



# Water transition to Waterscapes

*Strategic spatial planning for the synergy of living landscape in the IJsselmeer Region*

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Graduation studio Transitional Territories


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Second Mentor | Verena Elisabeth Balz

*-IJsselmeer-*

*"God creat the world, but the Dutch made the Netherlands."*






干旱

## **DROUGHT**

Spring likely to be driest ever in the Netherlands  
Rainfall about 50% below 1976 record

<https://nltimes.nl/2025/05/13/spring-likely-driest-ever-netherlands-rainfall-50-1976-record>



洪水

## **FLOOD**

High water gripped the Netherlands during the  
2023-2024 festive season.

For the second time in history, the five main  
Dutch flood barriers closed at the same time.

<https://www.deltares.nl/en/news/high-water-2023-2024-christmas-break>



气候不确定性

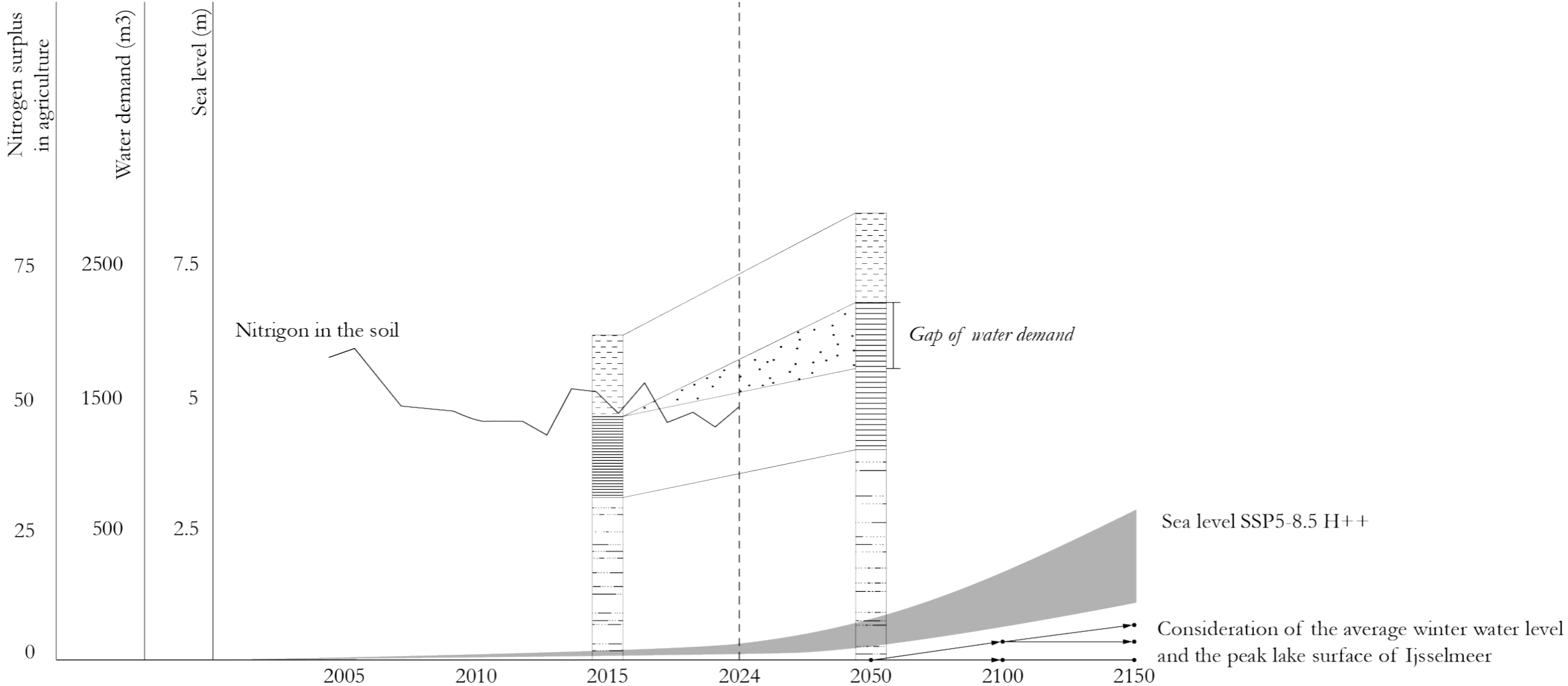
# CLIMATE UNCERTAINTY

Human society  
人类社会



Water systems  
水系统



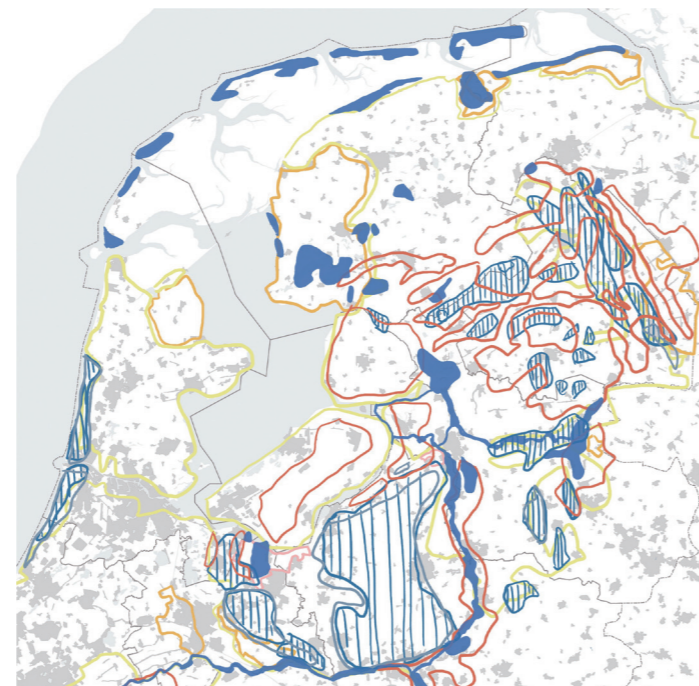




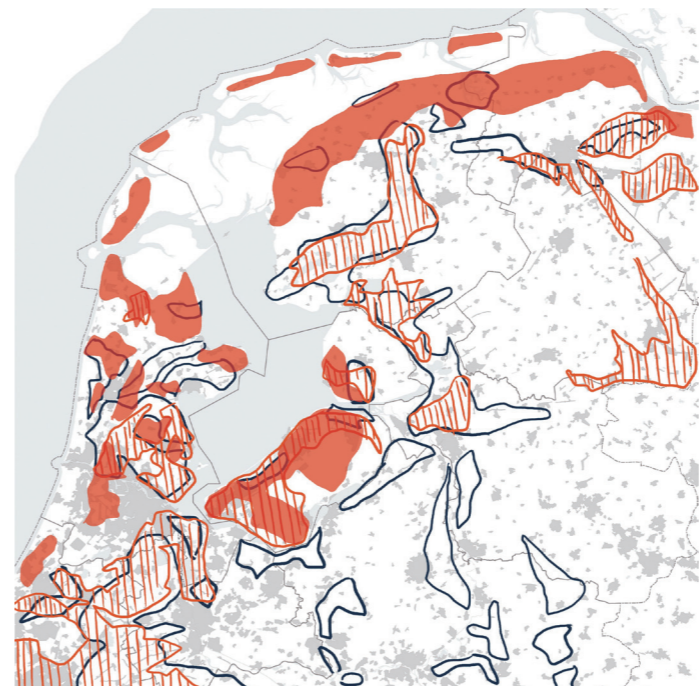
Water condition current



Soil condition current



Water condition 2050



Soil condition 2050

- Legend**
- Water
  - Urban area
  - Water condition
    - Flood risk
    - Average highest groundwater level
    - Lowest groundwater level
    - Surface water deficit extremely dry year
  - Soil condition
    - Soil subsidence
    - Location of the interface between fresh and salt water
    - Risk of oxygen stress

The spatial development of the IJsselmeer Region as a freshwater buffer is crucial for addressing **freshwater scarcity** in the northern Netherlands. However, this development gives rise to a **conflict between water and land use**. With the pressures of rising sea levels and urbanization, optimizing spatial planning to enhance **spatial quality** and ensure **long-term resilience** is essential for addressing these challenges.

#### **Challenges**

*Rising water demand and climate change threaten the buffer's capacity, impacting both human and more-than-human aspects (e.g., ecosystem services, biodiversity).*

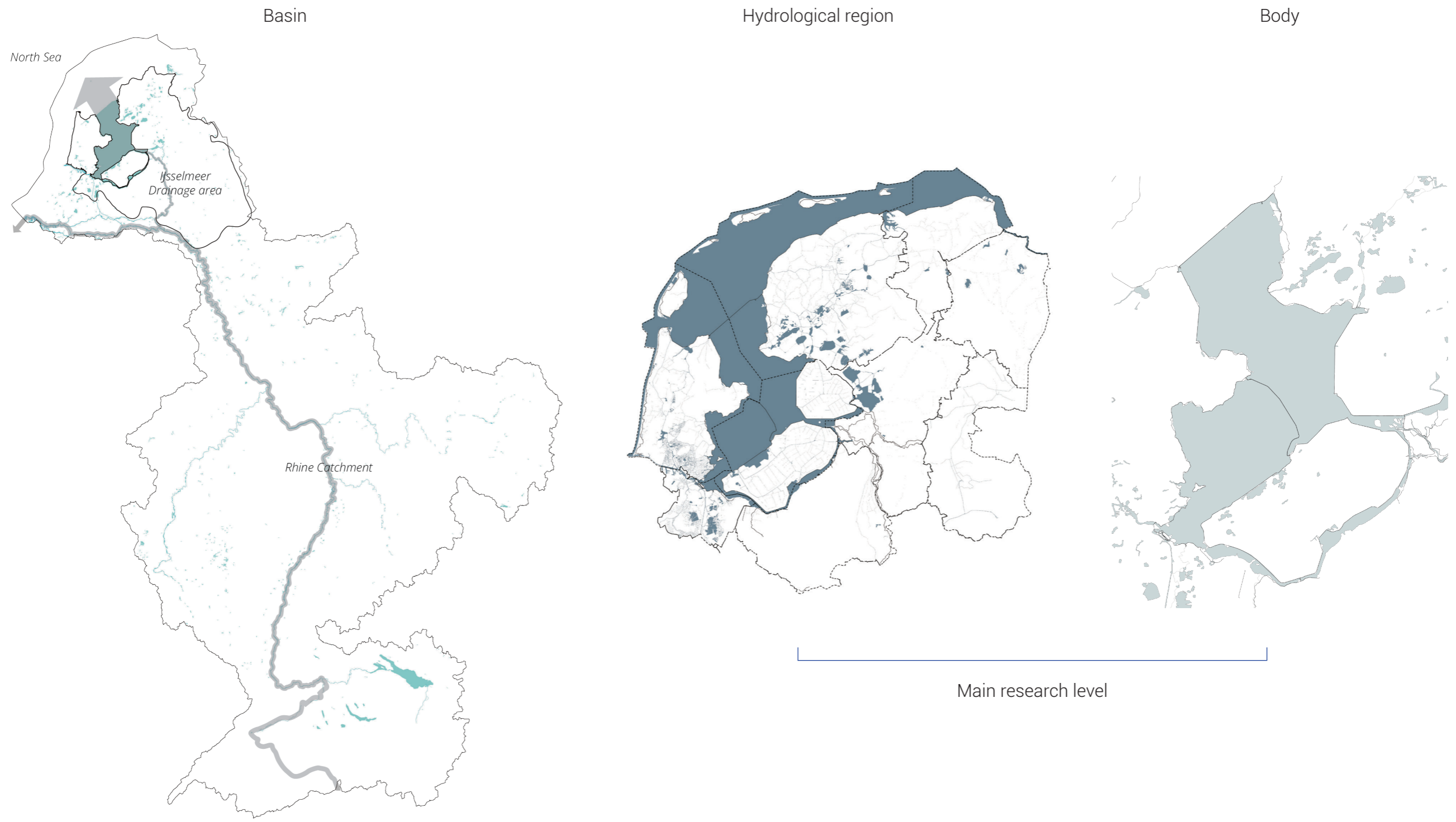
#### **Future-proof**

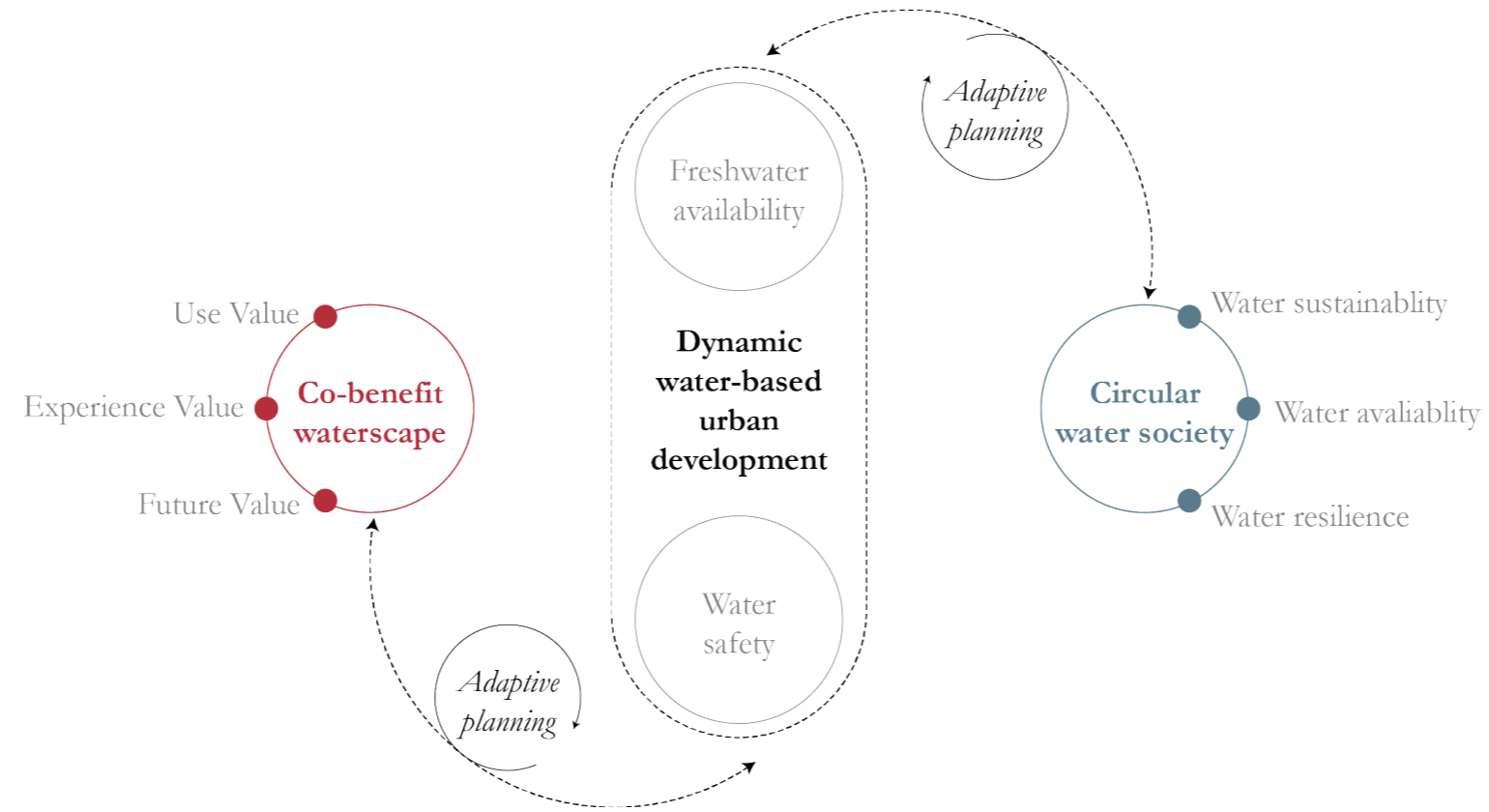
Organizing hydrological space is crucial to meet development needs and reduce risks from rising sea levels.

#### **Spatial quality**

*Addressing spatial quality is key to managing ecological, social, and cultural dimensions for sustainable development and resilience.*

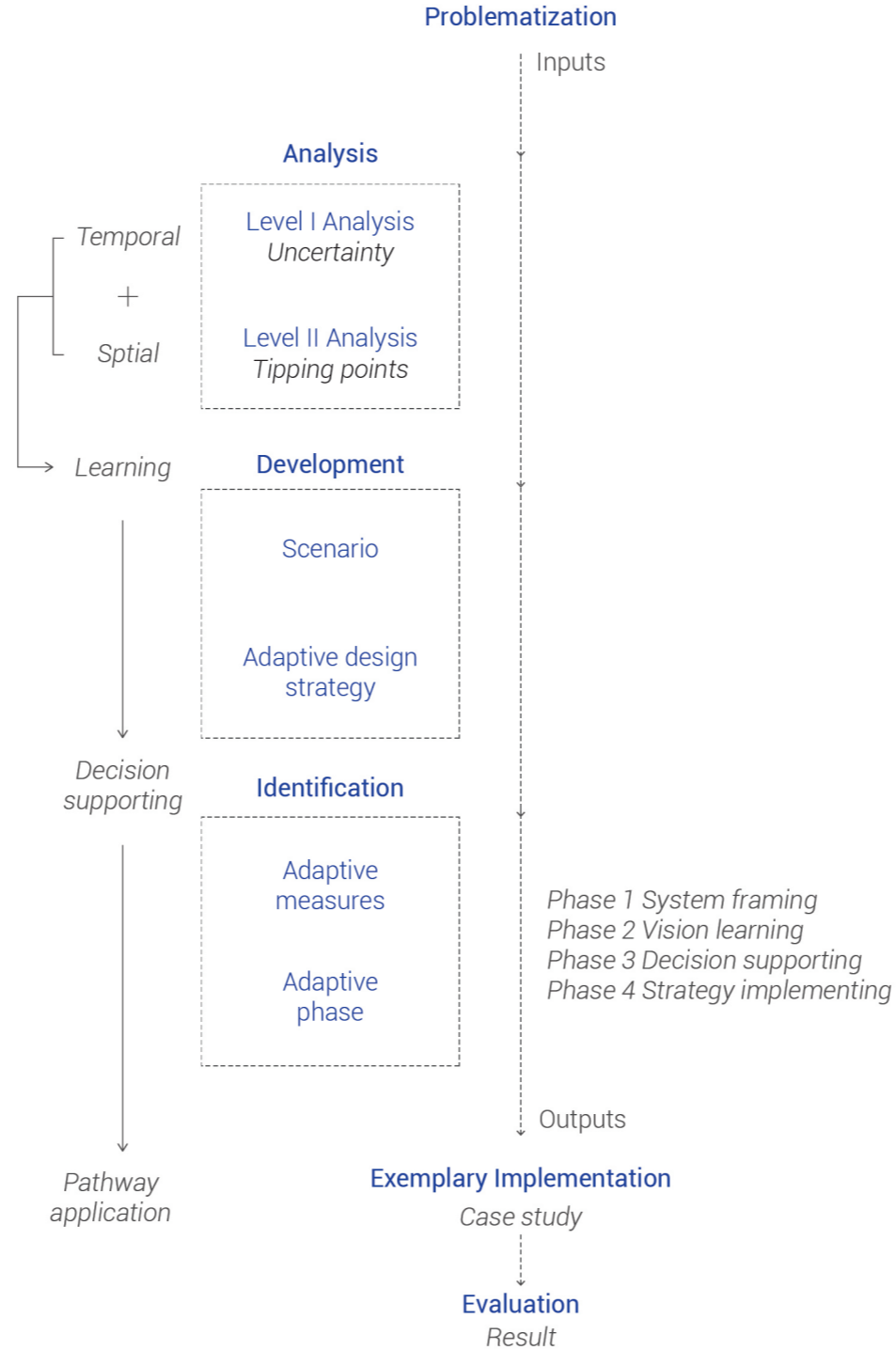
To propose a new **spatial adaptation approach** to water management within the hydrological area, serving as a knowledge advisory to foster co-benefits between **human and non-human entities**. This involves organizing synergies among diverse **ecosystem services** and finding a balance to bridge the gap between economic-centric and nature-centric development.

