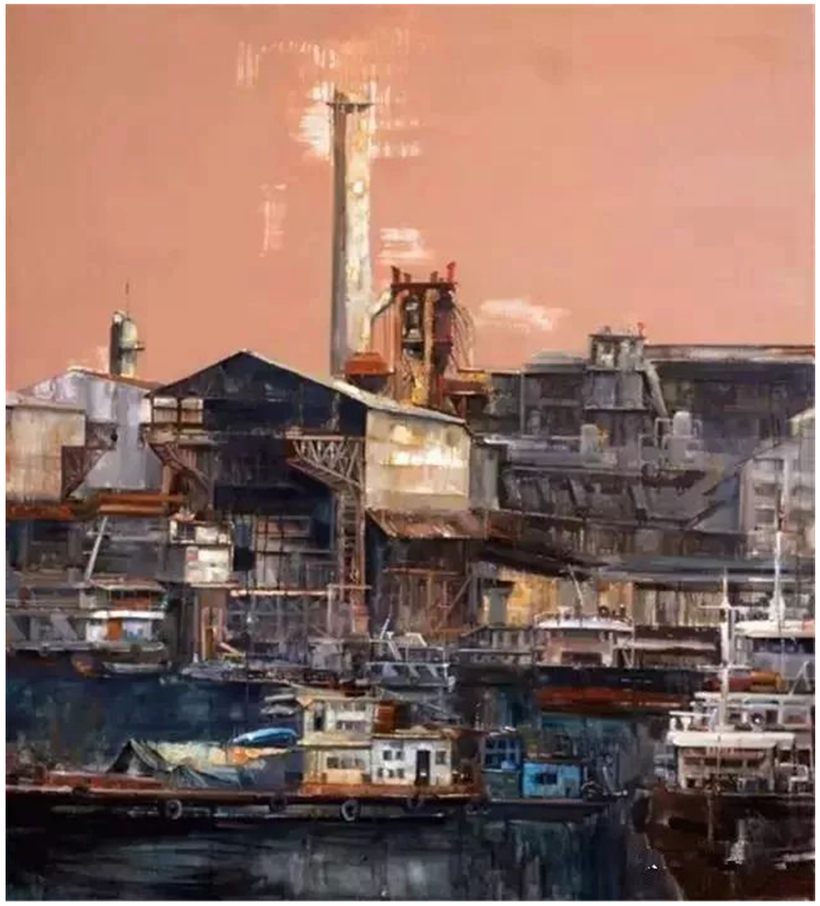


WATER RESILIENT INDUSTRIAL TRANSFORMATION

Yijing Li

First Mentor: Steffen Nijhuis

Second Mentor: Lei Qu

Graduation Project, TU Delft

INTROIDUCTION

ANALYSIS

PRINCIPLE
&
STRATEGY

DESIGN EXPLORATION

REFLECTION

FASCINATION



ECOLOGICAL

SOCIAL

CULTURAL

FASCINATION

GUANGZHOU

FOSHAN

DONGGUAN

WE WILL SURVIVE!

SHUNDE

JIANGMEN

ZHONGSHAN

SHENZHEN

ZHUHAI

HONGKONG

MACAO













FASCINATION

BEFORE – WORK & LIVE WITH NATURE



Dike - fish pond system



Water village



Dense water network



Transport by water

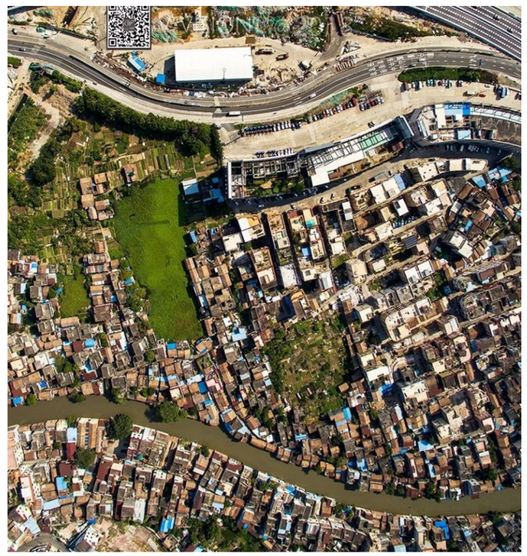
AFTER – INDUSTRIALIZATION



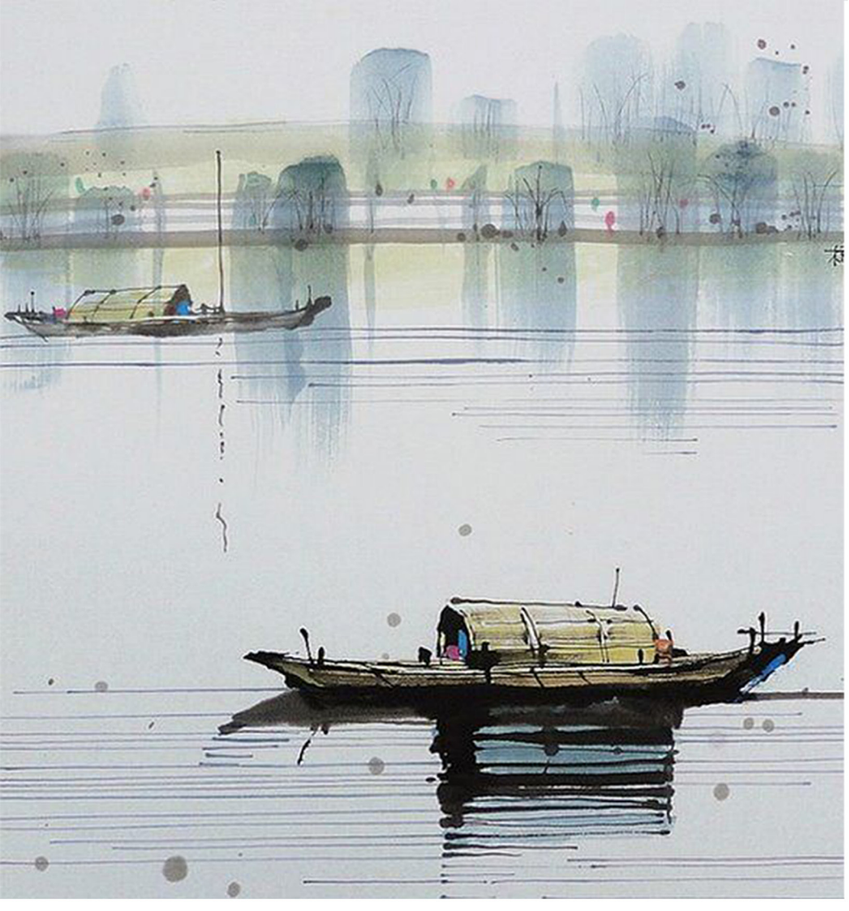
Factories replace farmland

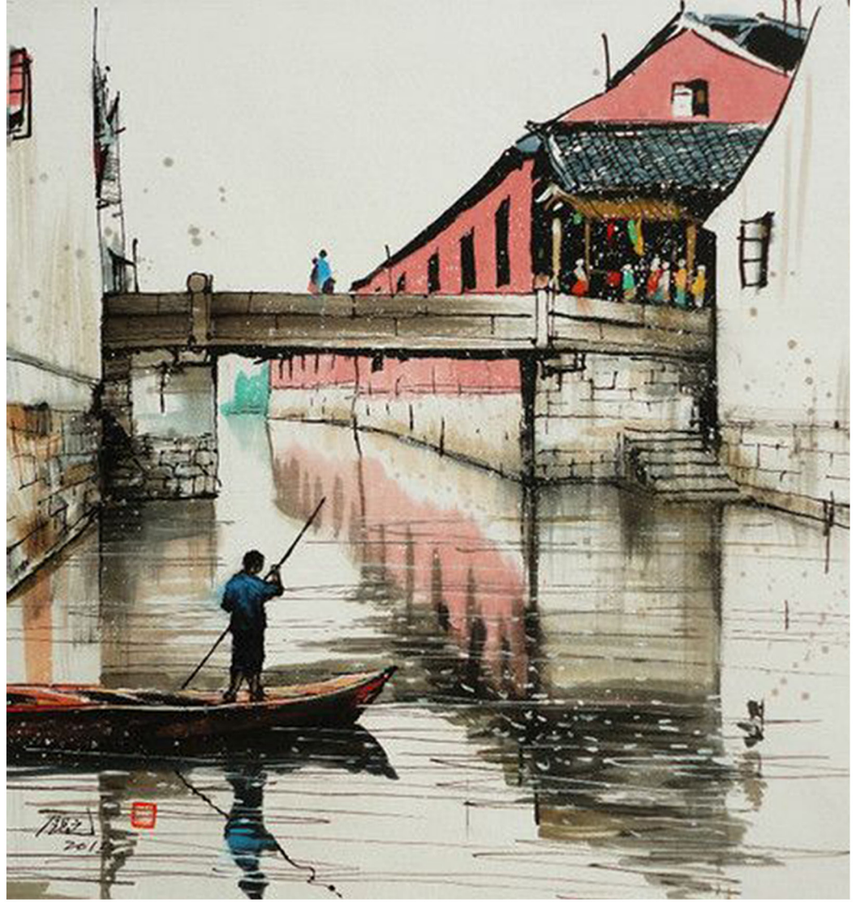


Road dominated traffic



Filling and narrowing waterways









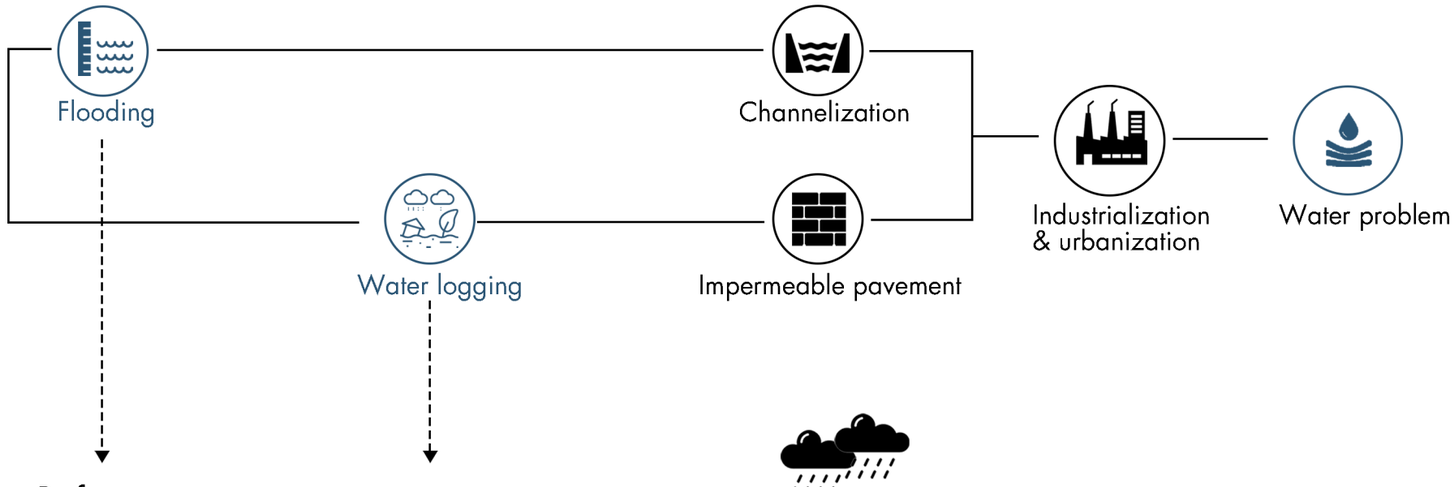


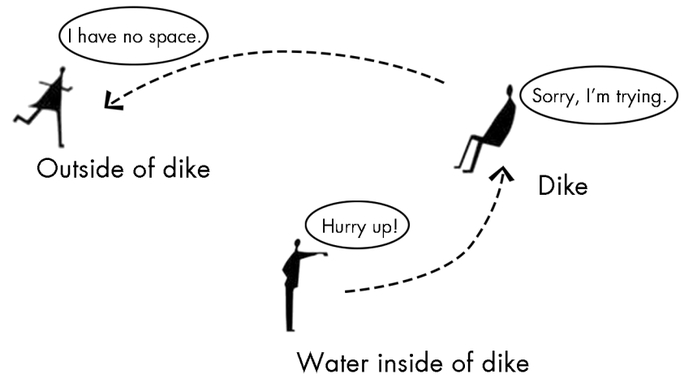


PROBLEM STATEMENT – WATERLOGGING



PROBLEM STATEMENT – WATERLOGGING





Before

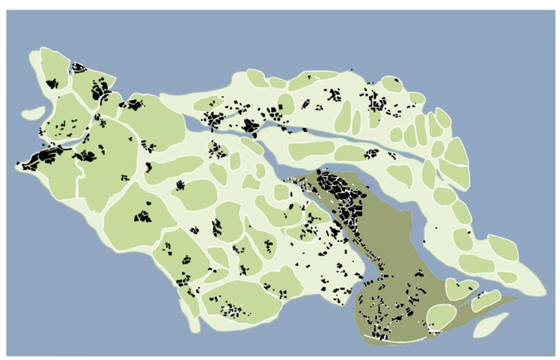




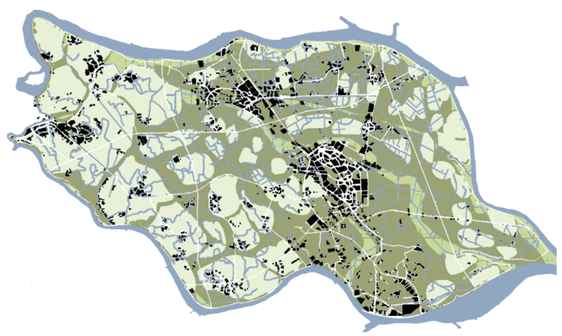
After industrilizaiton



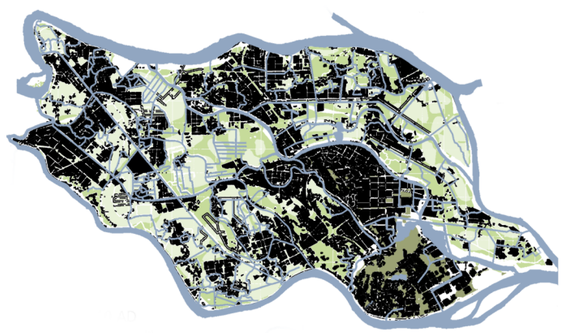
PROBLEM STATEMENT – UNCONTROLLED INDUSTRIALIZATION



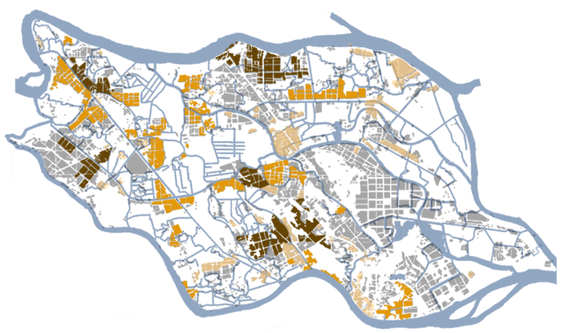
Before 1978



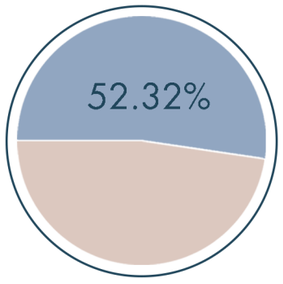
1978 - 1992



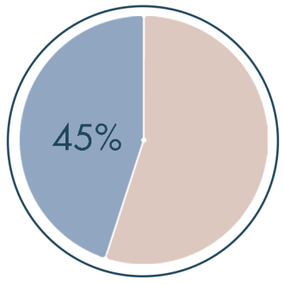
2010



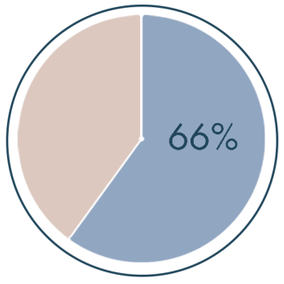
Industrialization (2010)



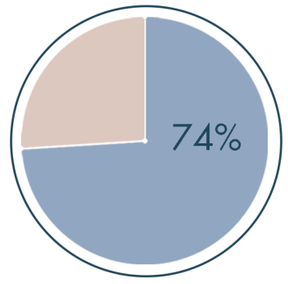
Built-up area/
Whole area



Industrial area/
Built-up area



Low-efficiency
industrial area/



Broken industiral
area

ABANDONED INDUSTRY IN SHUNDE











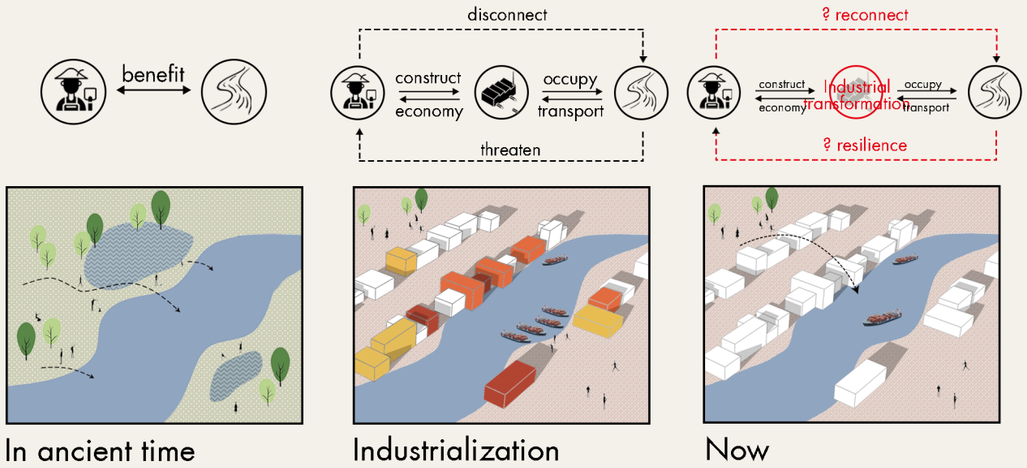


Can we make use of the chance of industrial transformation to explore landscape strategies for water resilience?



OBJECTIVE & RESEARCH QUESTIONS

" Identify and explore landscape based strategies and design principles for water resilient industrial transformation in Shunde district. "



To develop the thesis, the following 5 sub-questions need to be answered:

1. What is the difference between the existing water management system and historical water management strategies in Shunde district? Why the existing water management system cannot satisfy the discharge assignment?
2. What is the relationship between waterlogging and industrialization? Except for waterlogging, what are the other problems caused by industrialization?
3. What landscape-based principles and design strategies can help water resilience and industrial transformation work in an intergrown way?
4. How to apply the design strategies into the site and what are the potentials for landscape development in different scales?
5. What are the lessons learned from combing water resilience and industrial transformation?

