

# Guangzhou Metropolitan Park

Design of the landscape-nature  
network in Guangzhou to increase  
the adaptive resilience in the urban  
environment

Chuhan Zhang  
Student number: 5559227  
Flowscape, TUDelft

Mentors:  
Steffen Nijhuis  
Lei Qu



# GUANGZHOU--A CITY OF OLD AND NEW



<https://www.google.com/search?q=%E5%B9%BF%E5%B7%9E&tbm=isch&ved=2ahUKEwB49nph-PBAHV9f0HHajFBYMQ2-cCegQIABAA&oeq=%E5%B9%BF%E5%B7%9E&isrc=icr&ijnpbWcQzIcCCMQzIcCCMQzIFCAAQgAQyBQgAEIAEMgUJABCABDFCAADQACIcBQgAEIAEMgUJABCABDFCAAQgAQyBQgAEIAEogIABCABBAUJcKWJ4QYJeVaABw&imgres=7ziAGSAZIBATSYAQcGAgGgAQtd3Mtd2l6LWitZ8ABAQ&scrlent=img&ei=DU7R7221-9u3PalufmAl&bih=892&biw=1920#imgrc=zBUFWLg-zShZM>

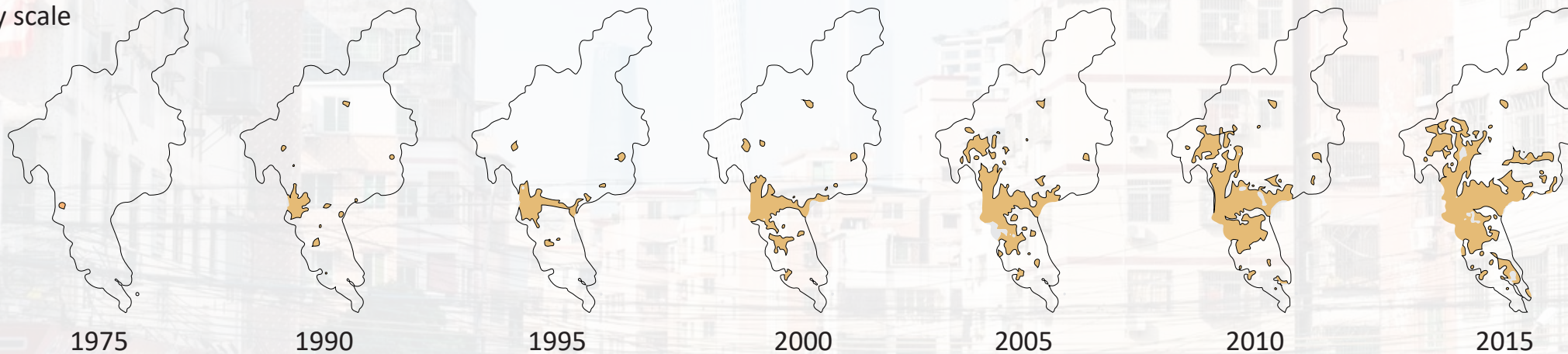
# GUANGZHOU--A CITY OF OLD AND NEW



[https://www.google.com/search?q=%E5%B9%BF%E5%B7%9E&tbm=isch&ved=2ahUKEwB49nph-PBAHV9f0HHajFByMQ2-cCegQIABAA&oeq=%E5%B9%BF%E5%B7%9E&is\\_icl=CjNpbWcQAzIECCMQzIECCMQzIFCAAQgAQyBQgAEIAEMgUjABCABDFCAADQACjBQgAEIAEMgUjABCABDFCAAQgAQyBQgAEIAEOgIABCABBAYUjKwJ4QYJeVaABw&imgres=7zAGSAZIBATSYAQcGgAQnd3Mtd2l6LWltZ8ABAQ&scclnt=img&ei=DU7R722...&usq=3PalufmAl&bih=892&biw=1920#imgrc=zBUFWLg-zShZM](https://www.google.com/search?q=%E5%B9%BF%E5%B7%9E&tbm=isch&ved=2ahUKEwB49nph-PBAHV9f0HHajFByMQ2-cCegQIABAA&oeq=%E5%B9%BF%E5%B7%9E&is_icl=CjNpbWcQAzIECCMQzIECCMQzIFCAAQgAQyBQgAEIAEMgUjABCABDFCAADQACjBQgAEIAEMgUjABCABDFCAAQgAQyBQgAEIAEOgIABCABBAYUjKwJ4QYJeVaABw&imgres=7zAGSAZIBATSYAQcGgAQnd3Mtd2l6LWltZ8ABAQ&scclnt=img&ei=DU7R722...&usq=3PalufmAl&bih=892&biw=1920#imgrc=zBUFWLg-zShZM)

## Urban expansion

### City scale

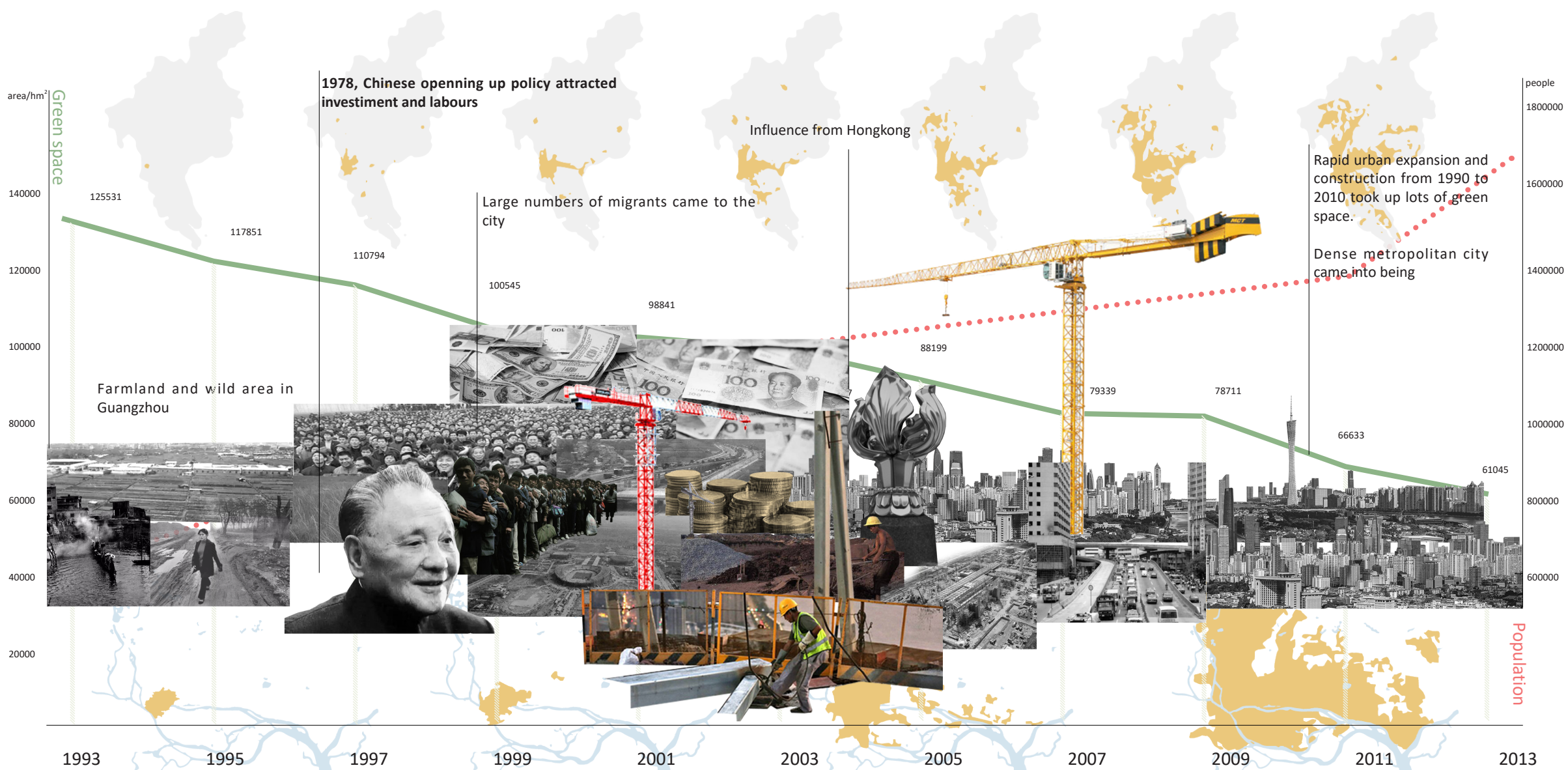


Source: (Meng et al., 2020) Redrawn by author

### City center scale



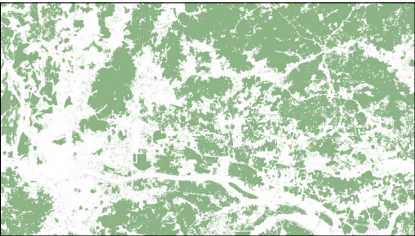
Source: Land use in Guangzhou



Data source: Xie, 2019  
Master thesis

## Shrinking green space

1988



2000



2010



2022



Data source: Google map

## Grey urban area -- Highways + Concrete city



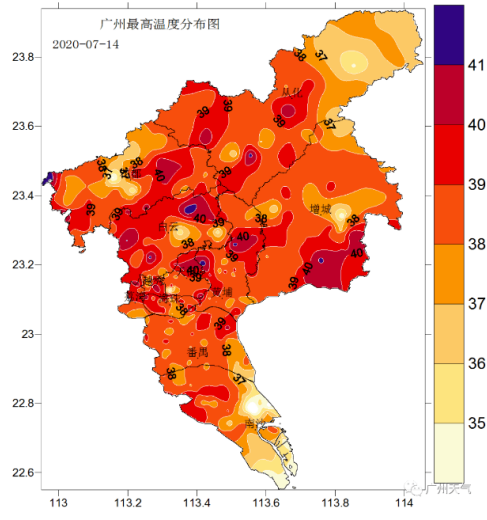
Source: [https://www.sohu.com/a/289635116\\_701855](https://www.sohu.com/a/289635116_701855)

## Dense urban villages with scarce green



Source: [http://slide.news.sina.com.cn/c/slide\\_1\\_2841\\_415050.html/d/8#p=1](http://slide.news.sina.com.cn/c/slide_1_2841_415050.html/d/8#p=1)

## Extreme temperature



## Temperature in summer, 2022

[https://www.sohu.com/a/410414691\\_132336](https://www.sohu.com/a/410414691_132336)

## Pedestrians try to shade the sun



<https://static.nfapp.southcn.com/content/202207/22/c6713574.html>



## May 2017

Source: <https://www.thestandard.com.hk/section-news/section/11/182565/Record-floods-as-storms-hit-Guangzhou>



## Aug. 2020

Source: <https://www.globaltimes.cn/page/202008/1199011.shtml>



## Sep: 2022

Source: xiaohongshu

## Loss of Bio diversity



<https://www.toutiao.com/article/7043677432804540958/?wid=1670256736261>

## PROBLEM: GREEN & RESILIENCE

**More green space was occupied or pushed outside the city as a result of fast urban expansion.**

Shrinking area



Imbalanced distribution



Lack of ecological concern





## GREEN SPACE

SHRINKING

IMBALANCE DISTRIBUTION

LACK OF ECOLOGY CONCERN

DECREASE RESILIENCE  
CAPACITY OF THE CITY



## PROBLEMS

FLOOD

EXTREME TEMPERATURE

POOR LIVING QUALITY

LOSS OF BIODIVERSITY

...

**How** to deal with the problems



## System in the past and now

Past



nature system

ADAPTATION

Now



urban system

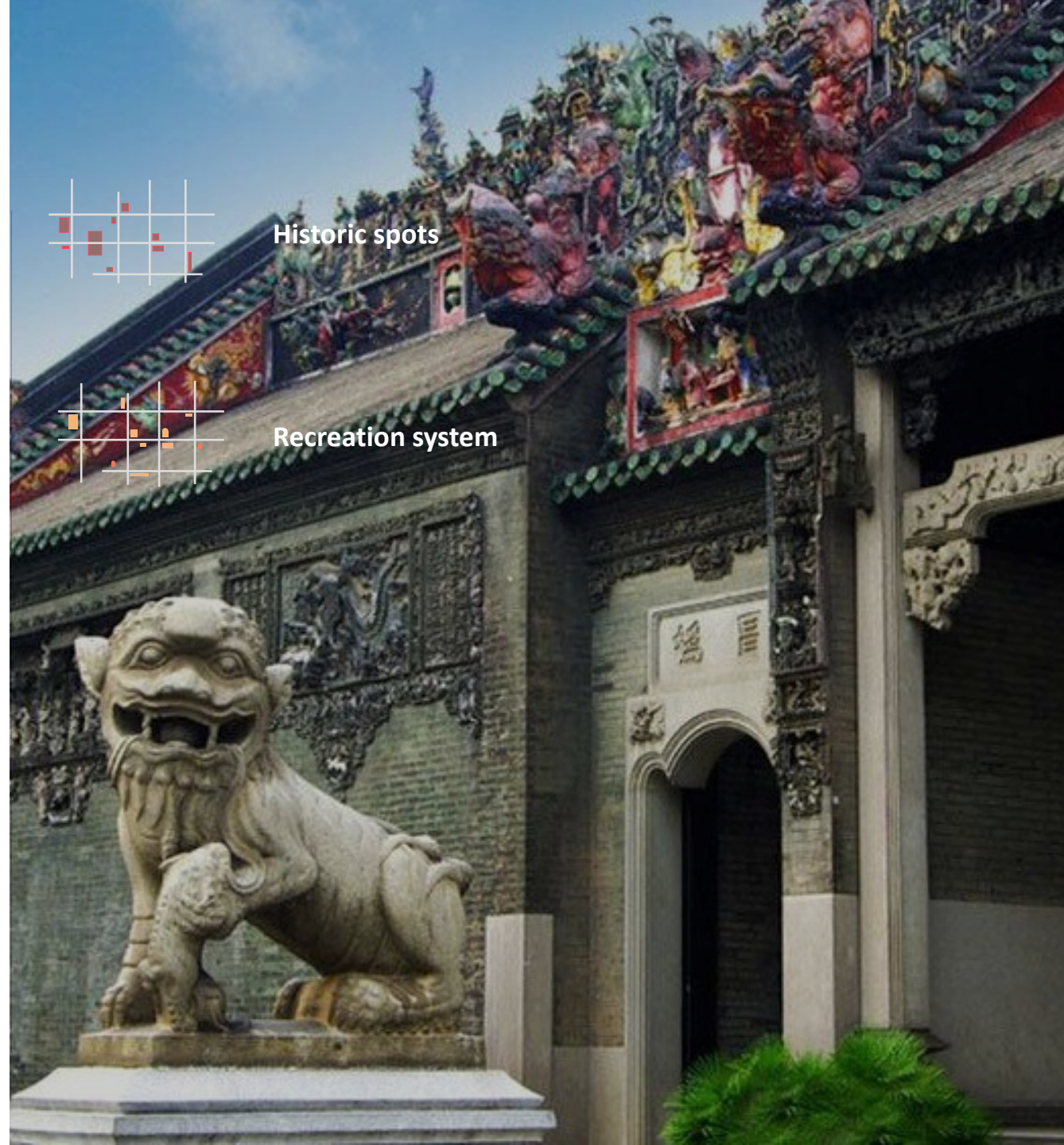
REPLACING

**A LANDSCAPE-NATURE  
NETWORK IS NEEDED**

A **LANDSCAPE-NATURE**  
**NETWORK** IS



A **LANDSCAPE-NATURE**  
**NETWORK** IS

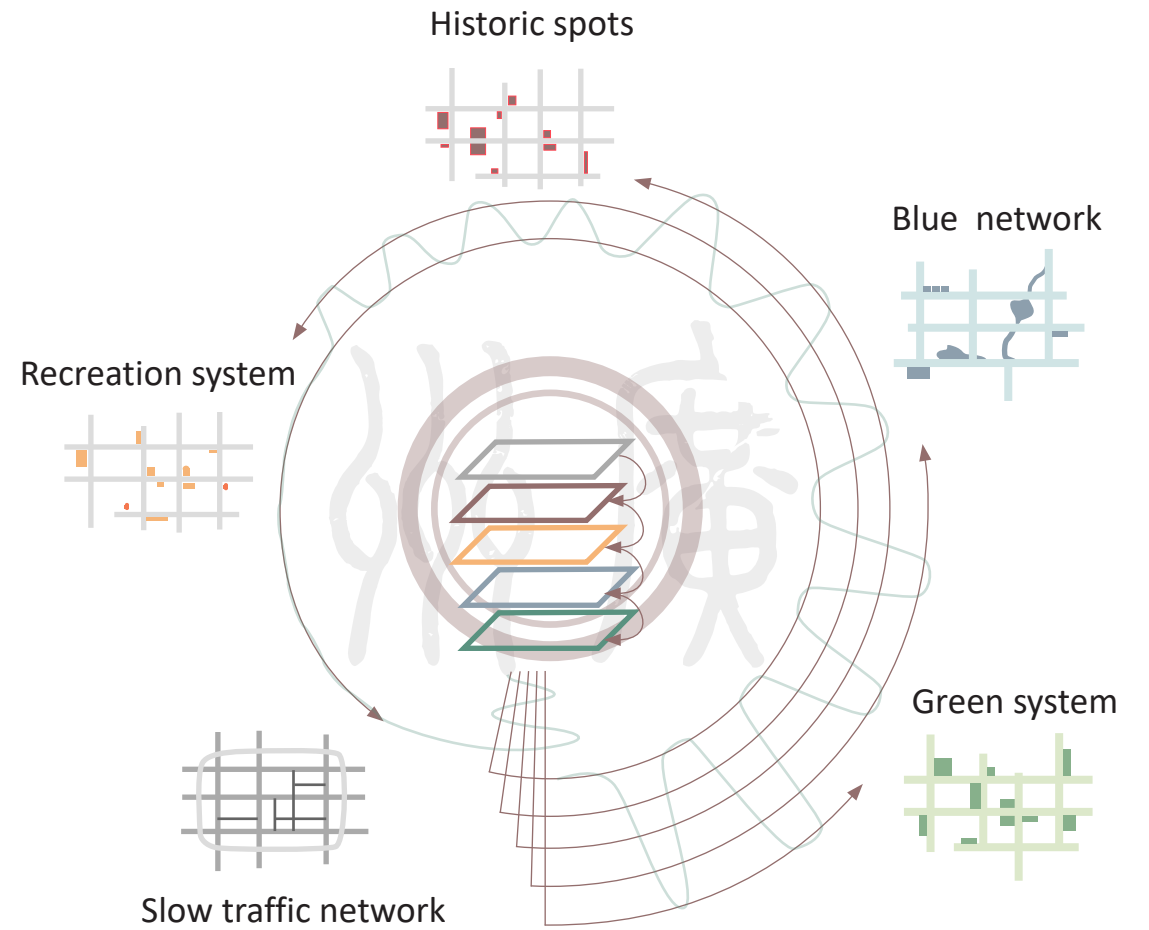


Historic spots



Recreation system

**A LANDSCAPE-NATURE  
NETWORK IS**



## RESEARCH OBJECTIVE

**Design the metropolitan landscape-nature network in Guangzhou in order to create a social-ecological inclusive and futureproof Guangzhou.**

### Sub-questions

1. How does the landscape-nature network function in Guangzhou?
2. What are the principles and strategies to develop a metropolitan landscape-nature network?
3. How can applying the landscape-nature network improve the urban environment and living conditions in Guangzhou through design?
4. What can be learned from Guangzhou for the creation of a landscape-nature network and what needs to be developed further?



## Sub-questions

### **1. How does the landscape-nature network function in Guangzhou?**

2. What are the principles and strategies to develop a metropolitan landscape-nature network?

3. How can applying the landscape-nature network improve the urban environment and living conditions in Guangzhou through design?

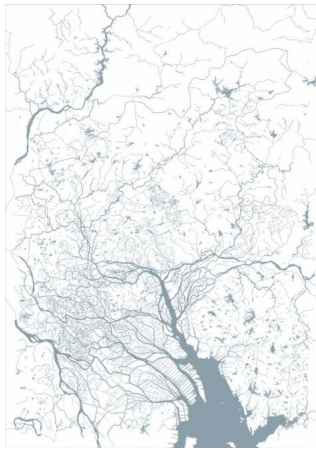
4. What can be learned from Guangzhou for the creation of a landscape-nature network and what needs to be developed further?

# A CITY OF "MOUNTAIN-CITY-AGRICULTURE-WATER"

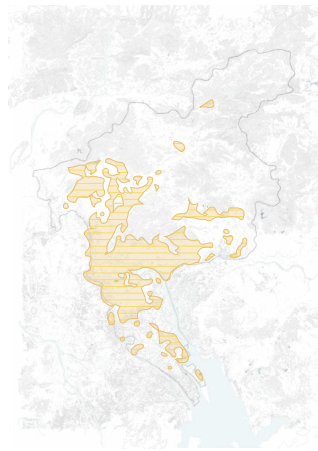
City scale



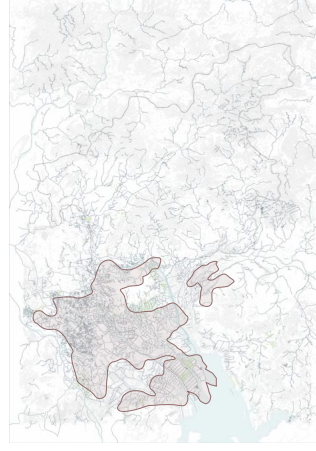
Mountain



Water



City



Agriculture

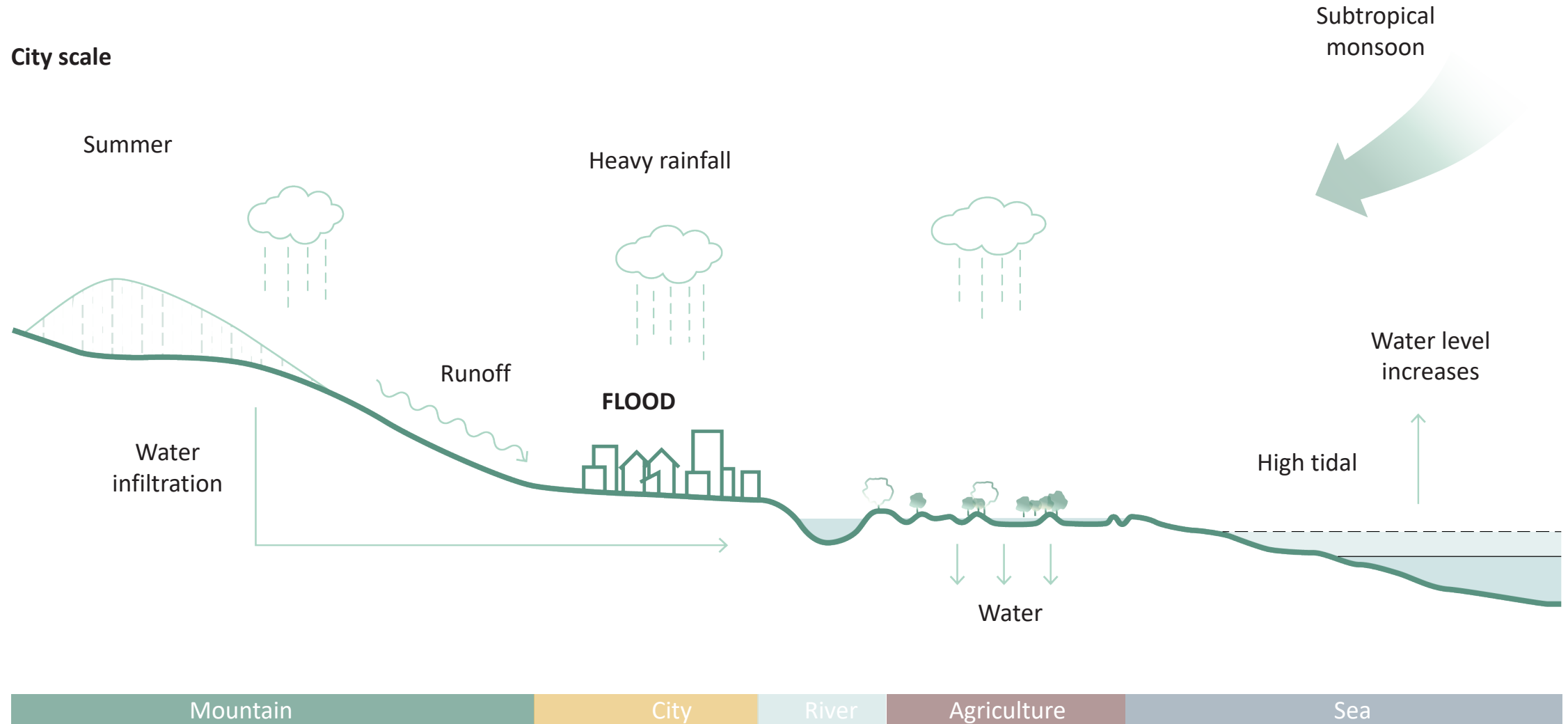


**Why** it leads to problems

?

# GREEN SPACE & FLOODING?

City scale



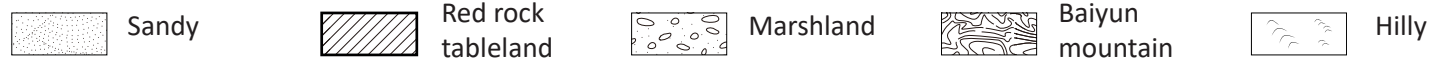
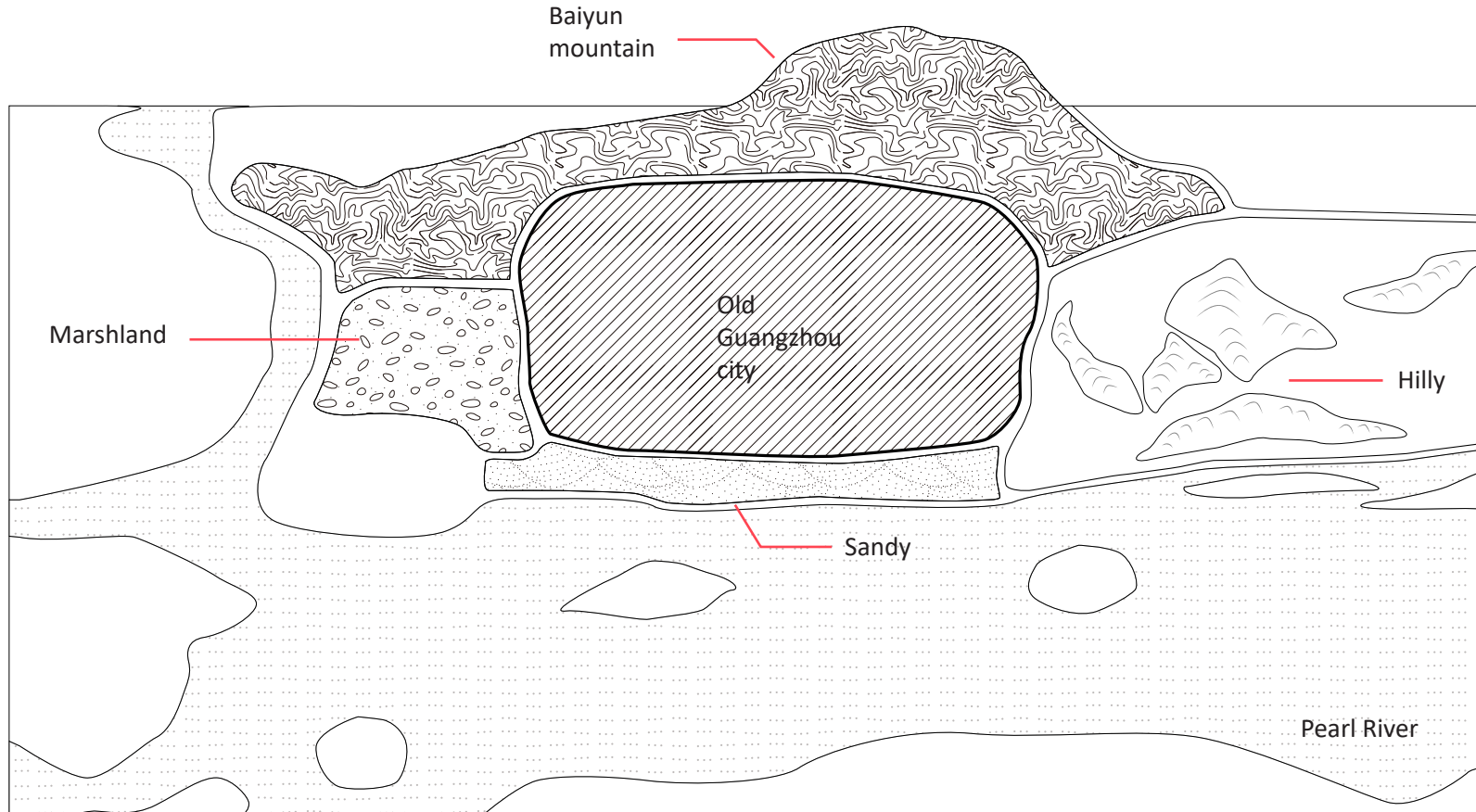
## CITY WAS ALWAYS PART OF LANDSCAPE AND NATURE



羊城山水形胜, 1892

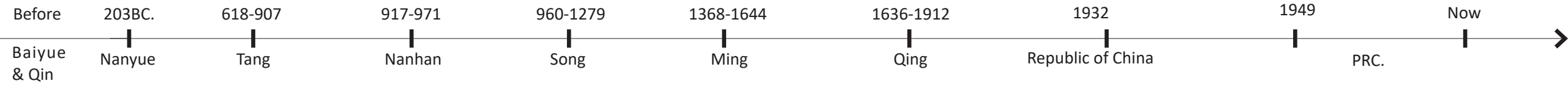
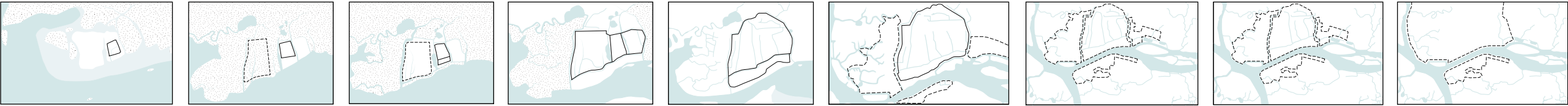
Source: [https://news.dayoo.com/guangzhou/202108/29/139995\\_54033673.htm](https://news.dayoo.com/guangzhou/202108/29/139995_54033673.htm)

