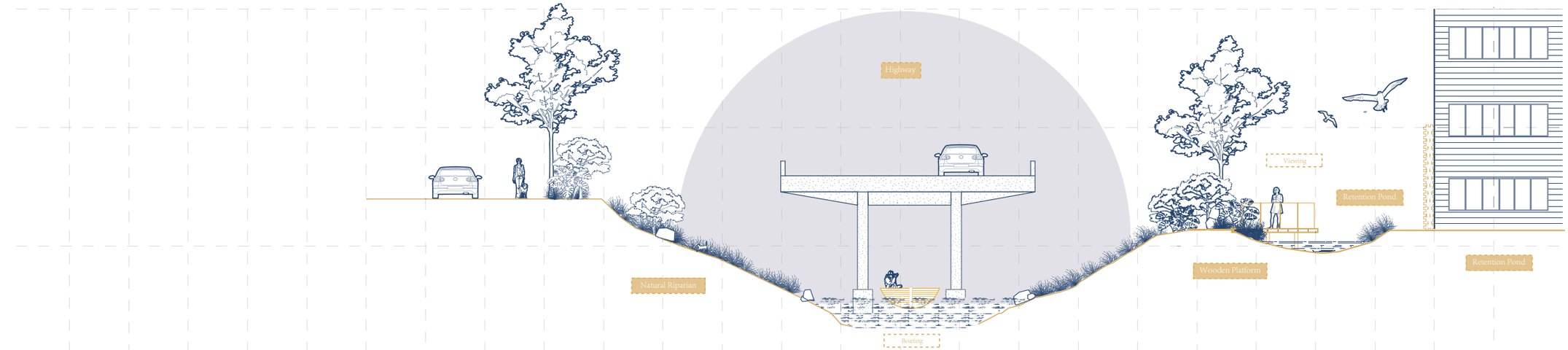
- no people use that walkway

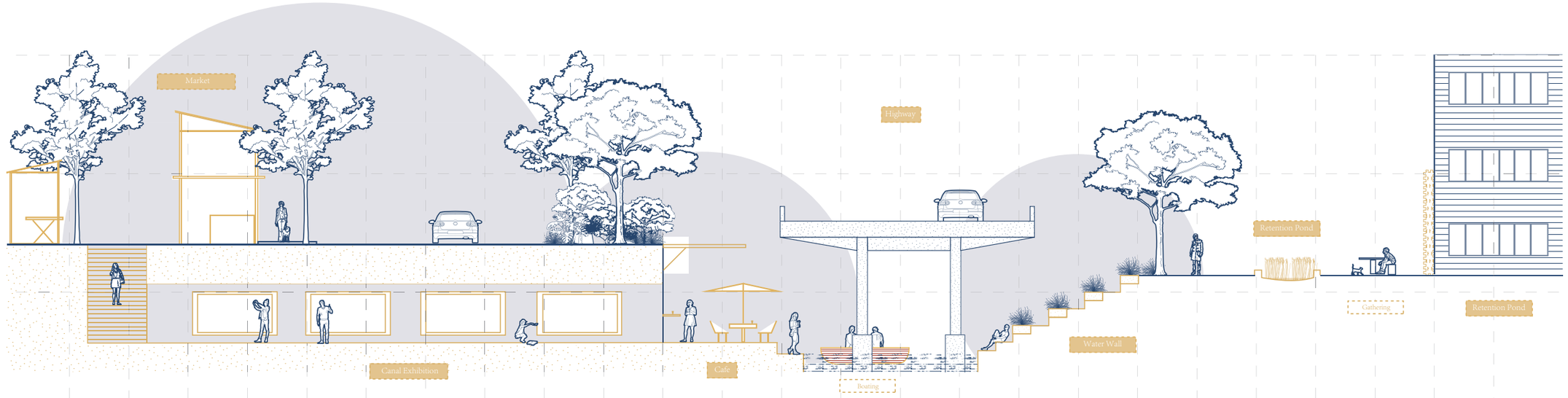


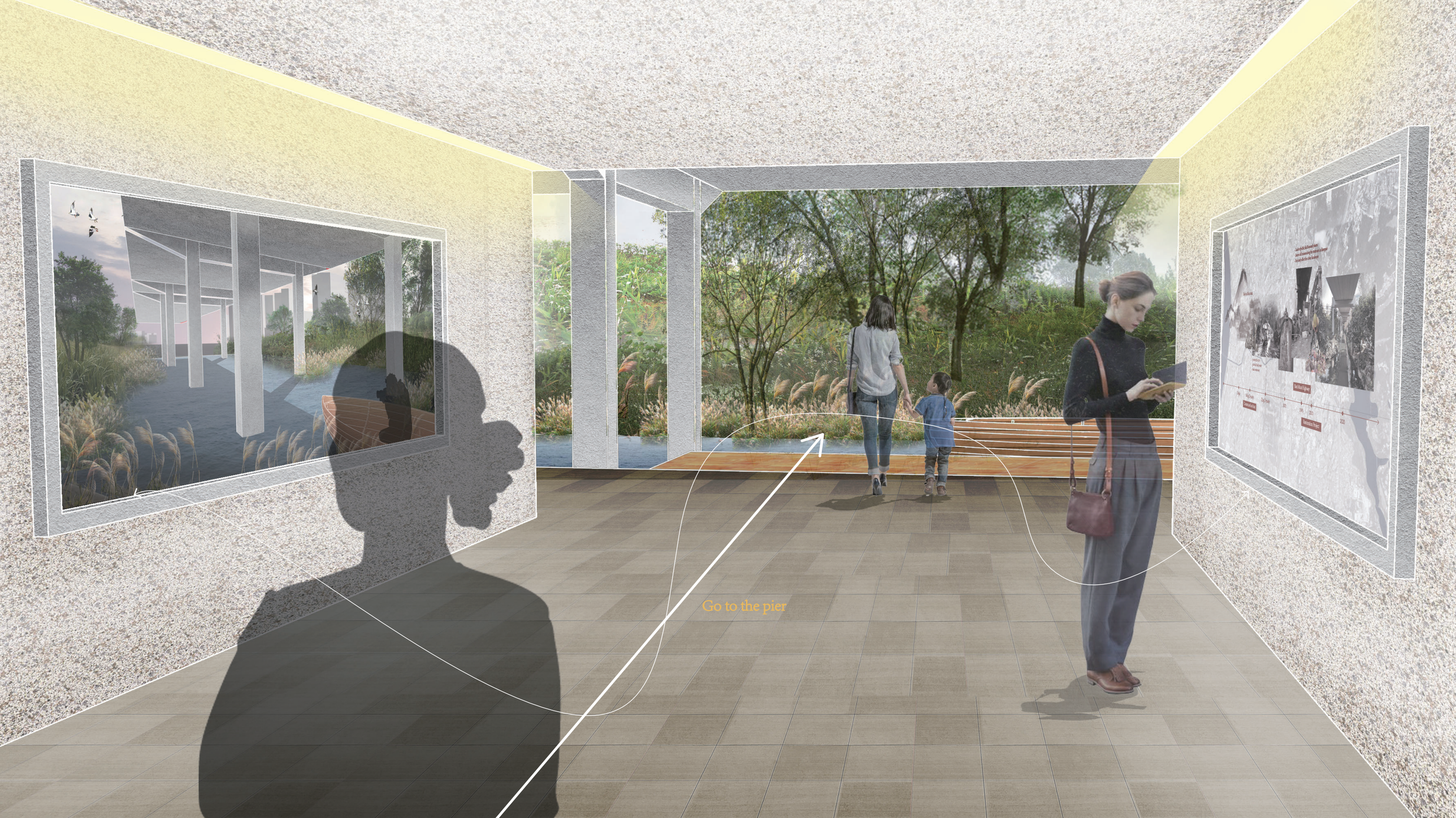


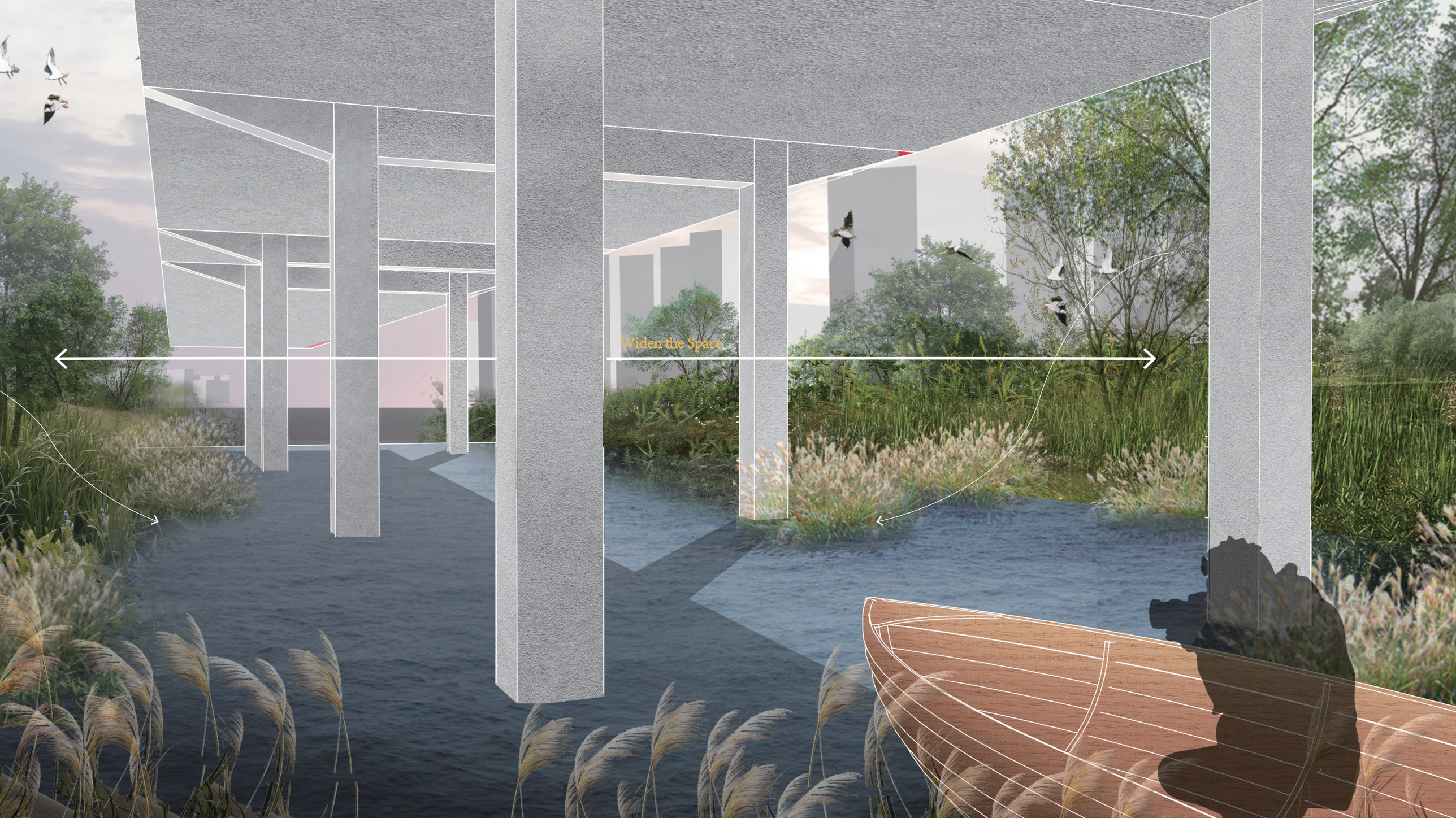
04

Roadside Green Space | Residential Area





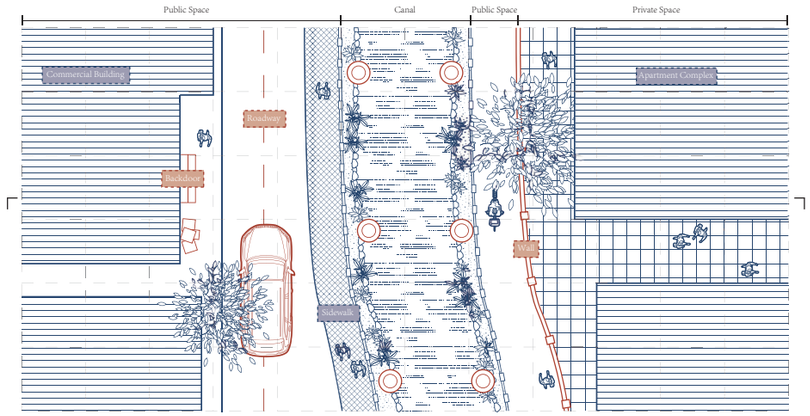

