Deep Forms: Nature Based Solutions

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and Turenscape

How can we survive?

Over 80% of the Chinese cities suffer air pollution, kills 1.2 million people each year

Flood: annual flood damage cost 100 billion US $

Draught: 400 of 662 cities in shortage of water

Pollution: 75% of the nation's surface water is polluted, 64% of cities' underground water is polluted

Habitat loss: 50% wetland disappeared in the past 50 years

Conventional solutions of single-minded engineering are not sustainable

Alternative---

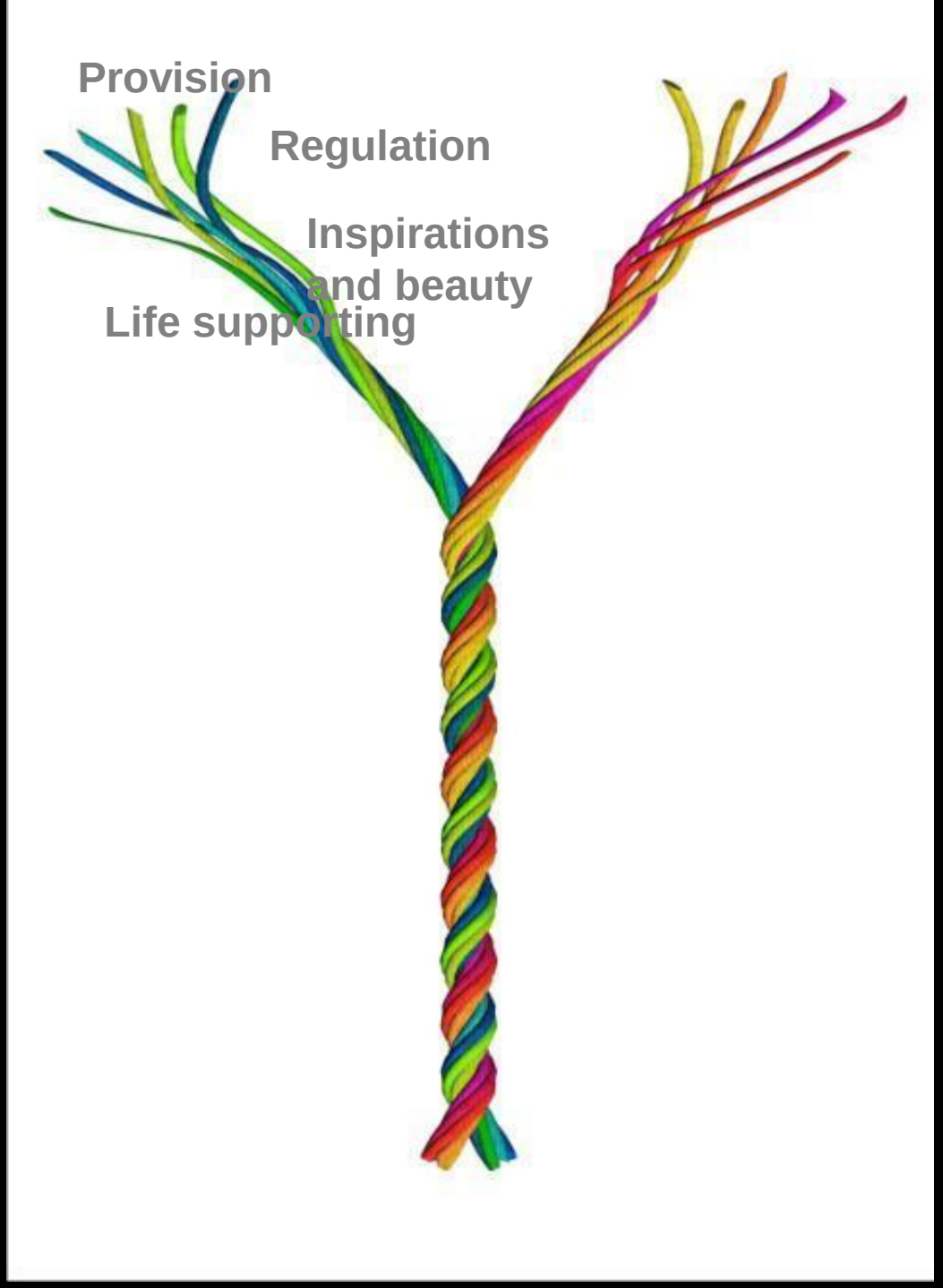
Nature based solutions: by planning and designing landscape as ecological infrastructures (Green Infrastructure) to provide multiple eco-services:

Provision

Regulation

Life supporting

Cultural and spiritual services



- **Such solutions result in deep forms that stands in contrast to shallow form, “which has only the surface perceptual order and lacks the solidity of coherent process beneath the surface" (Lyle, 1985).**

Deep form

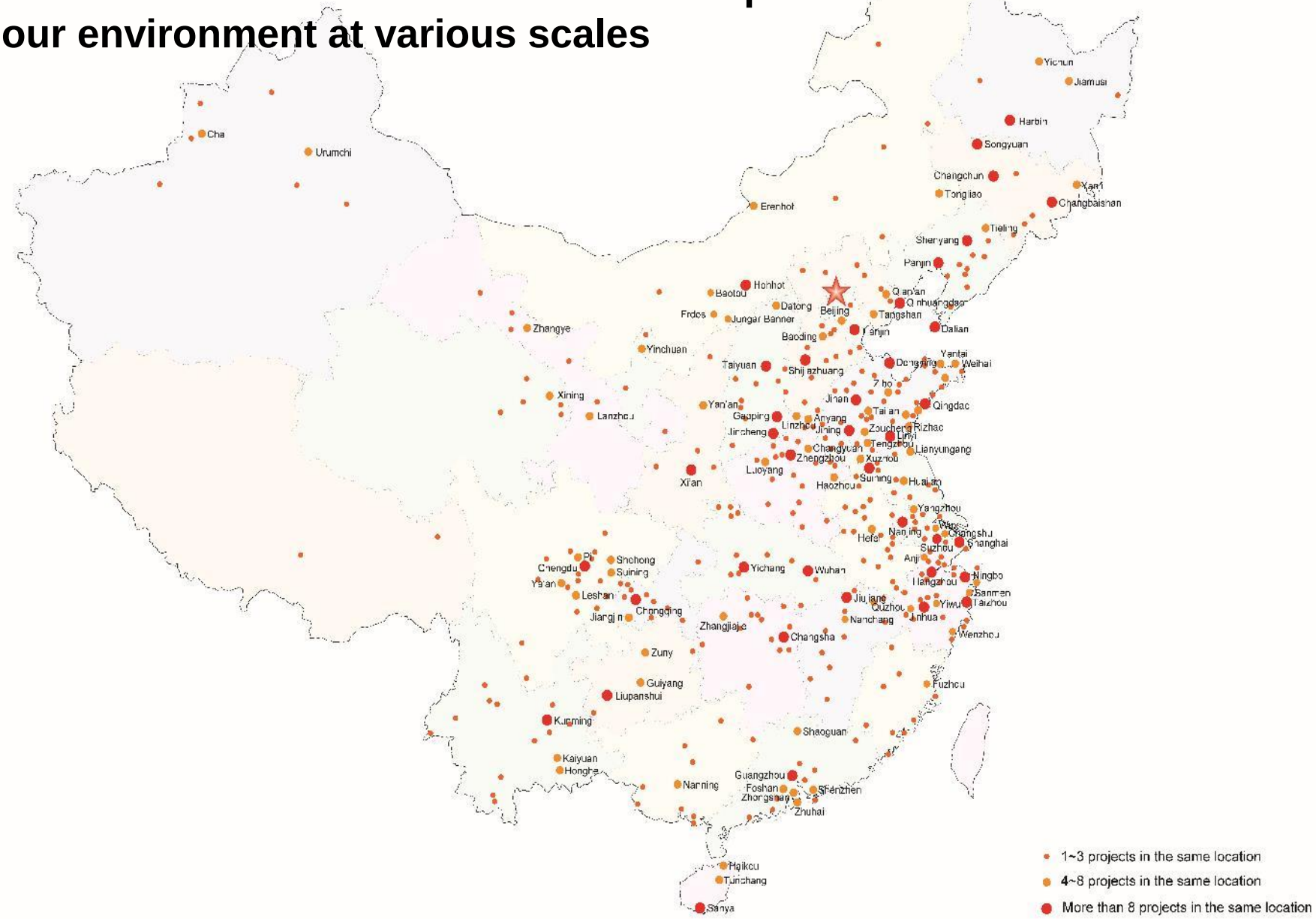
Shallow form and fake

Two strategies to create the ecological infrastructure, thus deep forms

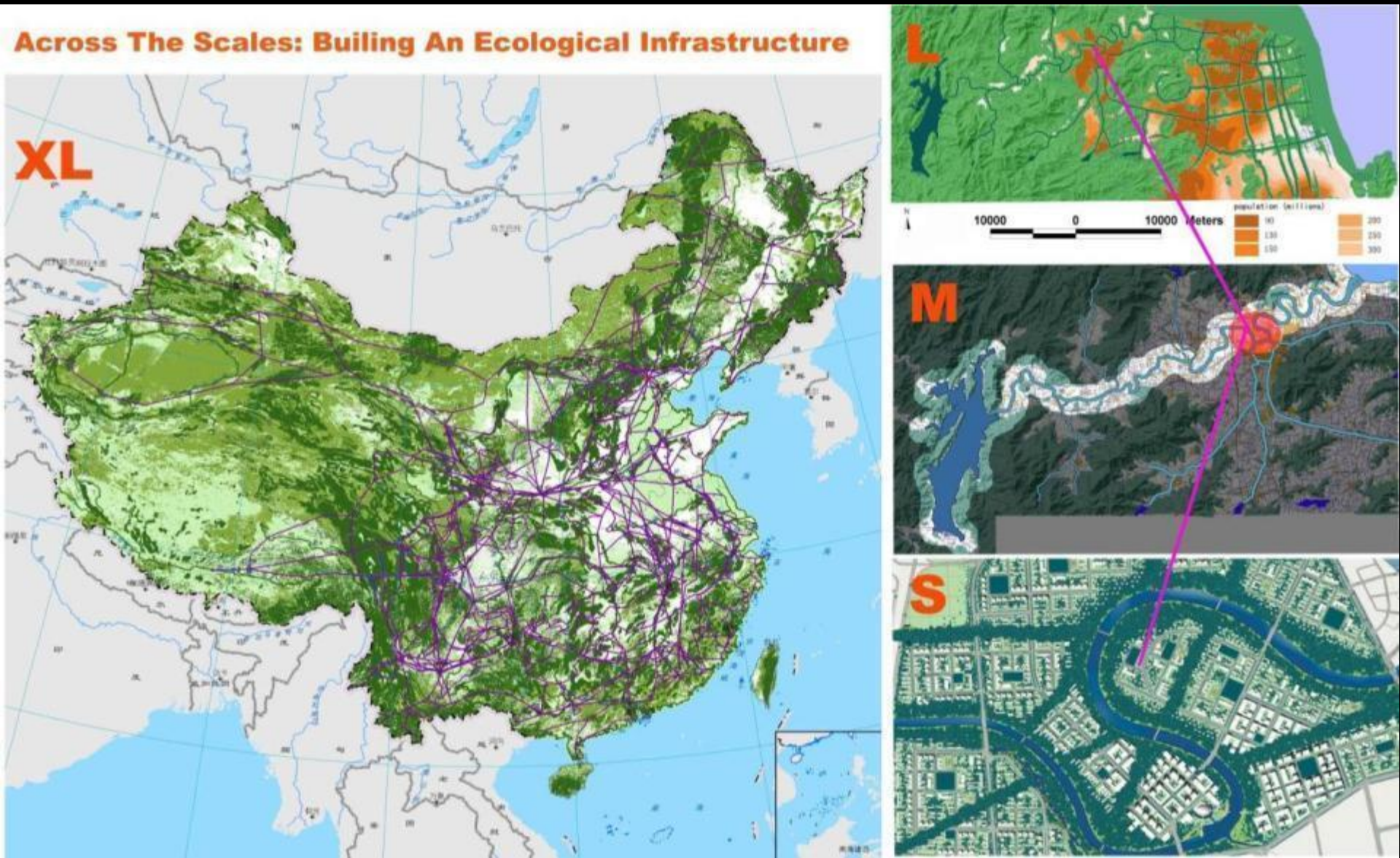
1. Planning to create configurative deep forms

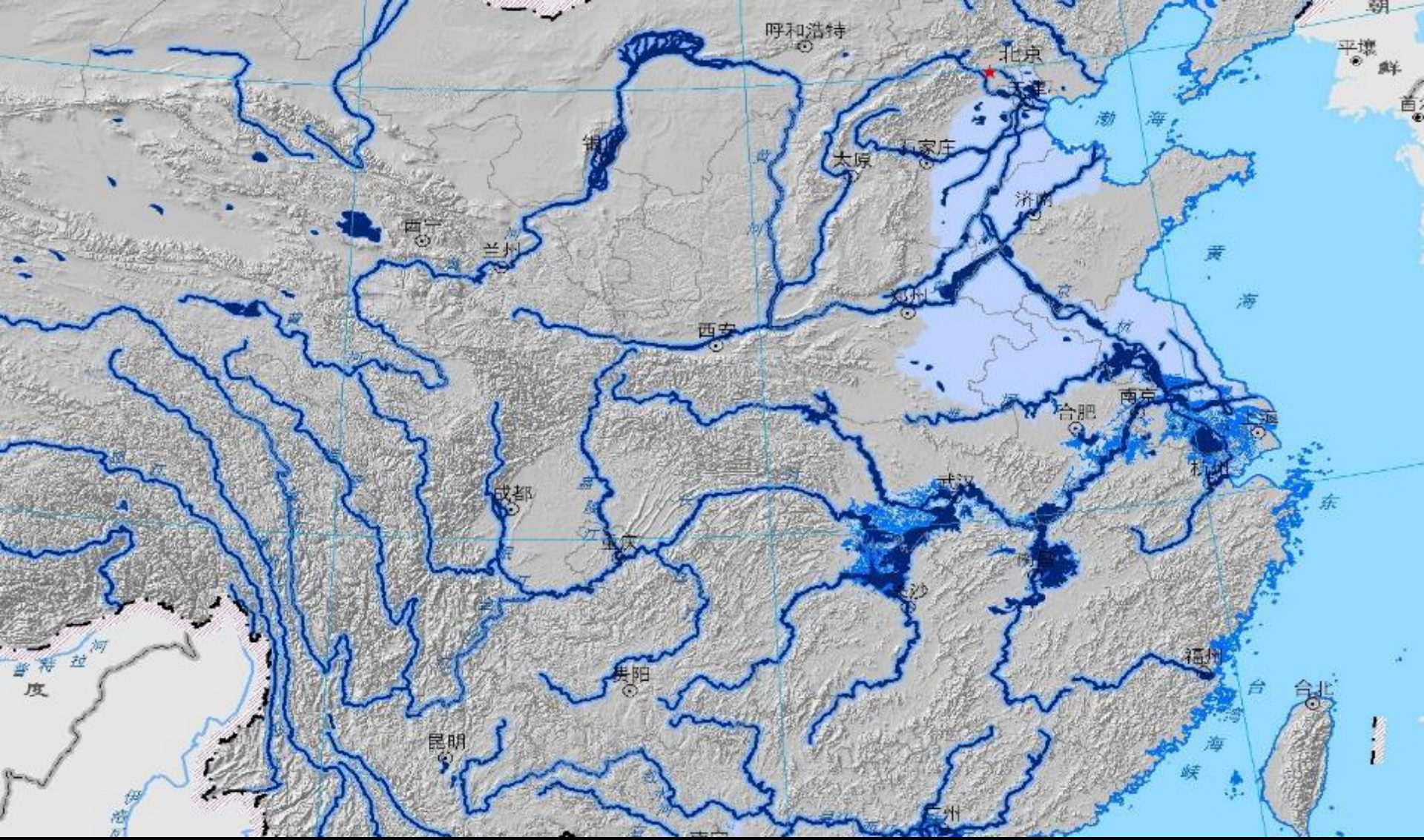
2. Design and engineering to create transformative deep forms

