Cultural-contextualized
WATER SENSITIVE PUBLIC SPACE

P4 Presentation
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4466853
18 May 2017

MOTIVATION

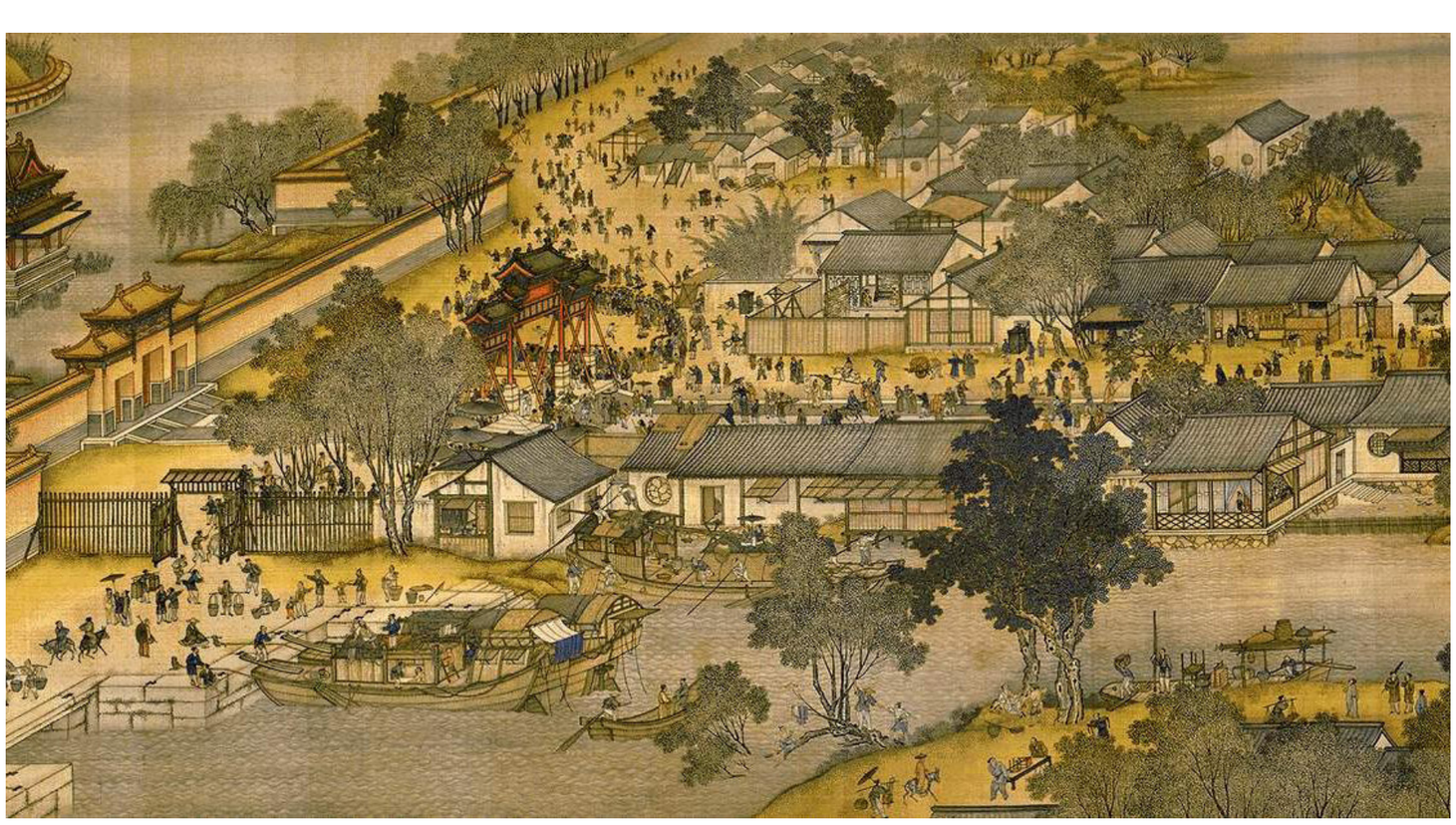


Fig. 1-1-3 Famous Painting by Chinese artist Zhang Zeduan "Along the River During the Qingming Festival": It captured the daily life of people and the landscape of the old-time capital along the river. Source: http://jgospel.net/

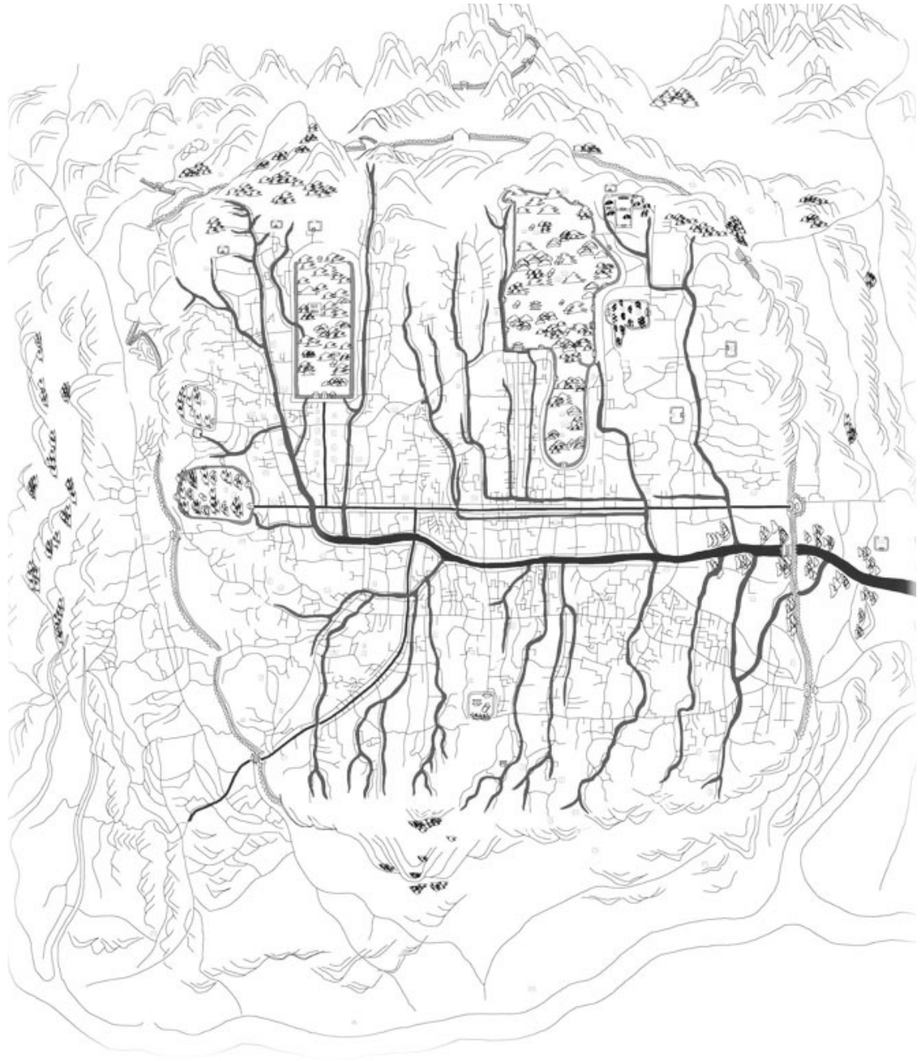
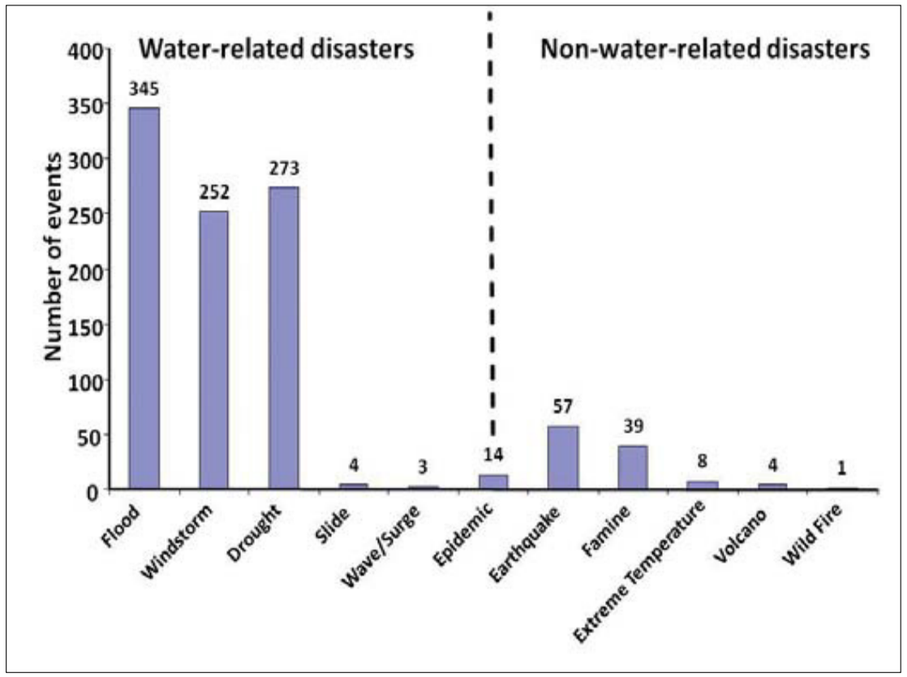


Fig. 1-1-2(right) City pattern of ancient Seoul, South Korea: Seoul was structured by a series of waterways and mountains. Source: Shannon (2013)

MOTIVATION



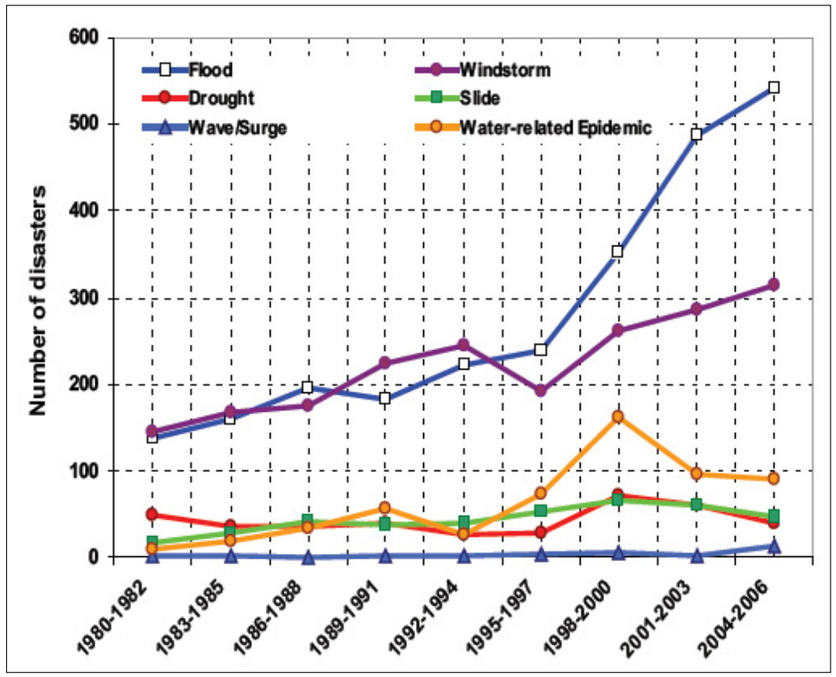
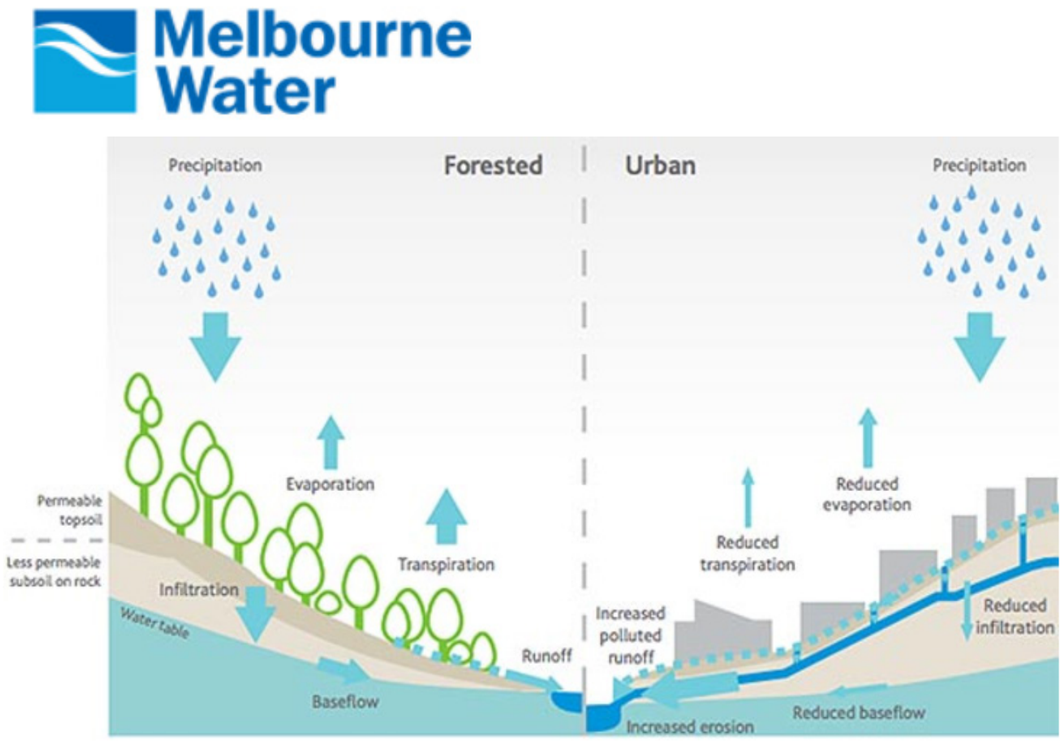


Fig. 1-1-5 The annul total and cumulative number of natural disaster events recorded globally between 1980 and 2006
Source: UNESCO (2009)

Fig. 1-1-6 People as victims of climate hazards
Source: https://blogs.worldbank.org/
http://energydesk.greenpeace.org/

WORLDWIDE EFFORTS



Low Impact Development (LID) in USA
Sustainable Urban Drainage Systems (SUDS) in UK,
Water Sensitive Urban Design (WSUD) in Australia (Liu 2016)

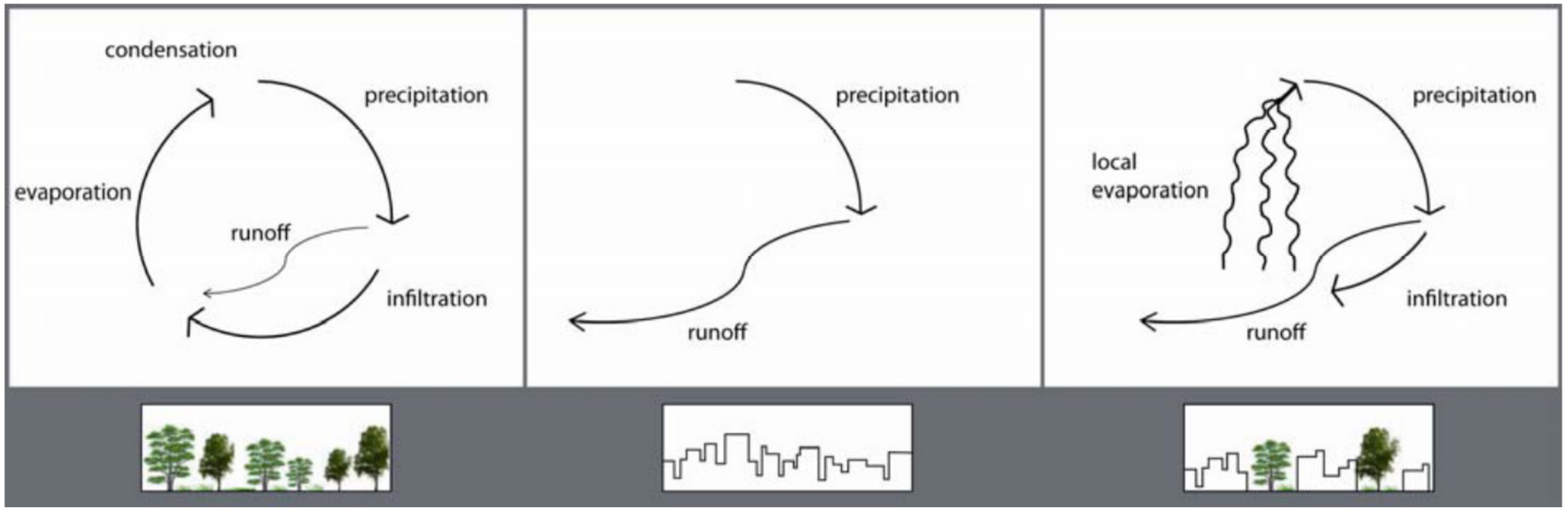


Fig. 1-2-2 Water cycle in natural systems (left); in an urban area without sustainable stormwater management (middle); and in an urban area with sustainable stormwater management (right)
Source: (Hoyer 2011)

