

Sponge City Program Practice Modeling and Scenario Classification

220318 Midpoint

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Motivation:

As one of the biggest top-down national policy in China, Sponge City Practice has been initiated in over 30 cities and invested over billion of dollars. However, after over seven years of practice, many cities in China are still suffering from severe water logging. Especially Zhengzhou, Henan, who has spent more than \$80 million in SCP since 2016, was overwhelmed by record-breaking flooding in July this year. It caused 53.2 billion yuan(about \$8.38 billion) in economic losses and took 292 lives.

The effectiveness and practice of SCP are facing unprecedented challenges and doubts. It is a wake-up call for us and an important question raised worth introspecting on — how can we improve the SCP practice in this situation and make it more effective?



1 Context



1.1 Spong City Overview

Without SCP



Rainfall

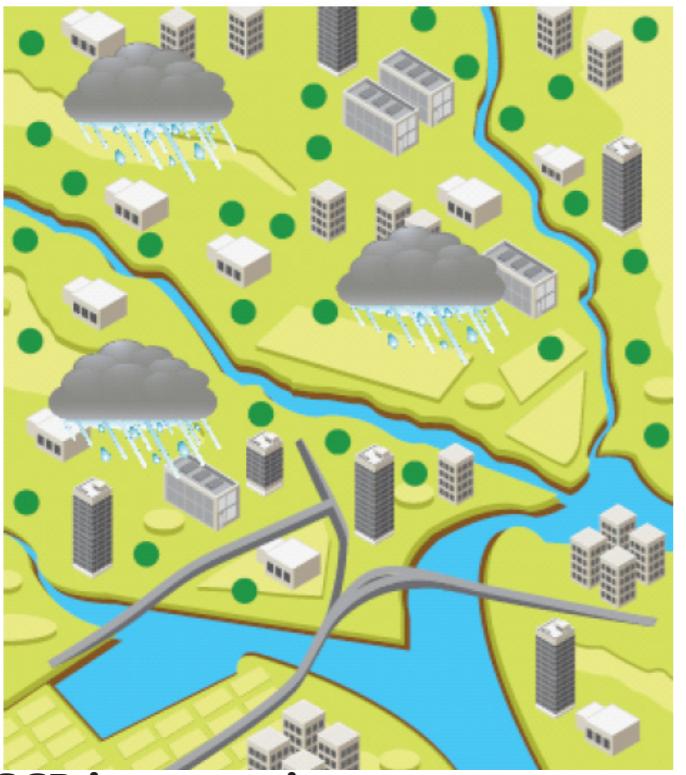


Runoff drains into trench directly



Water level rapidly raises

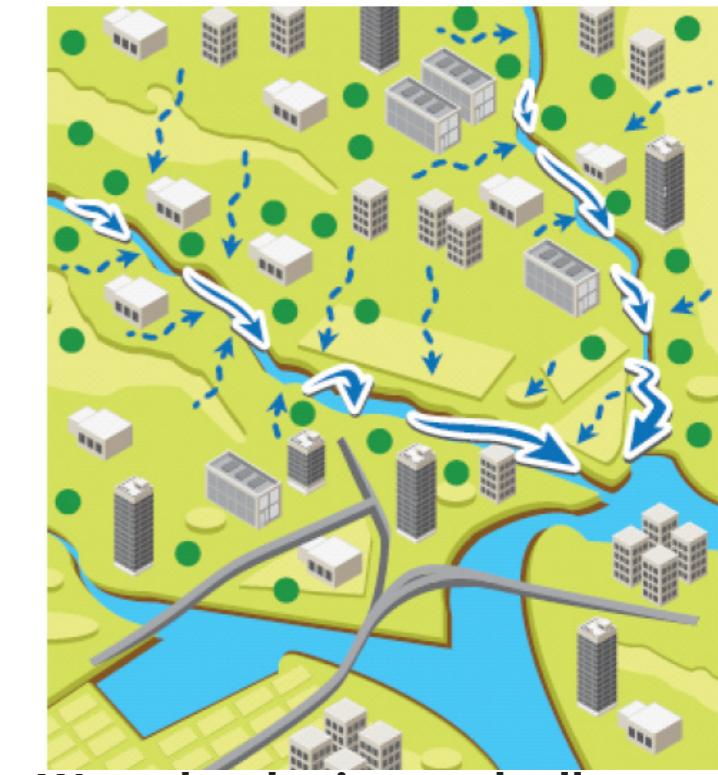
With SCP



SCP intervention



SCP slow down the rainfall



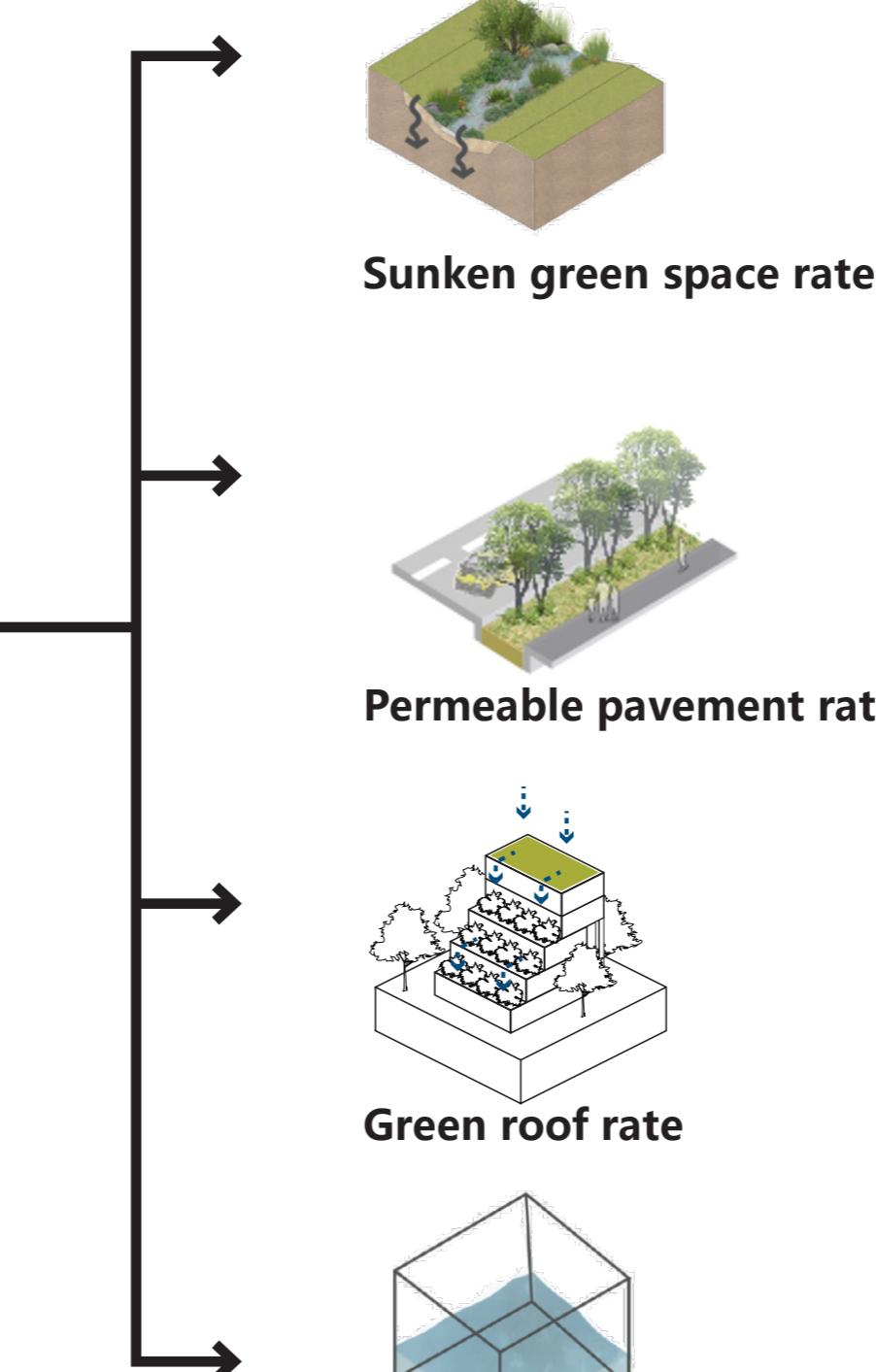
Water level raise gradually

1.1 Spong City Overview

Key Indicators:

$$\text{Volume capture ratio of annual rainfall} = \frac{\text{Design Fall}}{\text{Annual Rainfall}}$$