# Landform of Guangzhou city in history



# Changes and development in Guangzhou

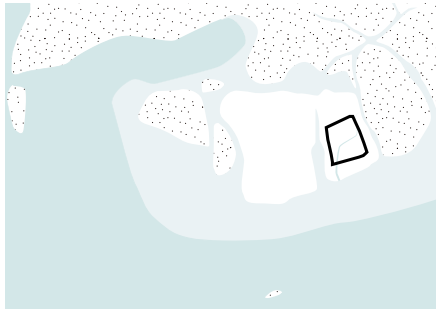
Source: (Liu, 2015); Historical maps of Guangzhou; (Guan, 2010)  
Redrawn by author



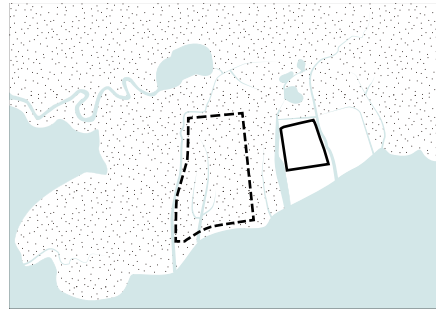
ESTABLISHMENT

EXPANSION

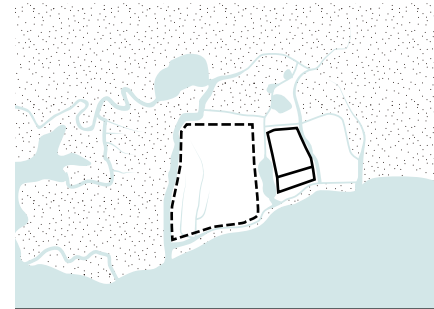
Before  
Baiyue &  
Qin



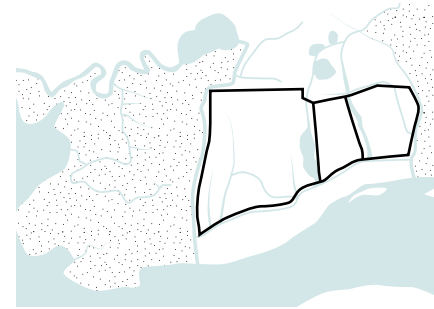
203BC.  
Nanyue



618-907  
Tang



917-971  
Nanhan



960-1279  
Song



1565  
Ming

ARRANGEMENT

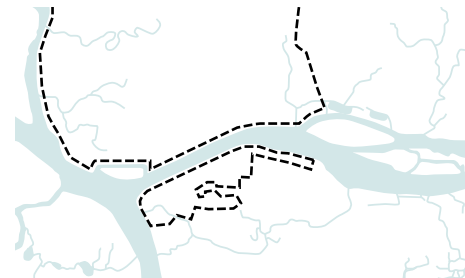
REPLACING



1800s  
Qing



1936  
Republic of China



1960  
PRC.

Source: (Liu, 2015) ;Historical maps of Guangzhou; (Guan, 2010)  
Redrawn by author

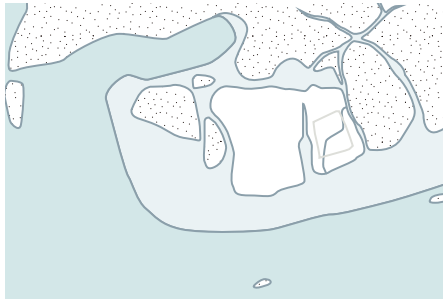




ESTABLISHMENT

EXPANSION

Before  
Baiyue &  
Qin



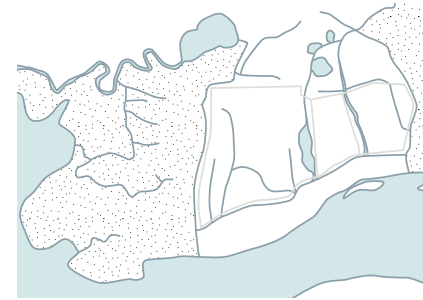
203BC.  
Nanyue



618-907  
Tang



917-971  
Nanhan



960-1279  
Song



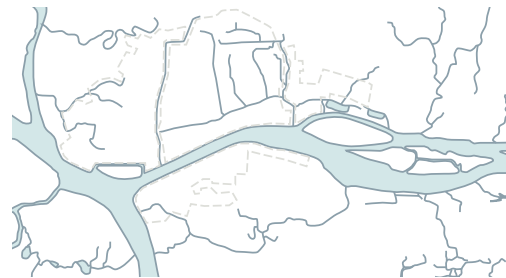
1565  
Ming

ARRANGEMENT

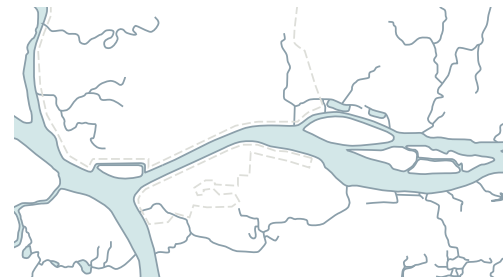
REPLACING



1800s  
Qing



1936  
Republic of China



1960  
PRC.

Source: (Liu, 2015) ;Historical maps of Guangzhou; (Guan, 2010)  
Redrawn by author



### Royal gardens + wild nature

Lake

Nanyue palace

Source: Nanyue historic museum

Water system in Nanyue palace

Garden

Creek

Imaginary picture of Nanyue palace

### Public defined landscape views

Landmark

Monument

### Public park system

Public park system

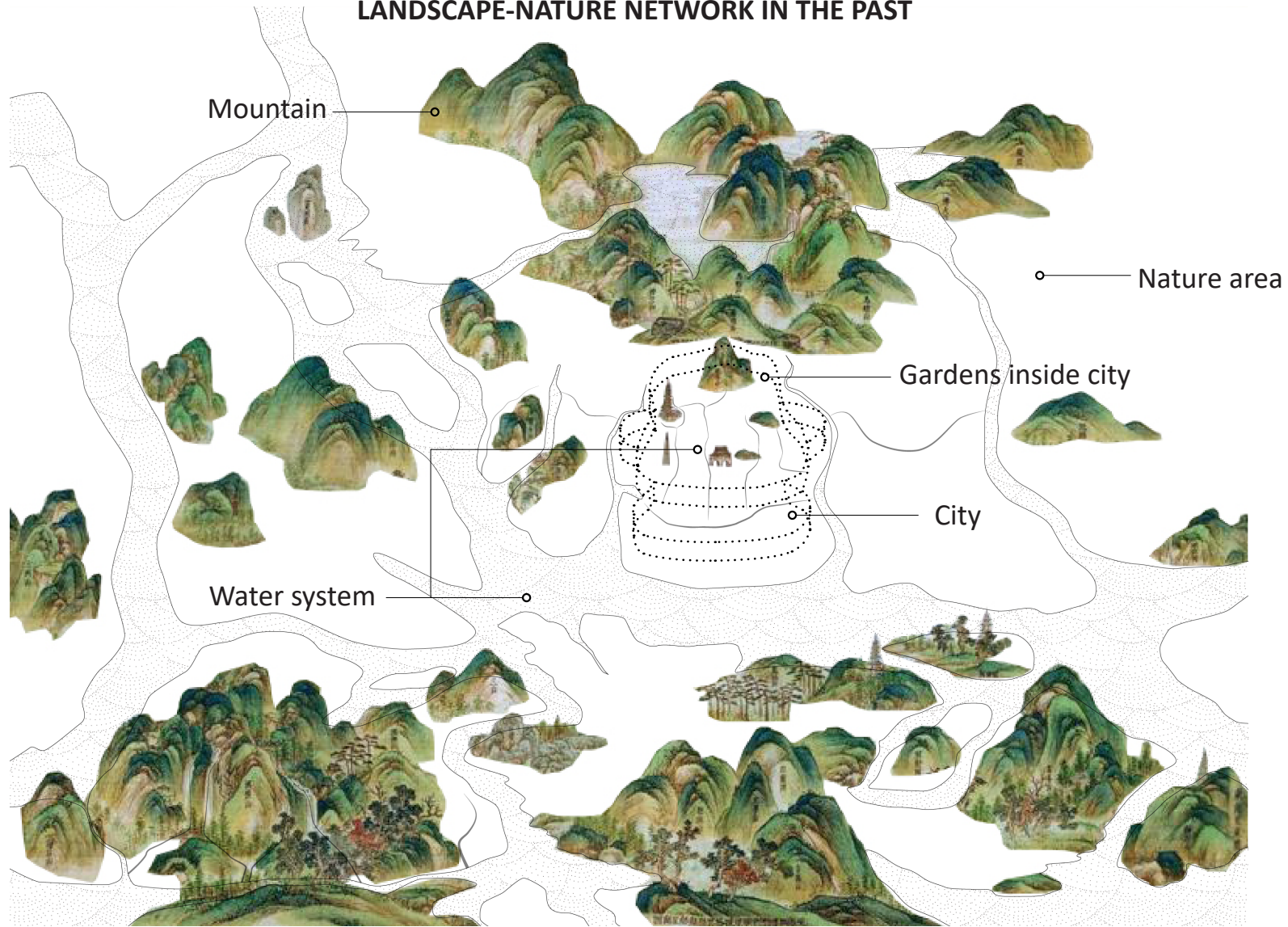
City park





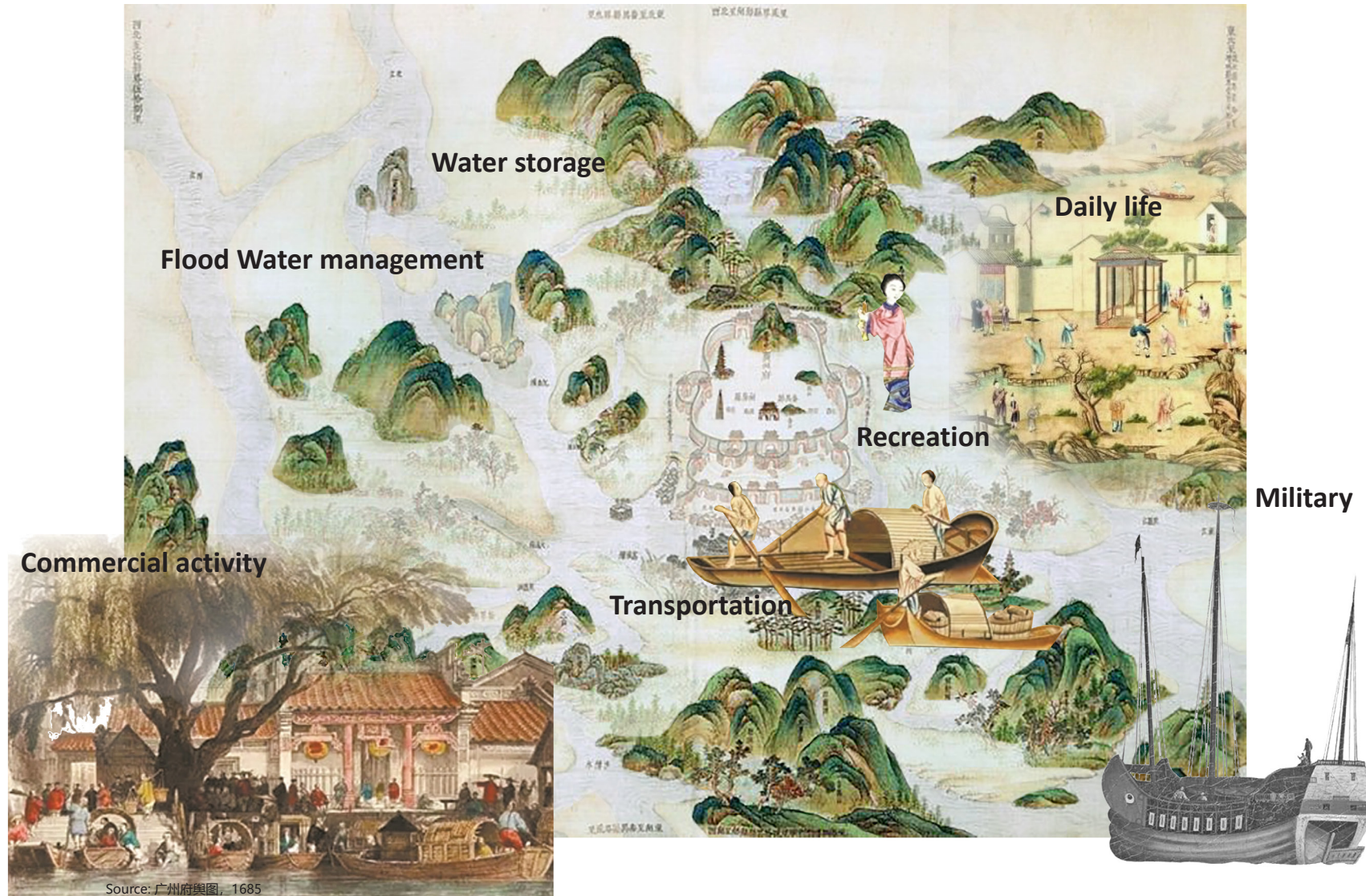
Source: 廣州府輿圖, 1685

# LANDSCAPE-NATURE NETWORK IN THE PAST



Source: 广州府輿图, 1685

# LANDSCAPE-NATURE NETWORK CLOSELY CONNECTED WITH PEOPLE



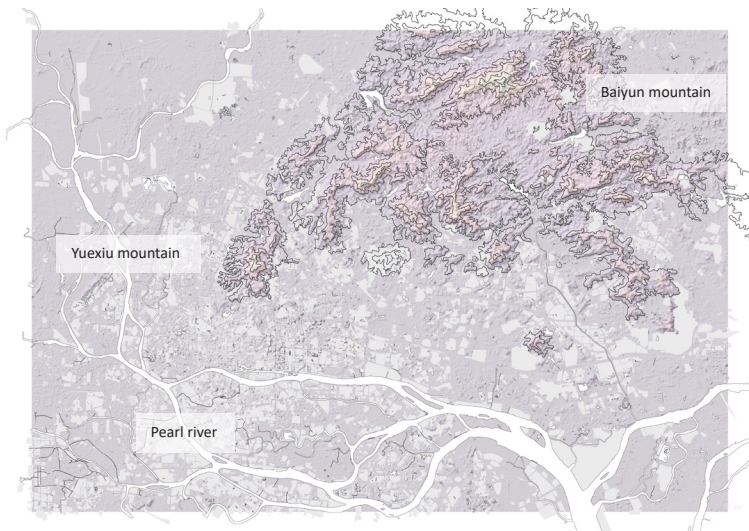
## THE CITY TO RE-EMBRACE LANDSCAPE AND NATURE



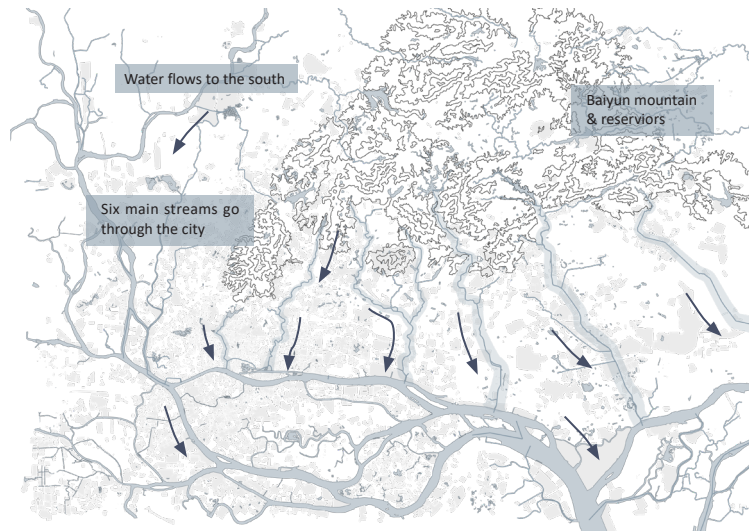
Source: Google picture

# NATURAL

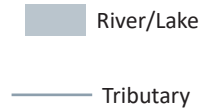
Topography



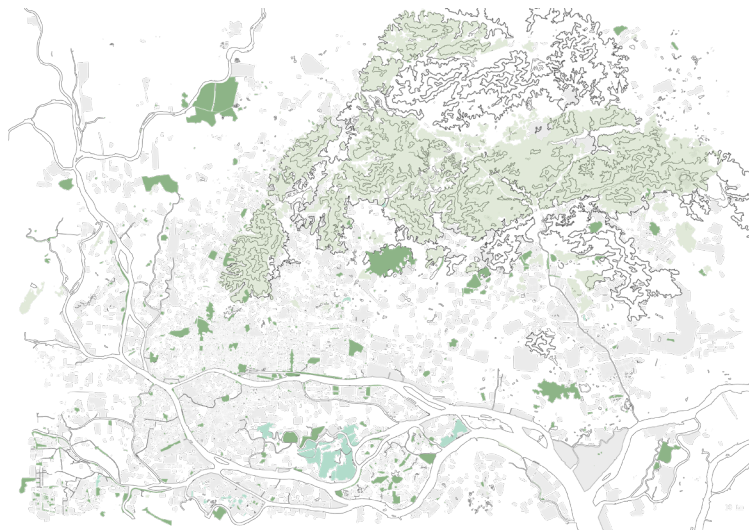
Topography



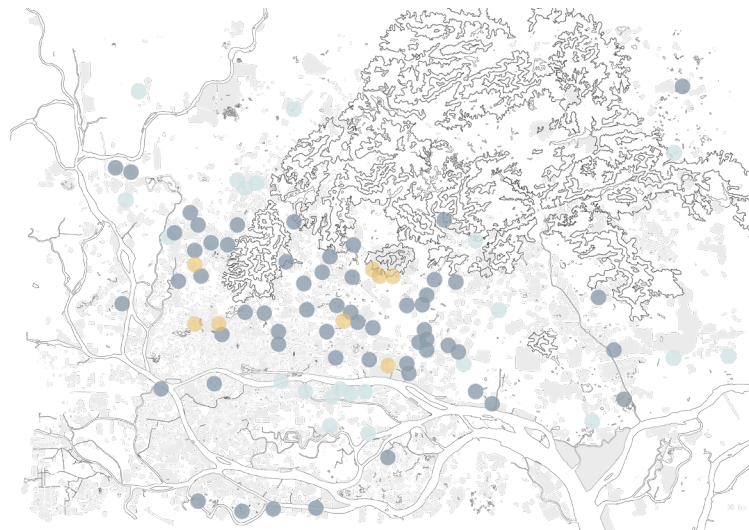
Water system



Water system



Green space



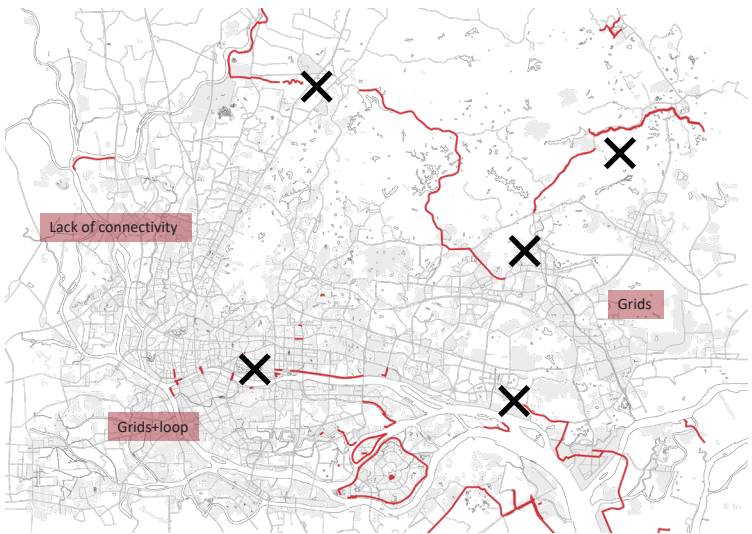
Flooding spots



Flooding spots

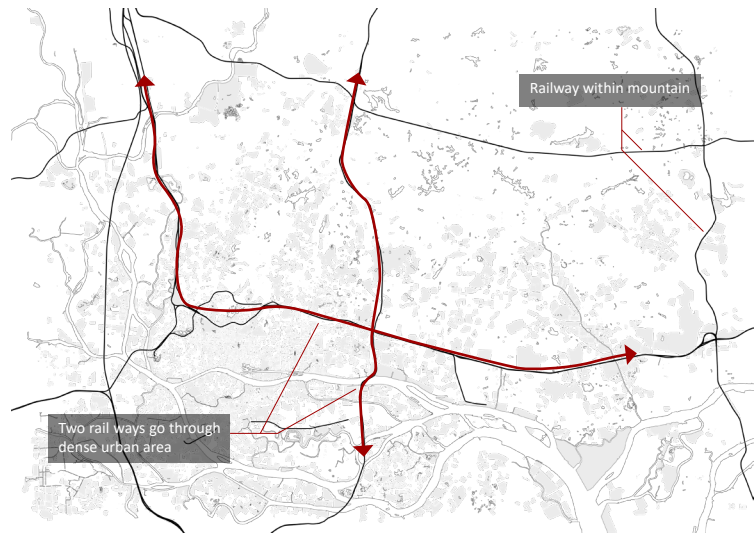
# SOCIAL

## Road system



Road system

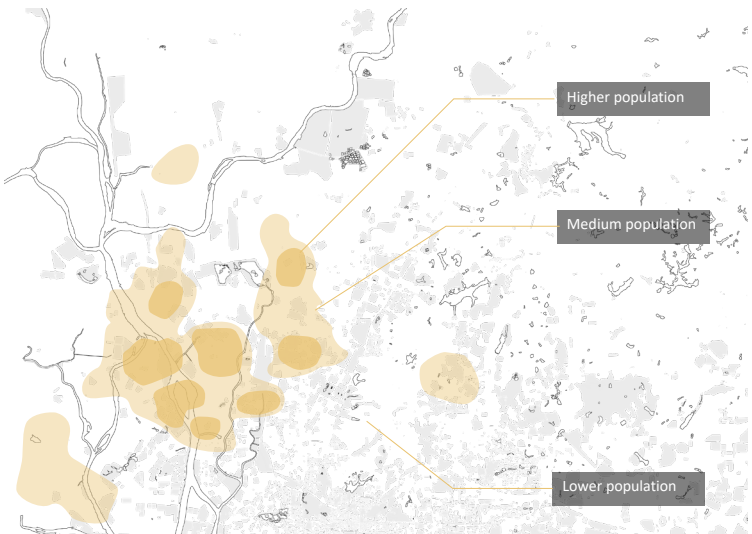
- Main road
- Branch road
- Bike way
- Build-up area



Railway

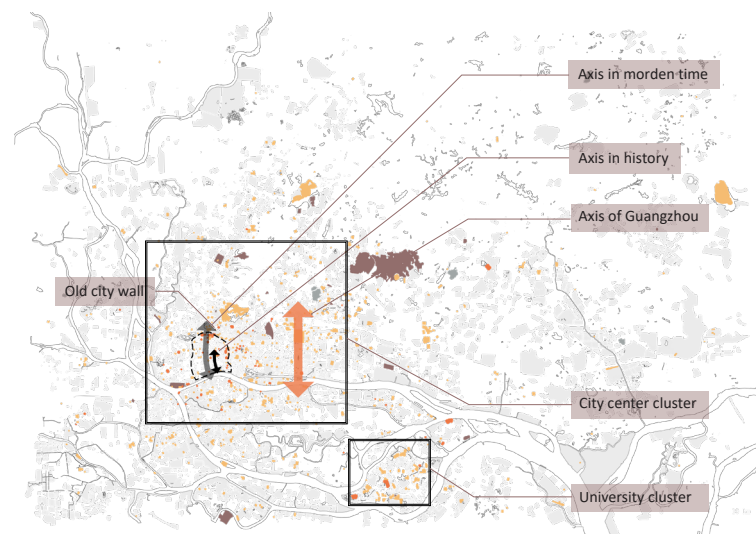
- Build-up area
- Railway

## Population



Population

- Build-up area
- Medium
- High

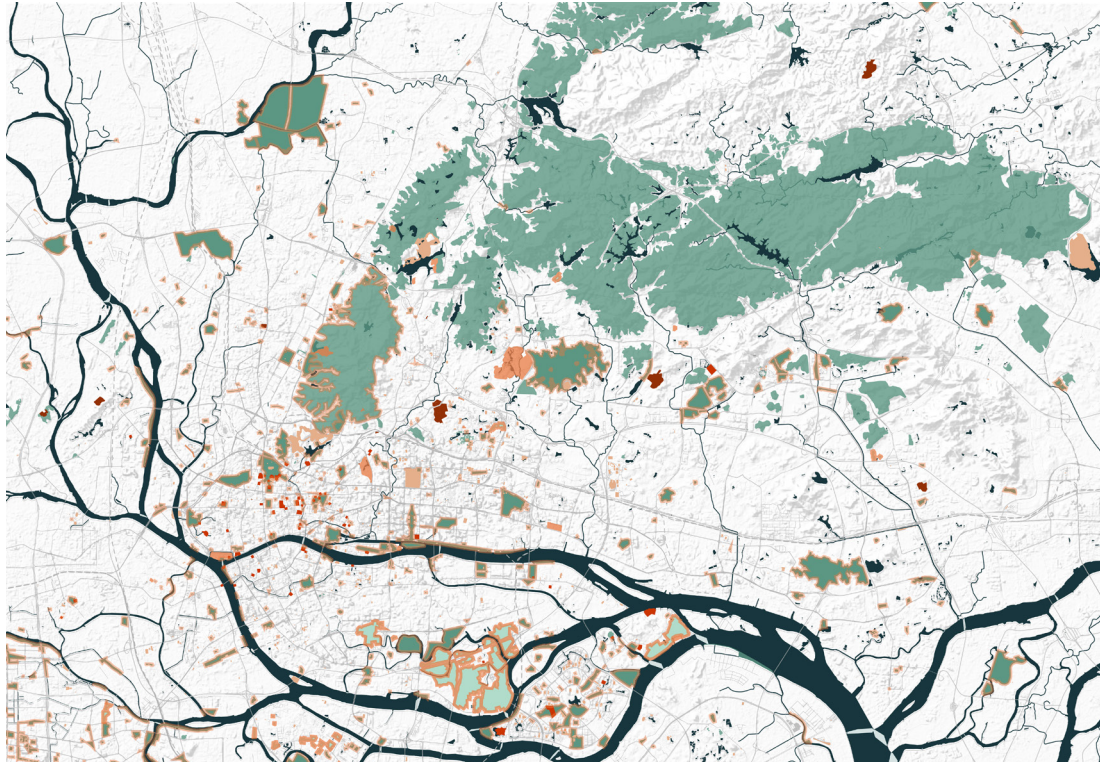


Recreation & historic spots

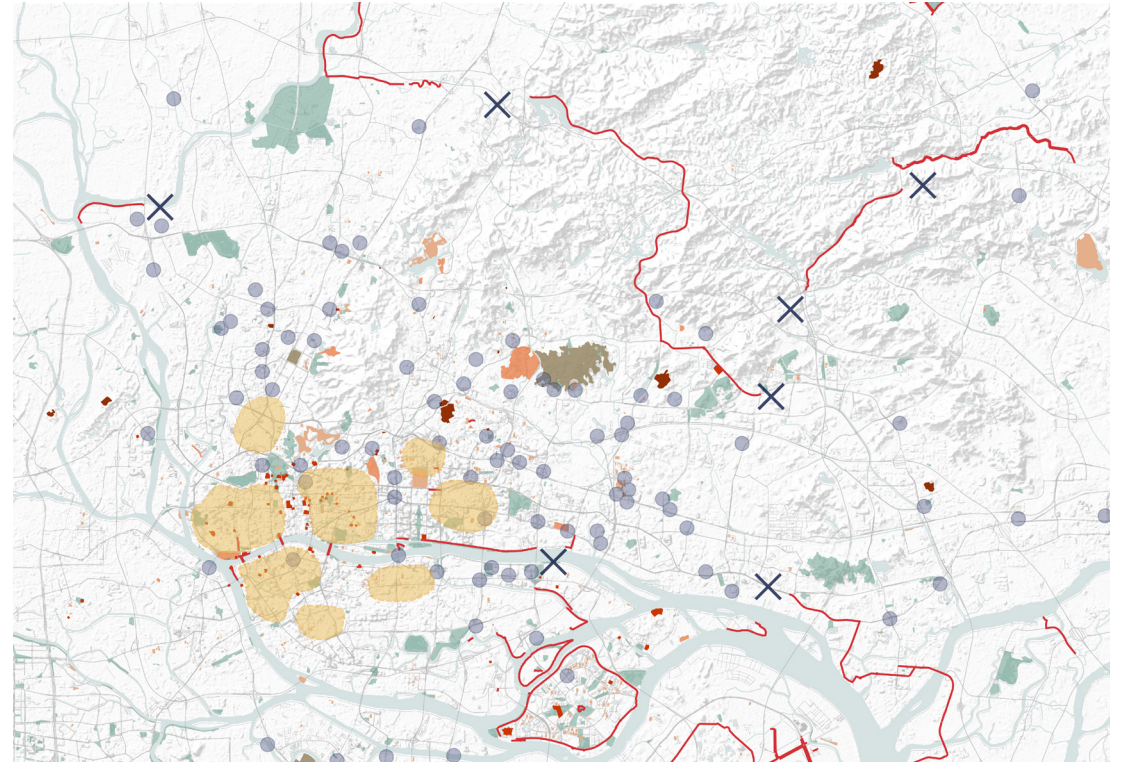
- Recreation
- Sports
- Historical spot
- Cemetary
- Build-up area