WATER CHALLENGE IN CHINA

Beijing

Shanghai

Shenzhen

Guangzhou

Sponge City Development Diagram

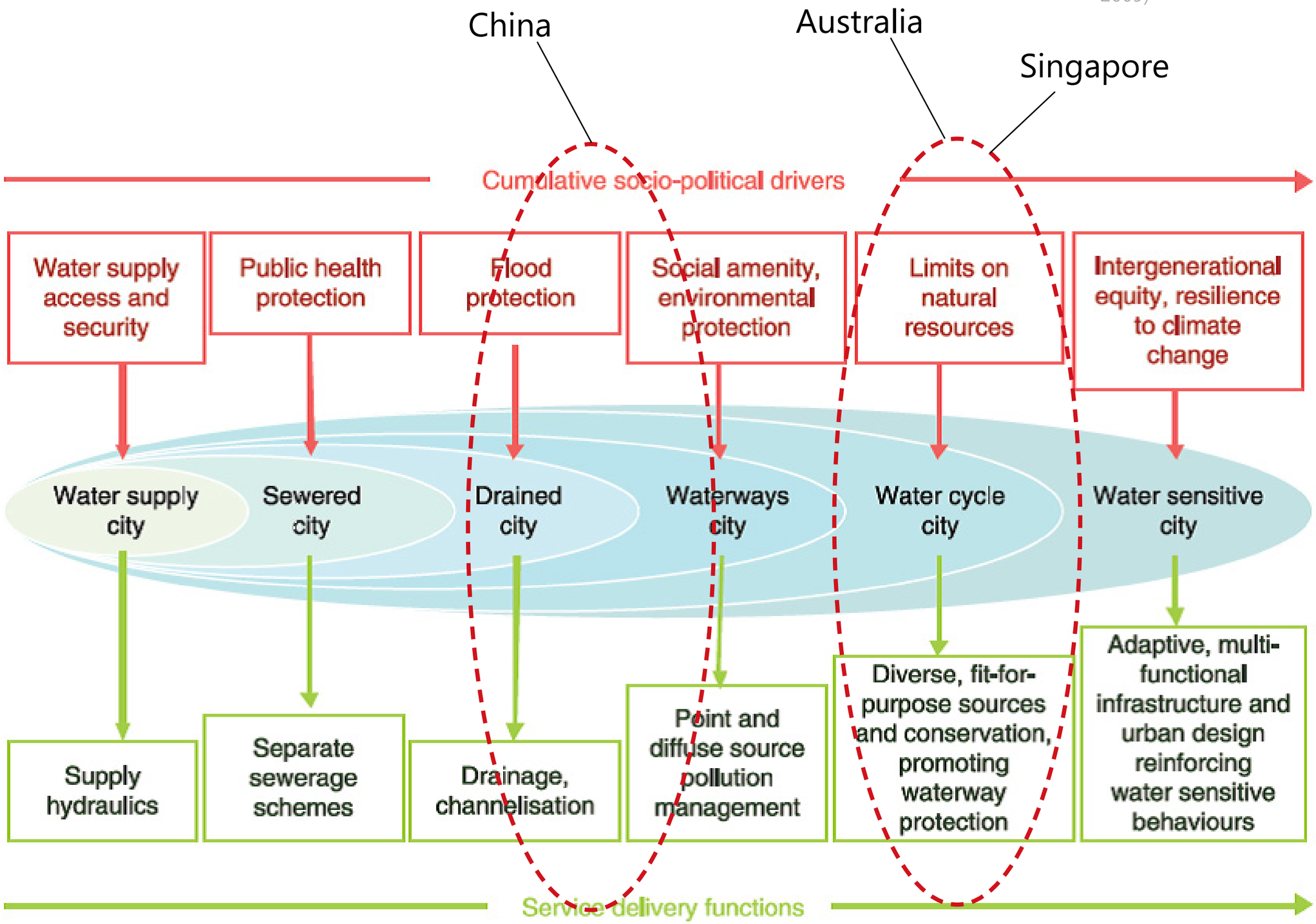
A"Sponge city" refers to a city where its urban underground water system operates like a sponge to absorb, store, leak and purify rainwater, and release it for reuse when necessary.

61% of all 351 investigated Chinese cities have waterlogging problem since 2008 to 2010 (Data: MOHURD, 2010)

Locations of Big Chinese cities and waterlogging pheonomena
Source: Adapted from http://www.chinahighlights.com/guangzhou/map.htm

WATER CHALLENGE IN CHINA

Fig. 1-2-3 Urban water management transitions framework
Source: (Brown, Keath et al. 2009)



WATER AND GUANGZHOU CITY

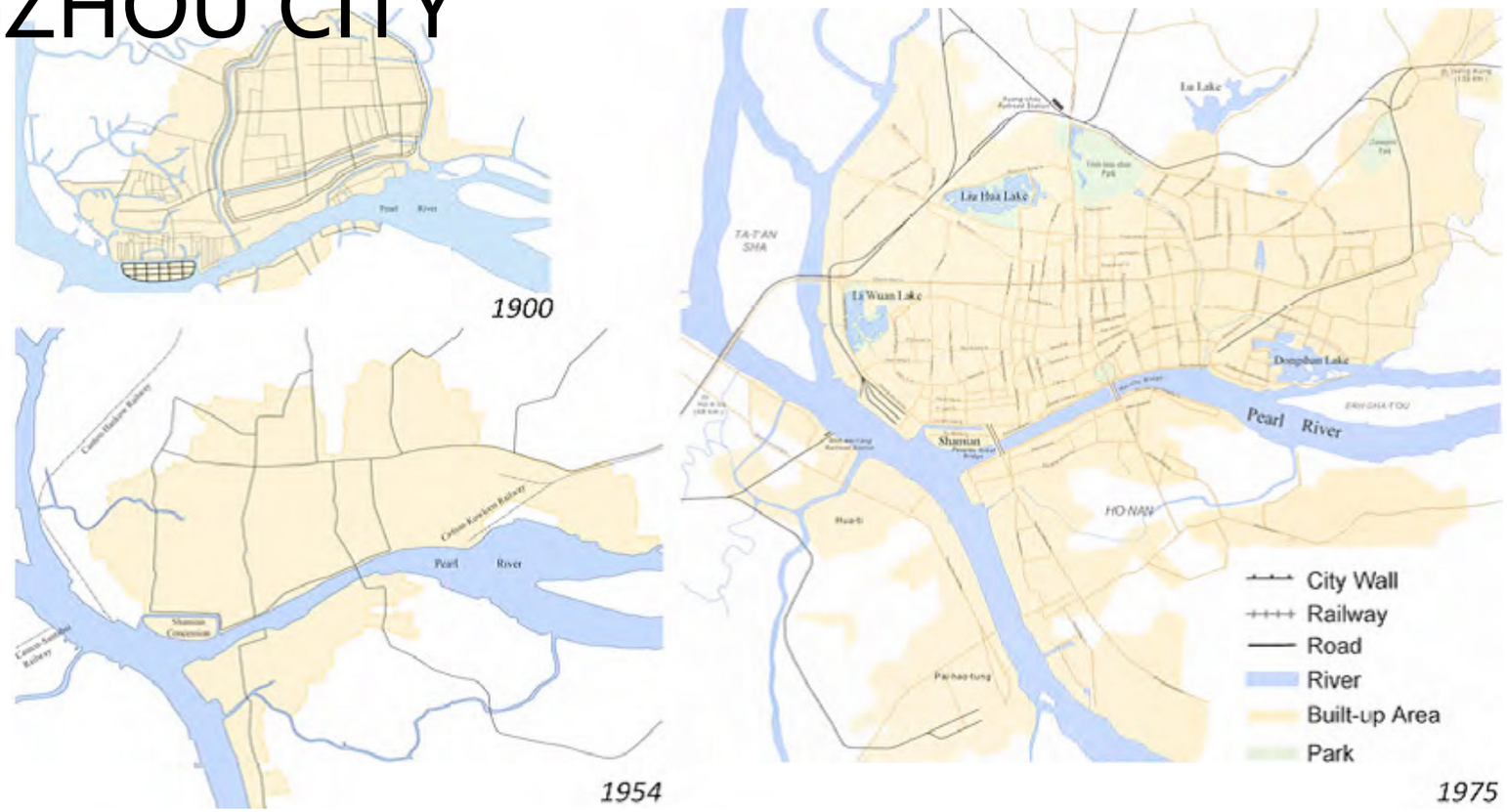


Fig. 1-2-9 Guangzhou city transformation and water sytem
Source: Tai (2011)

Ranking by AAL (US$million)					Ranking by relative AAL (percentage of city GDP)				
	Urban agglomeration	100year exposure	AAL, with protection (US$million)	AAL, with protection (percentage of GDP)		Urban agglomeration	100year exposure	AAL, with protection (US$million)	AAL, with protection (percentage GDP)
1	Guangzhou	38,508	687	1.32%	1	Guangzhou	38,508	687	1.32%
2	Miami	366,421	672	0.30%	2	New Orleans	143,963	507	1.21%
3	New York—Newark	236,530	628	0.08%	3	Guayaquil	3,687	98	0.95%
4	New Orleans	143,963	507	1.21%	4	Ho Chi Minh City	18,708	104	0.74%
5	Mumbai	23,188	284	0.47%	5	Abidjan	1,786	38	0.72%
6	Nagoya	77,988	260	0.26%	6	Zhanjiang	2,780	46	0.50%
7	Tampa—St. Petersburg	49,593	244	0.26%	7	Mumbai	23,188	284	0.47%
8	Boston	55,445	237	0.13%	8	Khulna	2,073	13	0.43%
9	Shenzen	11,338	169	0.38%	9	Palembang	1,161	27	0.39%

Table 1-1 City ranking by risk (AAL) and relative risk (AAL in percentage of GDP) for 2005
Resource: http://www.nature.com/

PUBLIC SPACE POTENTIALS

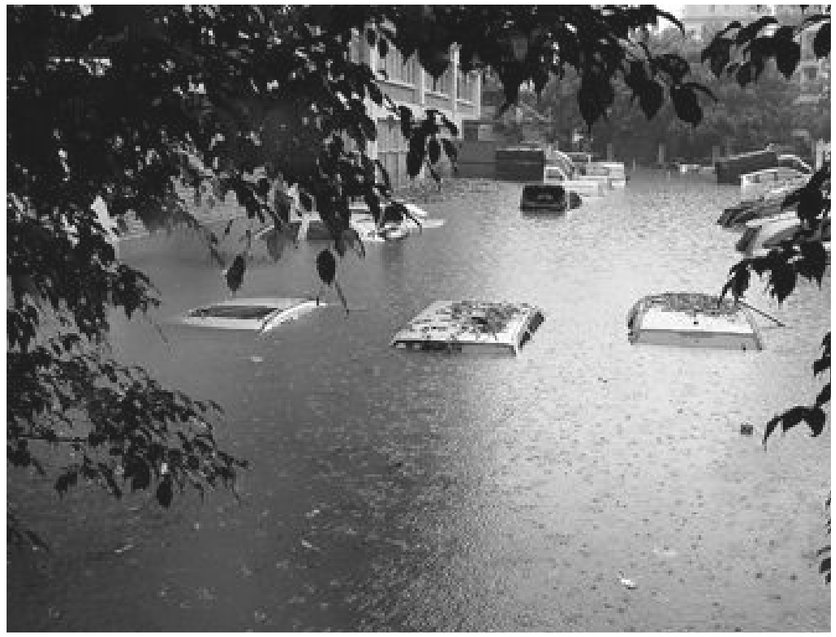
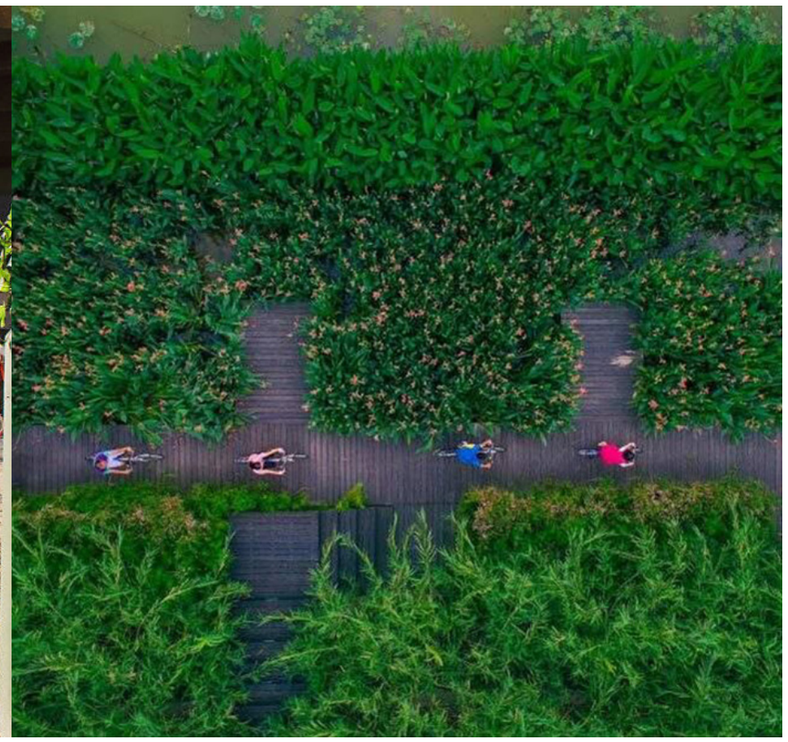


Fig. 1-2-12 Public spaces in Guangzhou cannot function normally because of water issue
Data resources: 2010 Guangzhou climate report

Fig. 1-2-10 (left) Donghaochong Water management Project: consideration of social and cultural importance
Source: https://tonyw20.tuchong.com/1002072/

Fig. 1-2-11 (right) The Þrst Sponge City Experimental Project in Guangzhou—Daguan Wetland Park: solely ecological and technical project
Source: http://www.archcy.com/



PROBLEM STATEMENT

Under the climate change background and the threats brought by water risks, public spaces in Guangzhou lacks water resilience to maintain its basic function and value when facing water disturbances. And in the future, public spaces are under the threat of losing vitality and identity for technical focused projects, lacking consideration of social and cultural dimensions.

RESEARCH QUESTIONS

What kind of spatial interventions can integrate technical, social and cultural dimensions to solve water risks in public space?

a. What are the future water challenges in public space as the consequence of global climate change?

b. What kind of spatial solutions can increase water resilience?

c. What kind of spatial solutions can evoke public space for people?

d. How can climate adaptive measures adapt to local Chinese nature value?

e. How can resilient public space design measures fit in local life and planning culture?

METHODOLOGY

a. What are the future water challenges in public space as the consequence of global climate change?

b. What kind of spatial solutions can increase water resilience?

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e. How can resilient public space design measures fit in local life and planning culture?