For about 20 years, my team have being testing such solutions in over 200 cities and showcased numerous replicable models for transforming our environment at various scales



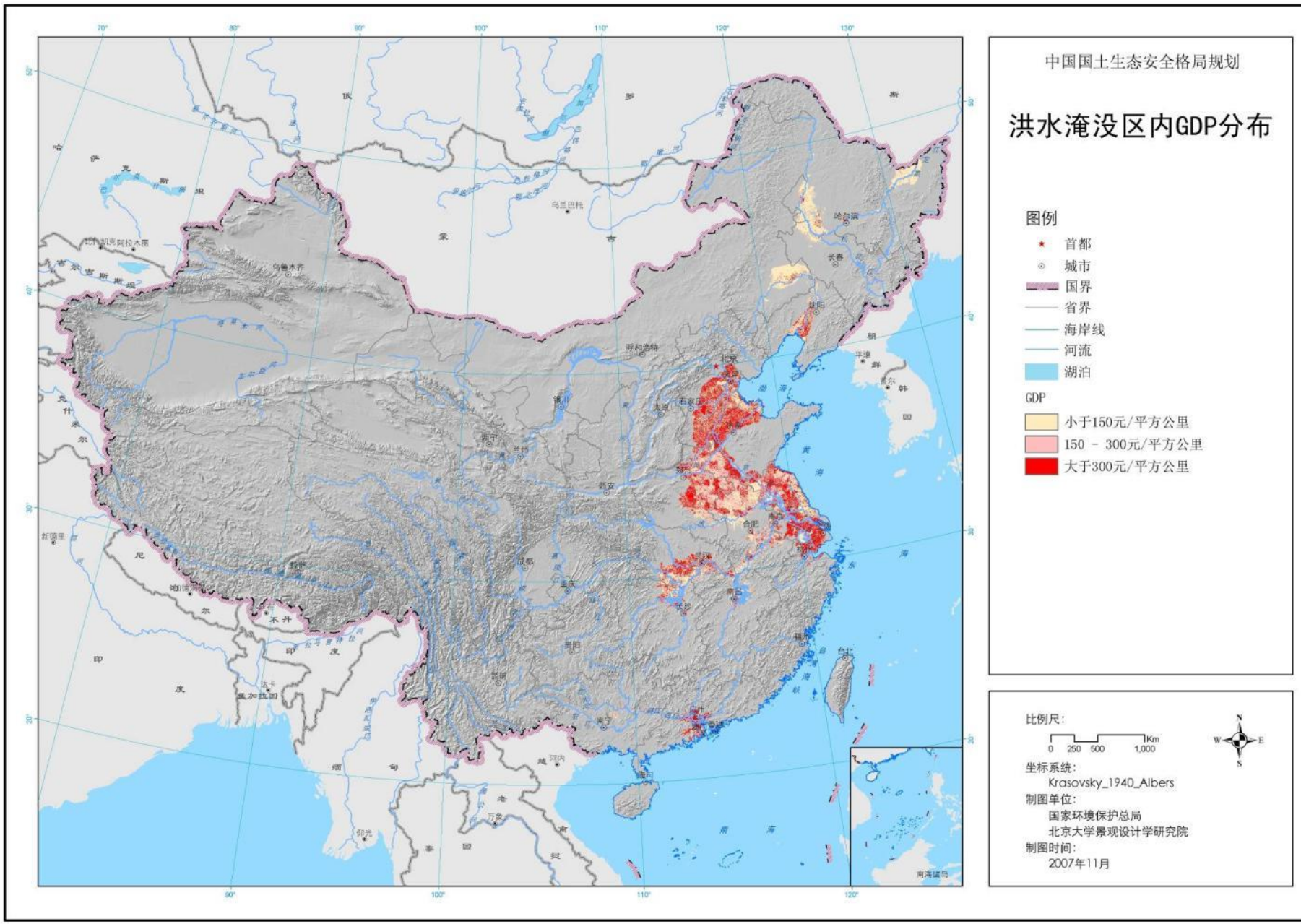
Planning to create configurative deep forms
Ecological Infrastructure across scales



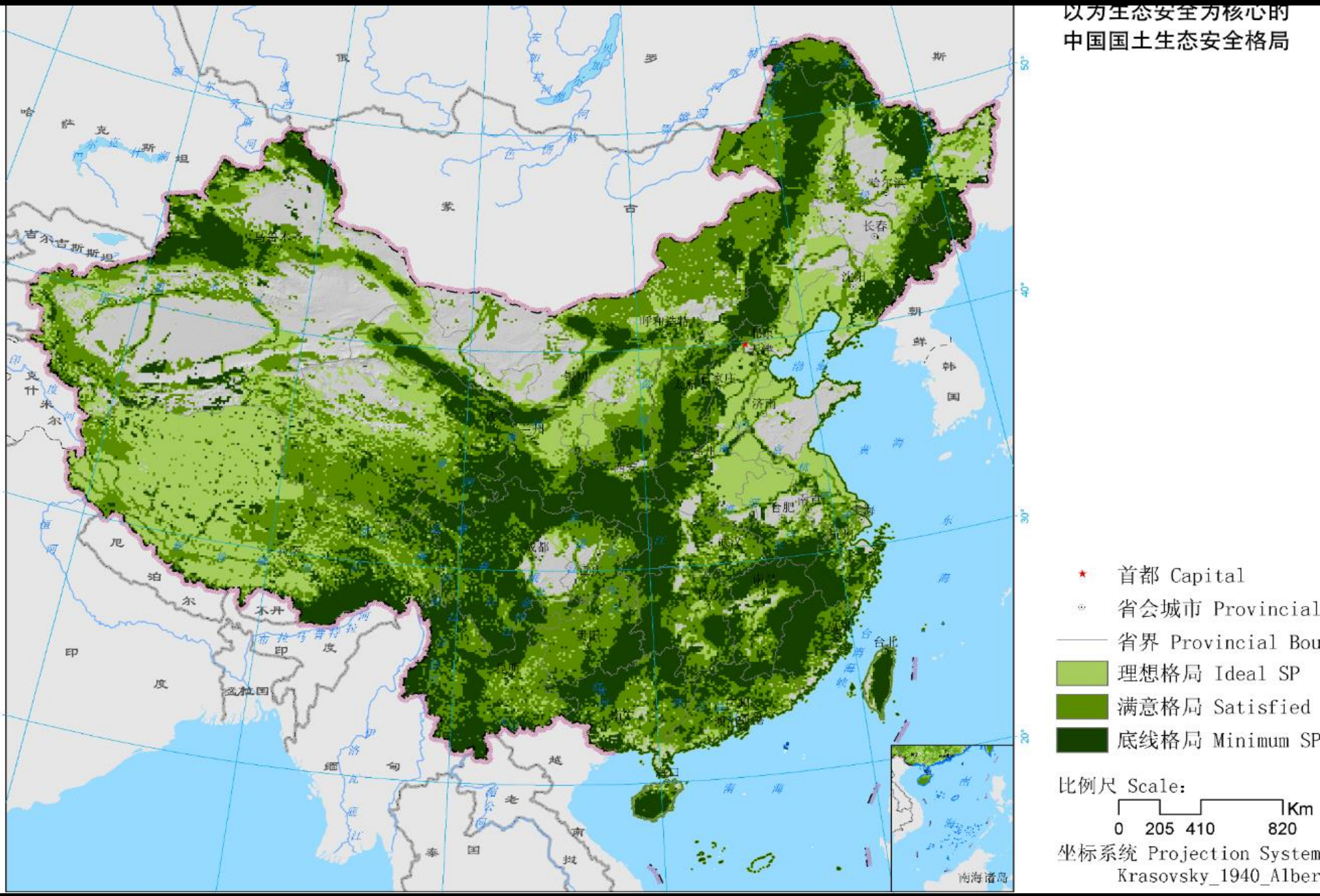


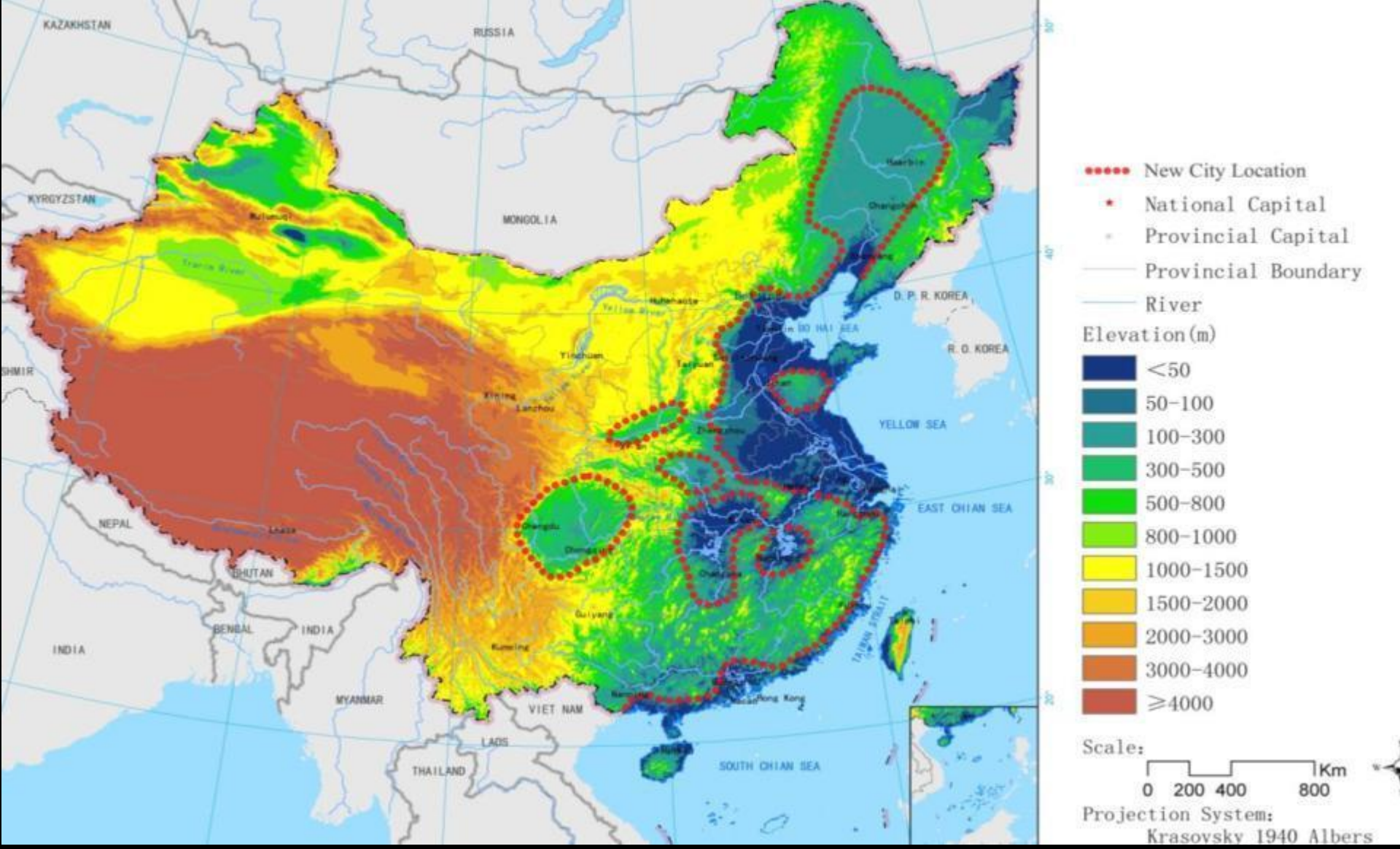
National water security pattern

- 1- year flood, 0.8% of the national land;
- 10 –year flood, 2.2% of the national land;
- 50-year-flood , 6.2% of the national land;


中国国土生态安全格局规划
洪水淹没区内GDP分布
图例
首都
城市
国界
省界
海岸线
河流
湖泊
GDP
小于150元/平方公里
150 - 300元/平方公里
大于300元/平方公里
比例尺:
0 250 500 1,000 Km
N
W E
S
坐标系统:
Krasovsky_1940_Albers
制图单位:
国家环境保护总局
北京大学景观设计学研究院
制图时间:
2007年11月

the national Ecological Infrastructure





The Foothills Strategy: where to build another 500 cities for 0.5 billion new immigrants (Kongjian Yu, Capitalizing on foothills: restoring the relationship between people and land. Harvard International Review; Summer 2012, Vol. 34 (1); 40-45)