METHODOLOGY

OBJECTIVE	RESEARCH QUESTIONS	METHODOLOGY	
Water resilient industrial transformation	**Understanding** water resilient industrial transformation - analysis - existing water management system | relationship between water problem and industrialization | existing condition of industrial area	MAPPING LITERATURE REVIEW FIELD TRIP	DESIGN RESEARCH
Landscape based strategies	**How** to improve water resilience in industrial transformation - principles | strategies - strategies for water resilience | strategies for industrial transformation	CASE STUDY LITERATURE REVIEW	
Design exploration - design - green and blue structure | water contribution | reuse of pulic space | process		MAPPING	RESEARCH BY DESIGN
Reflection			

INTROIDUCTION

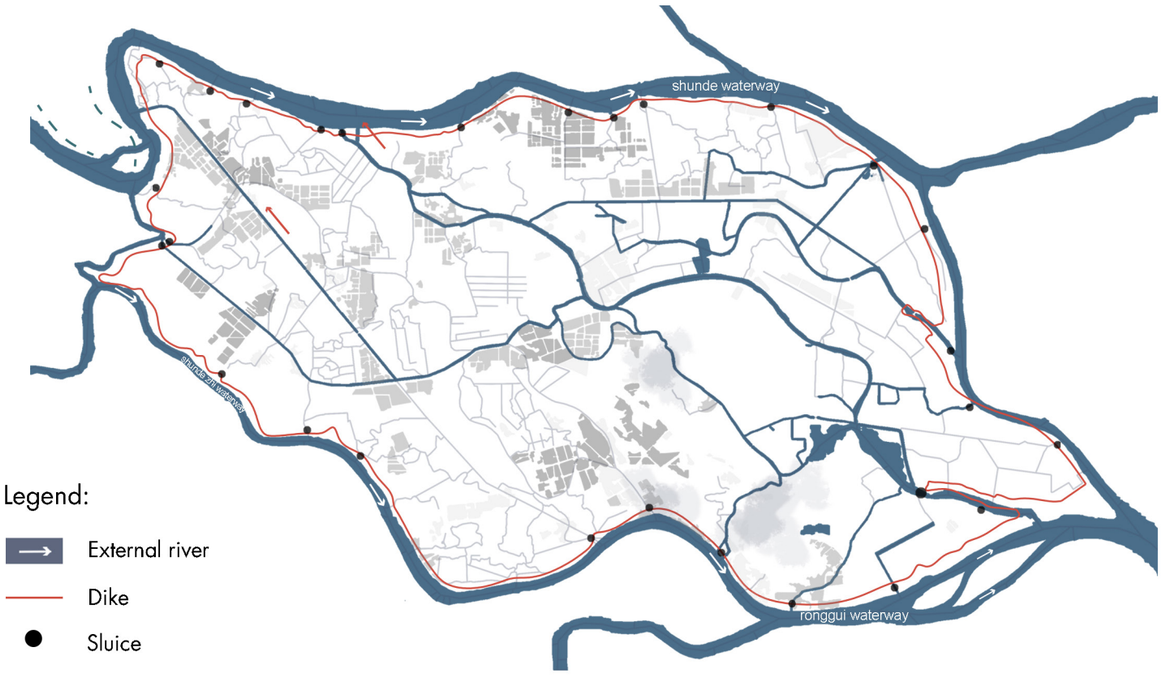
ANALYSIS

PRINCIPLE
&
STRATEGY

DESIGN EXPLORATION

REFLECTION

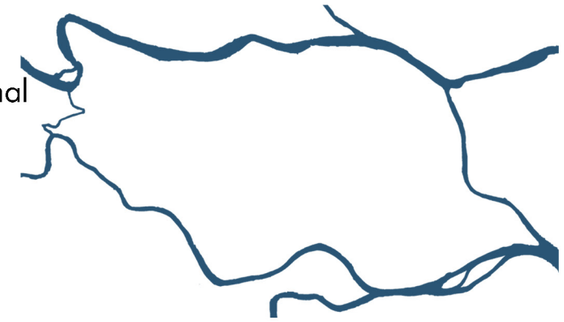
EXISTING WATER MANAGEMENT SYSTEM IN SHUNDE



Legend:

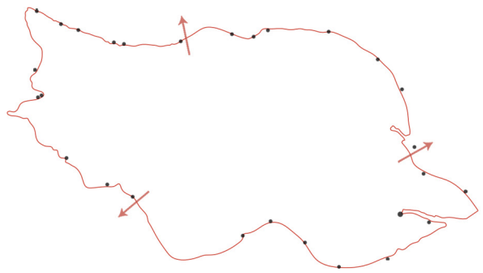
- External river
- Dike
- Sluice
- Dangerous place
- Electric drainage

External river





Dike & sluice





Canal



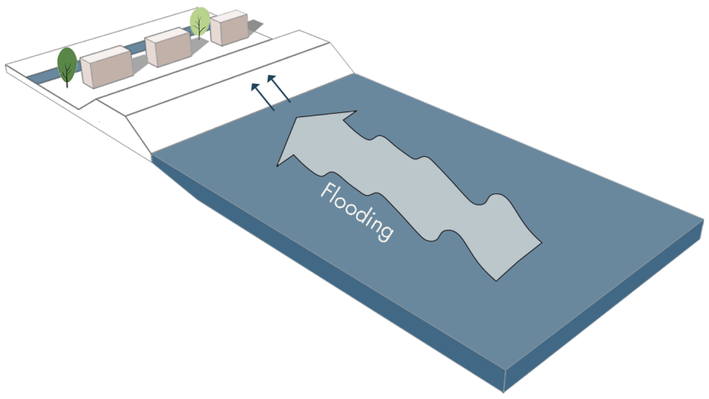


Stream

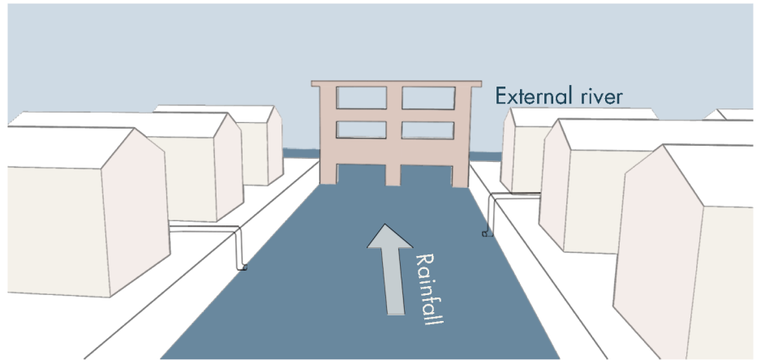




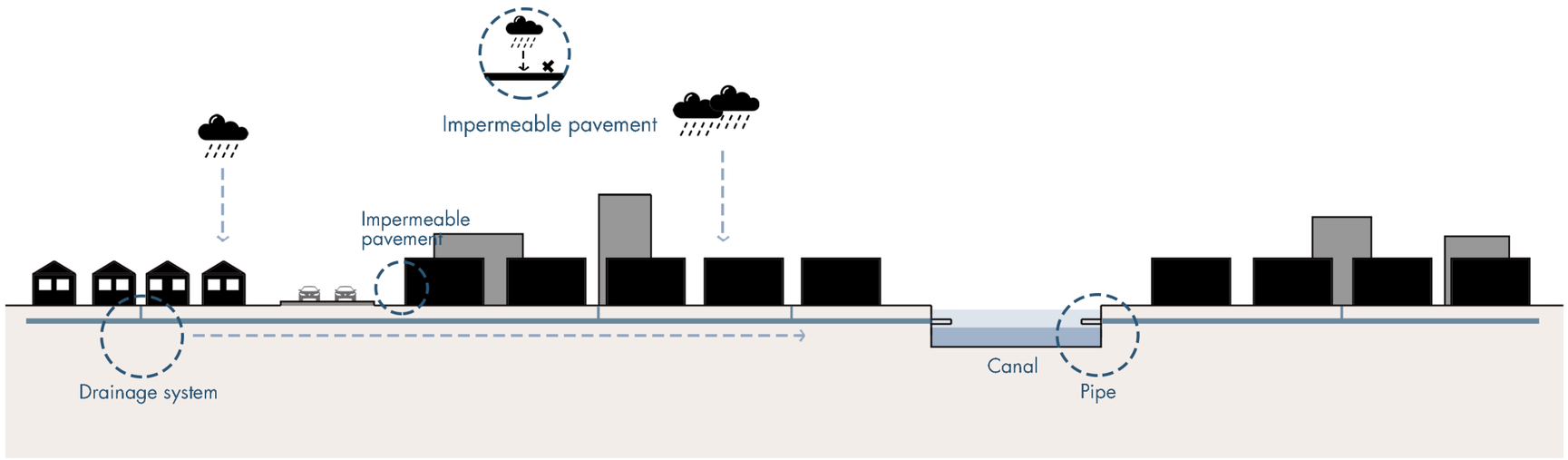
HARD ARTIFICIAL INFRASTRUCTURE



Dike



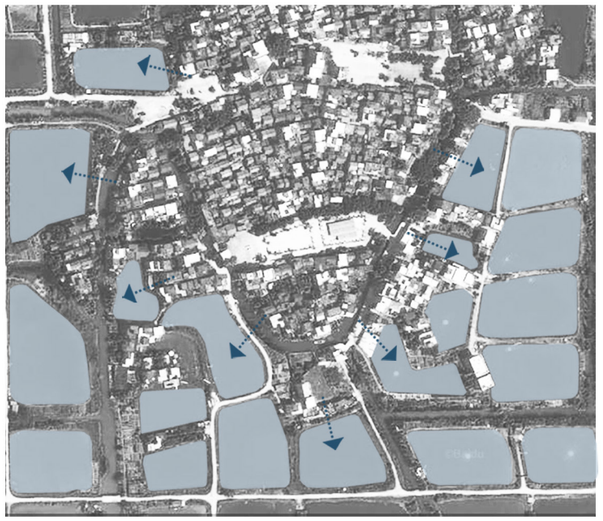
Sluice

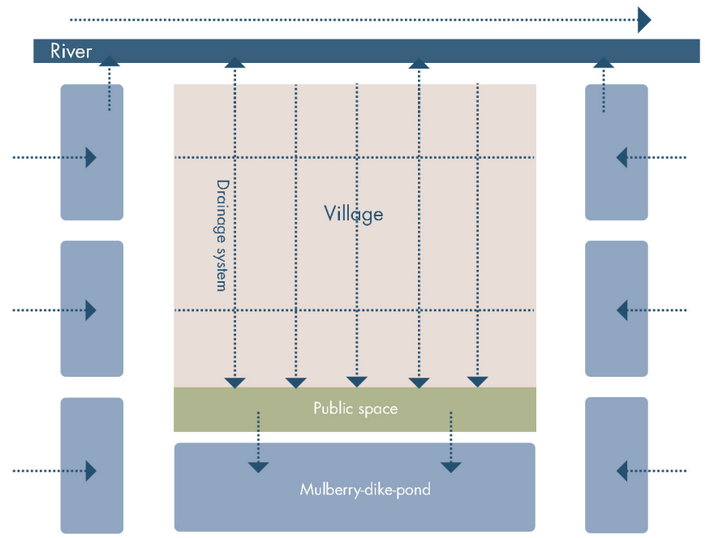


Internal drainage system

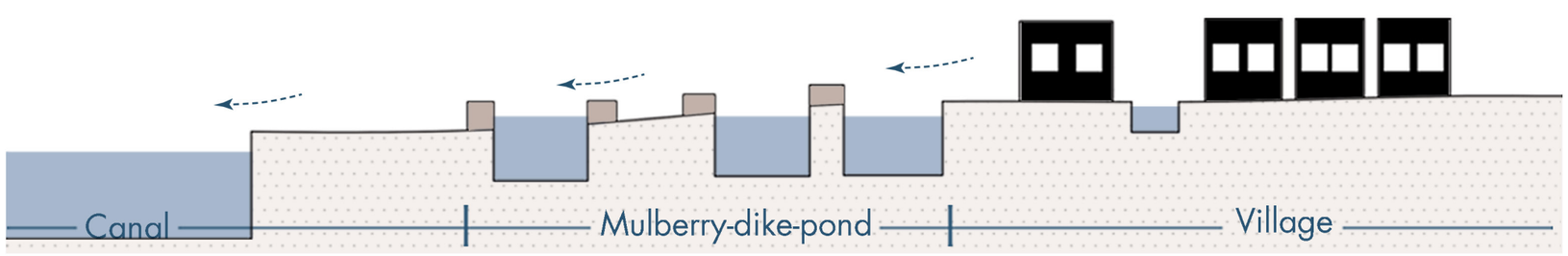
HISTORICAL WATER STRATEGIES – WORK WITH NATURE

Store rainwater in the lower area



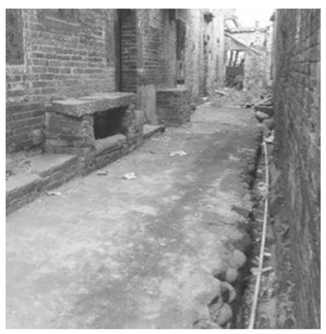


Natural water flow



Small elements for water management



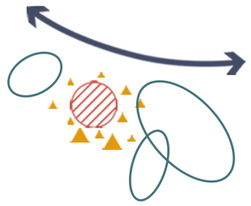




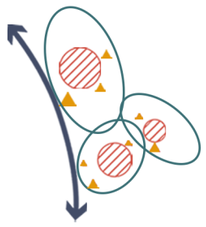


THE RELATIONSHIP BETWEEN VILLAGE AND INDUSTRIAL AREA

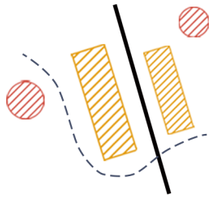
A The entire village is surrounded by factories

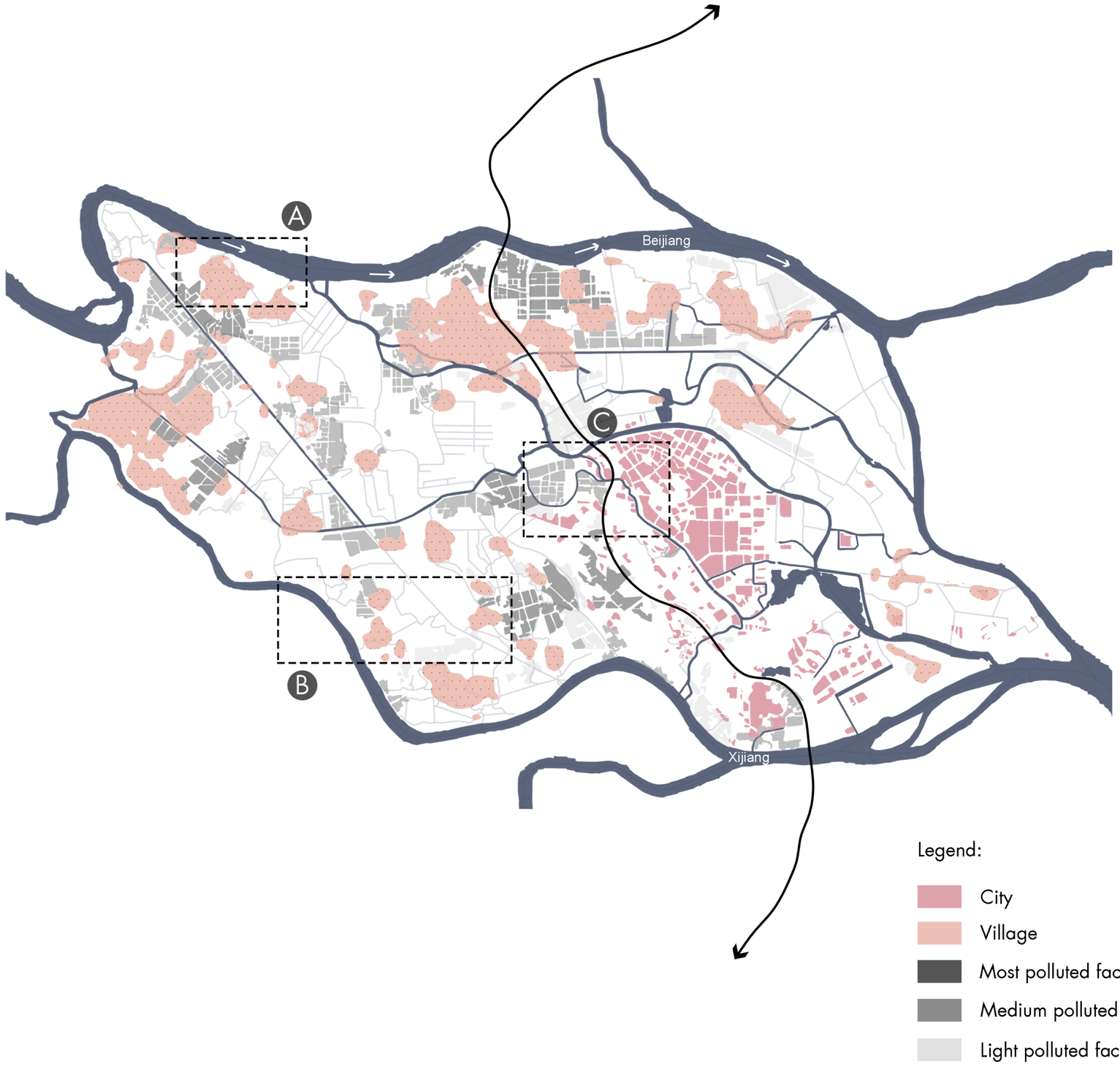


B Scattered factories around the village

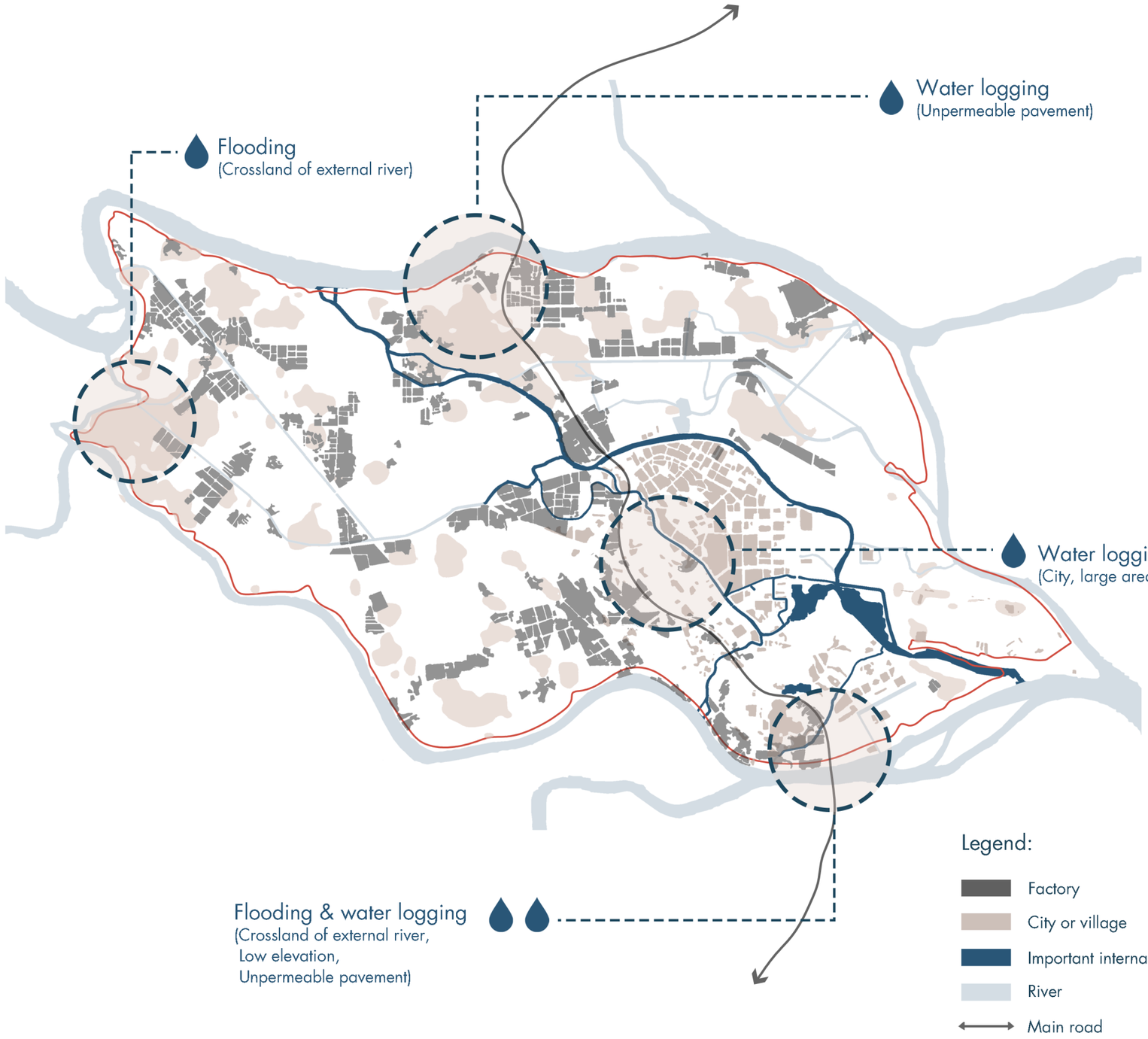


C Factories along the road

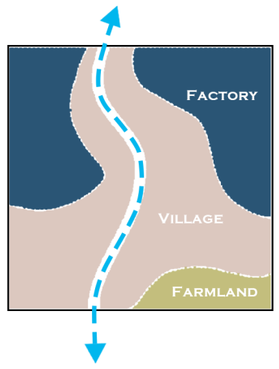




THE RELATIONSHIP BETWEEN WATERLOGGING POINTS AND INDUSTRIAL AREA

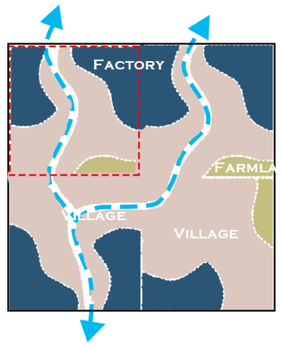


Village-owned factory



form

Scattered indusitrial area



CONCLUSION

From the analysis of industrial areas in Shunde, the conclusions are as follows:
Most of the industrial areas have the waterlogging problem because of the lower terrain and impermeable pavement.
Scattered factories also cause landscape fragmentation in Shunde. The quality of green space is low and people are lacking space for public activities.
Most industrial areas are distributed along the main road and the main river. It blocks people's way from backland to waterfront and makes it more difficult for people to experience water.
There are two main types of the industrial area, historical factories and village-owned factories. They both have problems with low-efficiency landuse and facing industrial transformation. These types of factories are closely related to water because of the convenient transportation and water supply.