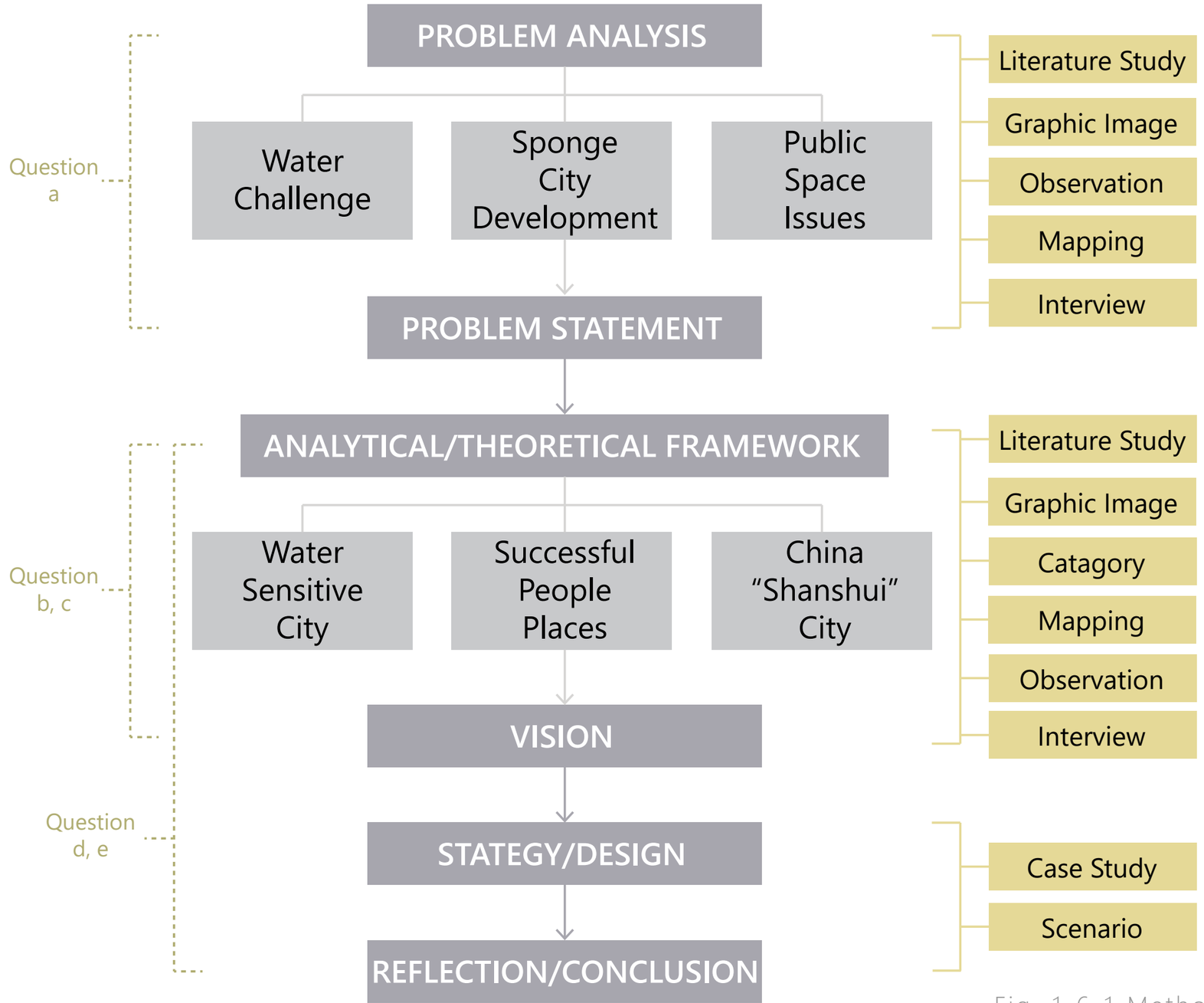


Fig. 1-6-1 Methodology Scheme
Source: Drawn by author

THEORETICAL FRAMEWORK

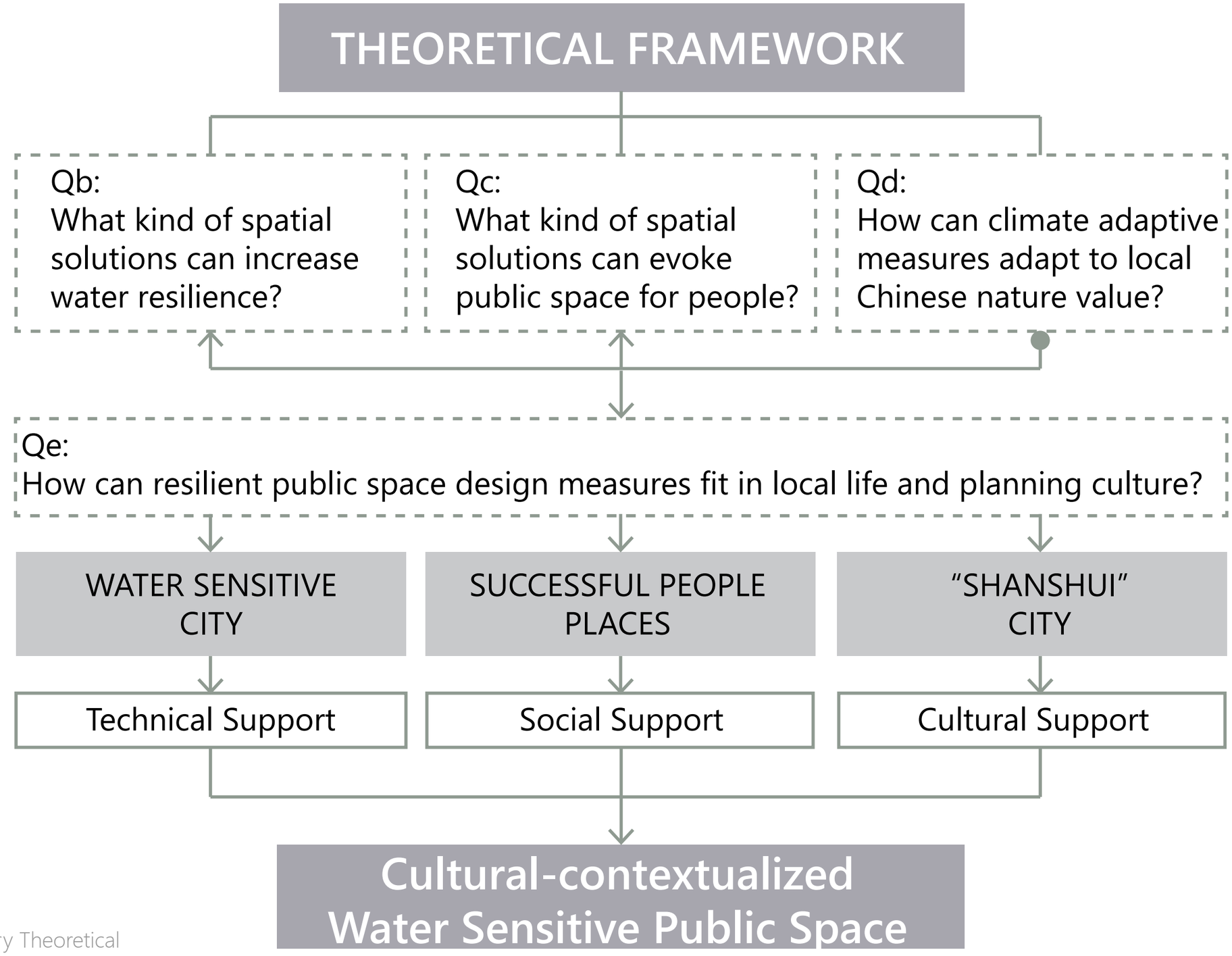


Fig. 2-1-1 Preliminary Theoretical Framework Source: Drawn by author

WATER SENSITIVE CITY

Diversifying Water Sources and Infra-structures

Providing Ecosystem Services

Building Social and Institutional Capital

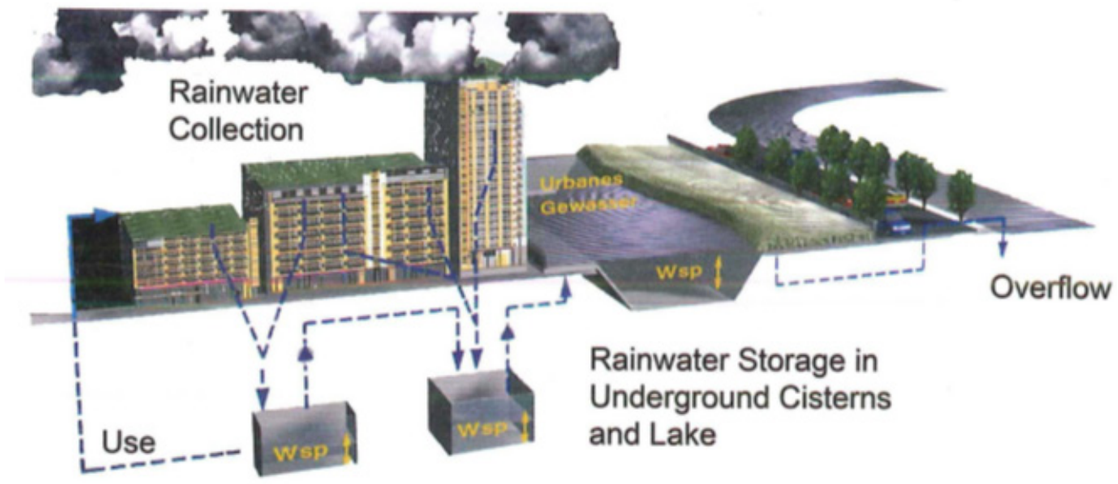


Fig. 2-2-1 The example of rainwater as alternated water resources (Potsdamer Platz in Berlin): rain is collected and stored in underground cisterns, eventually used in gardens and sanitation.
Source: Hoyer (2011)

Fig. 2-2-2 Swales of the police department in Brisbane, USA
Source: (Hoyer 2011)

Fig. 2-2-3 Biotopes for retention in Malmo, Sweden
Source: (Hoyer 2011)

"SHANSHUI" CITY

Integration with natural environment

Combination with Cantonese geography and climate

Chinese "shanshui" drawing: reflect the resolution of living with water nearby and mountain in the background
Source: www.99zihua.com

Fig. 2-3-3 Guangzhou Jiuyao Garden
Source: (Lu 2013)

Fig. 2-3-4 Guangzhou Yuyinshanfang Garden
Source: (Lu 2013)

Fig. 2-3-5 Ying Stone Landscape in Guangzhou Yuyinshanfang Garden Source: (Lu 2013)

BETTER PEOPLE PLACES

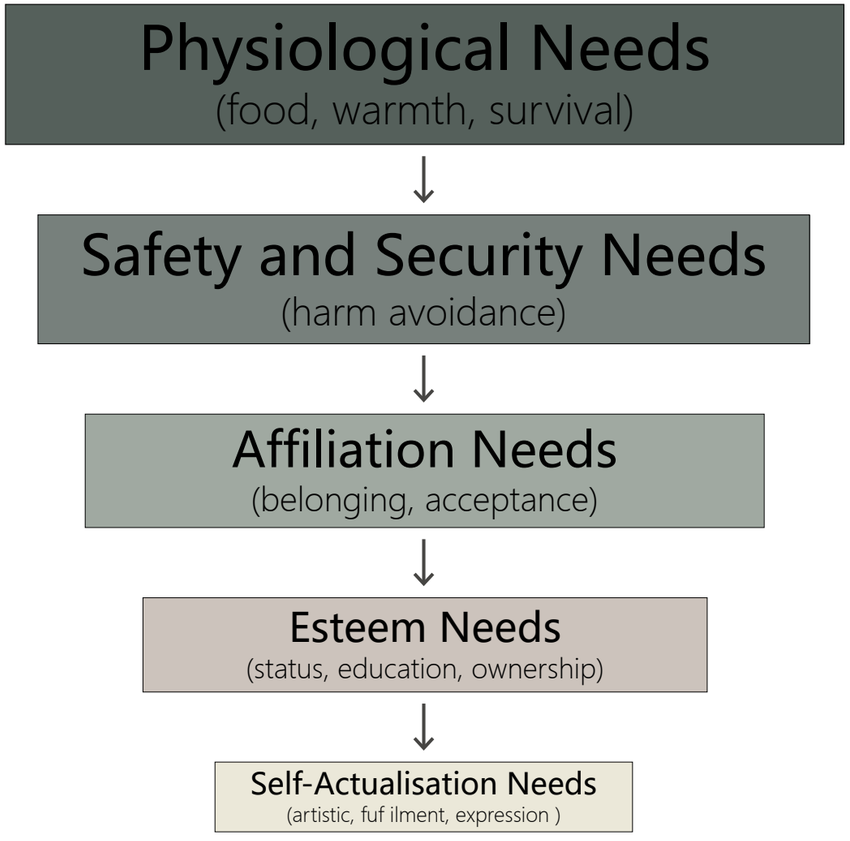


Fig. 2-4-1 Pyramid of human needs
Source: (Carmona 2010)

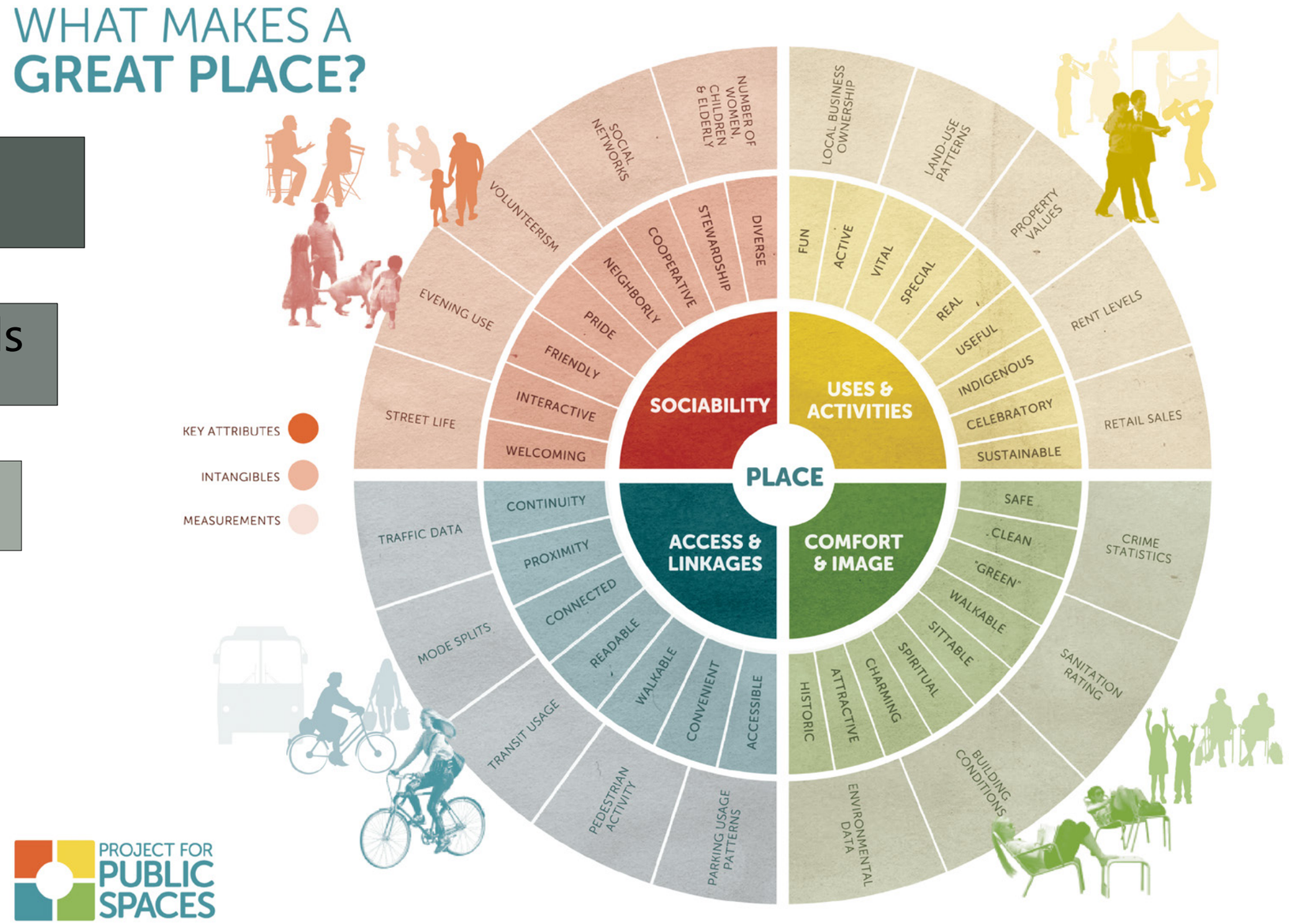
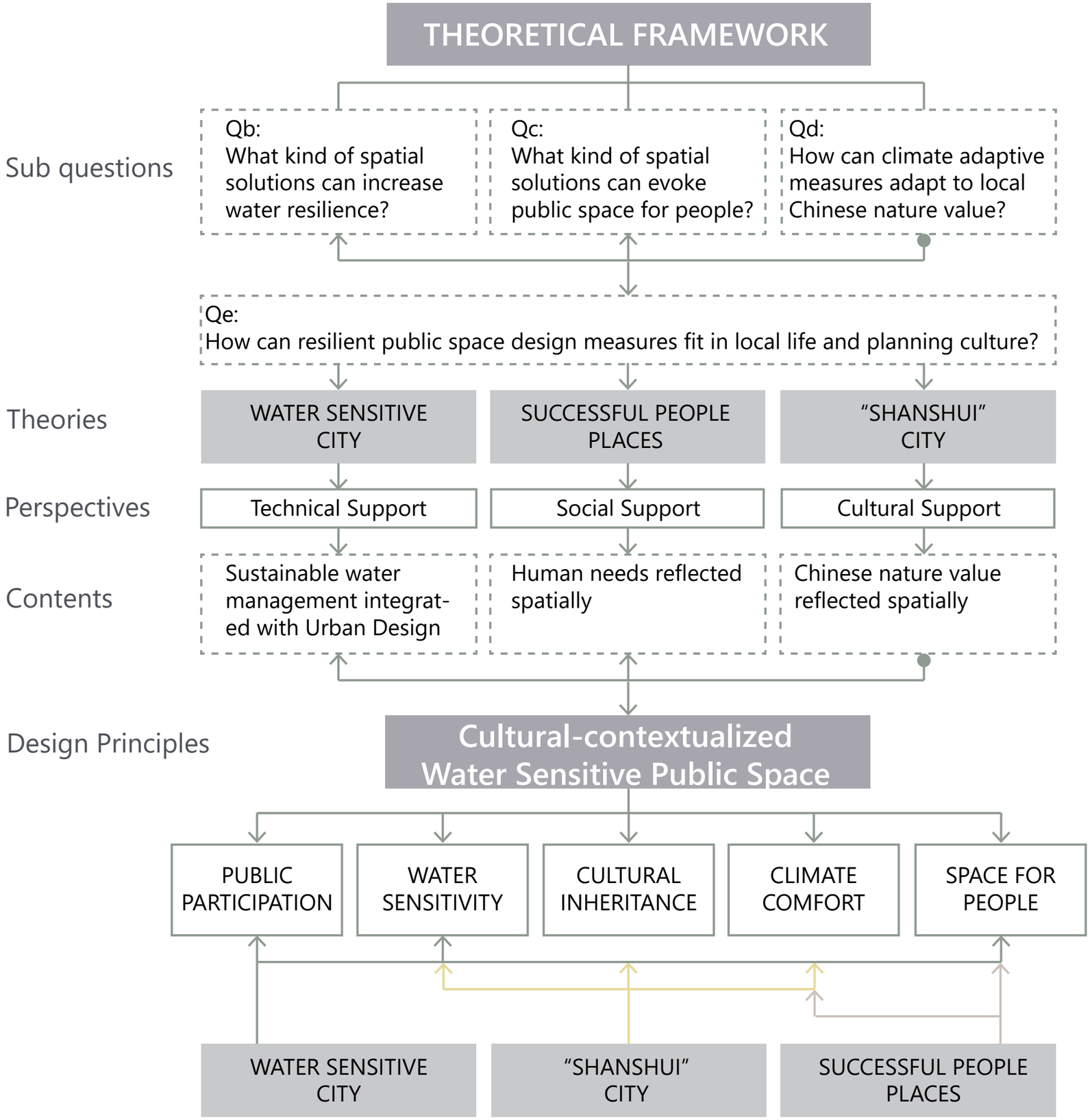