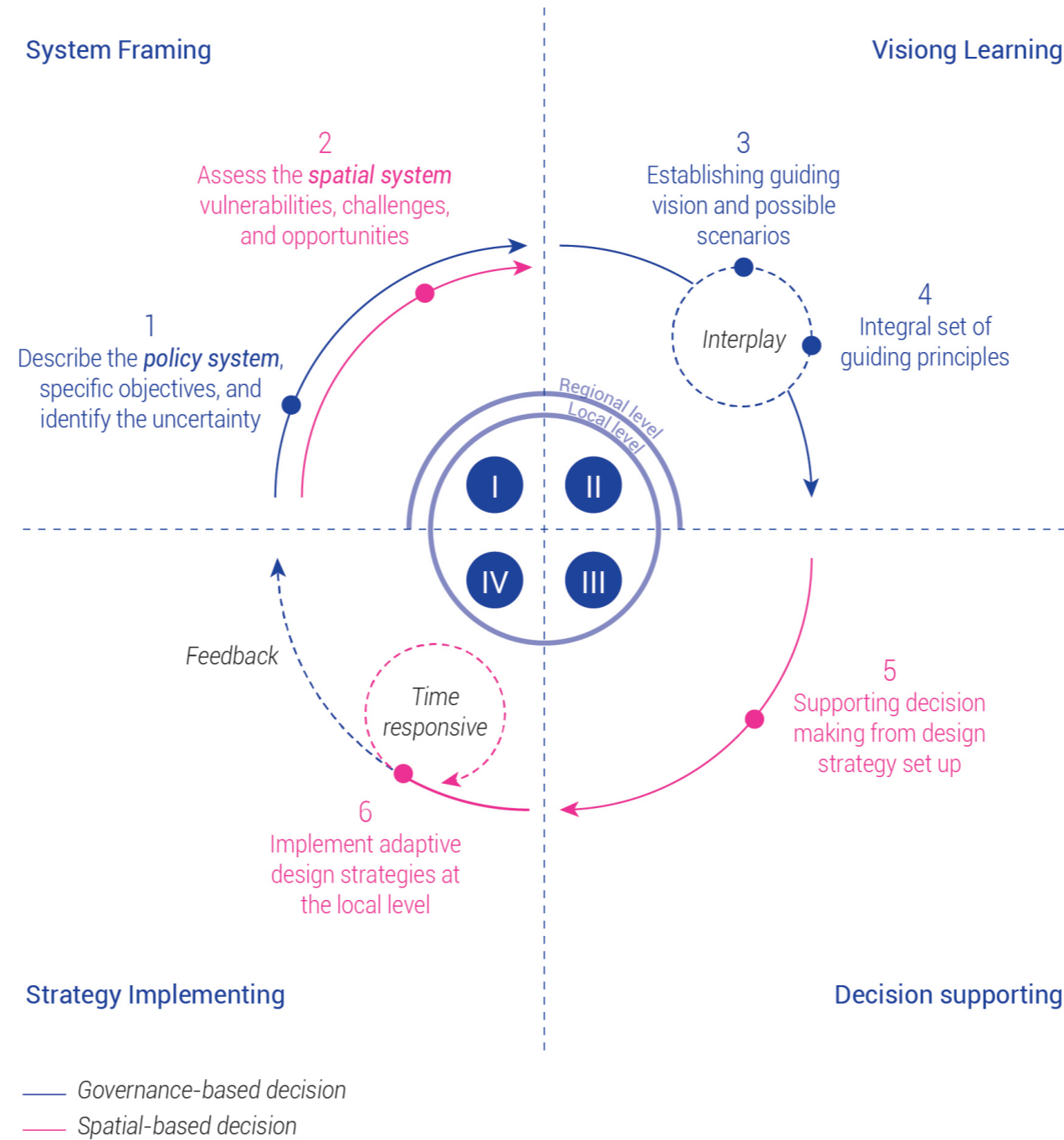


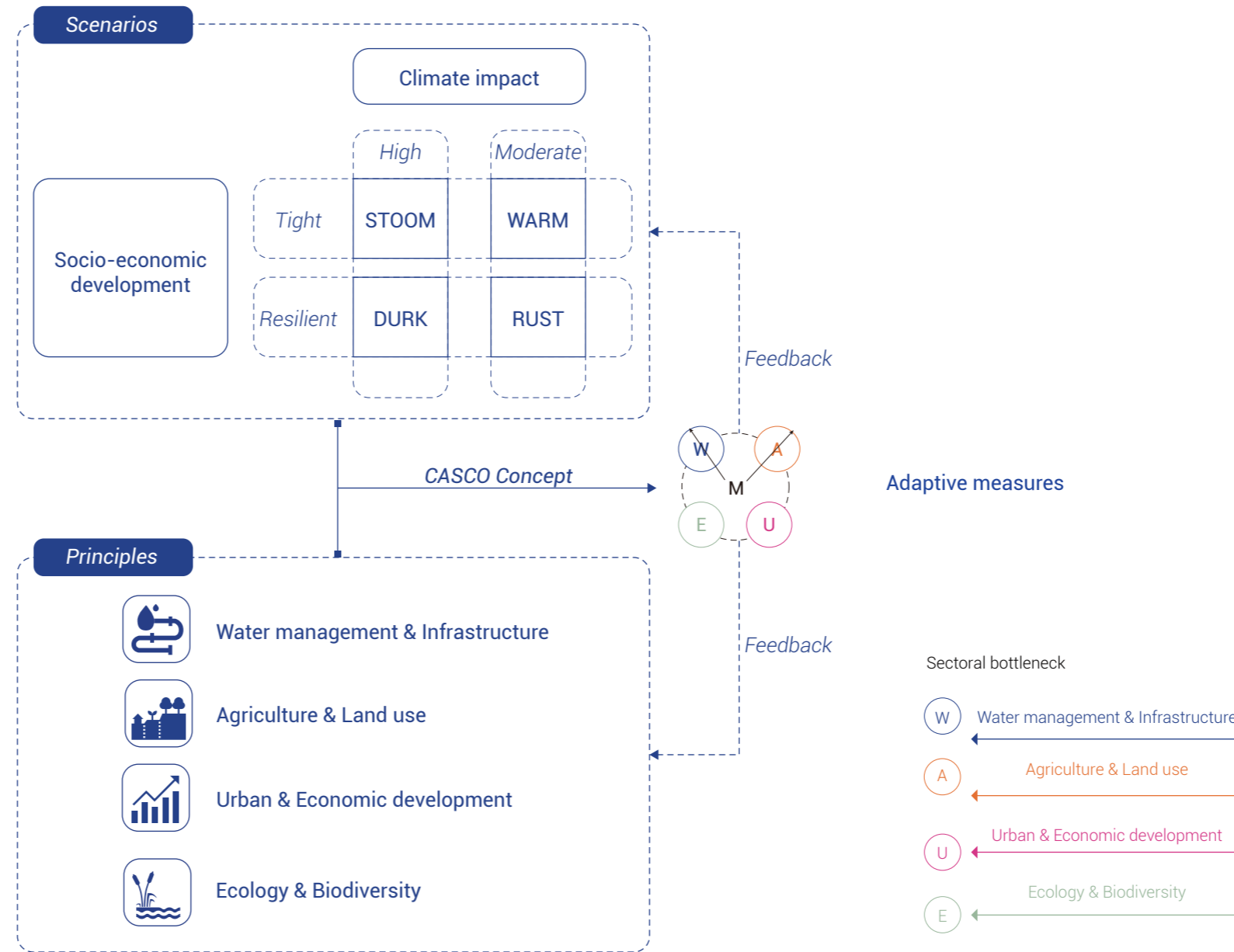


How can the water-based services (A) of IJsselmeer region organise system synergies and adapt to a future-proof (B) and circular waterscape (C)?

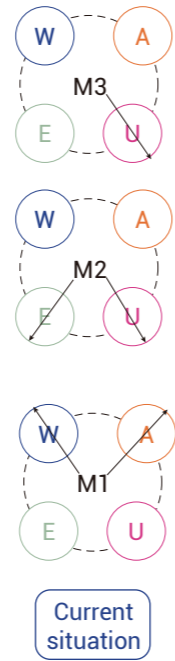
A: water-based services B: Future-proof C: Circular waterscape



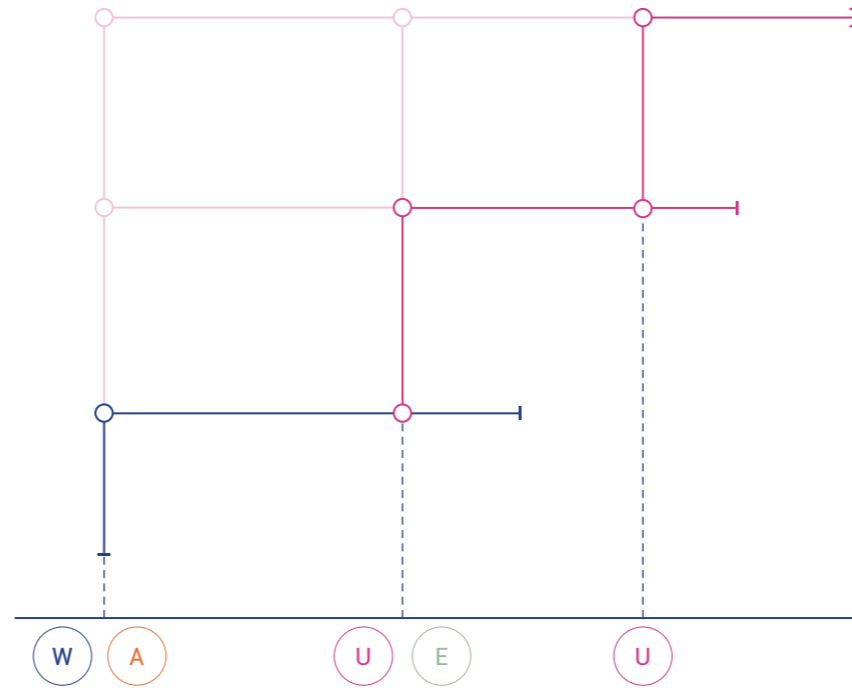




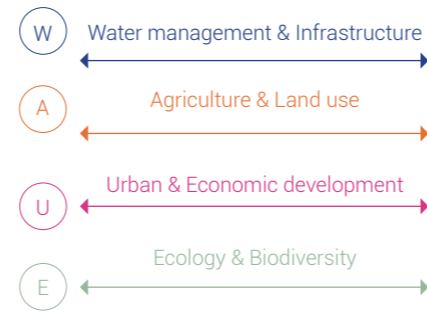
Adaptive measures



Transition phases



Sectoral bottleneck



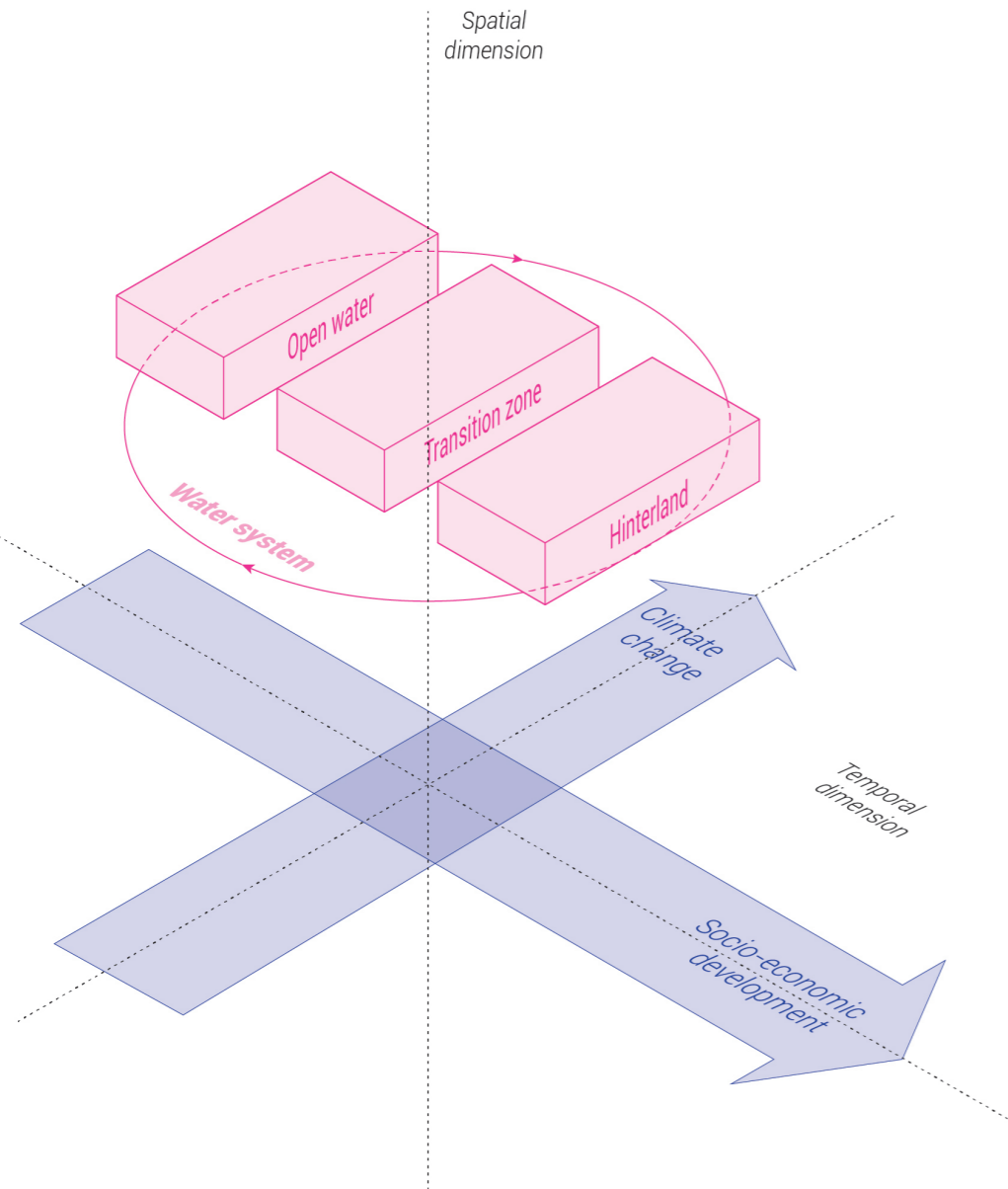
○ Decision point    —| Tipping point

UP



BOTTOM

Phase 1: System framing



Step 2  
Assess the system  
vulnerabilities,  
challenges, and  
opportunities

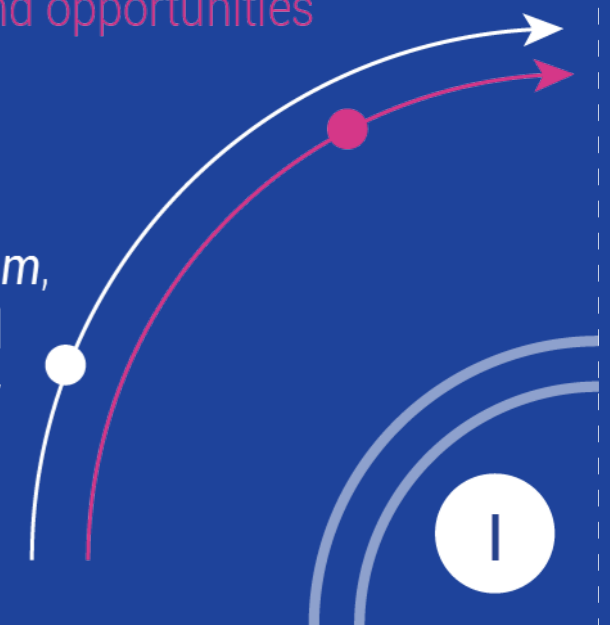
Step 1  
Describe the system,  
specific objectives,  
and identify the  
uncertainty