L

Ecological infrastructure

Regional Ecological Infrastructure

SPs for water

+

SPs to avoid geological disaster

+

SPs for biodiversity

+

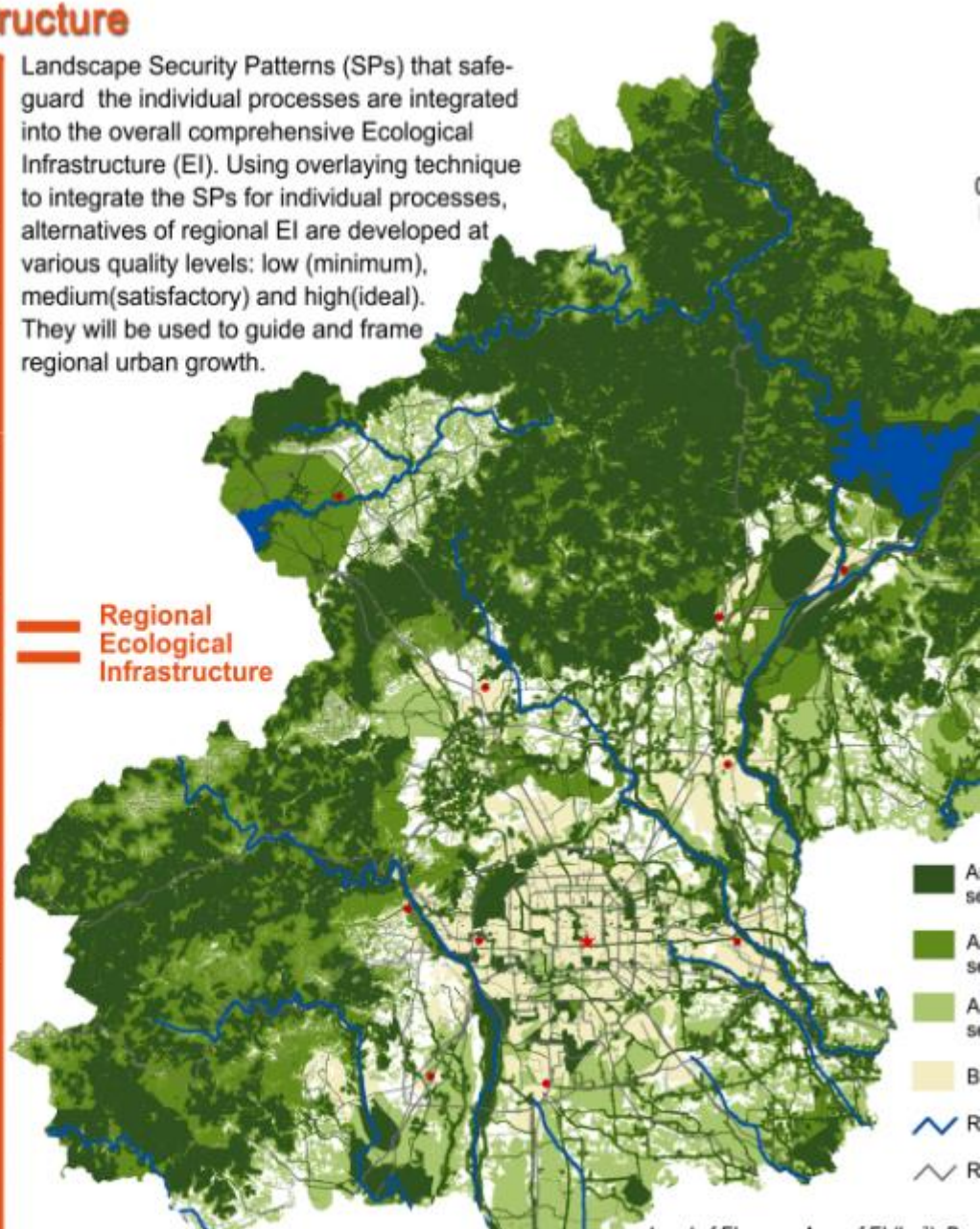
SPs for cultural heritage

+

SPs for recreation

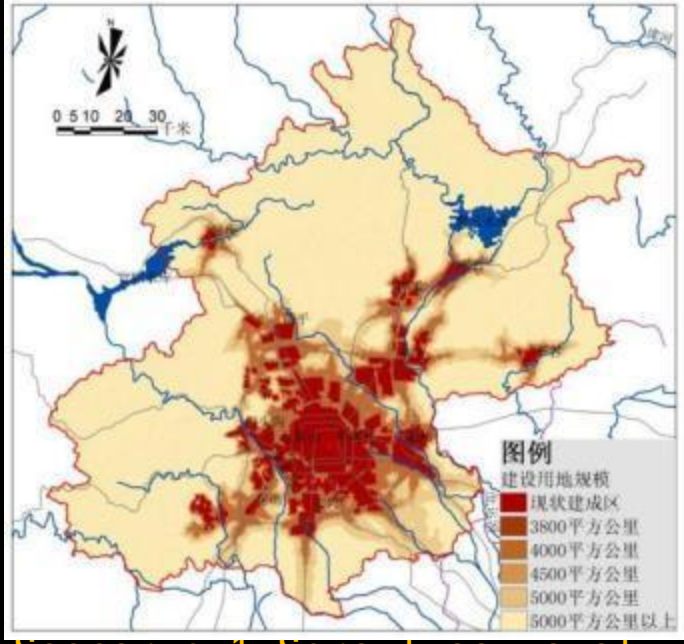
Landscape Security Patterns (SPs) that safe-guard the individual processes are integrated into the overall comprehensive Ecological Infrastructure (EI). Using overlaying technique to integrate the SPs for individual processes, alternatives of regional EI are developed at various quality levels: low (minimum), medium(satisfactory) and high(ideal). They will be used to guide and frame regional urban growth.

= Regional Ecological Infrastructure

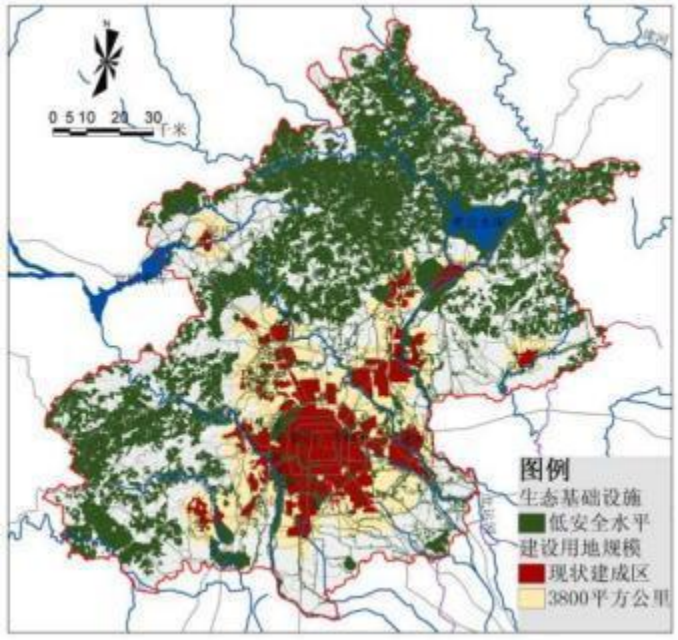


Level of EI	Area of EI (km²)	Perc... in to...
Minimum(lower)	7729	47.
Satisfying (medium)	11508	70.
Ideal(higher)	13902	85.

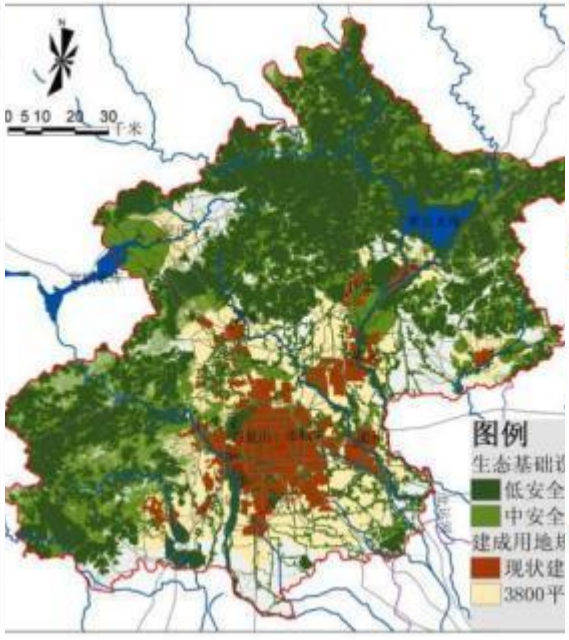
Landscape leads the way:
Urban growth based on EI



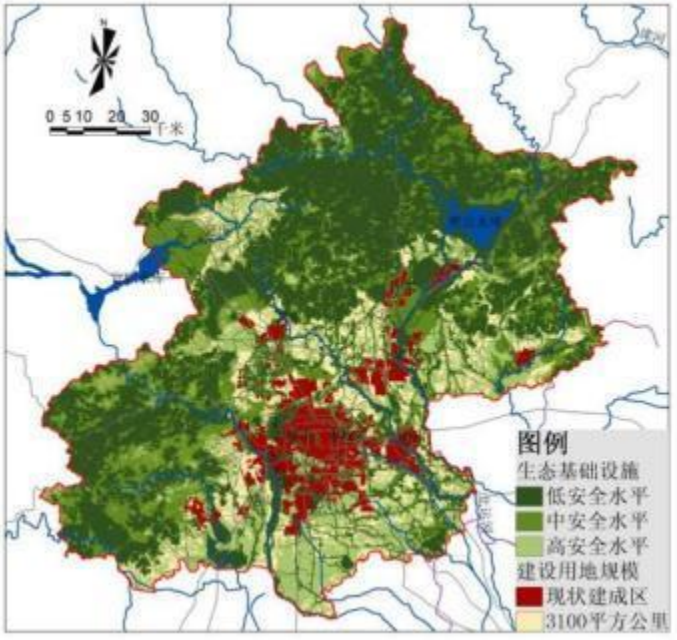
Scenario-1 Sprawl as usual



Scenario-3

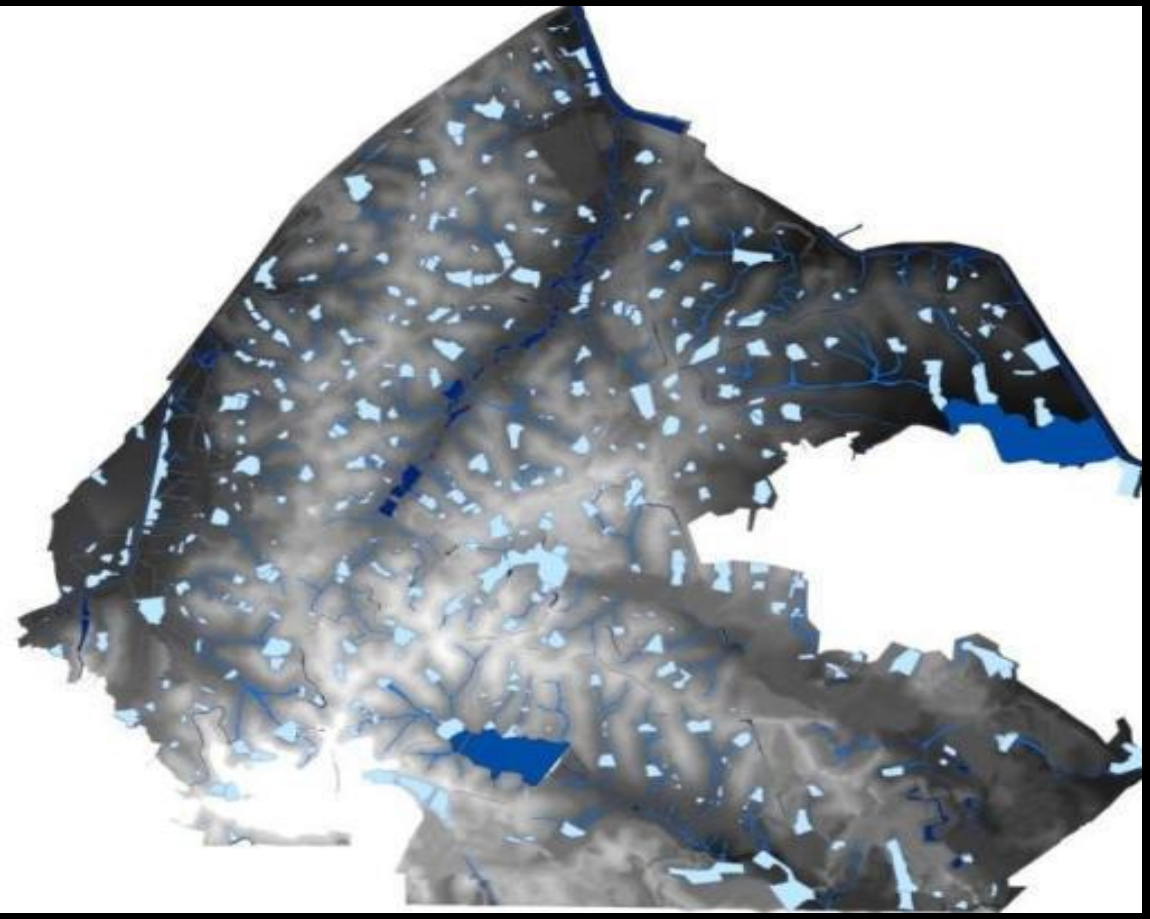


Scenario-4



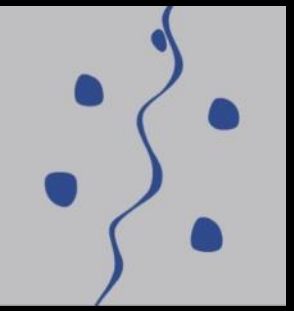
Scenario-5

M: urban design based on EI

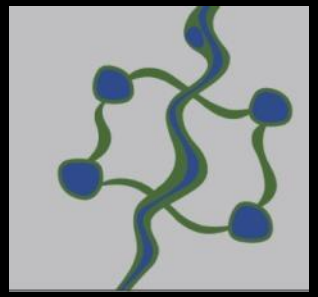


The subtle elevation change on the rolling terrain gives character to the existing water system,