Fig. 2-4-2 A Place diagram showing qualities of a great place.
Source: ((PPS) 2009)


THEORETICAL FRAMEWORK
Sub questions
Qb:
What kind of spatial solutions can increase water resilience?
Qc:
What kind of spatial solutions can evoke public space for people?
Qd:
How can climate adaptive measures adapt to local Chinese nature value?
Qe:
How can resilient public space design measures fit in local life and planning culture?
Theories
WATER SENSITIVE CITY
SUCCESSFUL PEOPLE PLACES
"SHANSHUI" CITY
Perspectives
Technical Support
Social Support
Cultural Support
Contents
Sustainable water management integrat-ed with Urban Design
Human needs reflected spatially
Chinese nature value reflected spatially
Design Principles
Cultural-contextualized Water Sensitive Public Space
PUBLIC PARTICIPATION
WATER SENSITIVITY
CULTURAL INHERITANCE
CLIMATE COMFORT
SPACE FOR PEOPLE
WATER SENSITIVE CITY
"SHANSHUI" CITY
SUCCESSFUL PEOPLE PLACES

ANALYTICAL FRAMEWORK

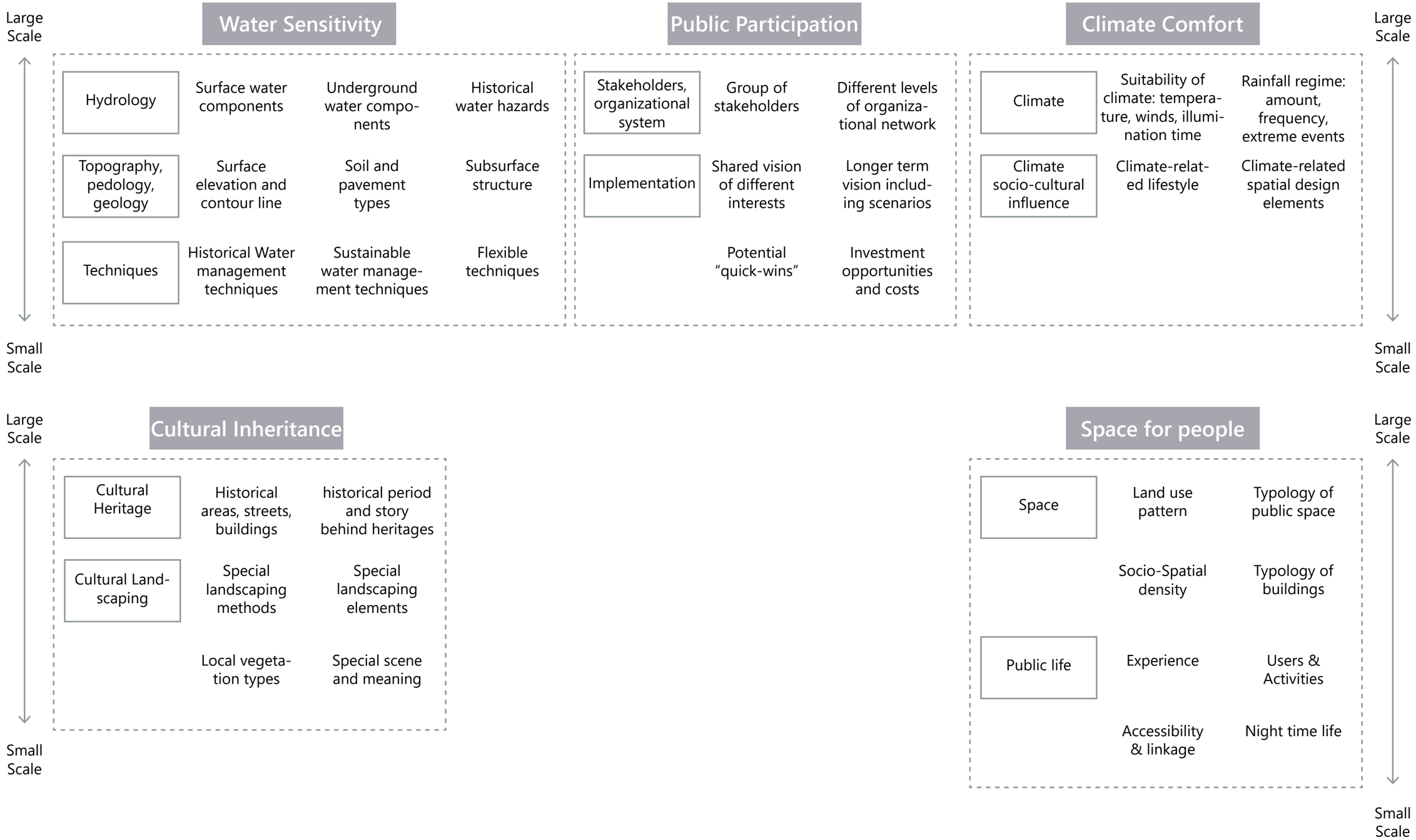


Fig. 3-1-1 Criteria and indicators of techni-cal-socio-cultural approach

Source: Drawn by author

LARGE SCALE

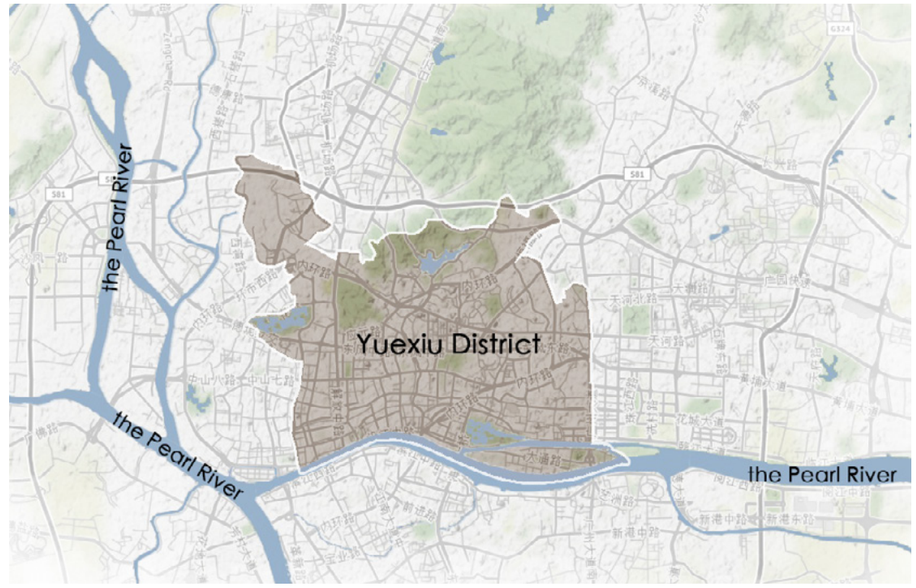
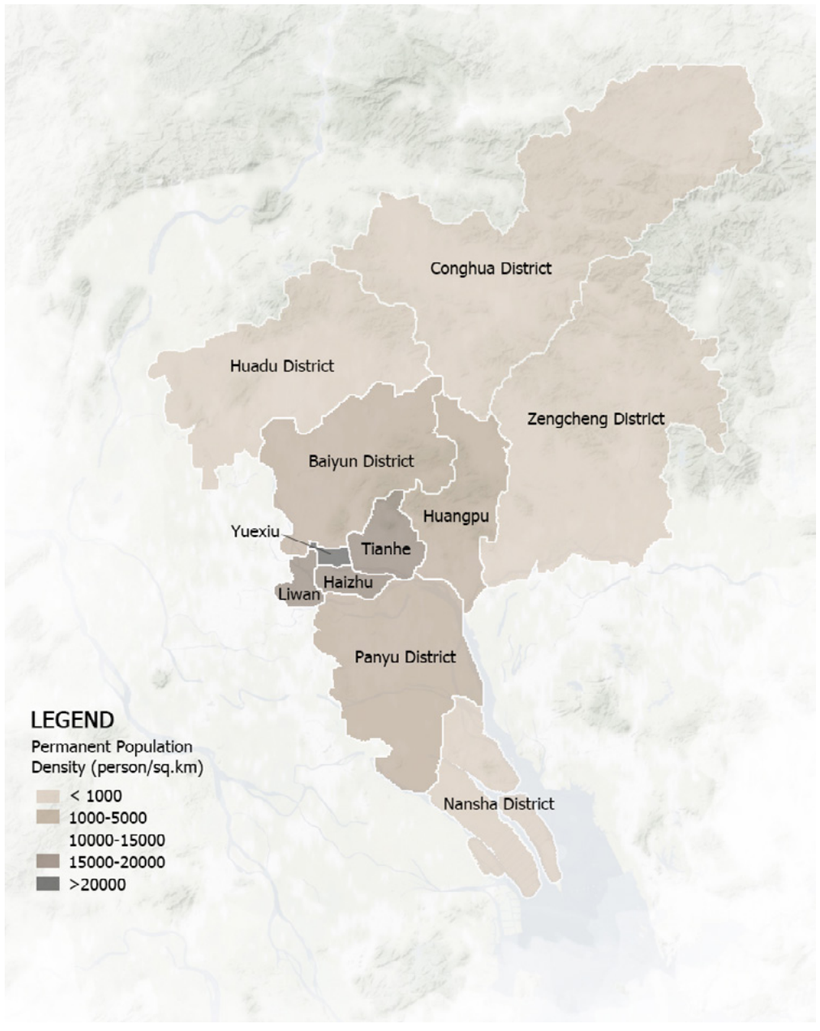


Fig. 3-2-2 (up) Yuexiu District and Sater Network
Source: Drawn by author



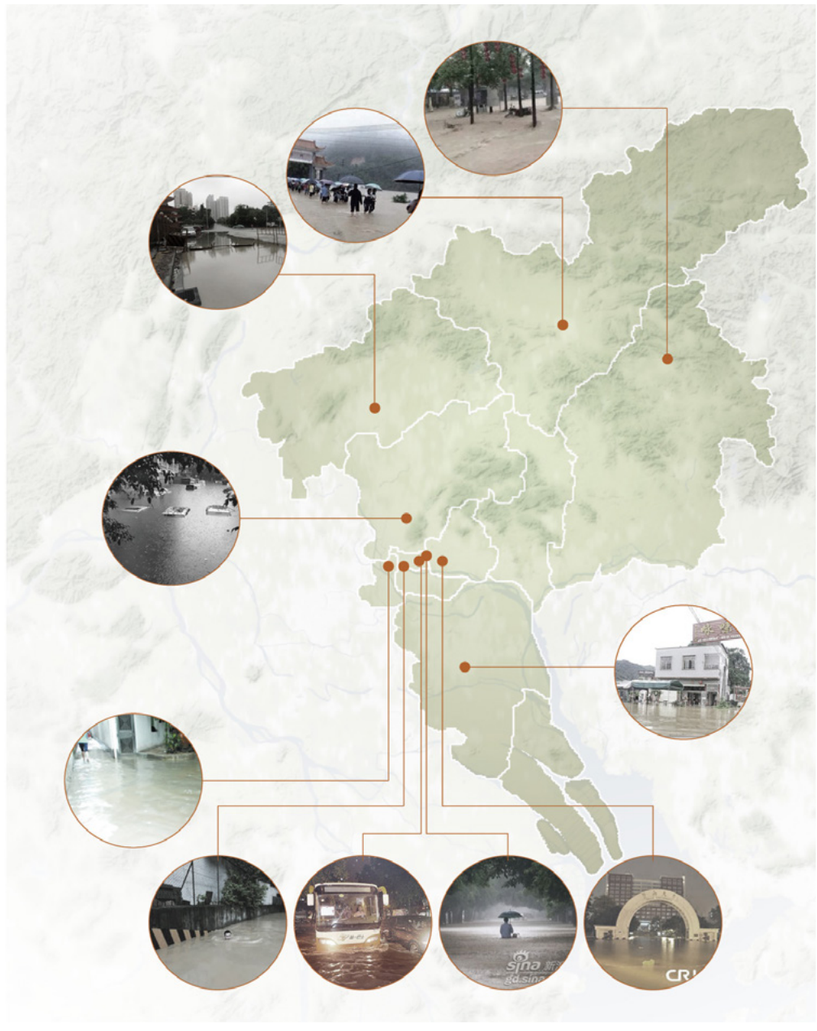


Fig. 3-2-1(left) 2013 Permanent Population Density of Urban Districts in Guangzhou
Data Source:
Guangzhou Statistical Yearbook (2014)

Fig. 3-2-2(right) 2010-2015 Guangzhou Severe Waterlogging Spots emphasized by annual climate reports
Source: (Hu 2011, Guangzhou Meteorological Bureau 2012, 2013, 2014, 2015, 2016)

WATER SENSITIVITY

3.3.1 Hydrology

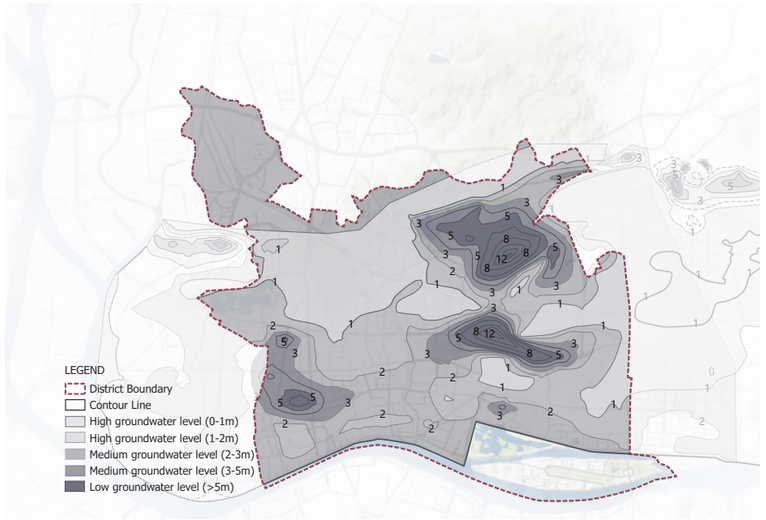


Fig. 3-3-2 Map of ground water level
Source: Adapted from Wang (2013)

3.3.2 Topography, Pedology and Geology

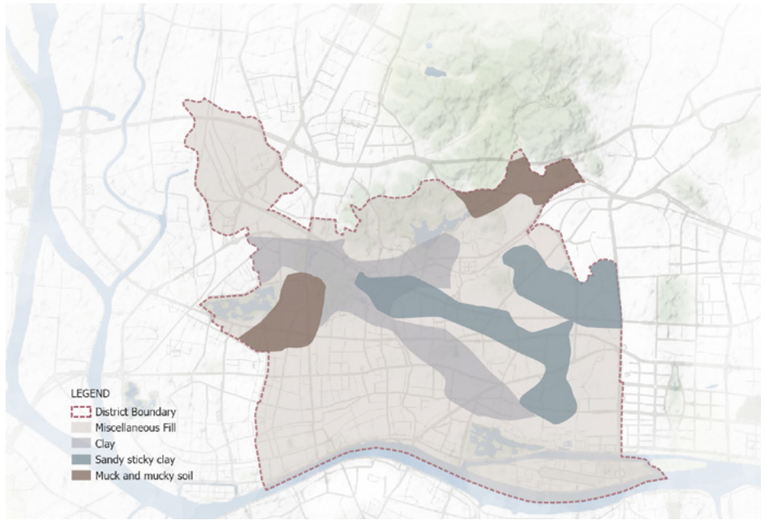
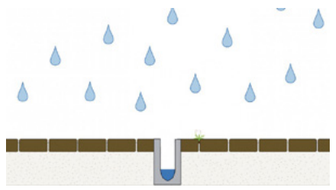


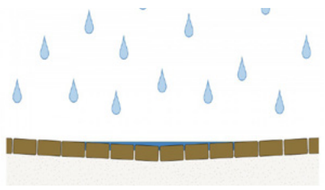
Fig. 3-3-7 Map of second layer soil (2m depth)
Source: Wang (2013)