# PHASE I System Framing

第一阶段：系统框架构建

2  
Assess the *spatial system*  
vulnerabilities, challenges,  
and opportunities

1  
Describe the *policy system*,  
specific objectives, and  
identify the uncertainty



# Water governance intervention

水治理干预

PHASE I

System Framing

STEP 1

Describe the policy system, specific objectives and identify the uncertainty

STEP 2

PHASE II

STEP 3

STEP 4

PHASE III

STEP 5

PHASE IV

STEP 6



Flood 1916

Spatial Transformation

Policy and Project

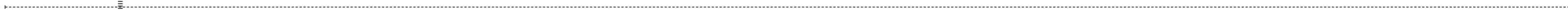
Zuiderzeewerken



1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2020 2050

Water Demand

Drinking water  
Irrigation  
Intensive agriculture  
Dam flushing  
Amenity use



# Water governance intervention

水治理干预

PHASE I

System Framing

STEP 1

Describe the policy system, specific objectives and identify the uncertainty

STEP 2

PHASE II

Spatial Transformation

STEP 3

STEP 4

PHASE III

Policy and Project

STEP 5

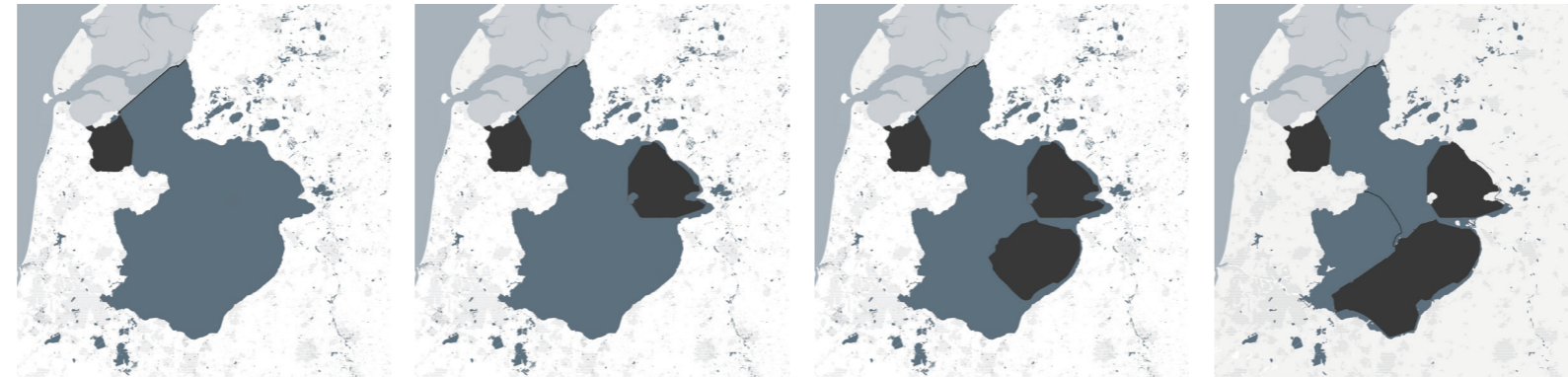
PHASE IV

STEP 6

Water Demand



Flood 1916



Enclosure and Land Reclamation

Zuiderzeewerken



1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2020 2050

- Drinking water
- Irrigation
- Intensive agriculture
- Dam flushing
- Amenity use

# Water governance intervention

水治理干预

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System Framing

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STEP 2

PHASE II

Spatial Transformation

STEP 3

STEP 4

PHASE III

Policy and Project

STEP 5

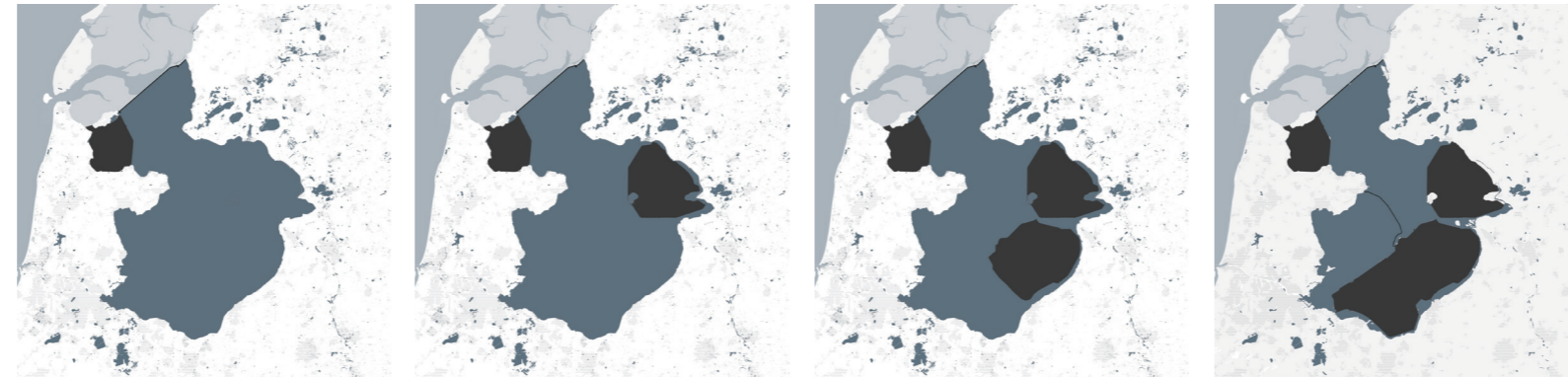
PHASE IV

STEP 6

Water Demand



Flood 1916



Enclosure and Land Reclamation

Zuiderzeewerken

Andijk

Wieringermeer

Afsluitdijk

Noord-oost polder

Oostelijk Flevoland

Zuidelijk Flevoland

Houtribdijk

Room for the River

Delta Programme

Delta programme

Subprograms

- Water Safety
- Freshwater Supply
- Spatial Adaptation

Regional Subprograms

IJsselmeer Region

PAGW

Programmatic Approach to Large Waters (PAGW)

Agenda IJsselmeergebieden 2050

Verkennde systeemanalyse IJsselmeergebied

Spatial exploration



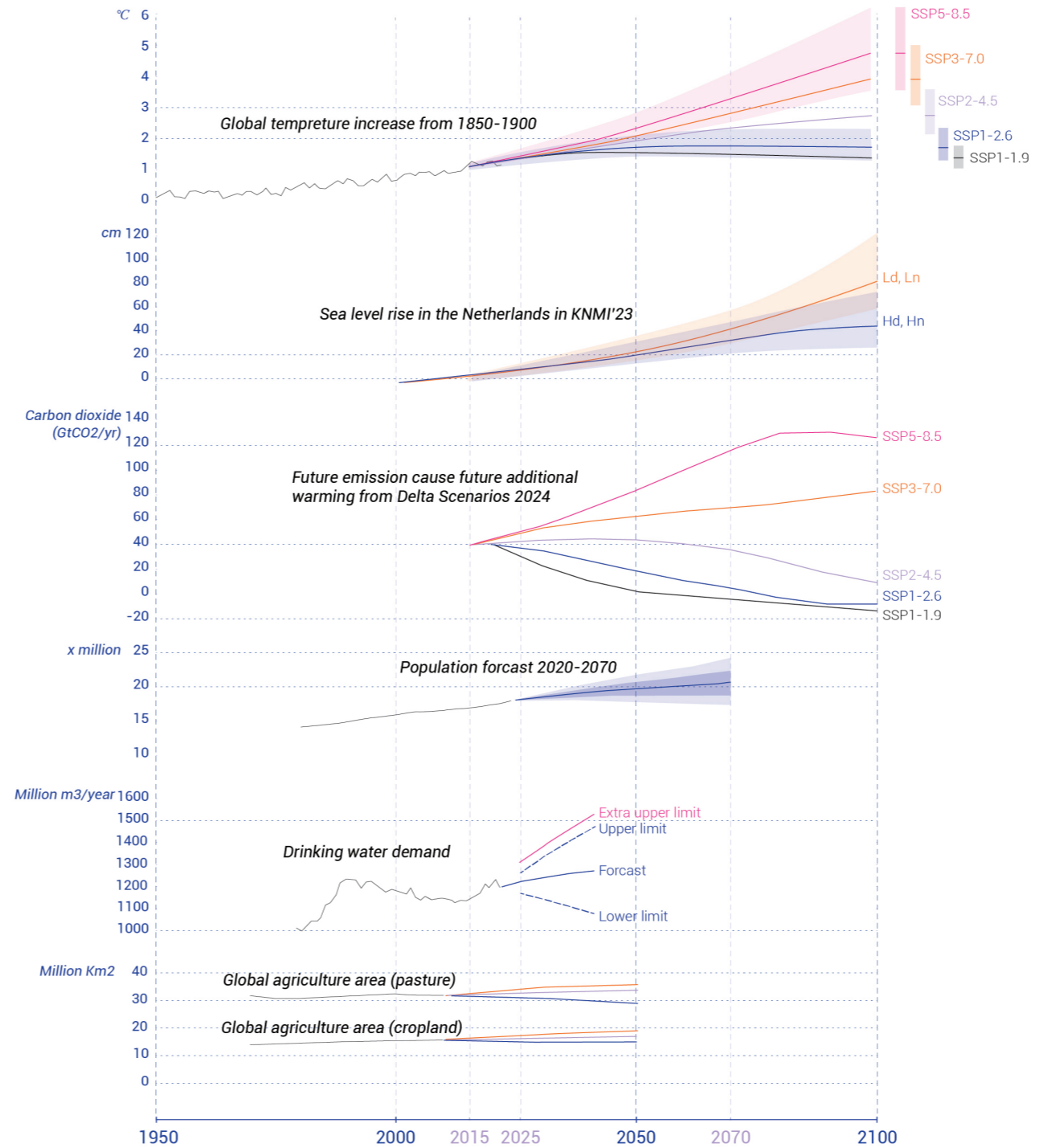
- Drinking water
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# Trends and uncertainty