Go to the pier

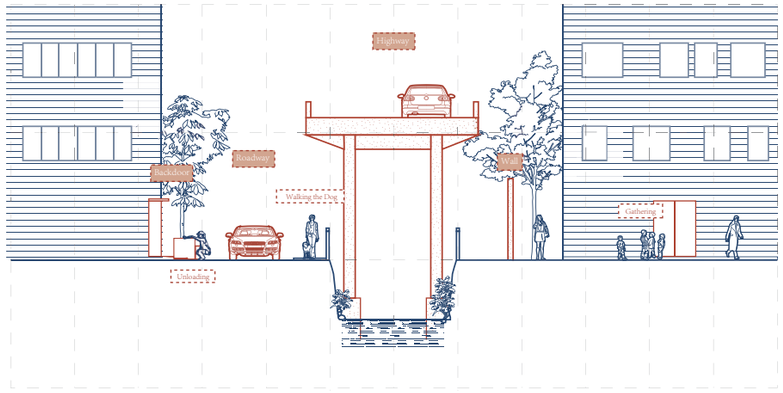

Widen the Space

Main Canal
Local Scale
03
04
06
N

03

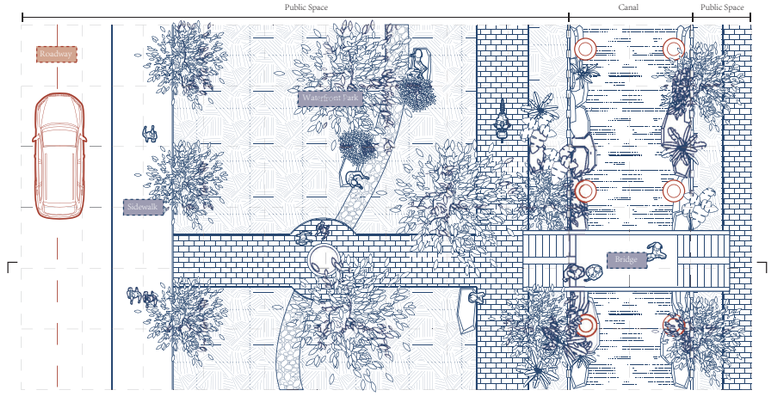
Commercial Building | Apartment Complex

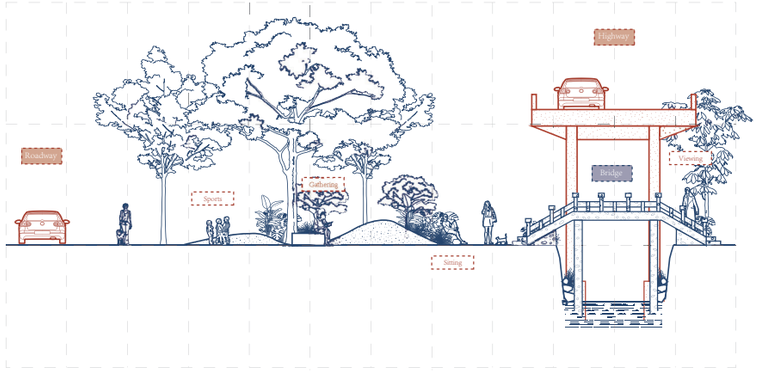




04

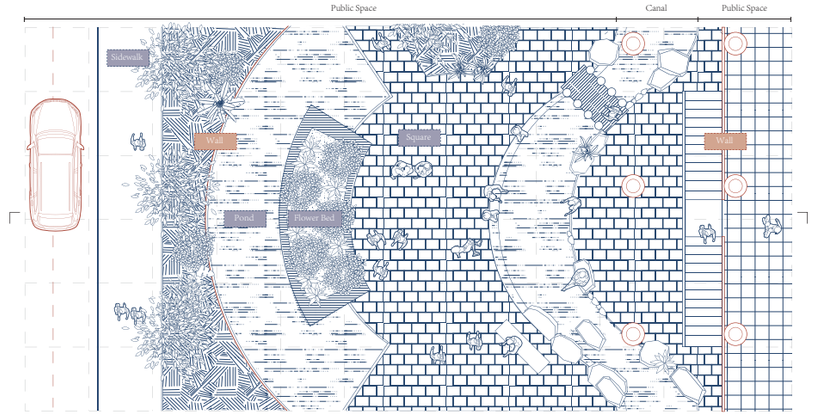
Waterfront Park |