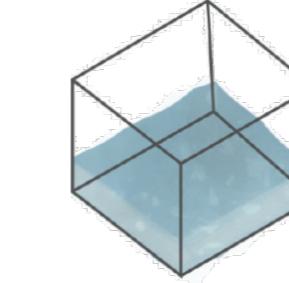
Individual Indicators:



Sunken green space rate and Sinking depth

Permeable pavement rate

Green roof rate



Retention Volume

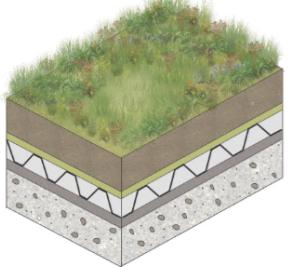
1.1 Sponge City Overview

Infiltration

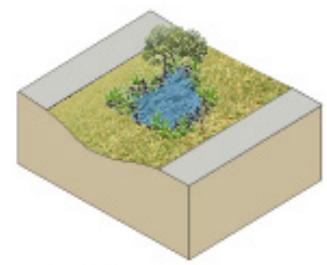


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Infiltration

- Permeable Pavement



- Green Roof



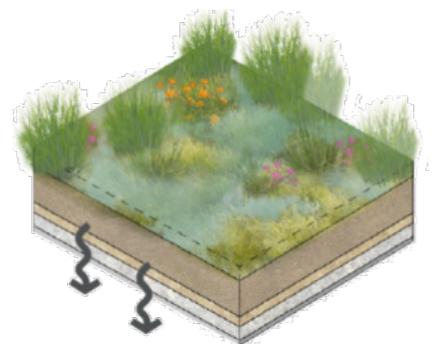
- Sunken Green Space

- Infiltration Pool

Retention

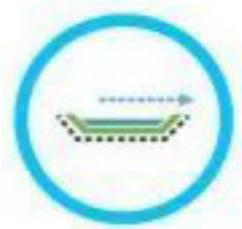


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Retention

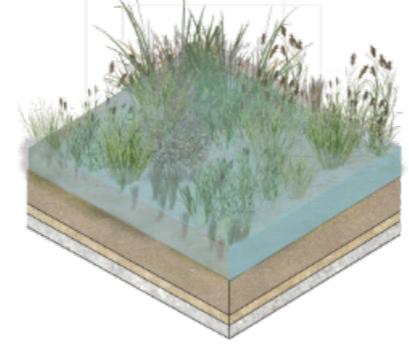


- Bio-retention

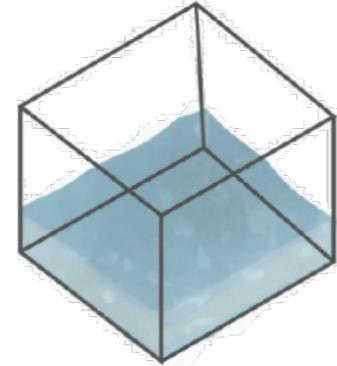
Detention



蓄
Detention



- Rain garden/Artificial wetland



- Pool

- Storm water Harvesting Tank



- Rainfall Tank

Cleansing



淨
Cleansing



Cleansing Biotope

Reuse



用
Reuse

- Groundwater

Drainage



排
Drainage



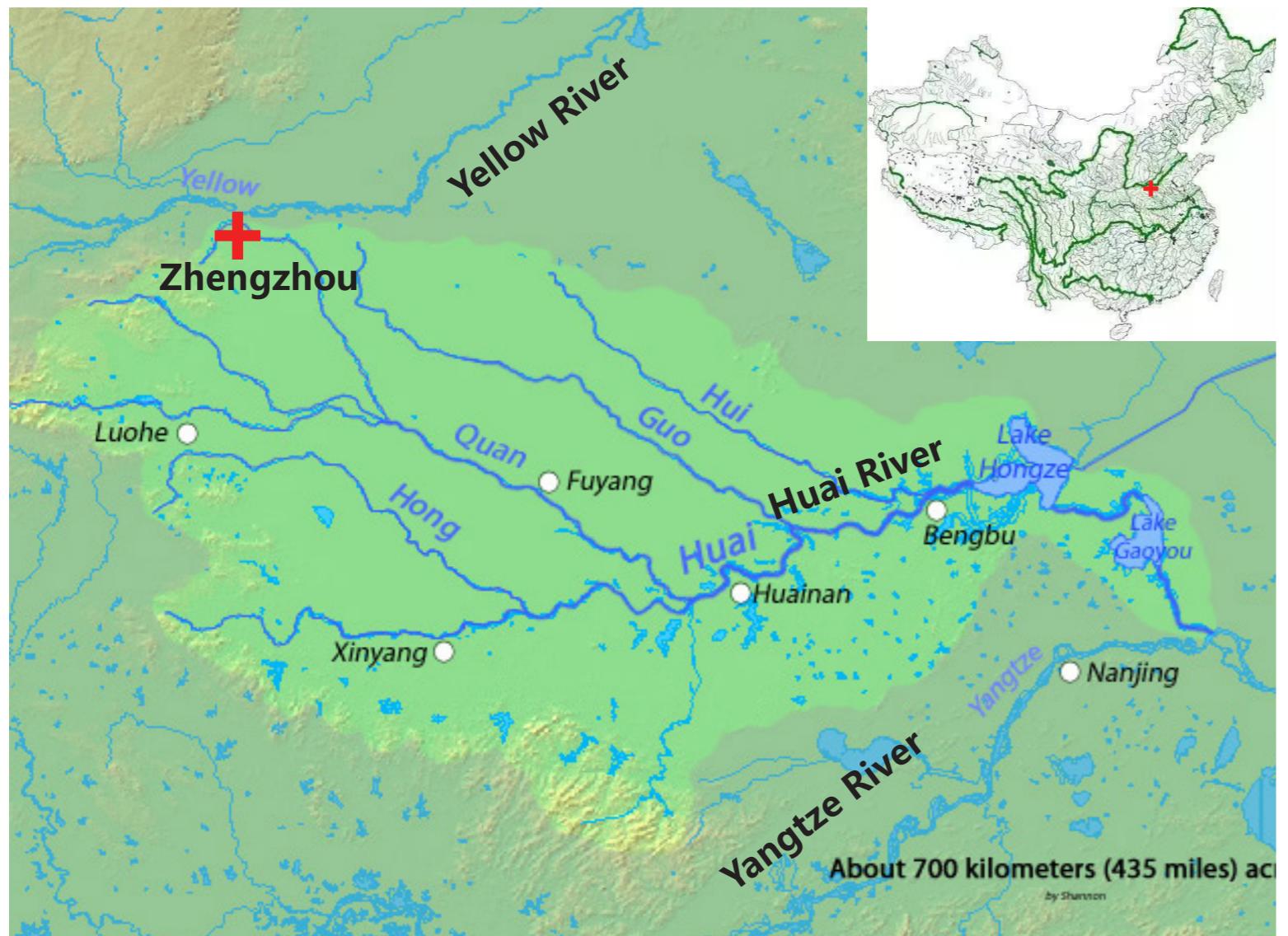
- Bioswale

- Infiltration trench

- Pump

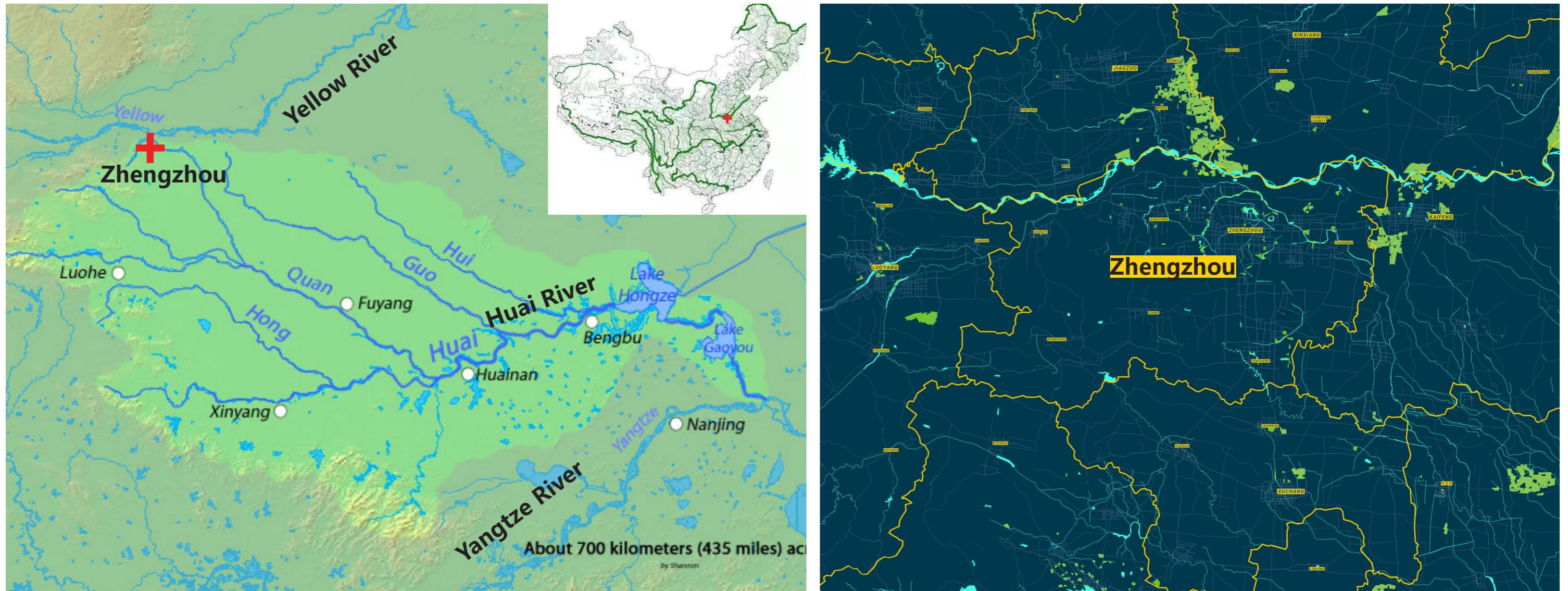
- Drainage canal

1.2 Site Description



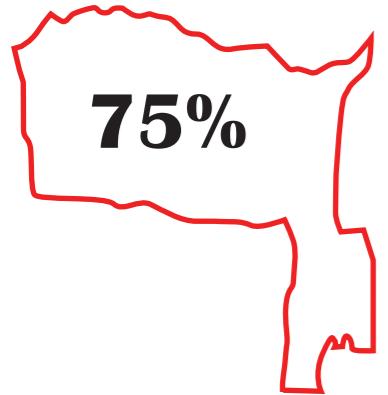
The city lies on the southern bank of the Yellow River, belongs to Husi River Basin.

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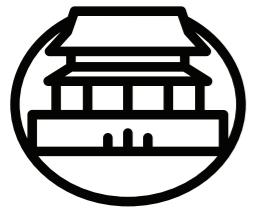


The city lies on the southern bank of the Yellow River, belongs to Husi River Basin.