趋势与不确定性

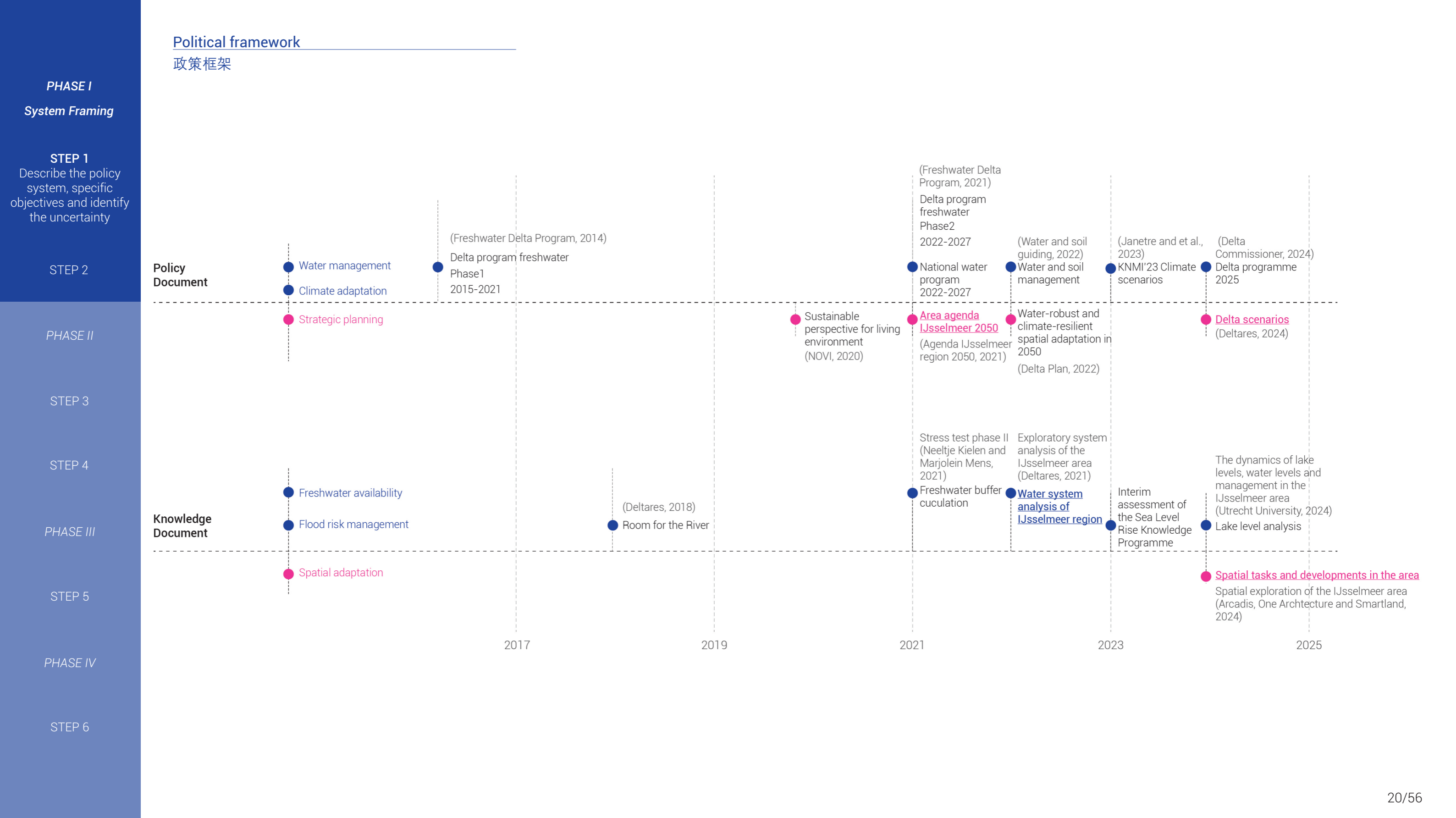
## Climate change

## Socio-economic development



Political framework

政策框架



PHASE I

System Framing

STEP 1

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STEP 2

PHASE II

STEP 3

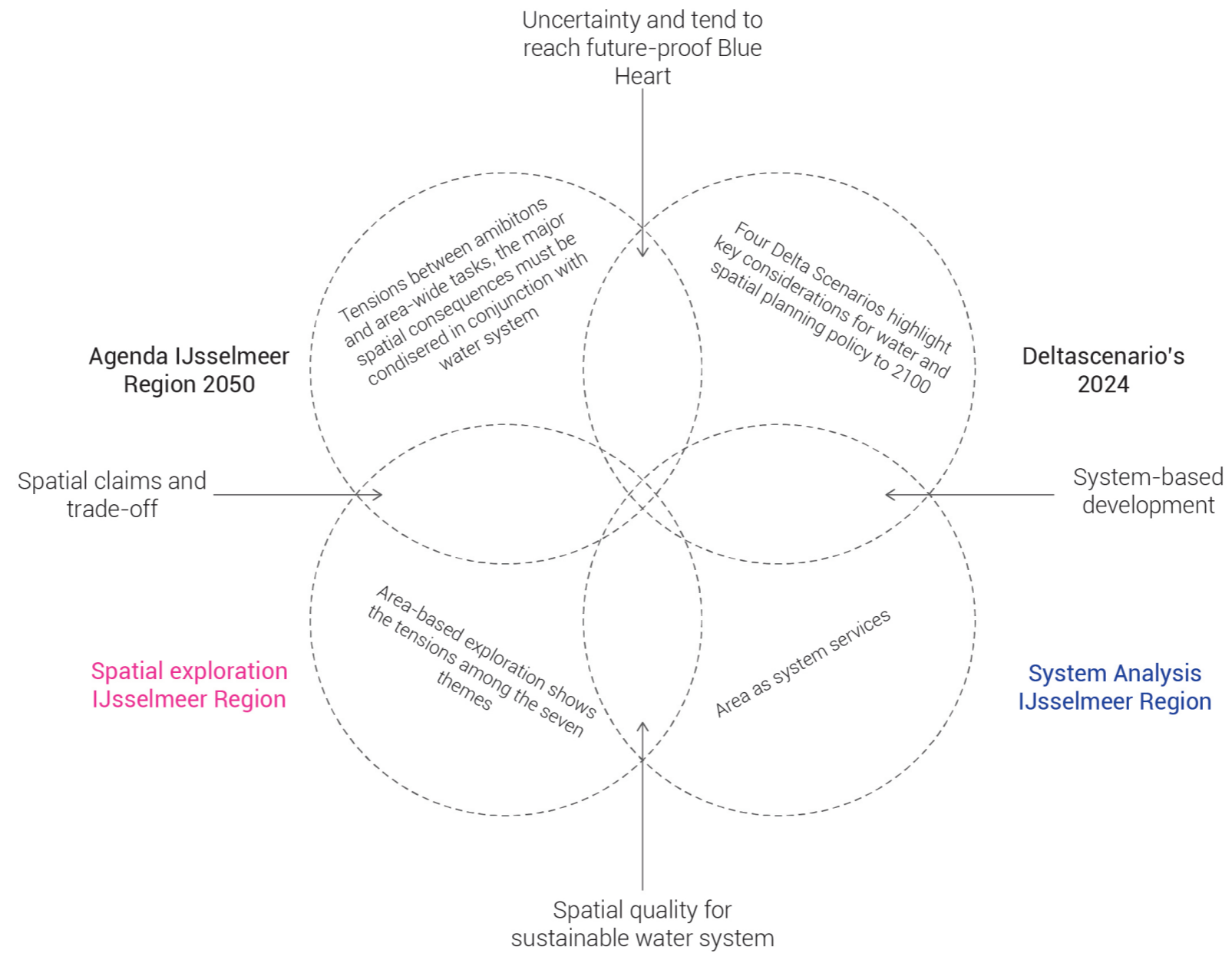
STEP 4

PHASE III

STEP 5

PHASE IV

STEP 6



# Critical situation

综合现状

PHASE I  
System Framing

STEP 1

STEP 2  
Assess the spatial system vulnerabilities, challenges and opportunities

PHASE II

STEP 3

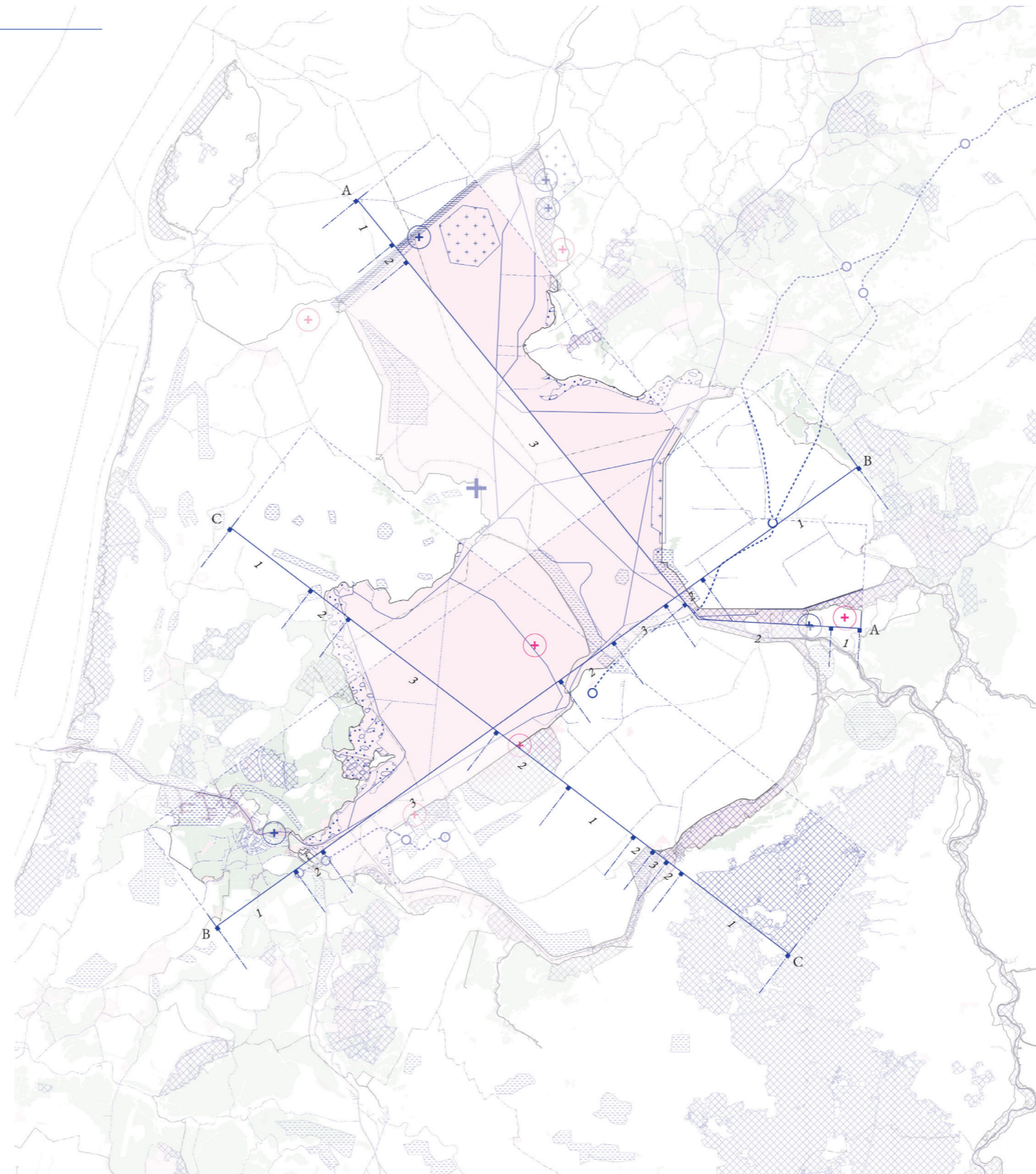
STEP 4

PHASE III

STEP 5

PHASE IV

STEP 6



### >Legend

- Peat area with higher water demand
- Natura 2000
- Threatened water intake
- Energy potential area
- Protected birds habitats
- Protected fish migration point
- 1 Hinterland
- 2 Transition zones
- 3 Large open water

Critical situation

综合现状

Hinterland

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STEP 5

PHASE IV

STEP 6

PRECONDITIONS

VALUES

ACTIVITIES

Freshwater availability

Water safety

Nature and biodiversity

Spatial quality

Livability and housing

Economic functions

Energy transition

Open water

P1 Water demand for new energy generation

P2 Inadequate depth for transportation

V1 Disruption of bird migration

A1 Recreational pressure

A2 Less space for commercial fishing and related business

A3 Tensions between energy generation and other function

Transition zones

P4 Flushing requirement of dam

P5 Water intake availability due to salinisation

P6 Outside dike building/ nature reduce water quality

P7 Unsafety infrastructure

V3 Fragedented migration routes

V4 Habitat fragmentation

V5 Dike reinforcement

V6 Tension between urbanization and space for river

A4 Unsafety water recreation outside dike

Hinterland

P8 Less freshwater storage capacity

P9 Decreasing groundwater level

P10 Uncontrolled nutrients

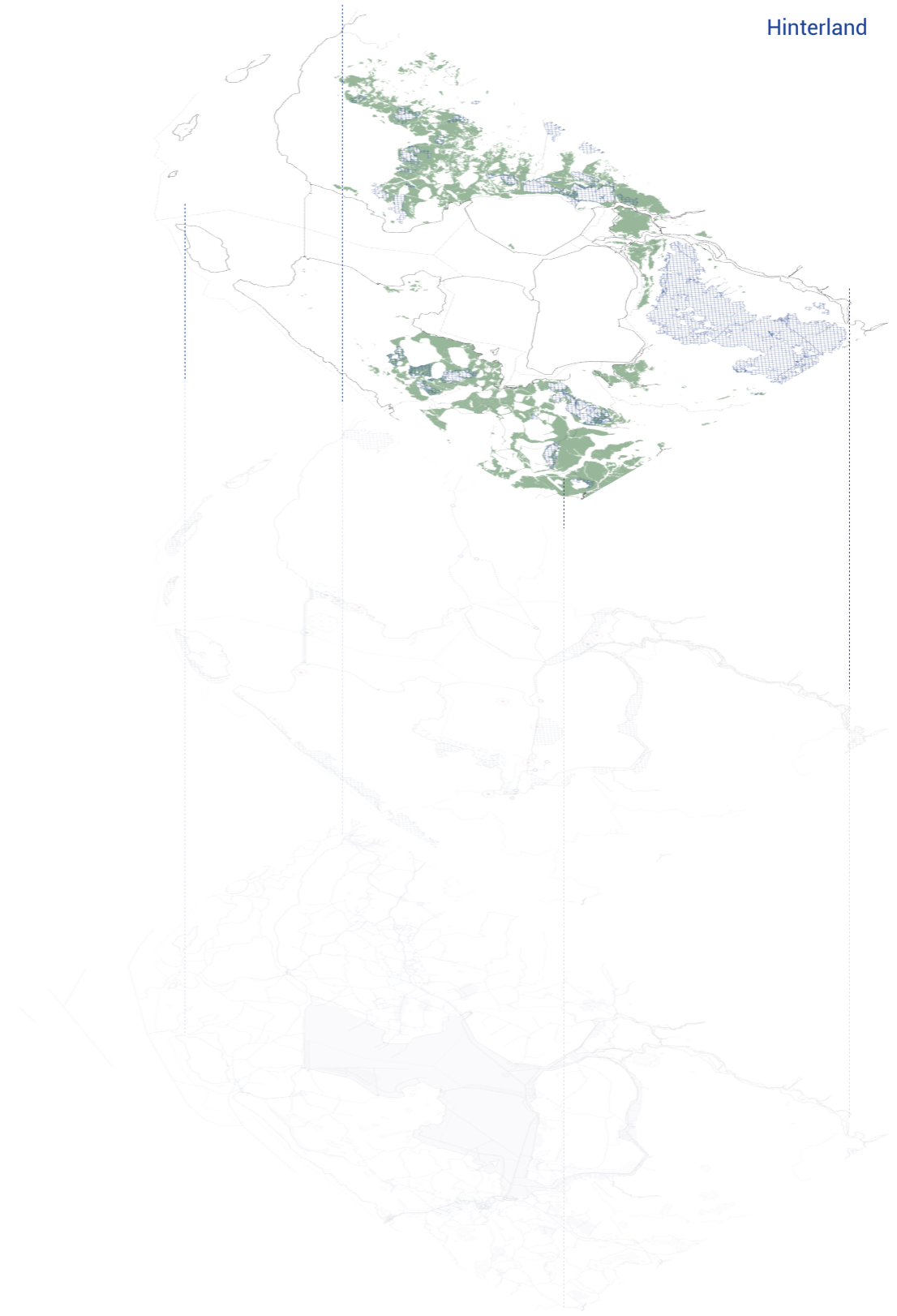
P11 Limited water detention

A5 Limited water infiltration

A6 Flushing and irrigation needs of agriculture

A7 Land subsidence

A8 Greenhouse effect due to CO2 emission from peat soil



# Critical situation

综合现状

**PHASE I**  
**System Framing**

STEP 1

**STEP 2**  
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**PHASE II**

STEP 3

STEP 4

**PHASE III**

STEP 5

**PHASE IV**

STEP 6

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Energy transition

## Open water

- P1 Water demand for new energy generation
- P2 Inadequate depth for transportation

- V1 Disruption of bird migration

- A1 Recreational pressure

- A2 Less space for commercial fishing and related business

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STEP 6

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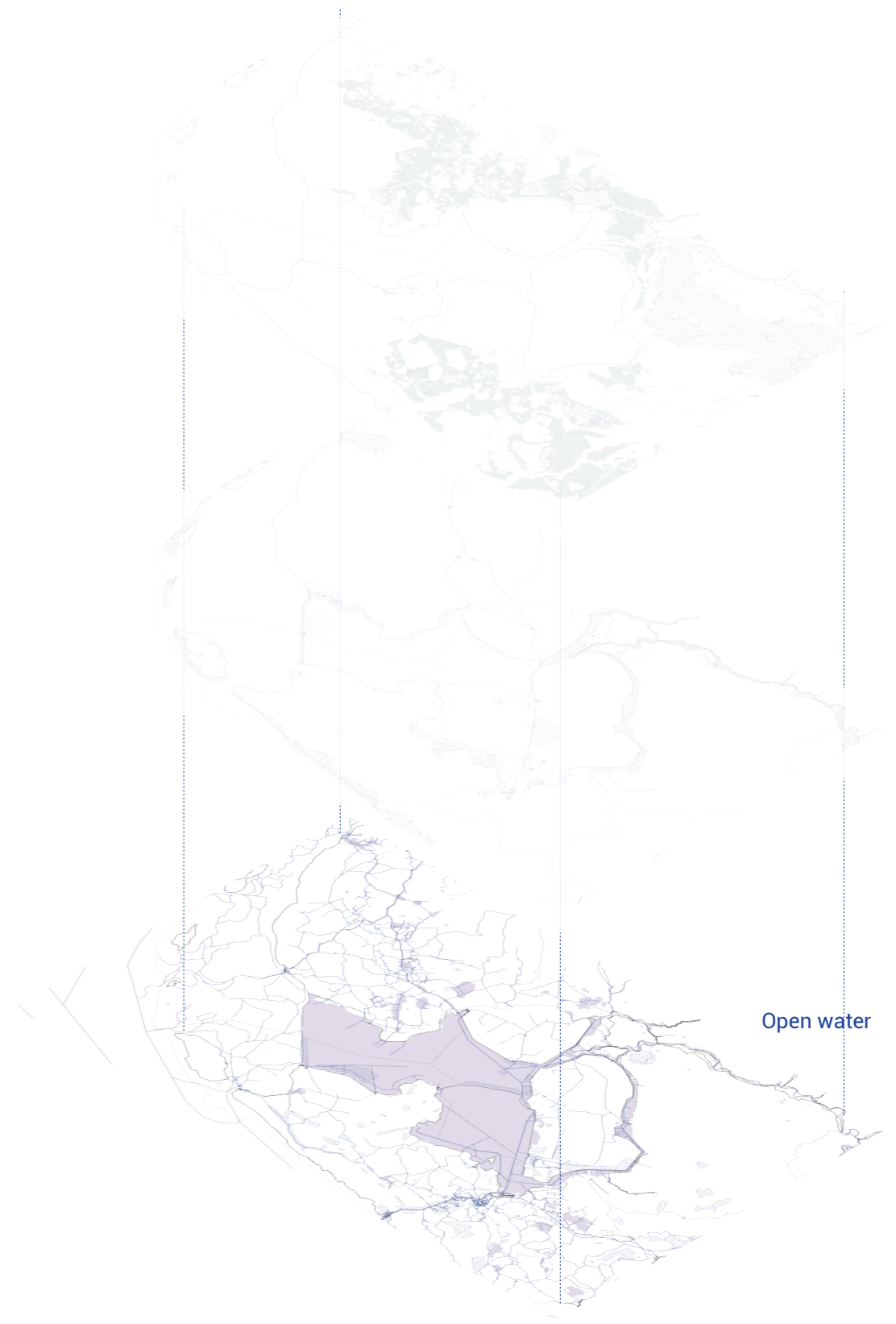
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## Spatial system analysis conclusion

### 空间分析总结

#### PHASE I

#### System Framing

#### STEP 1

#### STEP 2

Assess the spatial system vulnerabilities, challenges and opportunities

#### PHASE II

#### STEP 3

#### STEP 4

#### PHASE III

#### STEP 5

#### PHASE IV

#### STEP 6

#### Strengths

Have strong water-related history and culture  
People have identity with water  
Good base of water infrastructure

#### Weakness

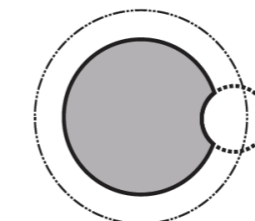
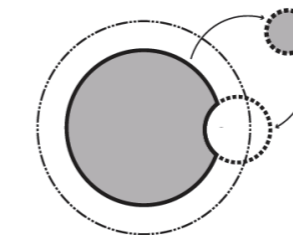
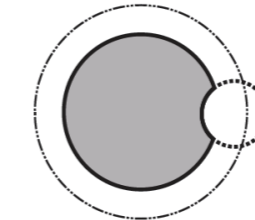
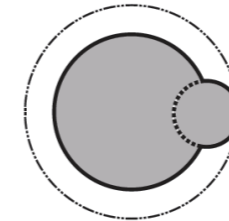
Water circularity  
Space conflict between flood storage and freshwater storage  
Lack of accessibility between land and water

#### Opportunities

More space for housing and energy use  
Educational use from water  
Co-benefit development with both ecology and socio-economic use

#### Threats

Climate change and increasing flooding events  
Habitats fragmentation due to water system change  
Rising demand of water  
Salinisation threaten the intake of freshwater



# PHASE II Vision Learning

第二阶段：愿景构建

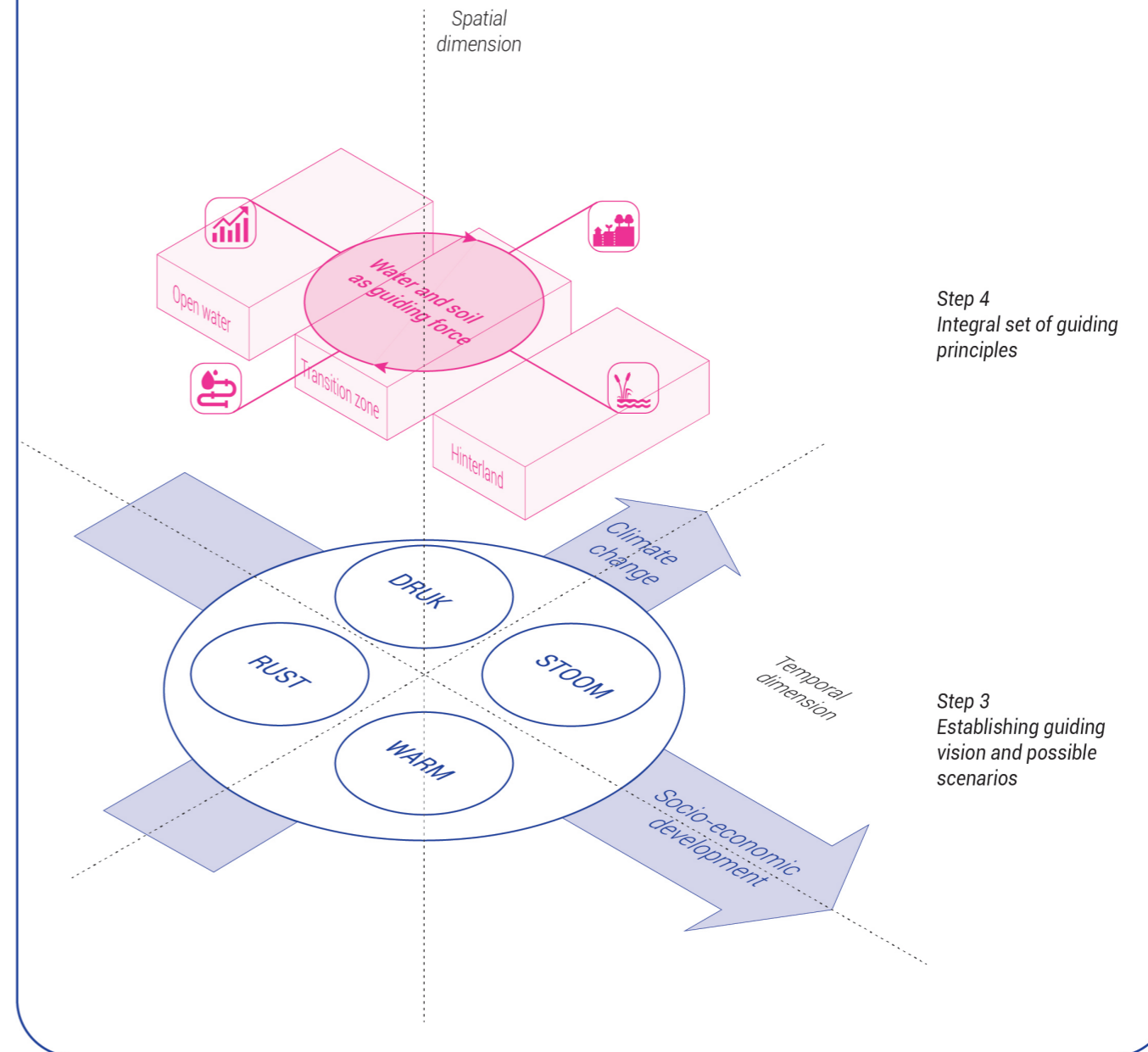
3  
Establishing guiding  
vision and possible  
scenarios