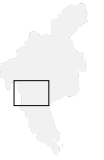
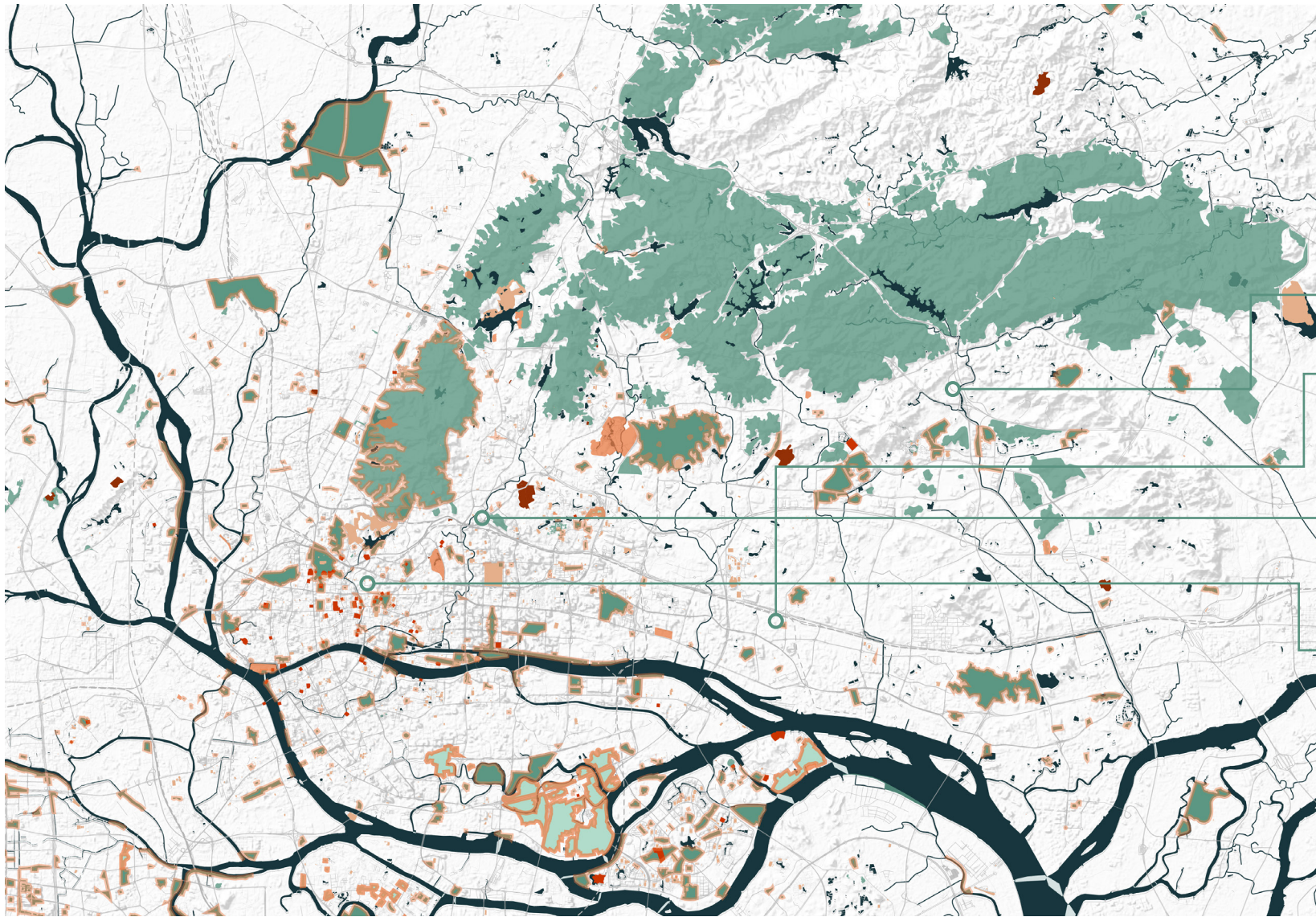


POTENTIAL



CHALLENGE





POTENTIAL --3 Carriers

Water system  
&  
Transportation  
system

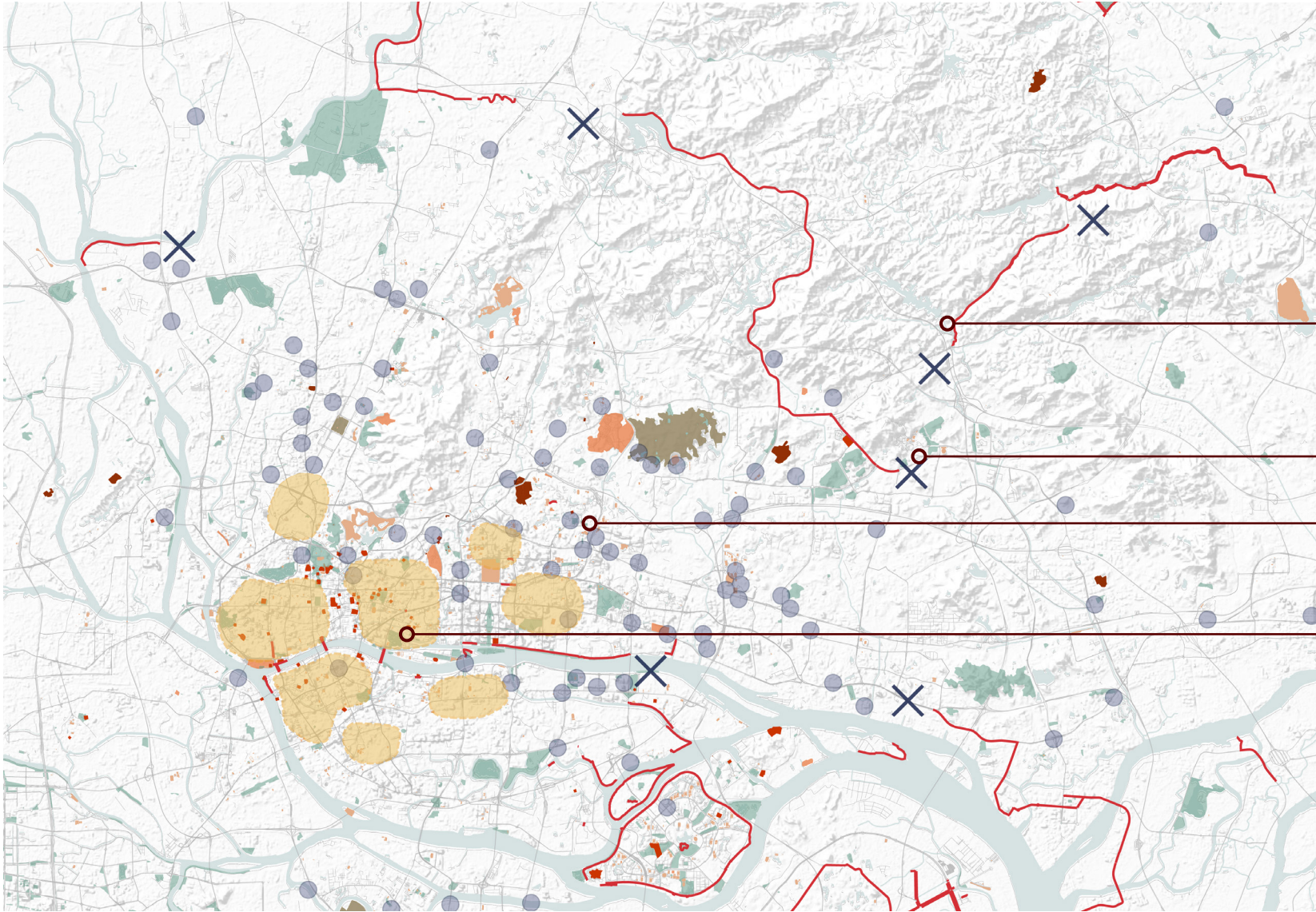
Carrier of  
green  
connection

Multi-scale green  
patches

Carrier of  
change

rich cultural nodes

Carrier of  
city vitality



CHALLENGE -- 3 Potential Carrier

Disconnected slow traffic system

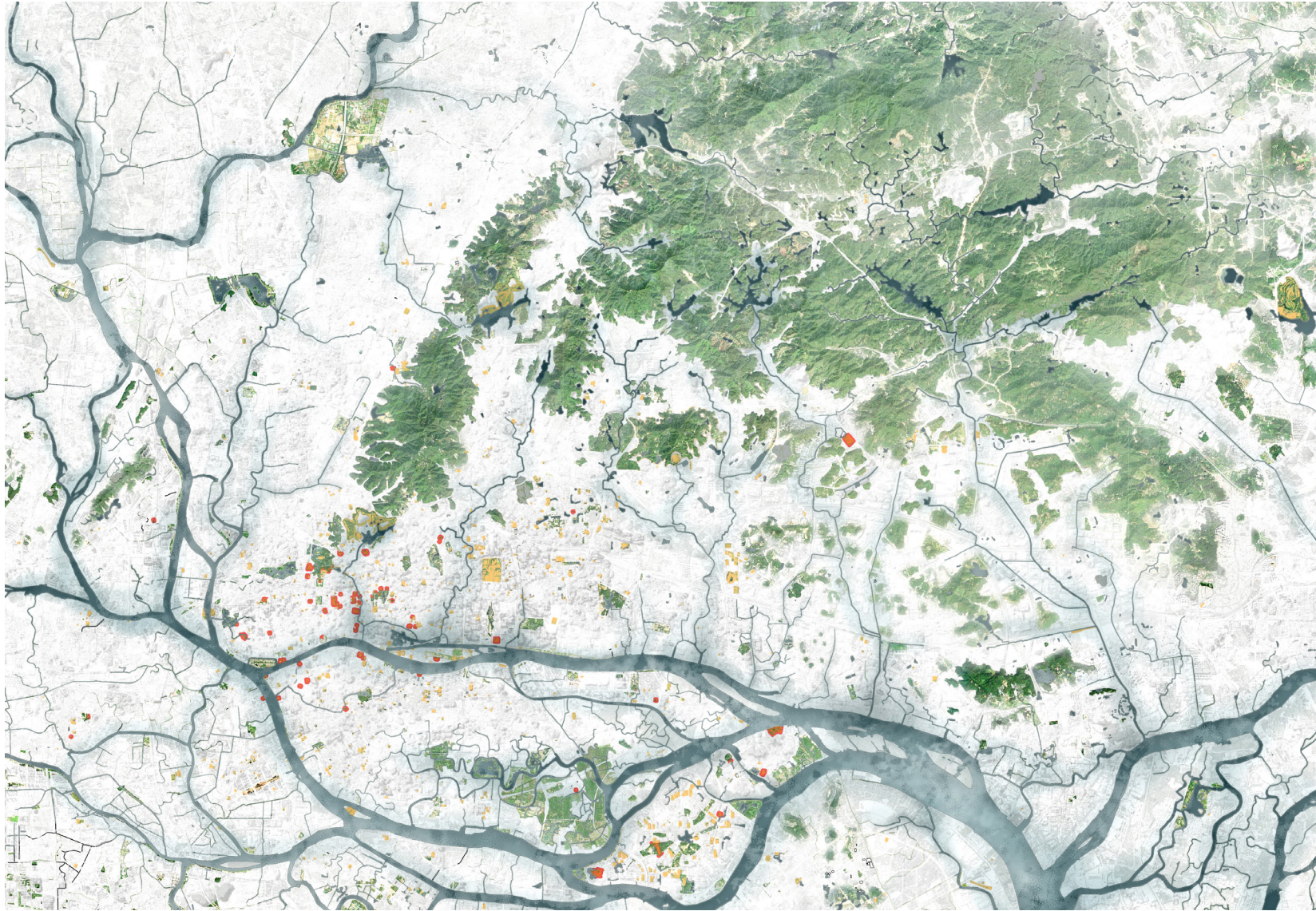
Carrier of green connection

Green islands & Flooding spots

Carrier of change

Denser urban area

Carrier of city vitality



## LANDSCAPE STRUCTURE

**Green as Base**

**Water as Backbone**

**Recreational & Historic  
nodes as Highlights**

## Sub-questions

1. How does the landscape-nature network function in Guangzhou?
2. What are the principles and strategies to develop a metropolitan landscape-nature network?
3. How can applying the landscape-nature network improve the urban environment and living conditions in Guangzhou through design?
4. What can be learned from Guangzhou for the creation of a landscape-nature network and what needs to be developed further?

# BOSTON'S PRACTICE OF METROPOLITAN PARK

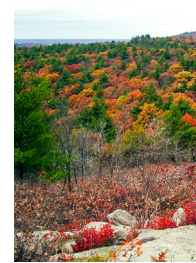


## 5 types of patches



Oceanfront

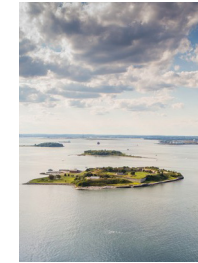
Source: Google picture



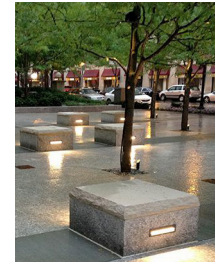
Outer rim forest



Riverfront



Innerbay shores and island and tidal estuary



Small squares and parks in dense populated area

## connections

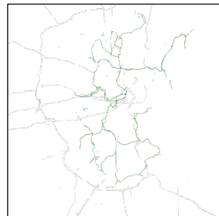
Water



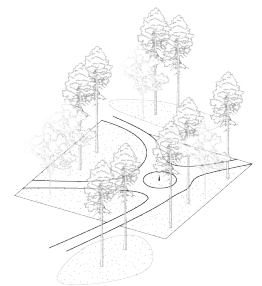
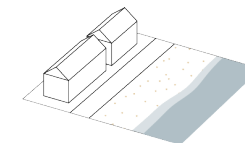
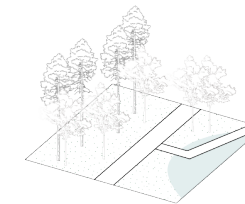
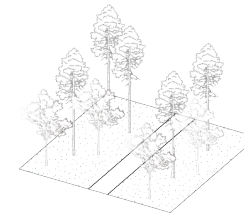
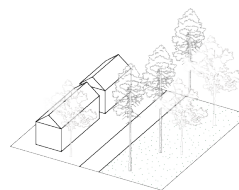
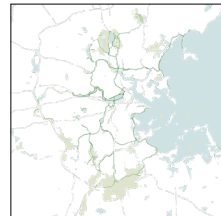
Green patches (historic landscape)



Parkway system



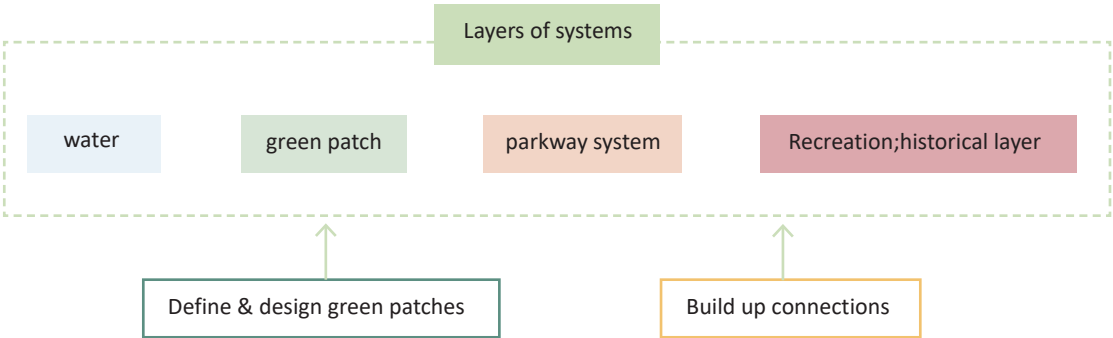
Recreation; historic landscape



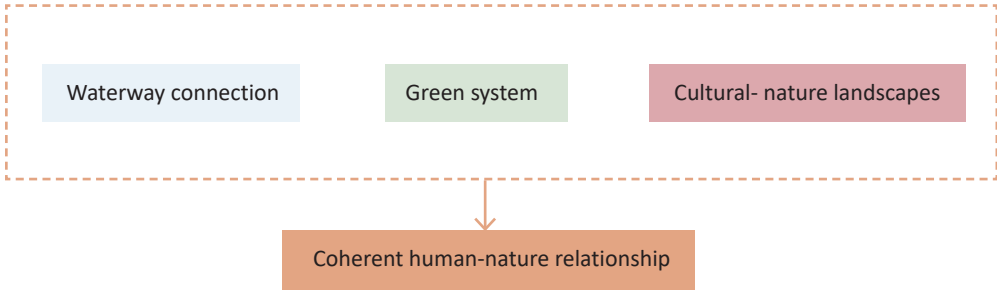
# Boston Metropolitan Park



# City as part of landscape and nature



+

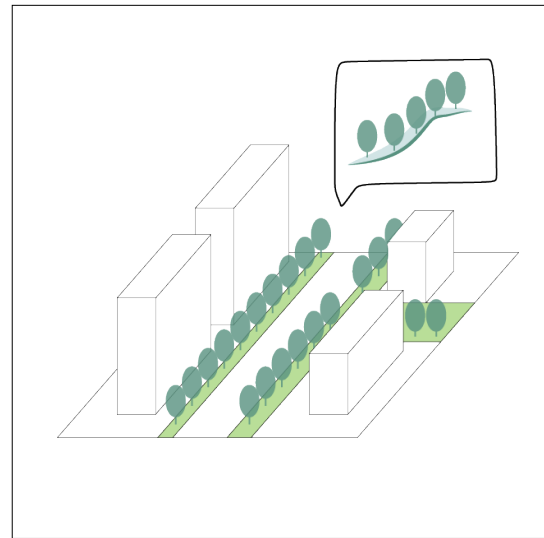


# STRATEGIES

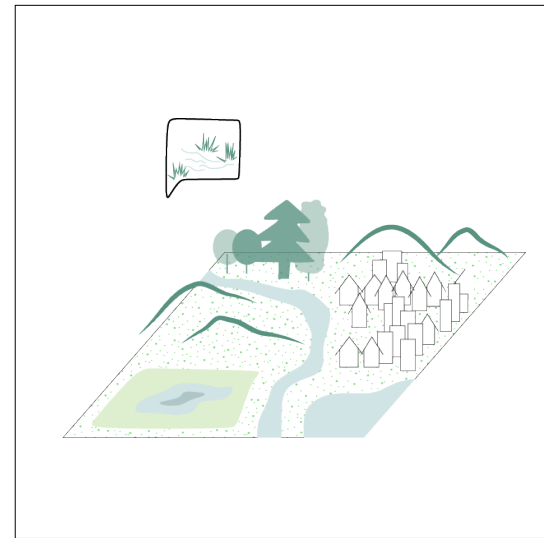
## A LANDSCAPE-NATURE NETWORK IN GUANGZHOU



Preserve green patches and blue space



Add connections and neighborhood penetration



Increase the resilience capacity  
Ecological concern



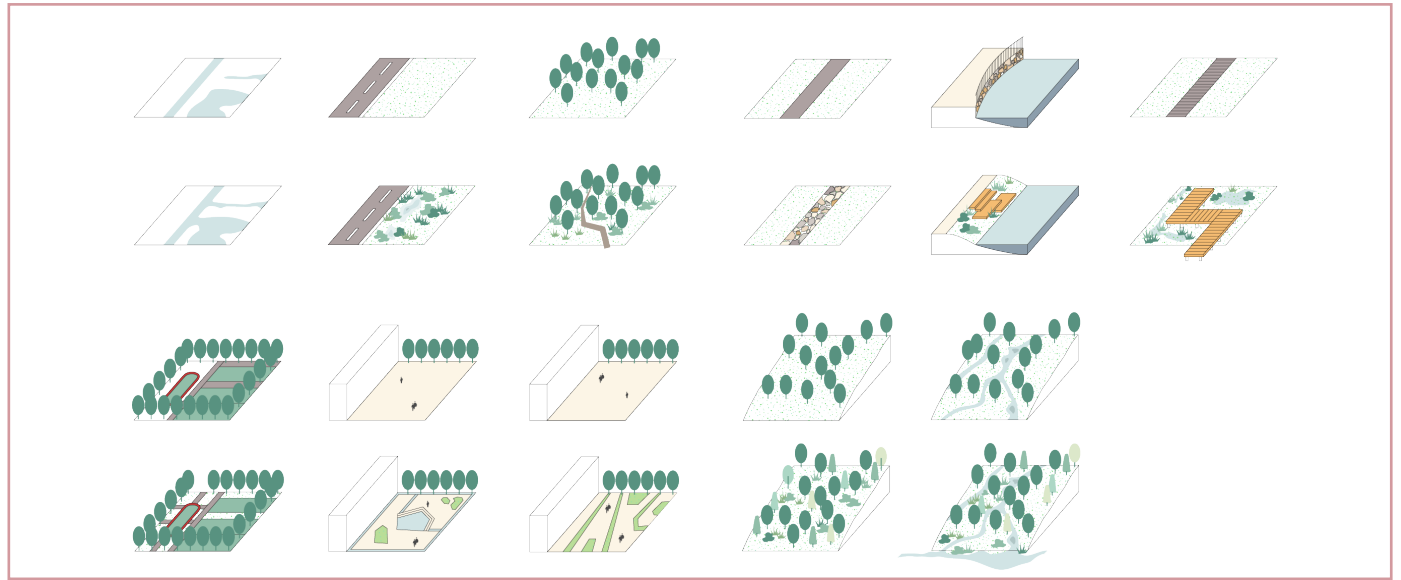
Involve recreation and historic spots



# PRINCIPLES

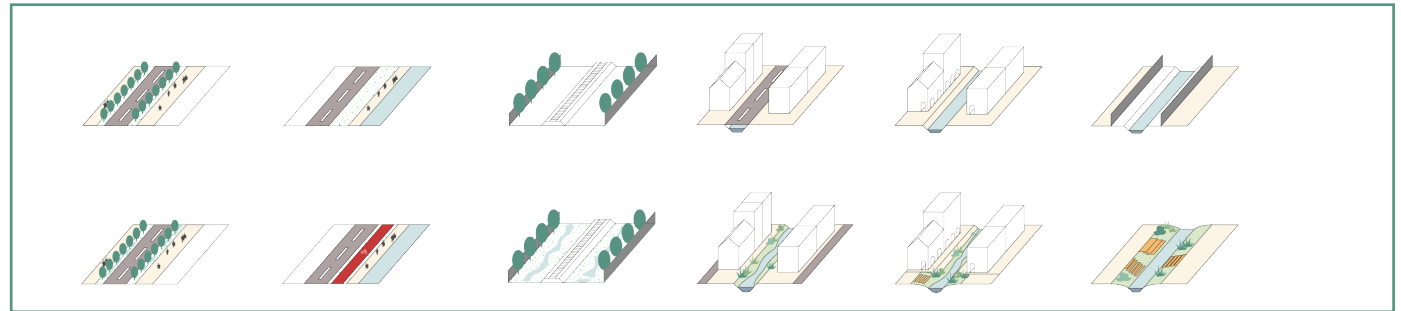
## For patches

Water connection; Increase biodiversity; flood water management



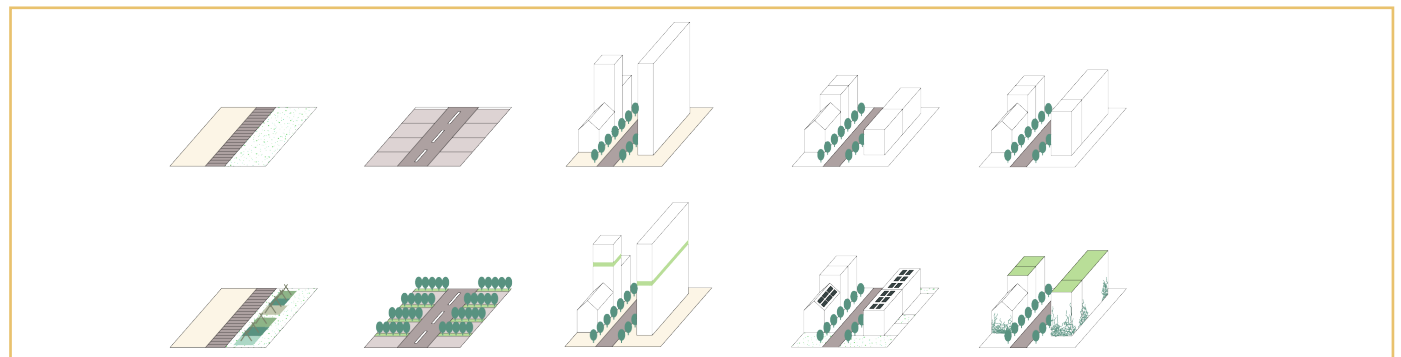
## For connections

Green-blue connections along water and traffic system; slow traffic ways



## For Neighbourhood and districts

Informal greens; neighborhood green-blue infrastructure



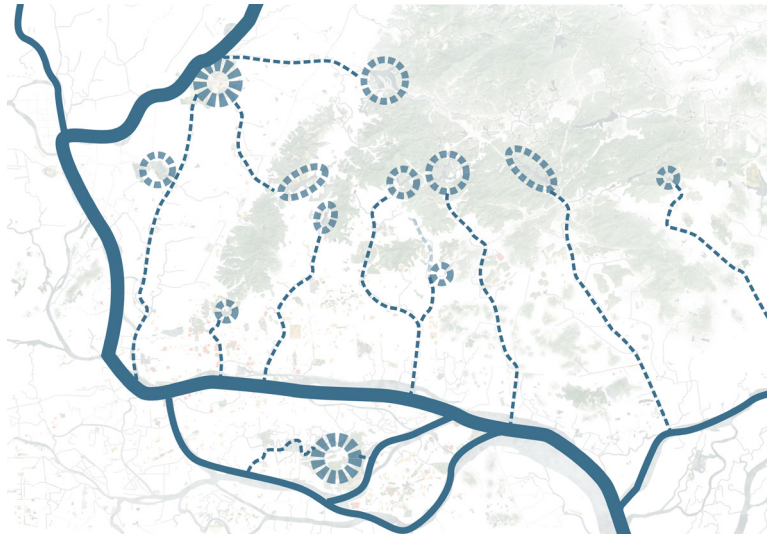
## Sub-questions

1. How does the landscape-nature network function in Guangzhou?
2. What are the principles and strategies to develop a metropolitan landscape-nature network?
3. How can applying the landscape-nature network improve the urban environment and living conditions in Guangzhou through design?
4. What can be learned from Guangzhou for the creation of a landscape-nature network and what needs to be developed further?