1.3 Current SCP planning process:



Overall Volume
Capture Ratio

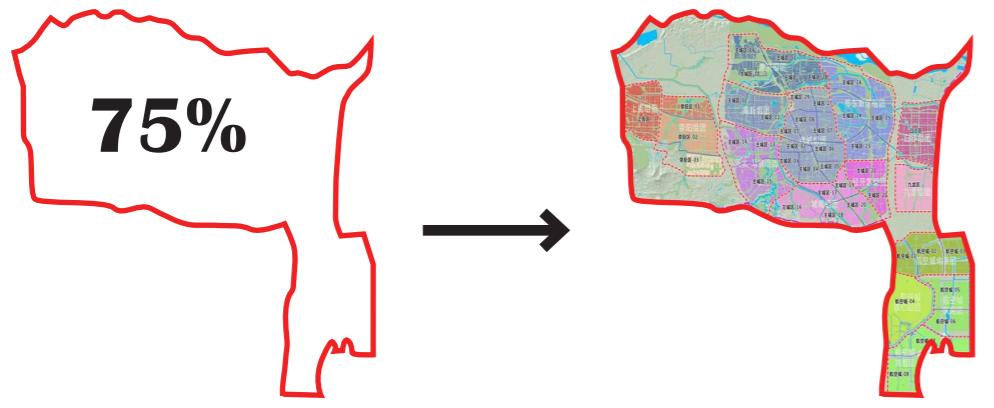


Central Government

TARGET

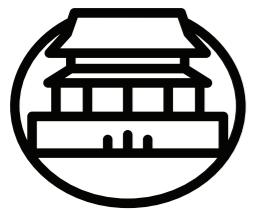


1.3 Current SCP planning process:



Overall Volume
Capture Ratio