4  
Integral set of  
guiding principles

Interplay



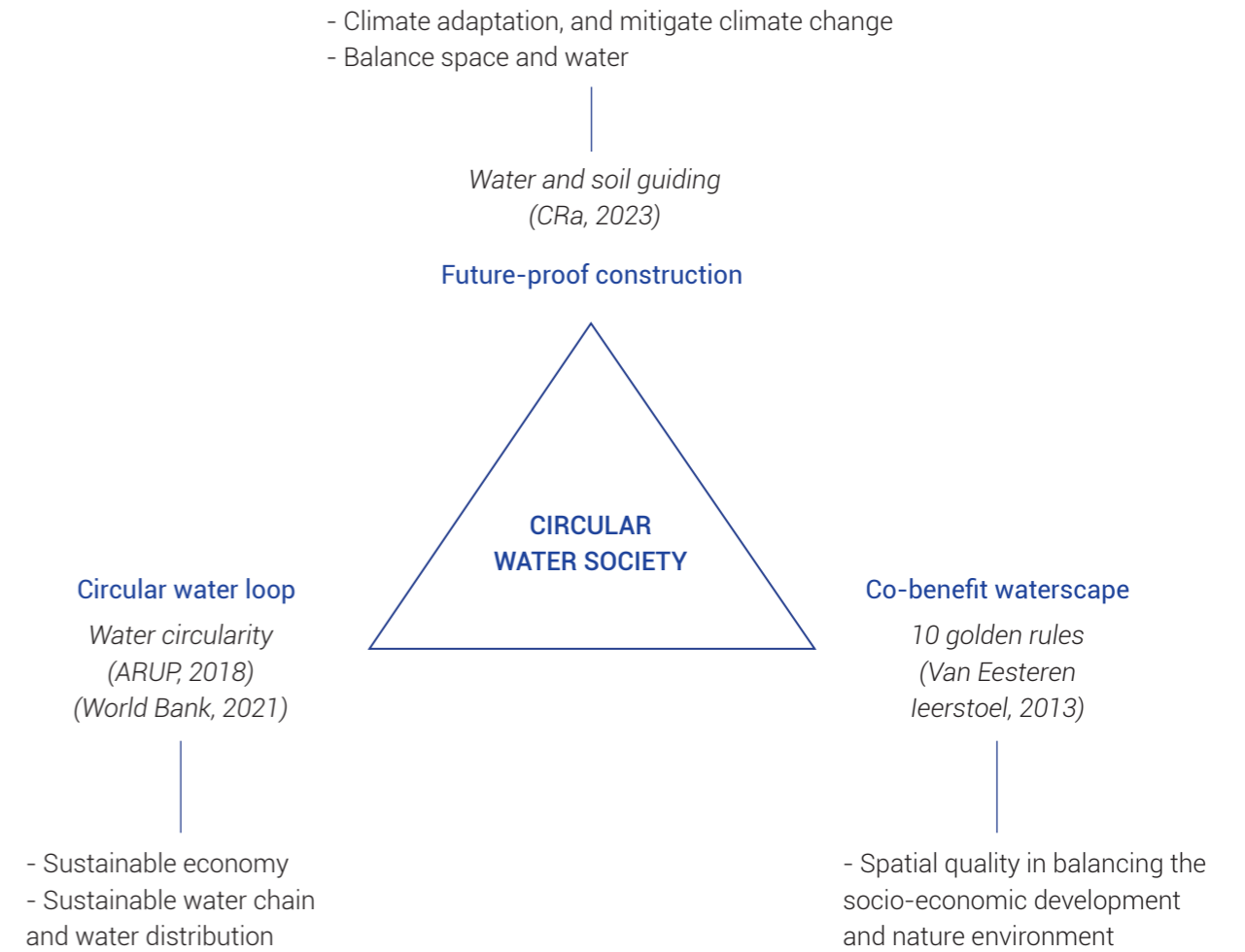
## Phase 2: Vision learning



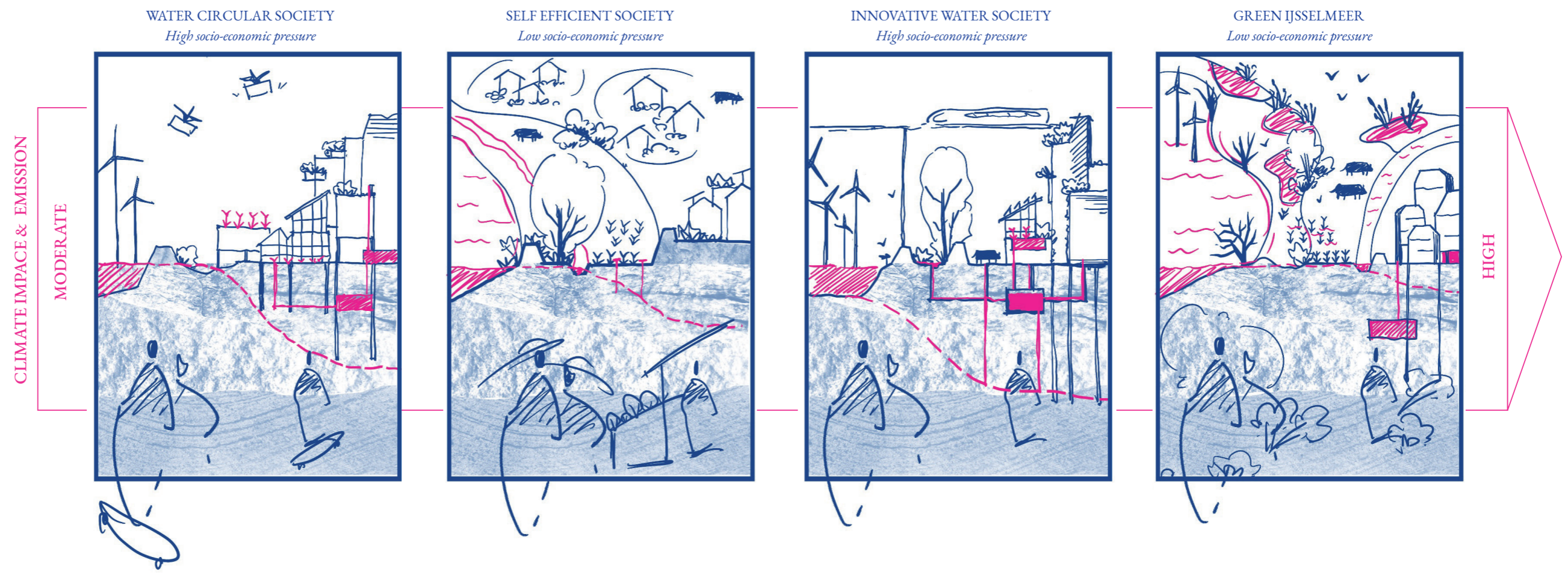
PHASE II
STEP 1
STEP 3
<b>PHASE II</b>
<b>Vision Learning</b>
<b>STEP 3</b>
Establish guiding principle and possible scenarios
STEP 4
PHASE III
STEP 5
PHASE IV
STEP 6



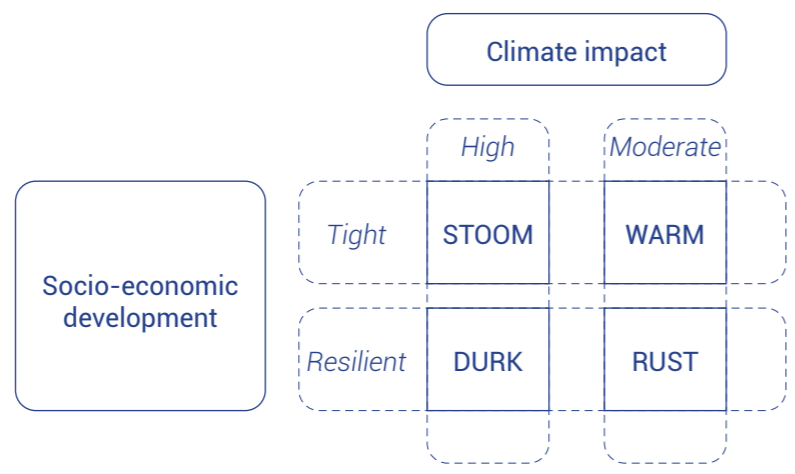
*By 2050, we envision the IJsselmeer Region as an area with a circular water system and a higher freshwater self-sufficiency rate, enabling the region to address the dual challenges of "too much water" and "too little water."*

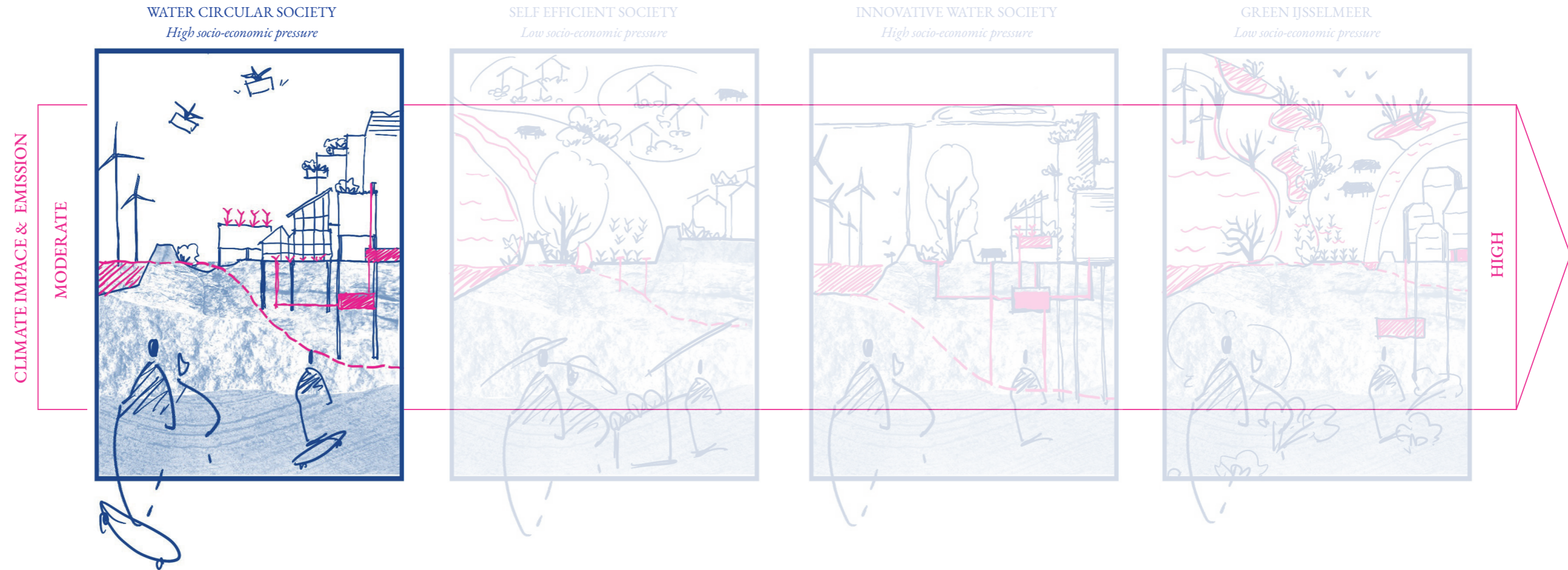


- PHASE II
- STEP 1
- STEP 3
- PHASE II**
- Vision Learning**
- STEP 3**
- Establish guiding principle and possible scenarios
- STEP 4



- PHASE III
- STEP 5
- PHASE IV**
- STEP 6





Scenario I: DRUK

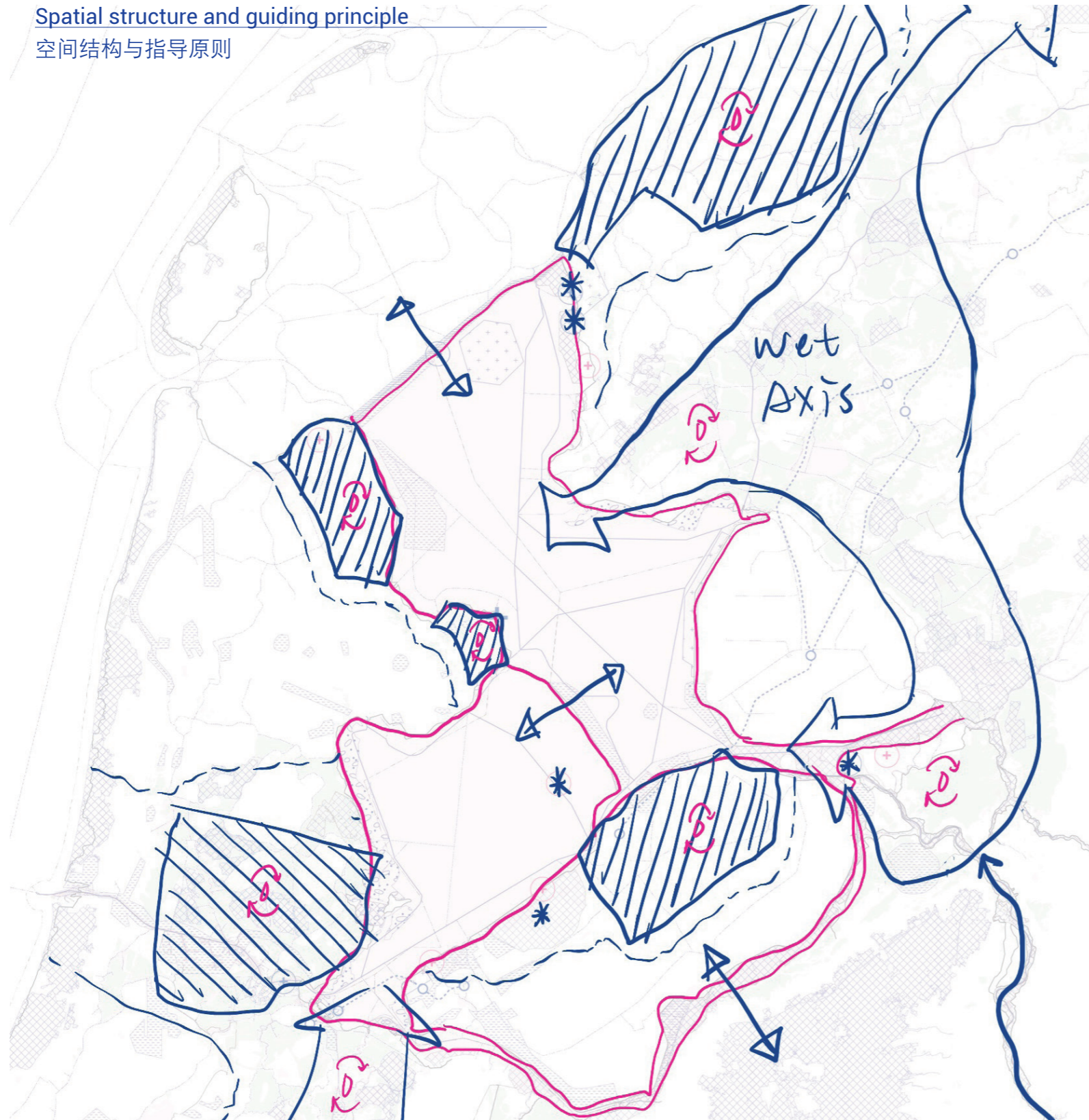
Climate impact	Temperature increase	■
	Drought, precipitation deficit, low river discharges	■
	Sea level rise	■
Emission	Rewetting the peat land	■
	Reduction through energy mobility, agriculture	■
Socio-economic pressure on water availability	Drinking water demand	■
	Economic growth (industry, shipping)	■
	Increase in nature area	■

<Degree of change in 2050

Limited ■  
Many ■

# Spatial structure and guiding principle

空间结构与指导原则



## Water quantity

Enhance the resilience of freshwater resource regulation, storage, and supply (e.g., increase the water storage capacity of lakes and surrounding areas to ensure water supply during droughts);

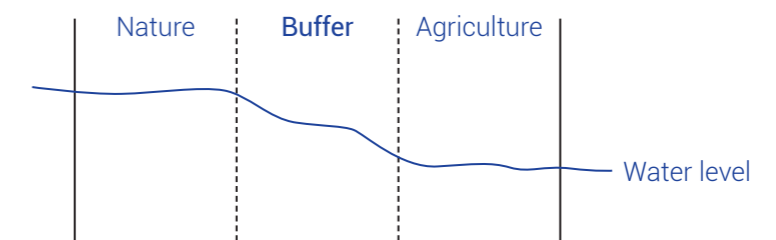
## Water quality and ecology

Improve water environment quality and promote ecosystem health (e.g., reduce nutrient loss and protect wetland biodiversity);

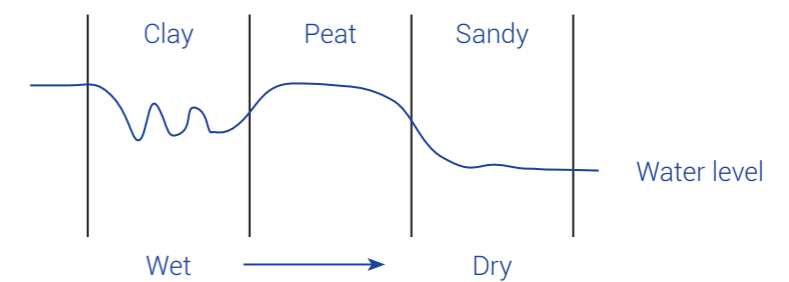
## Climate robust (Water safety)

Enhance the region's flood control and drought resistance capabilities and adaptability to climate extremes. These three objectives are mutually reinforcing and collectively serve the long-term vision of sustainable water cycle management.