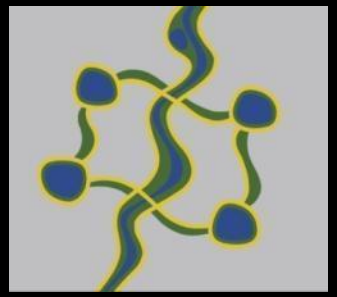
Conventional way of city building



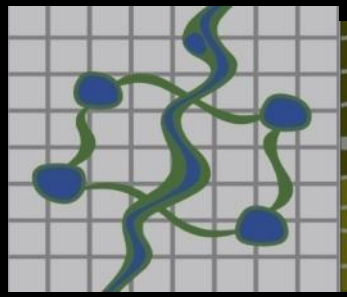
Existing water



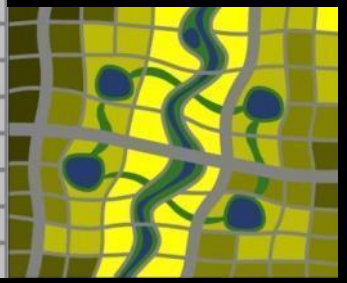
Water based EI based



EI integrated with pedestrian & bicycle paths

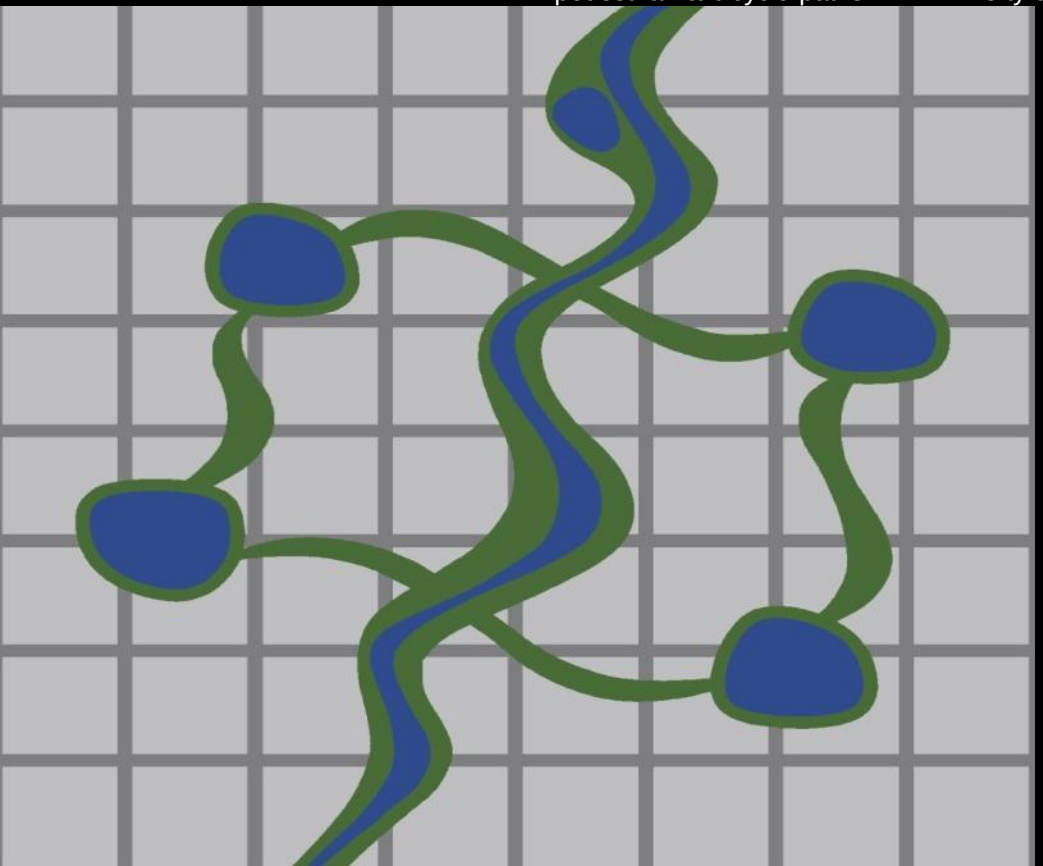


EI based circulation City deign based on EI



EI based land

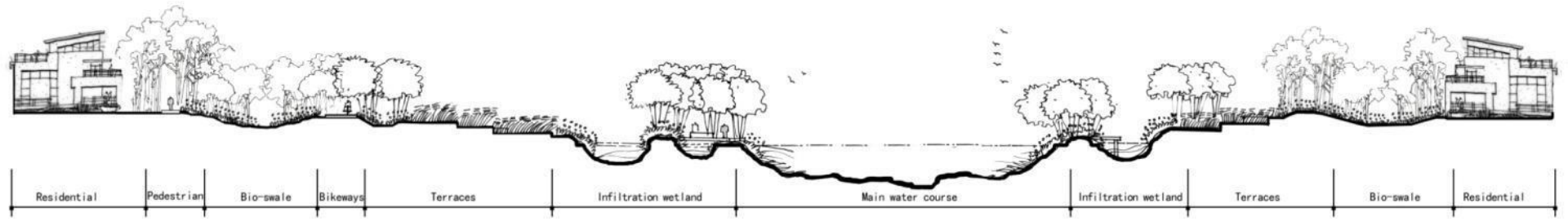
City based on EI



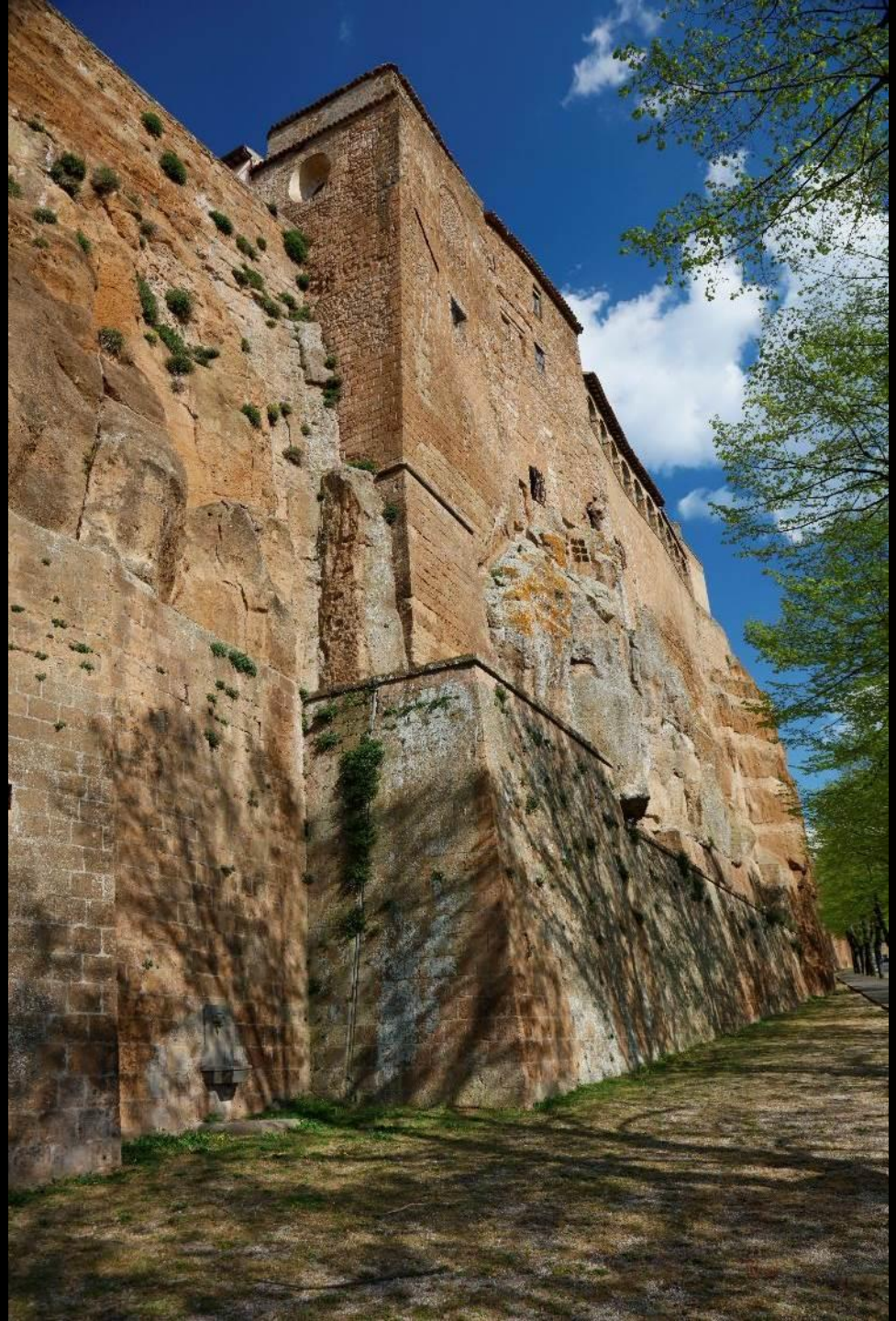
Landscape as infrastructure leading urban development

The stormwater collecting and filtrating system is the core for the ecological infrastructure of the new town. Three levels of green corridors were developed based that make up an


N
0 150 250 500 1000
庙山经济开发区
图例
牛山湖


Residential
Pedestrian
Bio-swale
Bikeways
Terraces
Infiltration wetland
Main water course
Infiltration wetland
Terraces
Bio-swale
Residential

Design and engineering to create transformative deep forms



• #1 Make Friends with Floods

- ***Annual flood damage cost 100 billion US $, 10 million people live in flood plain.***
- ***All Rivers in China are dammed and channelized with concrete flood walls, What can you***

浙江金华，与洪水为友：燕尾洲公园

- ***Before***

- *After*


100 Year Flood


20 Year Flood

Dry season

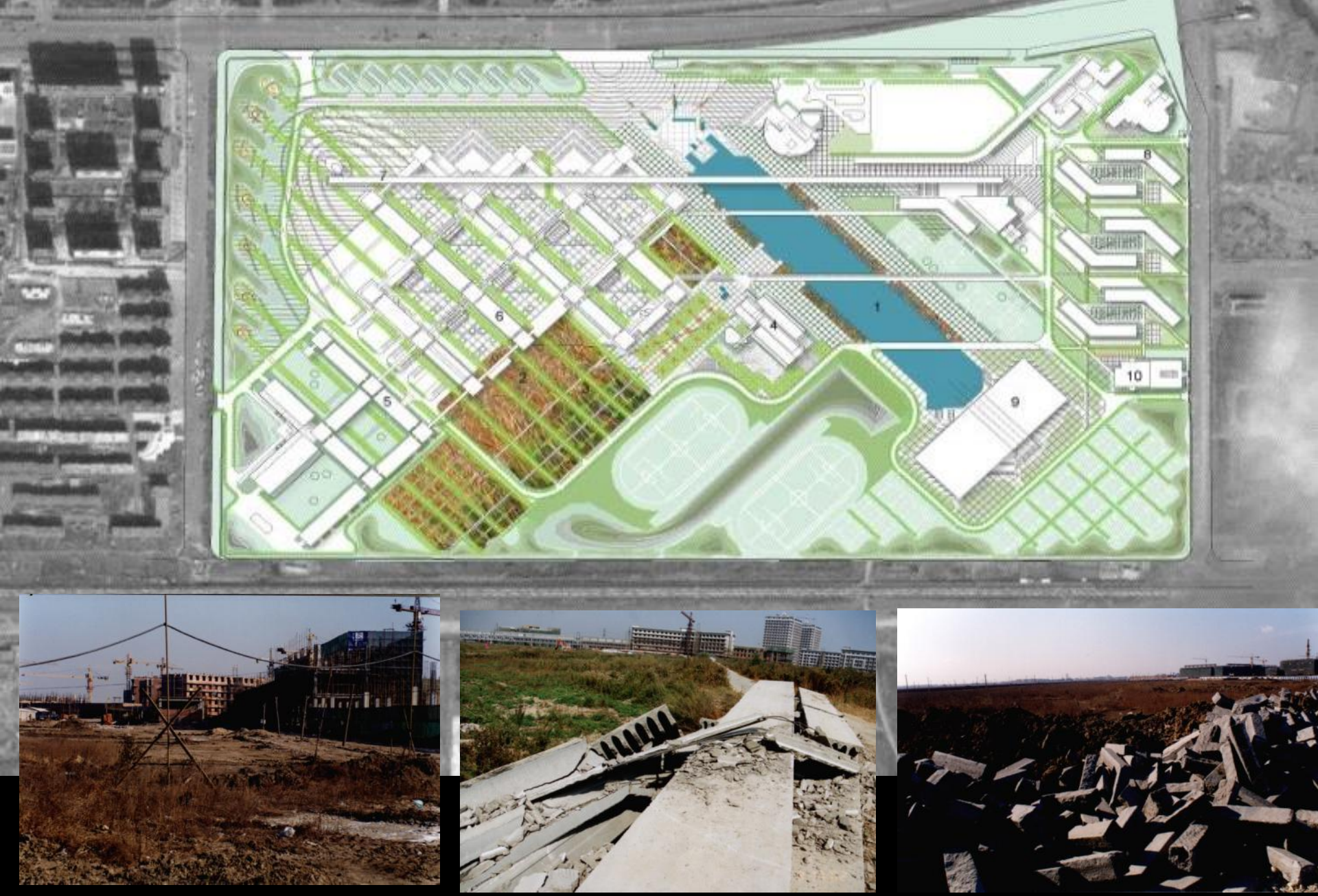
An aerial view of the park during the dry season, note the lush tall grasses covering the terraces on the embankment. The terraces are enriched by silt deposited during the flood season (view is toward the west, photo: September, 2016)

Dry season

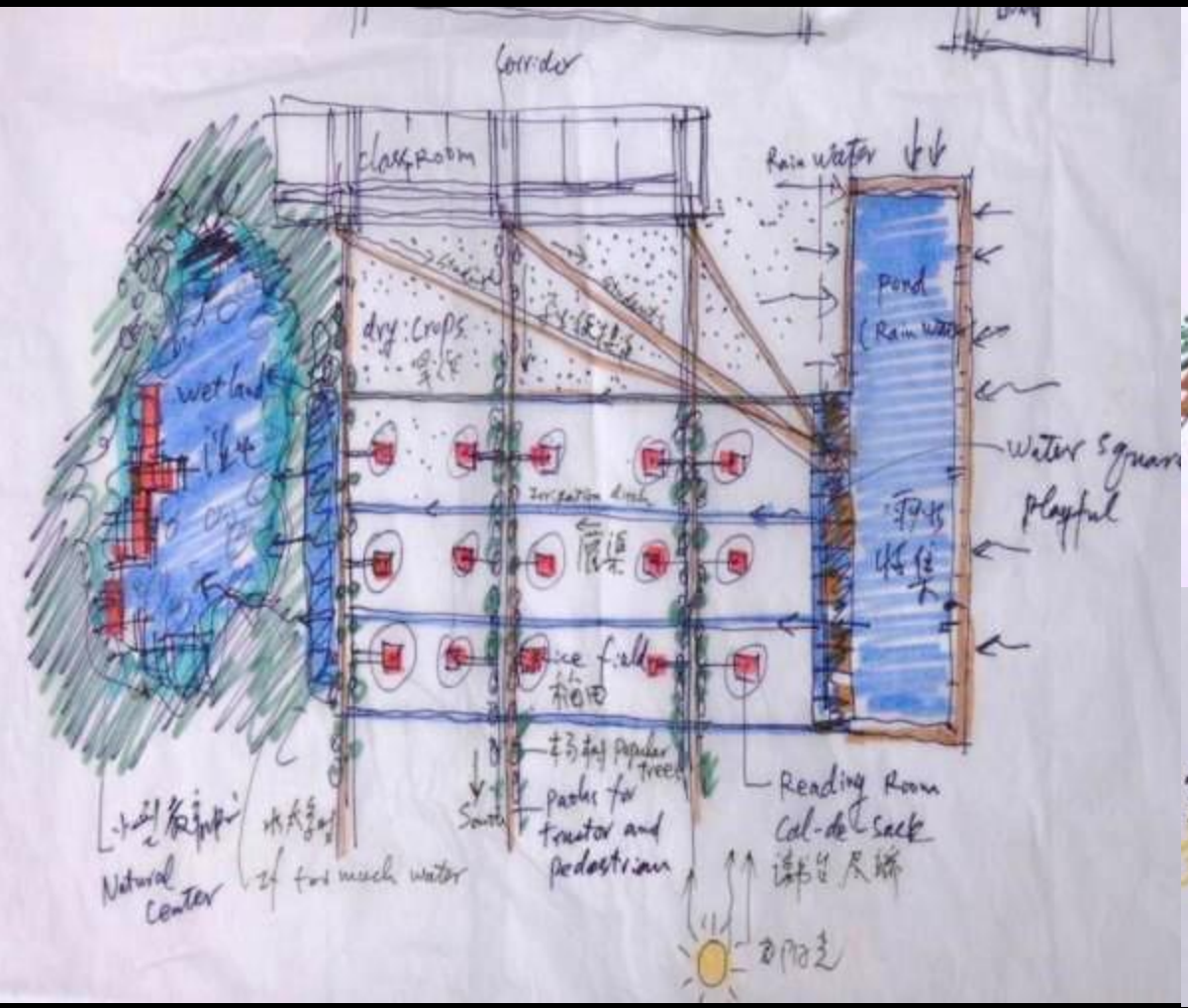
Flood season

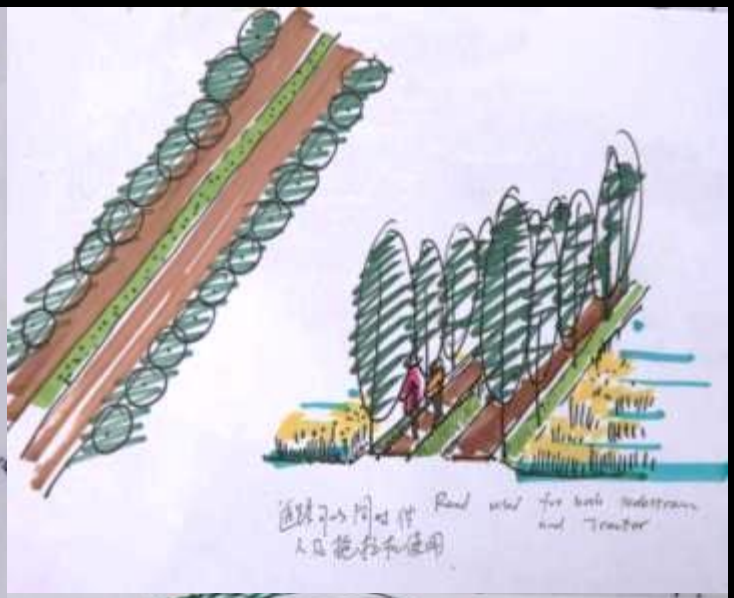
2 Go Productive

China has 20% of the world's population, but only 8% of world's arable land, 10% of which was lost in the past 30 years due to urban development.