District SCP Planning



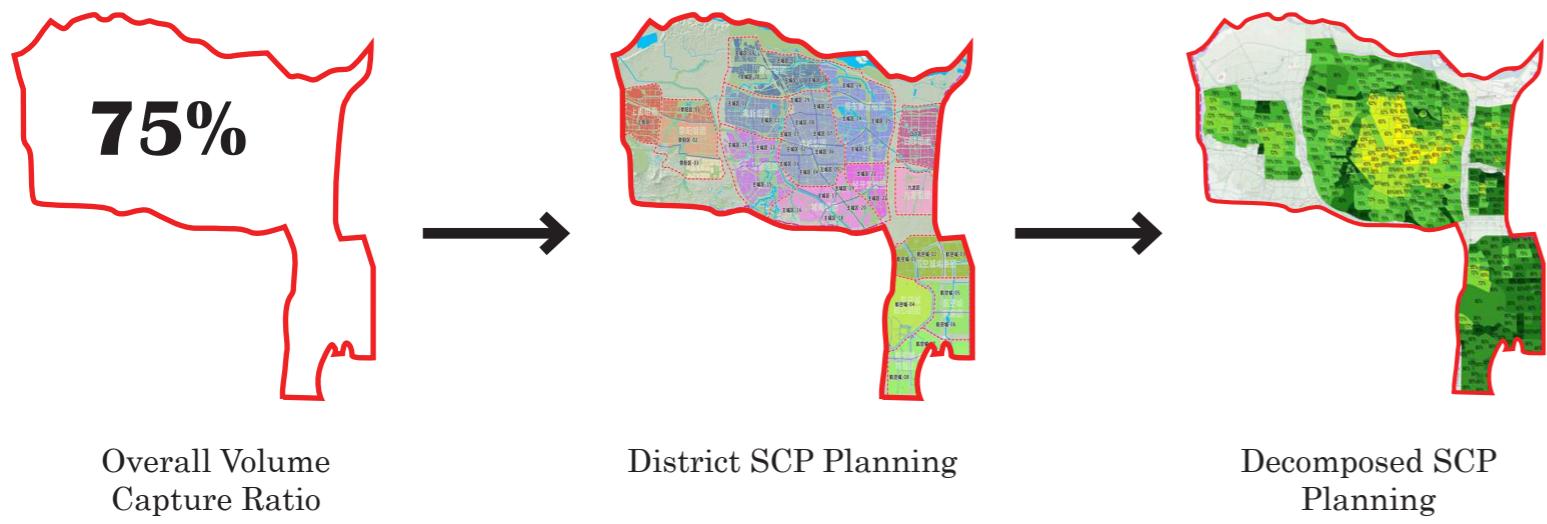
Central Government

TARGET

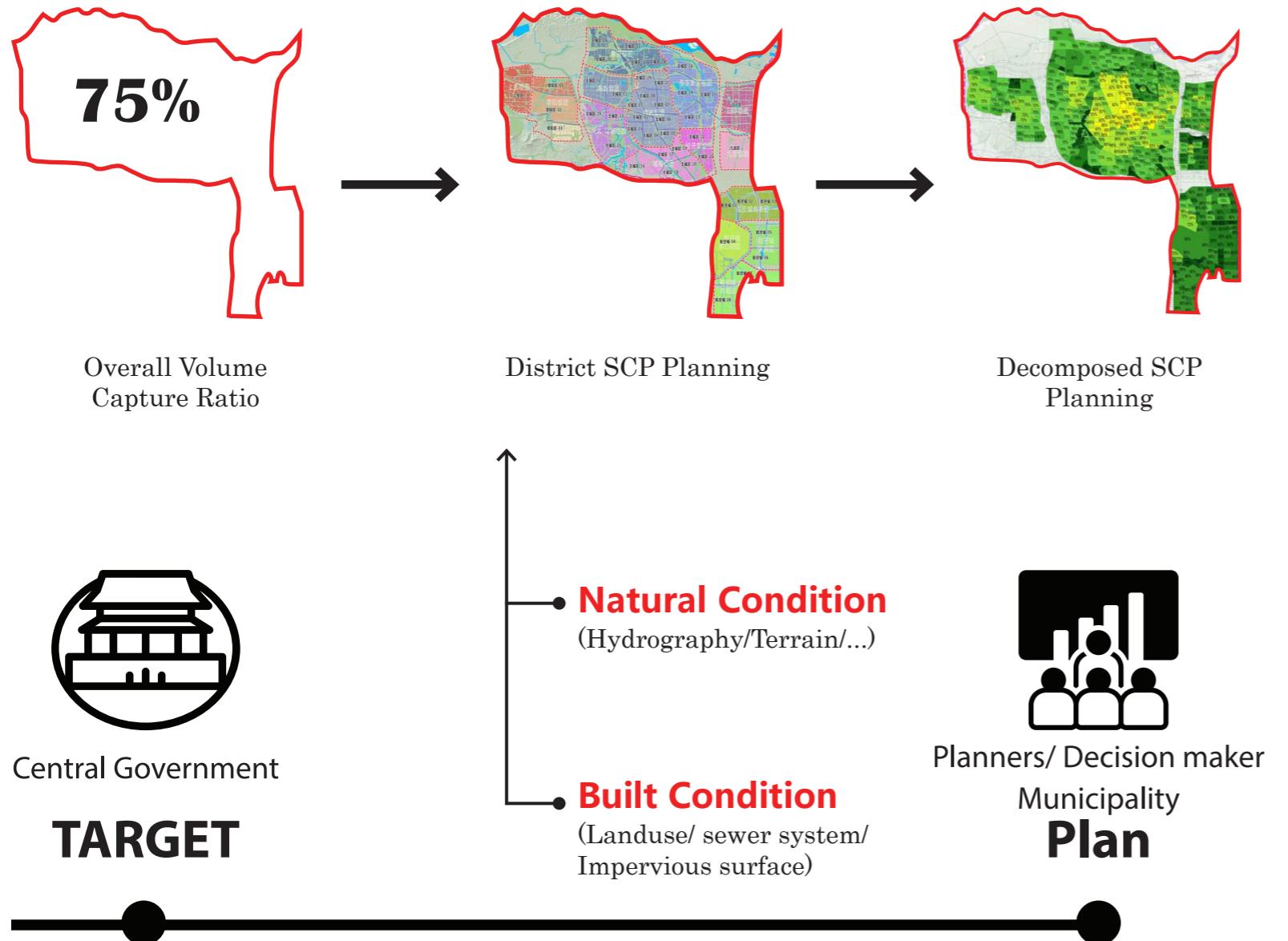


Planners/ Decision maker
Municipality
Plan

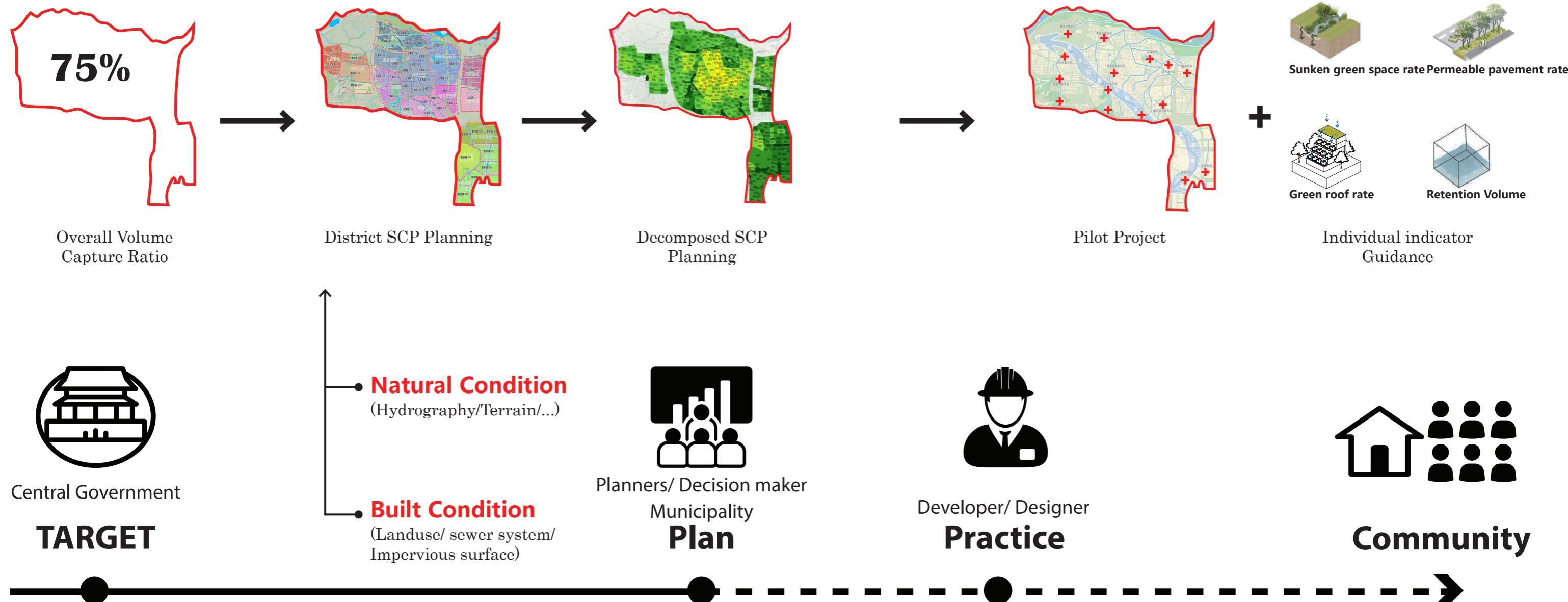
1.3 Current SCP planning process:



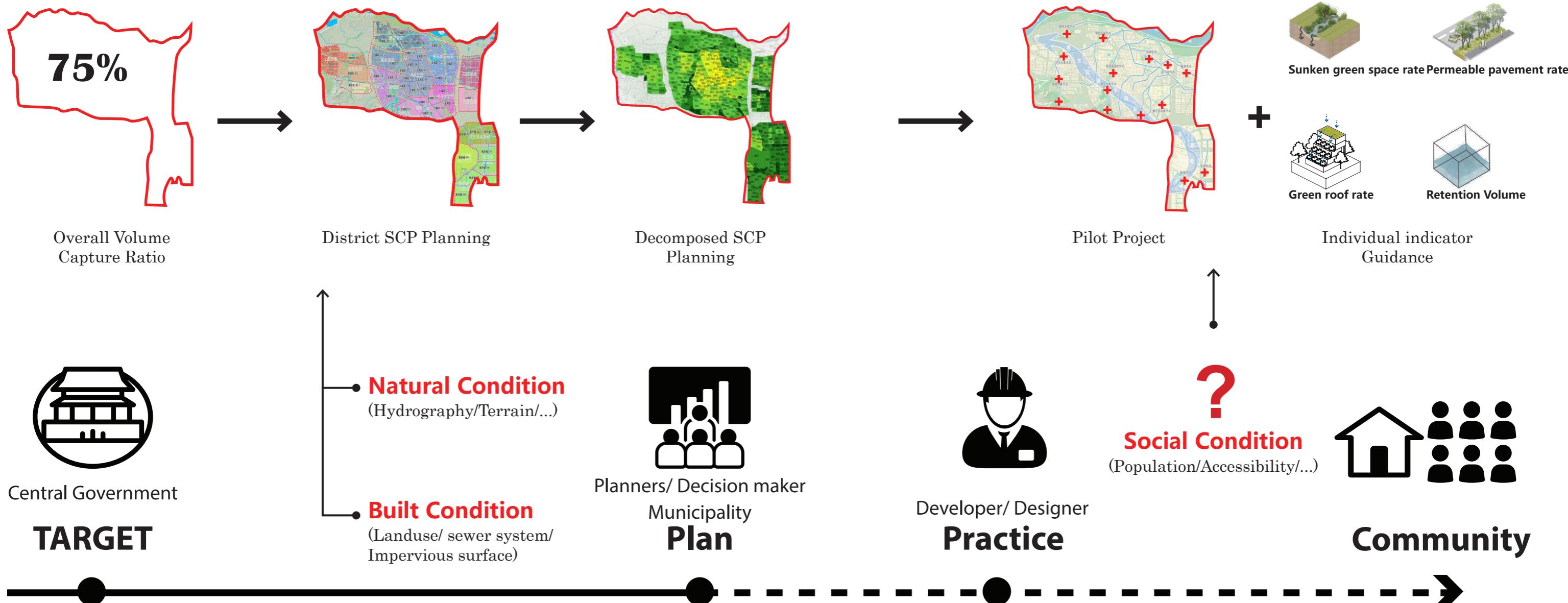
1.3 Current SCP planning process:



1.3 Current SCP planning process:



1.4 Gap



2. Question:

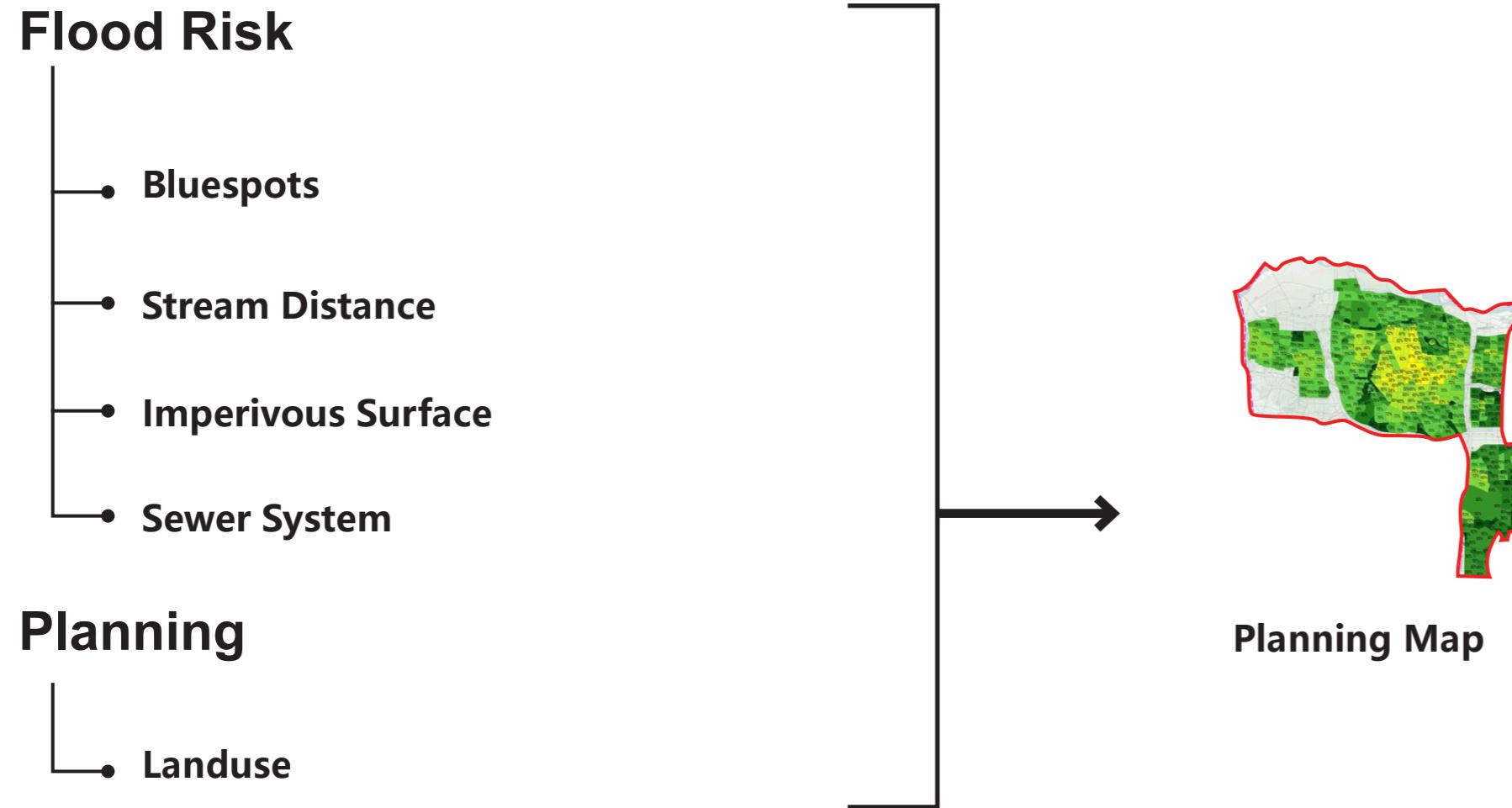
How to incorporate SOCIAL FACTORS in Sponge City Planning and Design?