3.3.3 Techniques

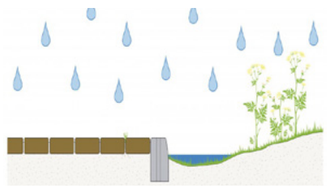
Modern Techniques



Gutters

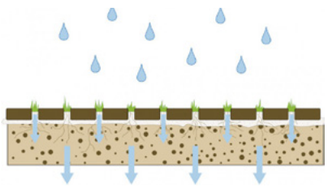


Hollow roads and sunken channels

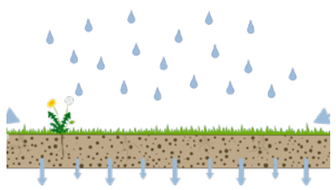


Ditches

Urban water channels

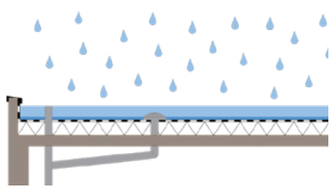


Permeable paving



Infiltration plane meadow

Infiltration ditches



Water roof

Historical Techniques

Fig. 3-3-17(up) Seepage well in ancient Canton
Source: Liu (2015)

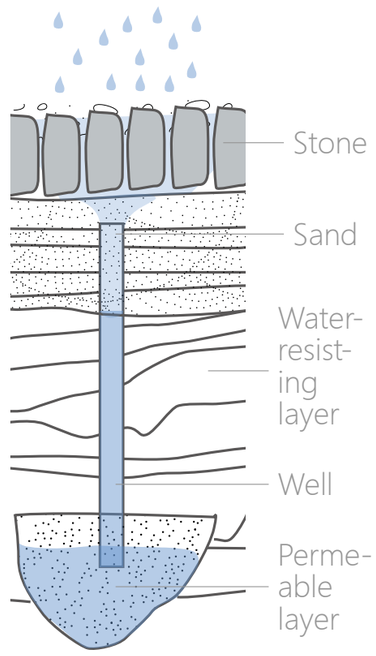


Fig. 3-3-18(up) Diagram of drainage and water treatment of seepage well
Source: Drawn by author

CULTURAL INHERITANCE

3.4.1 Cultural Heritage

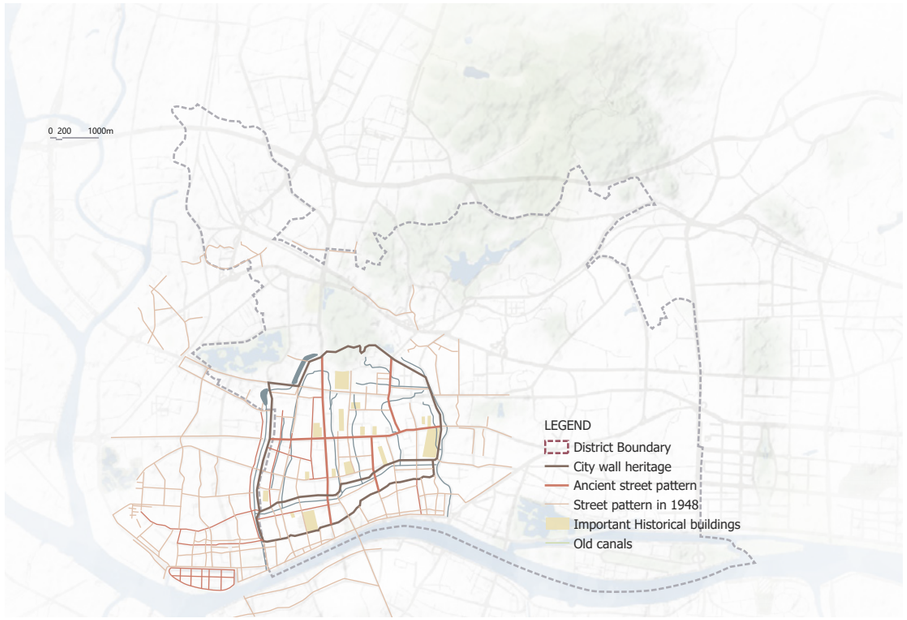


Fig. 3-4-2 Map of ancient city pattern and historical heritages
Source: Source:DEPT. of Historical And Cultural City, http://dhc.thupdi.com/

Arcade building in Chung-shan 6th Road
Source: https://zh.wikipedia.org/

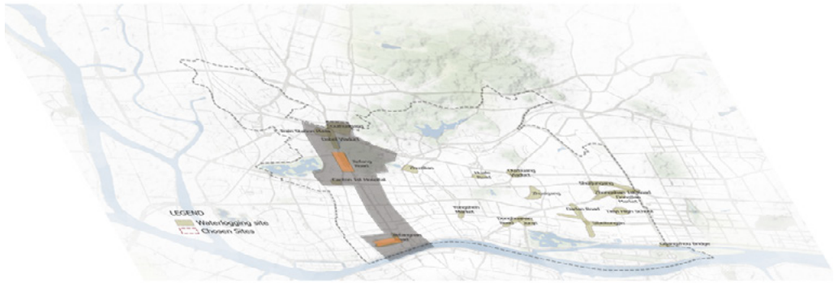
3.4.2 Cultural Landscaping

Fig. 3-4-4(left) Space division and comparison in Ke Garden
Source: http://blog.sina.com.cn/s/blog_5cf2b87f0101vvkg.html

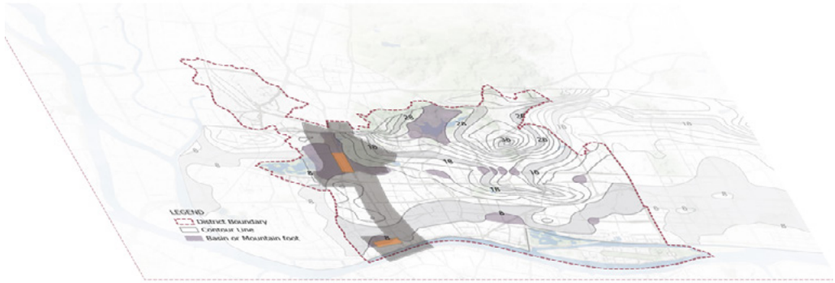
Fig. 3-4-5(right) Natural stone bank in Lou Lim Ieoc Garden, Macau
Source: http://www.bunbun-hk.com/BBS/Discuz/viewthread.php?tid=19221

Fig. 3-6-6 (right) Image of Canton water village
Source: Chen (2011)

MEDIUM SCALE



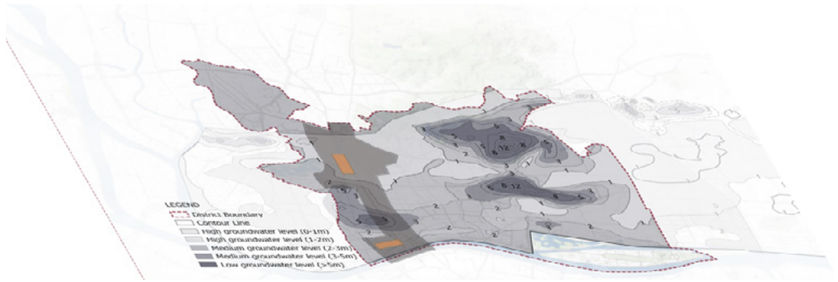
Historical hazard spots



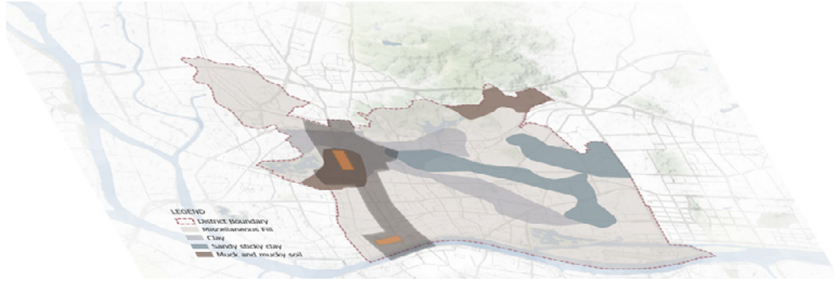
Topography

Water Sensitivity

Green-blue network

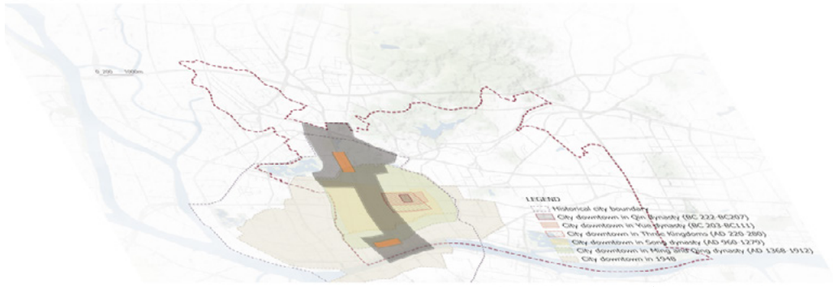


Underground water level

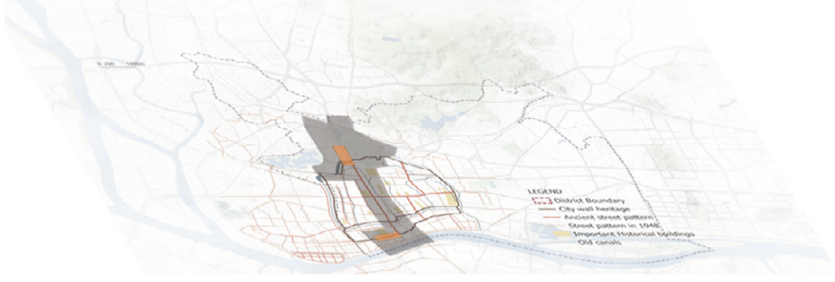


Surface and subsurface permeability

Cultural Inheritance



Distribution of historical areas



Distribution of historical heritage

Distribution of arcade buildings

SPACE FOR PEOPLE

3.6.1 Space

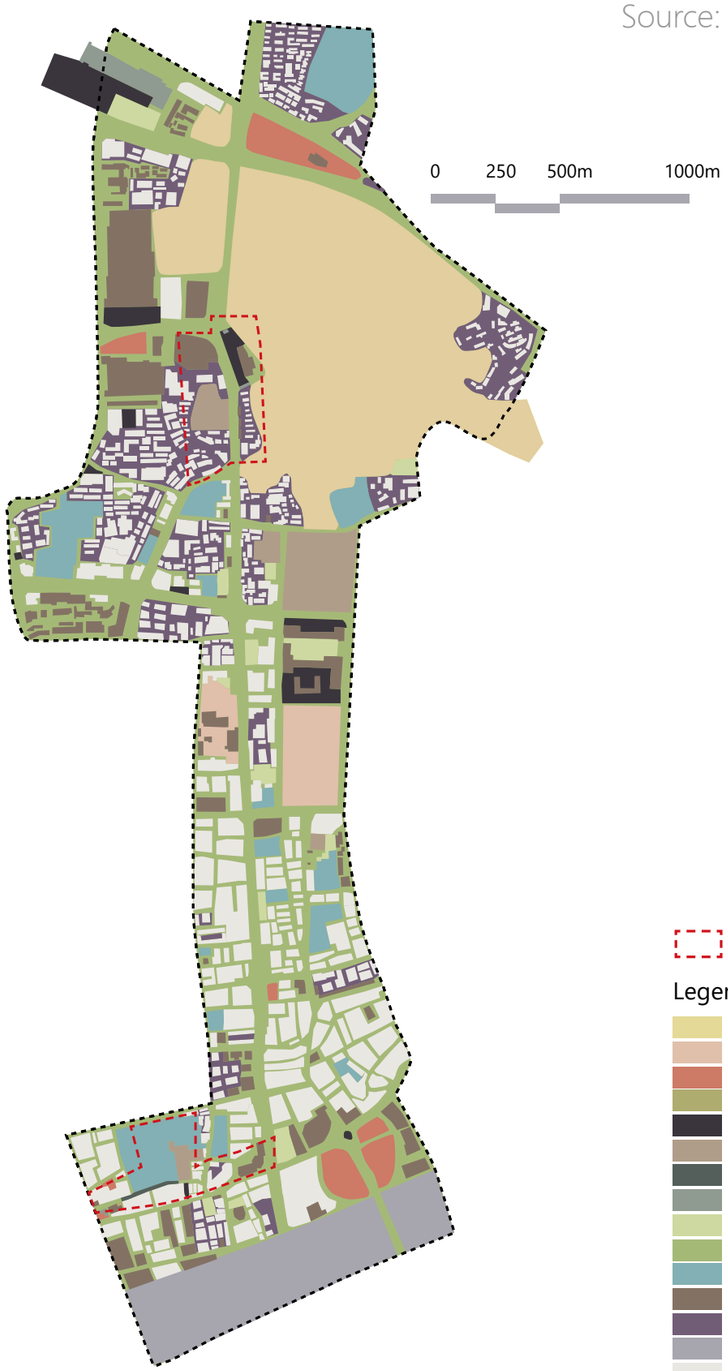
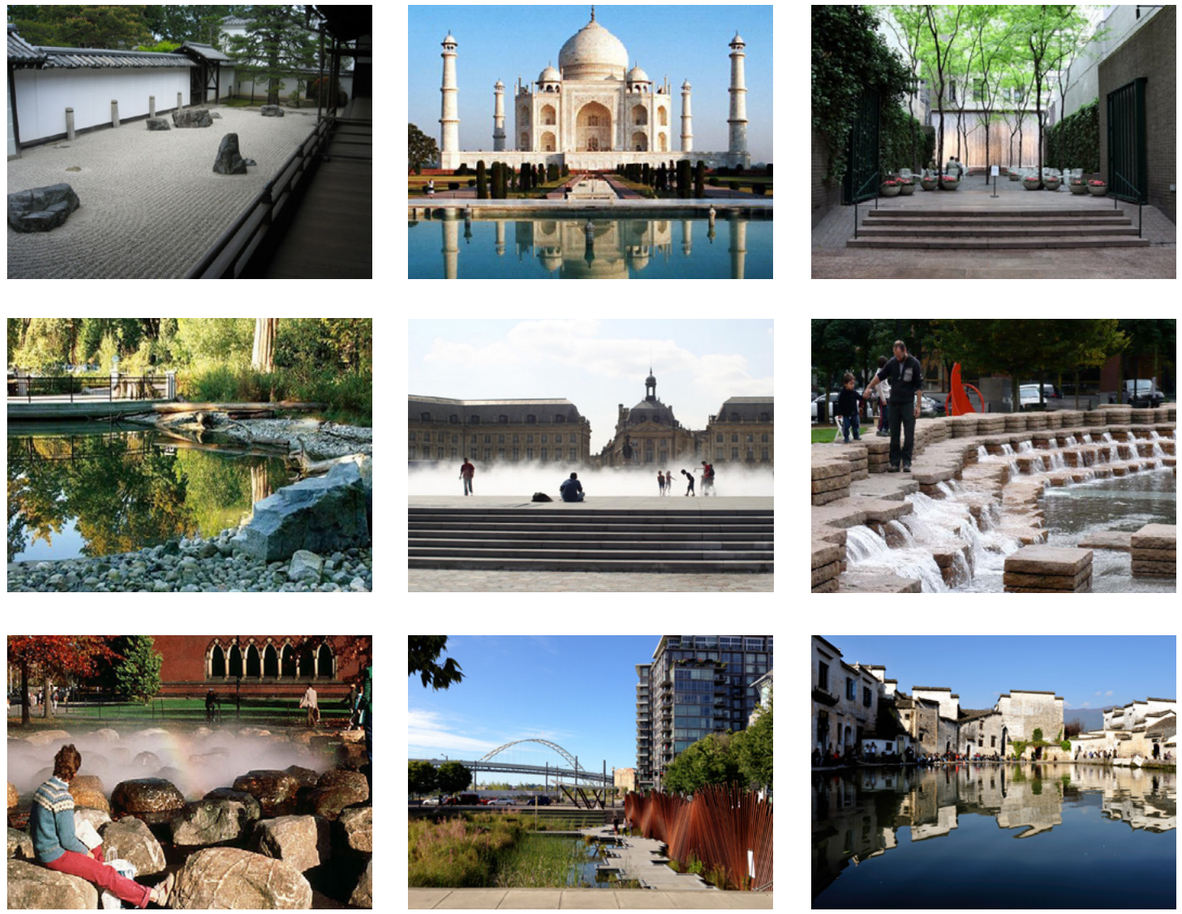


Fig. 3-6-3 Typology of public space
Source: Drawn by author

3.6.2 Experience



CLIMATE COMFORT & PUBLIC LIFE

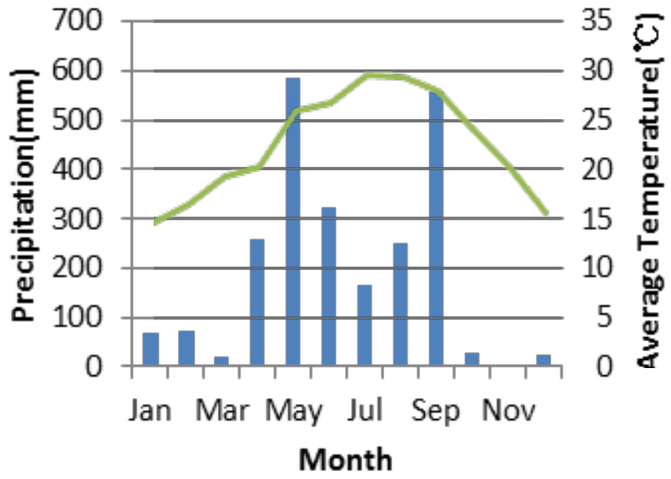


Fig.3-7-1 2010 Guangzhou monthly precipitation and temperature
Data resources: climate statistic data in Guangzhou Meteoro-logical Bureau (http://www.gz121.gov.cn/)