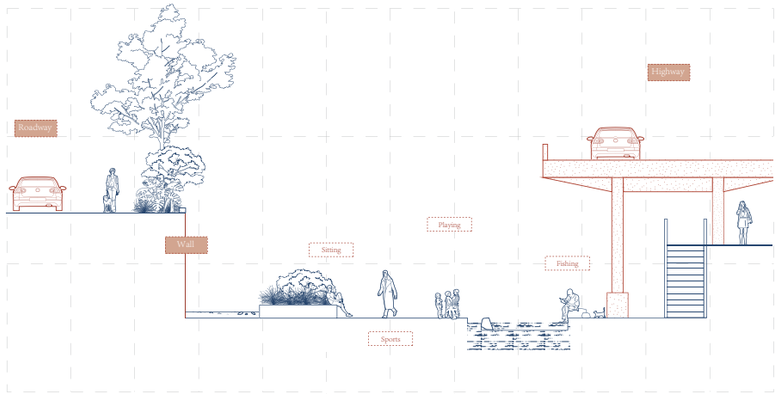




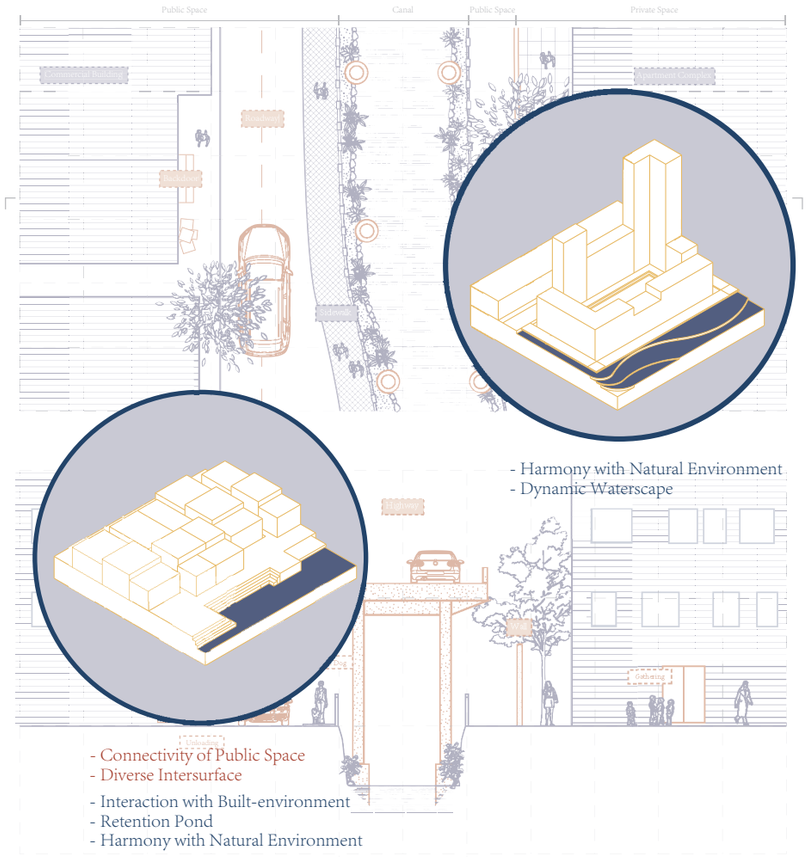
06

Open Square |

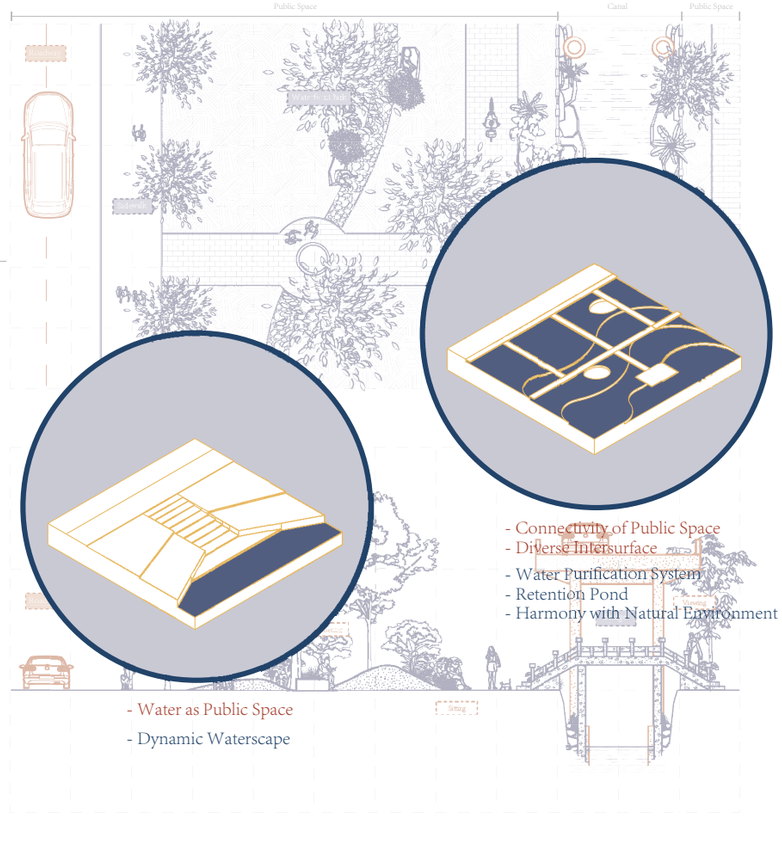




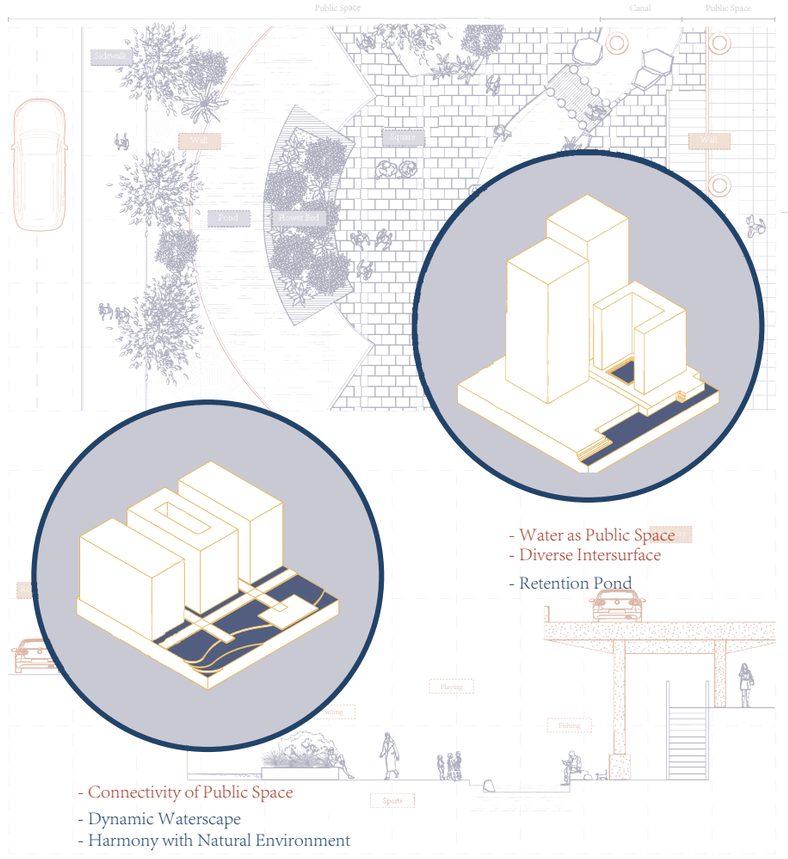
03 Commercial Building | Apartment Complex

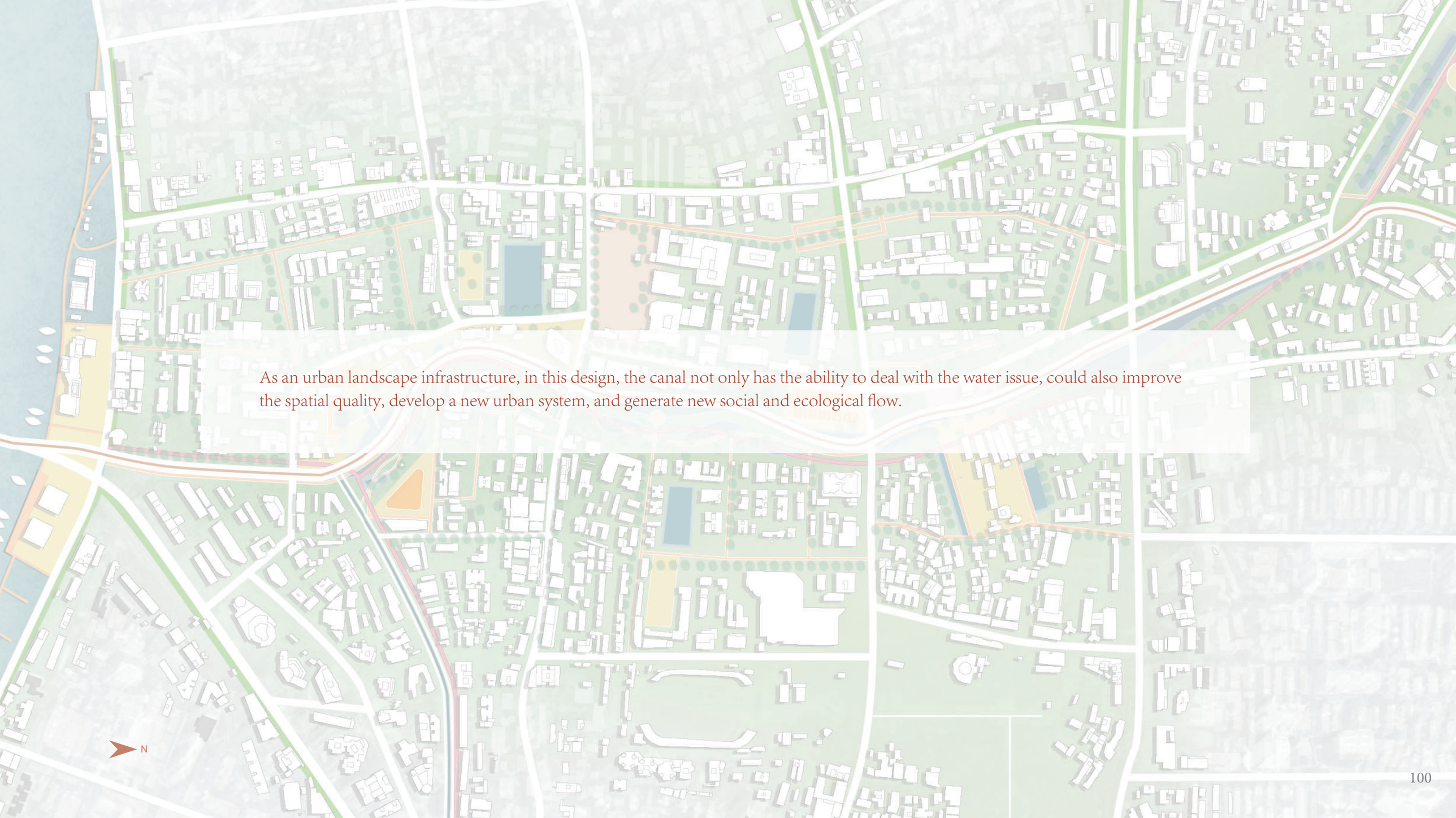


04 Waterfront Park