3. Method



3. Method - Existing

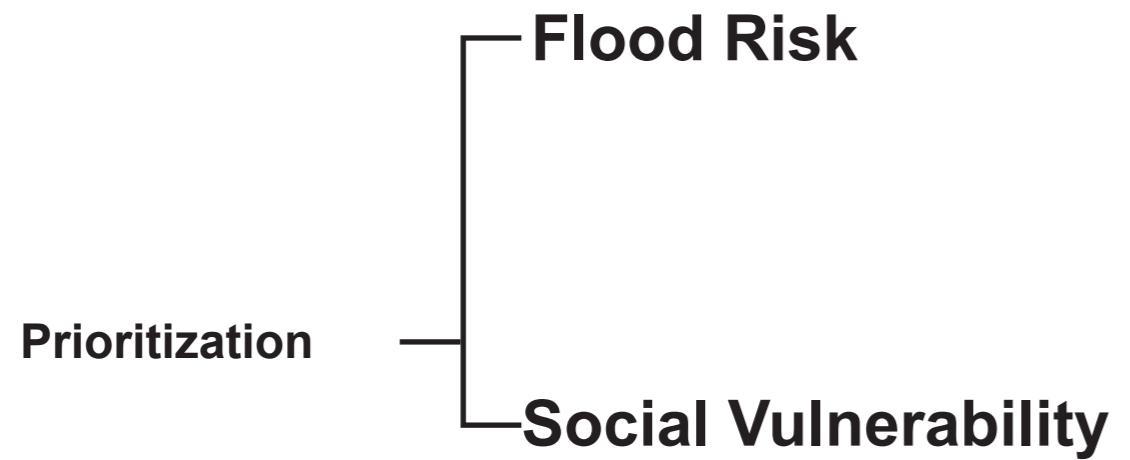


3. Method - Proposed

Prioritization

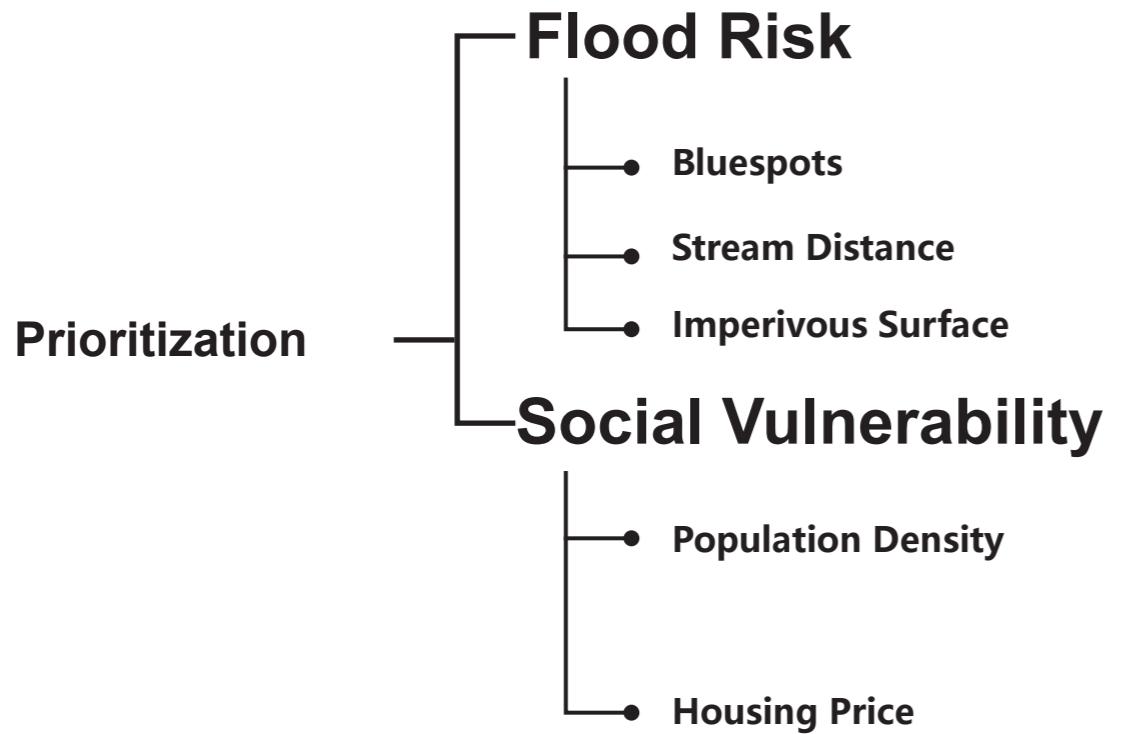
Categorization

3. Method - Proposed

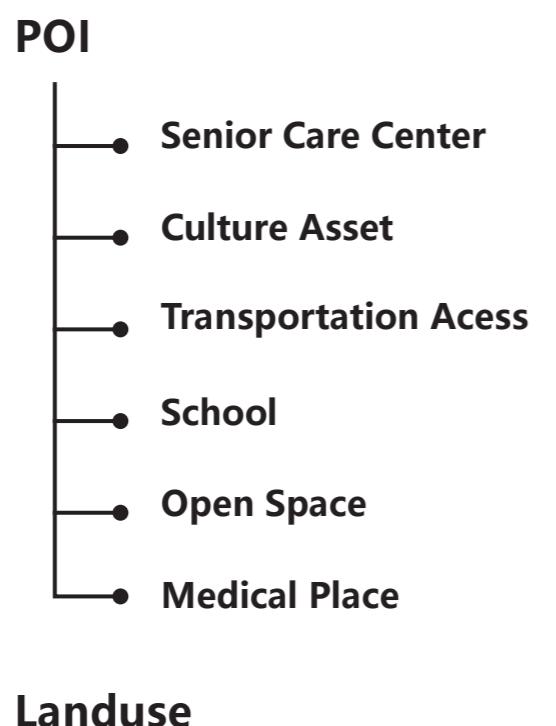


Categorization — Social Catchment

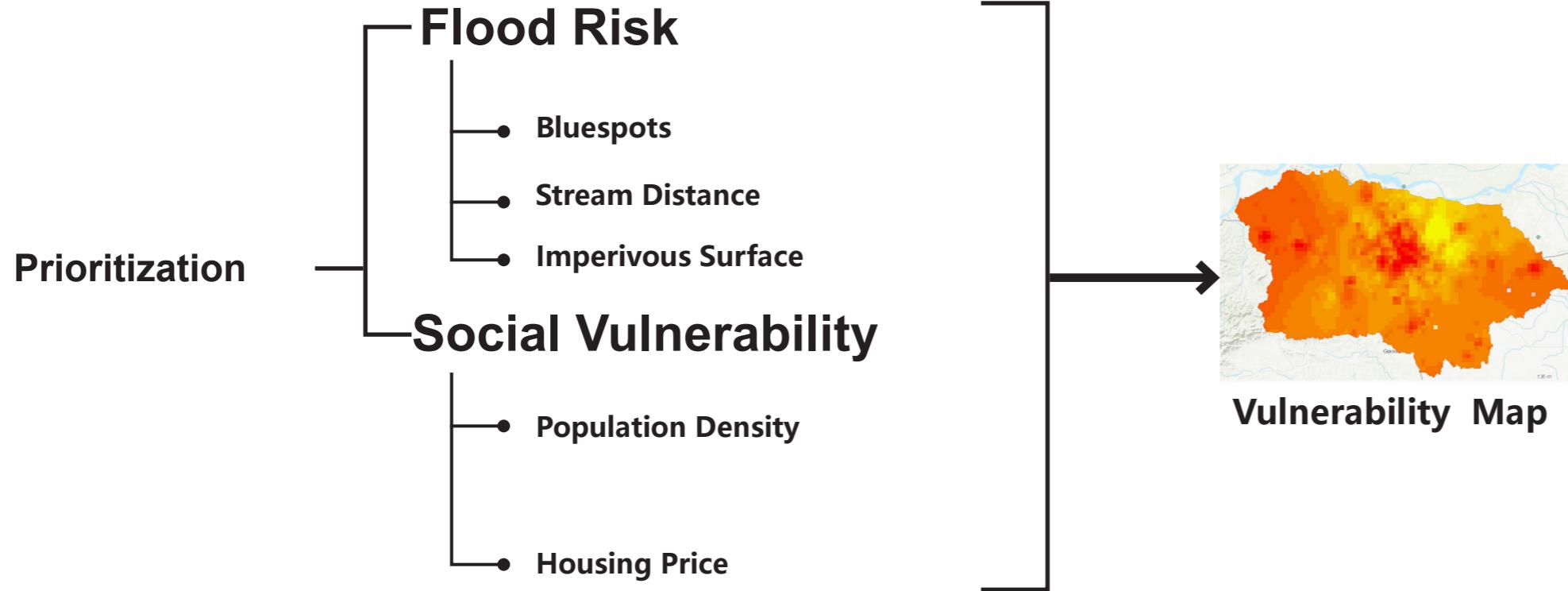
3. Method - Proposed



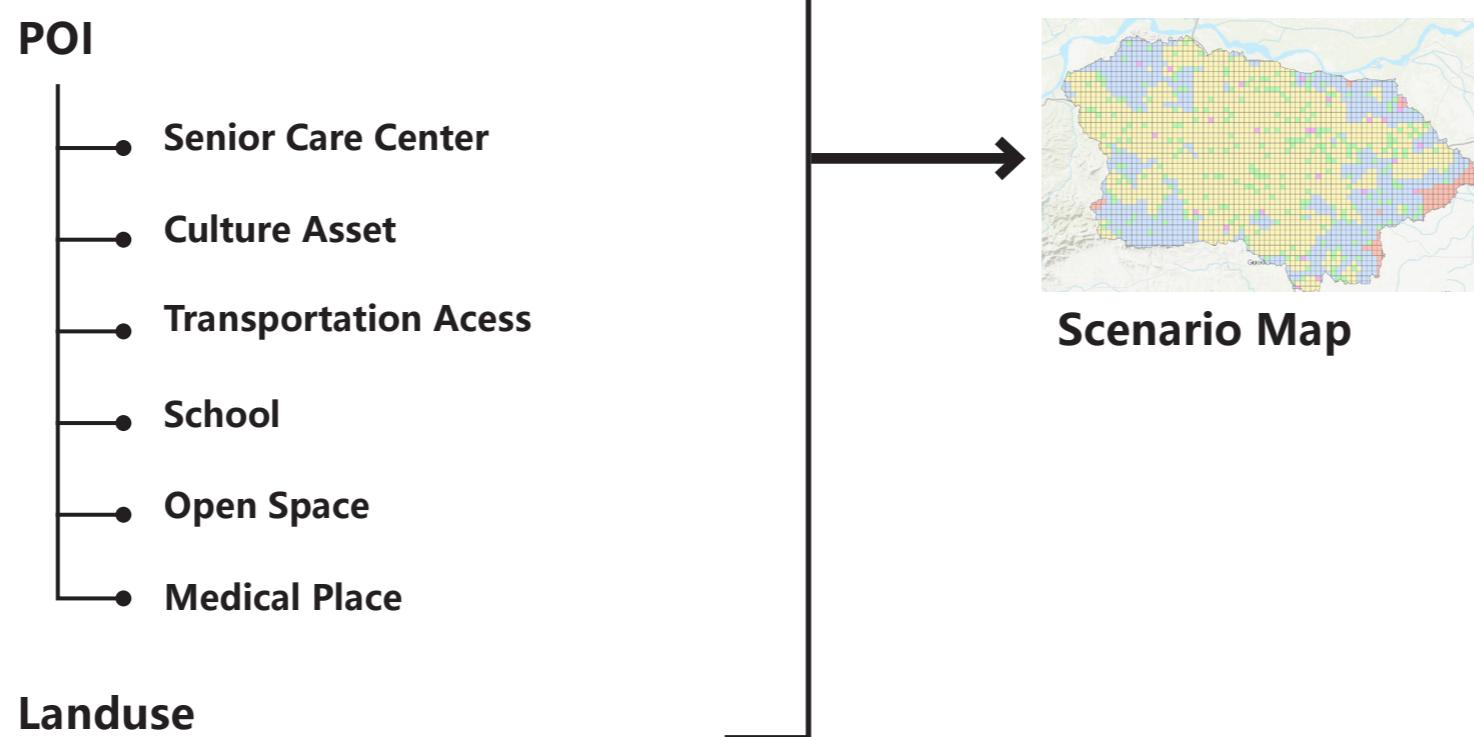