## Landuse adaptive water level



## Soil type-based water level transition



PHASE II

STEP 1

STEP 3

PHASE II

Vision Learning

STEP 3

Establish guiding principle and possible scenarios

STEP 4

PHASE III

STEP 5

PHASE IV

STEP 6

# Adaptive measures

适应性方法

PHASE II

STEP 1

STEP 3

PHASE II

Vision Learning

STEP 3

Establish guiding principle and possible scenarios

STEP 4

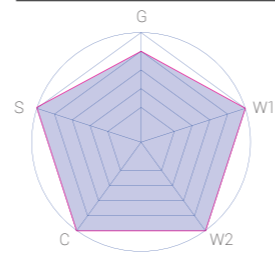
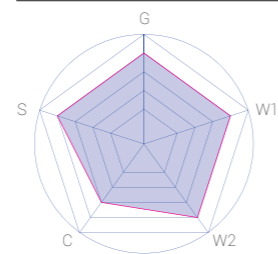
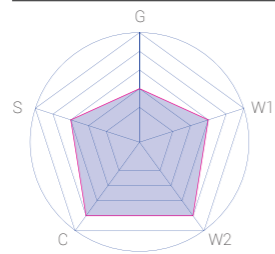
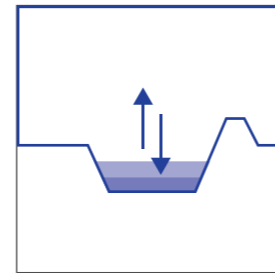
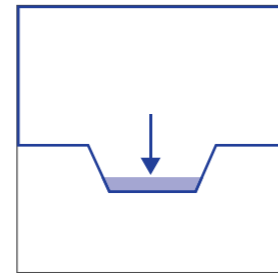
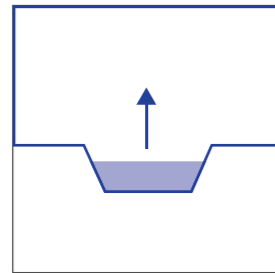
PHASE III

STEP 5

PHASE IV

STEP 6

## W1 Water infrastructure Climate adaptive water level

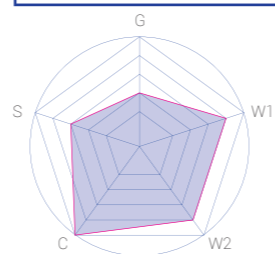
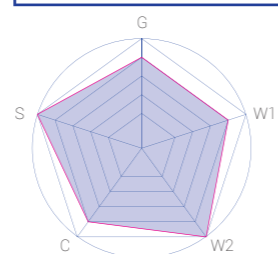
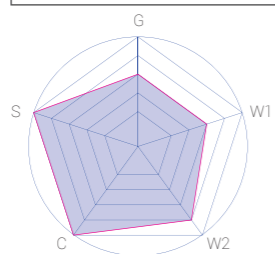
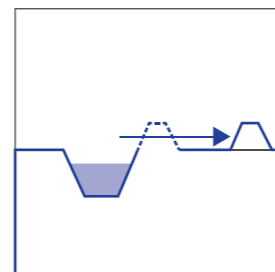
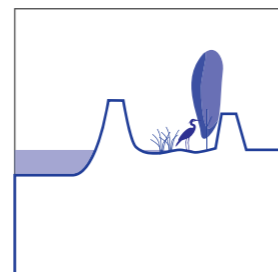
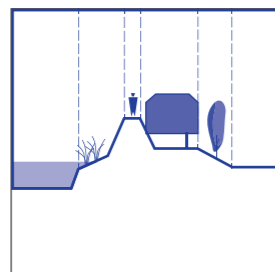


W1a High water level

W1b Low water level

W1c Flexible water level

## W2 Water infrastructure Climate adaptive water infrastructure

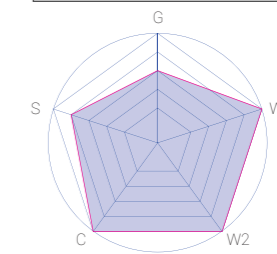
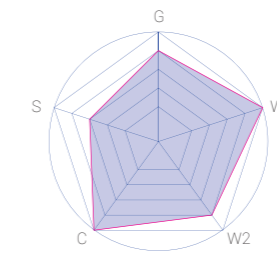
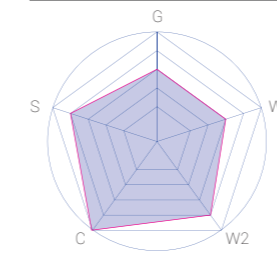
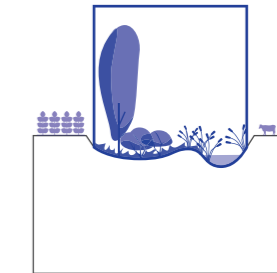
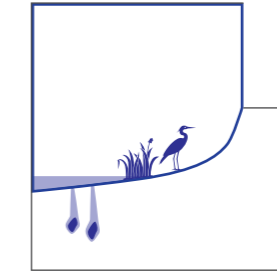
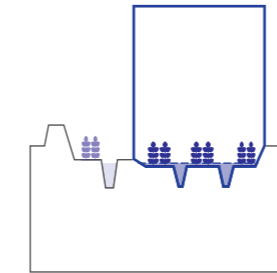


W2a Multifunctional dike

W2b Double dike system

W2c Transboundary depoldered area

## A1 Agriculture & Land use Nature inclusive agriculture

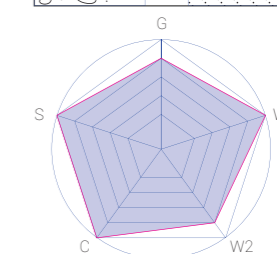
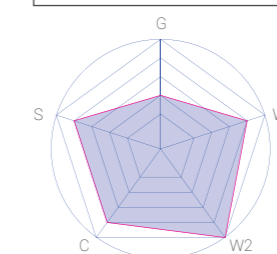
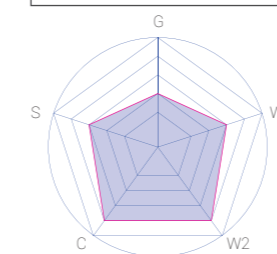
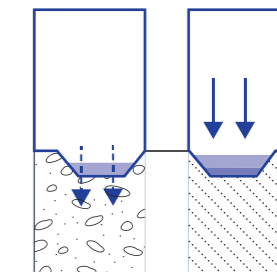
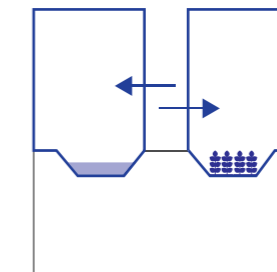


A1a Paludiculture

A1b Salt marsh

A1c Agro-ecological buffer zone

## A2 Agriculture & Land use Balancing sustainable land use



A2a Agro-pasture rotation

A2b Rotation water buffer farming

A2c Soil-based water retention

# Adaptive measures

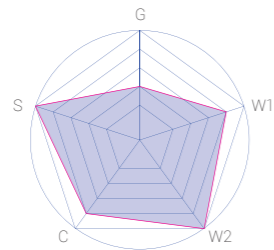
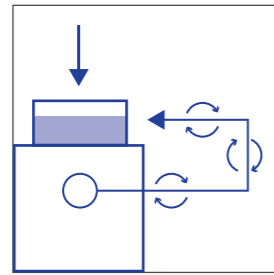
适应性方法

PHASE II

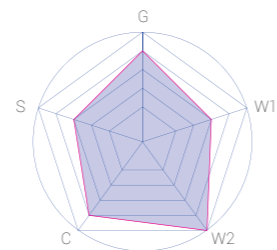
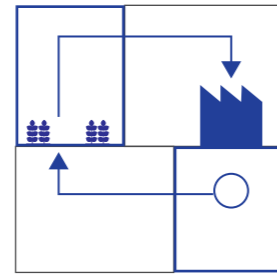
STEP 1

STEP 3

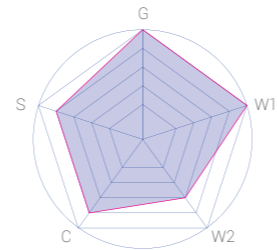
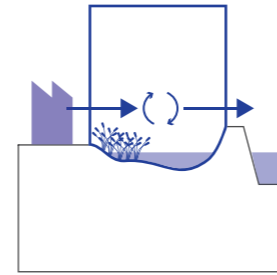
## E1 Water chain Close the water loop



E1a Decentralized water reuse

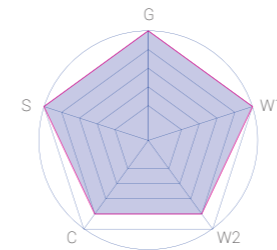
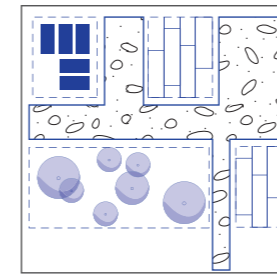


E1b Cross-sector water cycle system

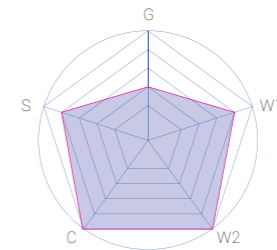
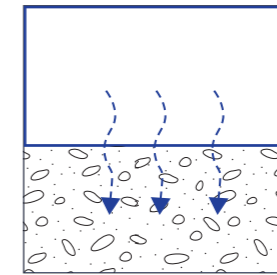


E1c Eco-integrated water purification system

## B1 Biodiversity & Ecology Systemic ecological landscape



B1a Ecological water quality buffer strip



B1b Adaptive sponge landscape

PHASE II

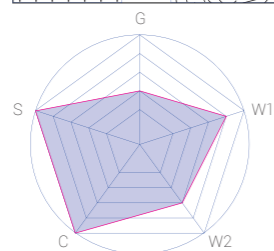
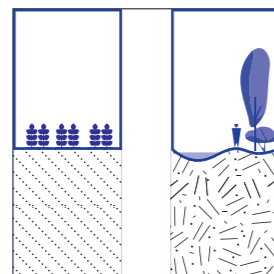
Vision Learning

STEP 3

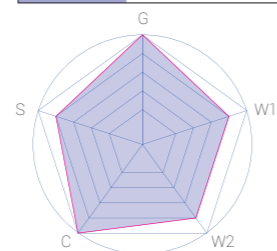
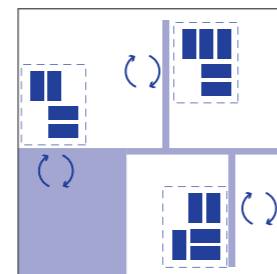
Establish guiding principle and possible scenarios

STEP 4

## E2 Water chain Efficient economic structure



E2a Water sensitive economic zoning



E2b tCrossing boundary water-economy systems

PHASE III

STEP 5

PHASE IV

STEP 6

# Northwest Overijssel

PHASE II

STEP 1

STEP 3

**PHASE II**  
*Vision Learning*

STEP 3

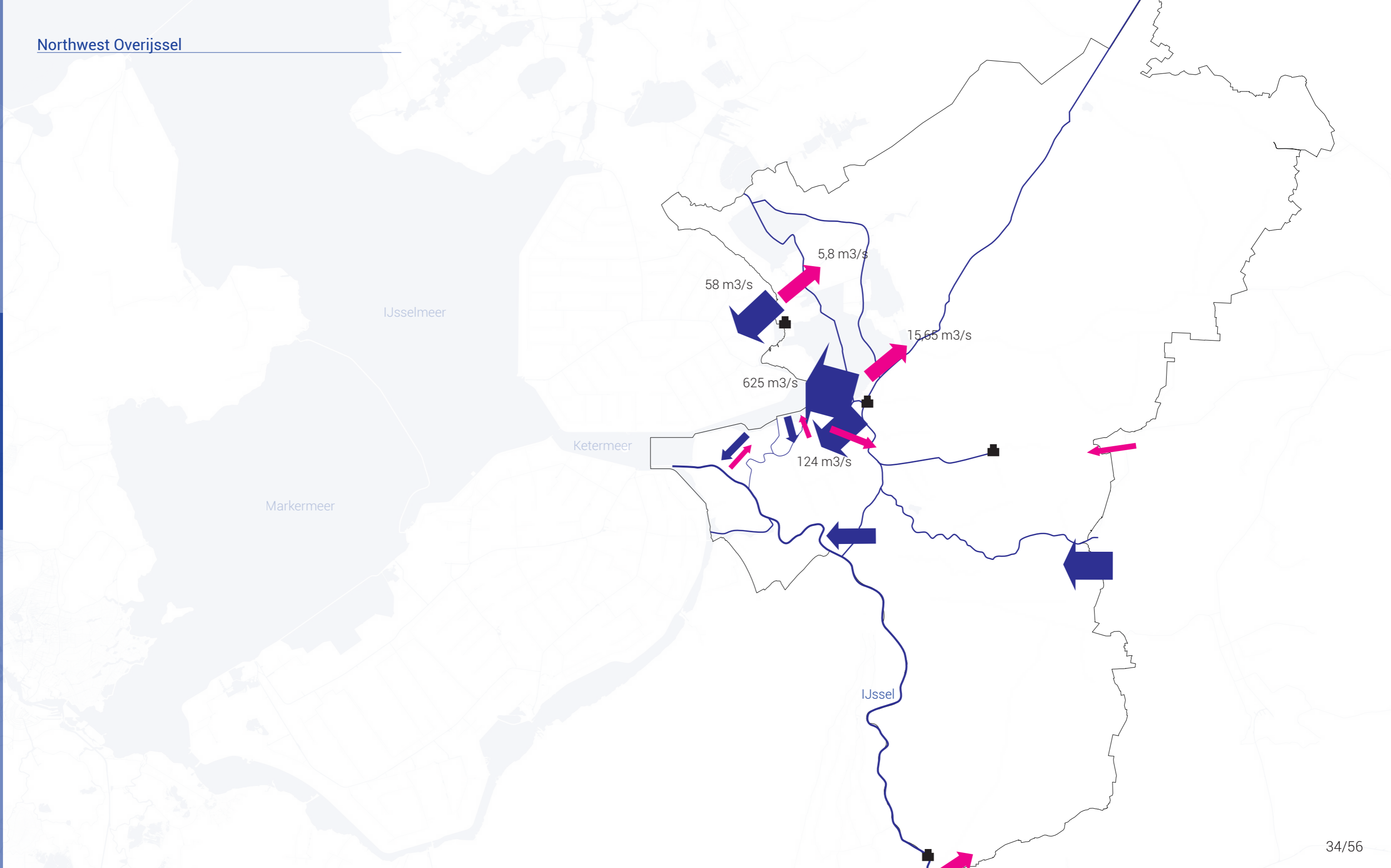
**STEP 4**  
Integral set of guiding principles to local level

PHASE III

STEP 5

PHASE IV

STEP 6



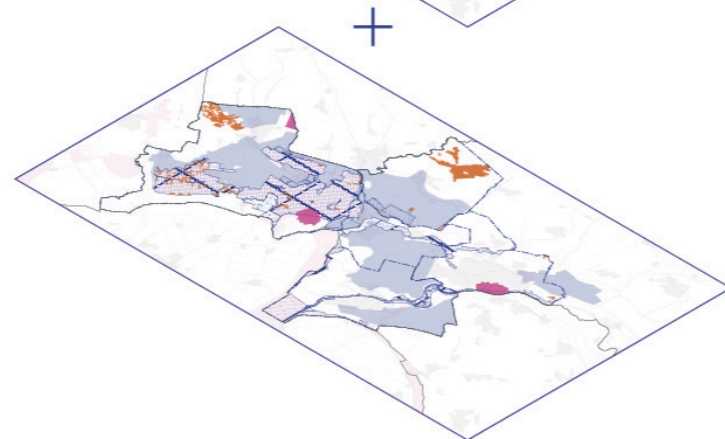
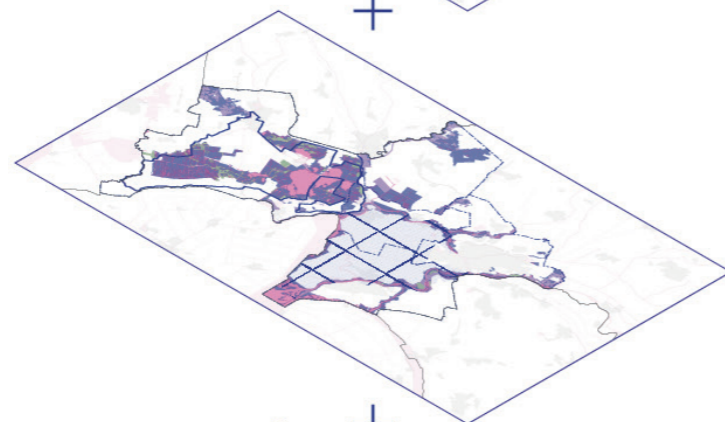
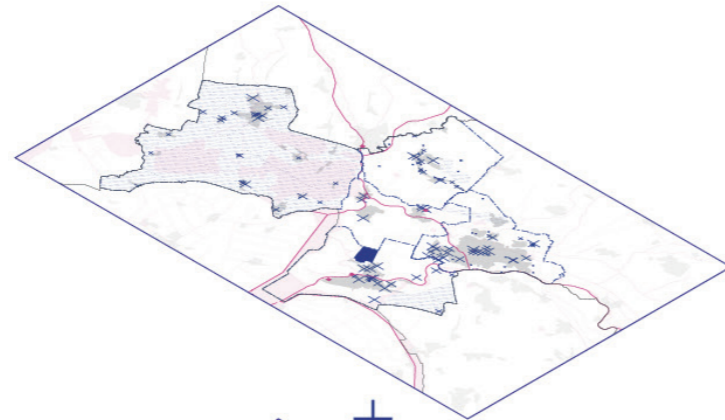
# Scenario set up

情景设定

PHASE II

STEP 1

STEP 3



PHASE II  
Vision Learning

STEP 3

STEP 4

Integral set of guiding principles to local level

PHASE III

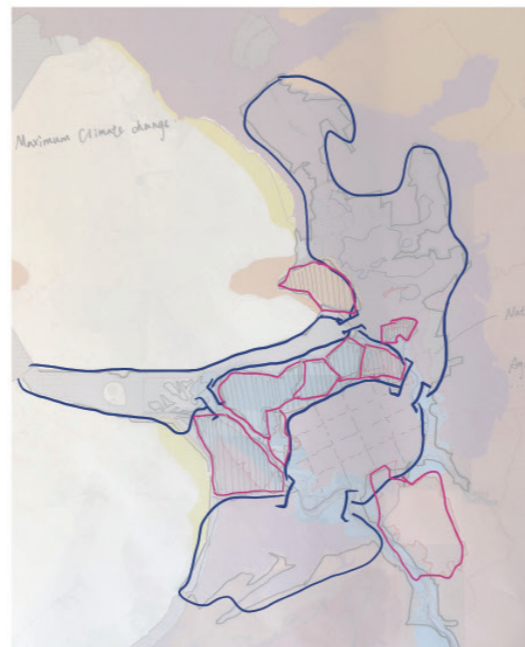
STEP 5

PHASE IV

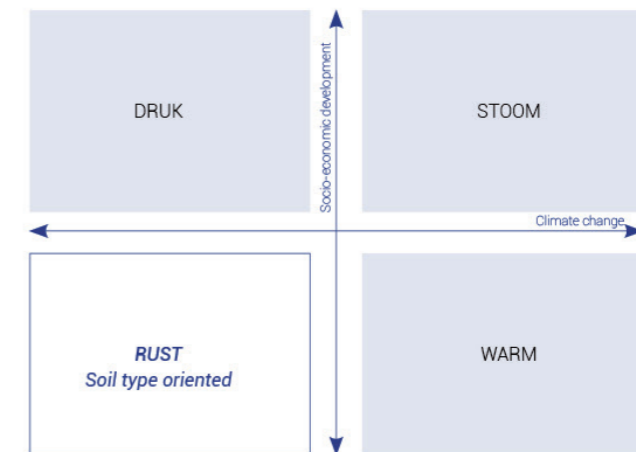
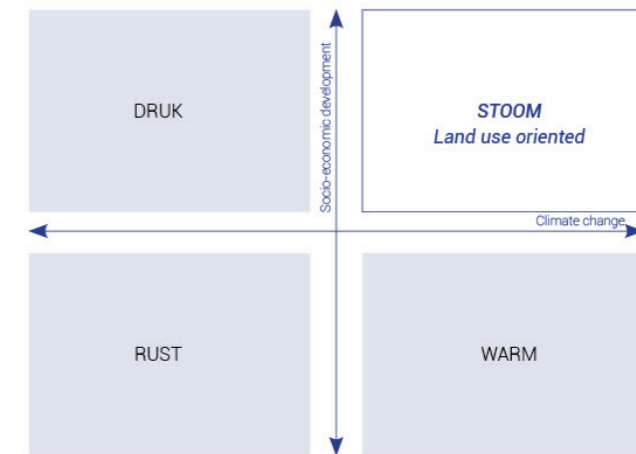
STEP 6