06 Open Square



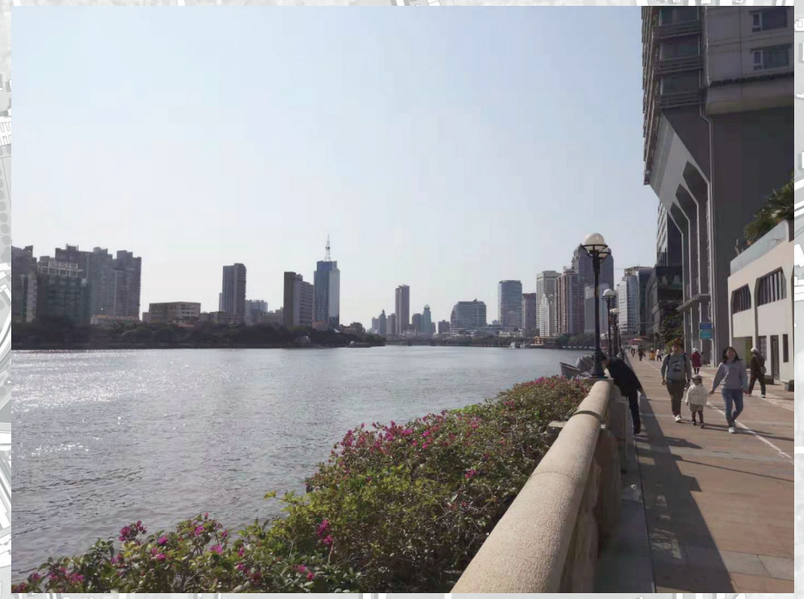


As an urban landscape infrastructure, in this design, the canal not only has the ability to deal with the water issue, could also improve the spatial quality, develop a new urban system, and generate new social and ecological flow.