Categorization — Social Catchment



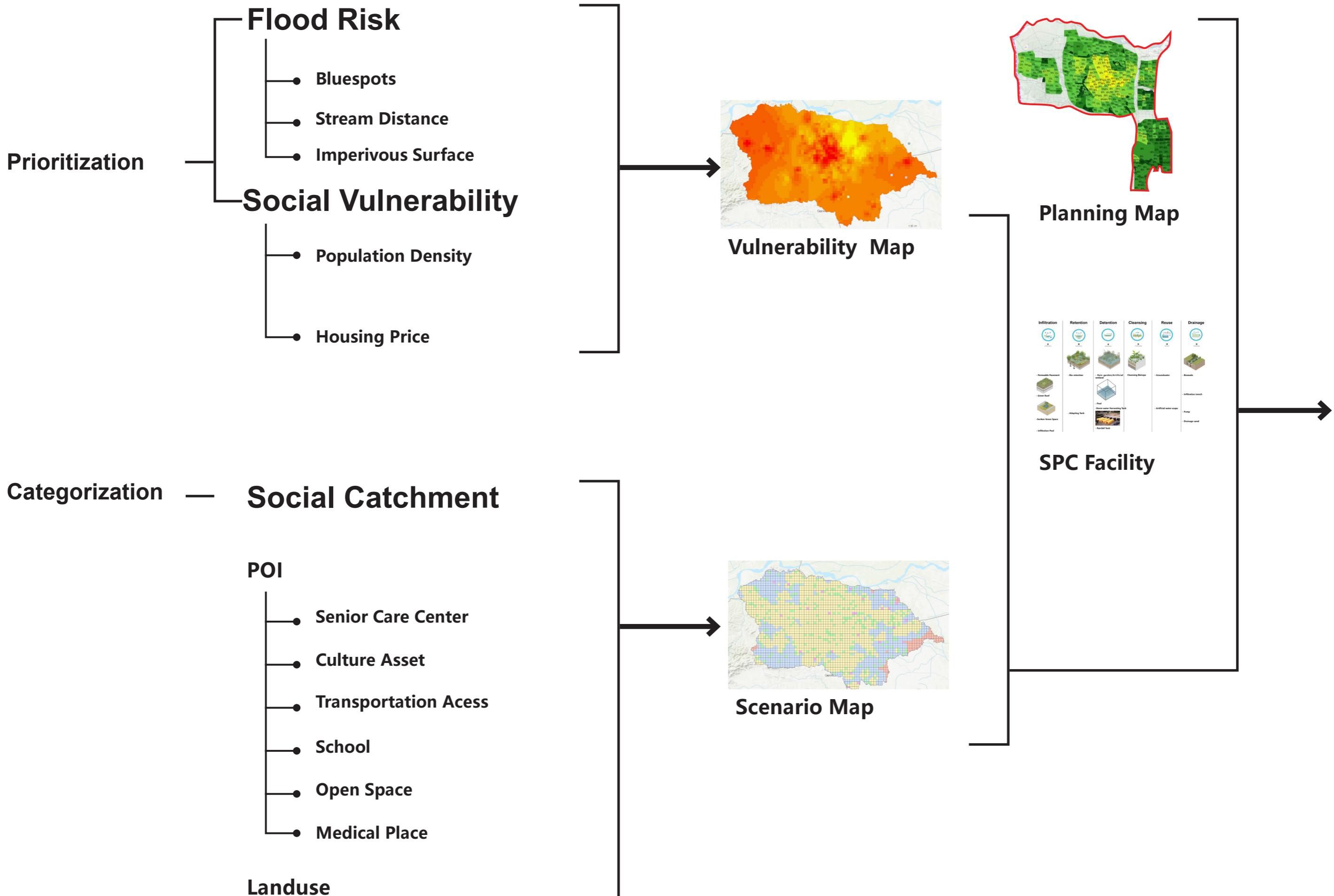
3. Method - Proposed



Categorization — Social Catchment



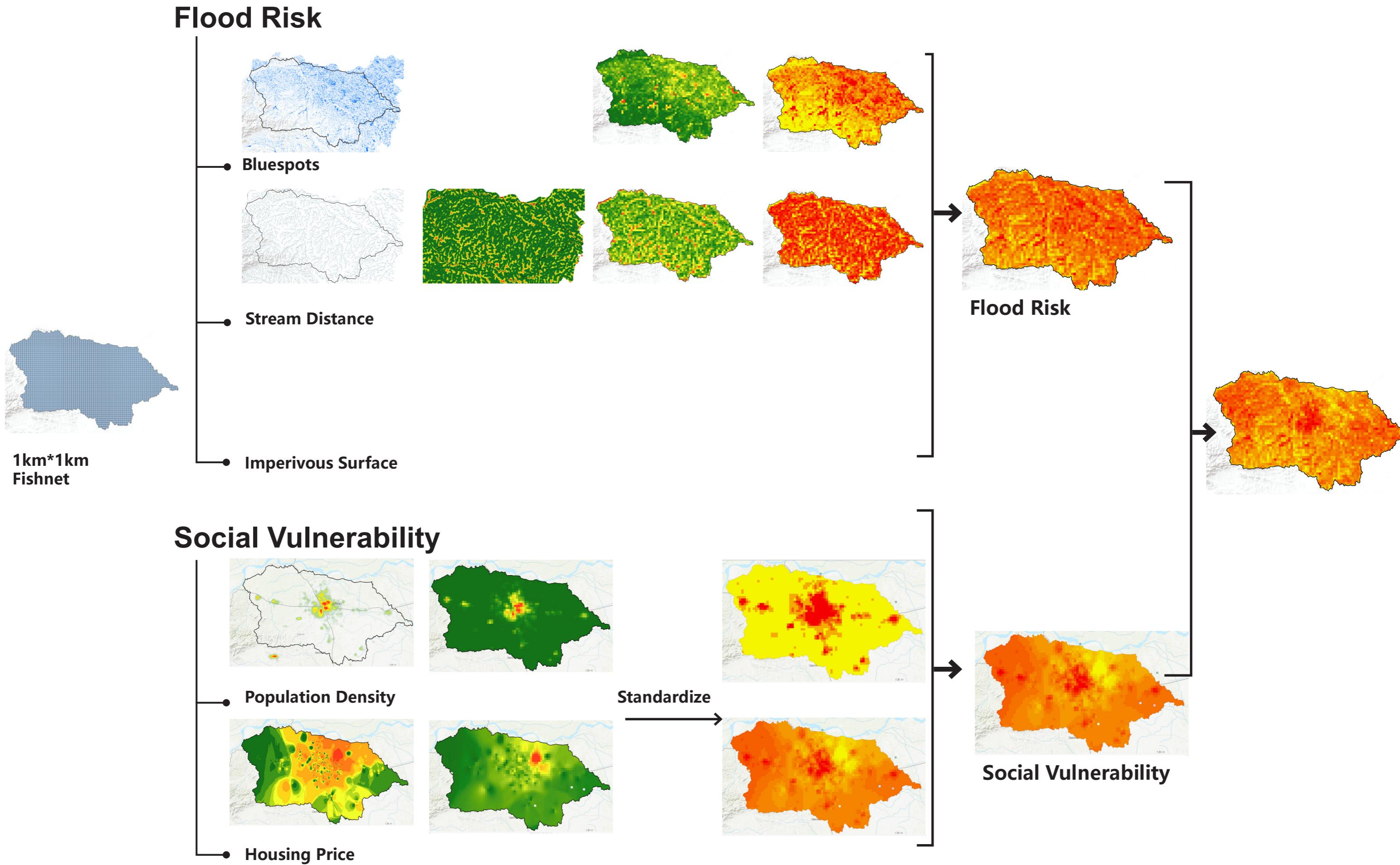
3. Method - Proposed



4. Method in detail

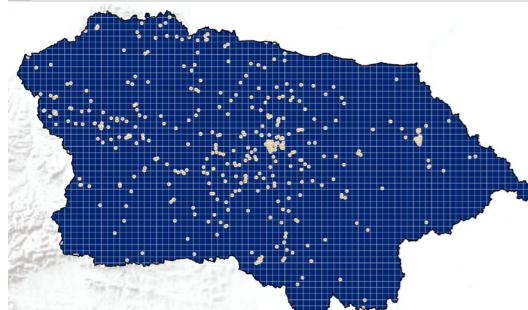


4.1 Vulnerability

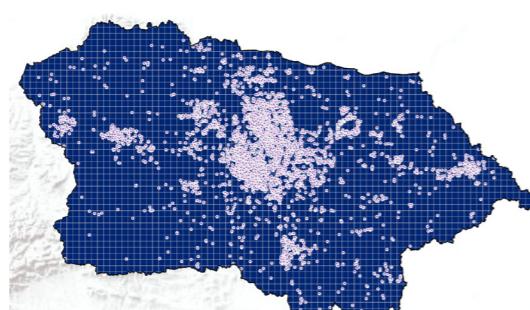


4.2 Social Catchment