# STRATEGIES FOR THE PARK SYSTEM

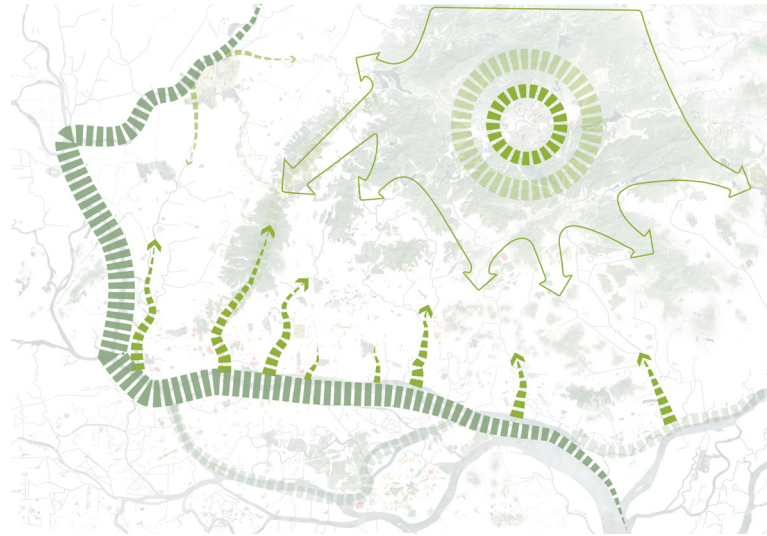


Water layer



Water as the backbone

Green layer



Green patches and connections

Recreational layer



Culture identity and activity space



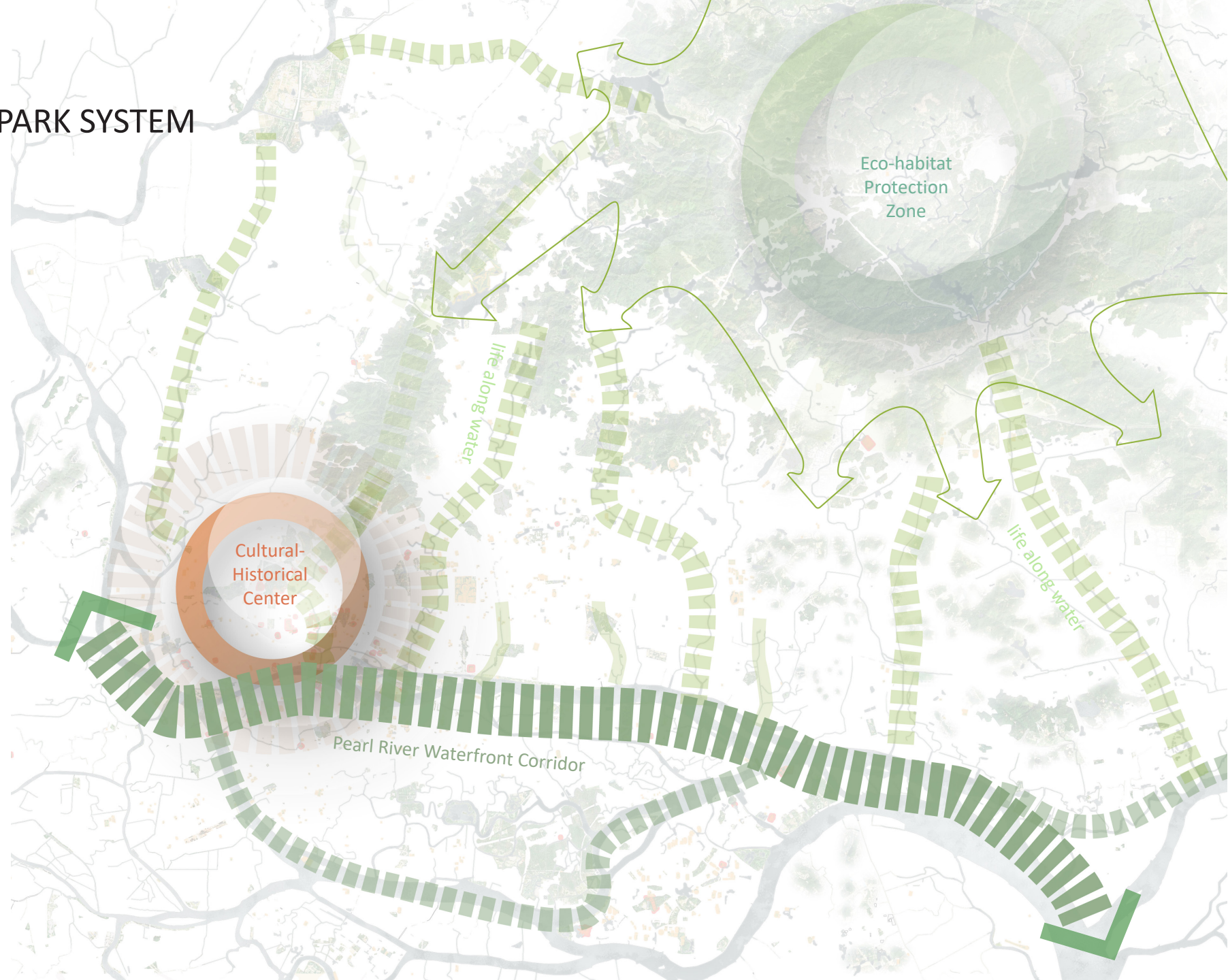
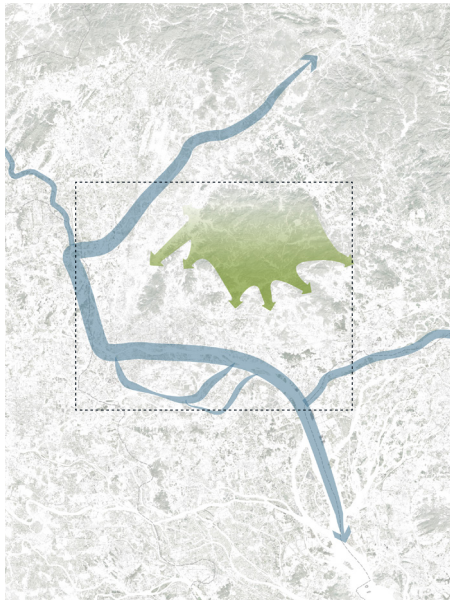
## Guangzhou Metropolitan Park

- Preserve green
- Create corridors
- Revitalize old city
- Restore cultural memories
- Interactive slow traffic

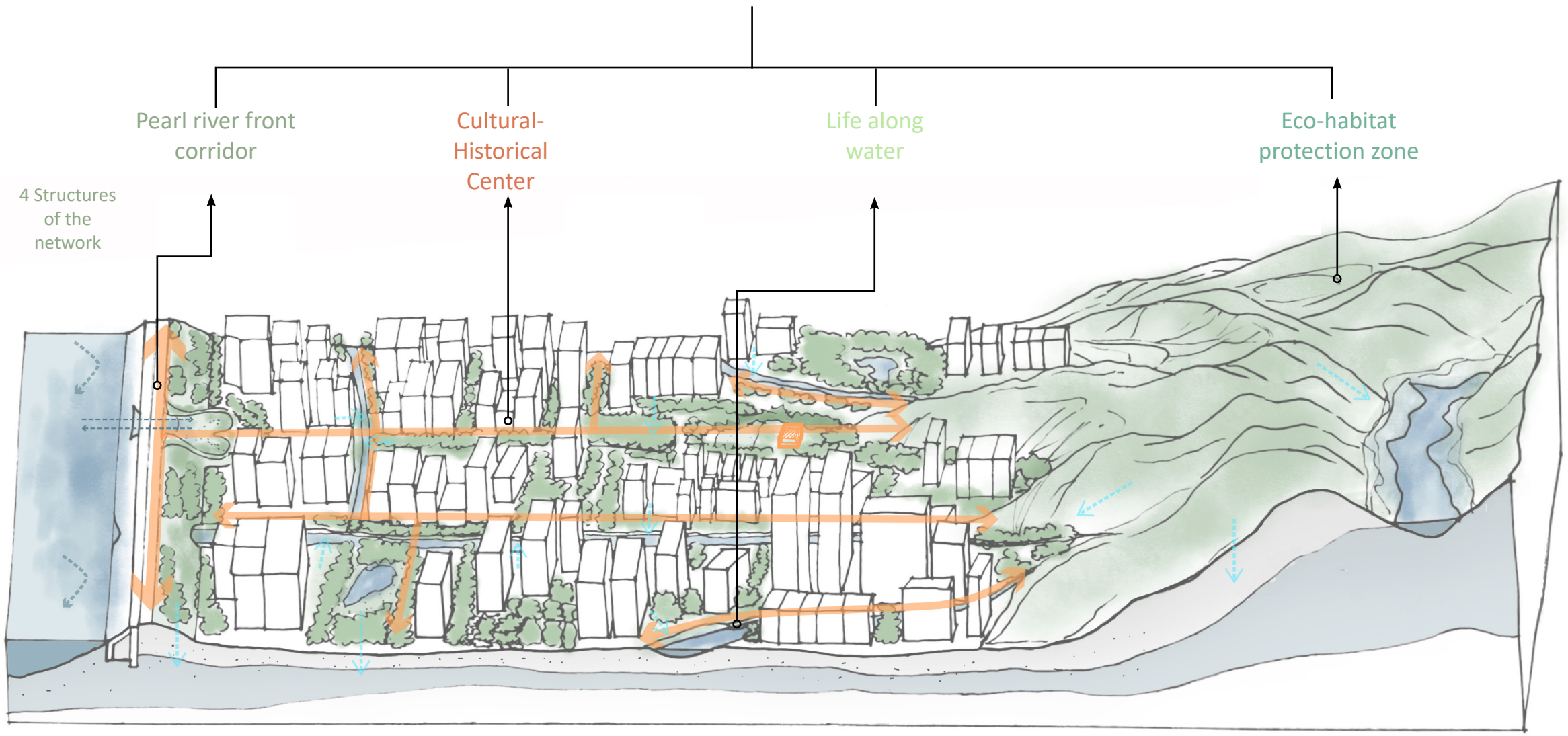
# MAIN STRUCTURES OF THE PARK SYSTEM

## Four critical areas

pearl riverfront corridor  
cultural-historical center  
eco-habitat protection zone  
inner city riverfront(live with water)



# A NEW LANDSCAPE-NATURE NETWORK



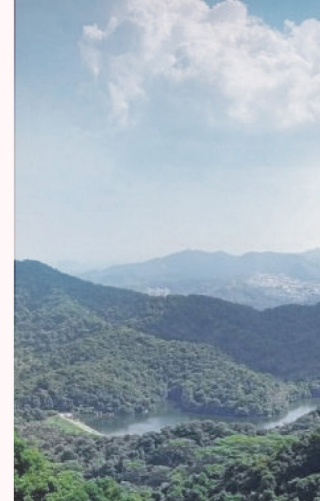
Pearl  
river front  
corridor

Cultural-  
Historical  
Center

Life along  
water

Eco-habitat  
protection  
zone

4 Structures  
of the  
network



Critical & problematic parts of the  
structures

Preserving & Recovery

Detail  
design

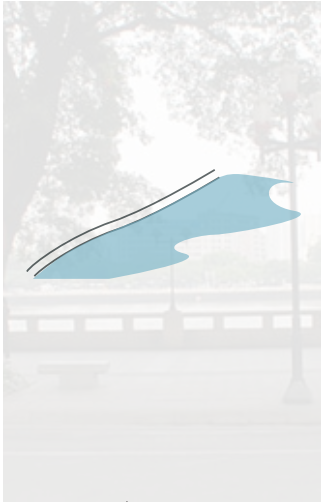
Pearl  
riverfront  
resilience

transforming  
historical site

reviving old  
canals

4 Structures  
of the  
network

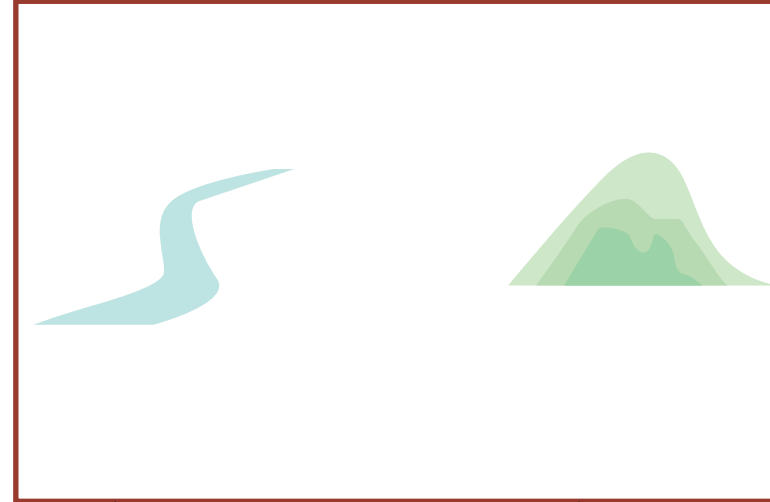
Pearl  
river front  
corridor



Cultural-  
Historical  
Center



Life along  
water



Eco-habitat  
protection  
zone

Critical & problematic structures

Preserving & Recovery

Detail  
design

Pearl  
riverfront  
resilience

transforming  
historical site

reviving old  
canals



Eco-habitat protection zone



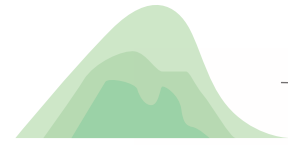
Government



Water department



Forestry department



Life along water

Policy making  
- preserving mountain  
& river space

ECO system protection  
& recovery

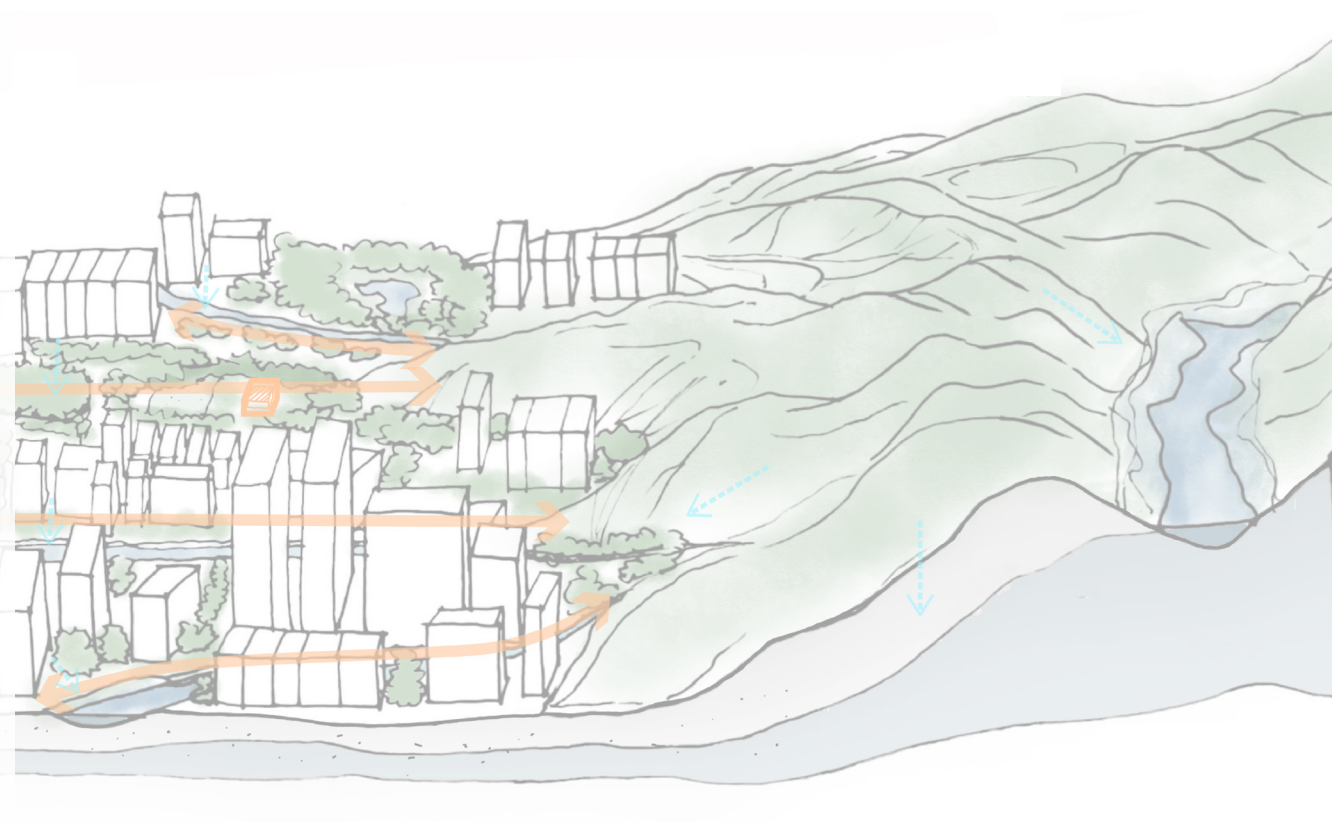
Recreation  
--cycling  
+hiking  
programmes



NGO



Urban planner & designer



Eco-habitat protection zone



Government



Water department



Forestry department

Increase biodiversity

Decrease surface runoff

Water storage



Life along water

Policy making  
- preserving mountain & river space

ECO system protection & recovery

Recreation  
--cycling  
+hiking  
programmes

Open waterfront for the public

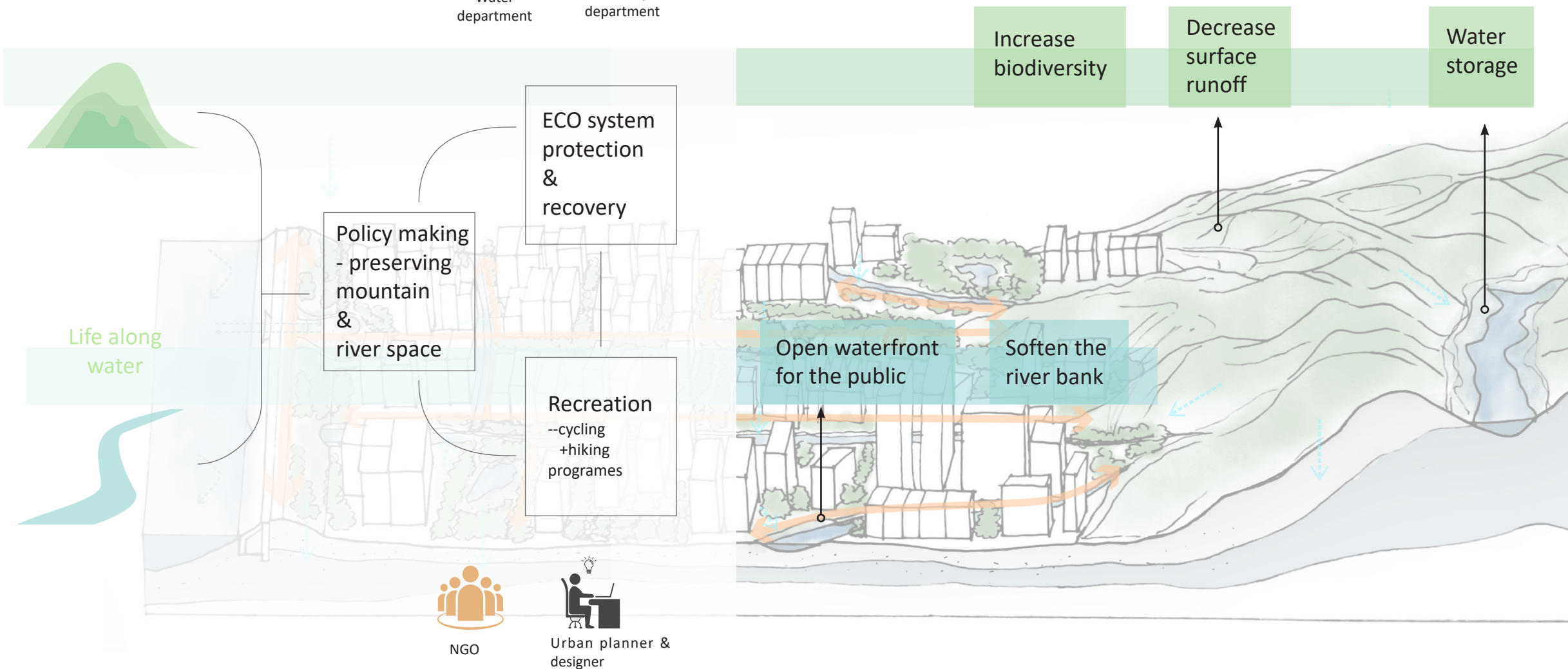
Soften the river bank

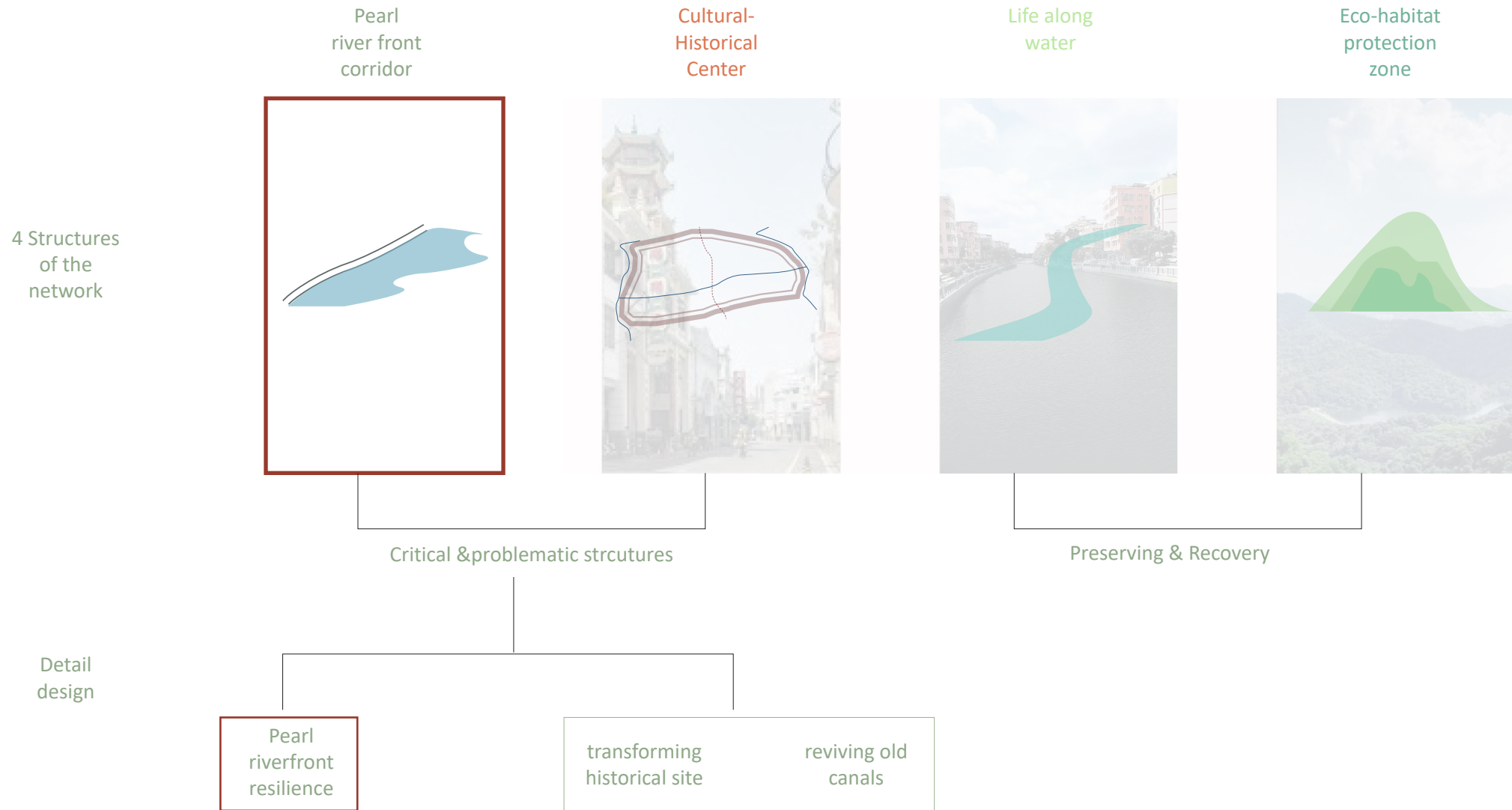


NGO

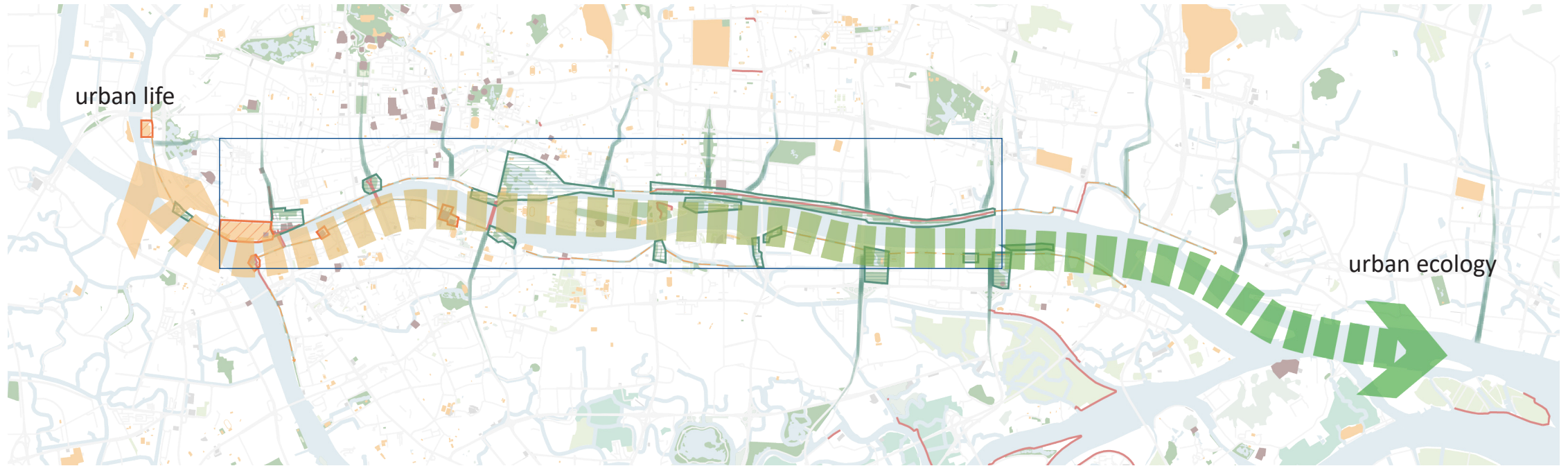


Urban planner & designer





# PEARL RIVER WATERFRONT CORRIDOR



urban life

urban ecology

museum

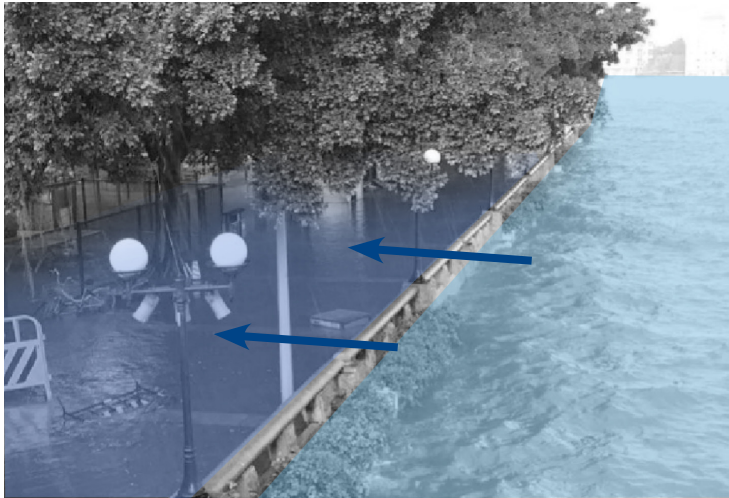
historical area

parks

recreation

waterfront parkway/ blue way

## Problem



Flooding



impermeable surface

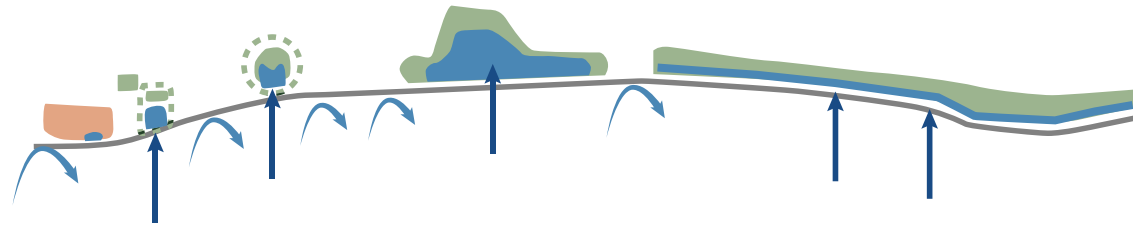


Monofunction

## WATER

protection

room for flooding

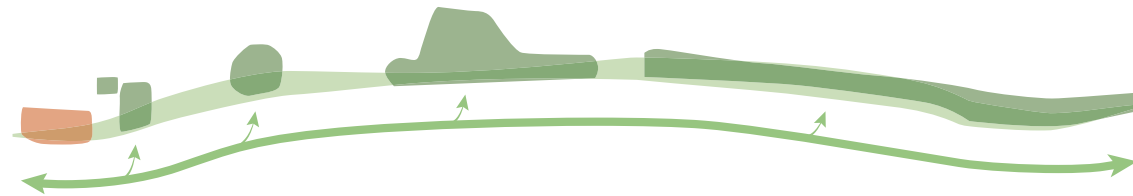


## GREEN

preserving

trasforming

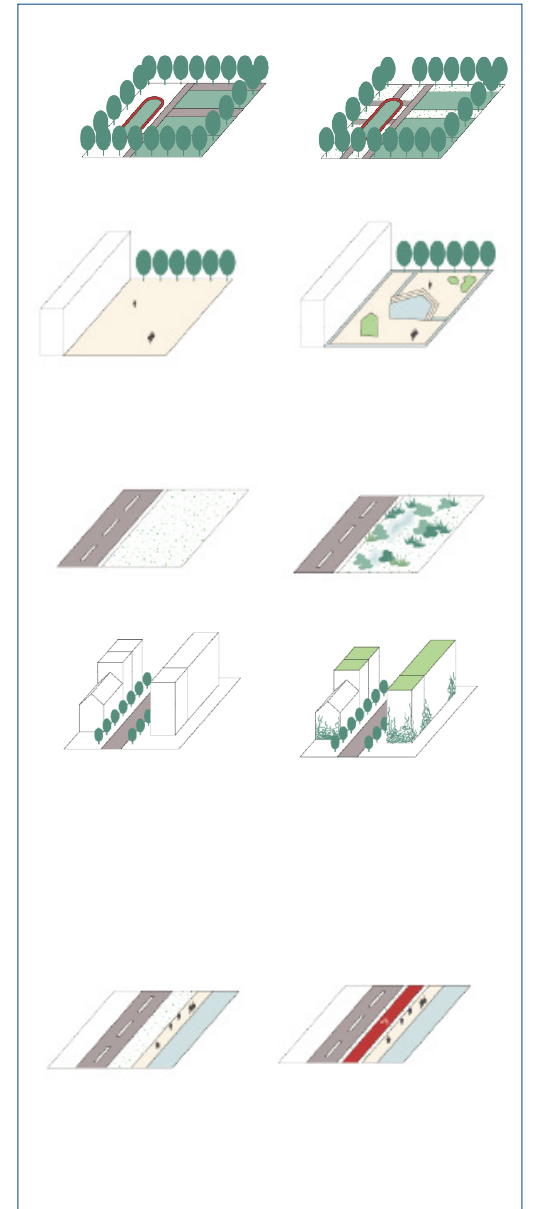
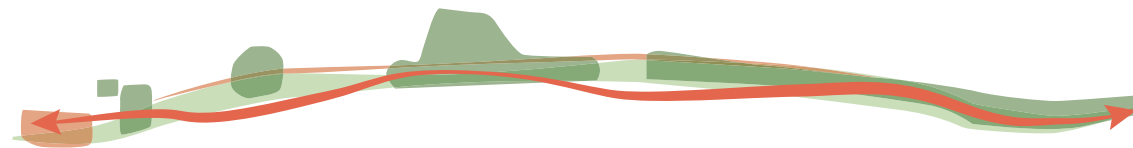
connection