Masterplan

River Mouth

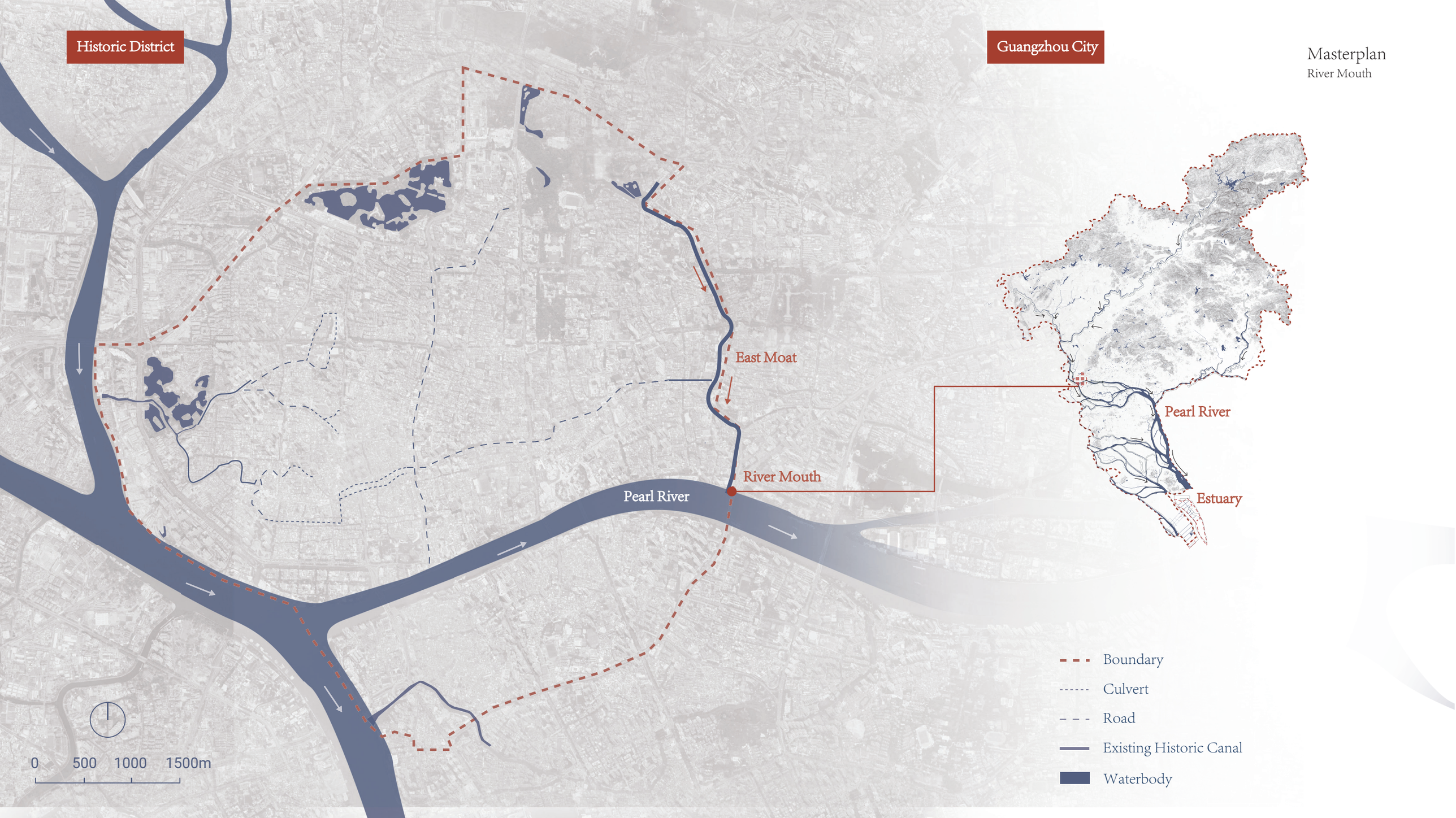
River Mouth

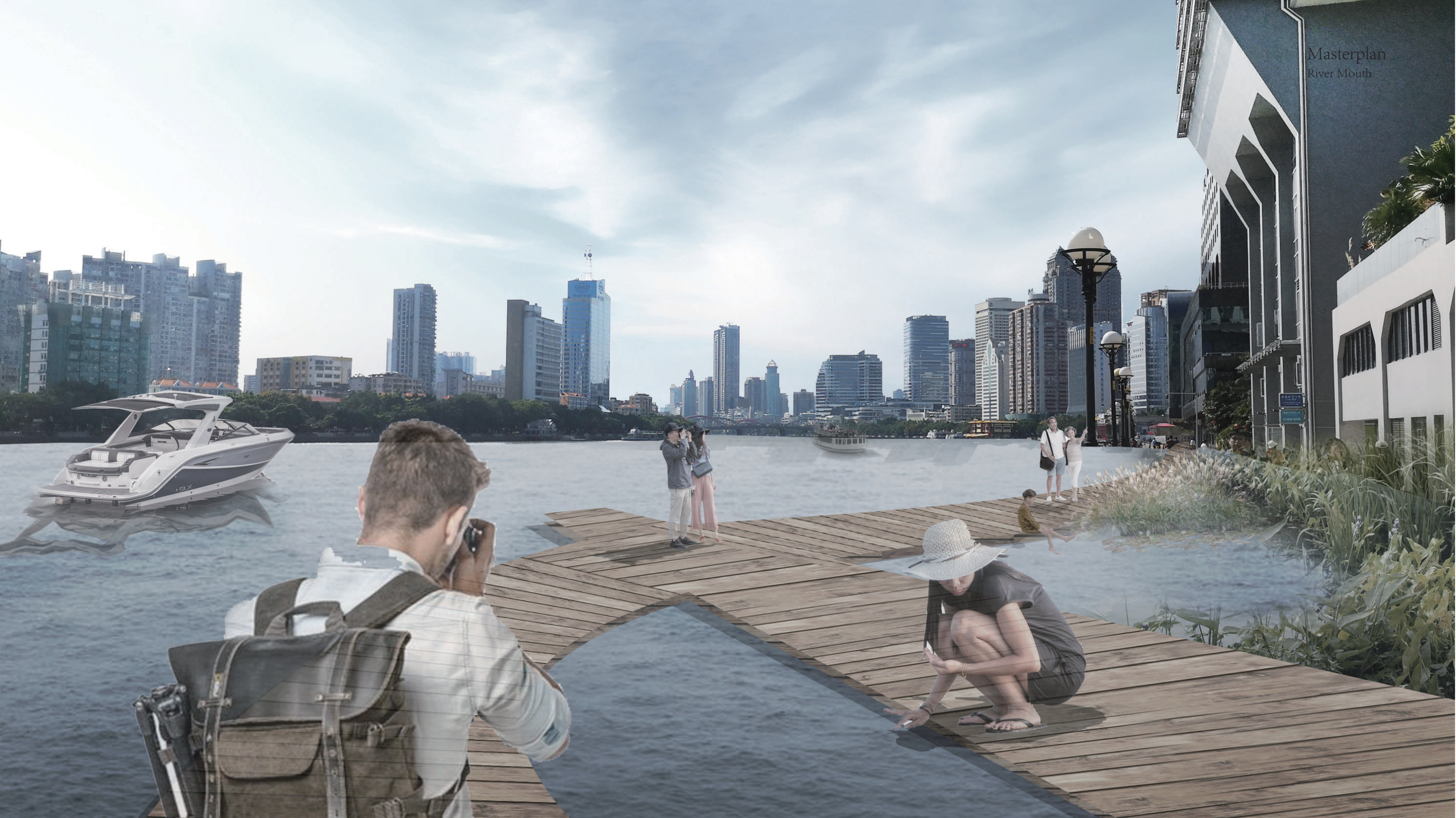


N

Masterplan

River Mouth





Masterplan

River Mouth

Masterplan