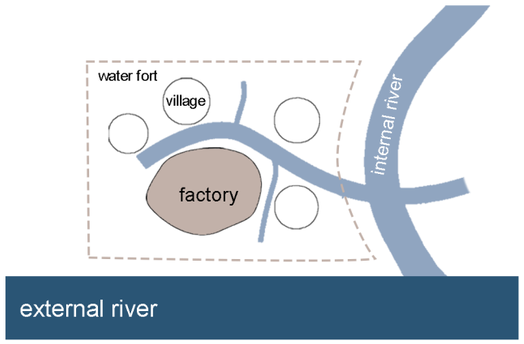
TWO TYPES OF INDUSTRIAL AREA

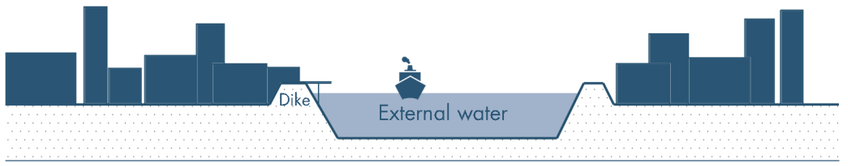
LOCATION

SECTION

HISTORICAL FACTORY

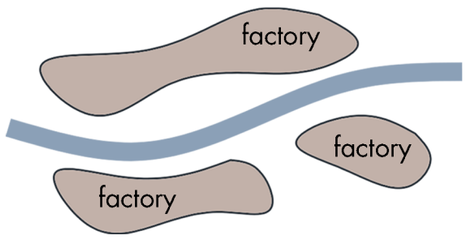


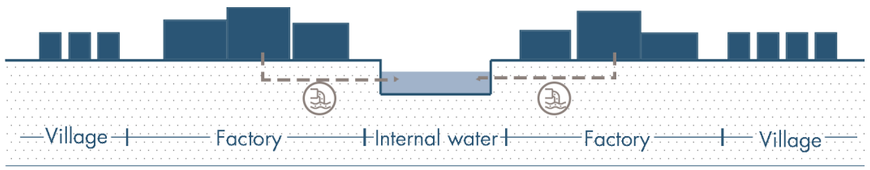




NORMAL
VILLAGE-OWNED
FACTORY







PATTERN

EXISTING CONDITION

CHARACTERISTIC

POTENTIALS







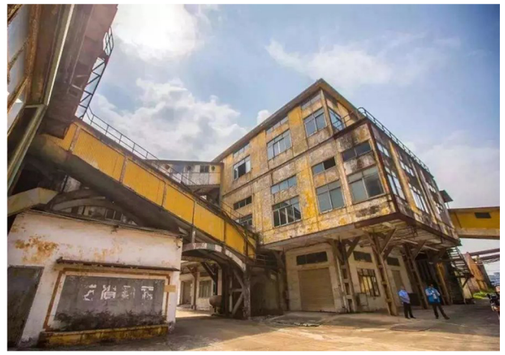
old buildings
& facilites



identity

PUBLIC PARK
WITH RESILIENCE FUNCTIONS







convenient
transportation



scattered
in the whole city

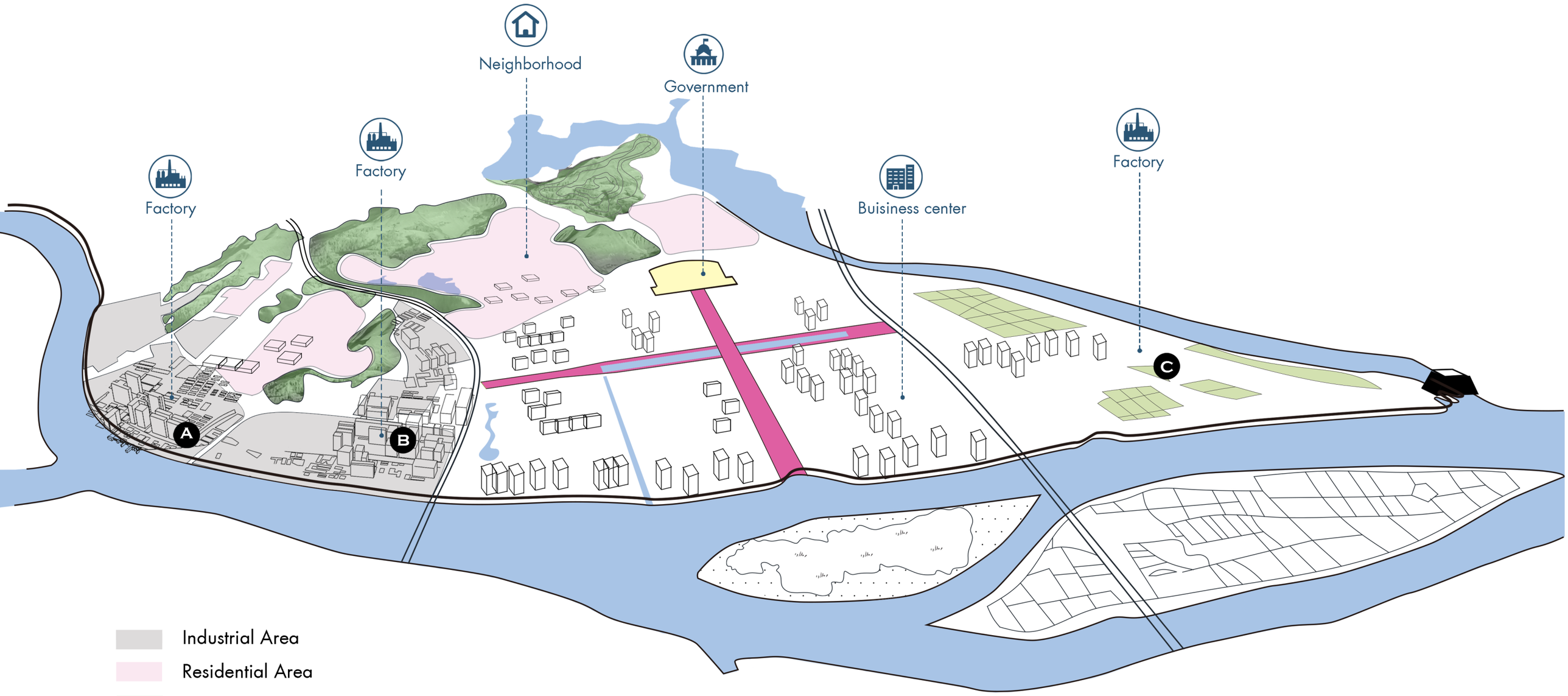
NEW INDUSTRY + WATER RETENTION BOX
(FORM A NETWORK)

SOUTH PART OF SHUNDE



DESHENG NEW DISTRICT

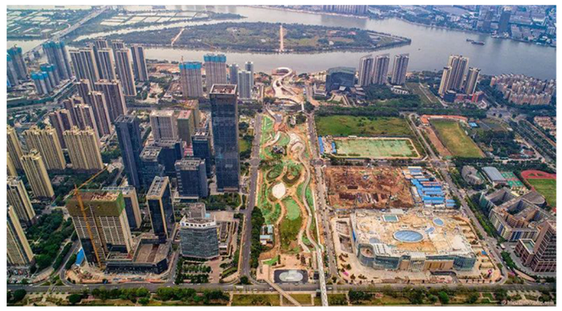
CONTEXT OF DESHENG NEW DISTRICT

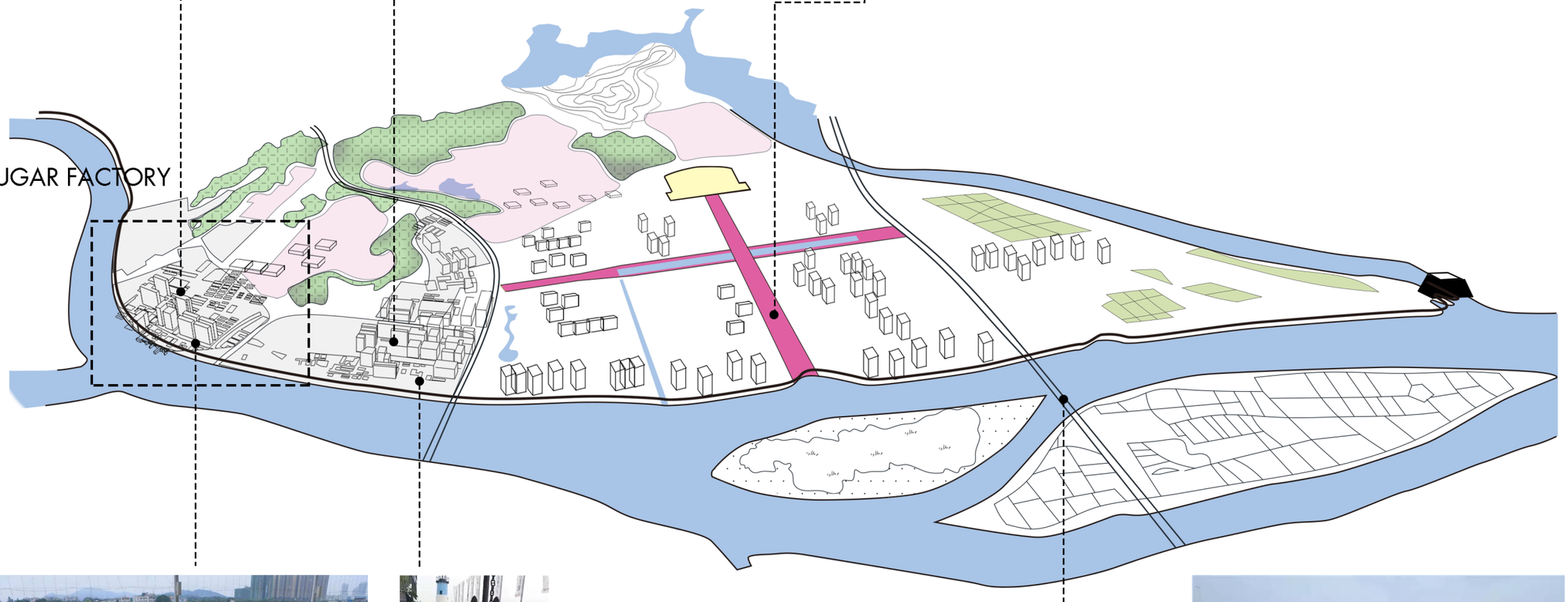


CHALLENGES & POTENTIALS

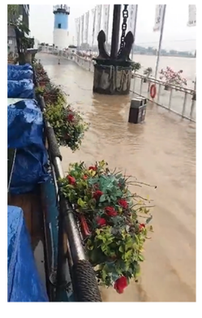














SHUNDE SUGAR FACTORY



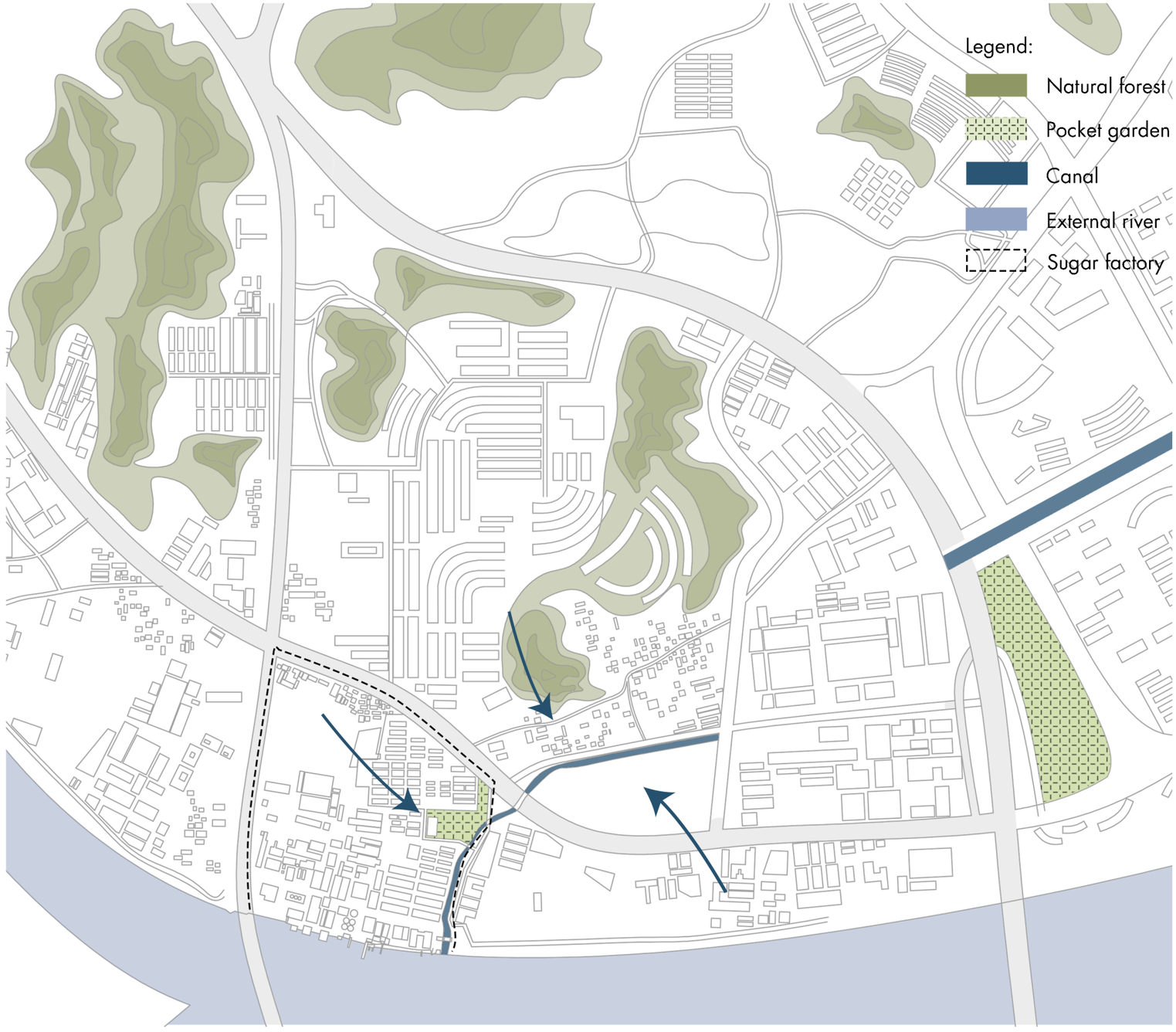
SCATTERED GREEN PATCHES AND SINGLE CANAL



Lack of connectivity between green spaces



Discharge all the water into this canal



MONO FUNCTION



Lack of space for public activities



Waterfront space is occupied by factories



MOBILITY



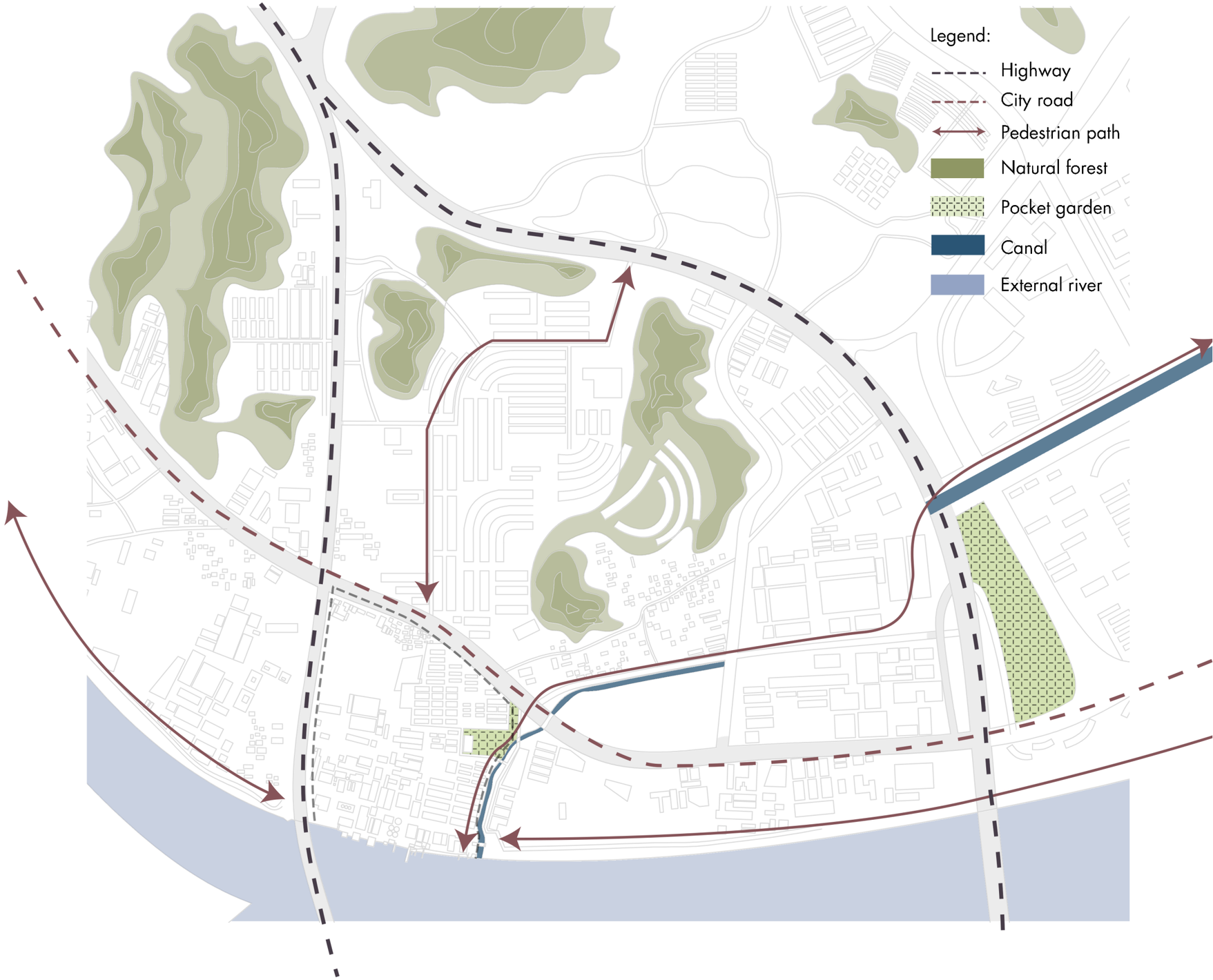
From backland to waterfront



From east to west



Bad quality of walking system



INDUSTRIAL HERITAGE



Legend:

- Residential area
- Industrial area (abandoned)
- University
- Lingnan park
- Warehouse
- Production workshop
- Office
- Quay

SUMMARY OF ANALYSIS

WATER ISSUES

1. The waterlogging problem is severe.

2. Lack of space for water retention, lack of water circular system.

INDUSTRIAL TRANSFORMATION

Some industrial heritage should be kept.

PUBLIC SPACE

1. Lack of public space with quality.

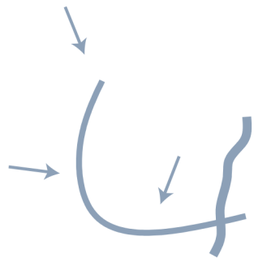
2. Lack of connectivity among green spaces.

MOBILITY

1. The connection from back land to the waterfront is blocked.

2. The quality of the slow walking path from the sub-city center to the waterfront is low.

PROPOSAL



Increase water retention

Inside of dike, it should increase water retention area. Outside of dike, it should leave some room for river.



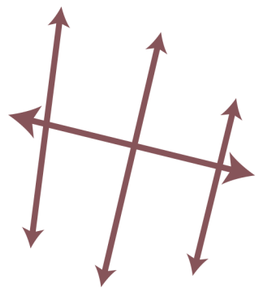
Reuse industrial heritage

Some buildings and facilities in sugar factory can be transformed for new industry, for example, creativity industry or technique park.



Construct green corridors

It is lack of connectivity among green spaces and lack of high quality of green space for public activities.



Improve connectivity

The connection from back land to waterfront should be improved. The quality of slow walking path from sub city center to waterfront should be improved.