Fig. 3-7-3 Site 2: Map of climate design
Source: Drawn by author

Ficus

Kayok: city tree

Fig.3-7-4 Site 2: Map of activities and user groups
Time: Nov. 29 17:30 2016
Source: Drawn by author

PUBLIC PARTICIPATION

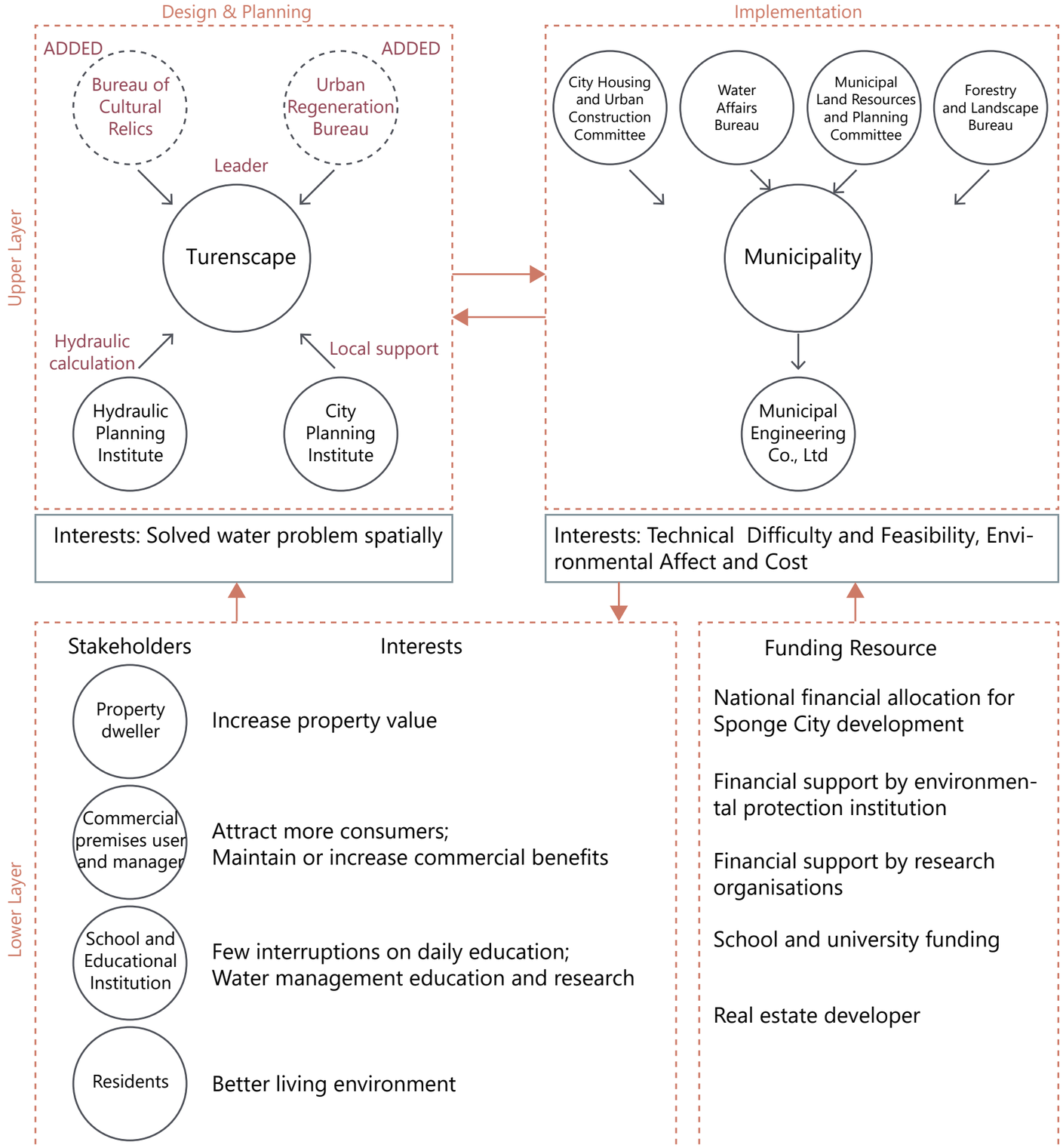
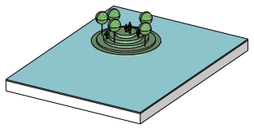


Fig. 3-8-2 Diagram of involved stakeholders and their interests
Source: Drawn by author

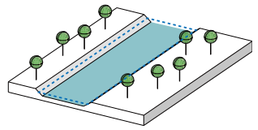
WATER SENSITIVITY

Mound



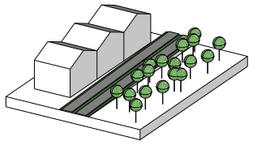
Evacuation refugee

Basin



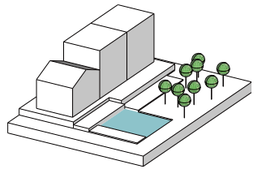
Water retention

Slope/Flat street



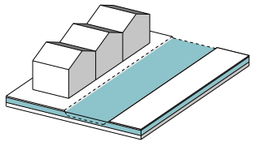
Conveyance path

Various topography



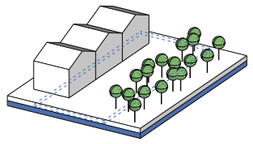
Height differentiation

High groundwater



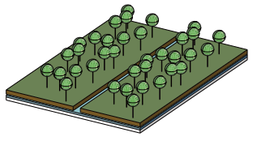
Expose water surface

Low groundwater



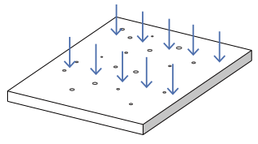
Underground management

Poor permeability



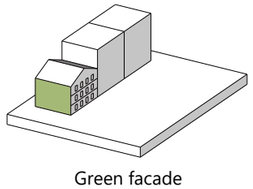
Avoid poor permeability layer

Well-drained ground



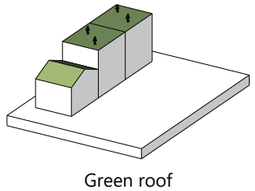
Surface infiltration

High-quality building



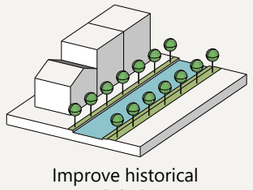
Green facade

Accessible roof



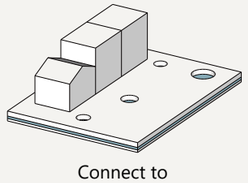
Green roof

Near canal system



Improve historical canal drainage

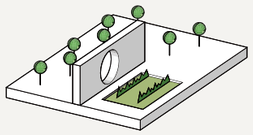
Basin far from surface water



Connect to underground water

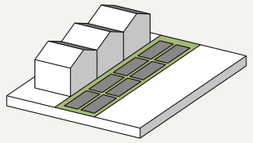
CULTURAL INHERITANCE

Historical areas



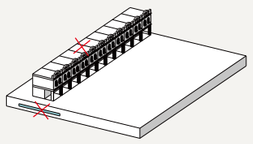
Cultural landscaping methods and elements

Historical streets



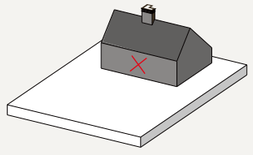
Keep part of old materials & Increase permeability

Arcade Building streets



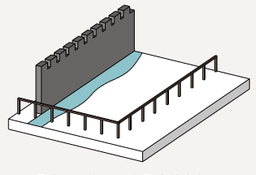
No structural change or underground measure

Historical heritages



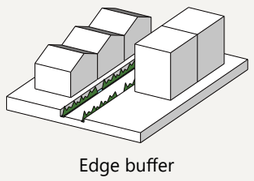
No water drainage change

Historical water management



Education & Exhibition

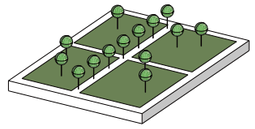
Man-made basin



Edge buffer

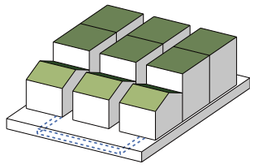
SPACE FOR PEOPLE

Urban sparse area



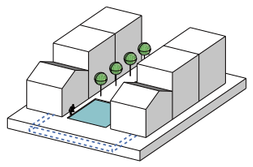
Surface water management

Urban dense area



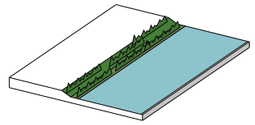
Underground or roof water management

Urban dense area



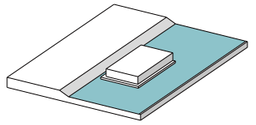
Multifunctional space

Water front



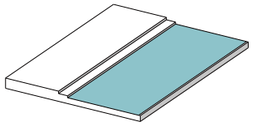
Varied bank & planting zone

Water front



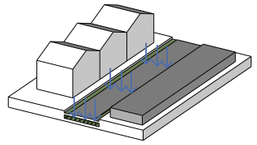
Floating building

Water front



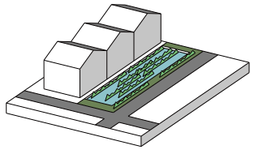
Height differentiation

Street market



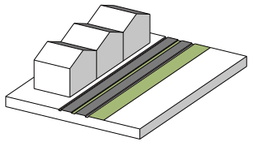
Conveyance & purification

Near roads or industry



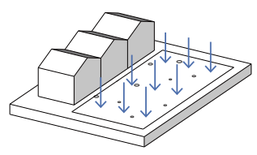
Water purification

Road



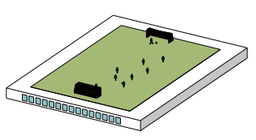
Conveyance

Pedestrian space & Parking lot



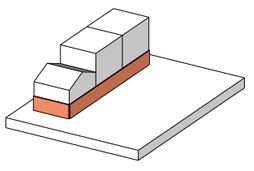
Increase infiltration

Schoolyard



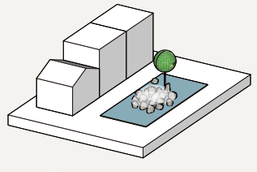
Geocellular system

Commercial area

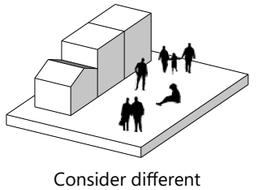


Sealable ground floor

Use water to create experience

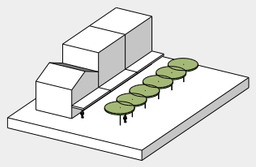


Introduce historical value of water

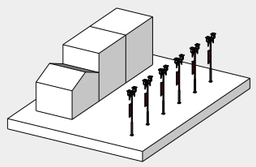


Consider different needs of user group

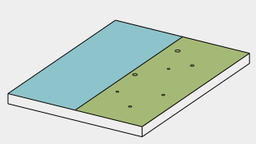
CLIMATE COMFORT



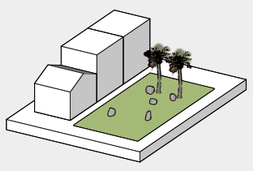
Provide enough shade



Nighttime design

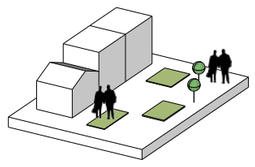


Dry & wet scenarios

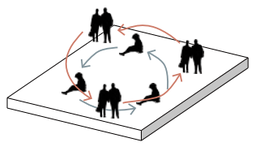


Local type vegetation

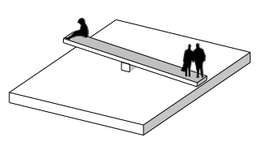
PUBLIC PARTICIPATION



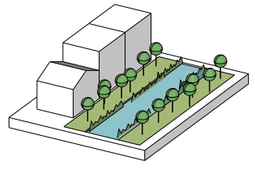
Half guide initiatives



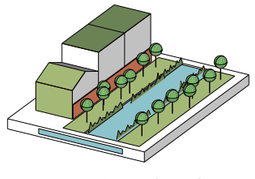
Cross-layer organizational network



Balance various interests



Effective "quick-wins"