River Mouth

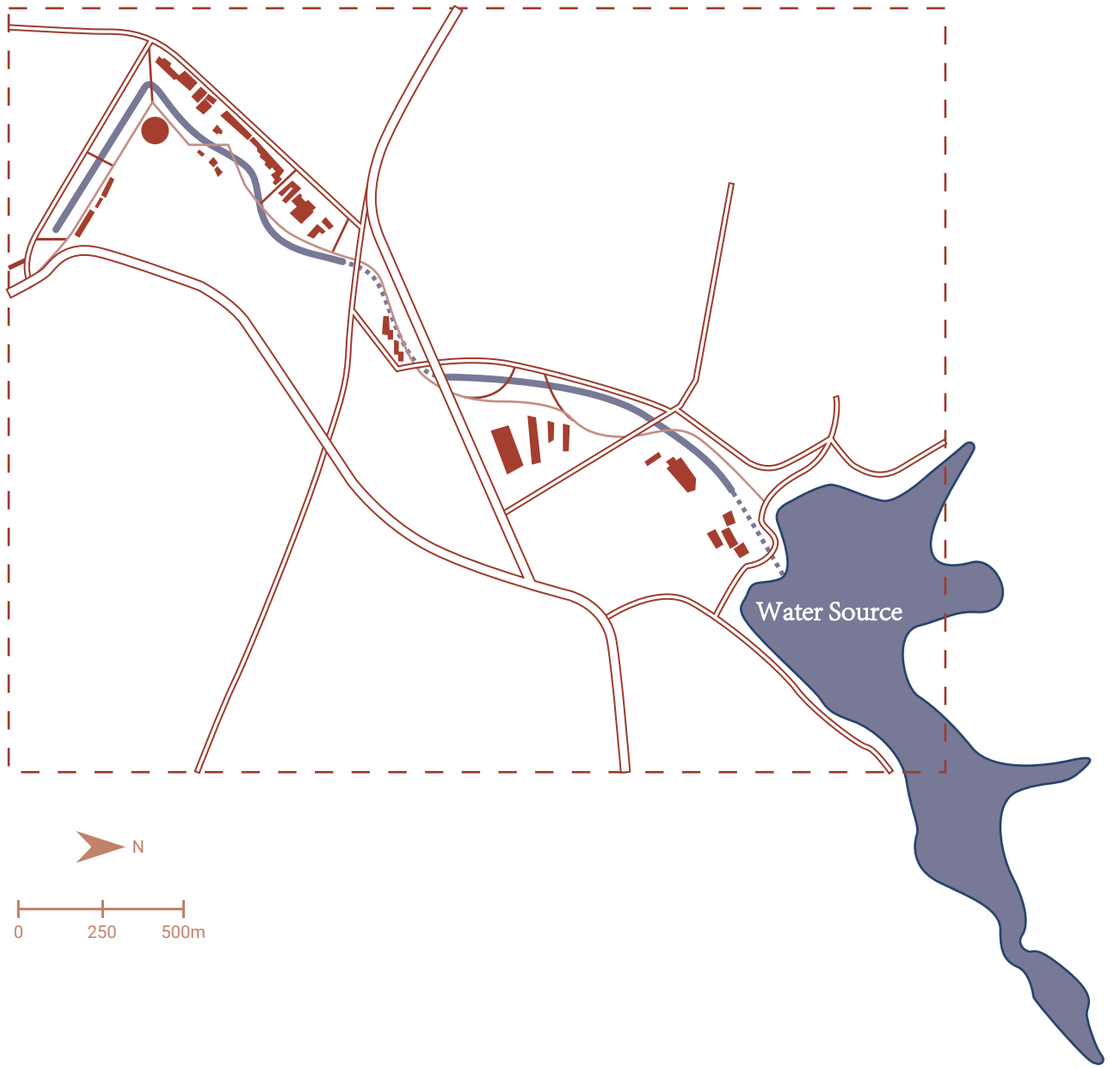
ASSIGNMENT

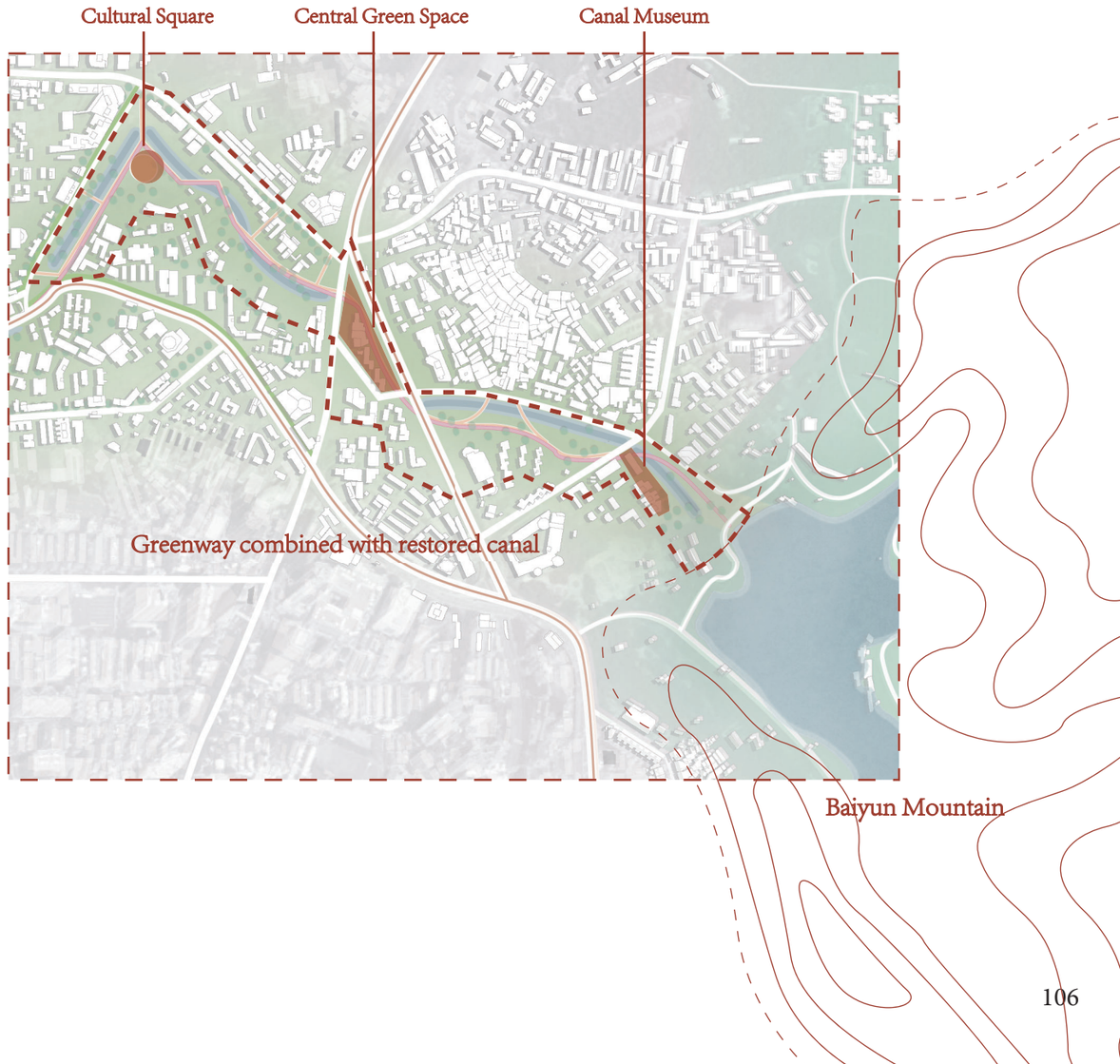
- Outstanding Waterfront Platform
- Ecology Aspect
- Various Water Activities