INTROIDUCTION

ANALYSIS

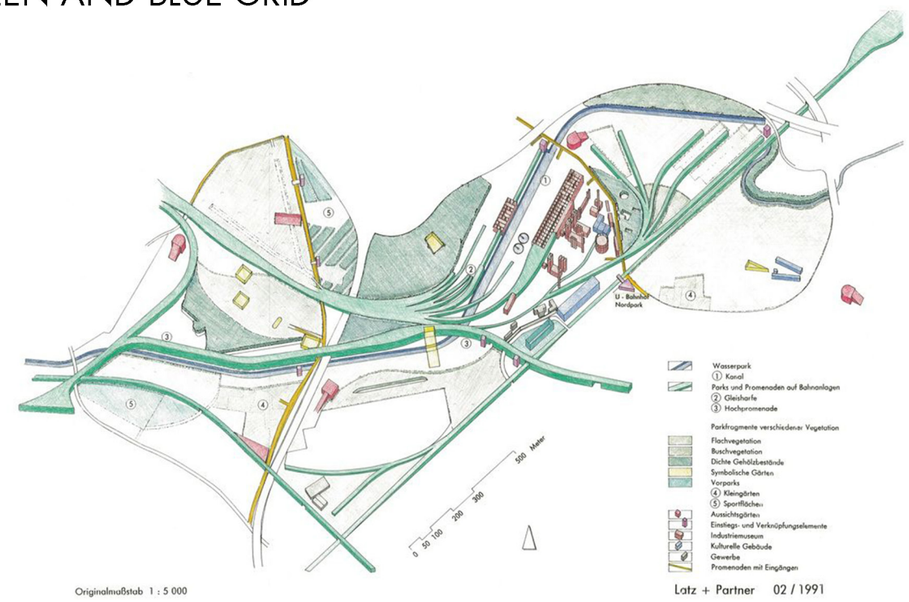
PRINCIPLE
&
STRATEGY

DESIGN EXPLORATION

REFLECTION

PRINCIPLES

GREEN AND BLUE GRID



TRANSFORMATIVE PERSPECTIVE









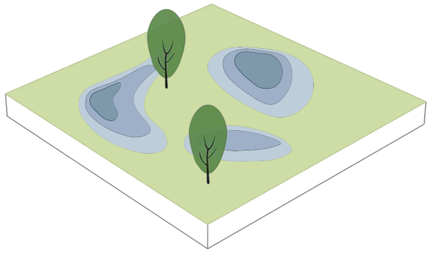


STRATEGIES

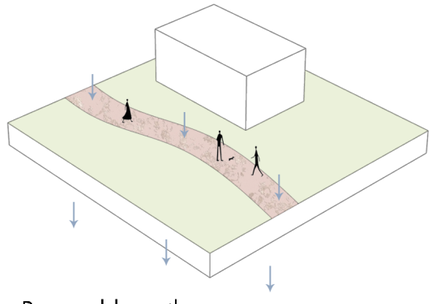
Strategies for water resilience

WATER STRATEGY: **COLLECTION, PURIFICATION, REUSE**

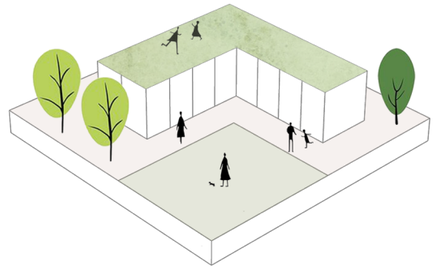
Collection



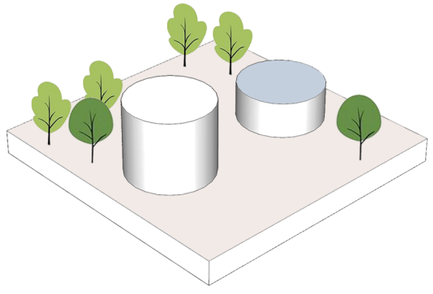
Terrain (grassland)



Permeable path

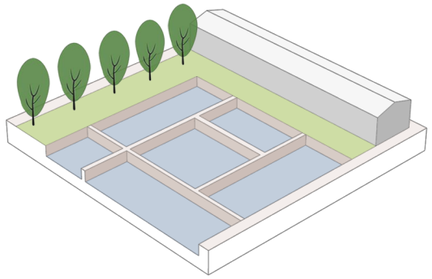


Green roof

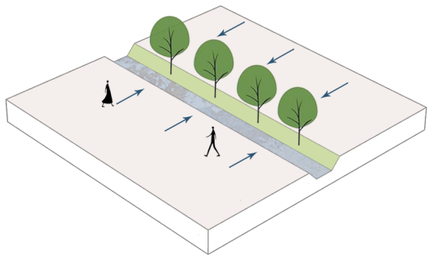


Water tank

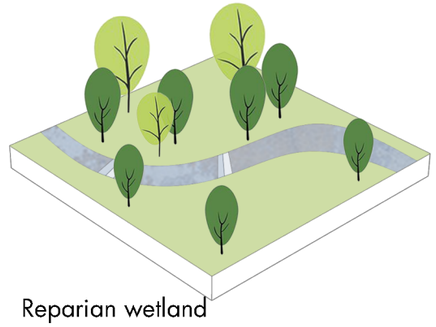
Purification



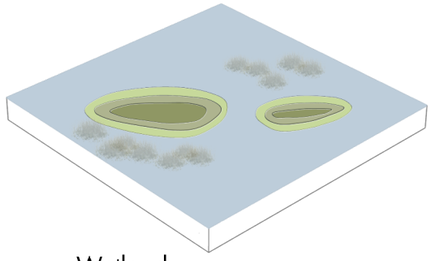
Sunken garden



Bioswale

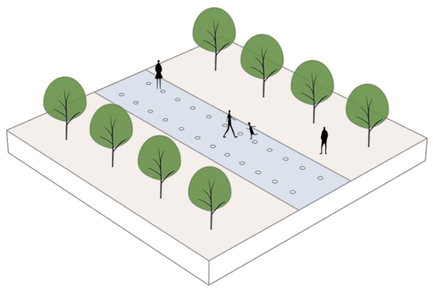


Reparian wetland

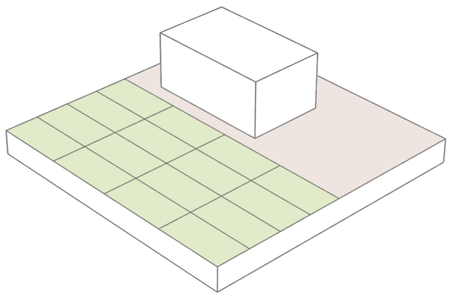


Wetland

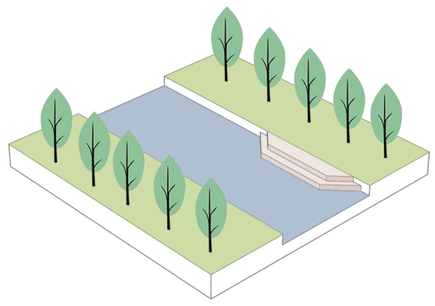
Reuse



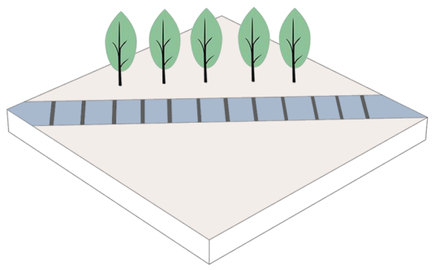
Music fountain



Urban agriculture



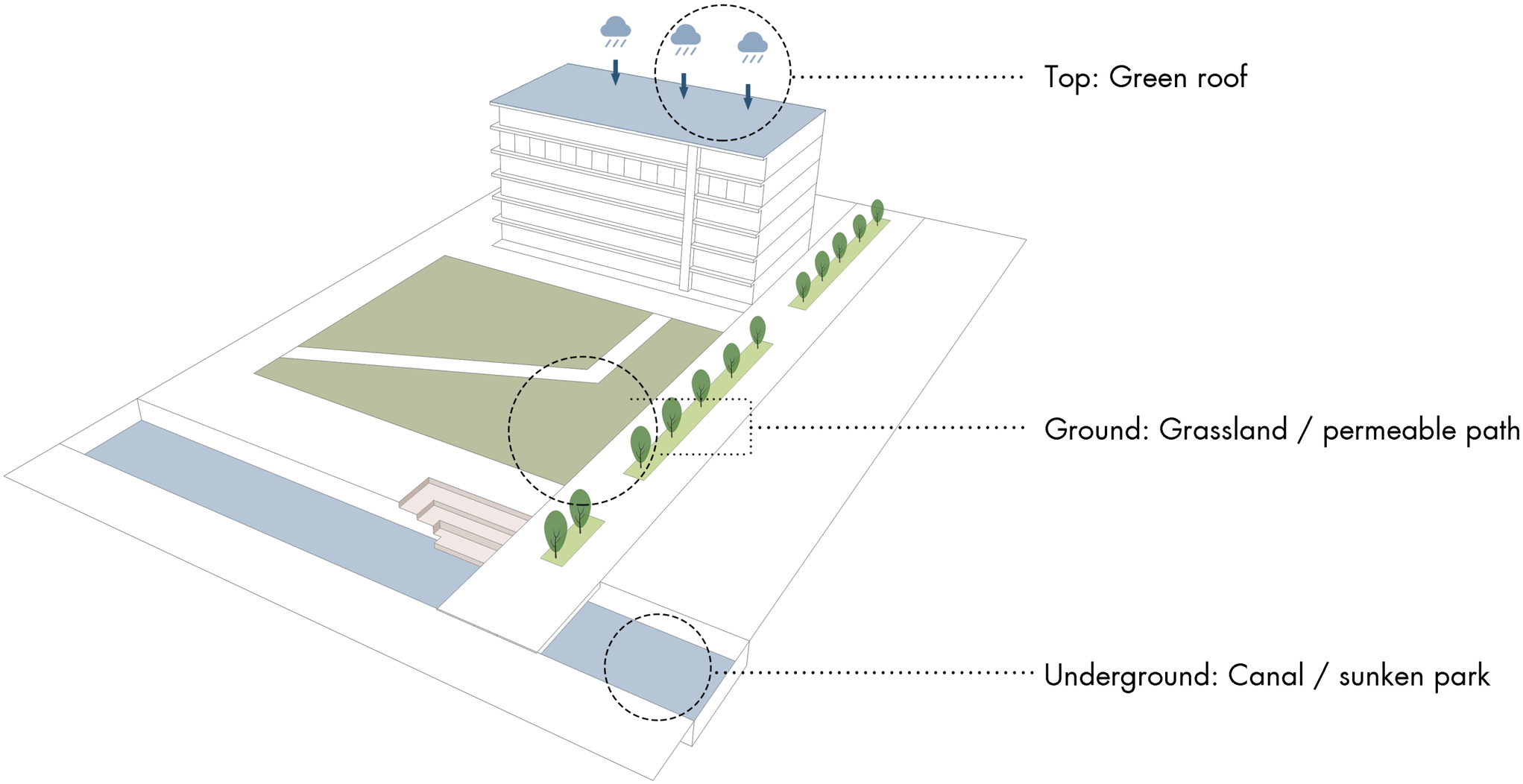
Canal



Train track

STRATEGIES

Strategies for water resilience



STRATEGIES

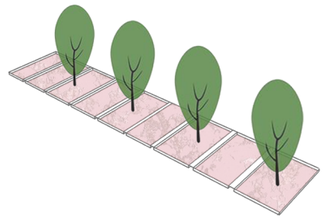
Strategies for industrial transformation

INDUSTRIAL TRANSFORMATION STRATEGY: ADDING, SUBTRACTING, DISASSEMBLING, DECORATION

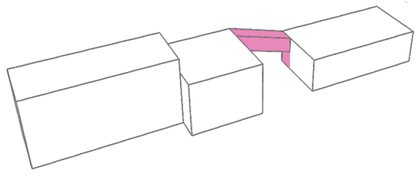
Adding



Chimney – climbing stairs

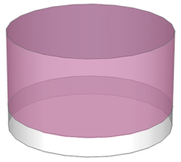


Rail track – plant box

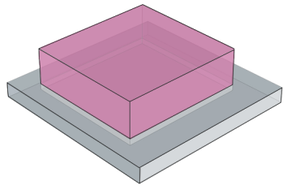


Corridor – stairs

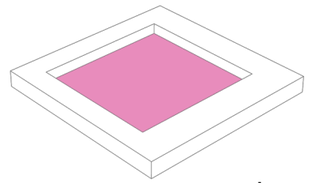
Subtracting



Water tank – water collection

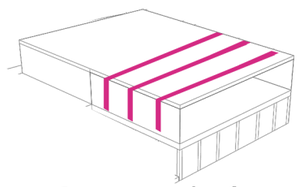


Water plant – sunken garden



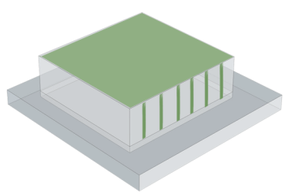
Water reservoir – outdoor theater

Disassembling



Quay – platform

Facade decoration



Warehouse – green facade



Buildings



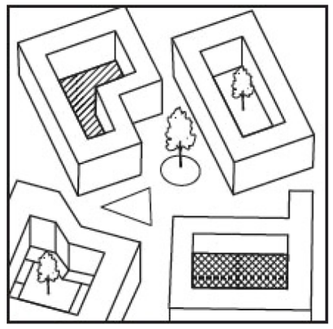
Signal



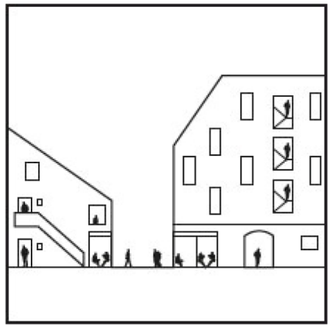
Facilities

STRATEGIES

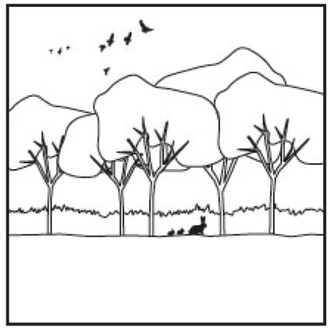
Strategies for public space



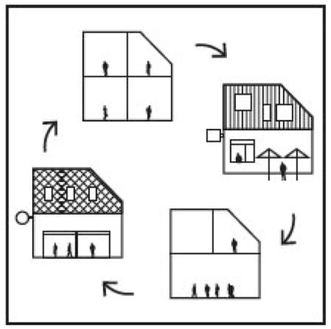
Diversity of outdoor space



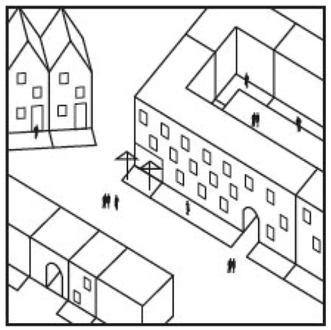
Walkability



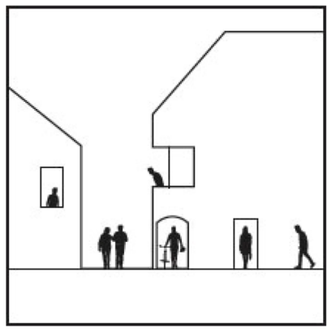
Greater biodiversity



Flexibility



Sense of control and identity



Human scale

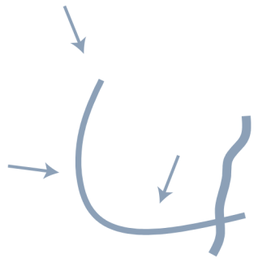
INTROIDUCTION

ANALYSIS

PRINCIPLE
&
STRATEGY

DESIGN EXPLORATION

REFLECTION



Increase water retention

Inside of dike, it should increase water retention area. Outside of dike, it should leave some room for river.



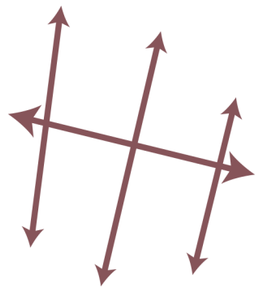
Reuse industrial heritage

Some buildings and facilities in sugar factory can be transformed for new industry, for example, creativity industry or technique park.



Construct green corridors

It is lack of connectivity among green spaces and lack of high quality of green space for public activities.

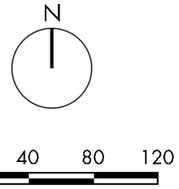


Improve connectivity

The connection from back land to waterfront should be improved. The quality of slow walking path from sub city center to waterfront should be improved.

DEVELOPMENT PLAN





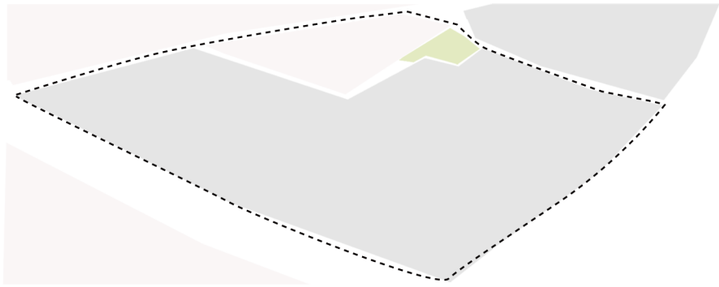
1. Entrance plaza
2. Grassland theater
3. Tourist service center
4. Creativity market
5. Artificial forest
6. Technique park
7. Outdoor exhibition
8. Outdoor performance
9. Climbing gym
10. Lotus pond
11. Sunken garden
12. Ecological park
13. Observation plateform
14. Creativity industry
15. Memorial plaza
16. Sugar museum
17. Tourist elevator
18. Mirror pond
19. Water theater
20. Music fountain plaza
21. Ecological canal
22. Main entrance
23. Parkway
24. Lingnan garden
25. Club
26. Food plaza
27. Basketball playground
28. Skatepark

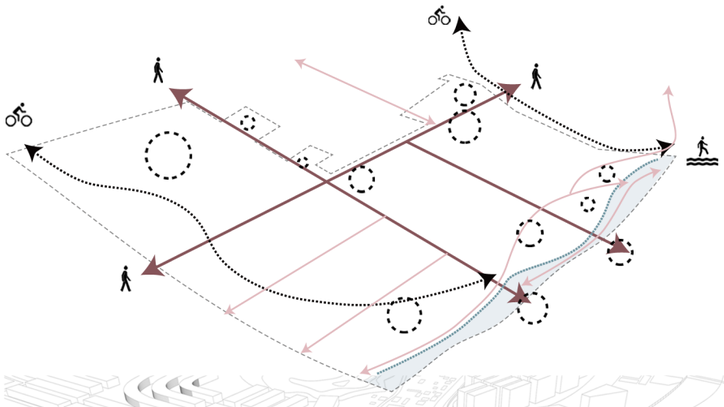
STRUCTURE



Theme area

- Public recreational park
- Dense forest area
- Museum park
- Technique park
- Creativity industry
- Water management exhibition
- Waterfront wetland
- Lingnan garden (community park)
- Sports area

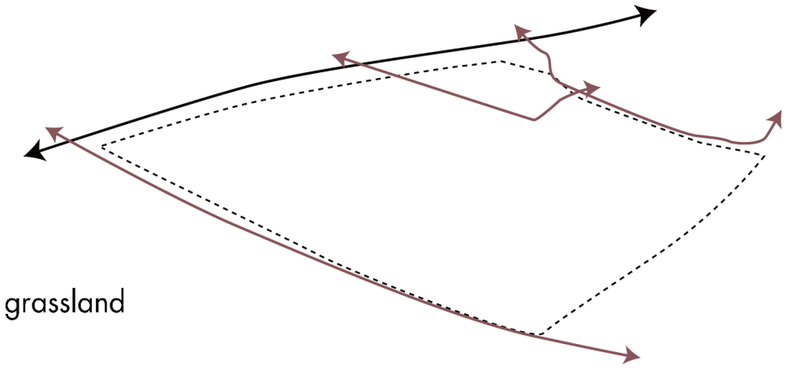




Mobility

- Main path
- Secondary path
- Bike lane
- New dike wall
- Space for event

Mobility

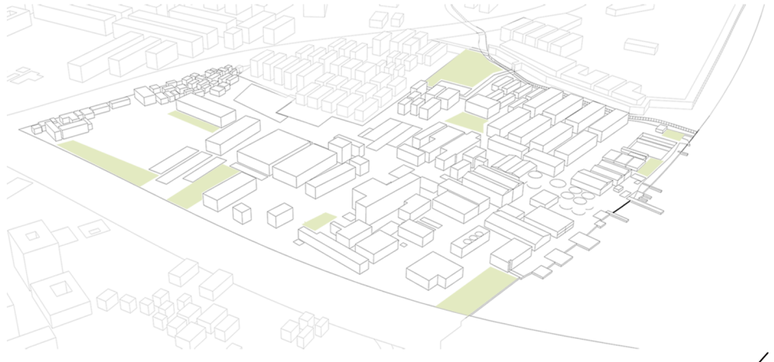


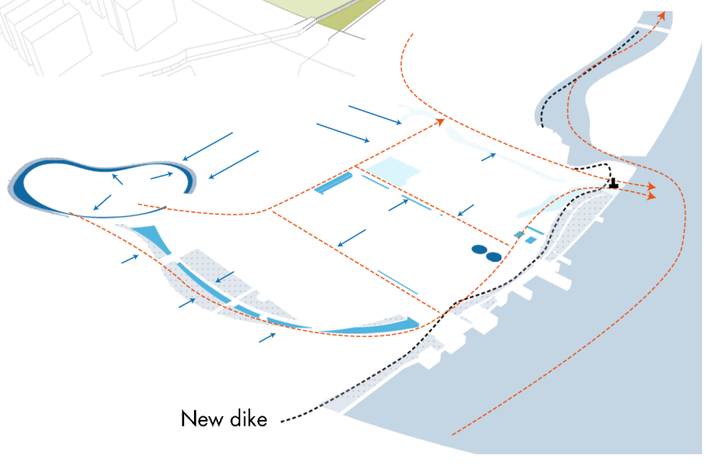


Green sturcture

- Grassland with terrain
- Artificial forest
- Reparian wetland
- Bioswale
- Natural wetland

Scattered grassland



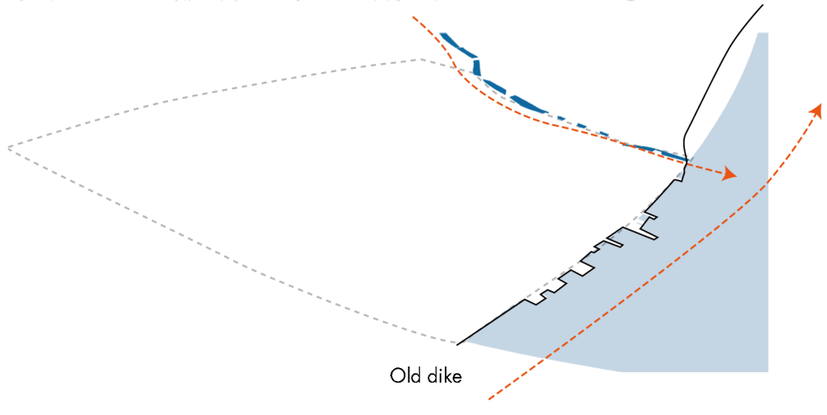


Water system

- Water collection
- Water purification
  - Reparian wetland
  - Floating wetland
  - Sucken garden
  - Bioswale
- Water reuse
  - Outdoor ecological park
  - Water theater
- Canal/ bio-pond
- Flooding
- Sluice