## SOCIAL CULTURAL

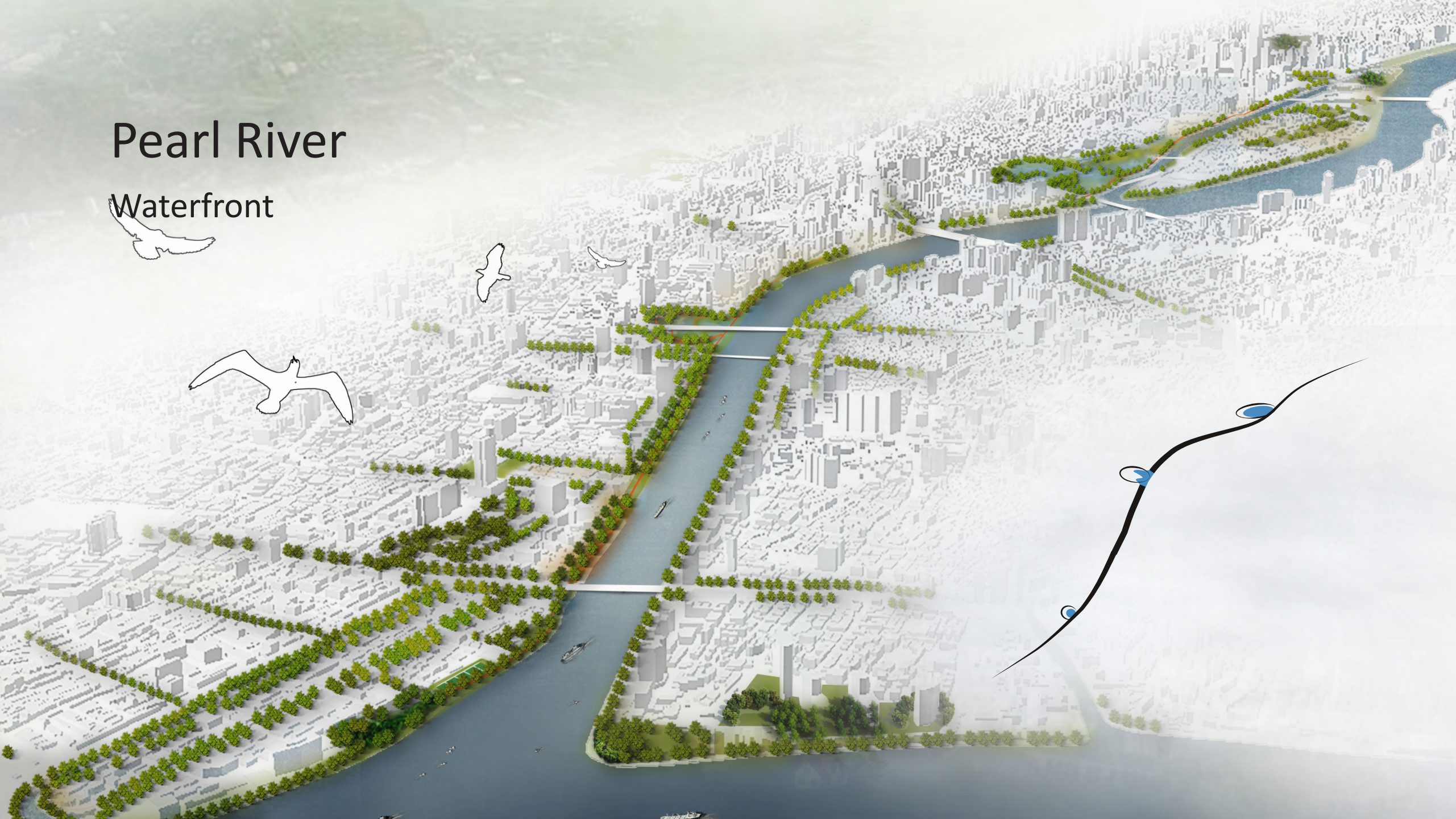
Route connection

public space for activity



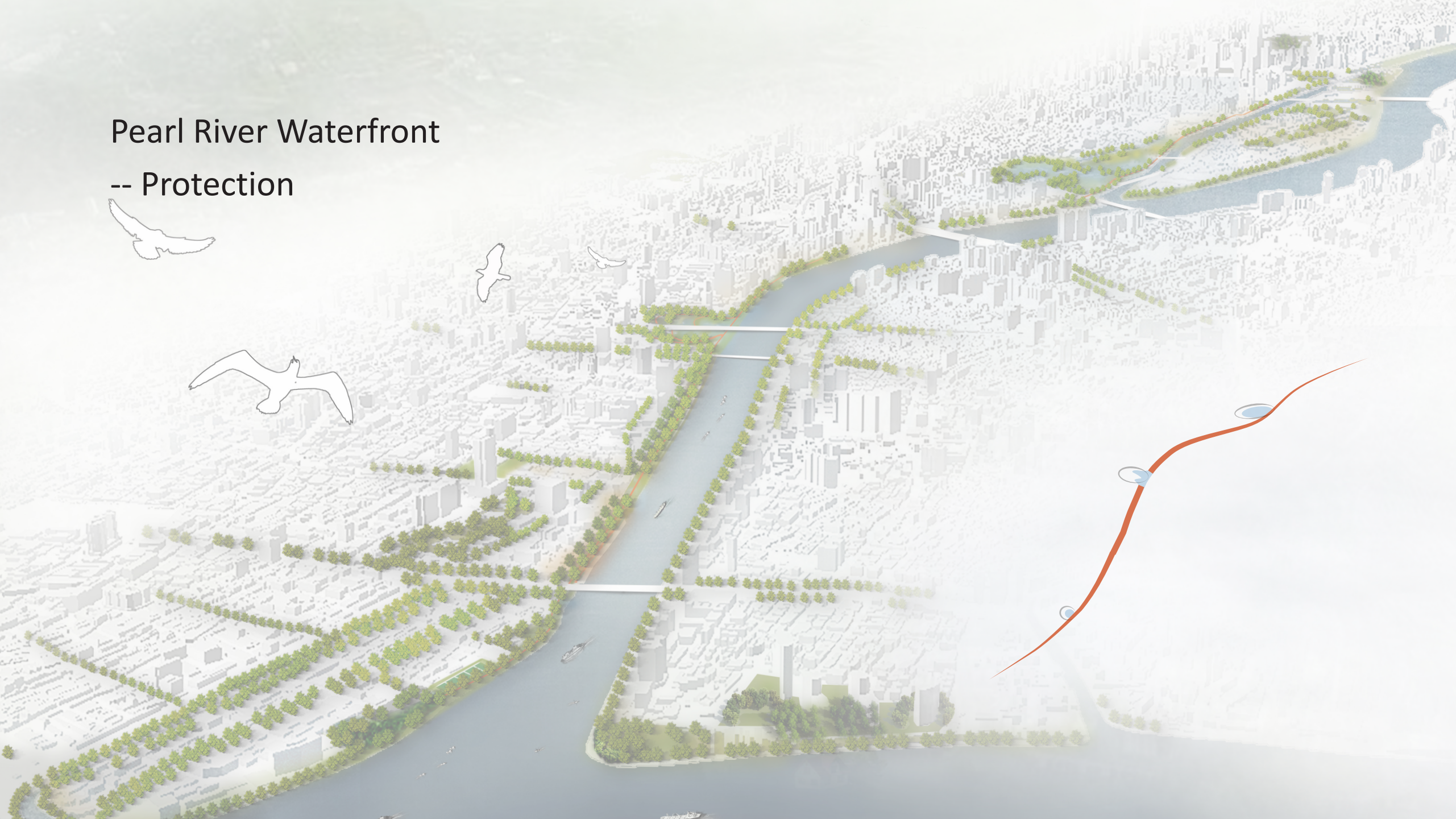
# Pearl River

Waterfront

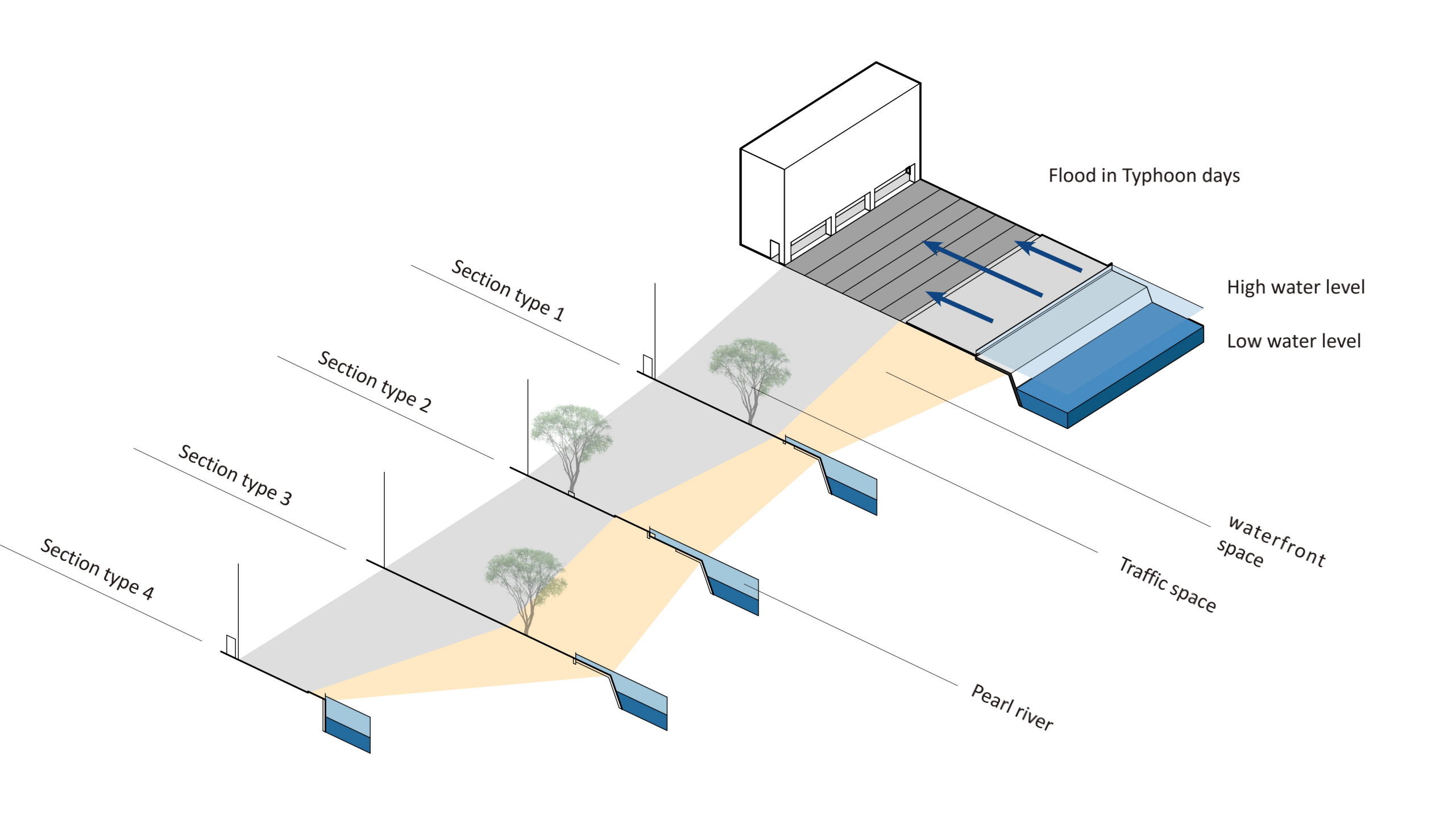


# Pearl River Waterfront

-- Protection





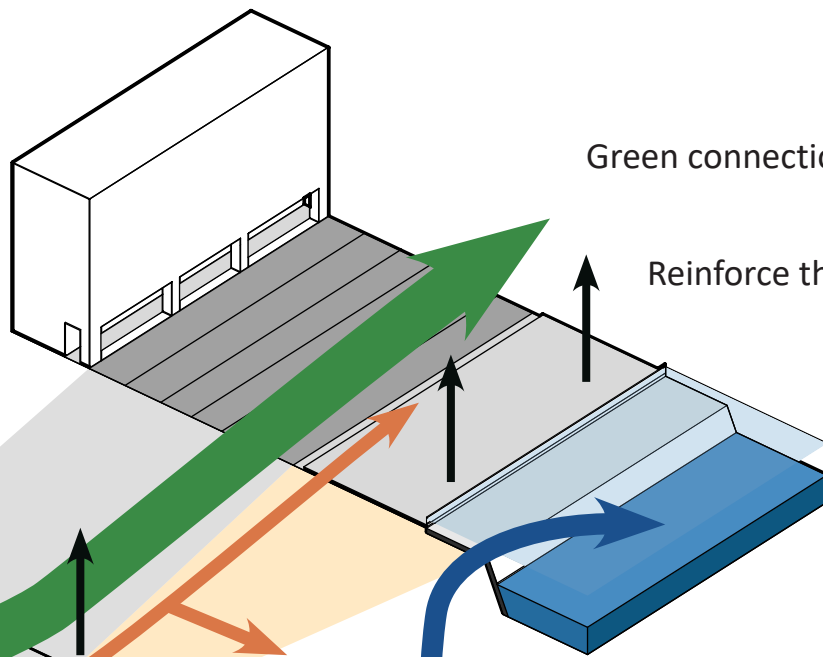




Design and educate

Knowledge and technical support

Urban planner & designer

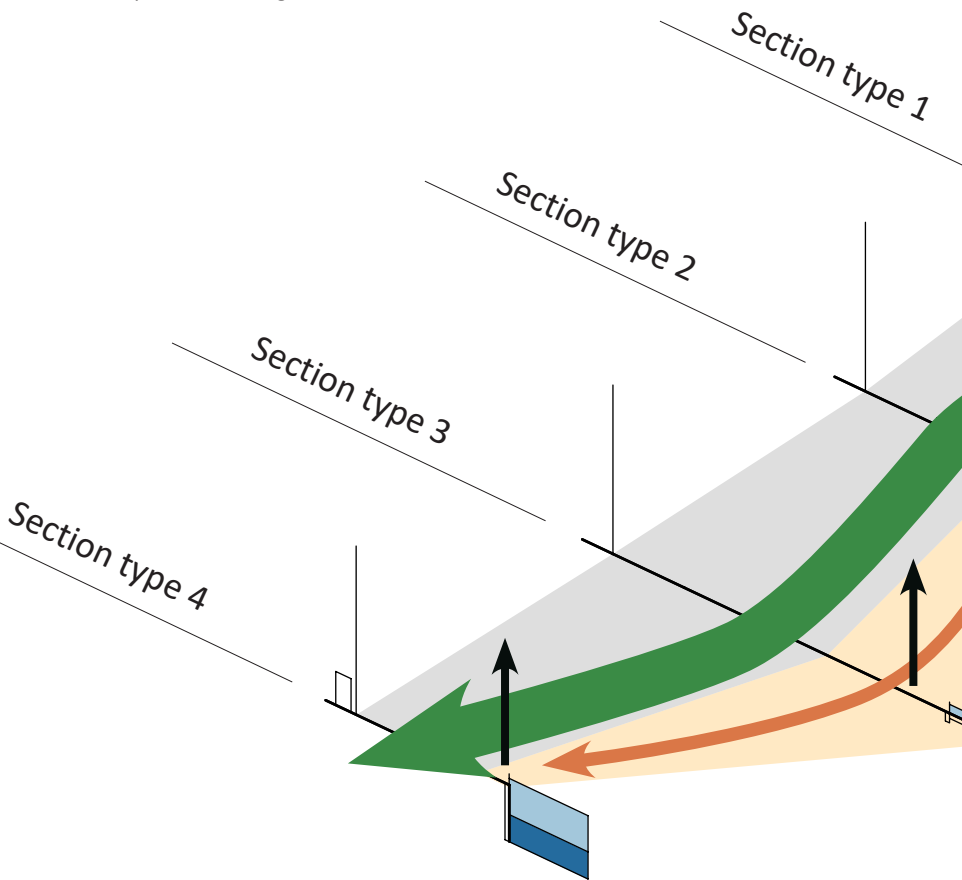


Green connection

Reinforce the dike

Protection from river flood

Public space



Traffic department



Water department

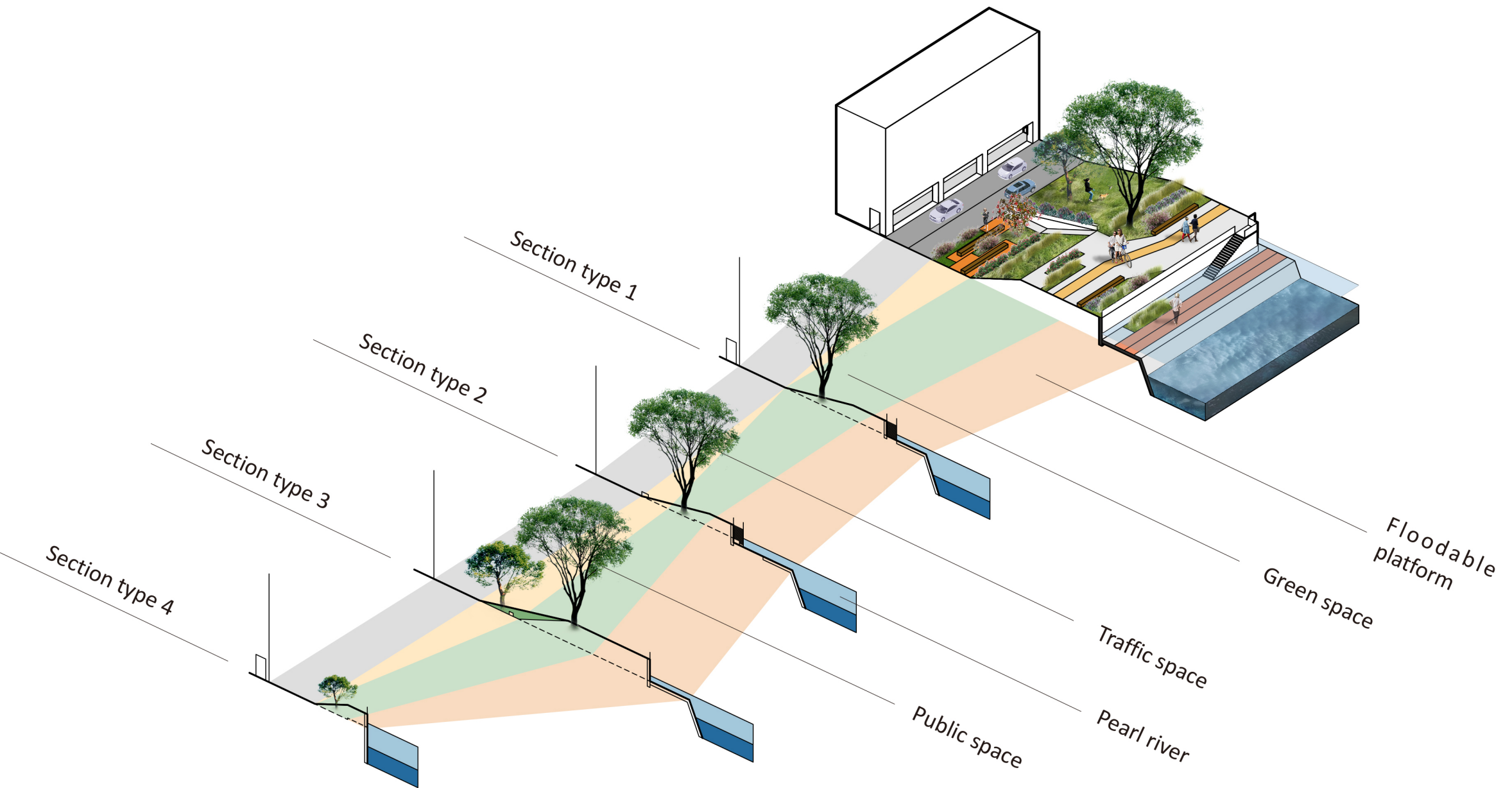


Government

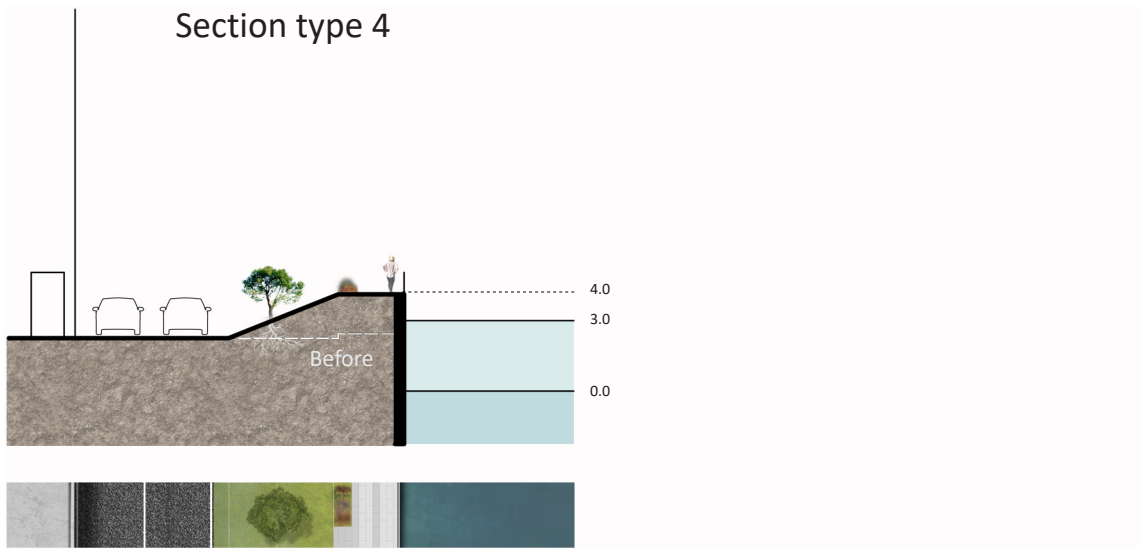
Reinforce the dike

Policy making for riverfront area

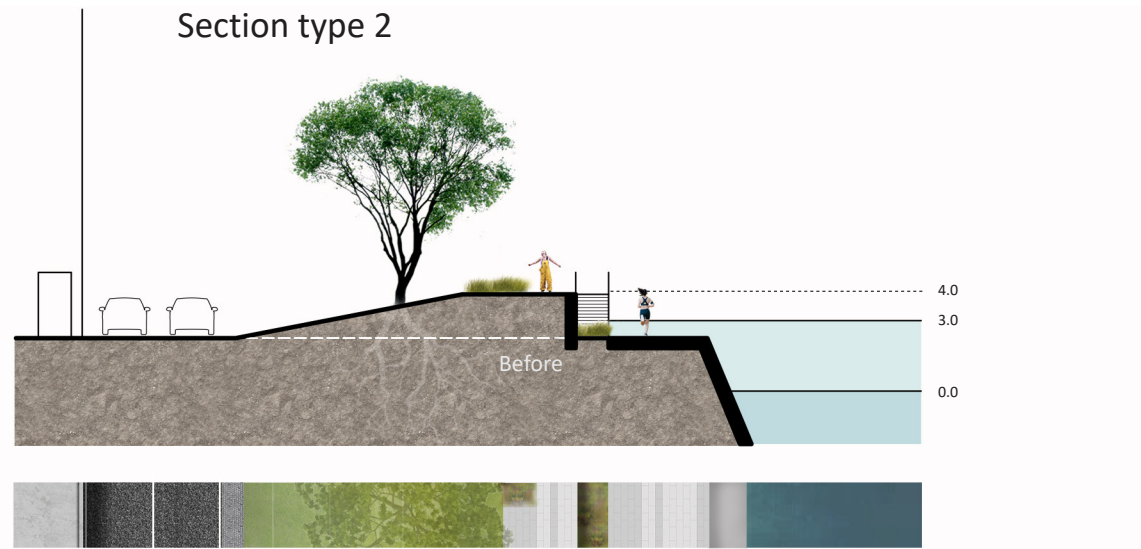
Financial and Construction support



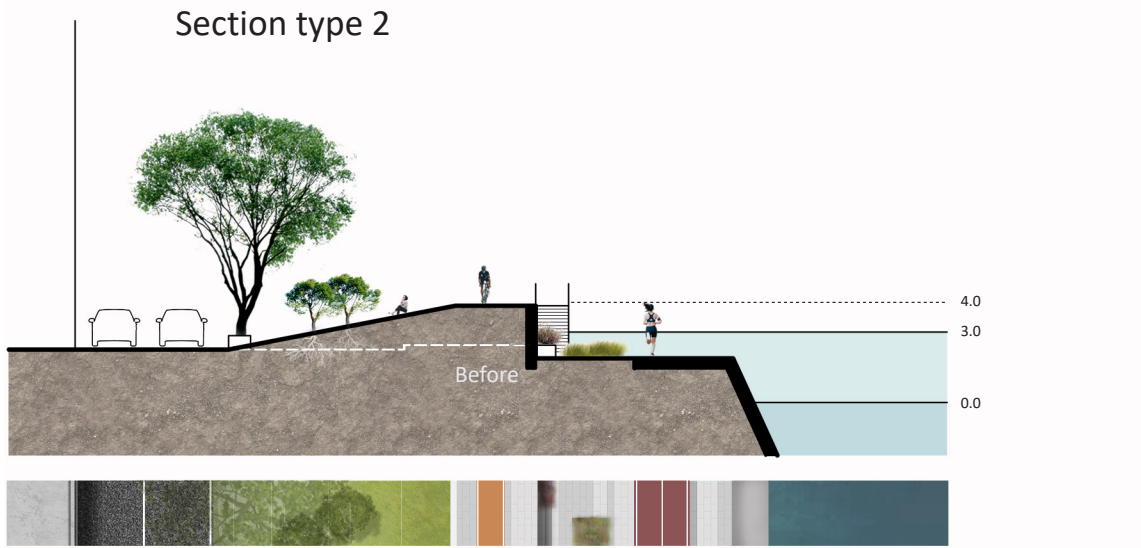
Section type 4



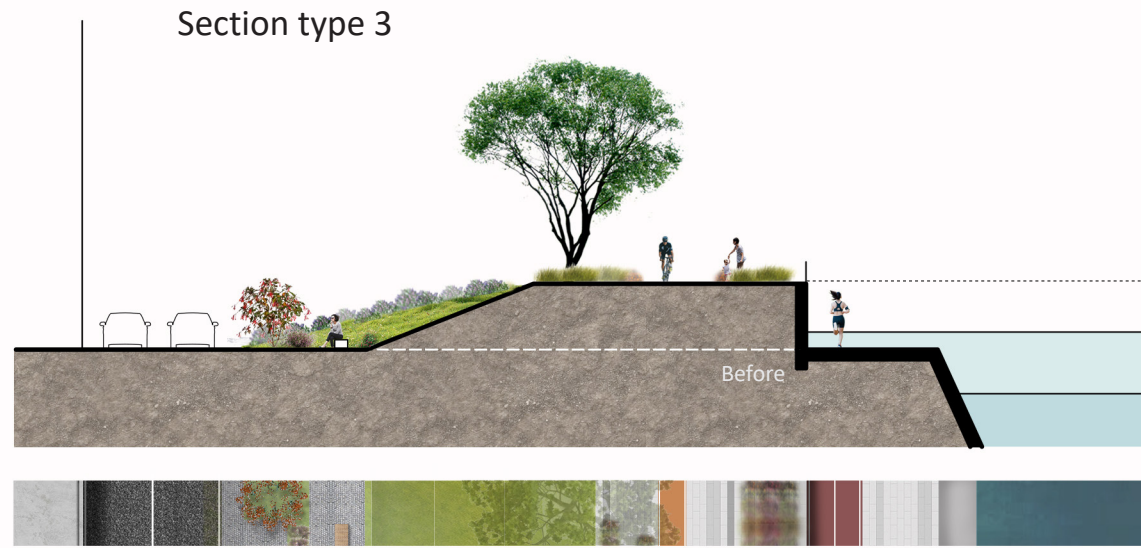
Section type 2



Section type 2



Section type 3

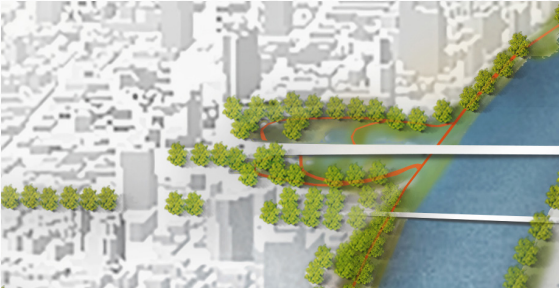


# Pearl River Waterfront--Floodable area

Waterfront park



Haizhu square



Waterfront sports area

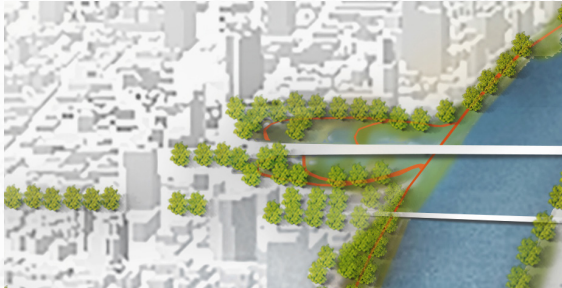


# Pearl River Waterfront--Floodable area

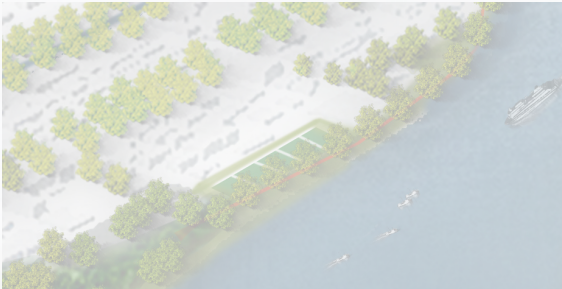
Waterfront park



Haizhu square



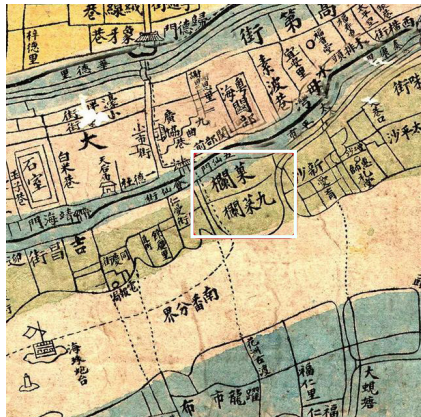
Waterfront sports area



# History of Haizhu square

1900

Because of the commercial development, it used to be market for fruits and vegetable.