Shenyang Jianzhu University





Water is harvested, crops (rice and buckwheat) are used for the landscape

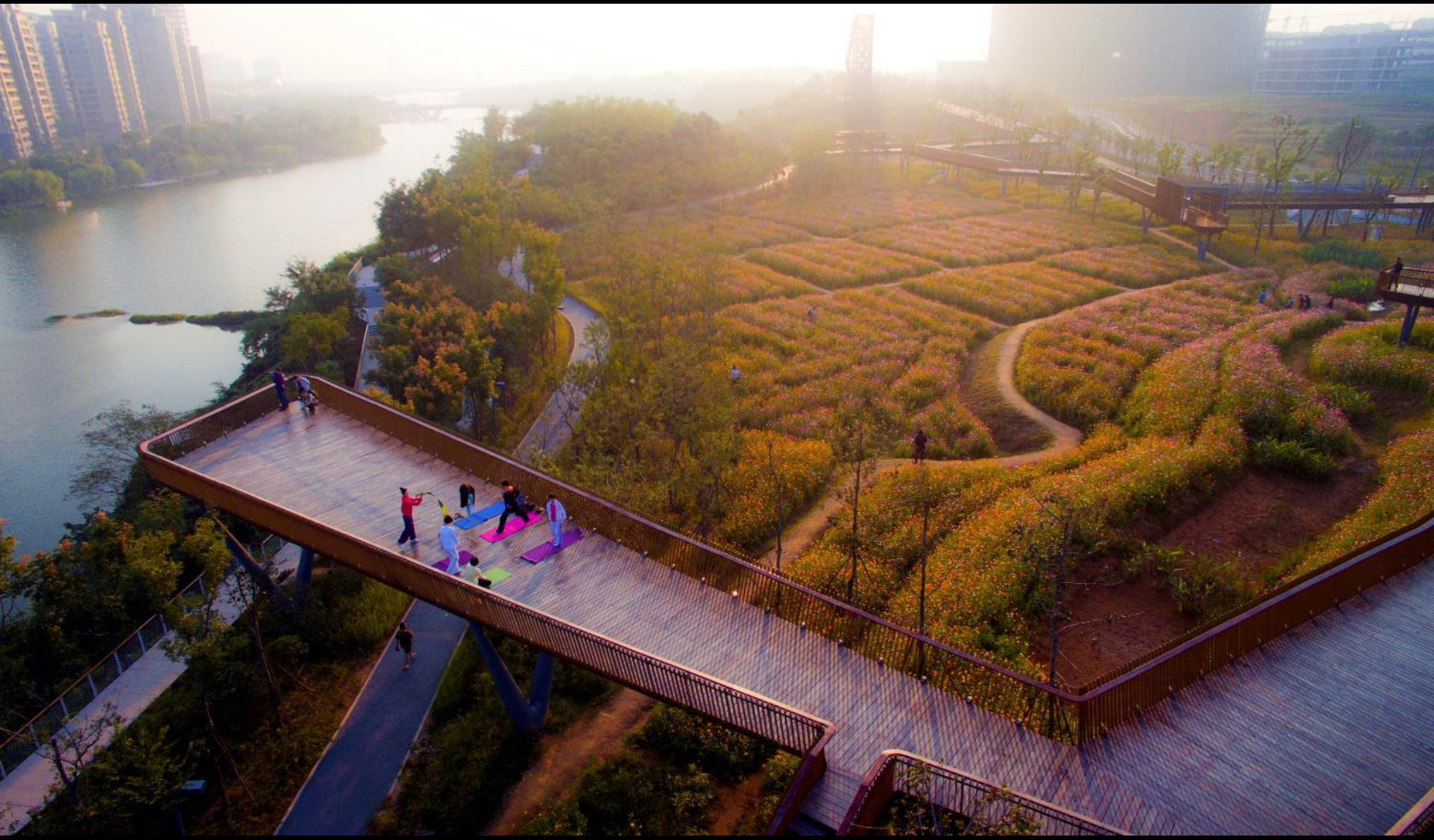
Rice fields are made penetrable using concrete narrow paths, that allow students and faculty to touch and feel the rice.

A professor on his way to class


The Rice Planting Day
19 5 2003

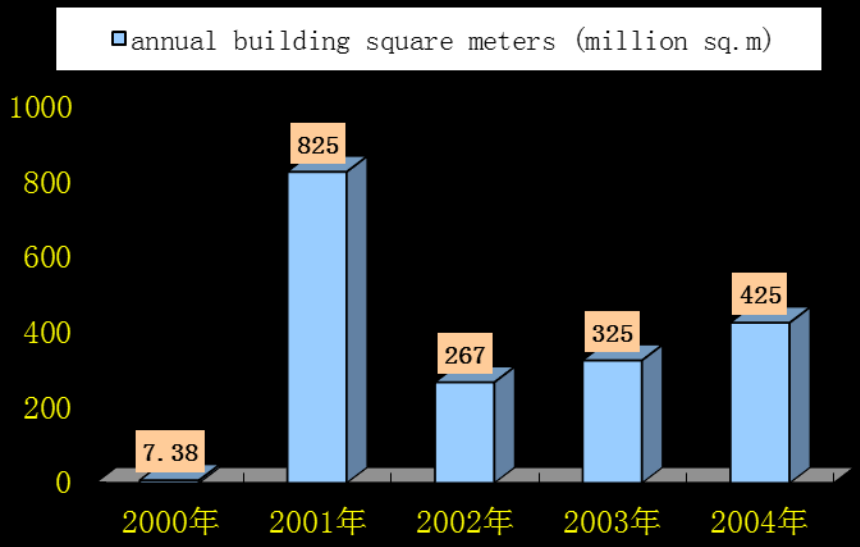
Golden Rice becomes an icon: the rice produced on the campus is harvested and distributed as “Golden Rice,” serving both as a keepsake for visitors of the school, and also as a source of identity for the newly established, urban campus.

Quzhou Luming Park, Zhejiang Province



#3 Value the Ordinary

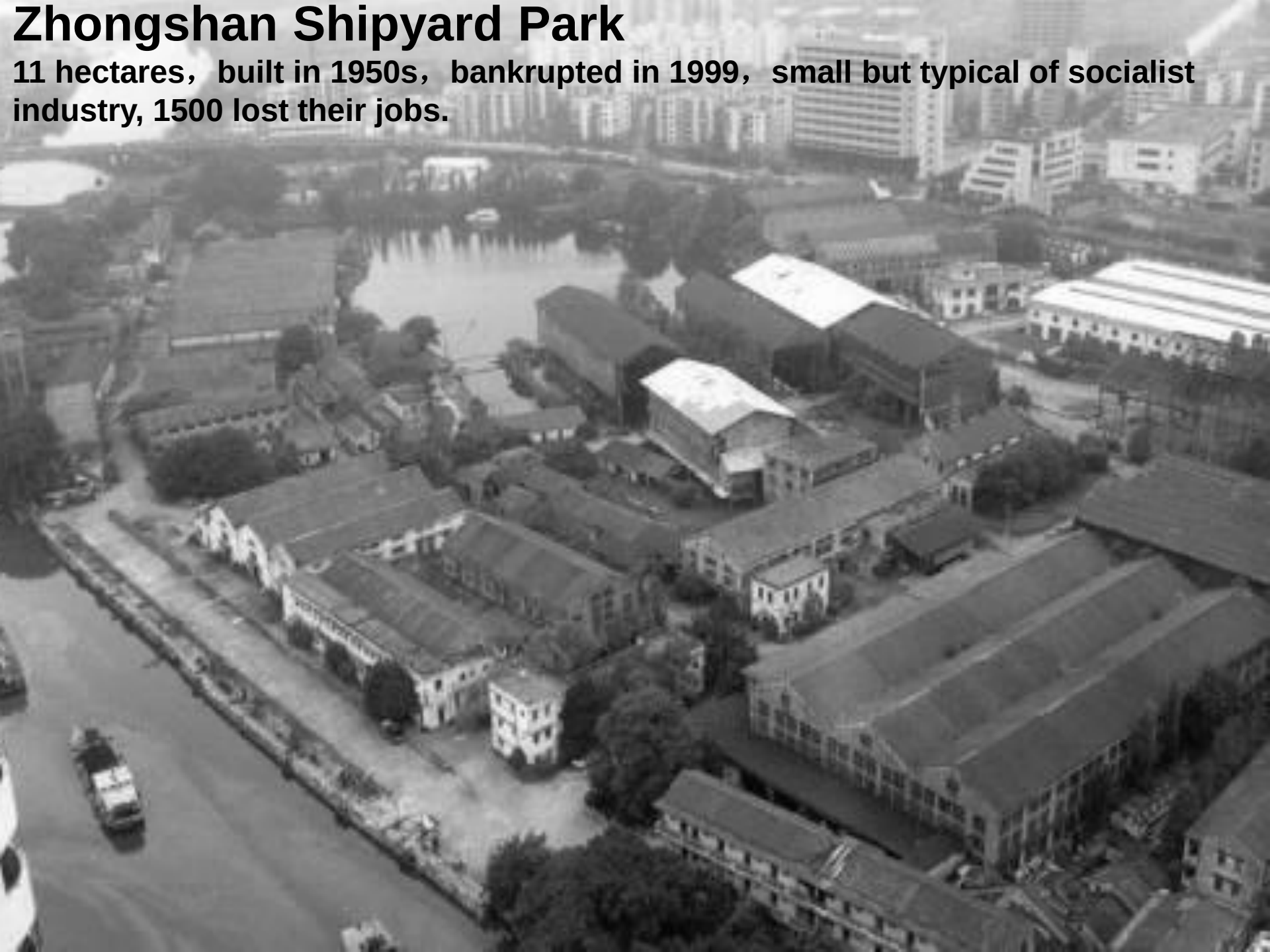
Hundreds of millions of square meters were built, and significant amount had been torn down. Thousands of villages and factories wiped out. What can you do?



Destroyed:
156 million square meters (2003)

Zhongshan Shipyard Park

11 hectares，built in 1950s，bankrupted in 1999，small but typical of socialist industry, 1500 lost their jobs.



Reserve, Reuse, Recycle


Sheraton


2005
景观图库 · 景观中国
photo.landscape.cn

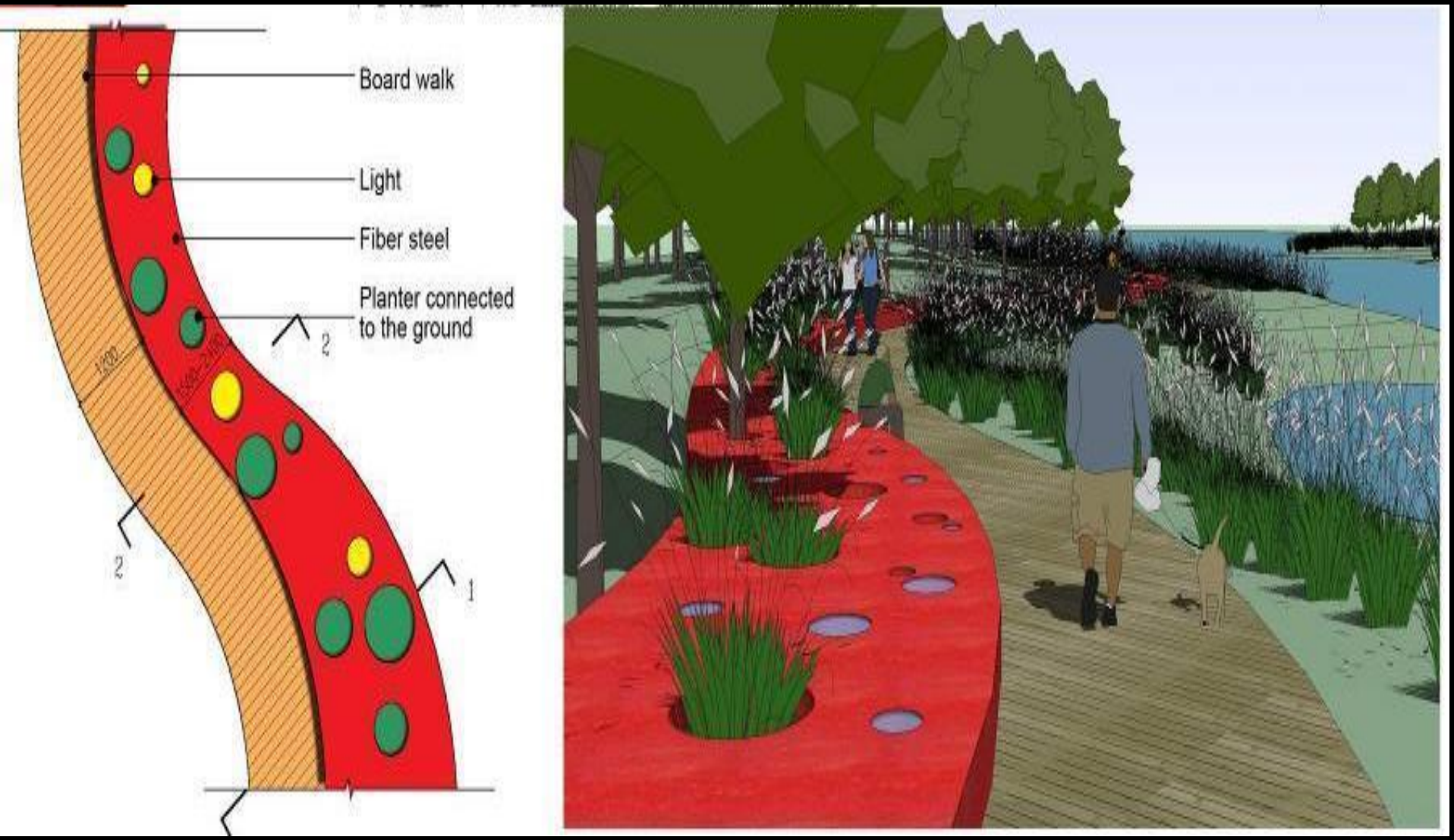

钓鱼区
Fishing Area

#4 Minimize Intervention and Maximize Return

Billions of dollars have been spent to turn nature into expensive urban landscapes.
What could be the alternatives?