New dike

Water flow

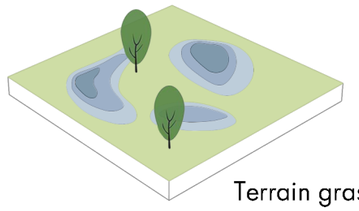


Old dike

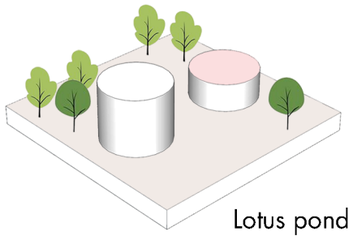
BLUE STRUCTURE



WATER COLLECTION

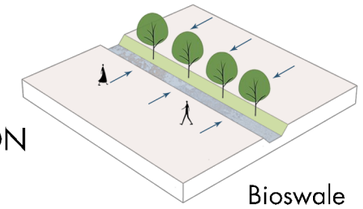


Terrain grassland

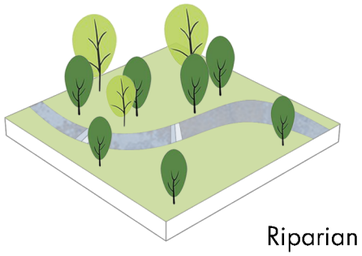


Lotus pond

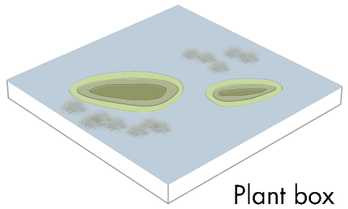
WATER PURIFICATION



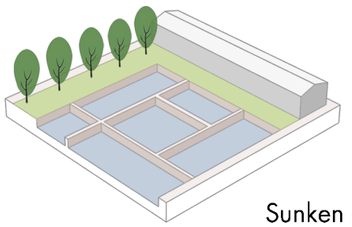
Bioswale



Riparian wetland

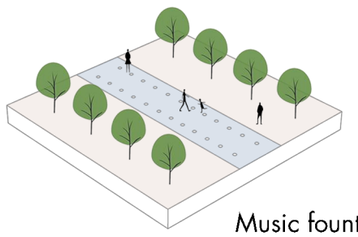


Plant box

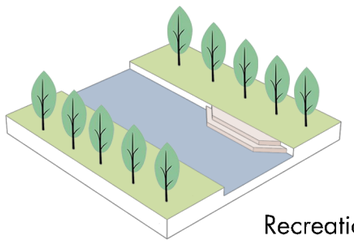


Sunken garden

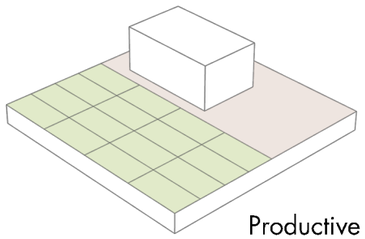
WATER REUSE



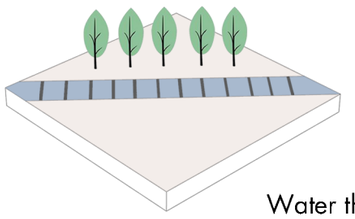
Music fountain



Recreational canal

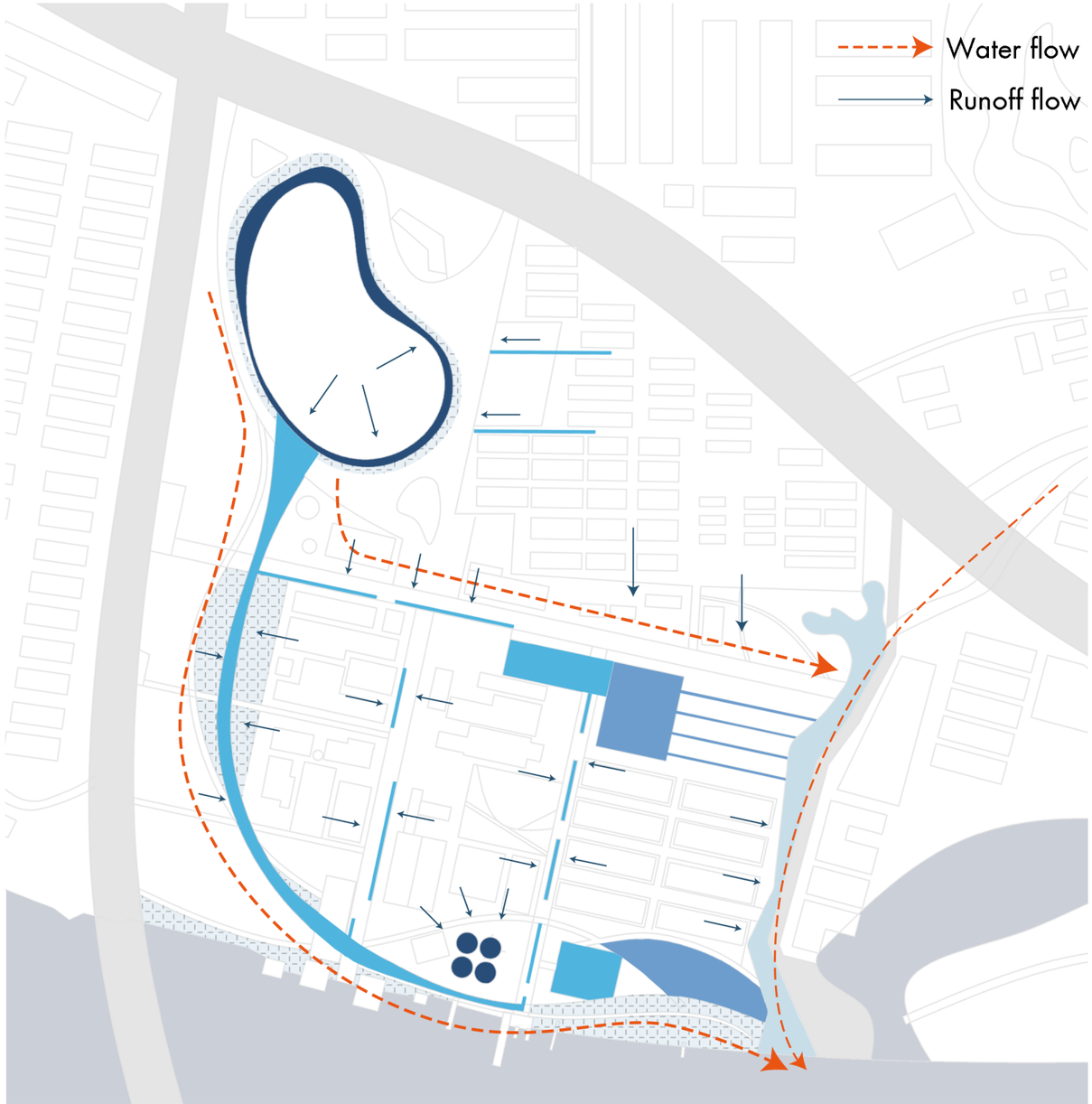


Productive use

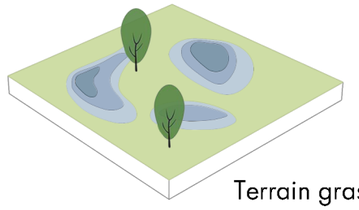


Water theater

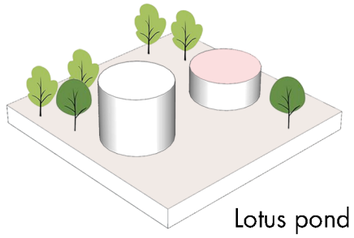
WATERFLOW AND RUNOFF FLOW



WATER COLLECTION

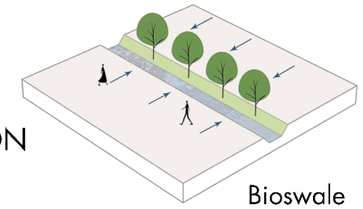


Terrain grassland

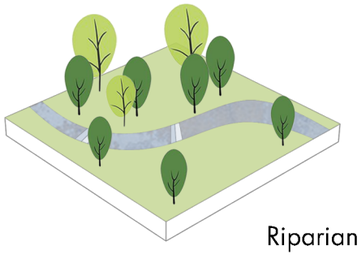


Lotus pond

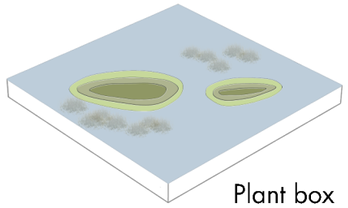
WATER PURIFICATION



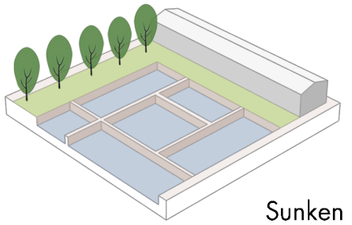
Bioswale



Riparian wetland

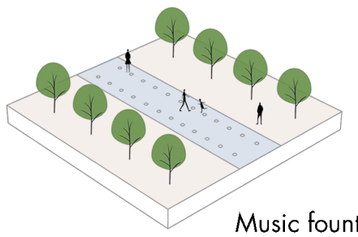


Plant box

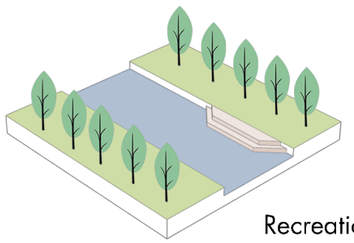


Sunken garden

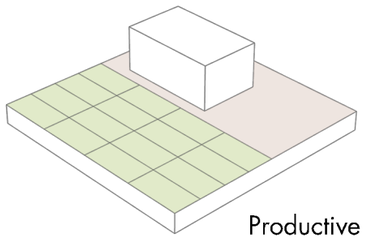
WATER REUSE



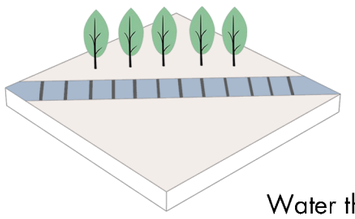
Music fountain



Recreational canal



Productive use

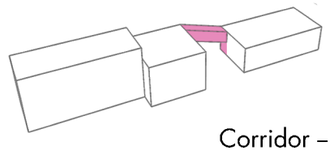


Water theater

INDUSTRIAL TRANSFORMATION

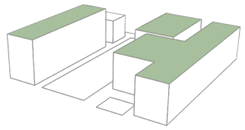


Production workshop



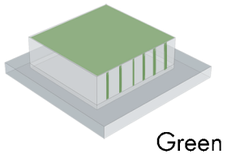
Corridor – elevator

Office building



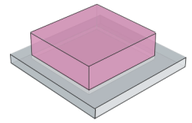
Green roof

Warehouse

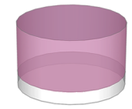