Long-term shared vision

STRATEGY AND DESIGN

VISION AND STRATEGY

Fig. 4-1-1 Vision Map

Source: Drawn by author

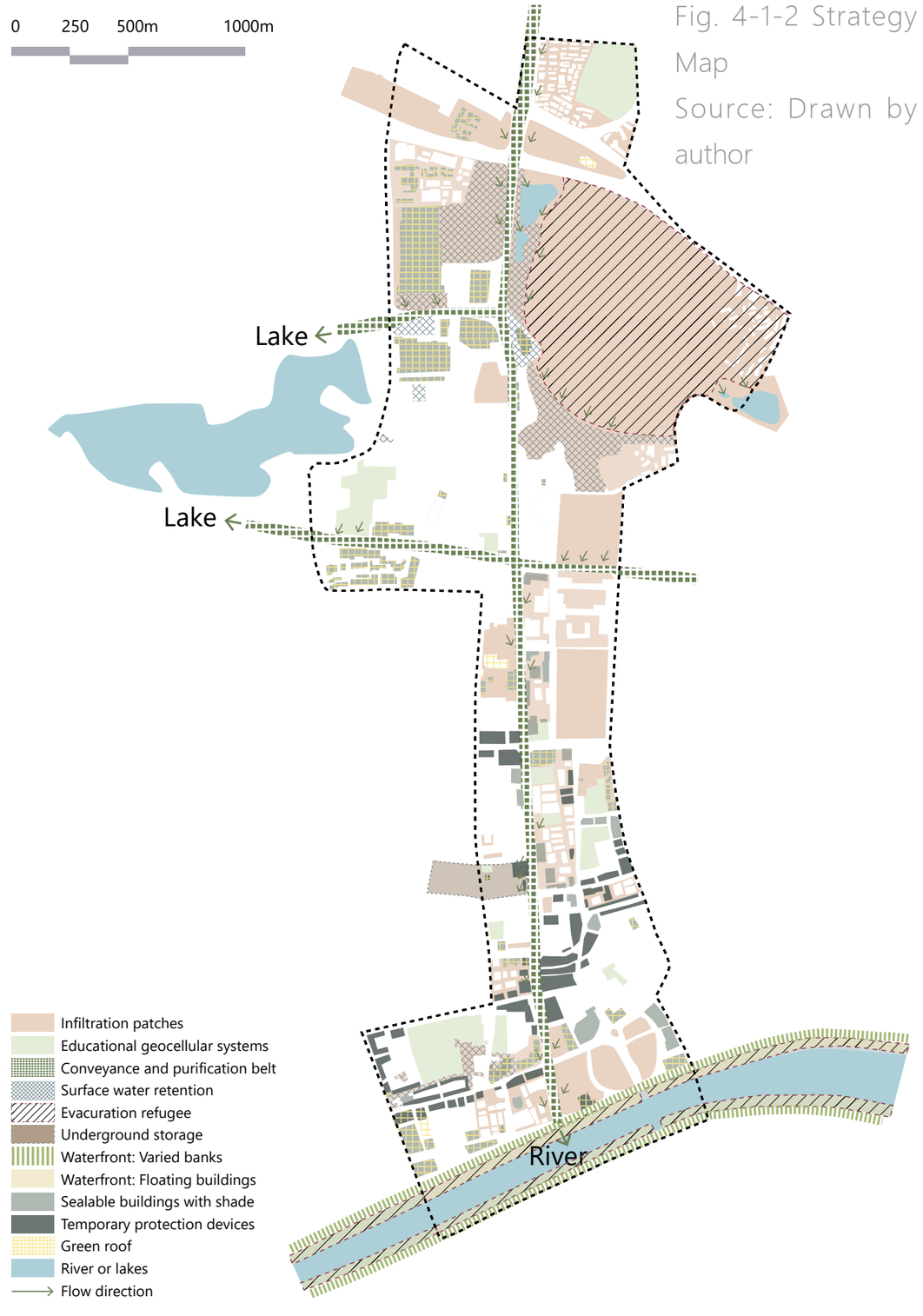


Fig. 4-1-2 Strategy Map

Source: Drawn by author

Fig. 4-1-3 Action process of Phase 1
Source: Drawn by author

Fig. 4-1-4 Action process of Phase 2
Source: Drawn by author

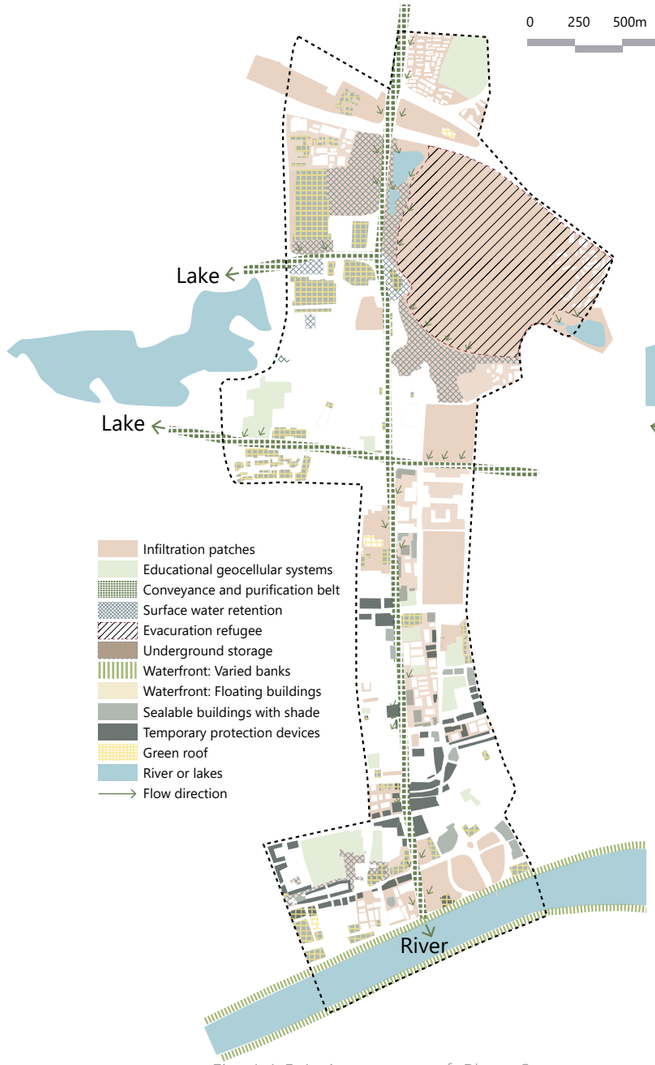


Fig. 4-1-5 Action process of Phase 3
Source: Drawn by author

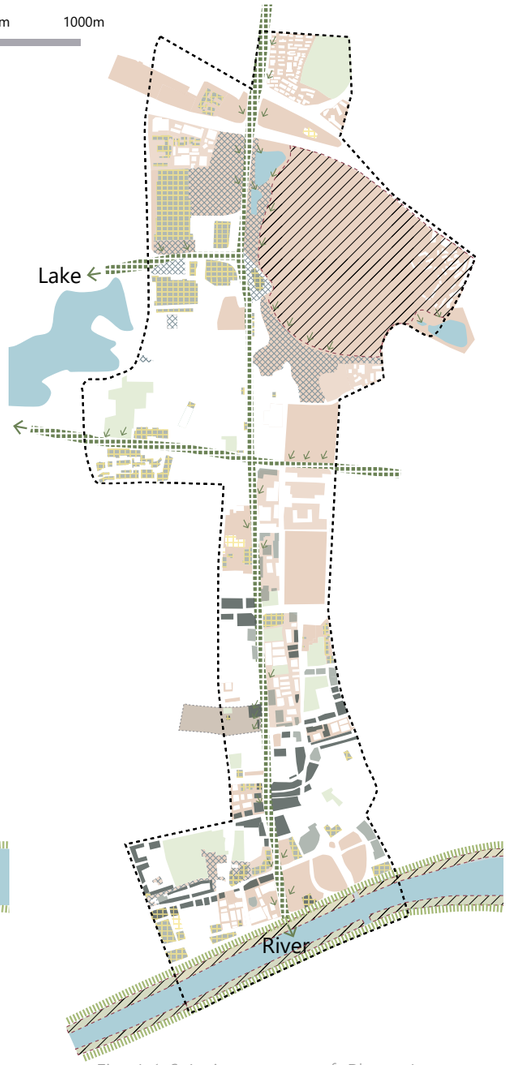


Fig. 4-1-6 Action process of Phase 4
Source: Drawn by author

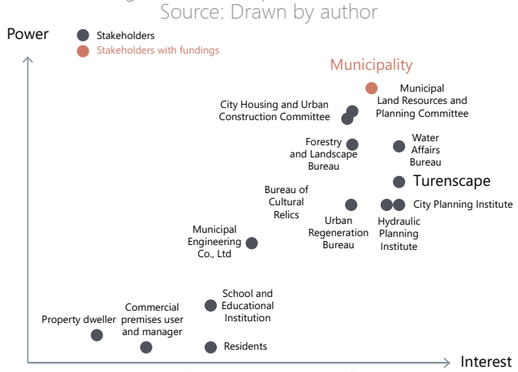


Fig. 4-1-7 Involved actors of Phase 1
Source: Drawn by author

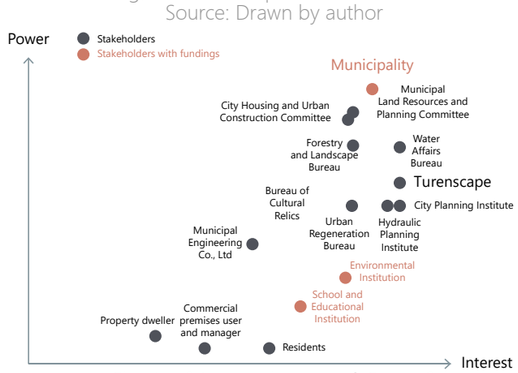


Fig. 4-1-8 Involved actors of Phase 2
Source: Drawn by author

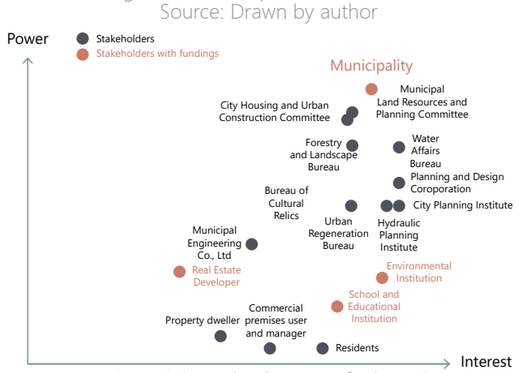


Fig. 4-1-9 Involved actors of Phase 3
Source: Drawn by author

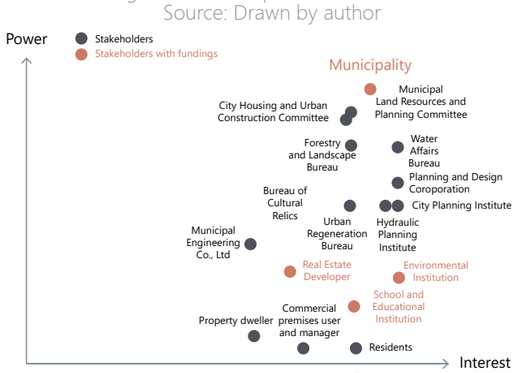
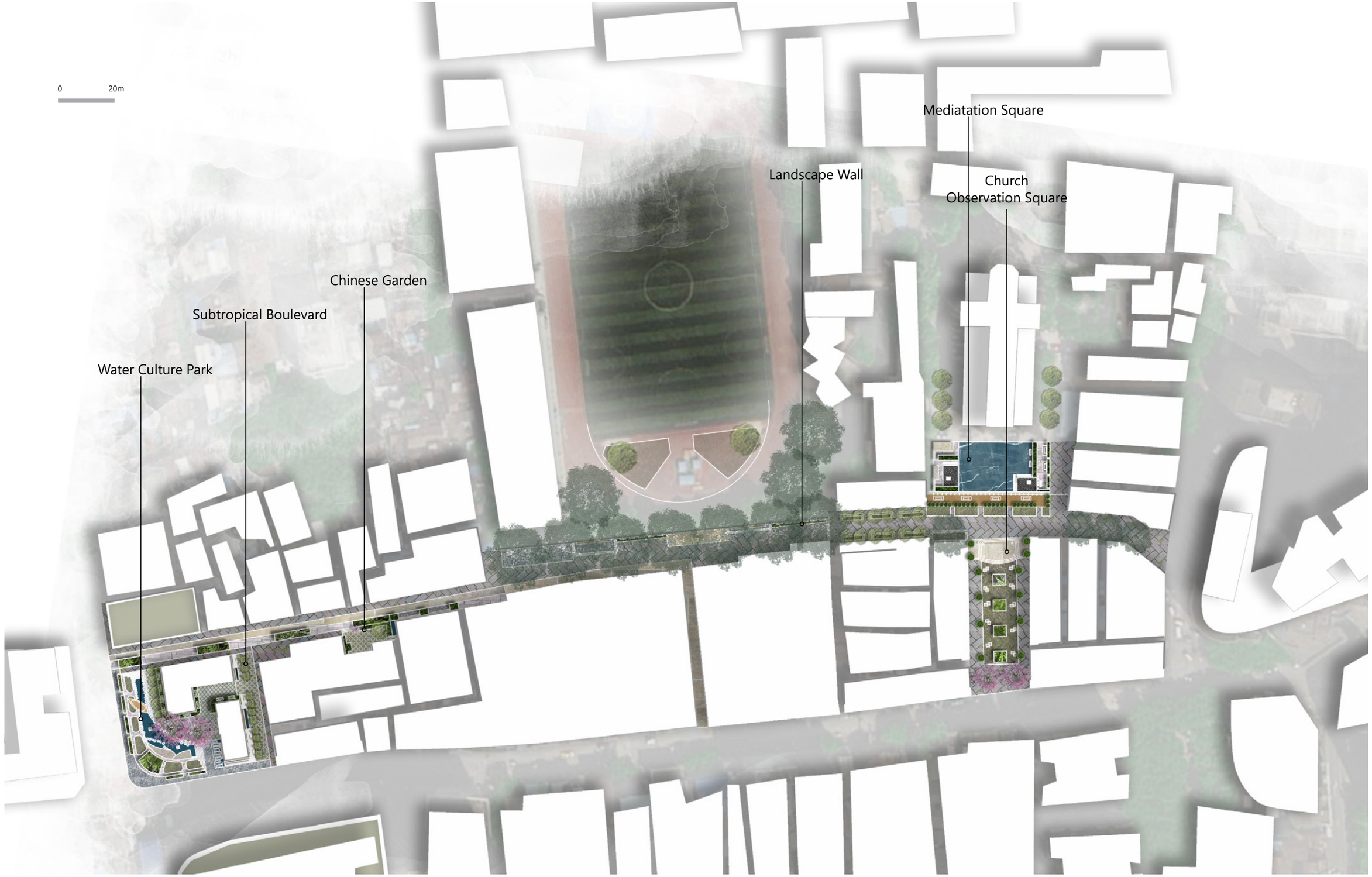


Fig. 4-1-10 Involved actors of Phase 4
Source: Drawn by author

DESIGN PROPOSAL

Fig. 4-3-1 Master Plan(daytime)
Source: Drawn by author



WATER SENSITIVITY

Fig. 4-3-10 Water cycle of Part 2
Source: Drawn by author

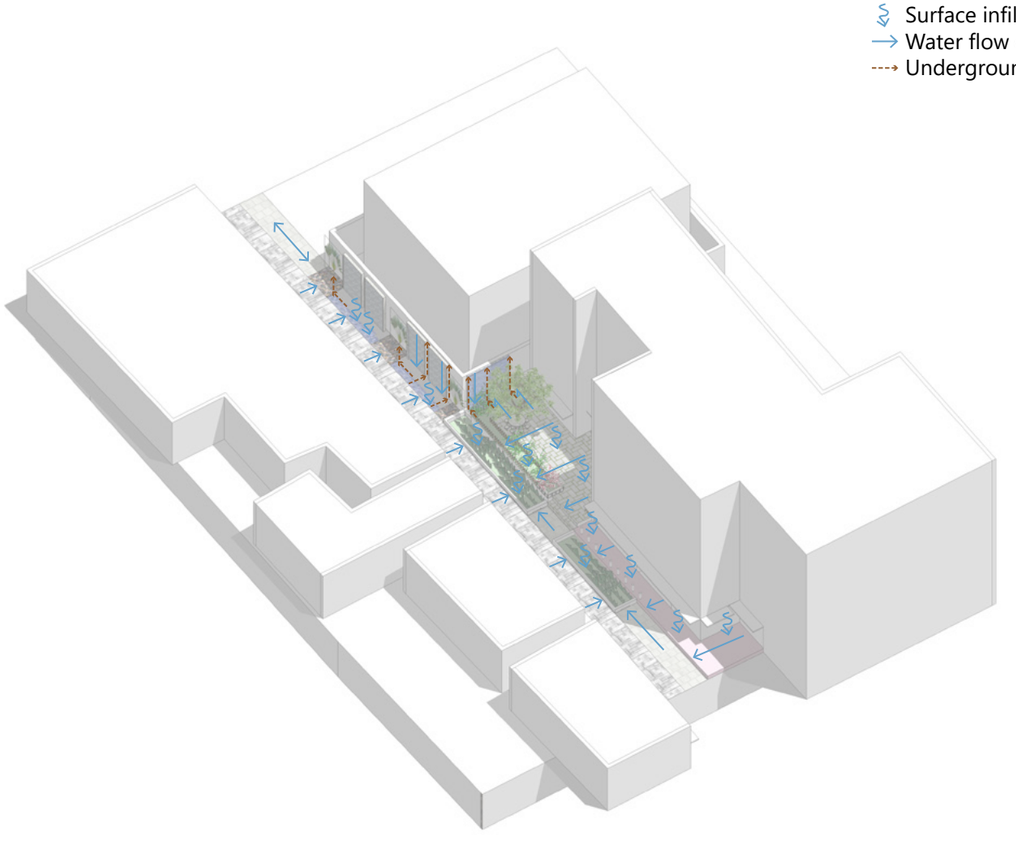
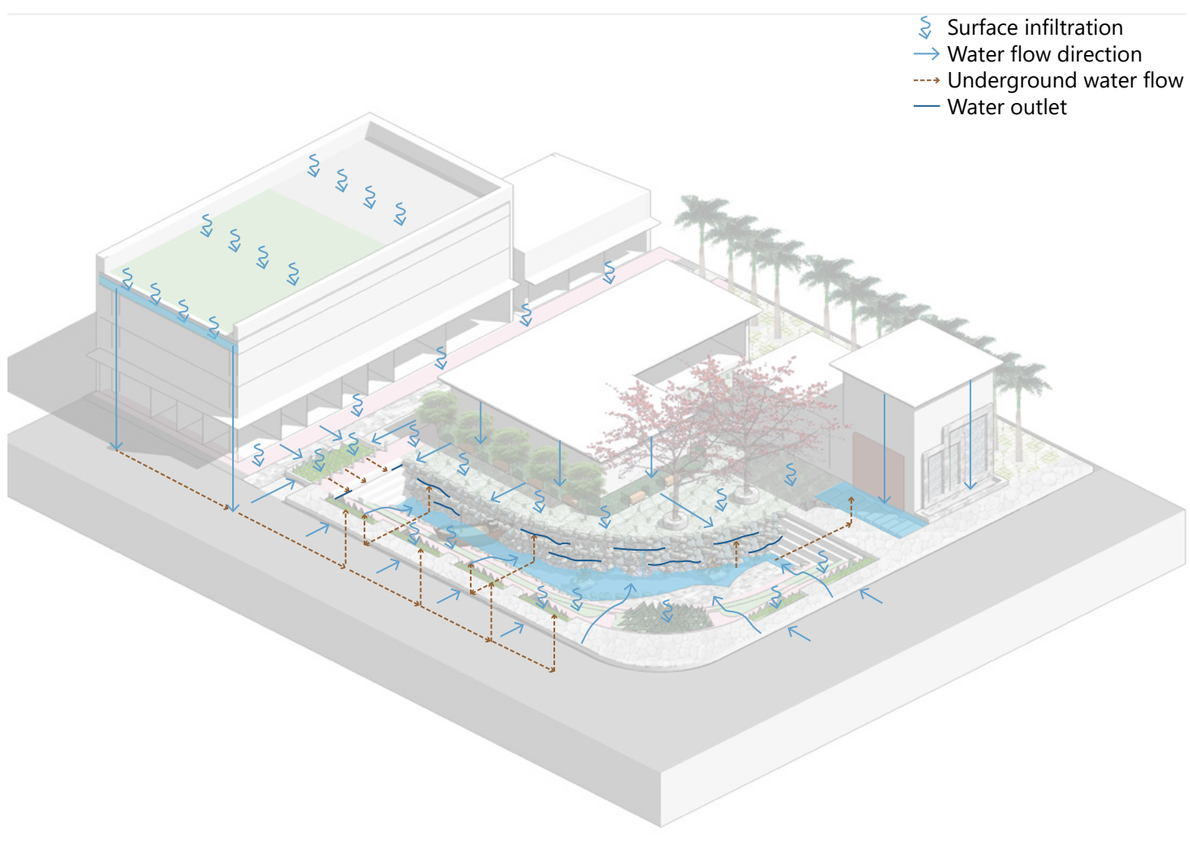