Under the name of safety and “beauty,” we created shallow form or fake forms

The Red Ribbon park, Qinghuangdoa City, Hebei Province Google earth


Board walk
Light
Fiber steel
Planter connected to the ground
2
2
1

A Beautiful Mess

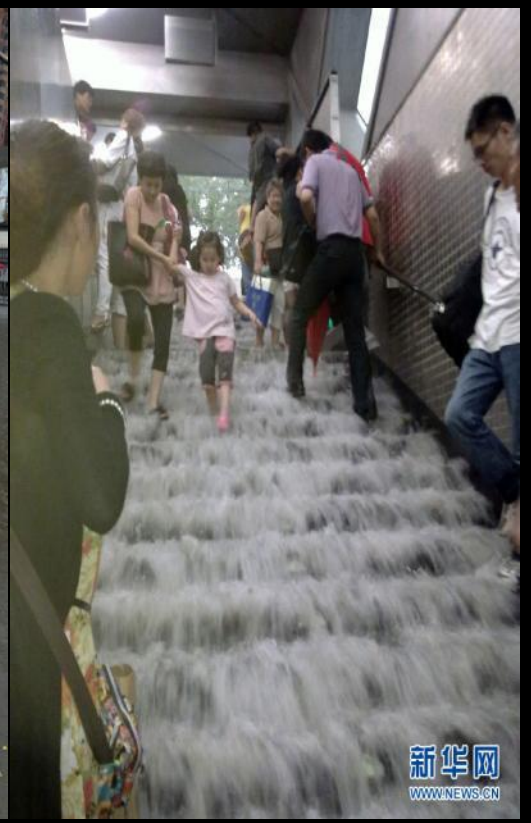

• Before

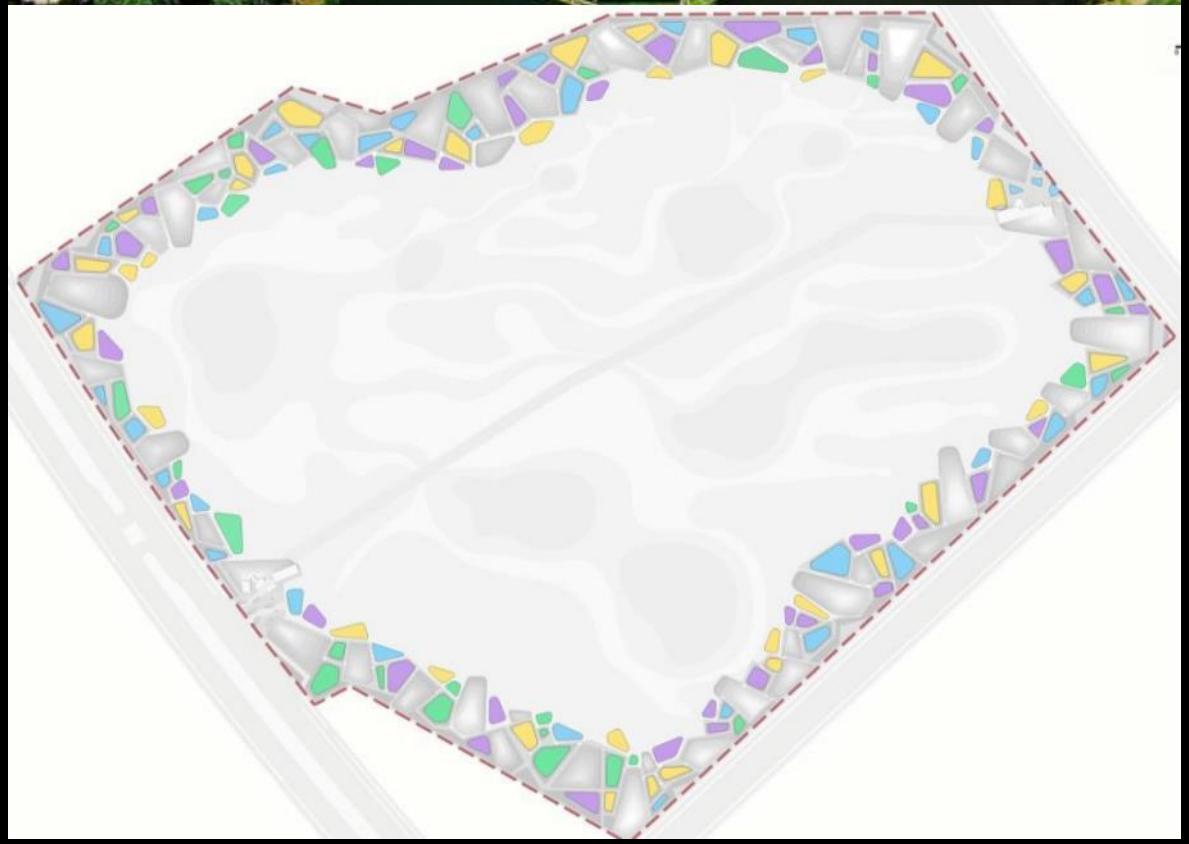
• *After*

#5 Sponge City: Green Infrastructure for A Water Resilient City

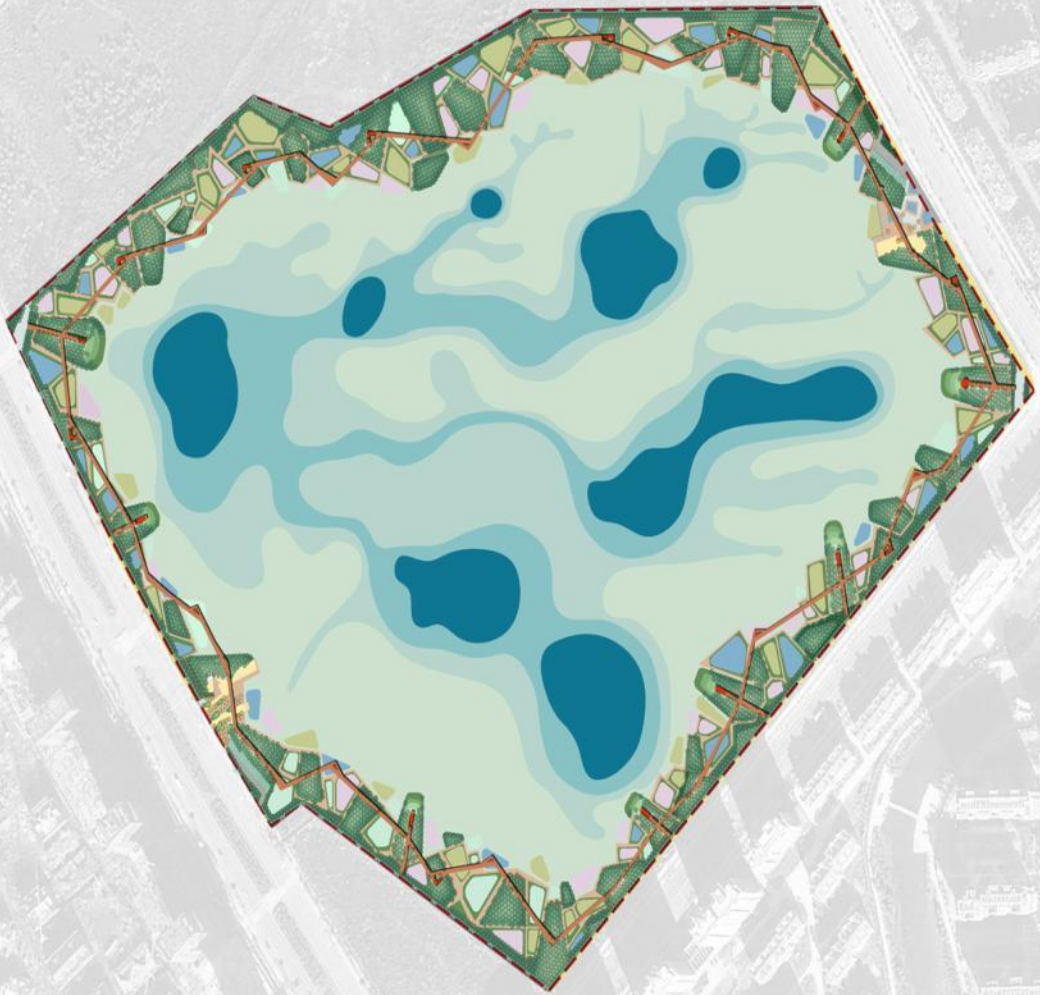
Almost all Chinese cities suffered the storm water inundation due to the monsoon climate, hundreds of people dies on street annually.

How to solve the problem in a wise way?