Green facade

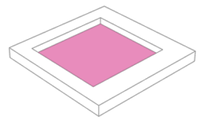
Water facility



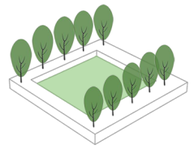
Water plant – purification



Water tank – collection

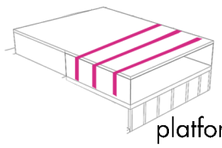


Water reservoir – water theater



Water reservoir – ecological park

Quay

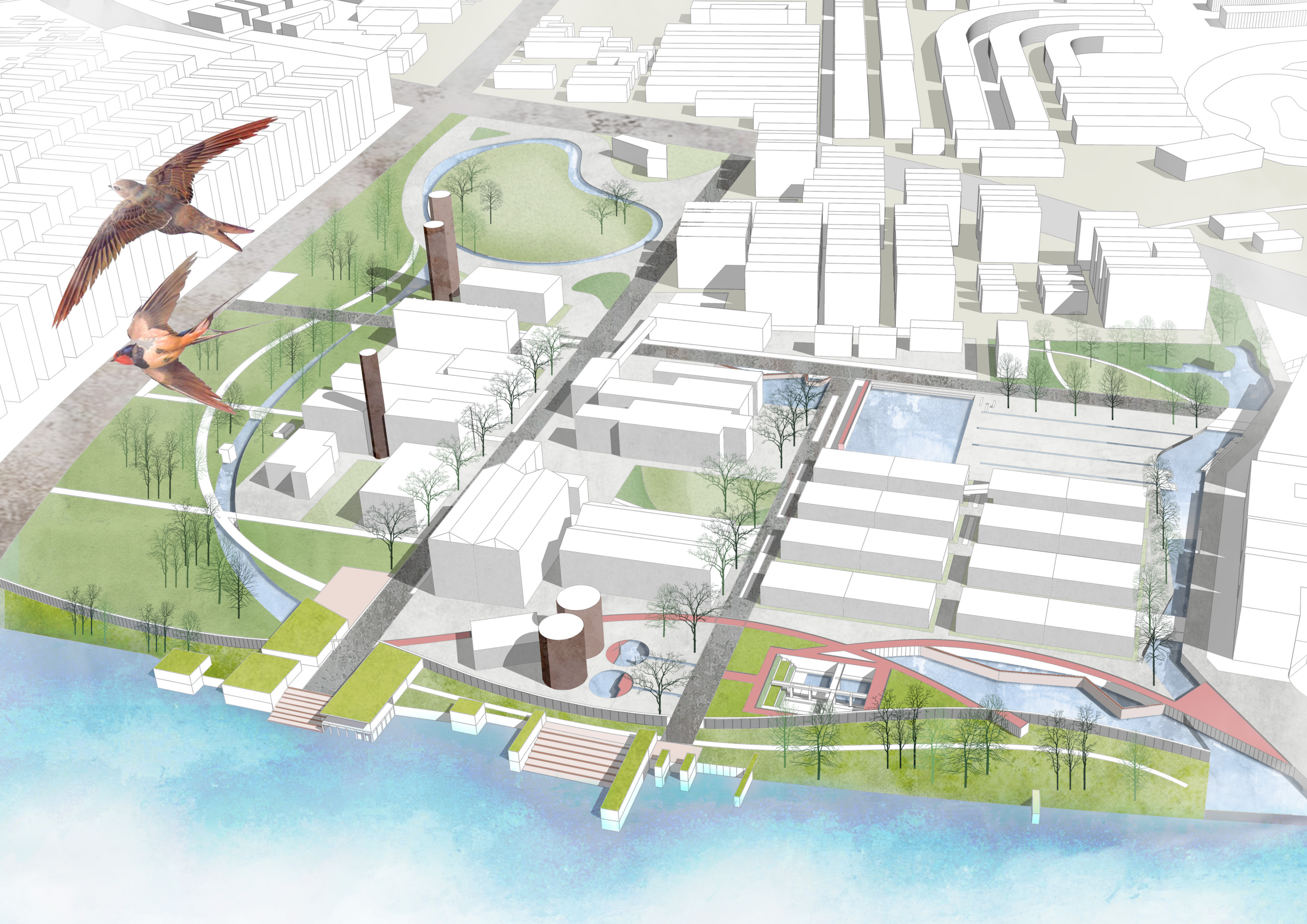


platform

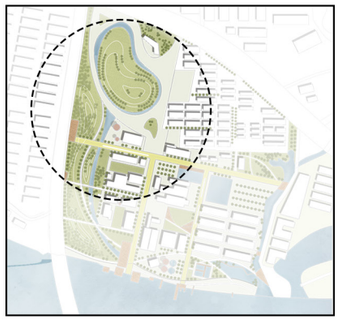
Chimney

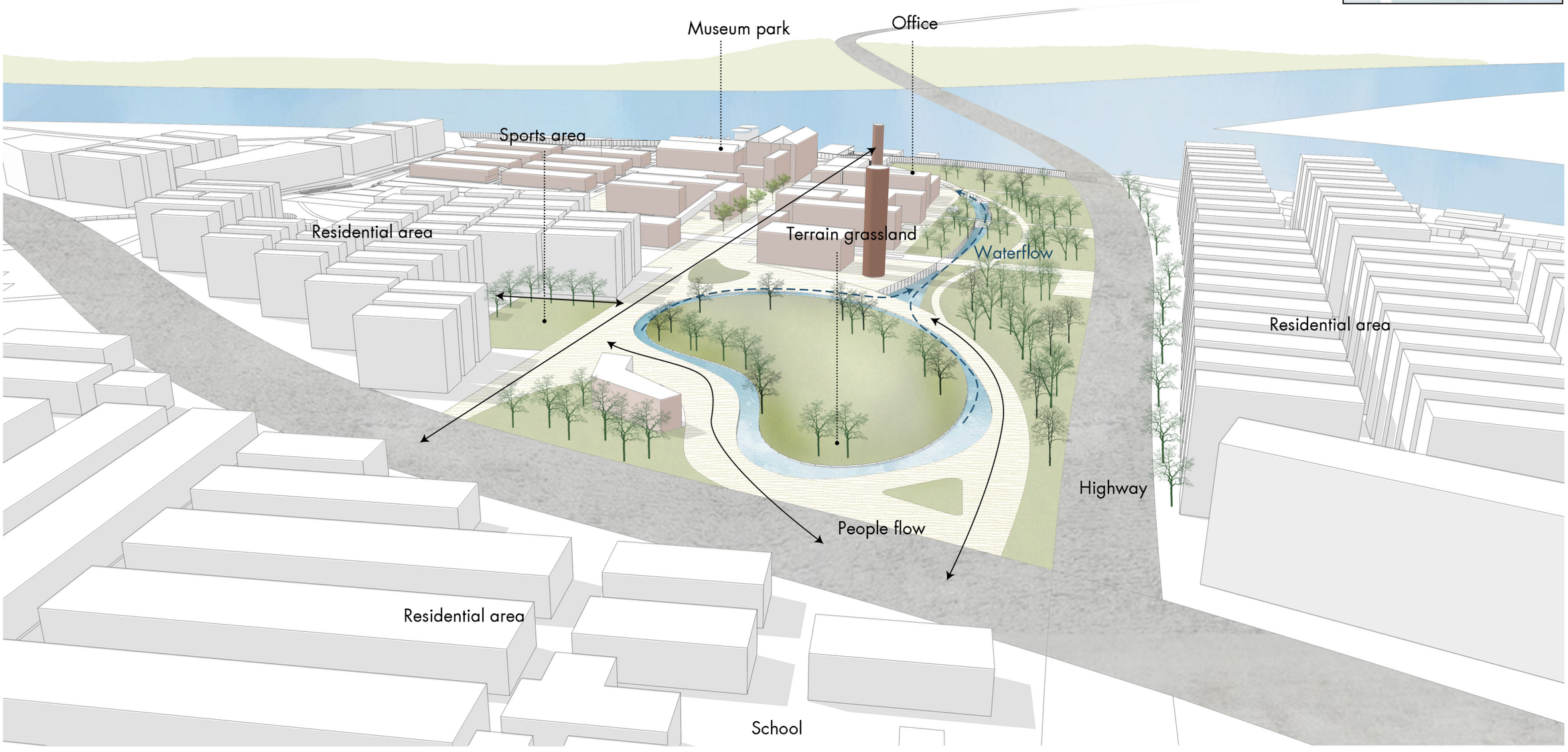


stairs



TERRAIN GRASSLAND AND NATURAL STREAM



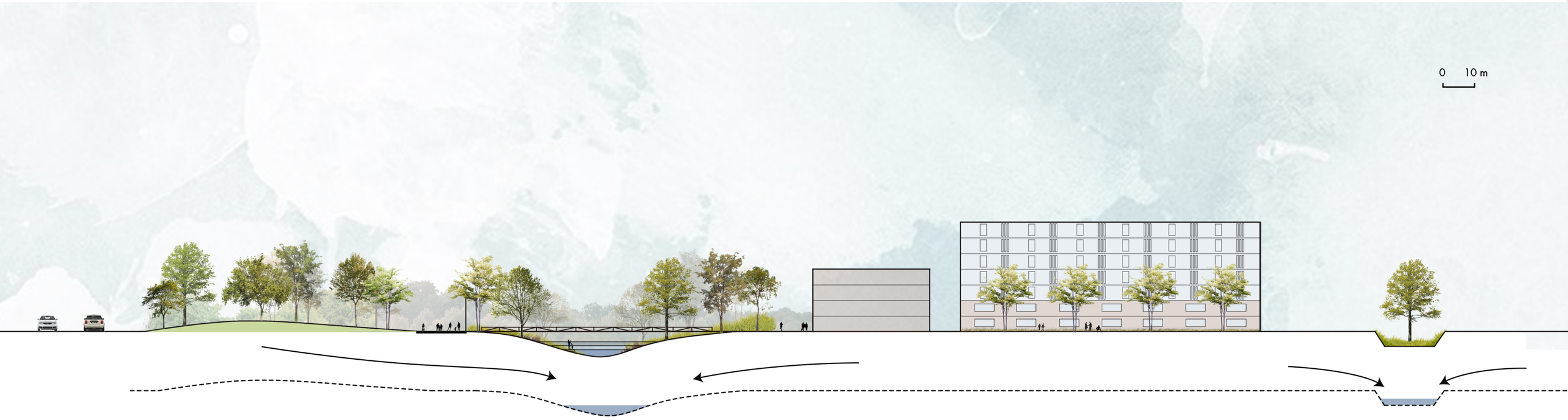


WATER COLLECTION AND WATER PURIFICATION



WATER COLLECTION

WATER COLLECTION



RIPARIAN WETLAND

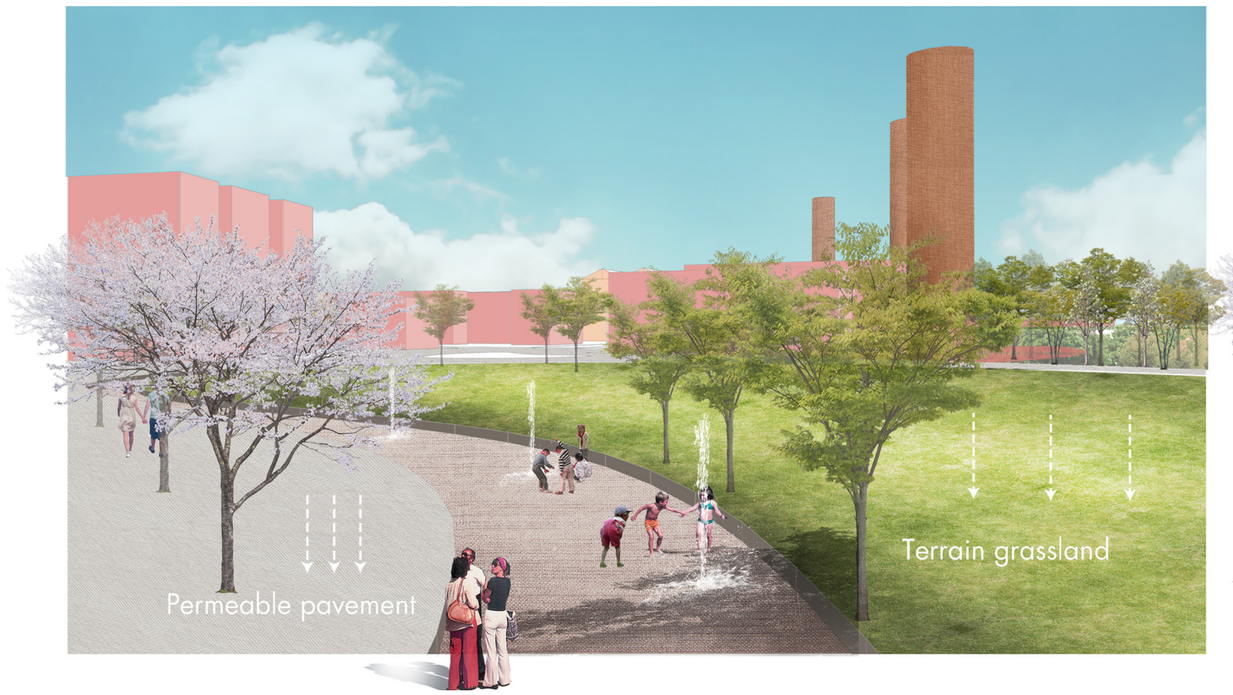
BIOSWALE

PUBLIC ACTIVITIES ON TERRAIN GRASSLAND – DRY SEASON

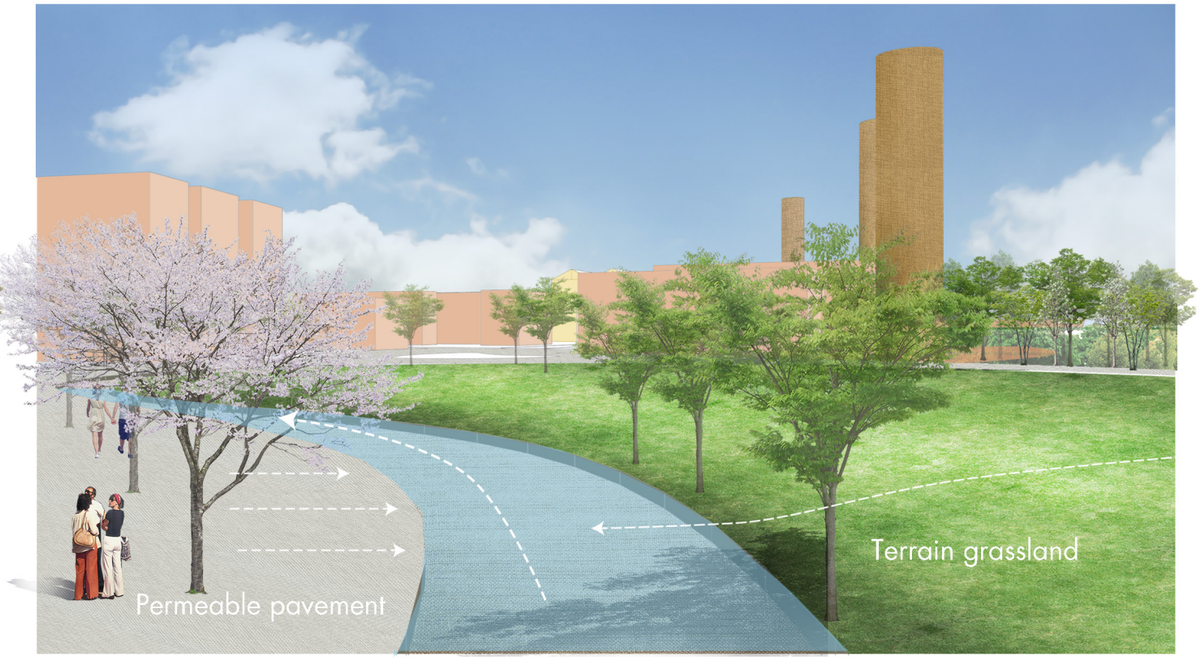


PUBLIC ACTIVITIES ON TERRAIN GRASSLAND – RAINY SEASON

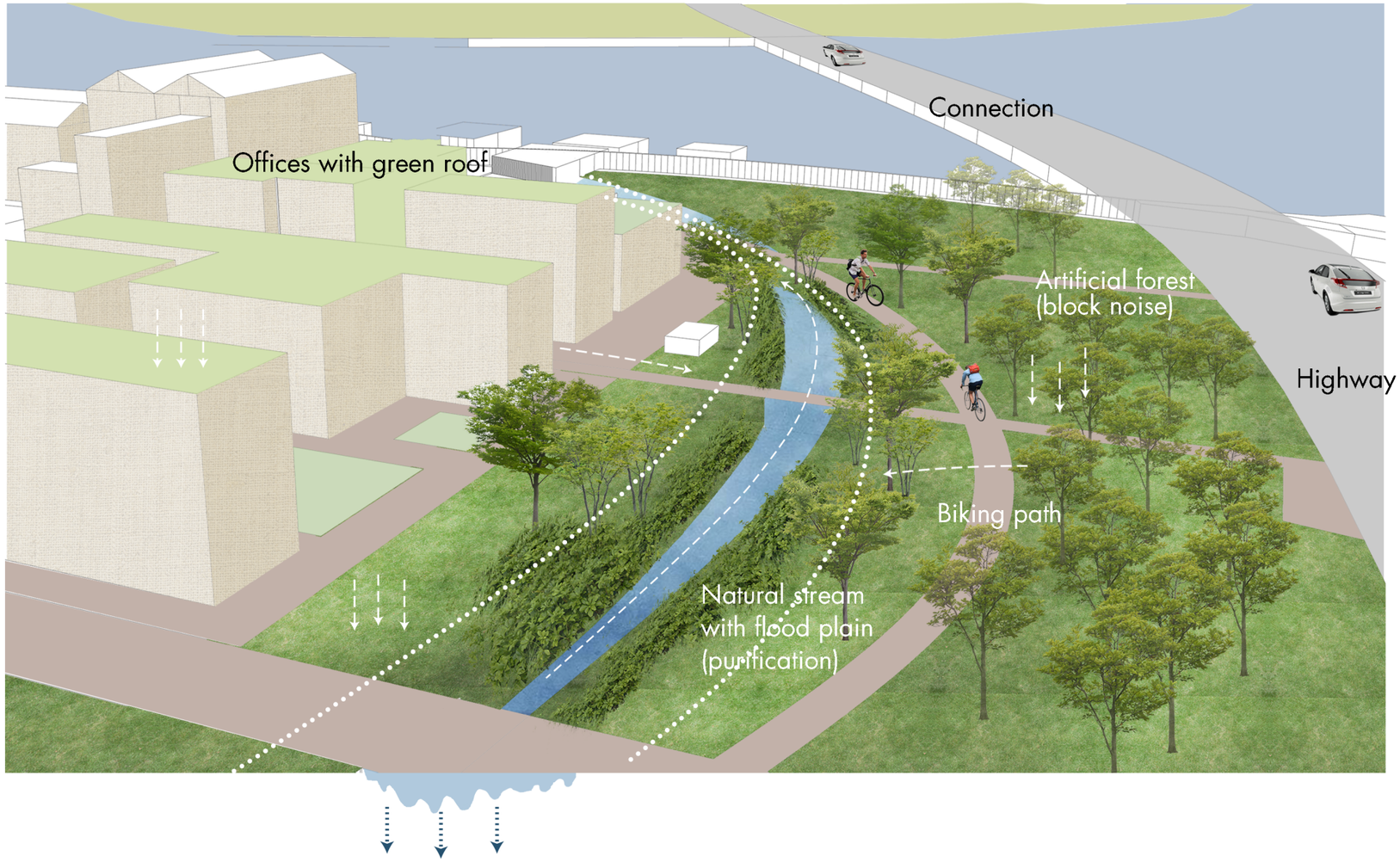
DRY SEASON



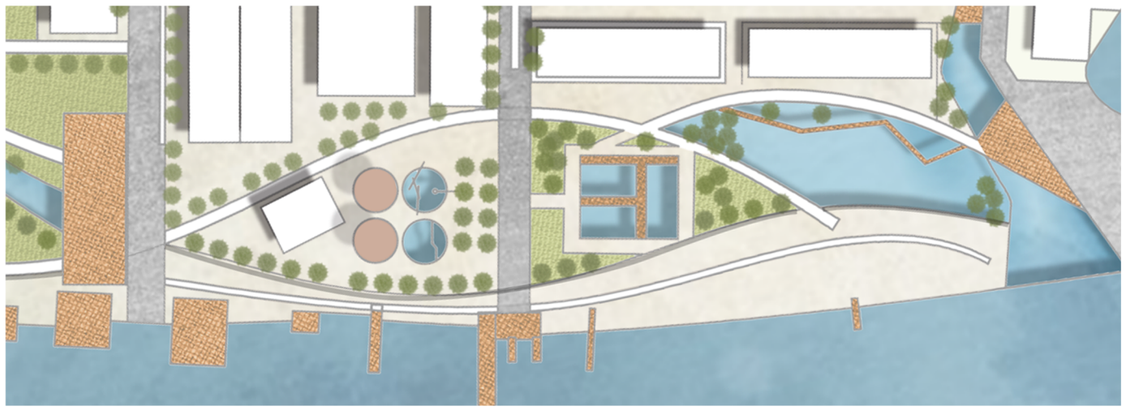
RAINY SEASON

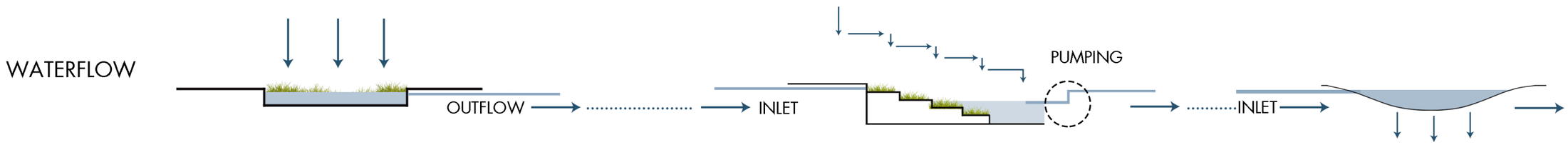


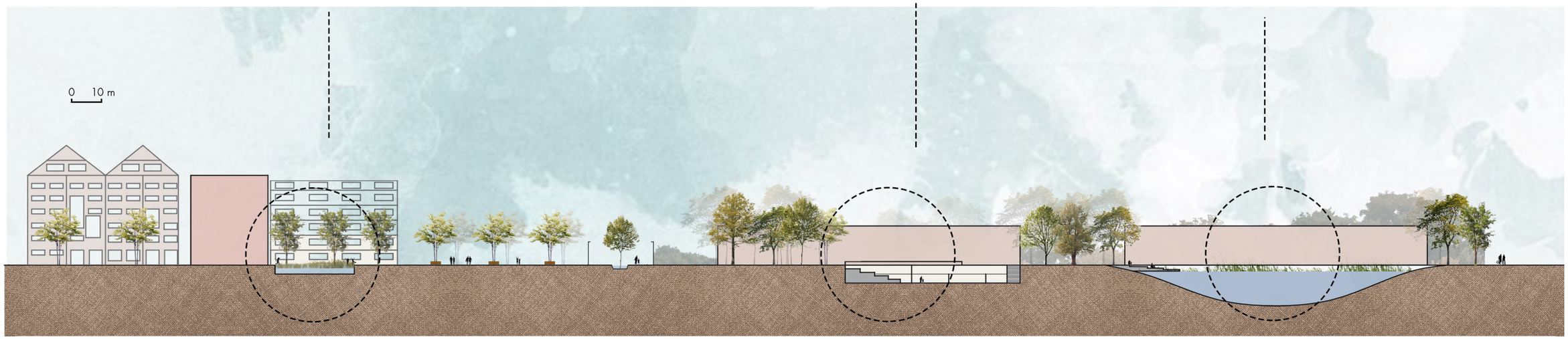
WATER PURIFICATION – NATURAL STREAM



WATER SYSTEM – TRANSFORMED FROM INDUSTRIAL FACILITIES







LOTUS GARDEN – WATER COLLECTION
(Old orange tank)

PATH

SUNKEN GARDEN – WATER PURIFICATION
(Old orange plant)

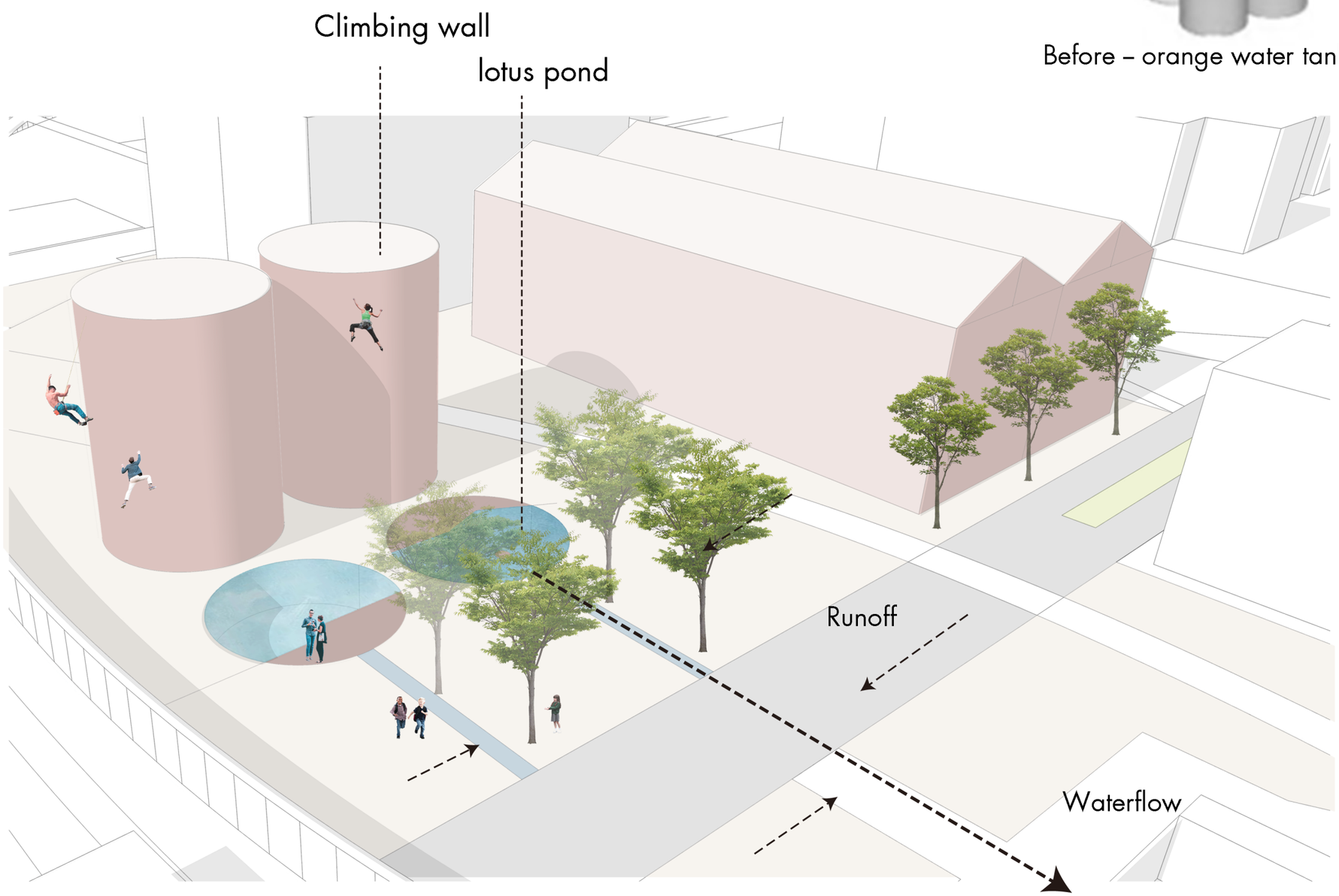
ECOLOGICAL PARK – WATER REUSE
(Old water reservoir)

SLOWTRA

TRANSFORME WATER TANK INTO LOTUS GARDEN

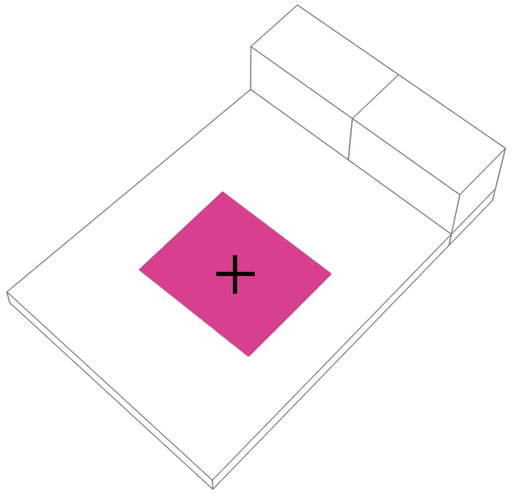


Before – orange water tank

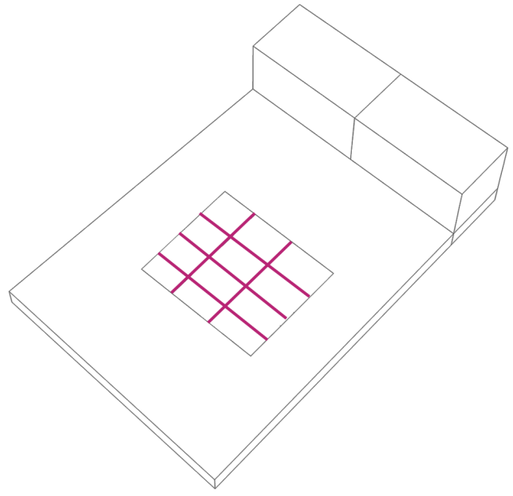


PROCESS OF THE TRANSFORMATION OF WATER PLANT

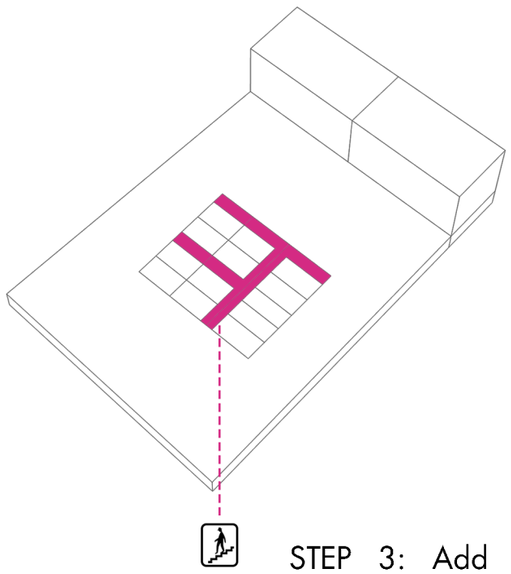
Transform from water plant into sunken rain garden: Maximize to preserve historical traces, dealing with functional measures.