POI



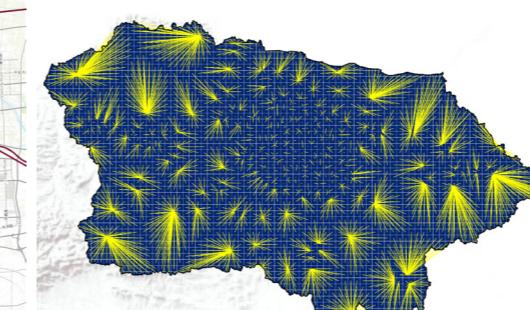
Cultural Asset



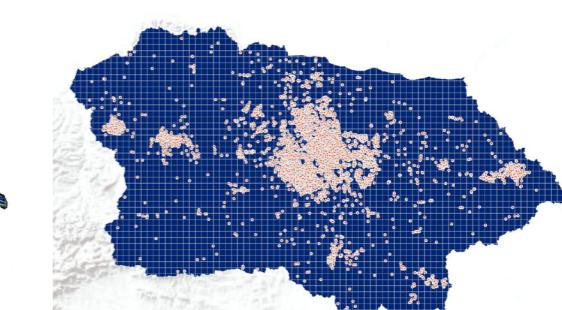
School



Transportation Acess

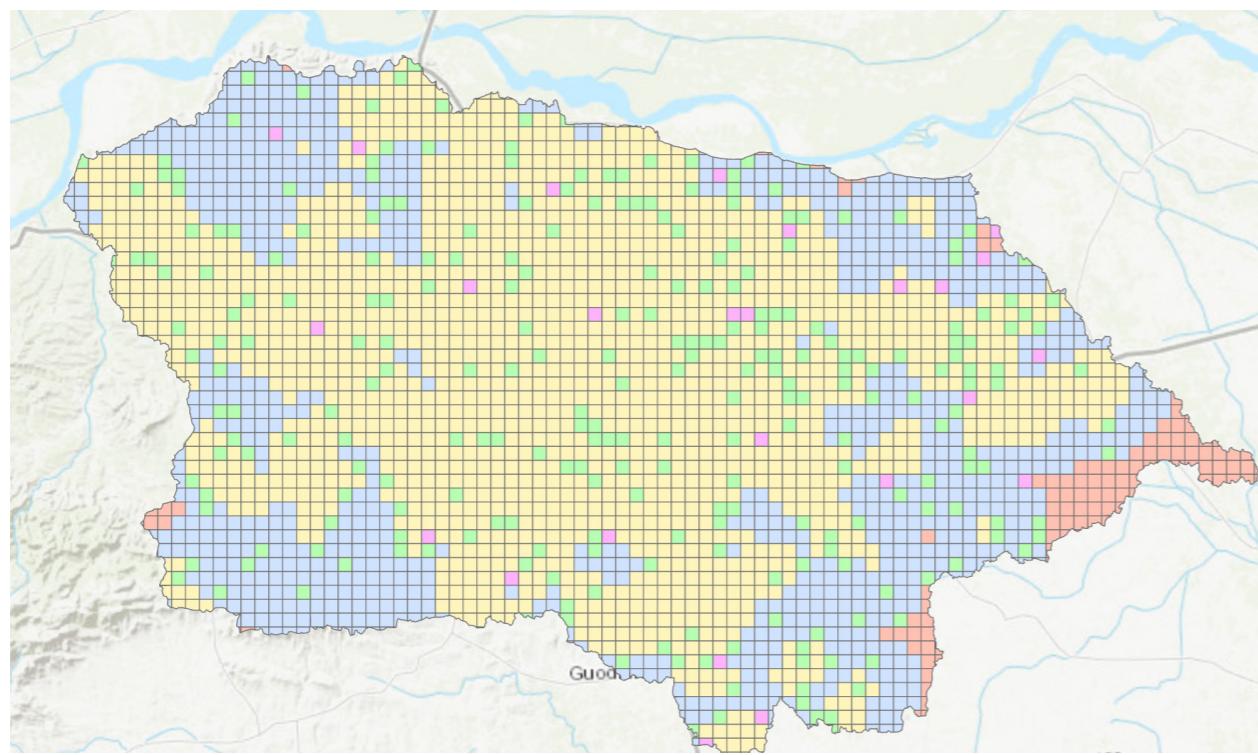
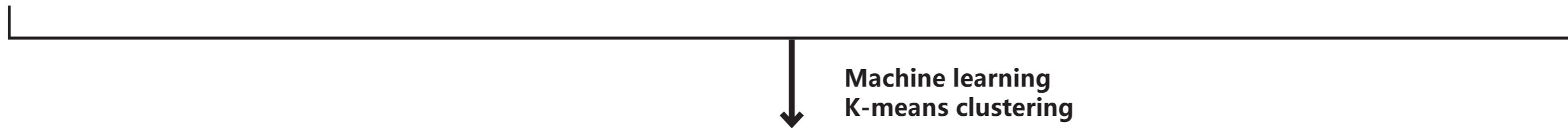


Open Space



Medical Place

Landuse



Social Catchment Typology

Type 1

Type 2

Type 3

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