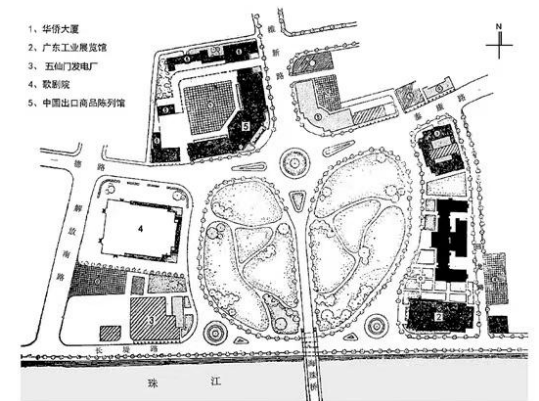
1938

It was bombed and destroyed in the war in 1938



1958

Haizhu Square came into being. It was designed as the central garden of the city

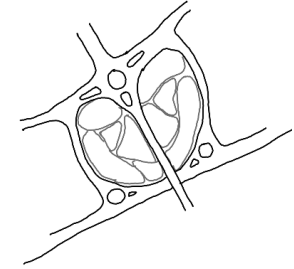
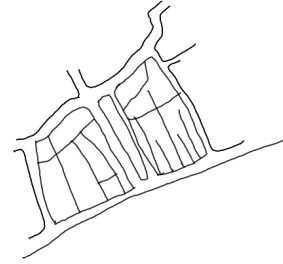
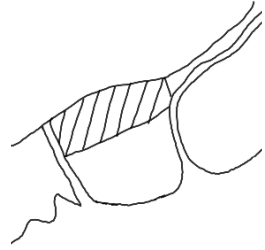


1900

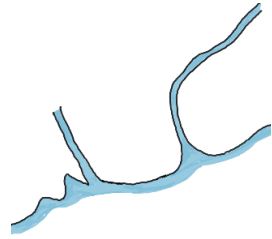
1938

1958

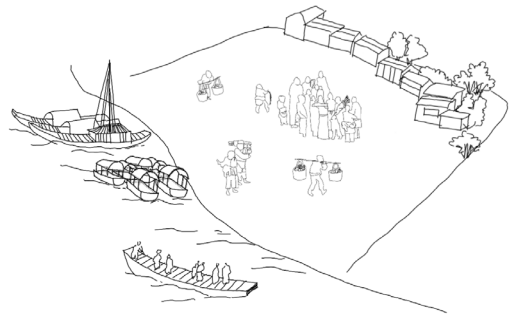
Change of pattern



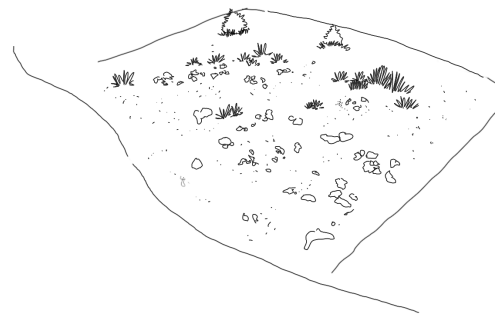
Change of water



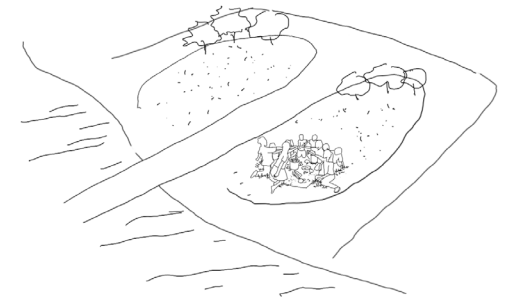
Change of function



fruit and vegetable market



full of garbage and weeds



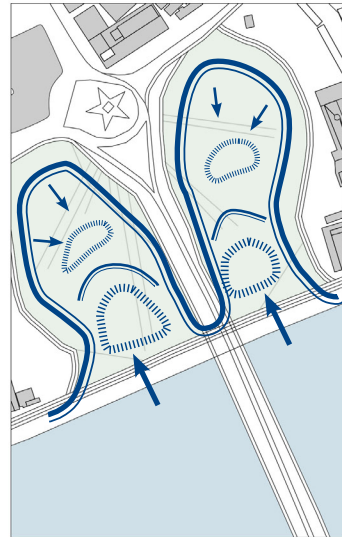
Central garden of the city



# Haizhu square

Current situation

Design exploration



Water



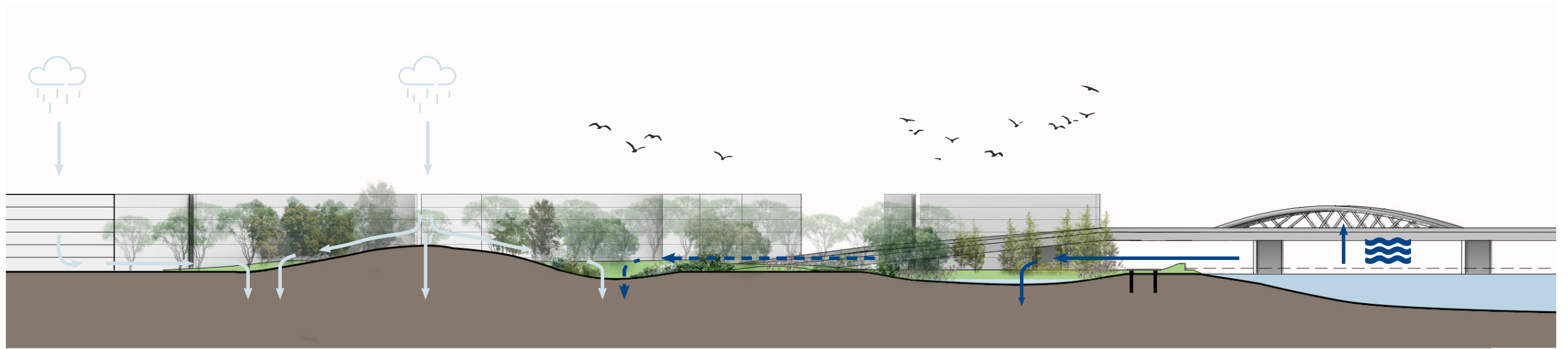
Green



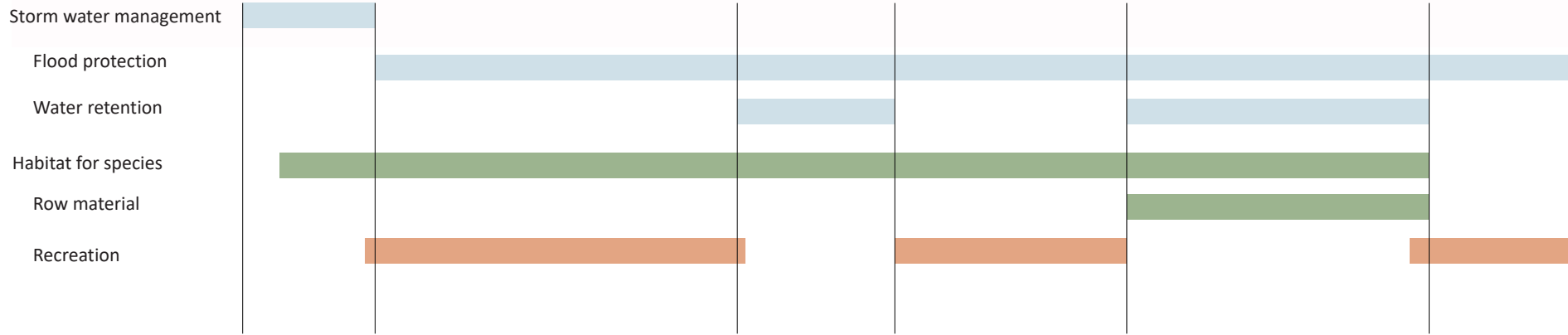
Recreation

0M 10M 50M

# Section

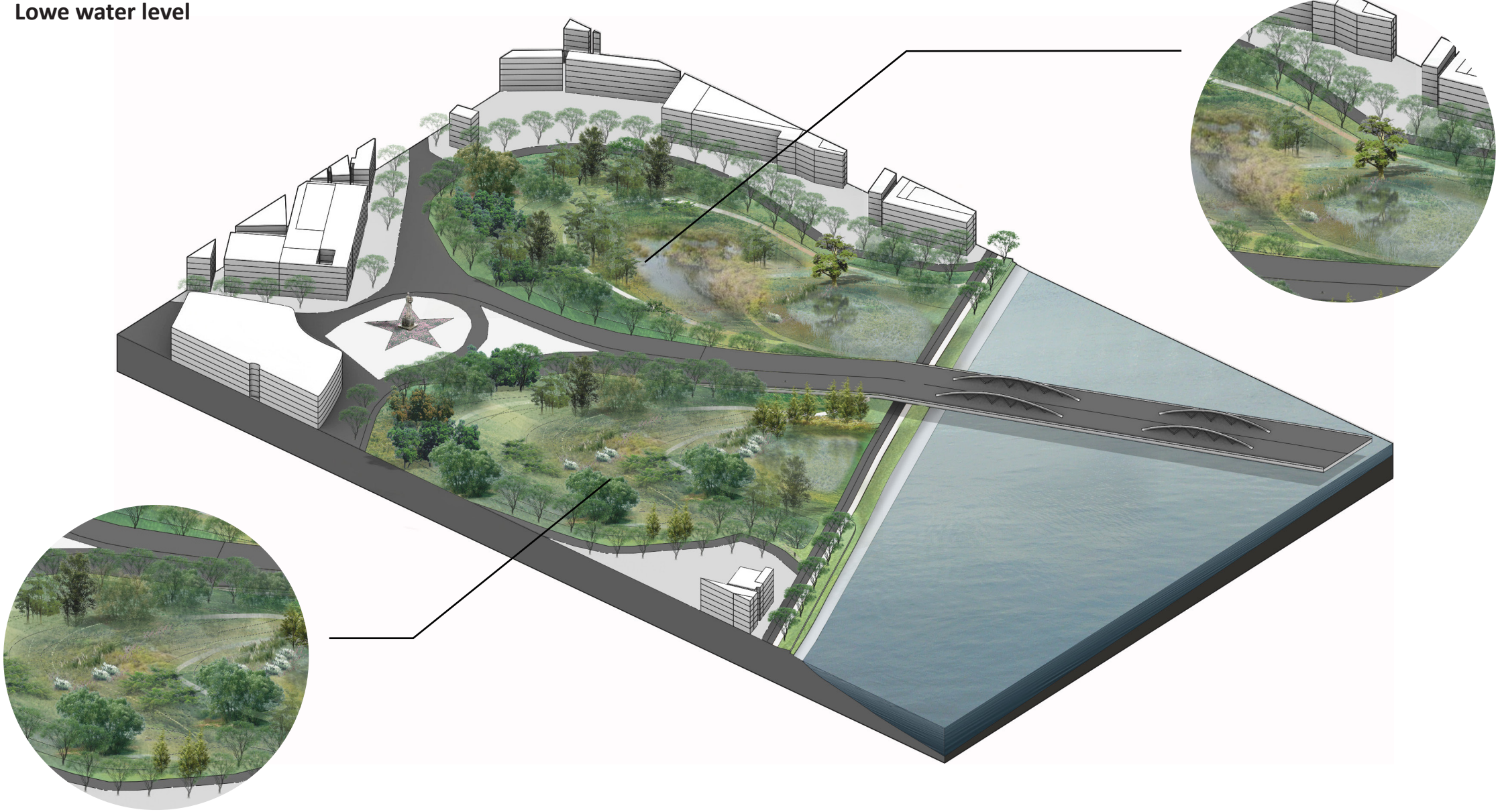


City      Rain garden      higher ground      lower ground      parkway      Wetland      River front dike      Pearl river

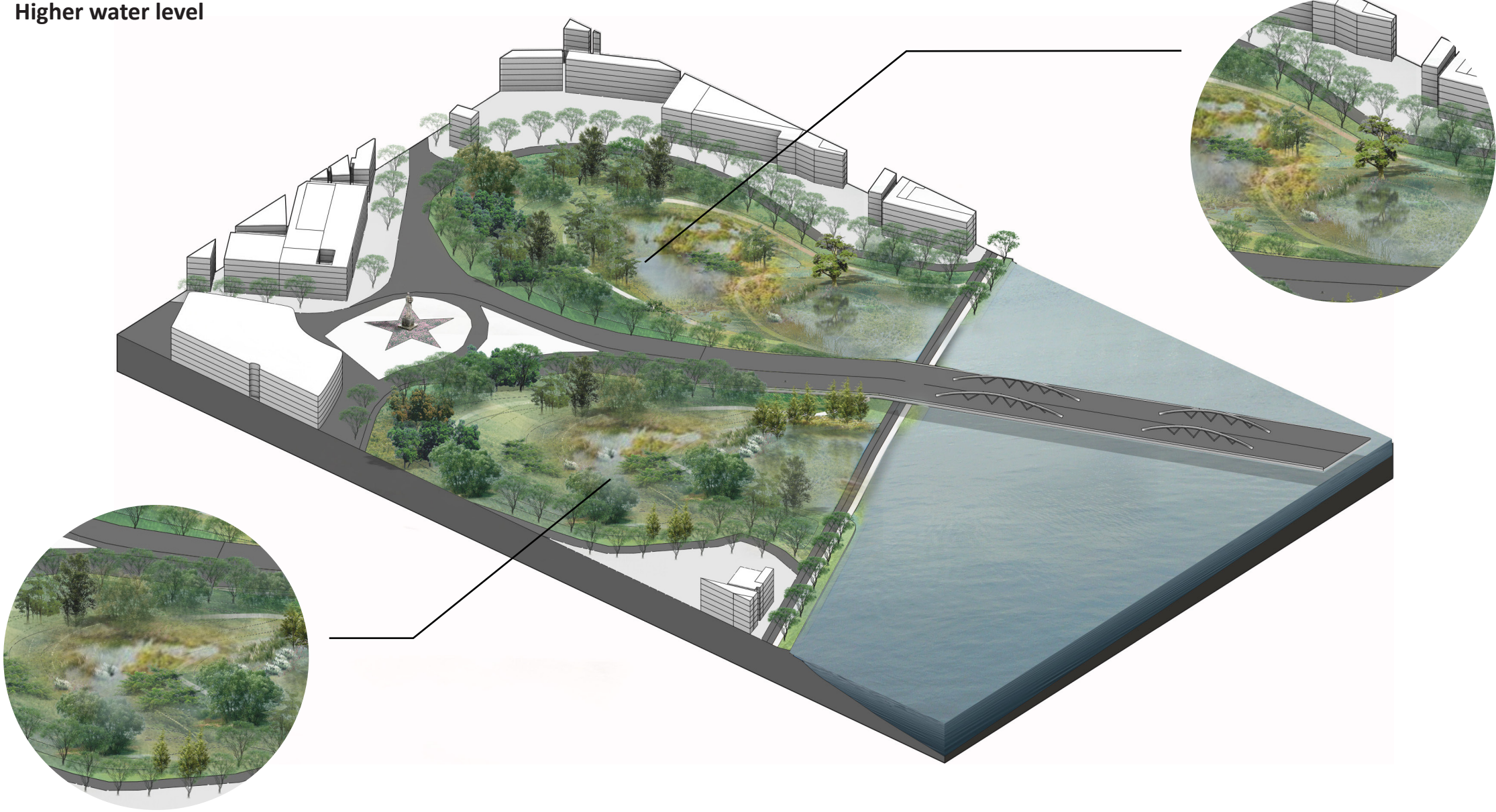


0M 2M 10M

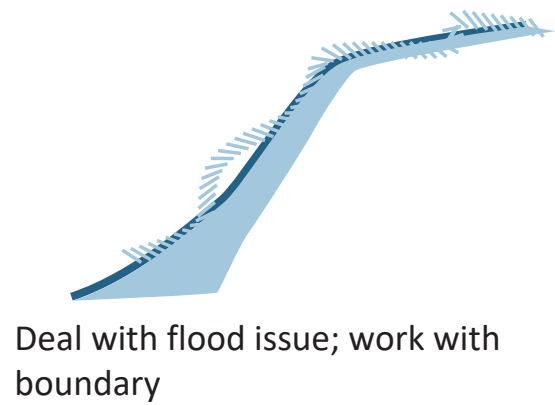
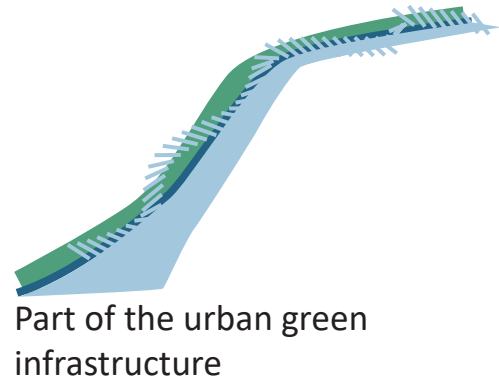
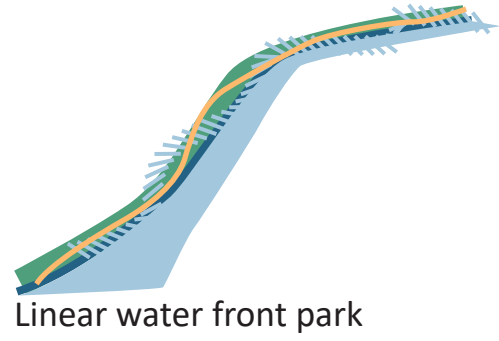
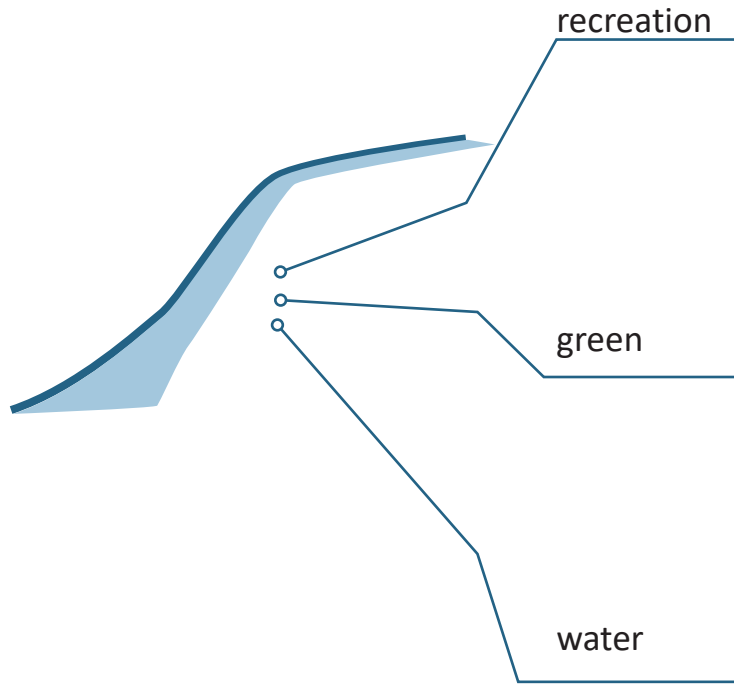
Low water level



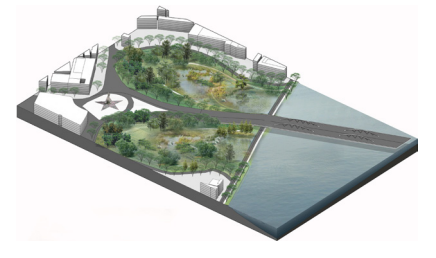
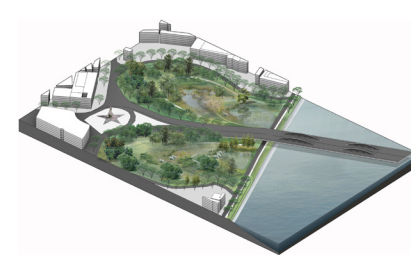
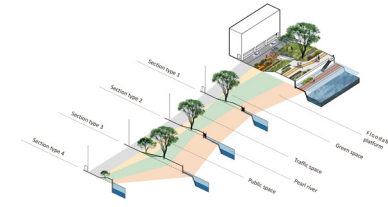
Higher water level