STOOM



RUST



# Scenario set up

情景设定

PHASE II

STEP 1

STEP 3

PHASE II

Vision Learning

STEP 3

STEP 4

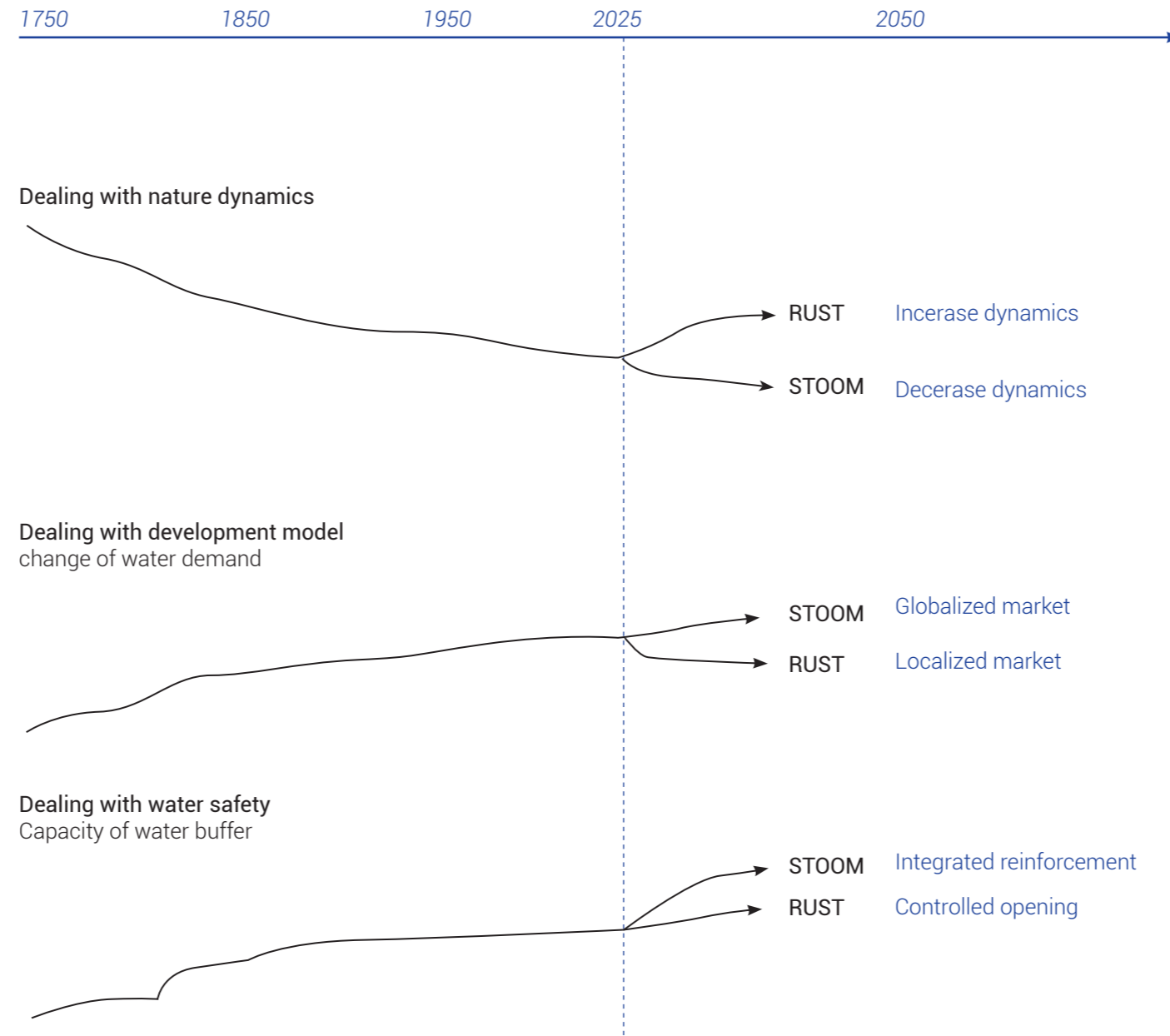
Integral set of guiding principles to local level