Fig. 4-3-7 Water cycle of Part 1
Source: Drawn by author



SPACE FOR PEOPLE

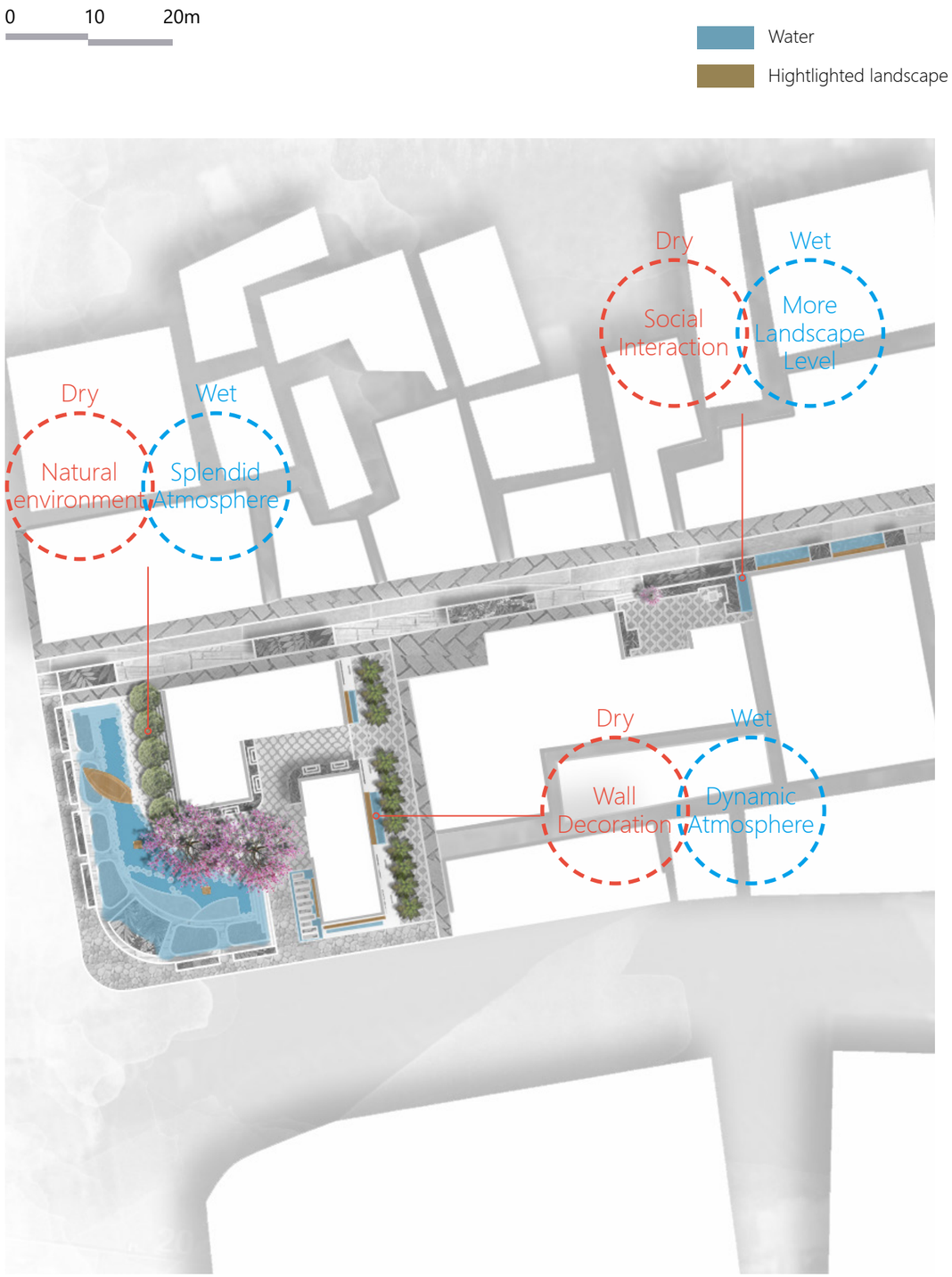


Fig. 4-3-2 Map of dry & wet scene and analysis of water experience (Part 1)
Source: Drawn by author

CLIMATE COMFORT

Fig. 4-3-1 Master Plan (nighttime)

Source: Drawn by author

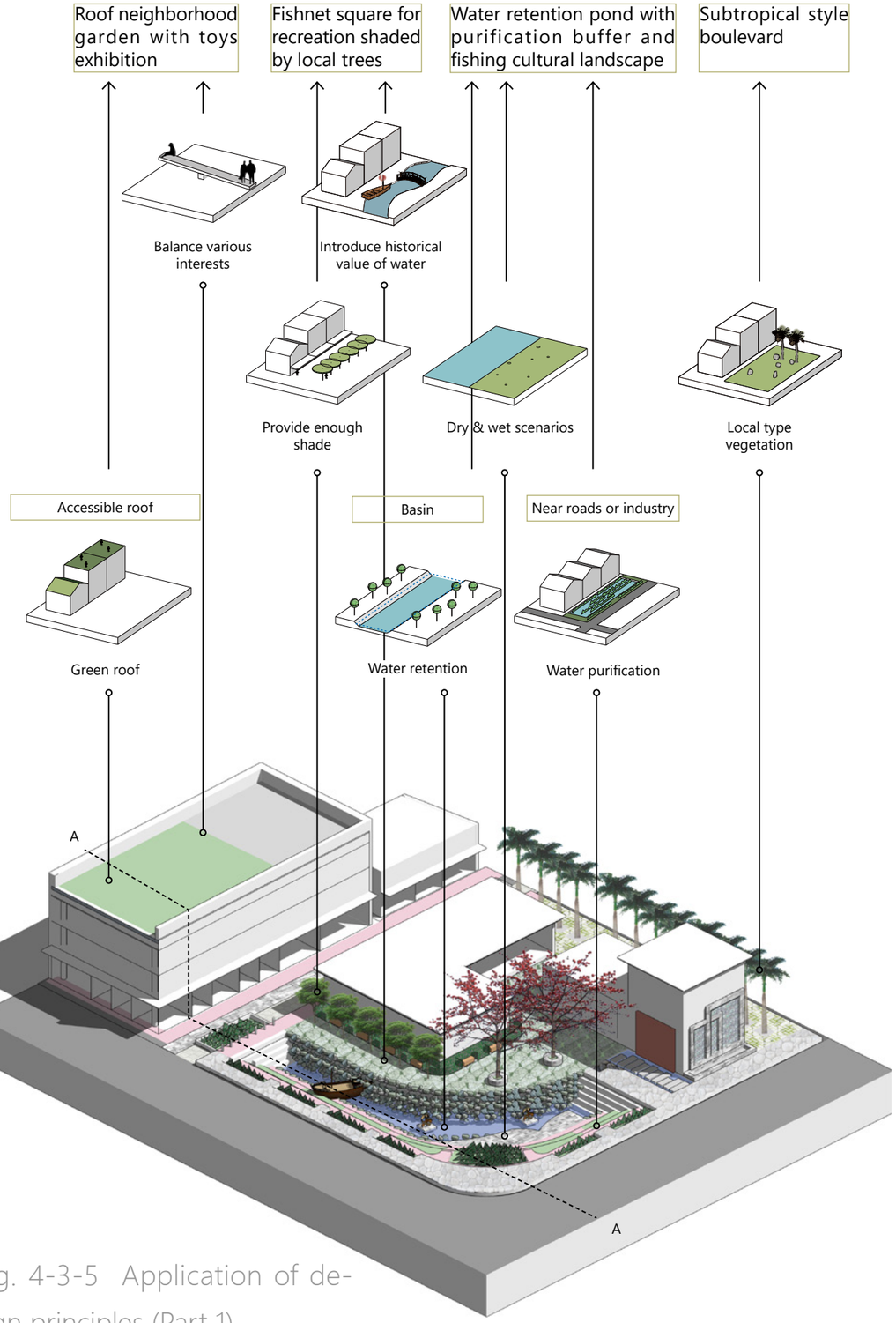


Fig. 4-3-5 Application of design principles (Part 1)
Source: Drawn by author

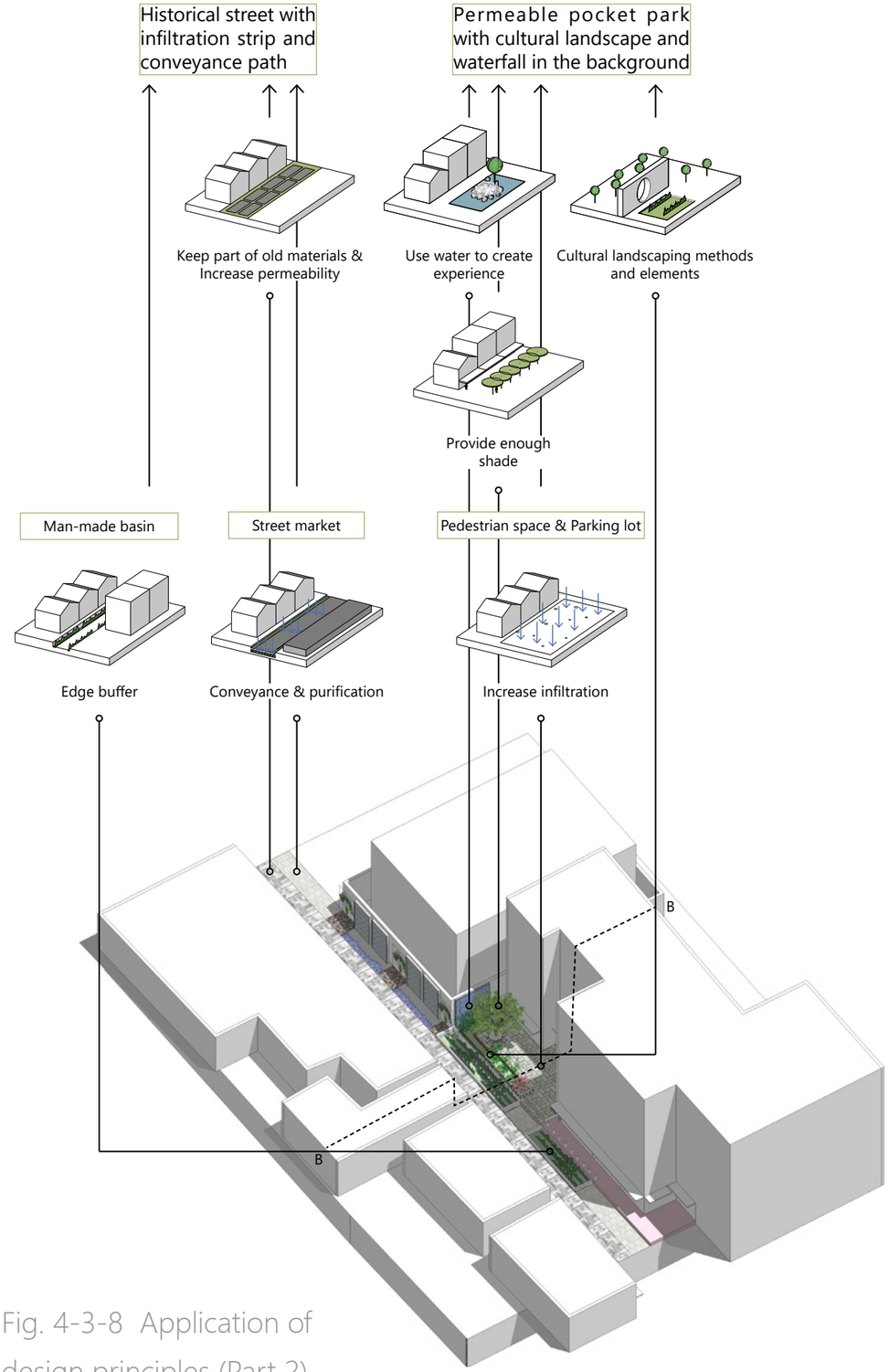
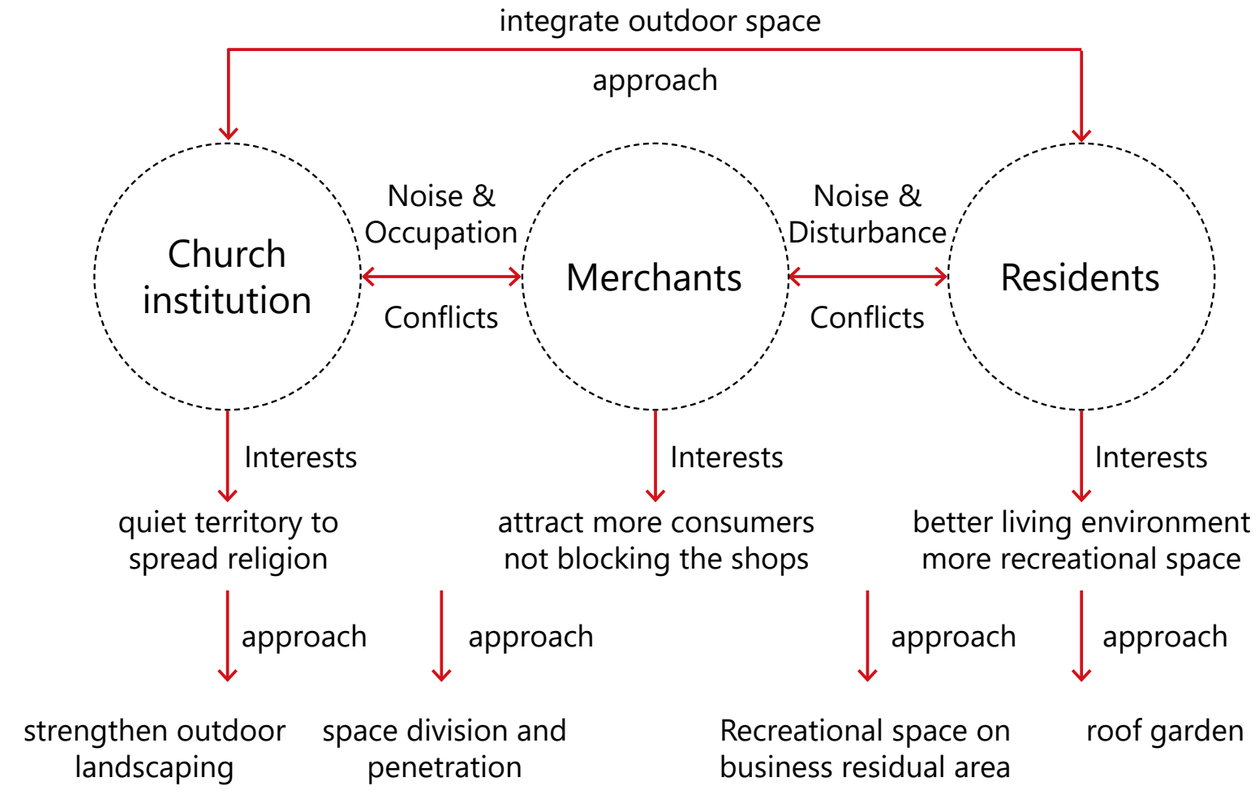


Fig. 4-3-8 Application of design principles (Part 2)
Source: Drawn by author

PUBLIC PARTICIPATION



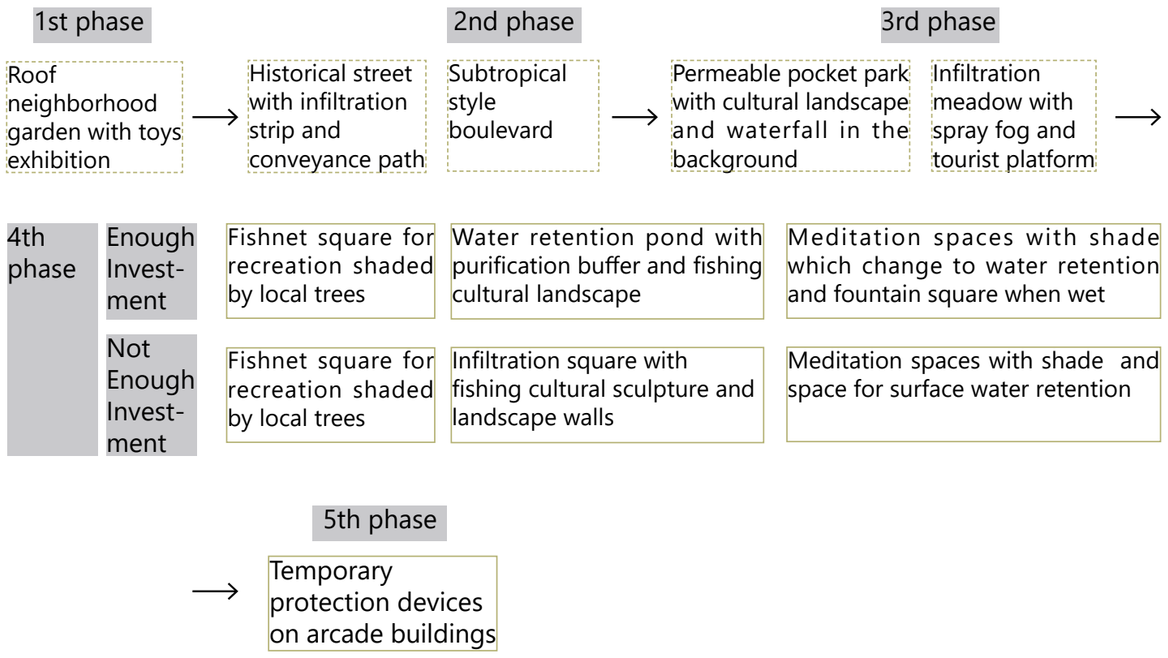


Fig. 4-3-14 Interests and conßicts between stakeholders

Source: Drawn by author