# Lessons learned



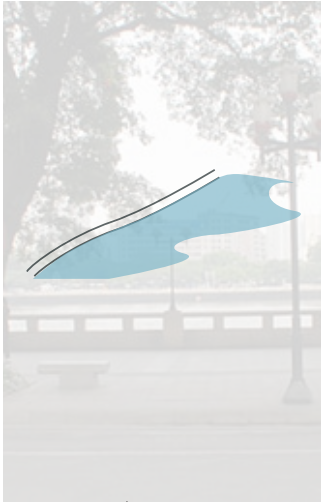
## Scale



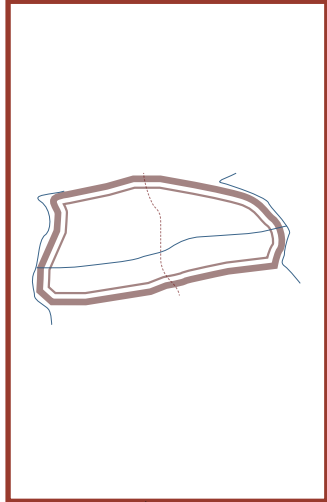
## Time

4 Structures  
of the  
network

Pearl  
river front  
corridor



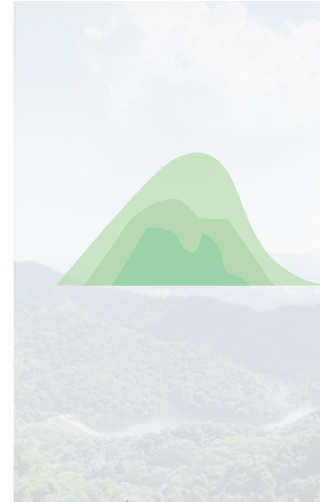
Cultural-  
Historical  
Center



Life along  
water



Eco-habitat  
protection  
zone



Critical & problematic structures

Preserving & Recovery

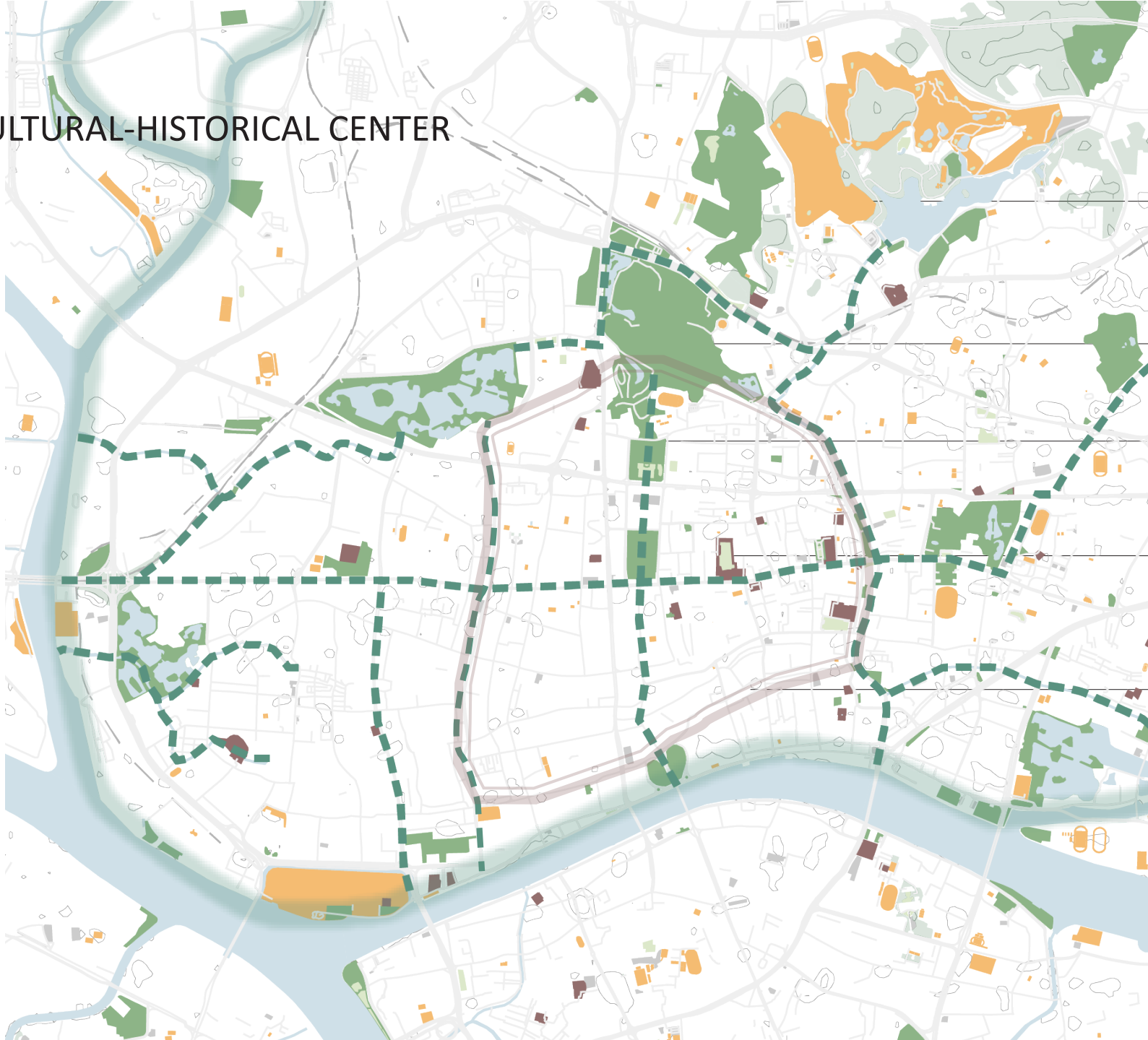
Detail  
design

Pearl  
riverfront  
resilience

transforming  
historical site

reviving old  
canals

CULTURAL-HISTORICAL CENTER



recreational

green space

green way

historical

original city wall

## Problems



Storm water flooding



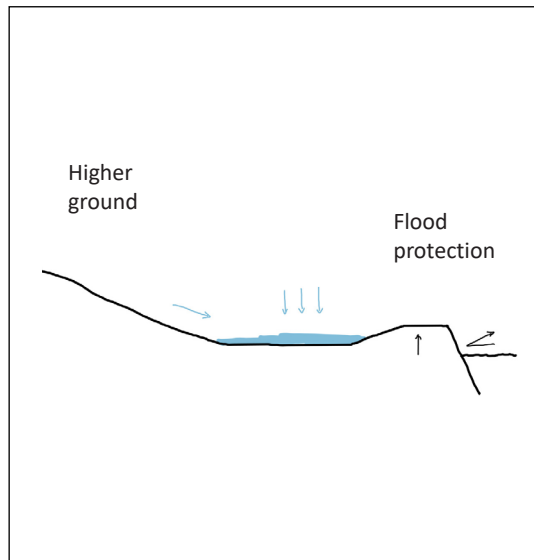
Lack of Green connection



Historical memory loss



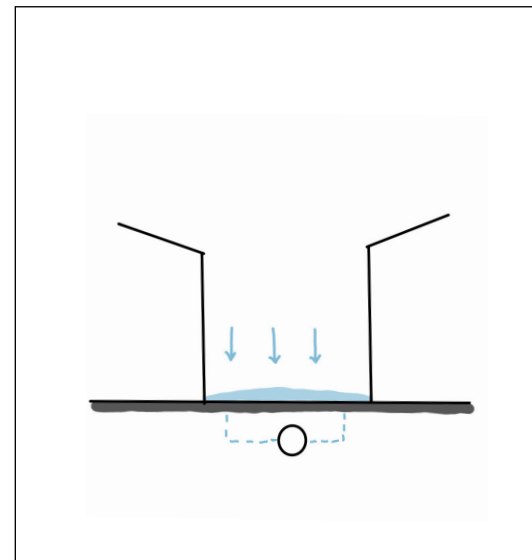
## Reasons for flooding



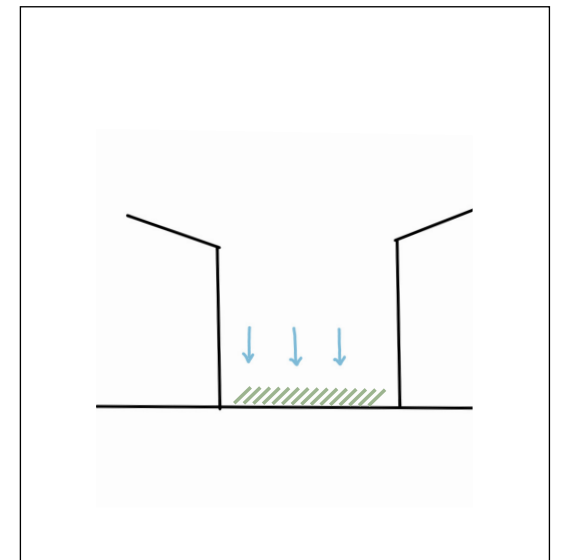
Topography



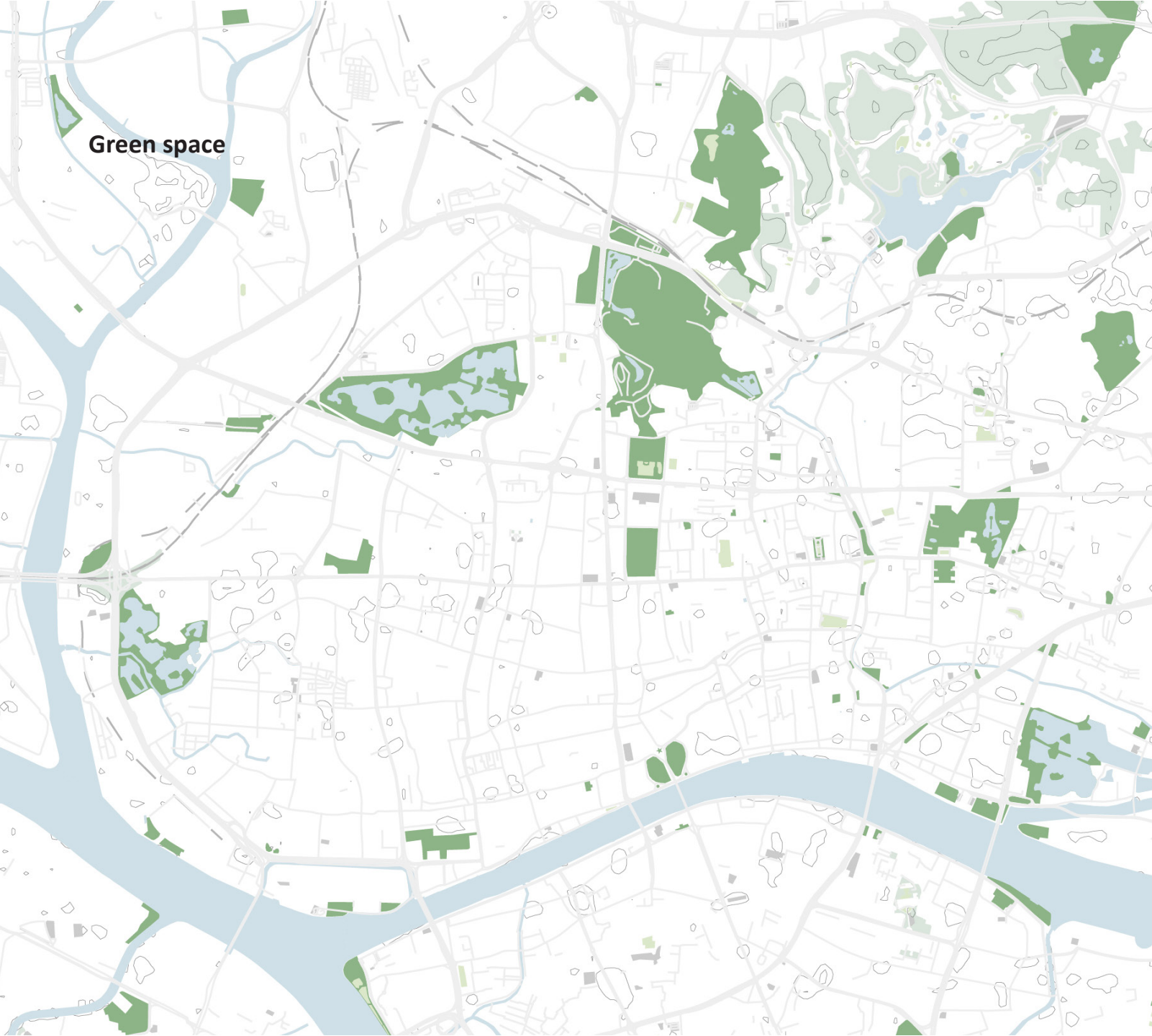
Covered waterway



Old infrastructure



Lack of sponge capacity



Green space

Mountain parks

Wetland parks

city park

Memorial parks

Other parks and squares

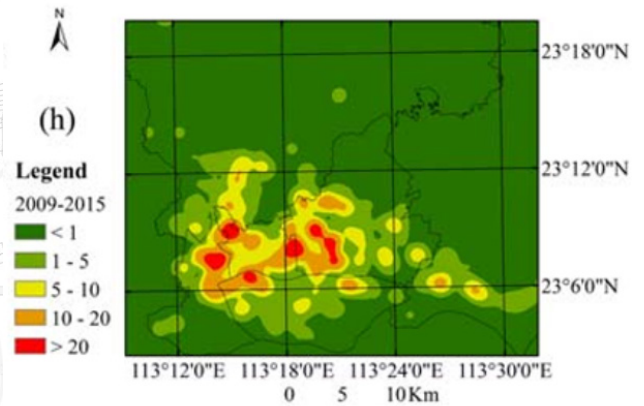
0M 500M 1500M



## Flooding & Disappeared waterways

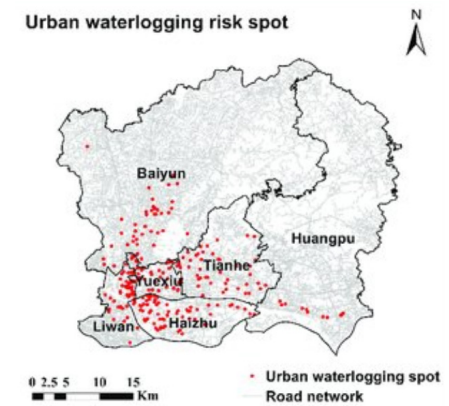


## Overall urban flooding area



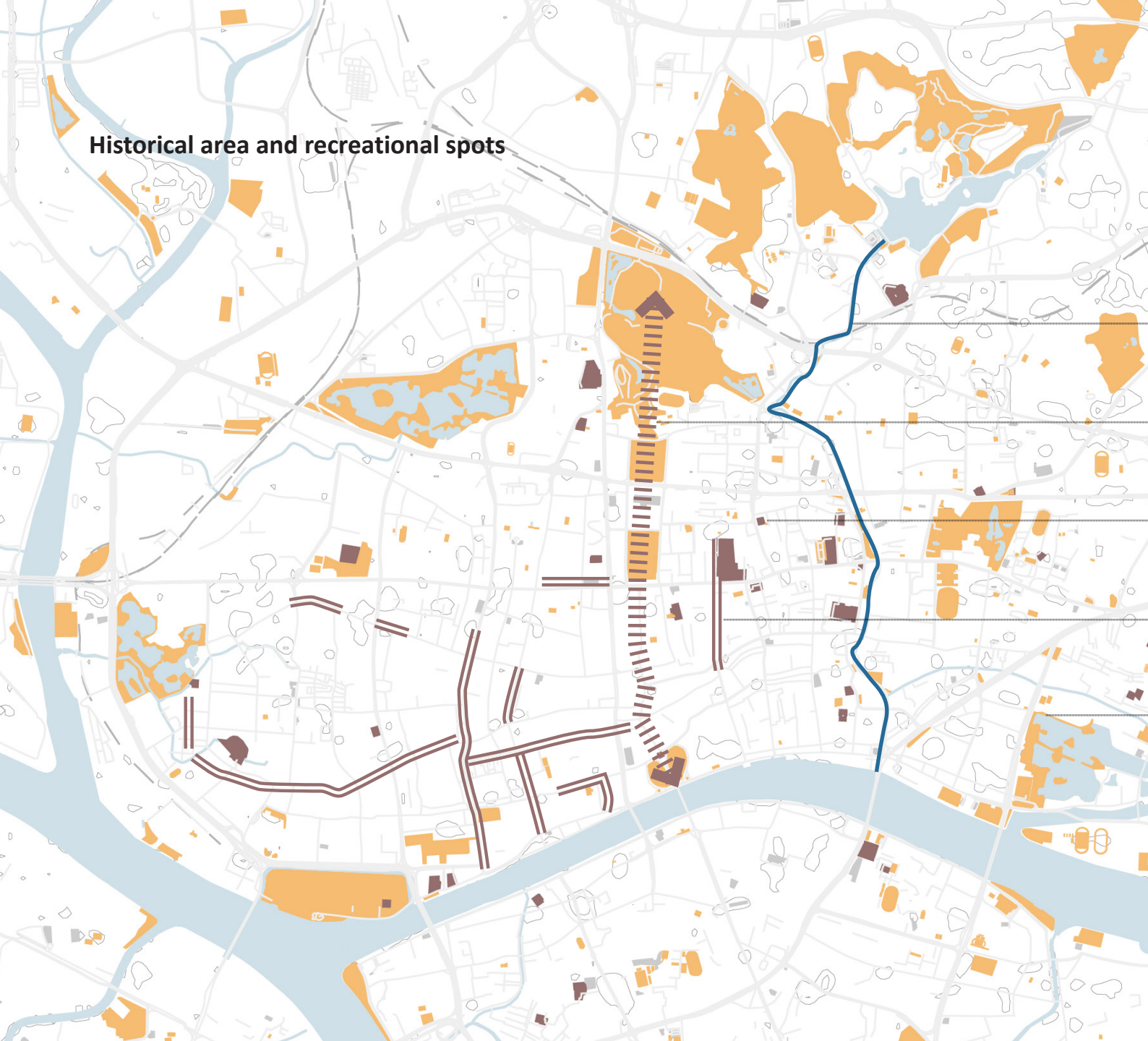
[chrome-extension://efaidnbmninnitbmpajpcgtcltfeindmkaj/https://gp.sysu.edu.cn/sites/gp.live.dpcms4.sysu.edu.cn/files/inline-files/HuangH\\_WangX\\_2018\\_STE\\_The\\_changing\\_pattern\\_of\\_urban\\_flooding\\_Guangzhou\\_China.pdf](chrome-extension://efaidnbmninnitbmpajpcgtcltfeindmkaj/https://gp.sysu.edu.cn/sites/gp.live.dpcms4.sysu.edu.cn/files/inline-files/HuangH_WangX_2018_STE_The_changing_pattern_of_urban_flooding_Guangzhou_China.pdf)

## Urban waterlogging risk spot



[https://www.researchgate.net/publication/325198553\\_Effects\\_of\\_Impervious\\_Surface\\_on\\_the\\_Spatial\\_Distribution\\_of\\_Urban\\_Waterlogging\\_Risk\\_Spots\\_at\\_Multiple\\_Scales\\_in\\_Guangzhou\\_South\\_China](https://www.researchgate.net/publication/325198553_Effects_of_Impervious_Surface_on_the_Spatial_Distribution_of_Urban_Waterlogging_Risk_Spots_at_Multiple_Scales_in_Guangzhou_South_China)

**Historical area and recreational spots**



old canal

old axis

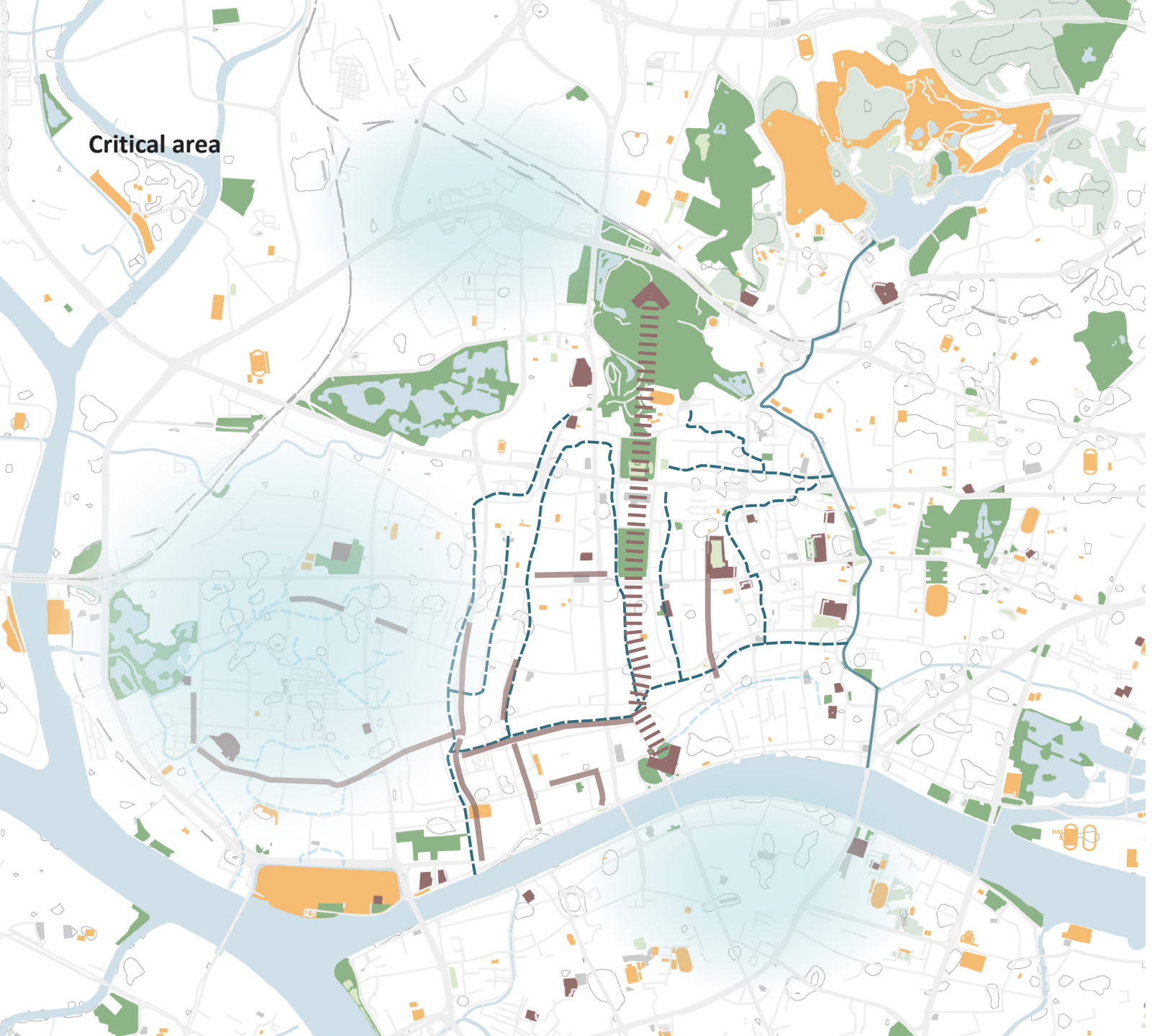
Historical remains

old Qilou street

Recreational area

0M 500M 1500M



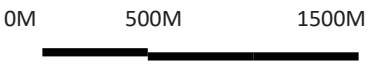


Critical area

hold rain water where it is to relieve the draining pressure of west area

emphasize the cultural identity of the old city

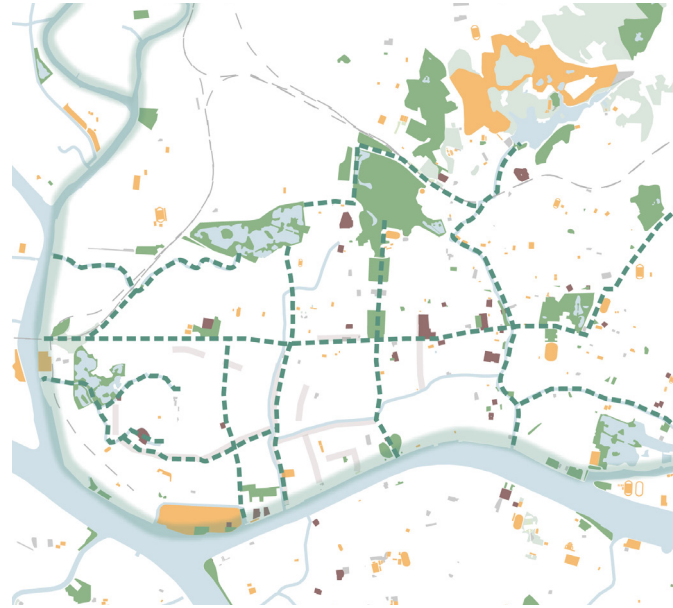
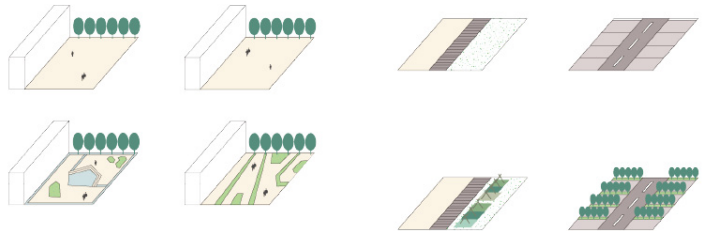
Recreational area and more green space inside old city



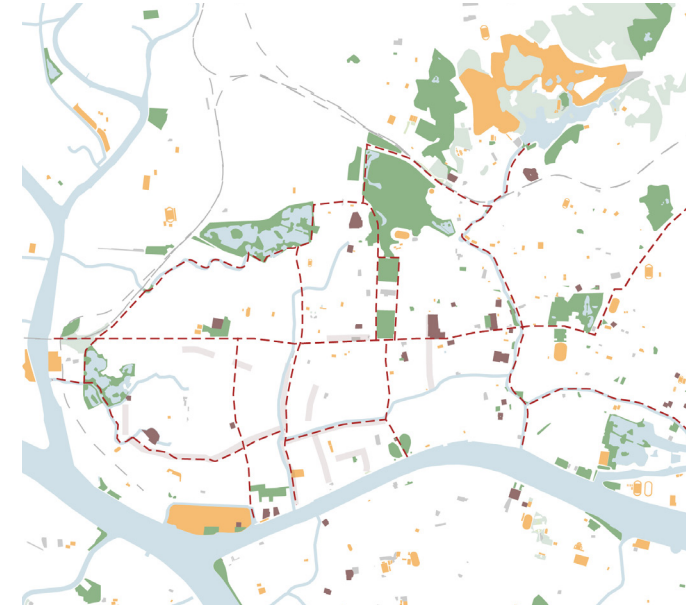
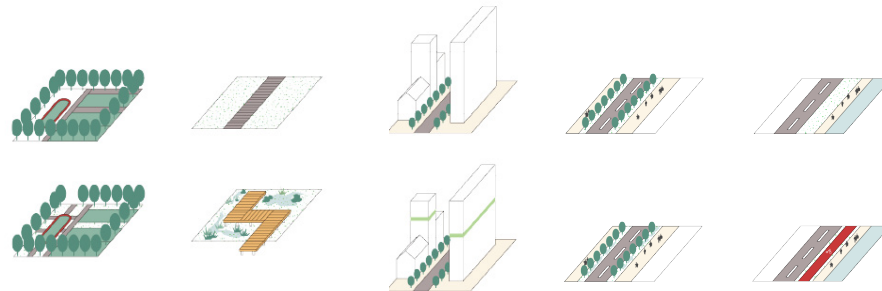
# Strategies



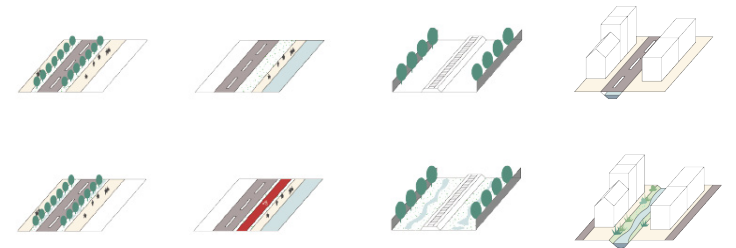
step 1 regeneration of old canals



step 2 improve sponge capacity



step 3 slow-life historical city



# Cultural-Historical Center



Old axis of the city





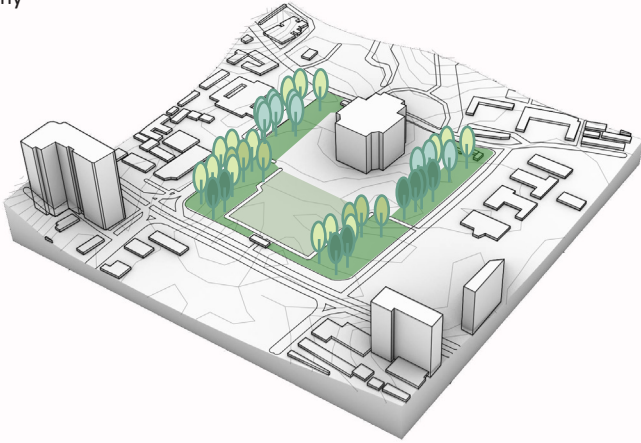
Old axis of the city

Green patch  
Zhongshan memorial park

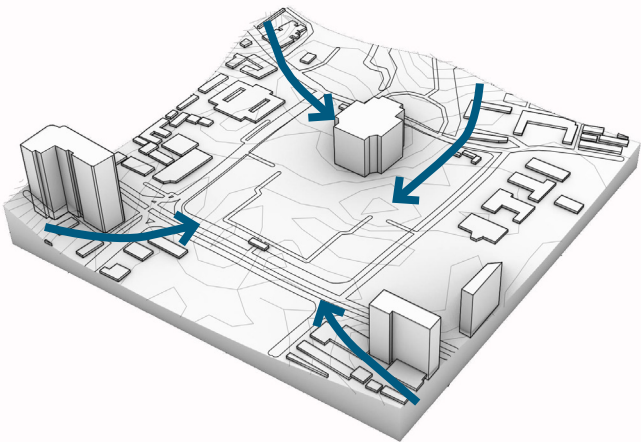


## Green patch-Zhongshan memorial park

Topography



Runoff flow

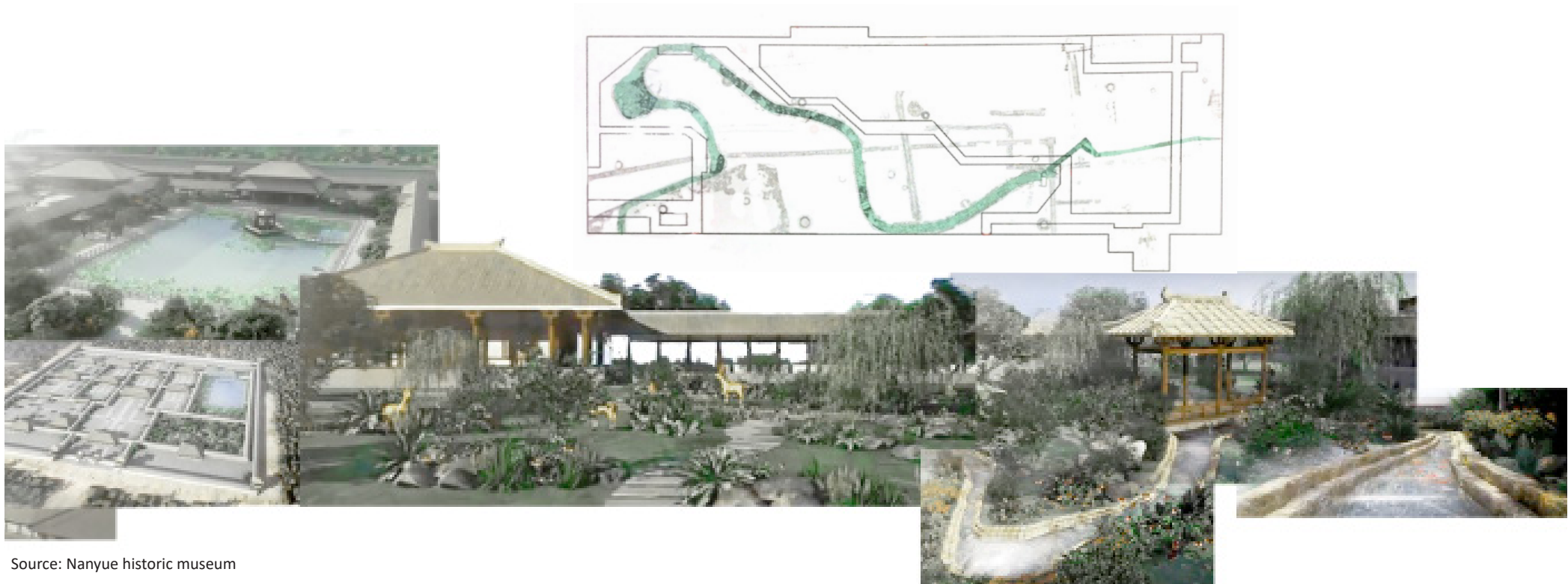


Culture



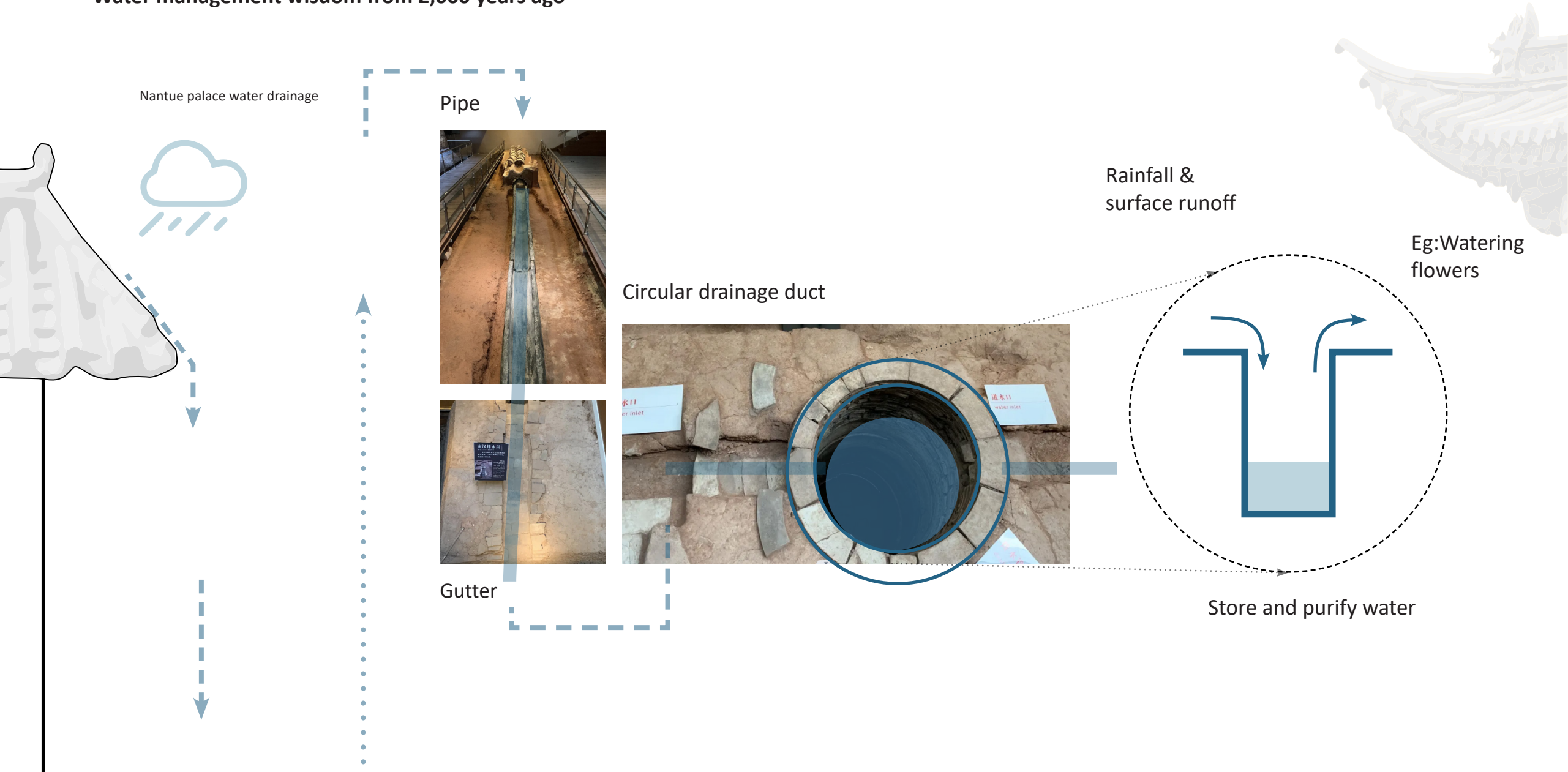
## Water management wisdom from 2,000 years ago

Nantue palace garden



Source: Nanyue historic museum

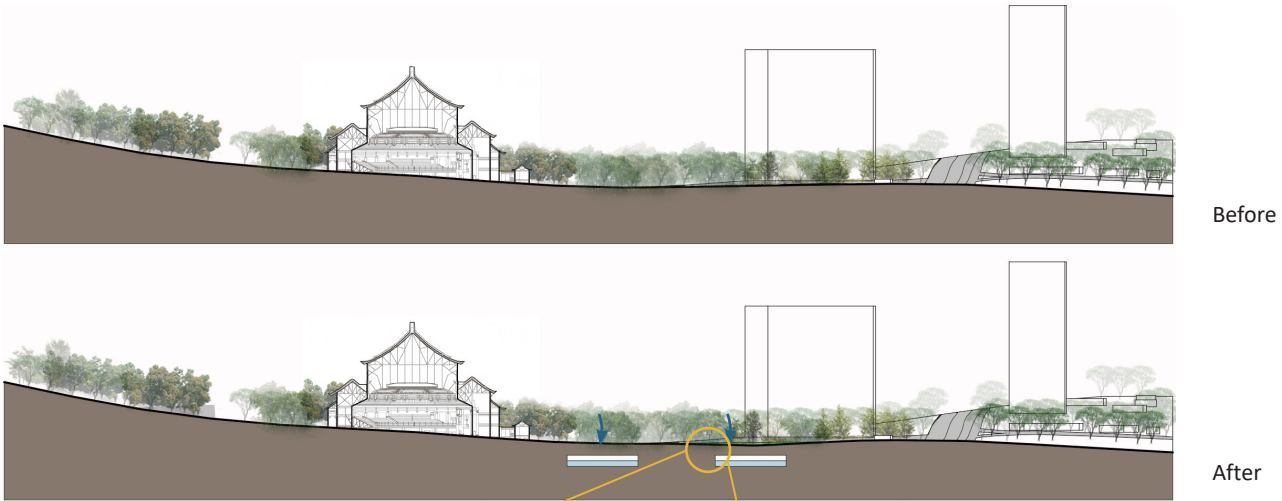
# Water management wisdom from 2,000 years ago