Masterplan
Upper Stream

ASSIGNMENT

- Continuous Greenway
- Combined with local identity and cultural elements
- Activity Center for Neighbourhood



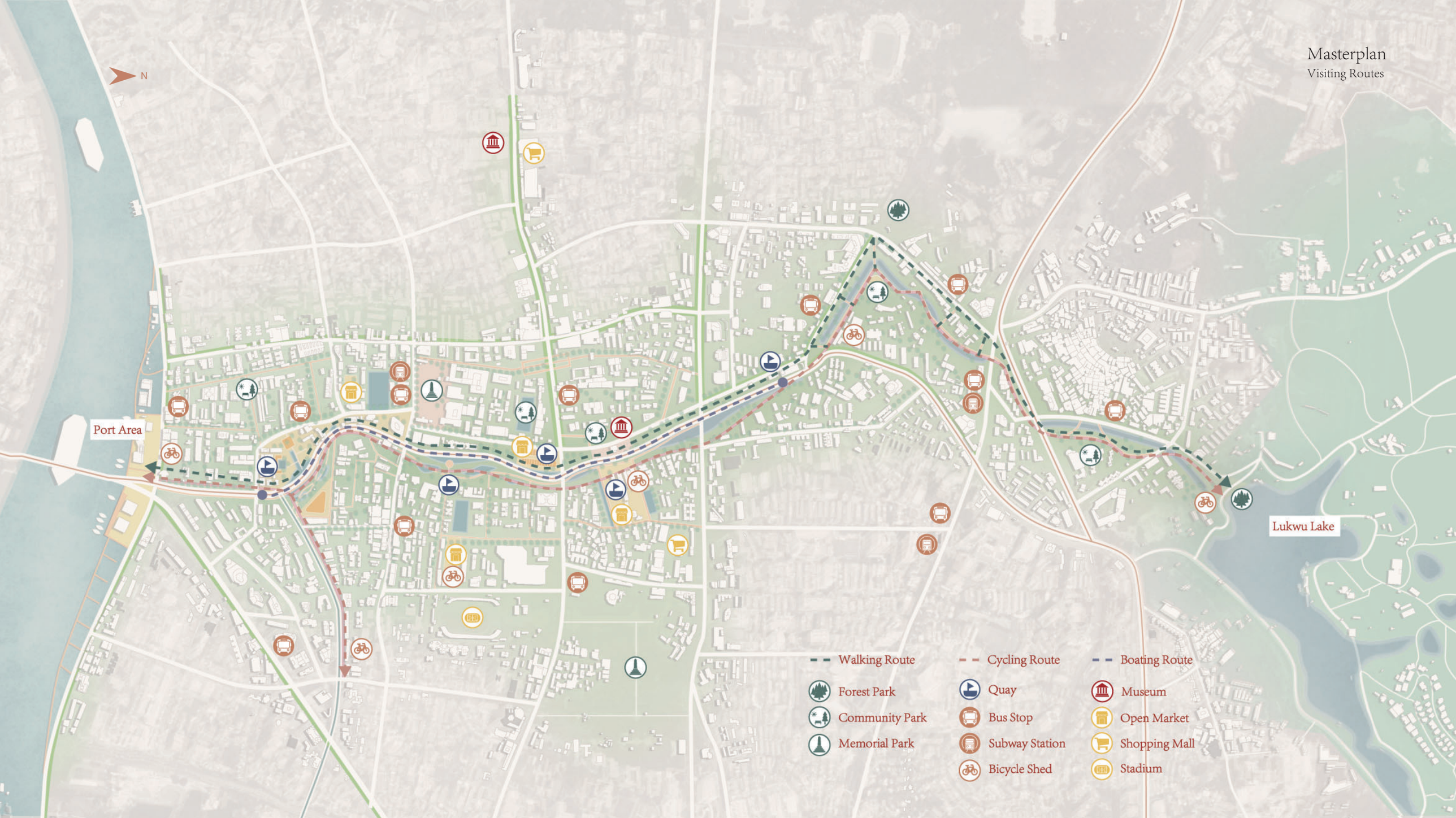


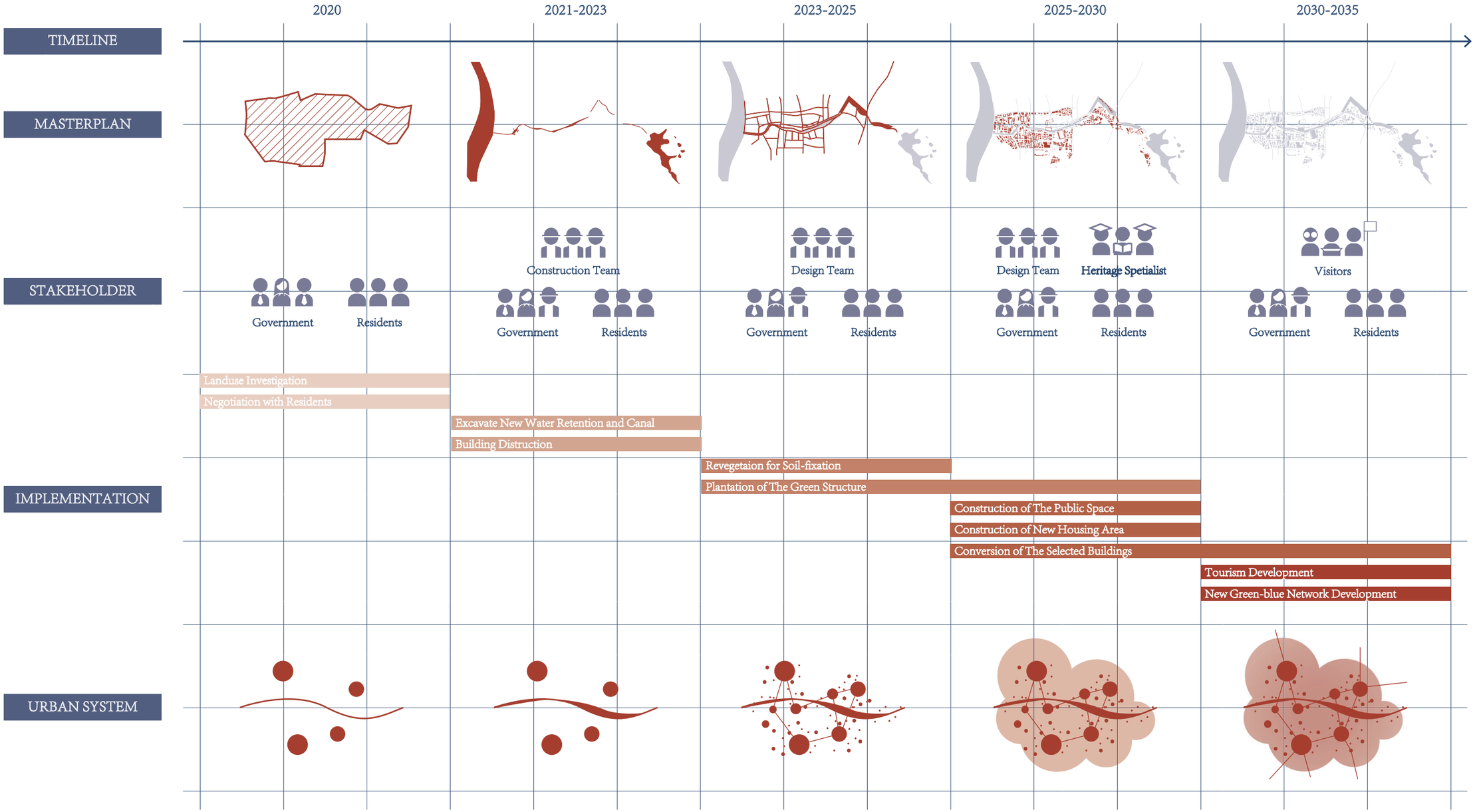
Masterplan
Upper Stream

Lingnan Architectural Style
East Moat
Water Activities
Green Space

Masterplan

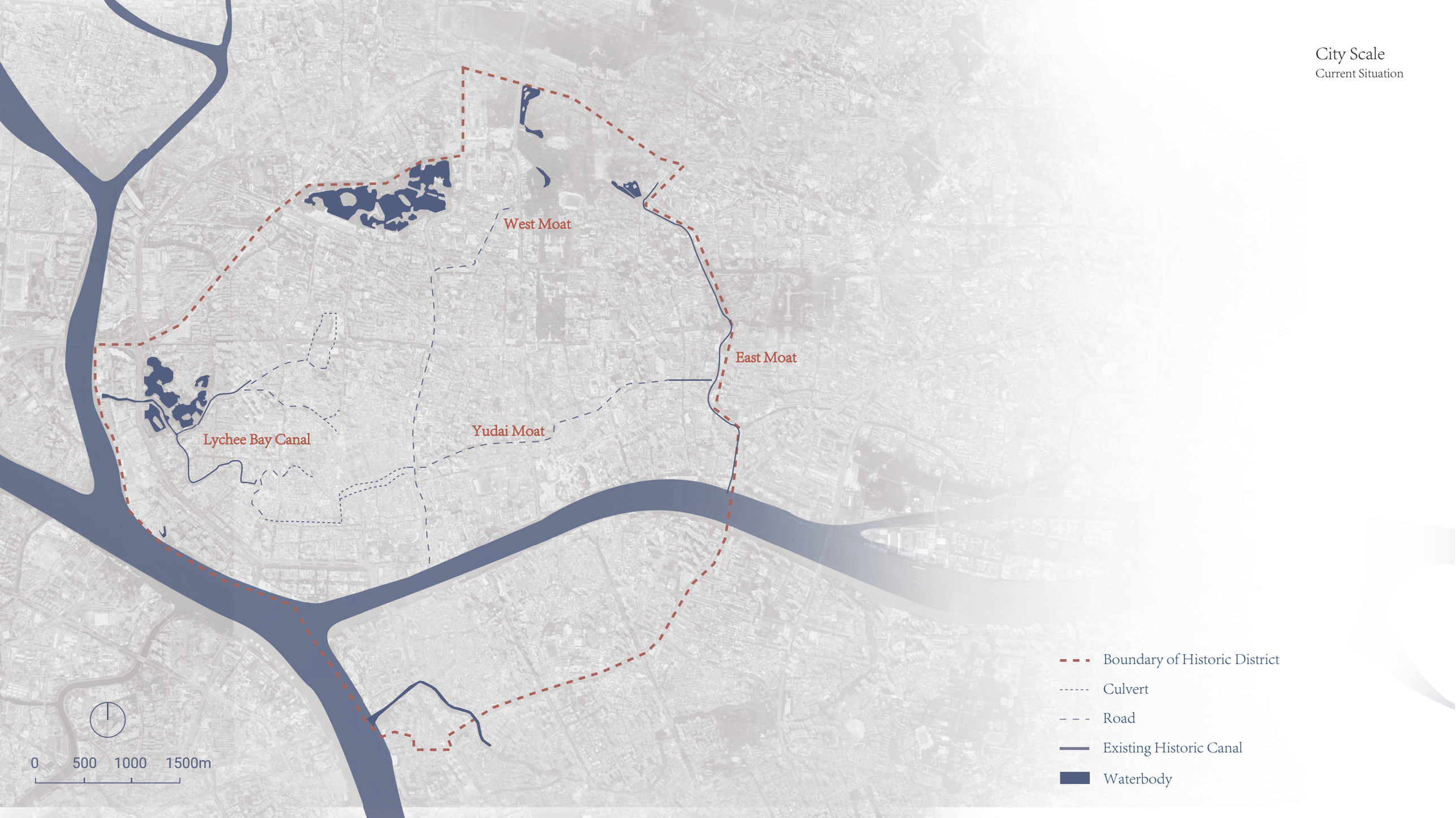
Visiting Routes




2020
2021-2023
2023-2025
2025-2030
2030-2035
TIMELINE
MASTERPLAN
STAKEHOLDER
Government
Residents
Construction Team
Design Team
Heritage Spetialist
Visitors
IMPLEMENTATION
Landuse Investigation
Negotiation with Residents
Excavate New Water Retention and Canal
Building Distruction
Revegetaion for Soil-fixation
Plantation of The Green Structure
Construction of The Public Space
Construction of New Housing Area
Conversion of The Selected Buildings
Tourism Development
New Green-blue Network Development
URBAN SYSTEM

City Scale

Current Situation



City Scale

Vision

- Continous public space and experince
- New green-blue structure
- Give new energy to canal area

- More space for water
- More permeable surfece
- Canals flow thourgh every corner of the historic district

Boundary of Historic District

Historic canals to be restored

Canal area to be transformed

Research Questions

- How to redefine the role of the historic canal system in Guangzhou as water landscape infrastructure adapting to future urban development?

Understanding historic canal and its surrouding area as a system | Notify the challenges of city development | New urban landscape infrastructure

- What are the challenges Guangzhou faced with in the rapid urban development as a coastal city?

Understanding the urban landscape as a layered and complex system

- What can we learn from the history and how can we apply the design principles in today’s situation?

The nature of challenges | Design Principles | Multiscale design

- How can the canal system as a landscape infrastructure work with canal area, and what layers and local identity can be added to the urban area?

Understanding landscape infrastructure as a system in dynamic | Urban landscape infrastructure as armatures for urban development, facilitating interactions between systems

- The Limitation of the Study

As a landscape architect...

- Research for design

Design as a research orientation

- Research through design

Spatial design as specific research process | Design as a means to produce practical-productive knowledge