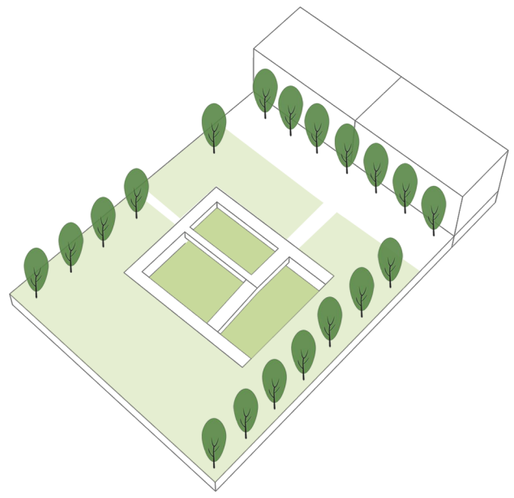
STEP 1: Remove the top cover



STEP 2: Selectively preserve the internal structure



STEP 3: Add pedestrian path and vertical transportation according to original structure

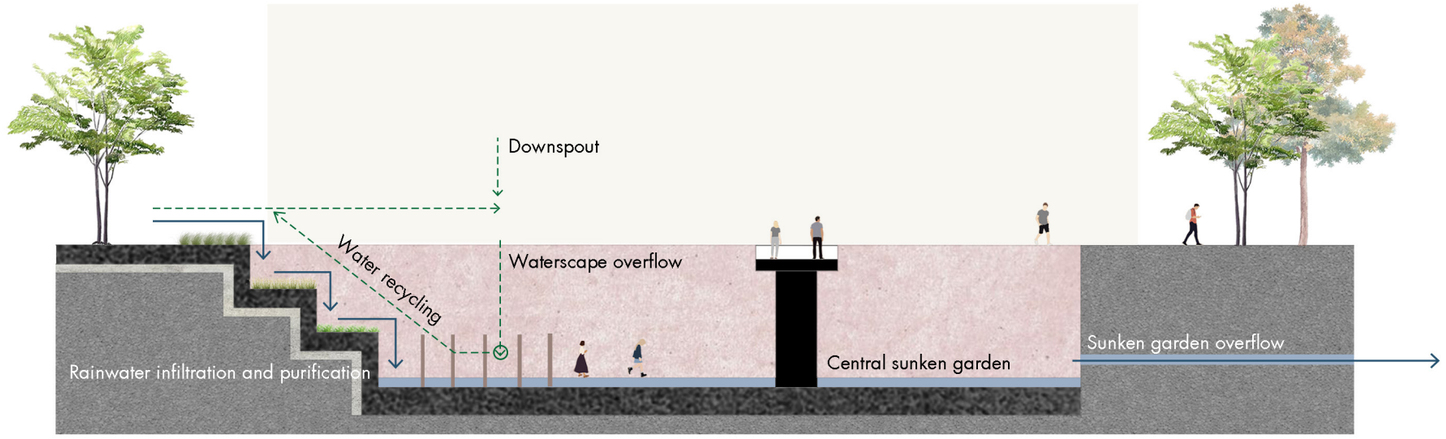


STEP 4: Create a stormwater purification system by keeping the vegetation nearby and adding vegetation to the bottom of the pond

SUNKEN GARDEN

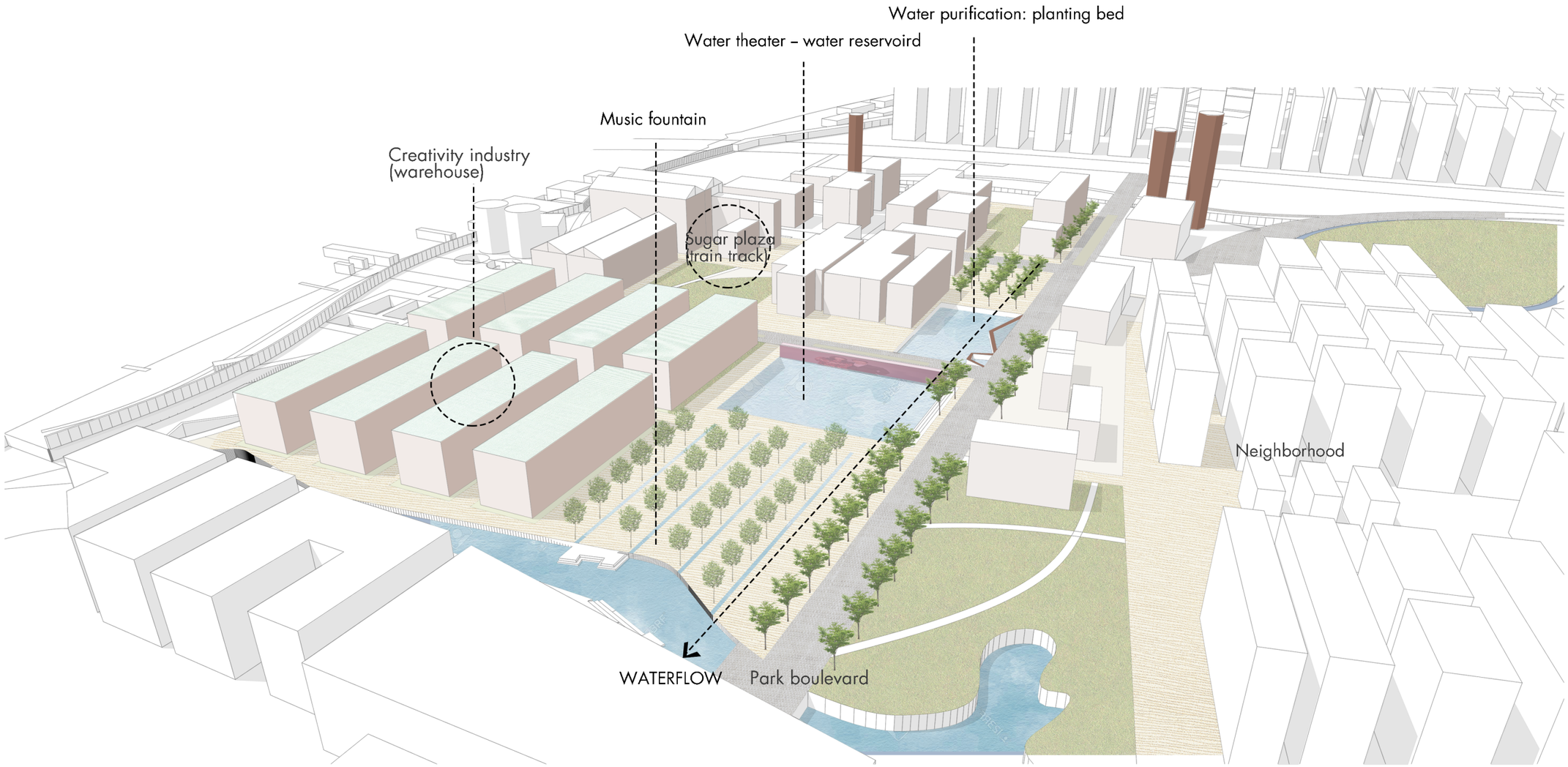
Water purification and infiltration system

Waterscape and water recycling system

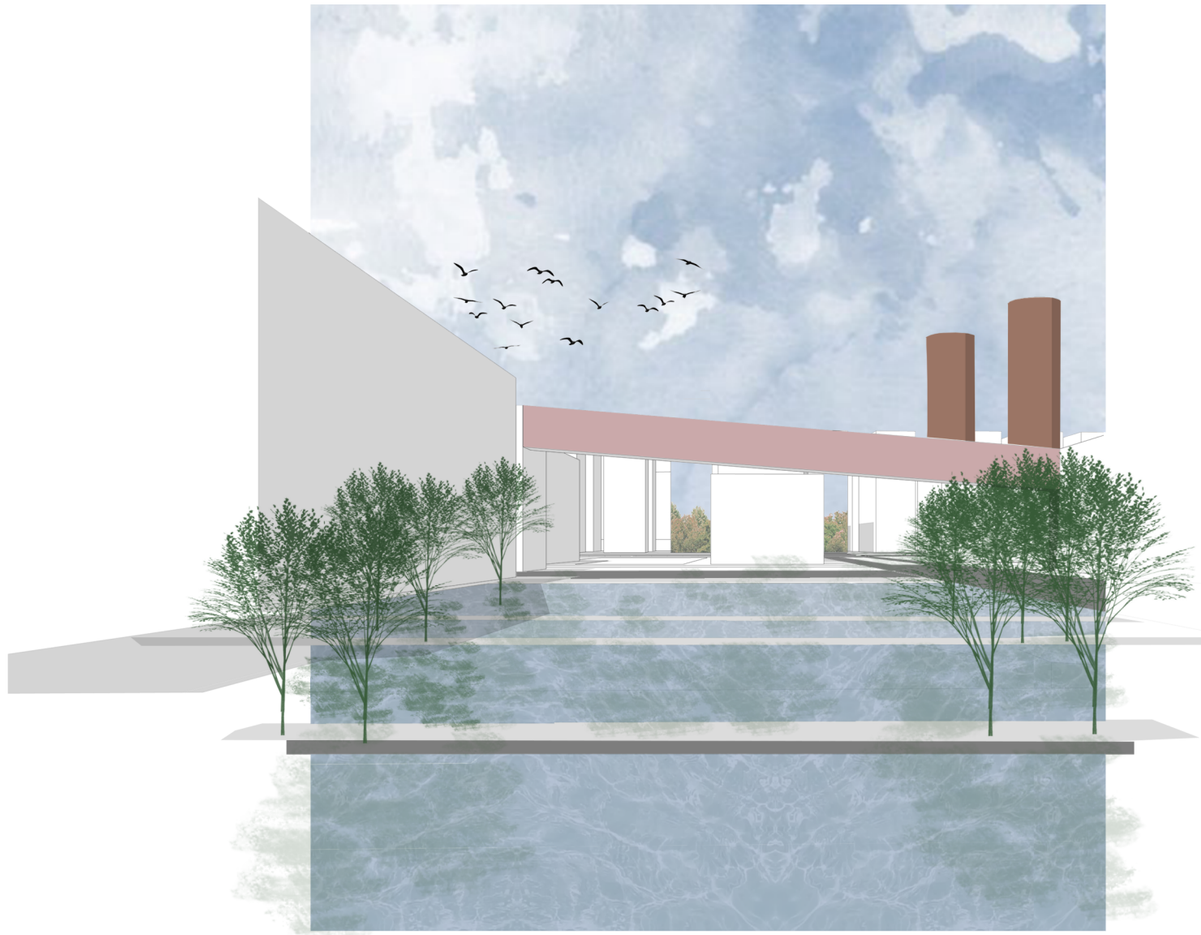


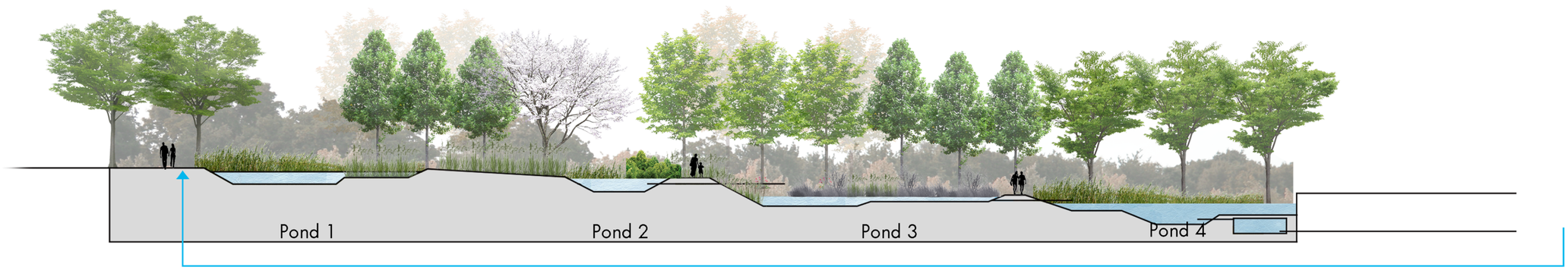


PARKWAY


Water purification: planting bed
Water theater – water reservoird
Music fountain
Creativity industry
(warehouse)
Sugar plaza
(train track)
Neighborhood
WATERFLOW
Park boulevard

WATER PURIFICATION – TERRACE WETLAND



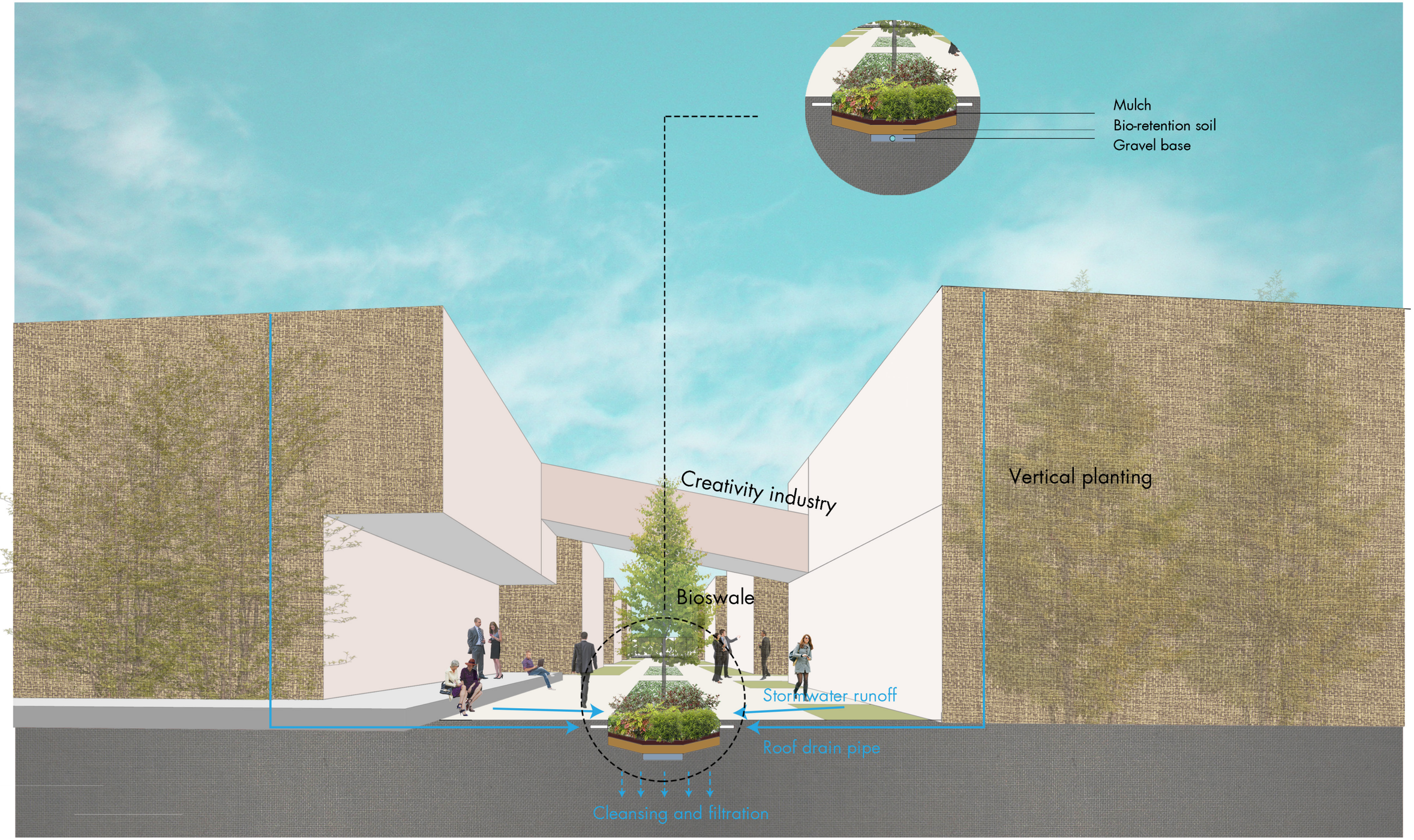


0 10m

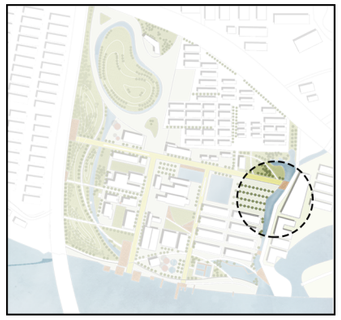
PARKWAY – SLOW TRAFFIC TO SUB CITY CENTER