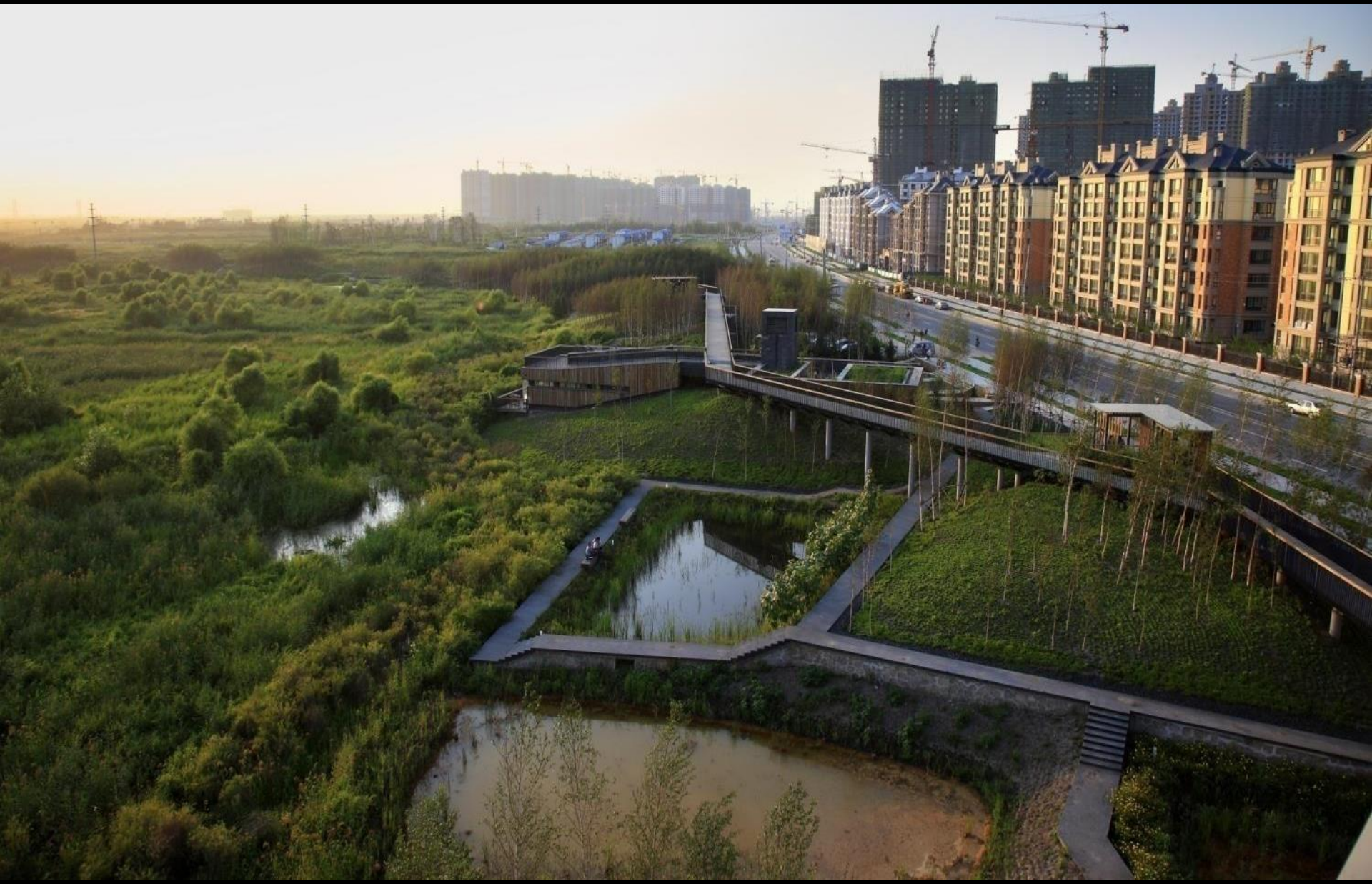
Inspired by the pond-and-dyke system

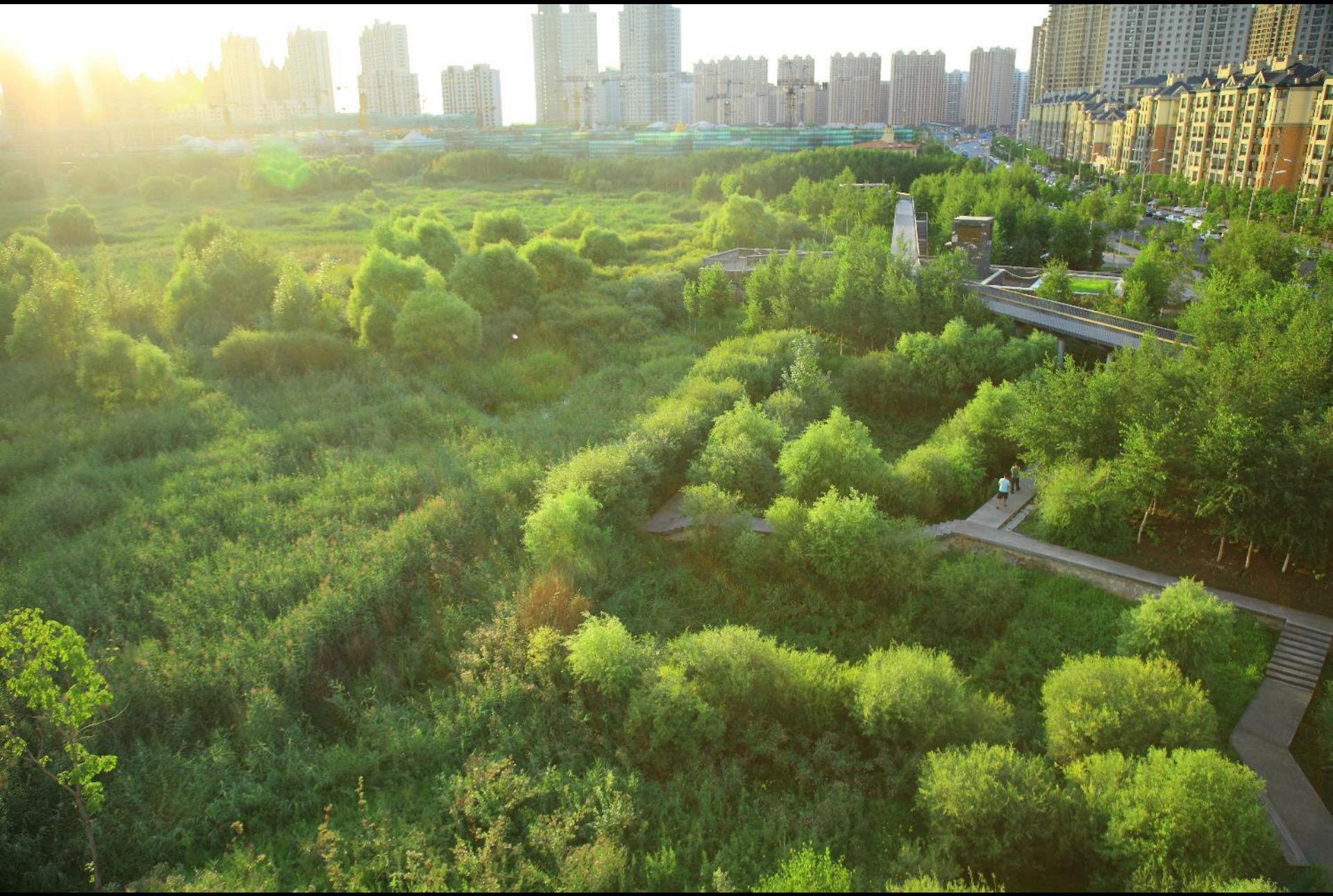


Qunli Stormwater Park Ha’erbin, 33 ha

- ***Before***

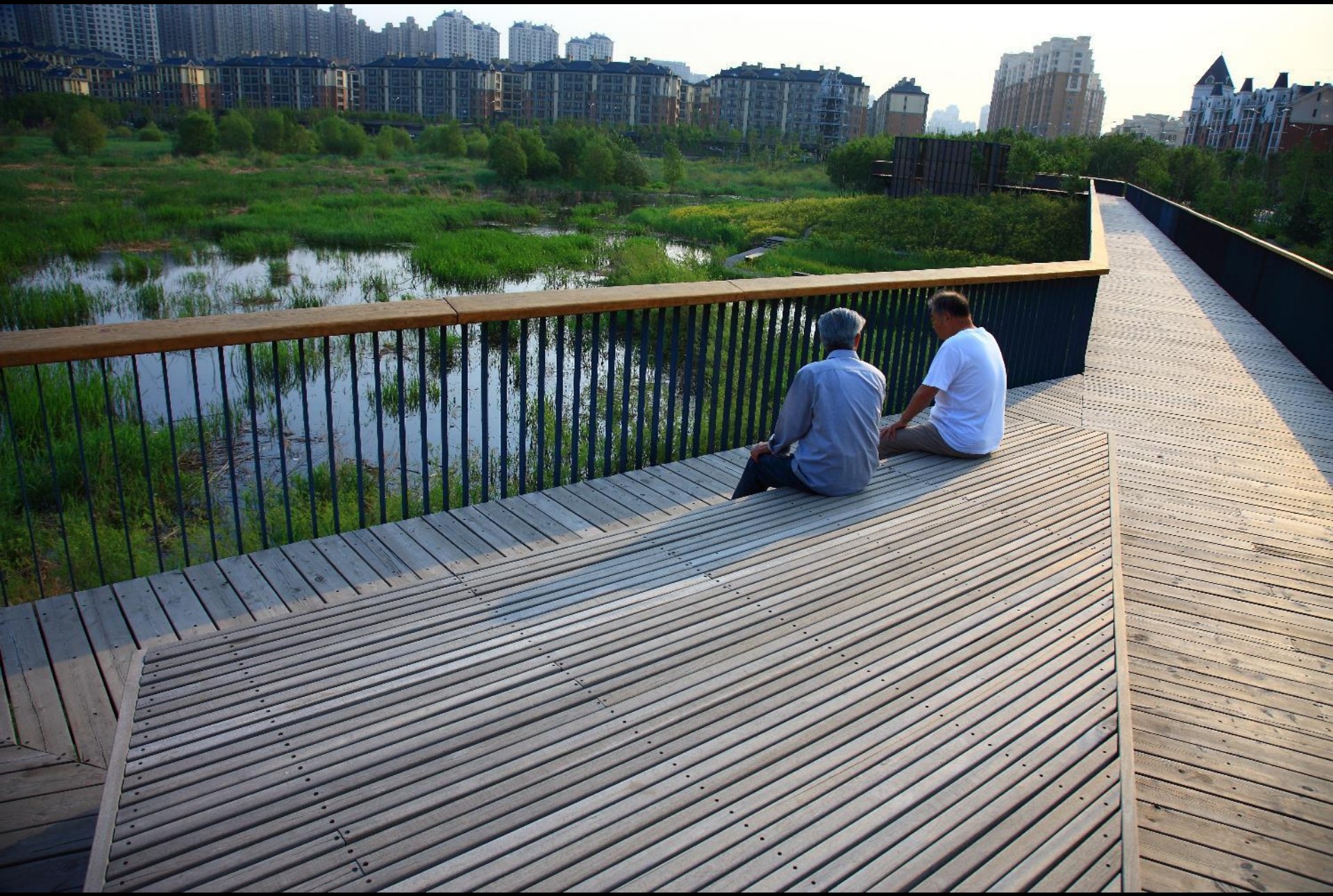

• After





2012

2014



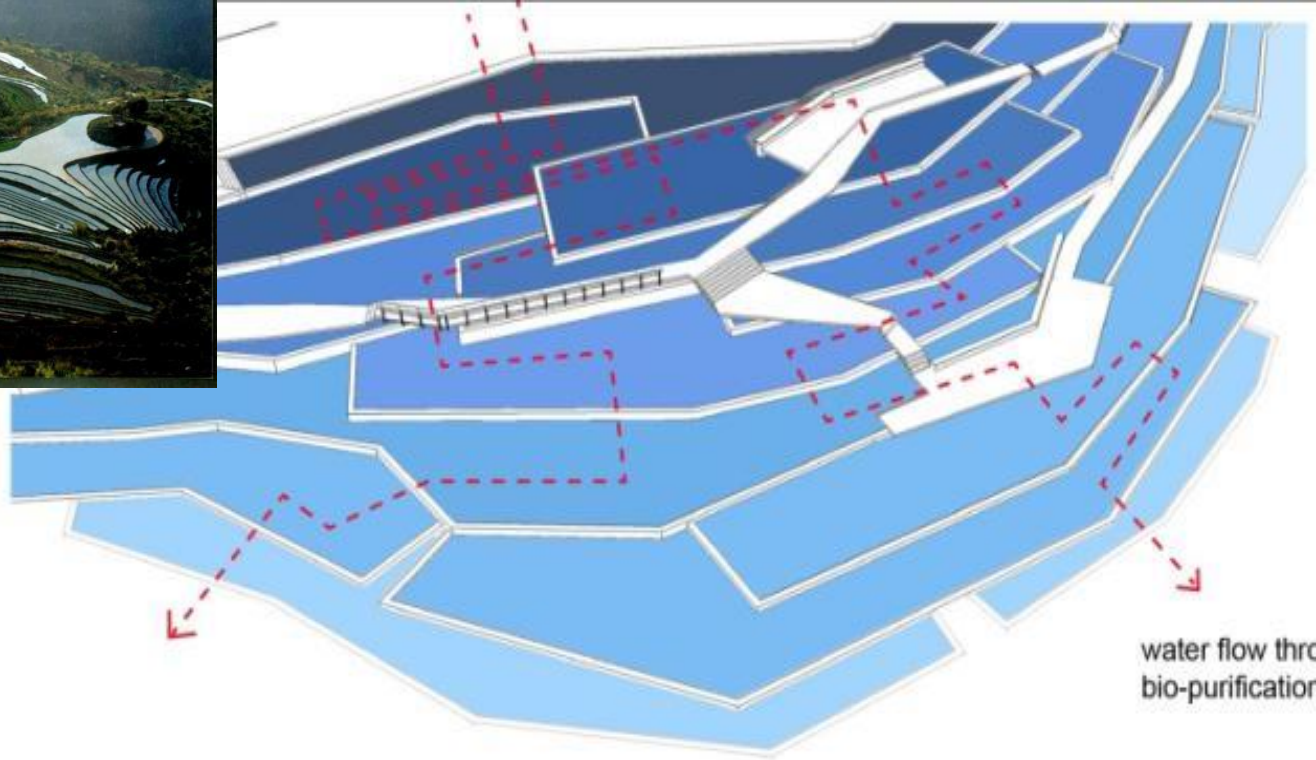
10% green sponge can solve the urban inundation problem

#6 Landscape as living system to cleanse polluted water

75% of the nation's surface water is polluted, 64％ of cities' underground water is polluted, 1/3 of the national population are under the threat of drinking water pollution, what can we do?

Shanghai Houtan Park

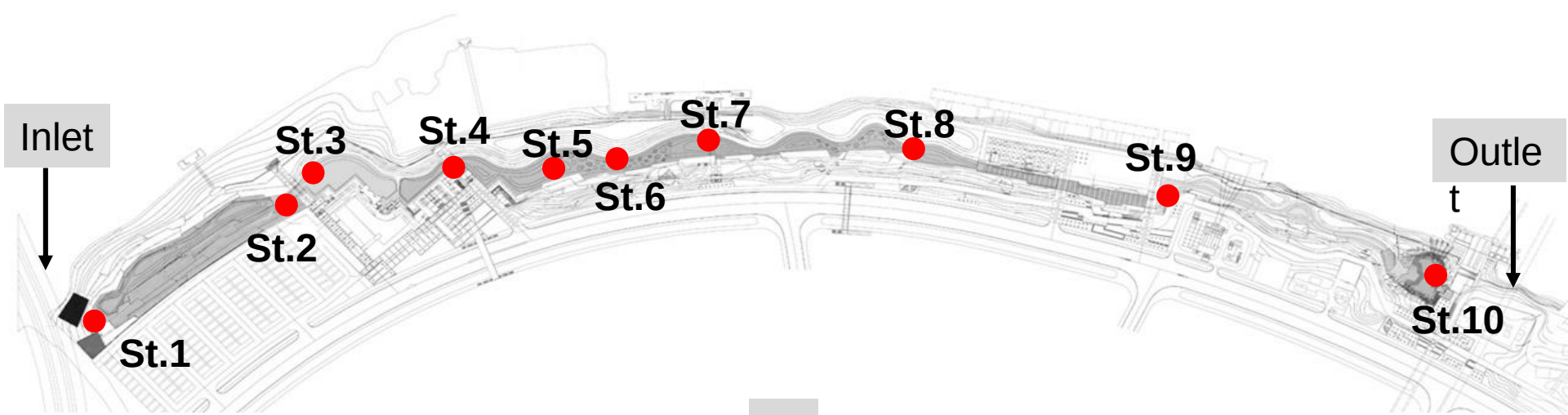
10 hectares., 1700 m long, producing 2400 cubic meter of water per day

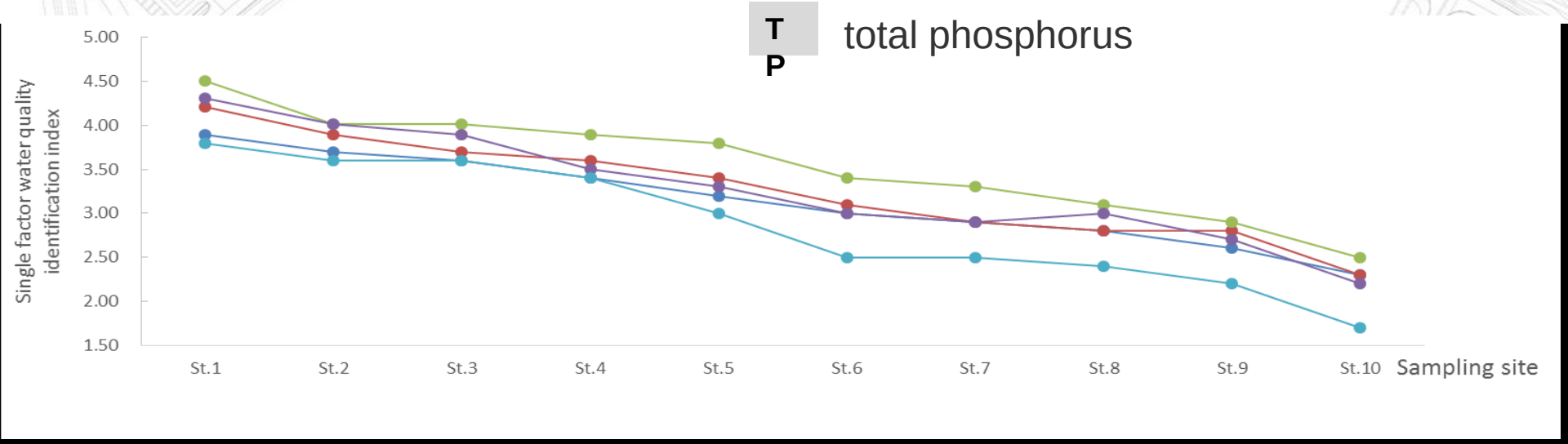


Aeriation and filtration processes

Aeriation

Created a life supporting system for biodiversity and low maintenance





10 hectares., 1700 m long, producing 2400 cubic meter of water per day, water for 5000 people