Green patch-Zhongshan memorial park



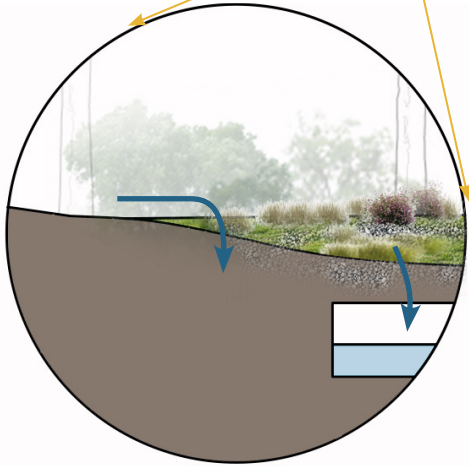
0M 10M 50M



Before

After

0M 10M 50M



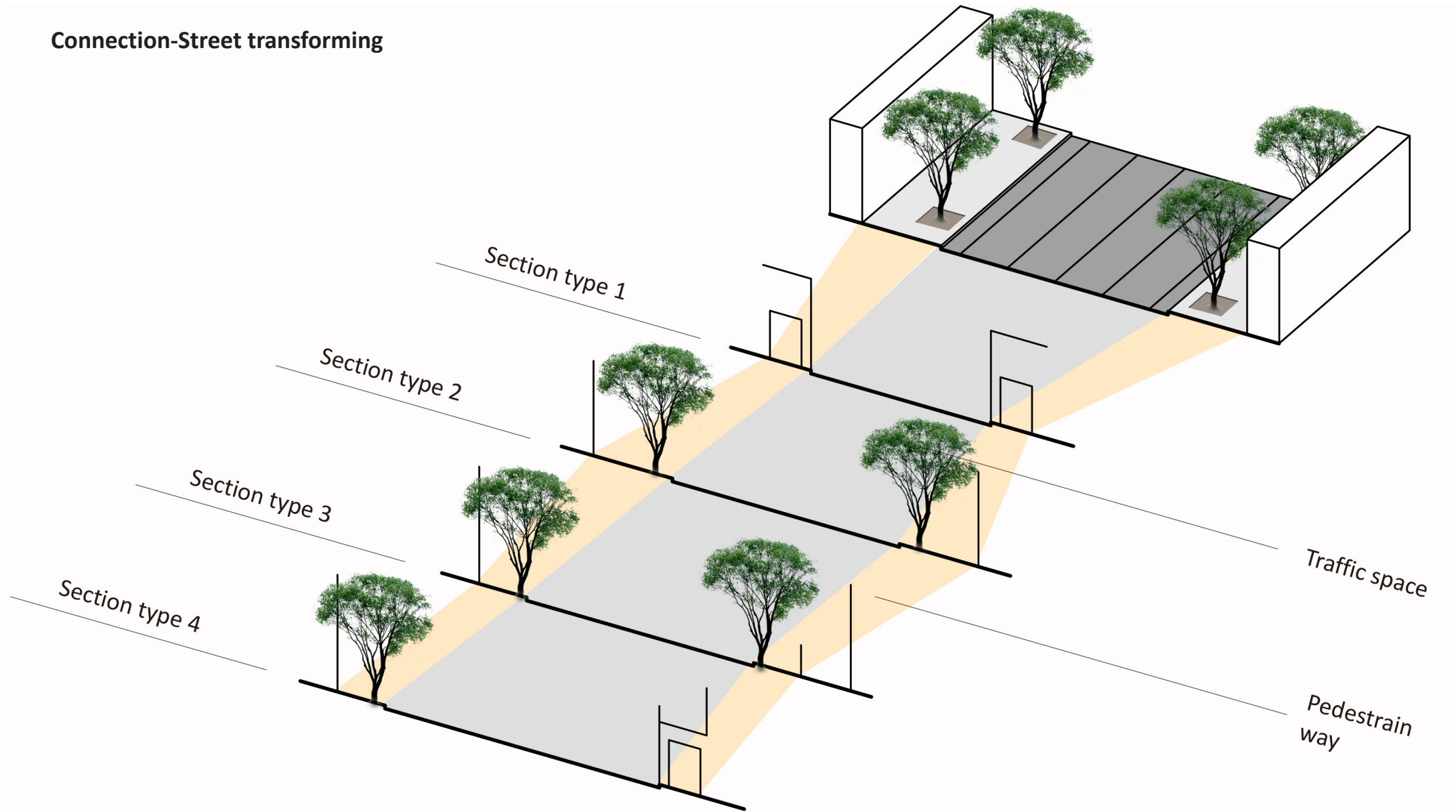
0M 10M 50M

Old axis of the city

Green Connection  
Street transforming



# Connection-Street transforming



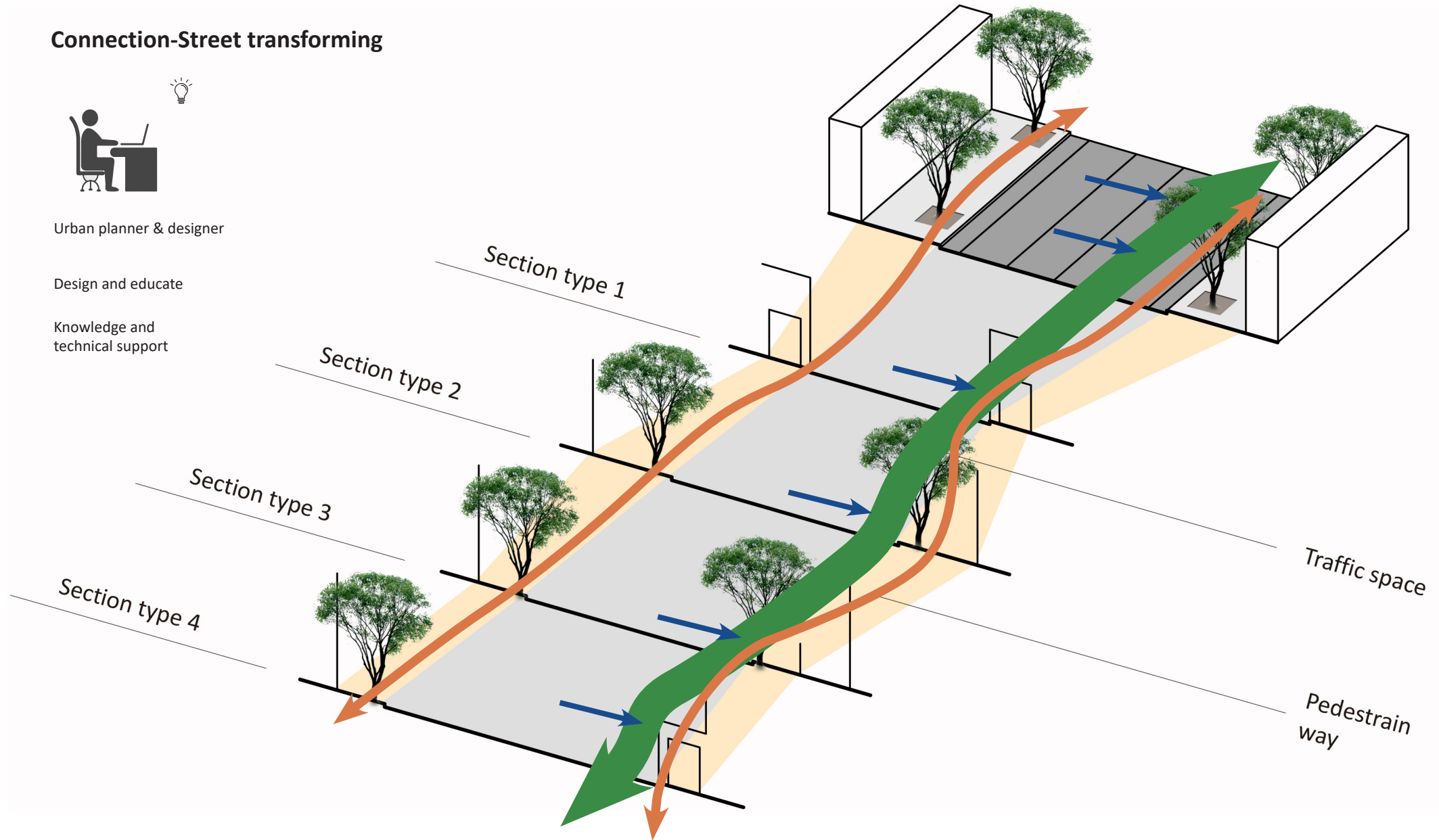
# Connection-Street transforming



Urban planner & designer

Design and educate

Knowledge and technical support



Traffic department



Water department



Government



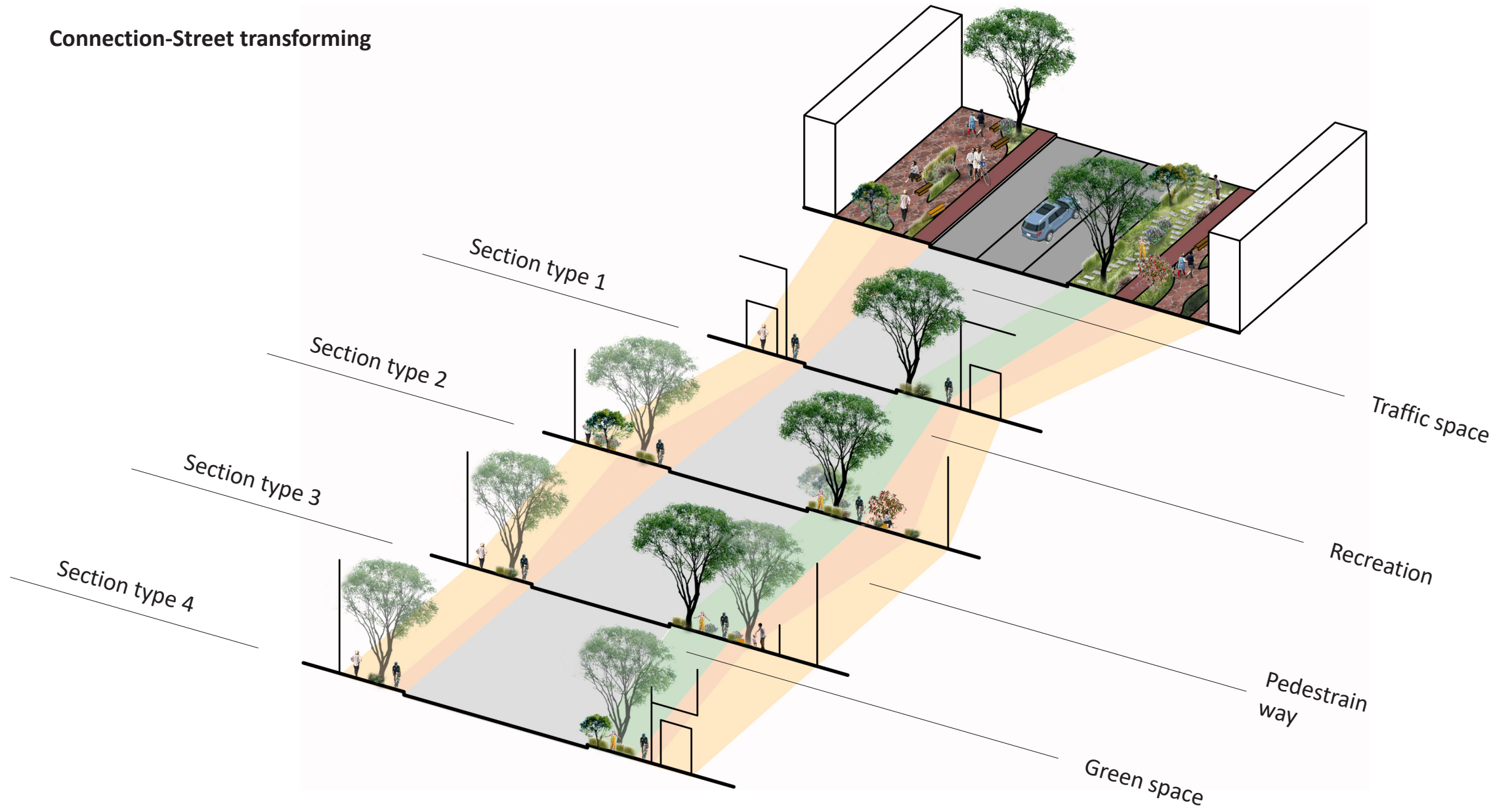
Forestry department

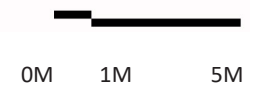
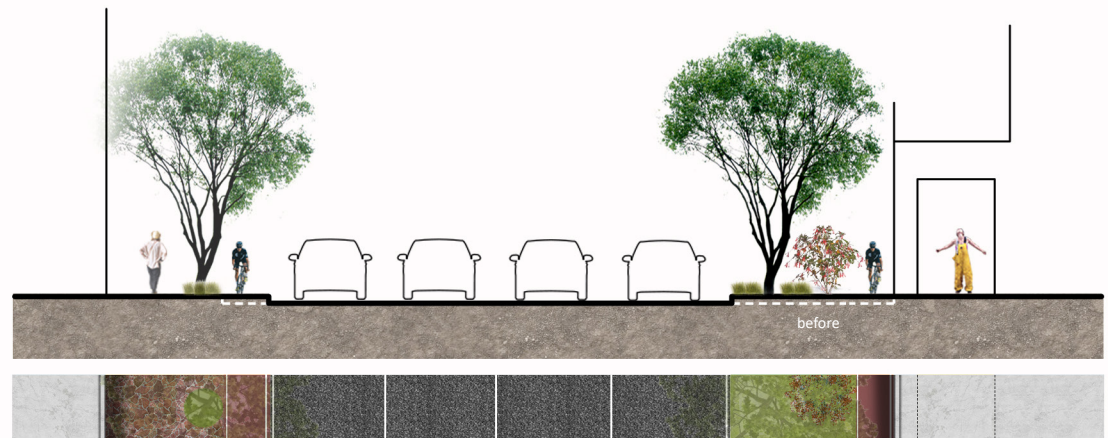
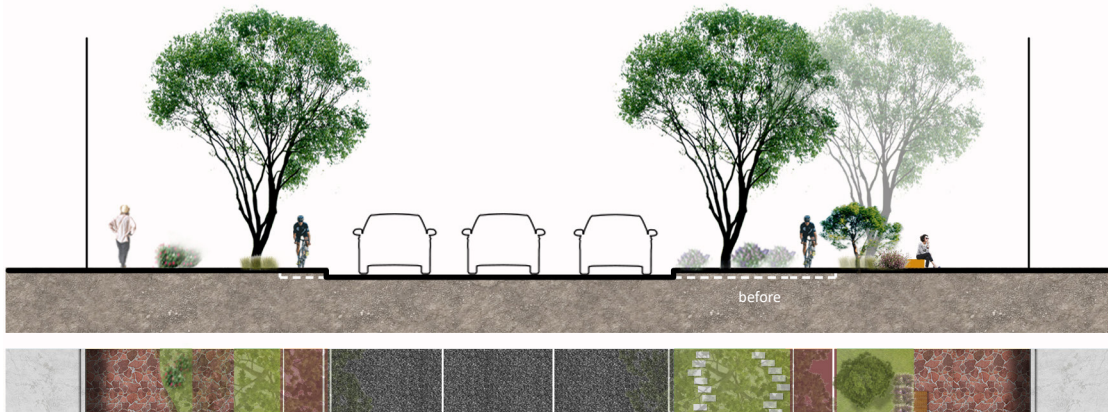
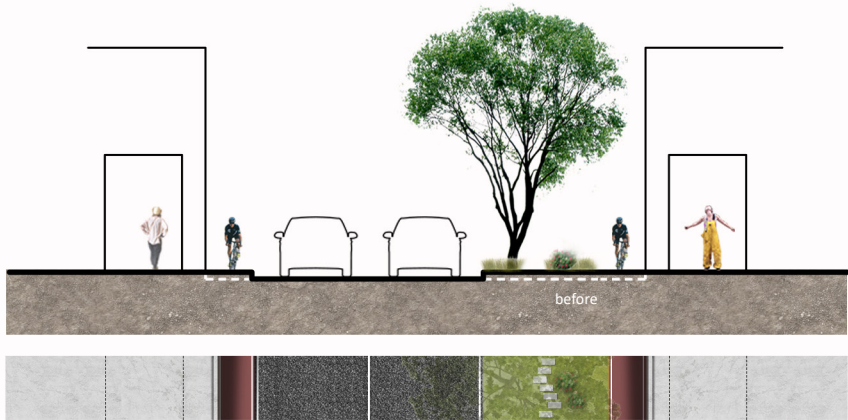
Road transformation

Financial and Construction support



# Connection-Street transforming





Old axis of the city



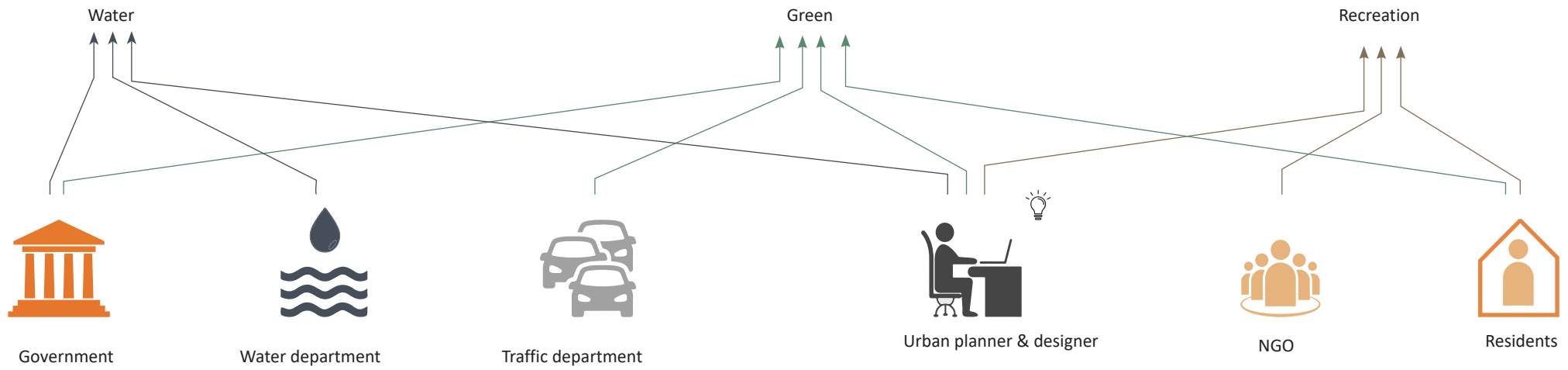
Yudaihao neighbourhood  
green-blue system

History of Yudaihao

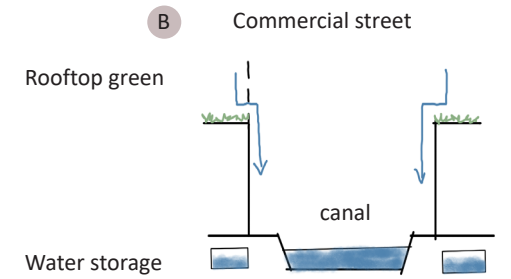
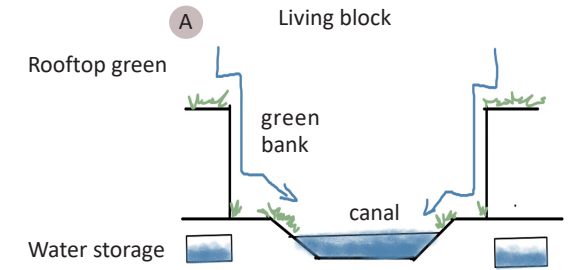
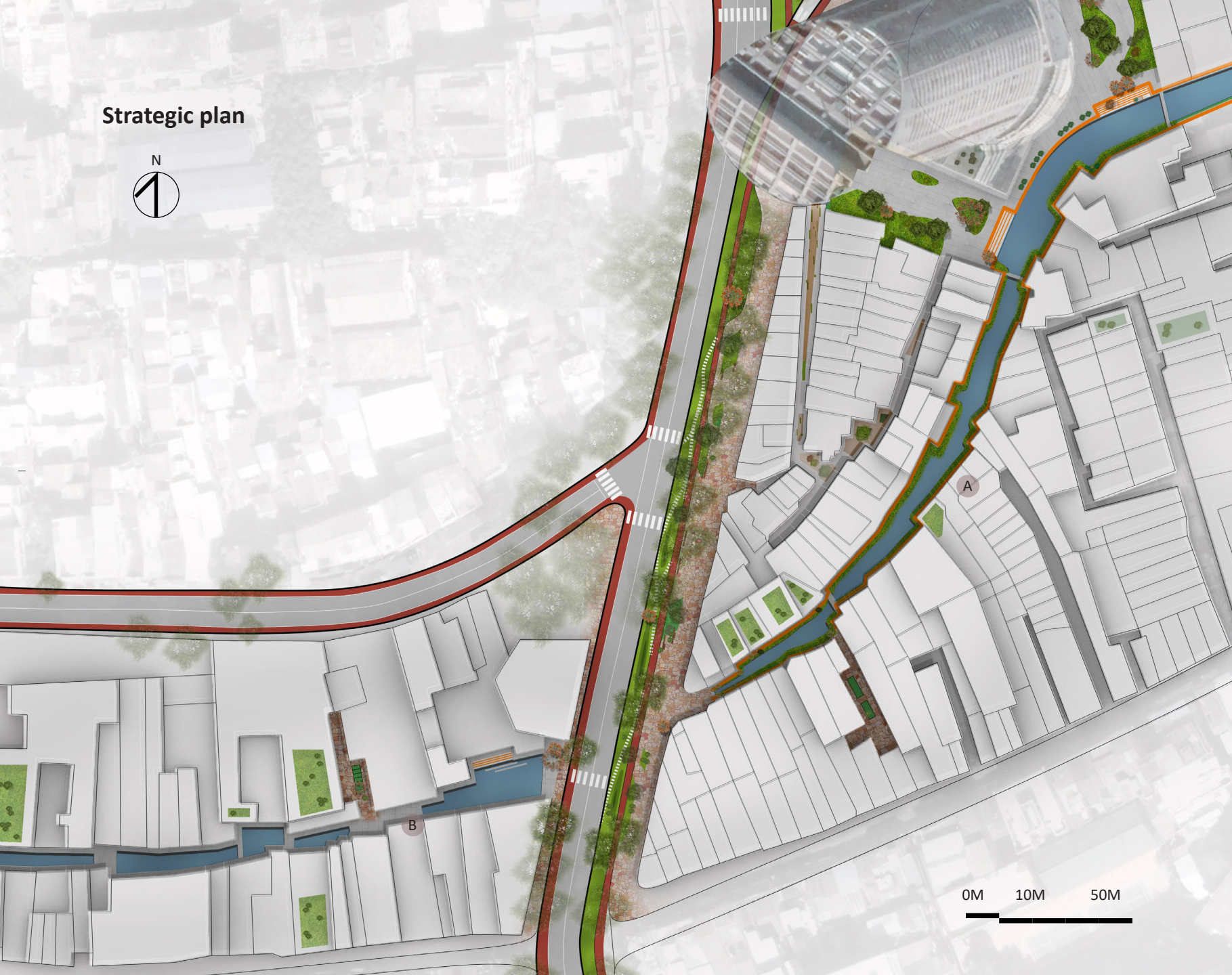


.....>

# Yudaihao Neighborhood green-blue system



# Strategic plan



0M 10M 50M

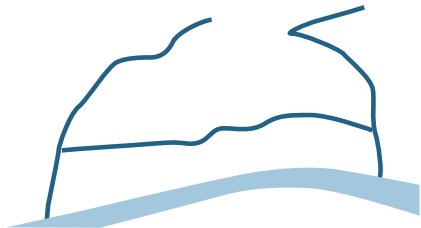


Commercial street

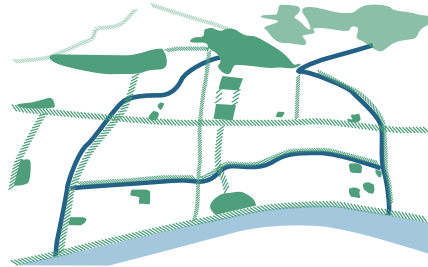


Living block

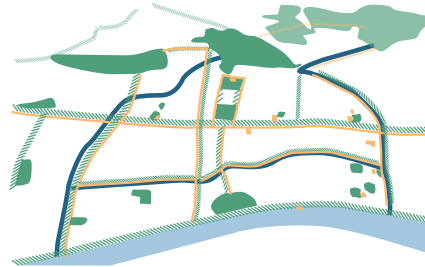
# Lessons learned



Historical waterway water system connection

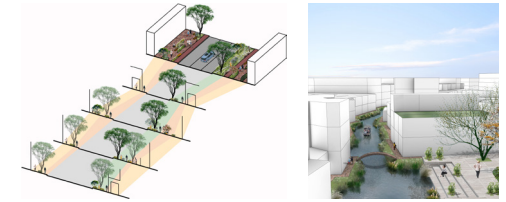


Part of the urban green infrastructure



Interactive recreational-cultural system

## Scale



## Palimpsest



nature system  
ADAPTATION

Read site from history;  
learn from traditional wisdom

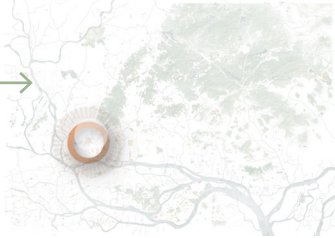




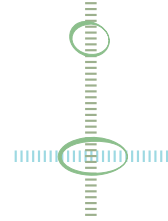
**A LANDSCAPE-NATURE NETWORK** IN GUANGZHOU

## More problematic parts of the structure

### OLD CITY CENTER



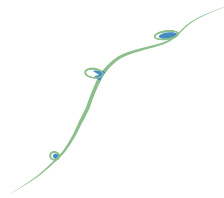
### Regional strategies



### Detail design

Historical green patch  
Connection  
Historical canal

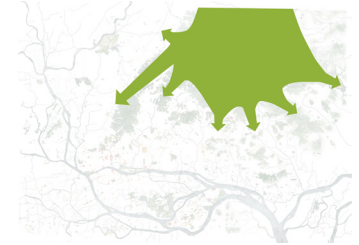
### PEARL RIVERFRONT CORRIDOR



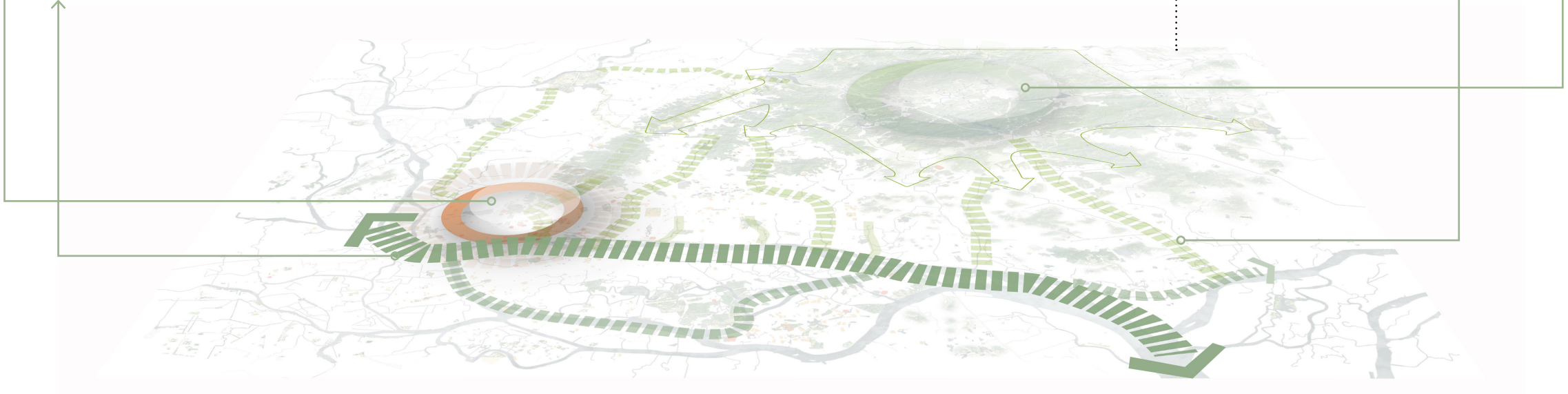
Floodable area  
Protection

## Existing parts of the structure

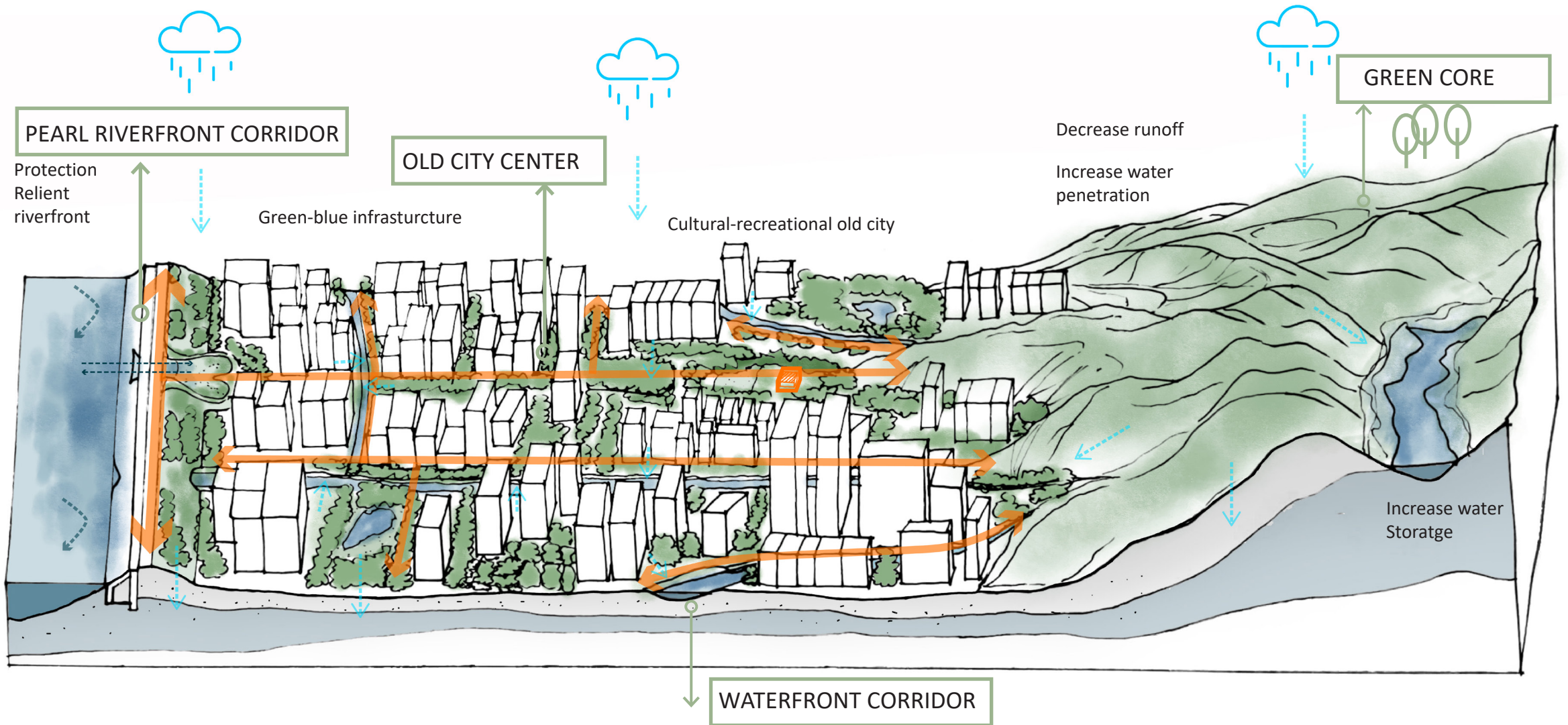
### GREEN CORE



### WATERFRONT CORRIDOR



# HOW DOES THE SYSTEM WORK?



An aerial photograph of Guangzhou, China, overlaid with a network of red lines and colored markers. The red lines form a complex, interconnected web across the city, following major roads and river corridors. Numerous small, semi-transparent colored squares (red, orange, yellow, and green) are scattered throughout the urban landscape, indicating specific nodes or points of interest within the network. The background shows a mix of urban development, green spaces, and water bodies.

**A LANDSCAPE-NATURE NETWORK IN GUANGZHOU**