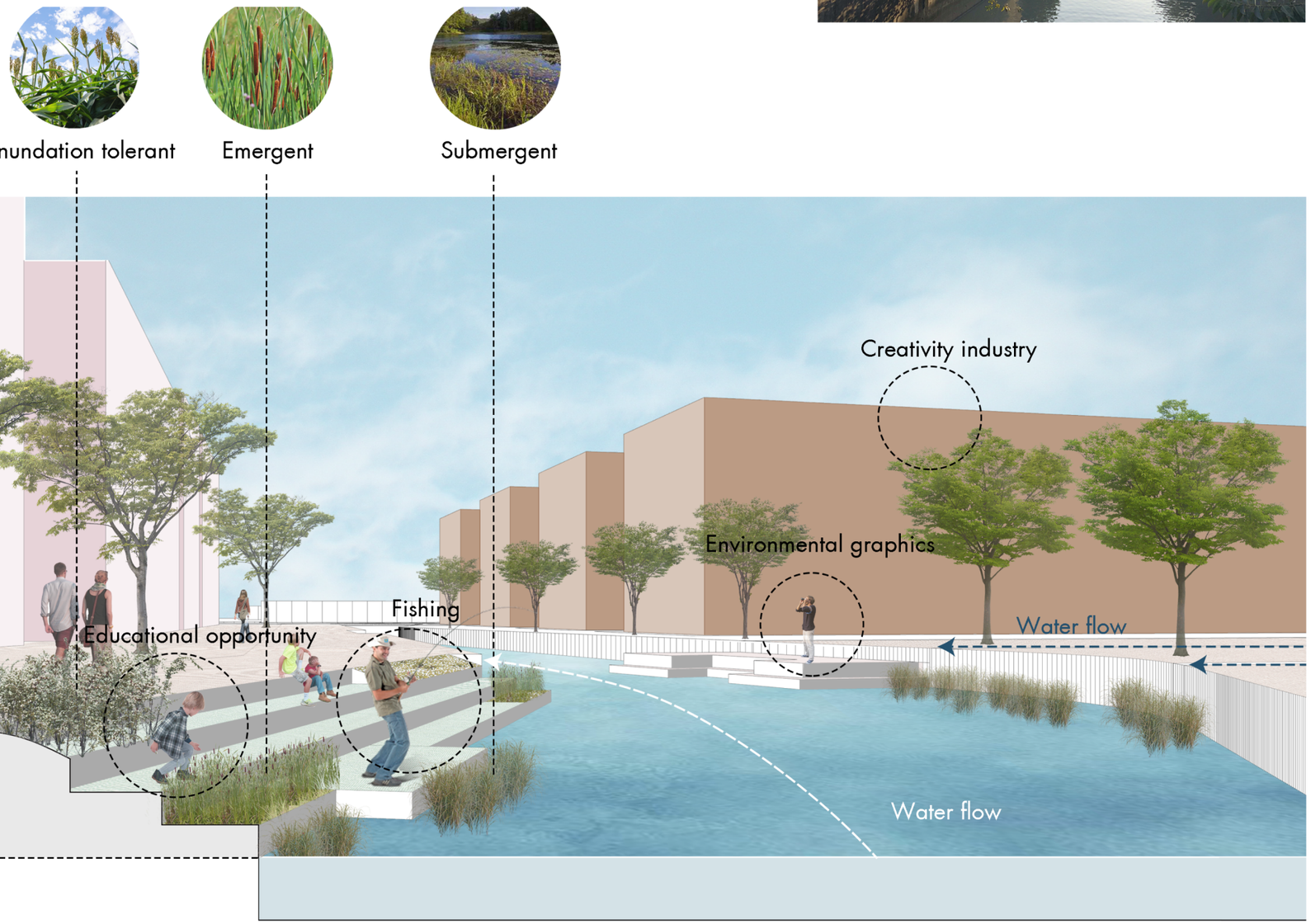
WORK IN THE PARK



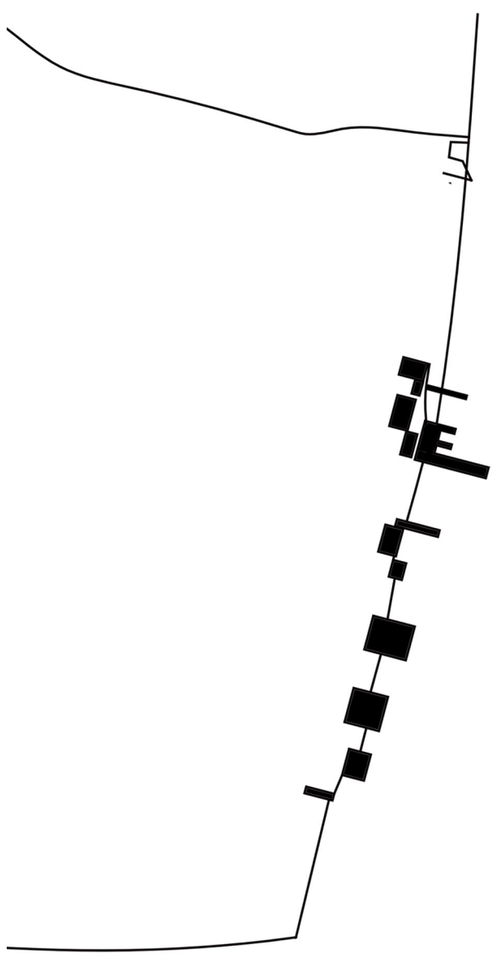
WATER REUSE – REVITALIZE CANAL

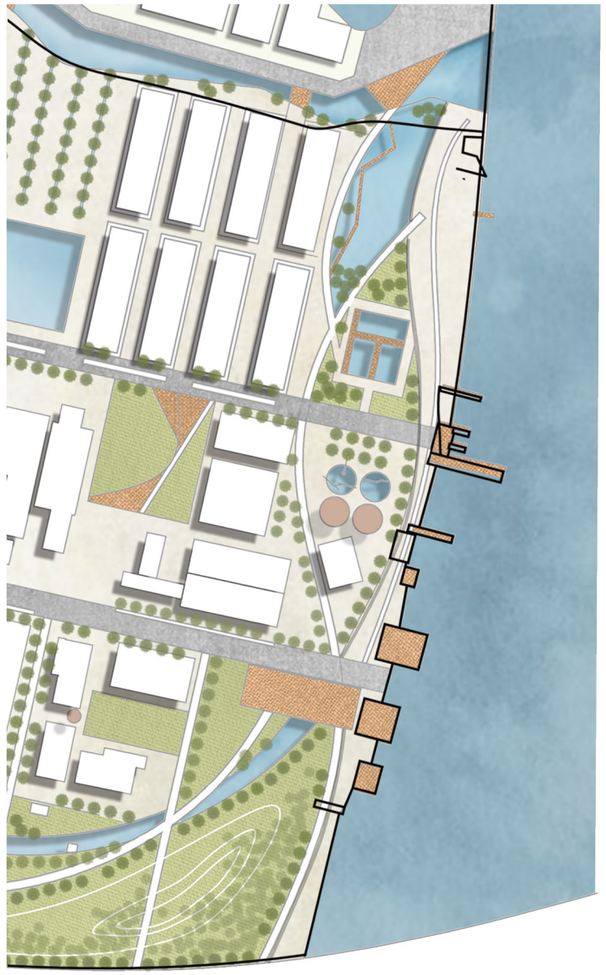




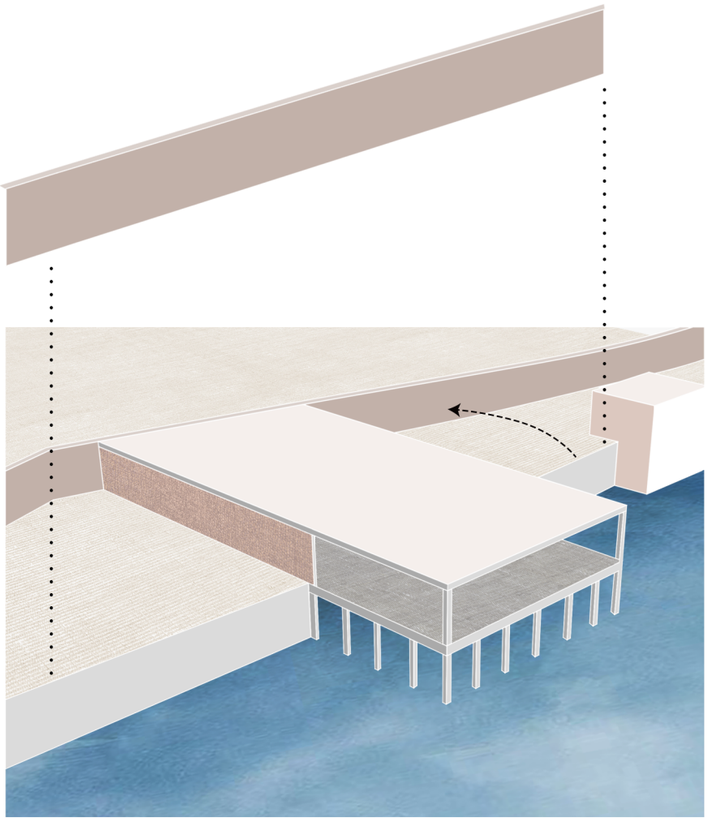


OUTSIDE OF DIKE – MAKE ROOM FOR RIVER

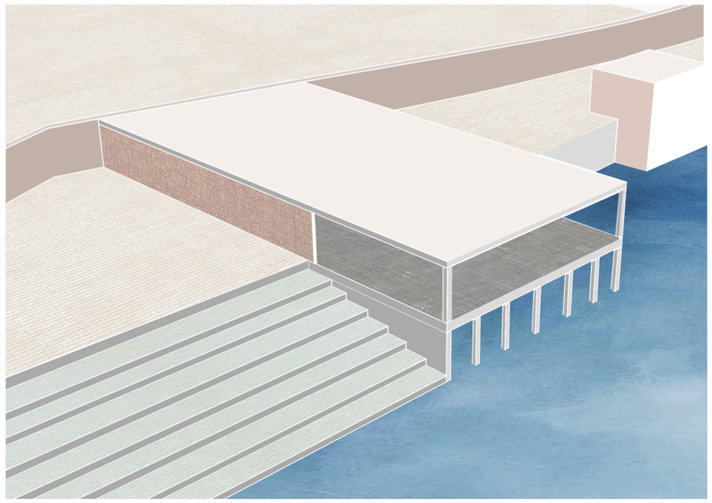




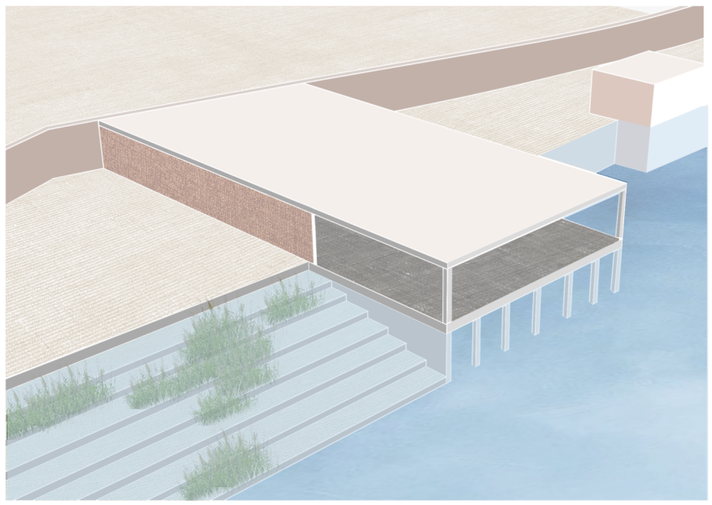
OUTSIDE OF DIKE – MAKE ROOM FOR RIVER



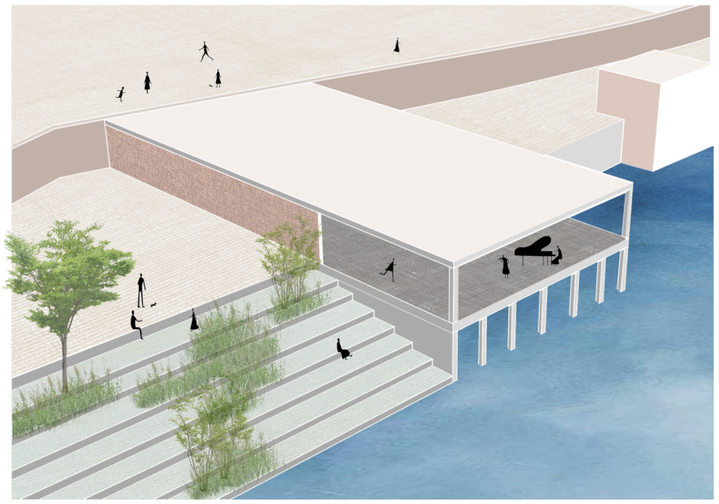
STEP 1: Remove dike to innerland



STEP 2: Add terraces for recreational function and catchment of sedimentation during flooding

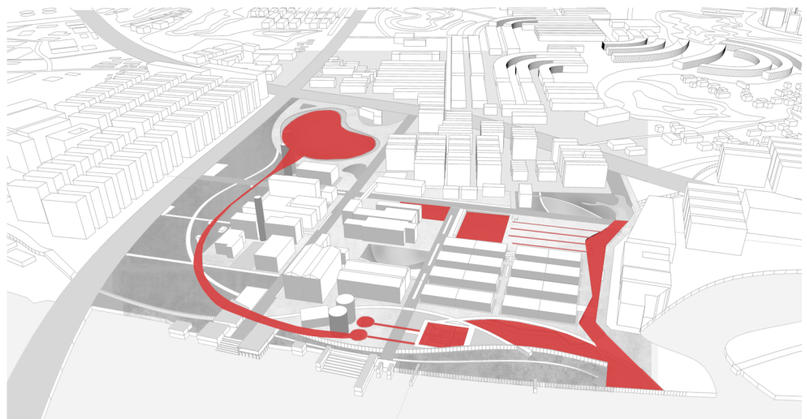


STEP 3: Set sand-fix plant



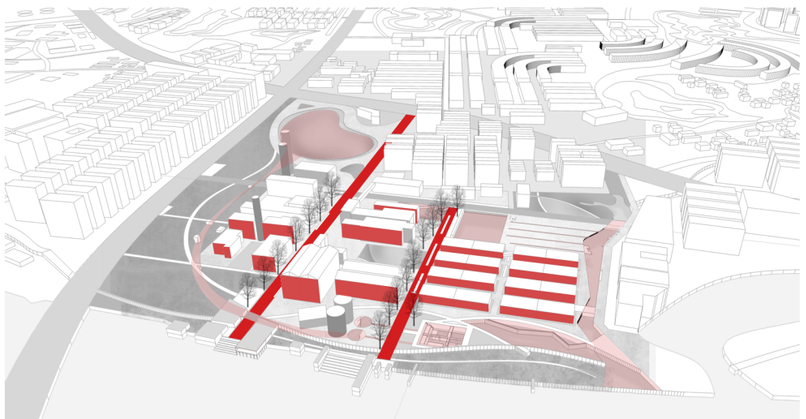
STEP 4: Provide environment for events

THE IMPLEMENT OF DEVELOPMENT PLAN IN PHASES



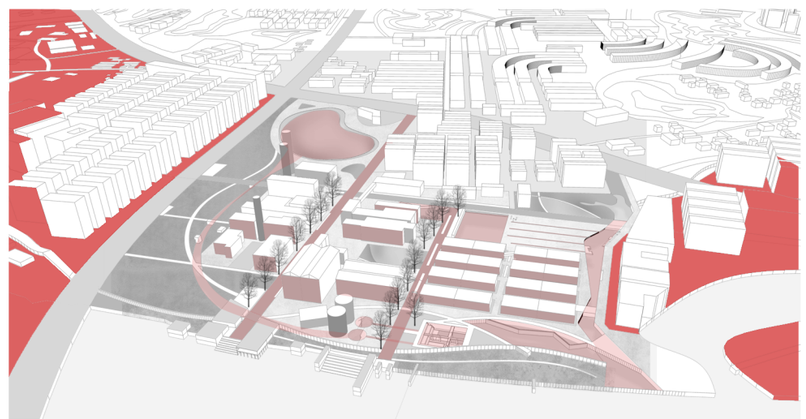
PHASE 1: CONSTRUCT COMPLETED WATER RESILIENT SYSTEM

The first step is based on existing facilities and space to construct a completed water resilient system with functions of water collection, water purification and water reuse. It can solve the waterlogging problem efficiently and also prove water safety in this area. At the same time, the environment in the factory is improved and more and more people will be attracted here for public activities.



PHASE 2: ACTIVATE INDUSTRY RENEWAL

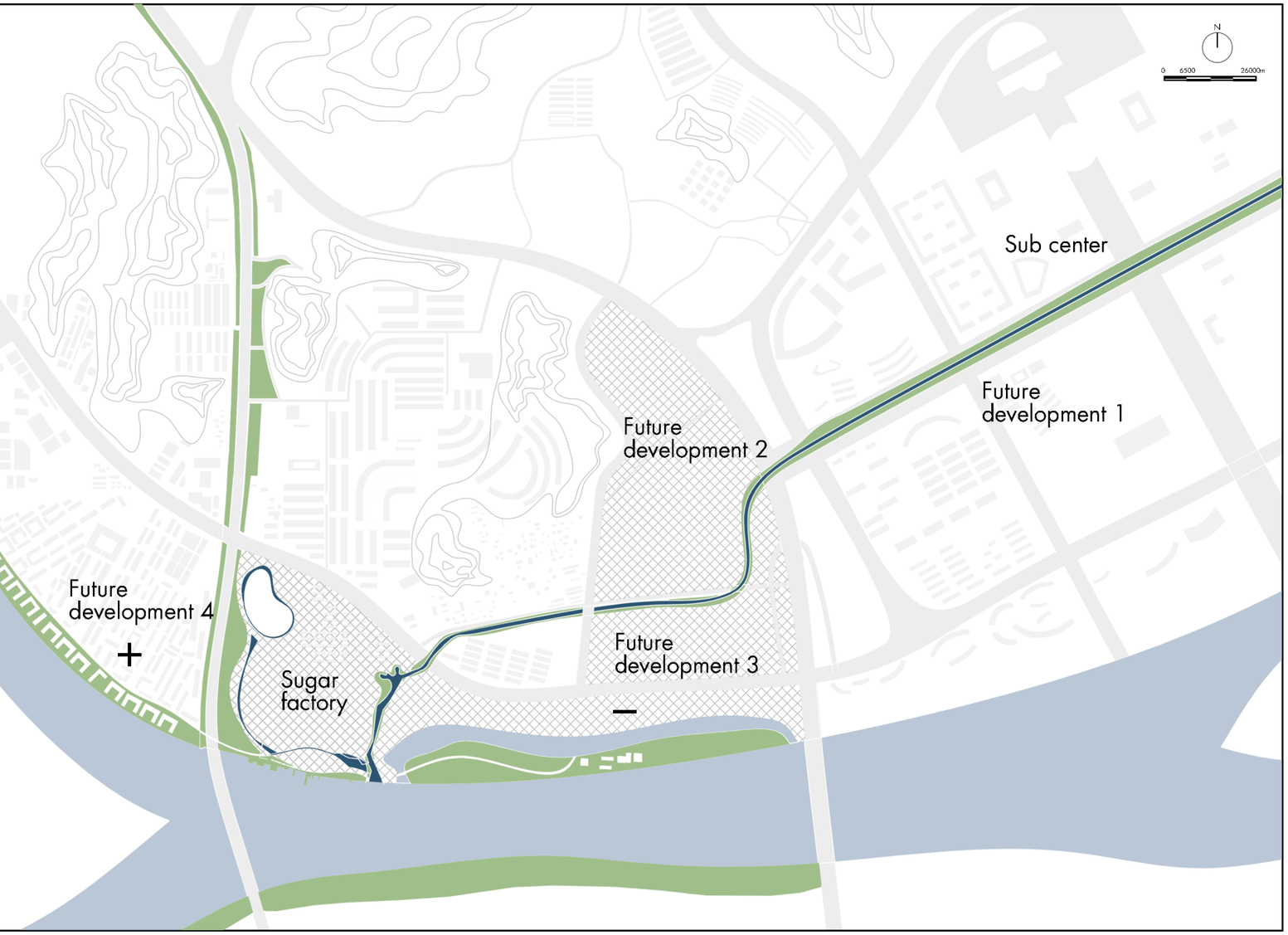
Then we introduce the new industry to this area to make full use of the old buildings and public spaces. For example, the production workshops are transformed into the sugar museum park, old offices can be reused and old warehouses can be refunctioned for the creative industry. The connection between north to south is improved and more economic value is added to this site.



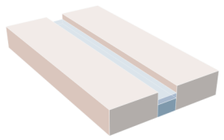
PHASE 3: ACCELERATE THE SURROUNDING INDUSTRAIL TRANSFORMATION

With the successful transformation in this site and the expansion of the sub-city center, it will accelerate the speed of industrial transformation in the surroundings and integrate to the sub-center very well.

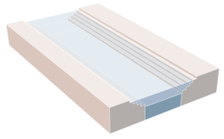
VISION IN LARGE SCALE



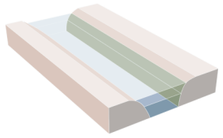
Future development 1



Existing condition



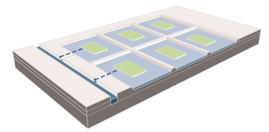
Terrace



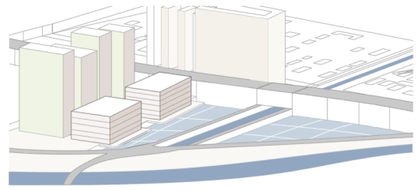
Riparian wetland

Future development 2

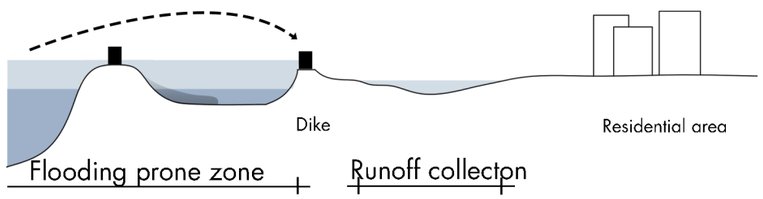
Connect deae-end canal connection water reservoir with canal



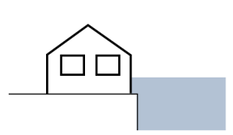
Intergrate agricultural production with research and civic amenities



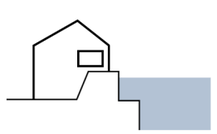
Future development 3 -



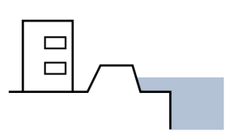
Future development 4 +



Building outside of dike



On top of dike



Inside of dike



INTROIDUCTION

ANALYSIS

PRINCIPLE
&
STRATEGY

DESIGN EXPLORATION

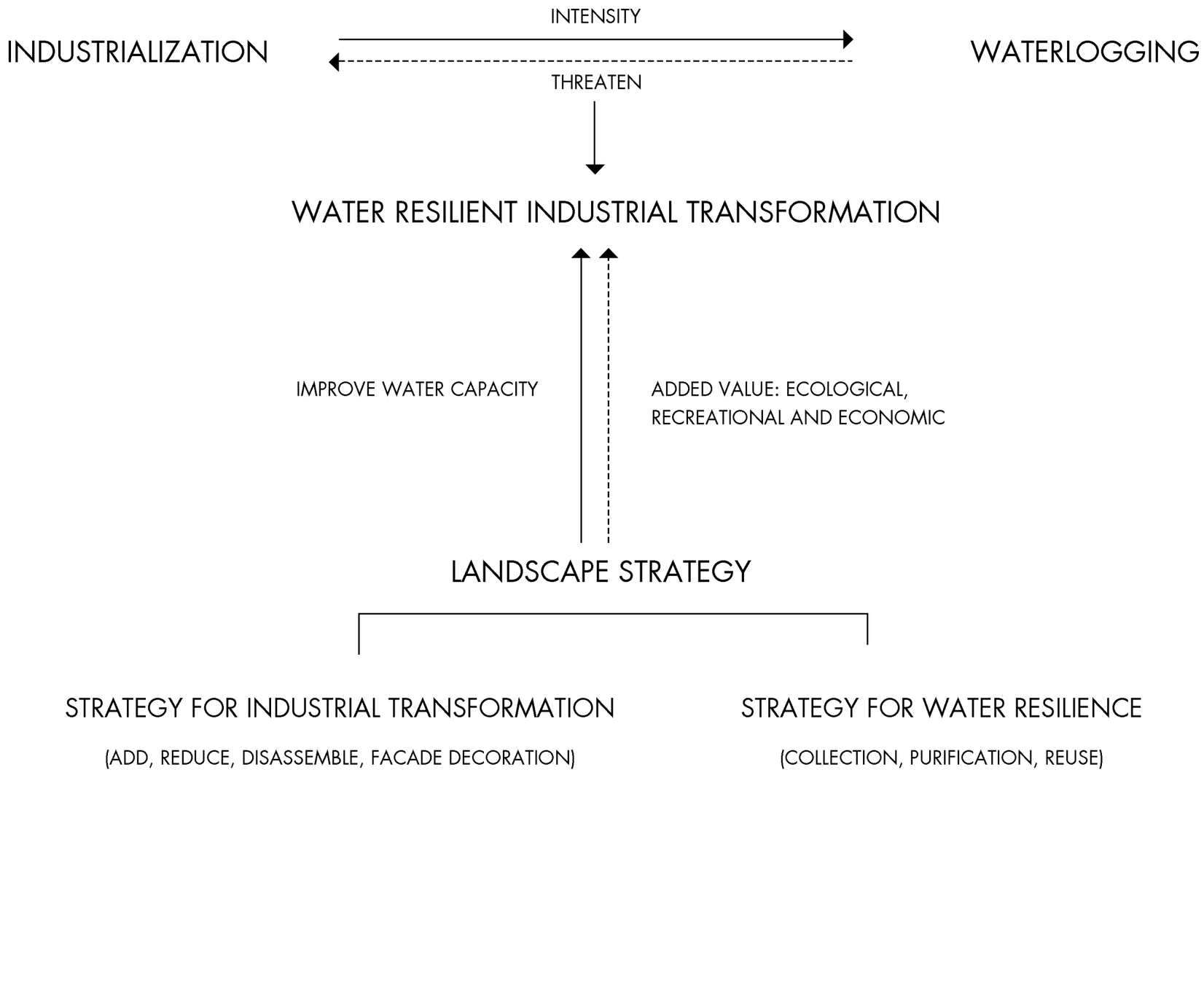
REFLECTION

REFLECTION

Can we make use of the chance of industrial transformation to explore landscape strategies for water resilience?

– Reflection on my research objective

(Explanation on next page)





THANKS!