#7 “Green sponge” to remediate the soil contamination

60% of the urban soil is contaminated

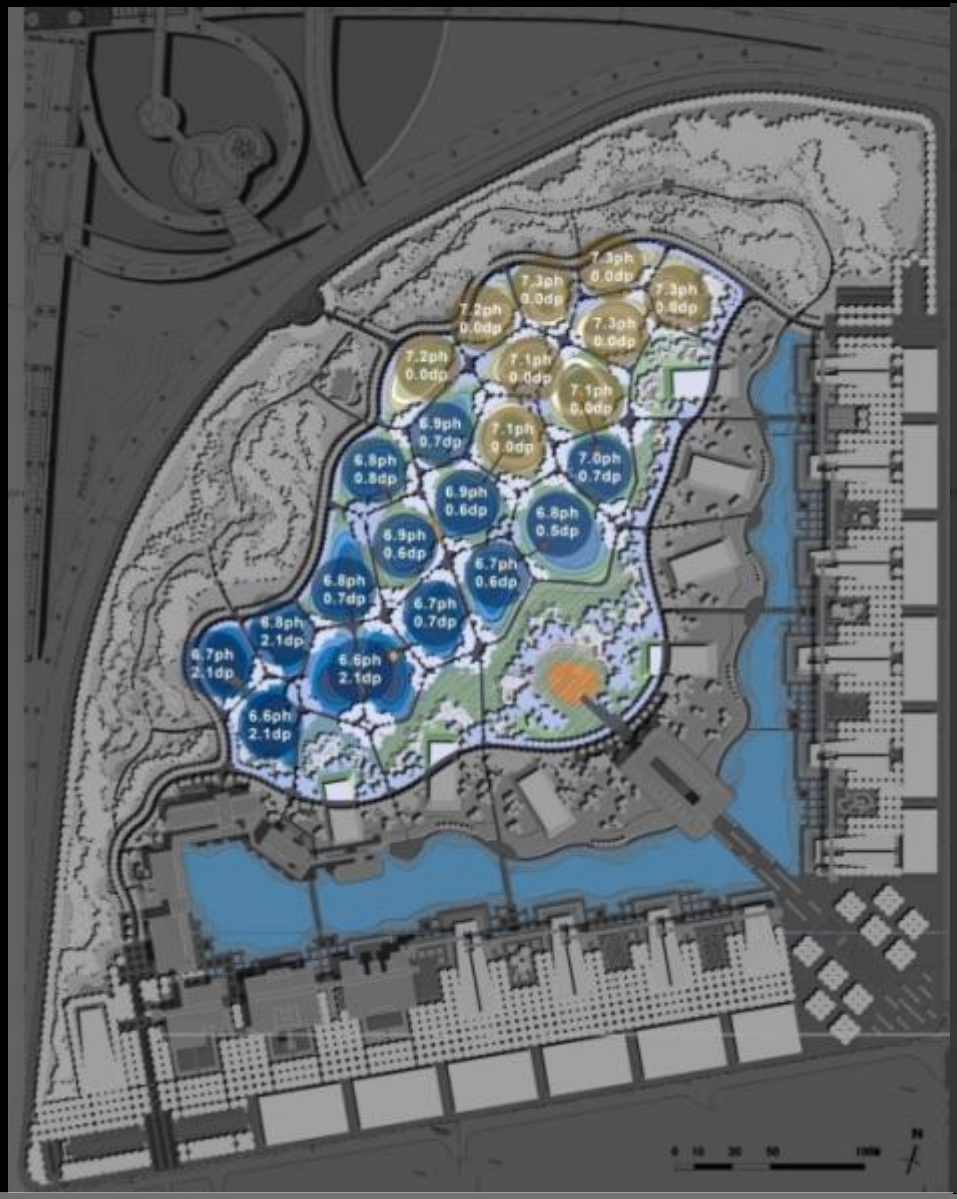
Qiaoyuan Park, Tianjin City

• ***Before***


• After

PH value management

Management of PH and water

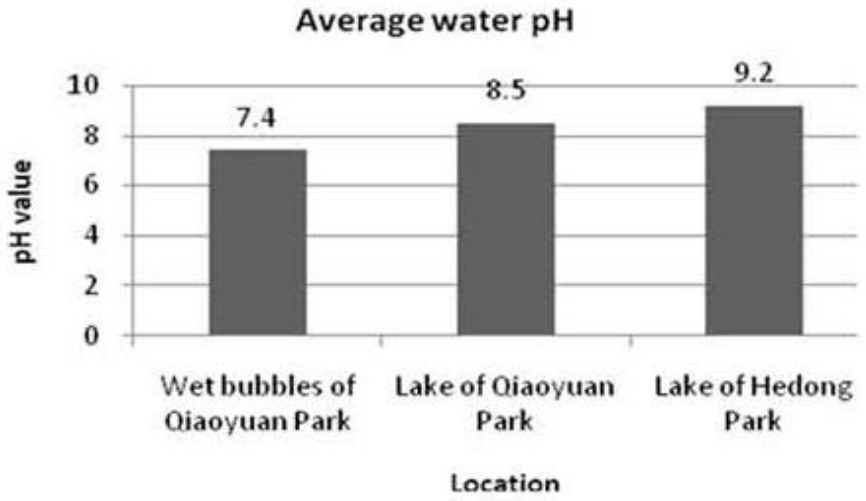


PH Values

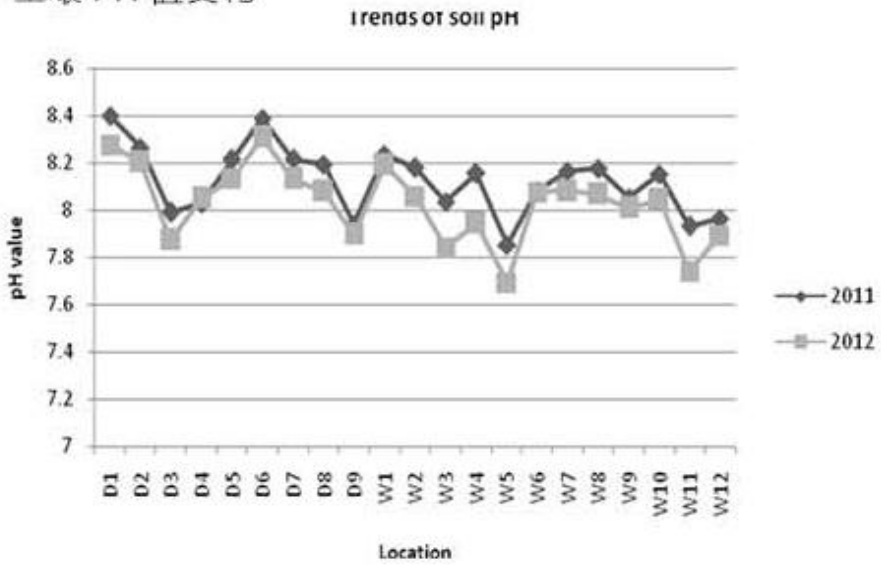
Water Flow

Shallow pond

3 雨水流

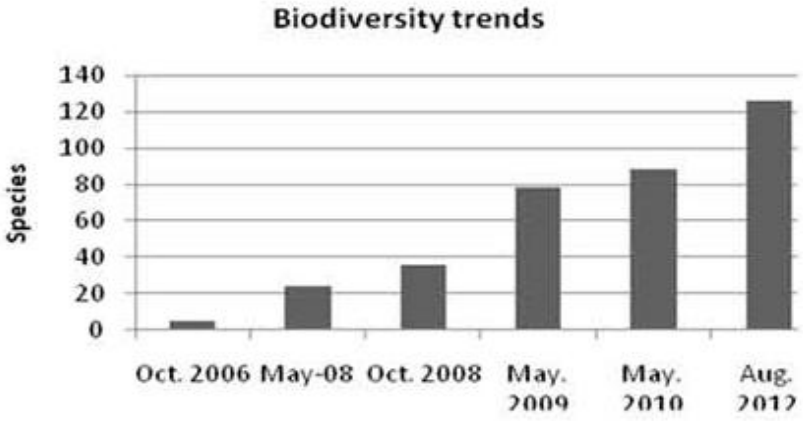


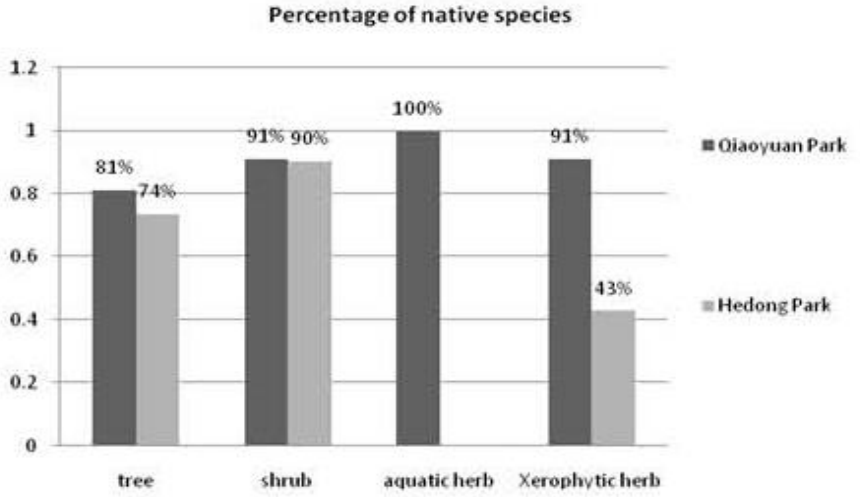
4 土壤 PH 值变化



5 与其他水体对比，生态服务仿生技术对场地盐碱度明显改善

6 2011–2012 对每个水泡测定的 PH 值的变化结果碱性明显下降





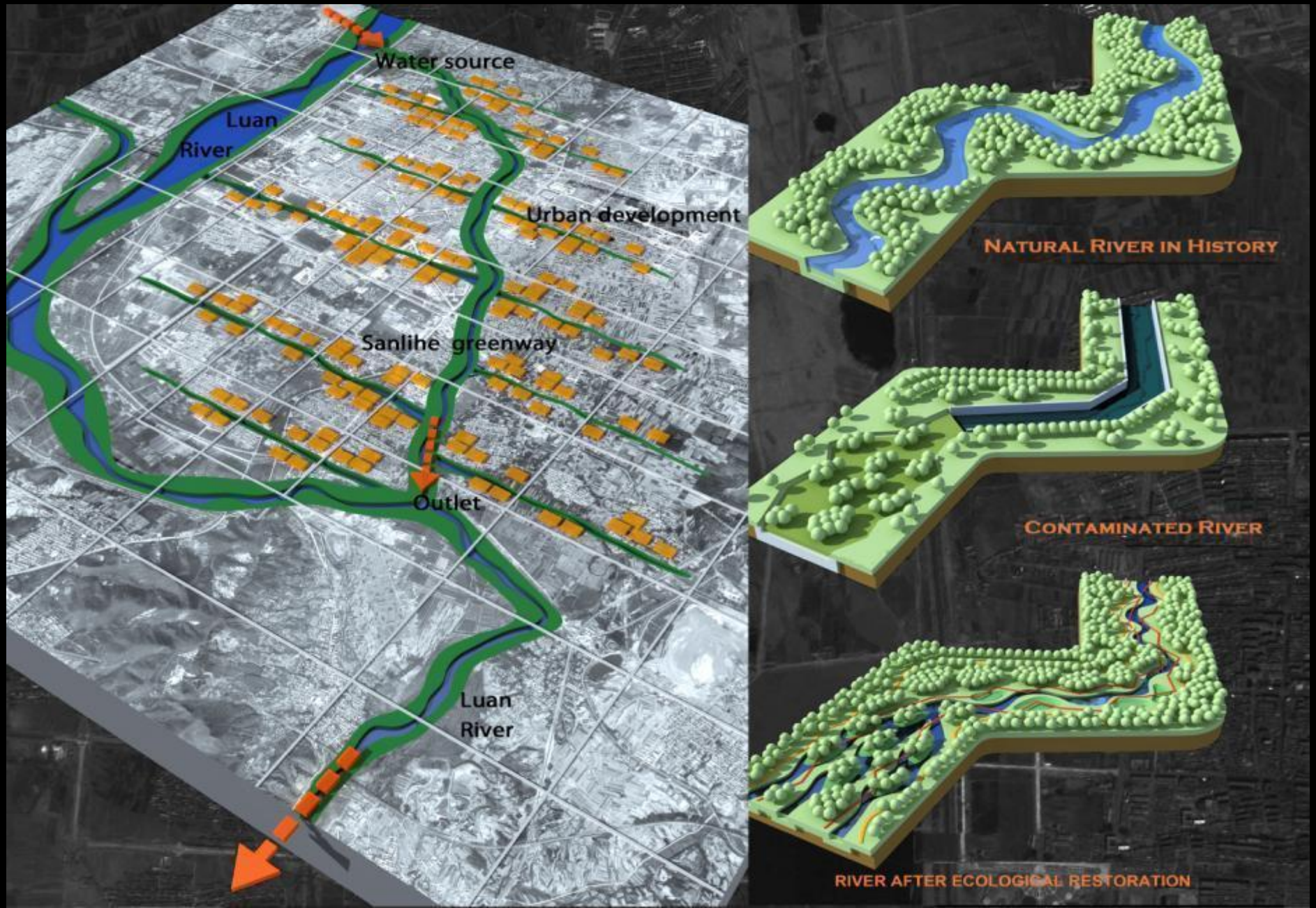
7 恢复后的生境，生物多样性逐年提高

#8 Green Solutions to Recover Mother Rivers

Thousands of rivers are mistreated , how can they be recovered

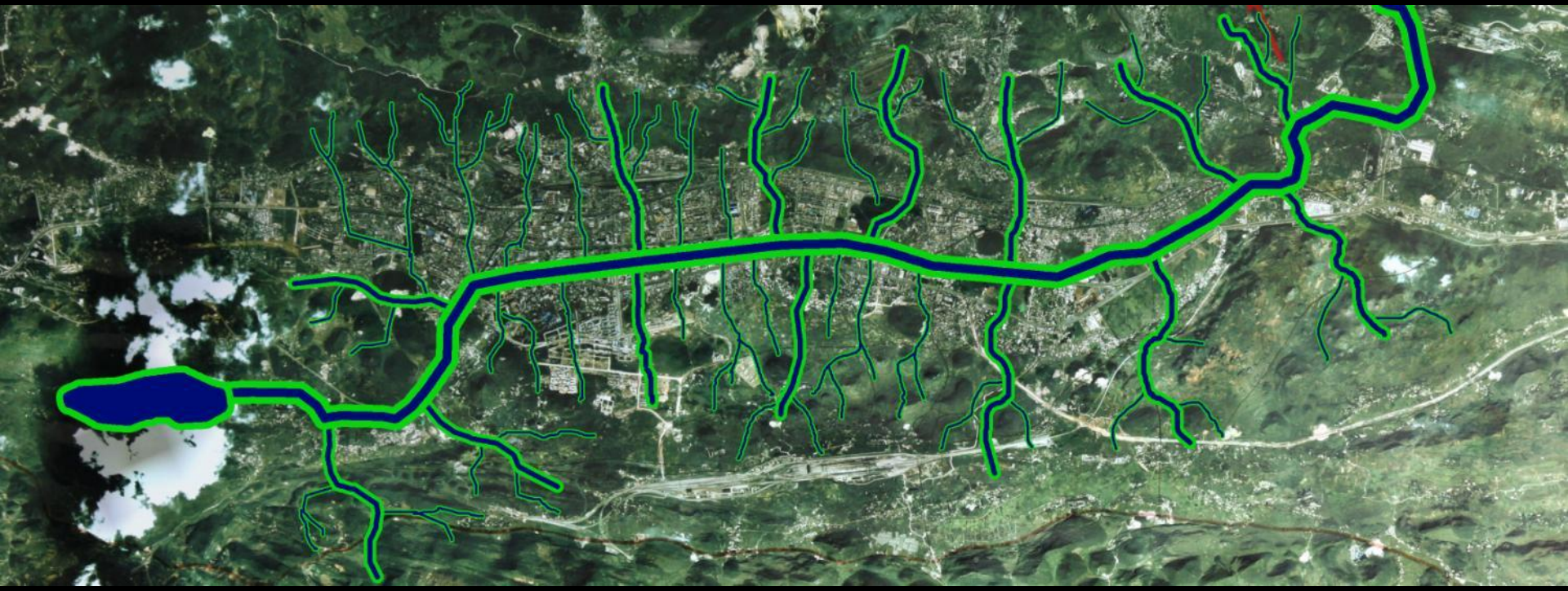
The Sanlihe River, 11 Kilometers long, Qian'an City, Hebei Province

- ***Before***


Water source
Luan River
Urban development
Sanlihe greenway
Outlet
Luan River
NATURAL RIVER IN HISTORY
CONTAMINATED RIVER
RIVER AFTER ECOLOGICAL RESTORATION

#9 **Green Solutions to Transform A City**

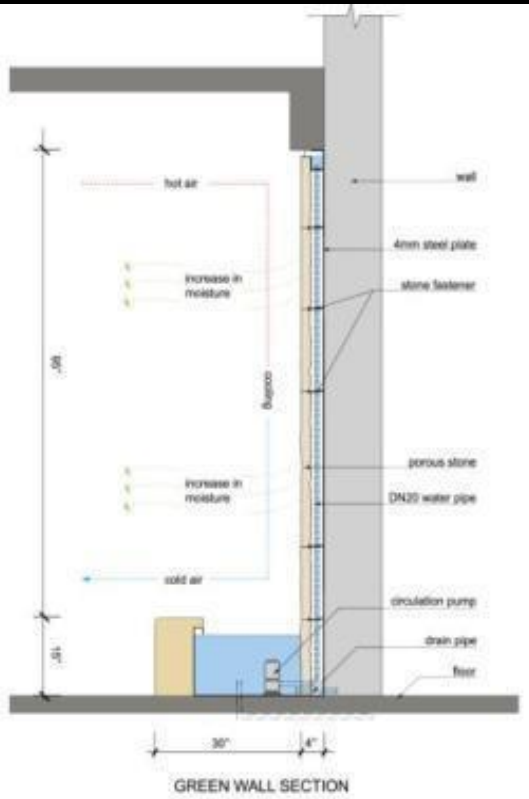
Liupanhsui City, *Guizhou*



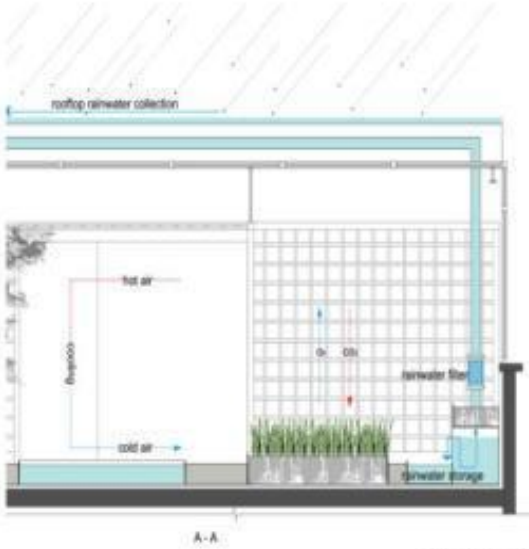
#10 Begin From my home: Small solution to big problem

40 billion square meters of building, 2 billions increase every year, 99% of them are energy inefficient, how can we help?

MASTER PLAN



GREEN WALL SECTION



08 The vegetable garden: productive ecosystems that provide fresh fruits and vegetables for the kitchen

2010

2013

2014

Community education: Small solution to big problem

Small solution to big problem
This home
collects 52 tons of rain water
saves 2000 KW of electricity
produces 32kg of vegetable

If every building is green, we can save the energy equivalent to 10 Three Gorge Dams, 30% of national energy consumption

We think like a king, but act like peasants

Peasants who change the national landscape

Turenscape Group Photo

Landscape Architecture is an art of survival that creates deep forms

Through
Planning,
Design and Engineering and management

Thank you!