PHASE III

STEP 5

PHASE IV

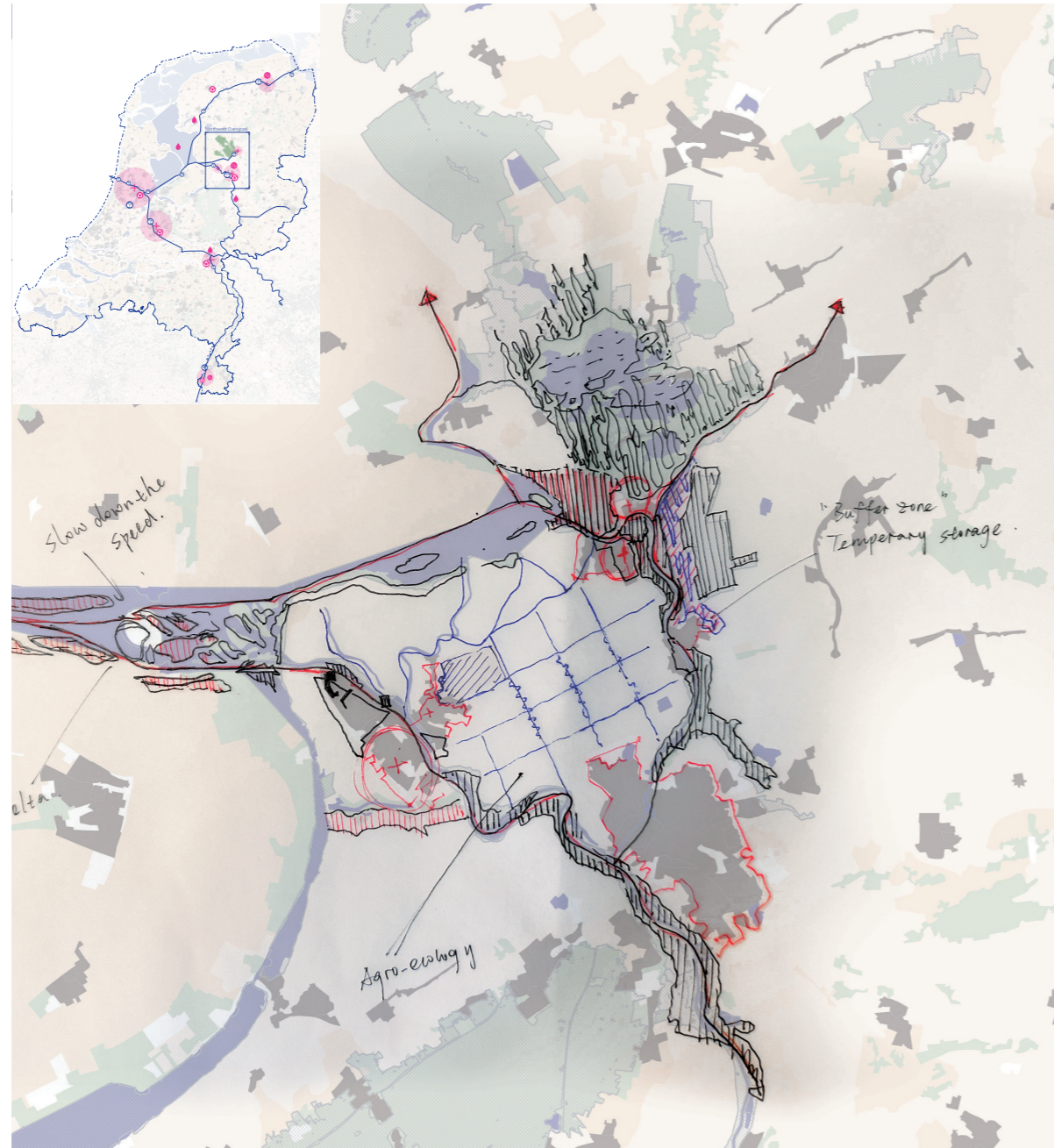
STEP 6



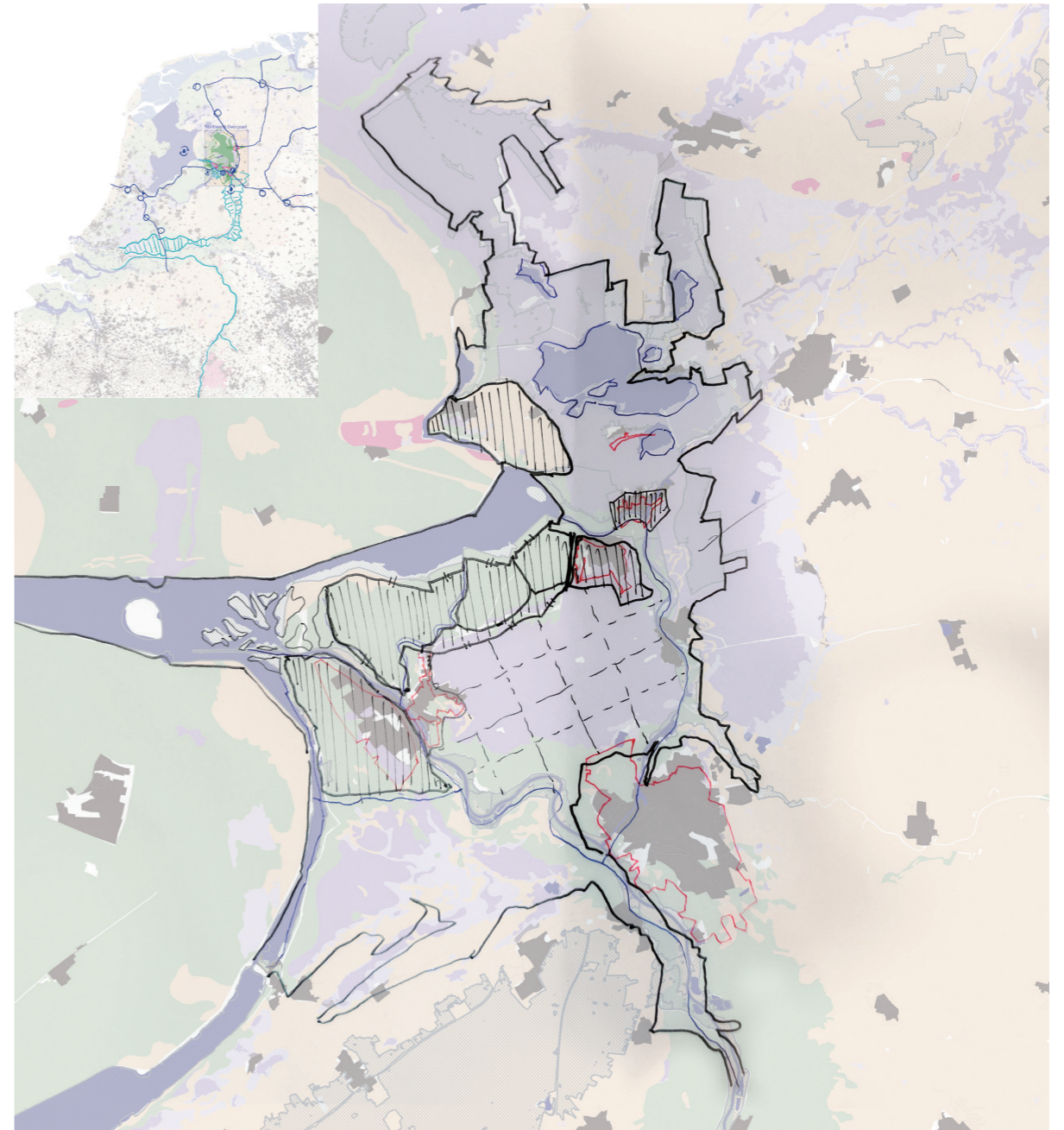
# Scenario set up

情景设定

### STEAM scenario model



### RUST scenario model



PHASE II

STEP 1

STEP 3

PHASE II

Vision Learning

STEP 3

STEP 4

Integral set of guiding principles to local level

PHASE III

STEP 5

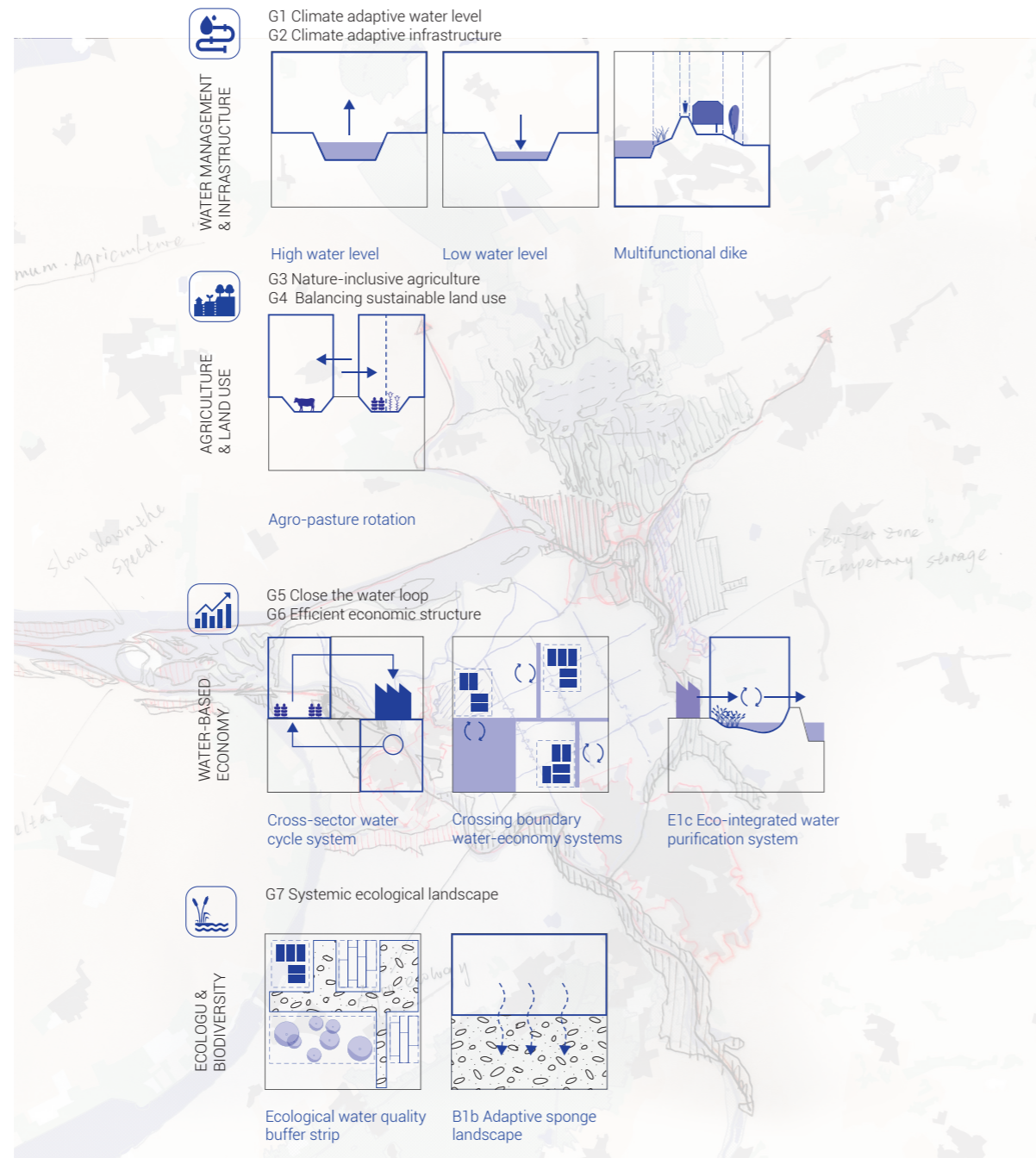
PHASE IV

STEP 6

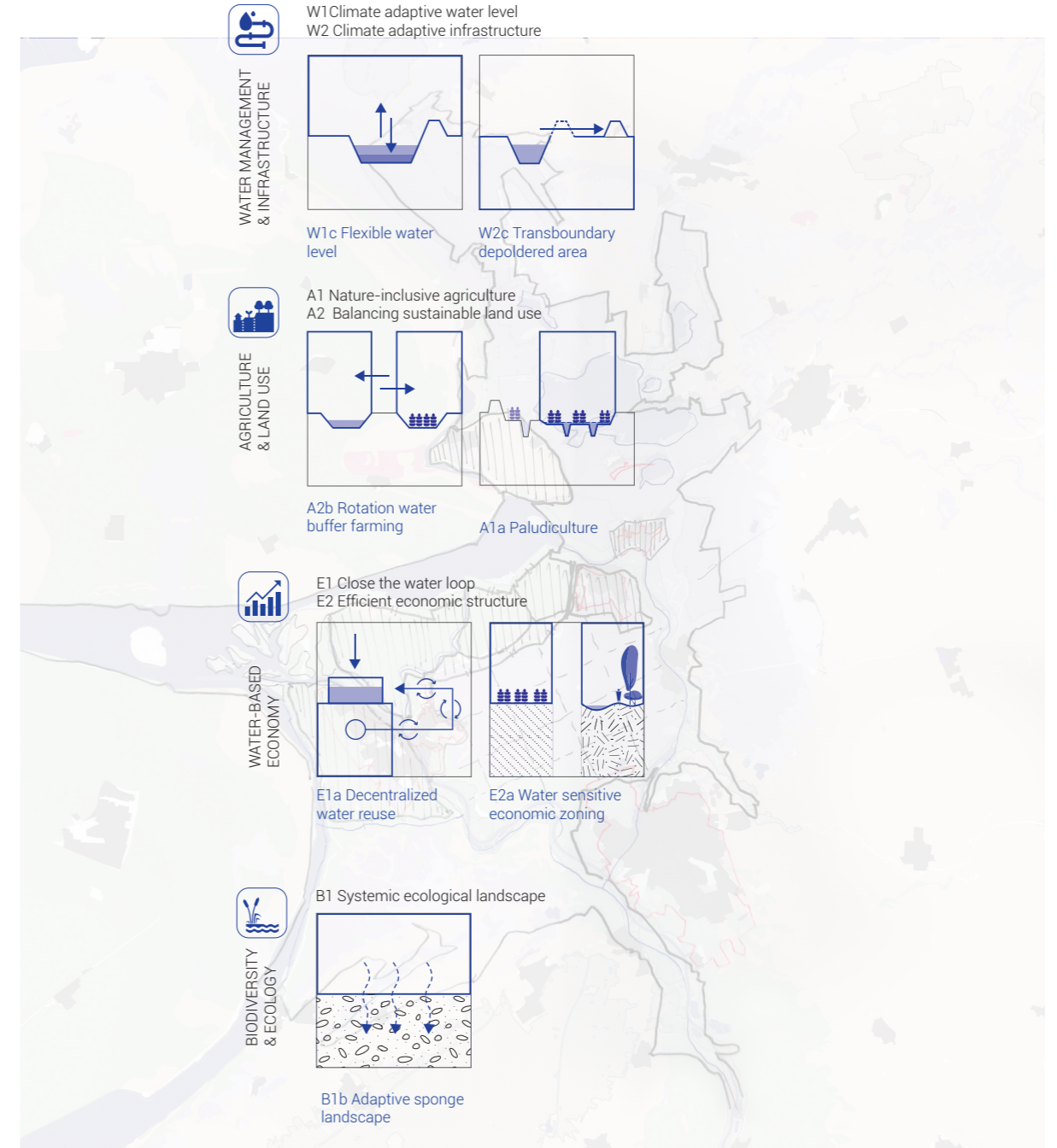
# Scenario set up

情景设定

## STEAM scenario model



## RUST scenario model



PHASE II

STEP 1

STEP 3

PHASE II

Vision Learning

STEP 3

STEP 4

Integral set of guiding principles to local level

PHASE III

STEP 5

PHASE IV

STEP 6

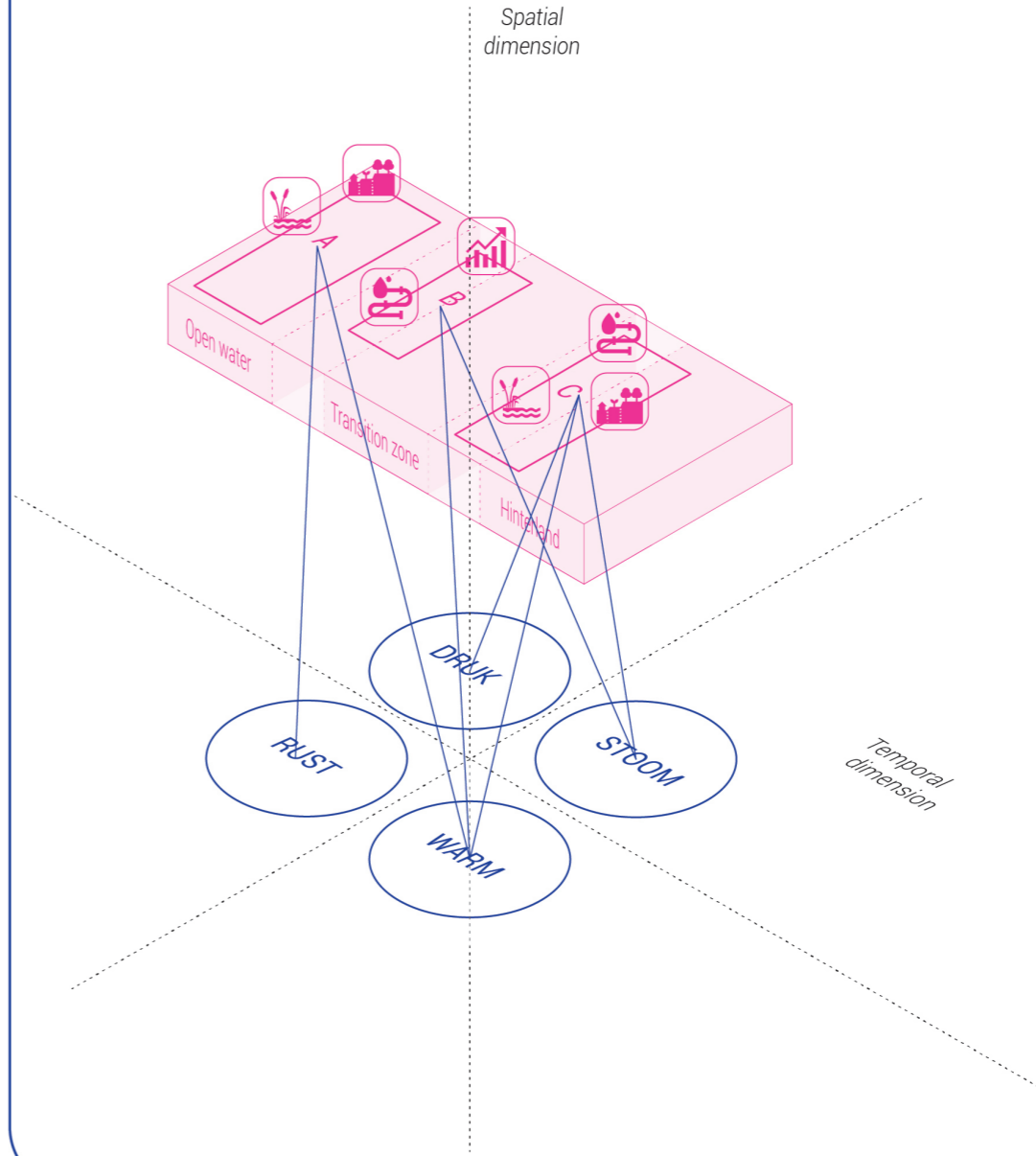


5  
Supporting decision  
making from design  
strategy set up

# PHASE III Decision supporting

第三阶段：决策支持

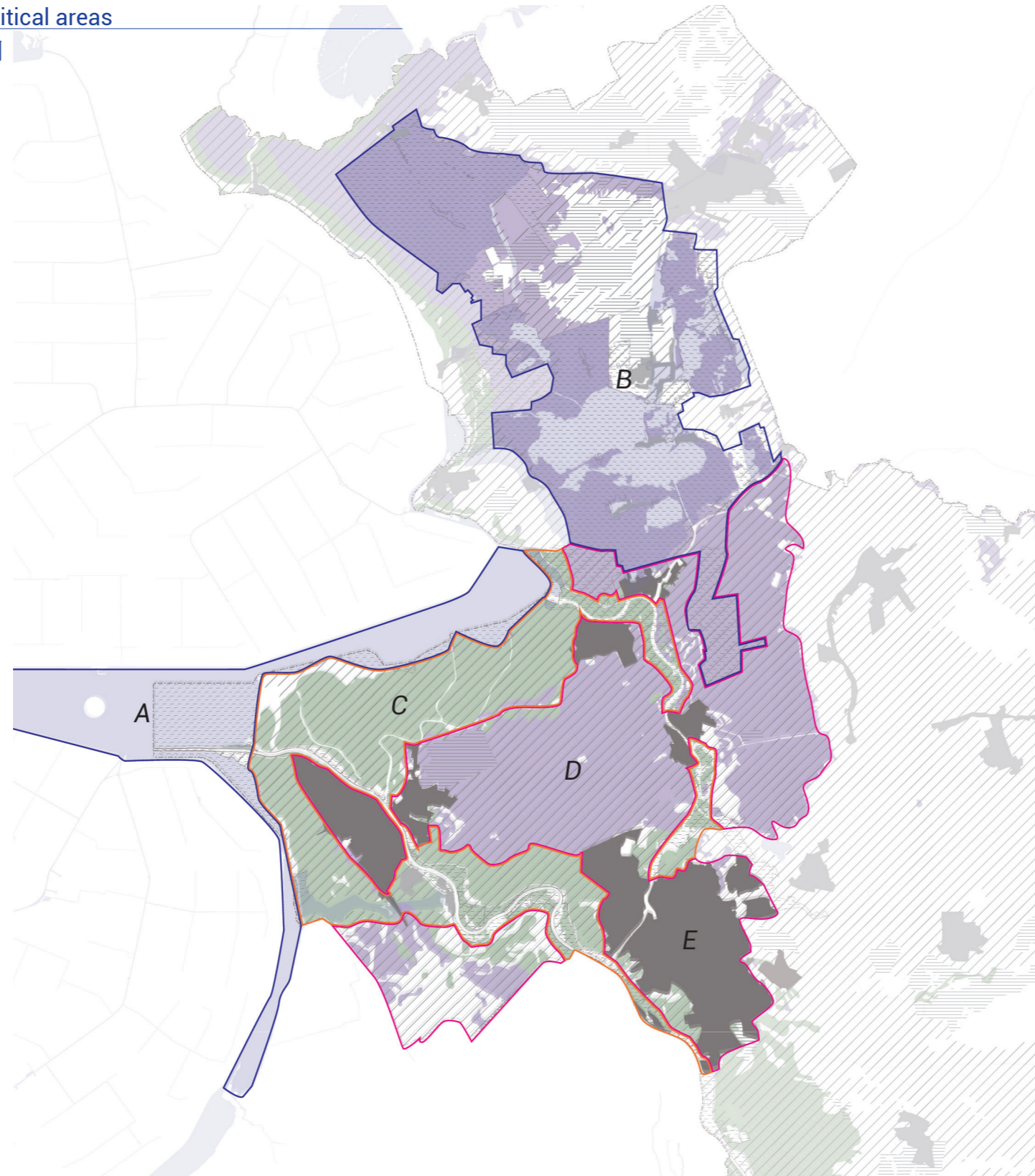
## Phase 3: Decision supporting



Step 5  
Supporting decision  
making from design  
strategy set up

# Identifying critical areas

关键区域识别



### <Legend

Category A & B  
Areas that do not change in either scenario

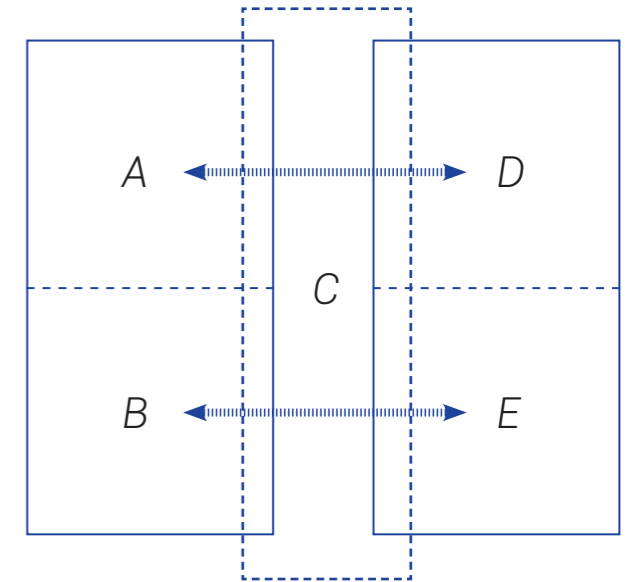
- Peat land
- Water system
- Natura 2000 area

Category C  
Areas that change in one scenario and not in the other

- River clay land
- Intensive agriculture
- River clay land

Category D & E  
Areas that change in both scenarios, but in different ways and under the influence of different drivers

- Built area
- Peat land
- Pasture



- PHASE II
- STEP 1
- STEP 3
- PHASE II
- STEP 3
- STEP 4
- PHASE III**
- Decision supporting**
- STEP 5**
- Support decision-making from design strategy setup
- PHASE IV
- STEP 6

## Sub-area spatial typologies

子区域空间类型

PHASE II

STEP 1

STEP 3

PHASE II

STEP 3

STEP 4

**PHASE III**

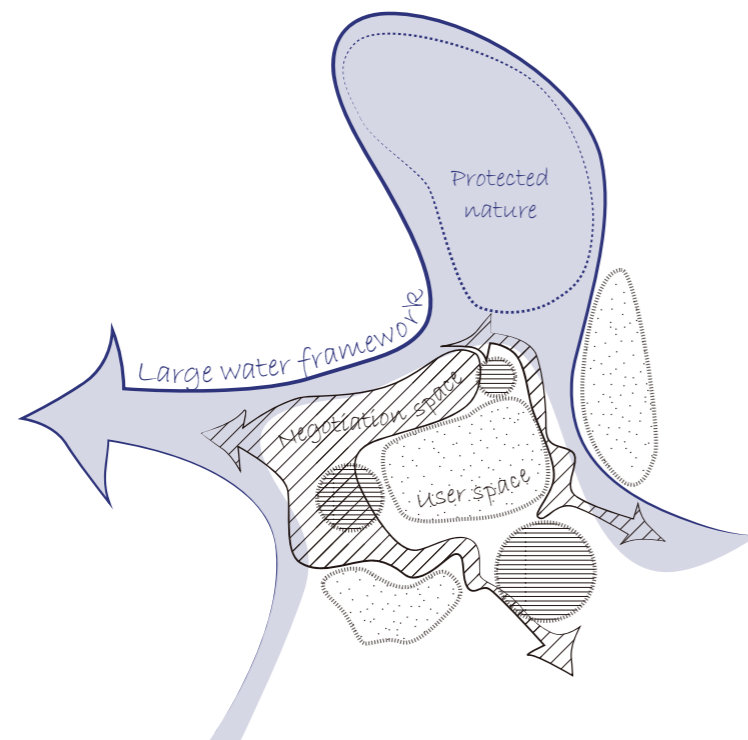
**Decision supporting**

**STEP 5**

Support decision-making from design strategy setup

PHASE IV

STEP 6



## Sub-area spatial typologies

子区域空间类型

PHASE II

STEP 1

STEP 3

PHASE II

STEP 3

STEP 4

PHASE III

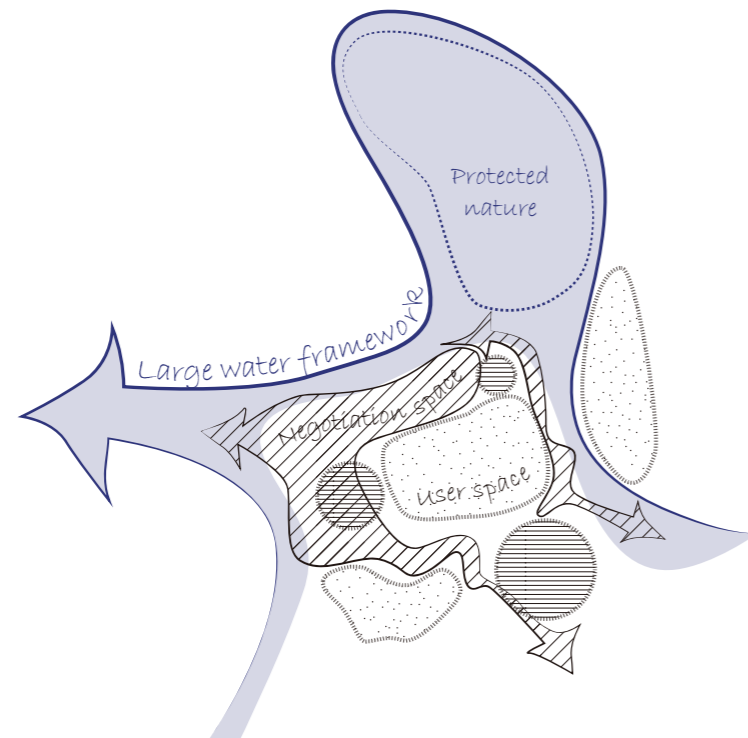
Decision supporting

STEP 5

Support decision-making from design strategy setup

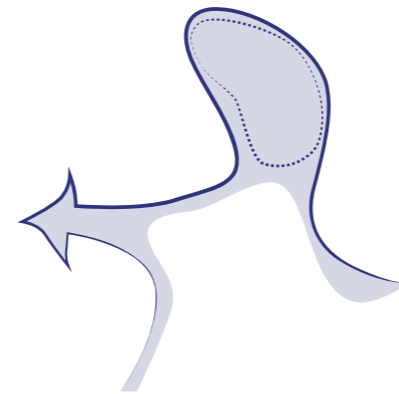
PHASE IV

STEP 6

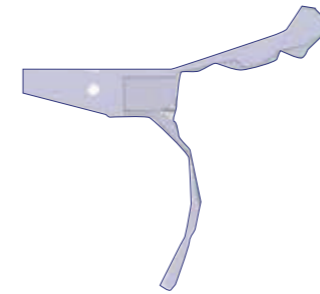


### Structure of design

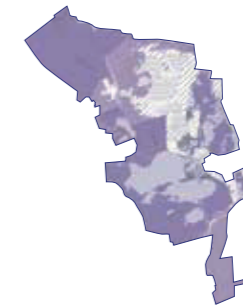
In order to achieve the ambition of water circularity, the research set up a spatial structure with three different spaces. These spaces were based on different roles of space in relation to water quality, quantity, and safety. The areas in consideration are dynamic in synergy, with the large water framework serving as the base water buffer. Expansion of capacity is achieved through the adjustment of local functions in specific areas.



Large water framework



**Inner delta**  
acts as an exchange interface with the lake at the downstream end of the river



**Protected nature**  
acts as the largest hydrological stabilization area that ensure the basic freshwater buffer capacity



Negotiation space



**Clay river landscape**  
acts as an exchange interface with the other two types of areas, conditions changing frequently due to different tasks of surrounding areas



User space



**Peat landscape**  
acts as a functionality area with mainly agriculture use, transition depends on the condition of negotiation space



**Built area**  
acts as a functionality area with mainly urban area, transition depends on the condition of negotiation space

## Sub-area spatial typologies

子区域空间类型

PHASE II

STEP 1

STEP 3

PHASE II

STEP 3

STEP 4

PHASE III

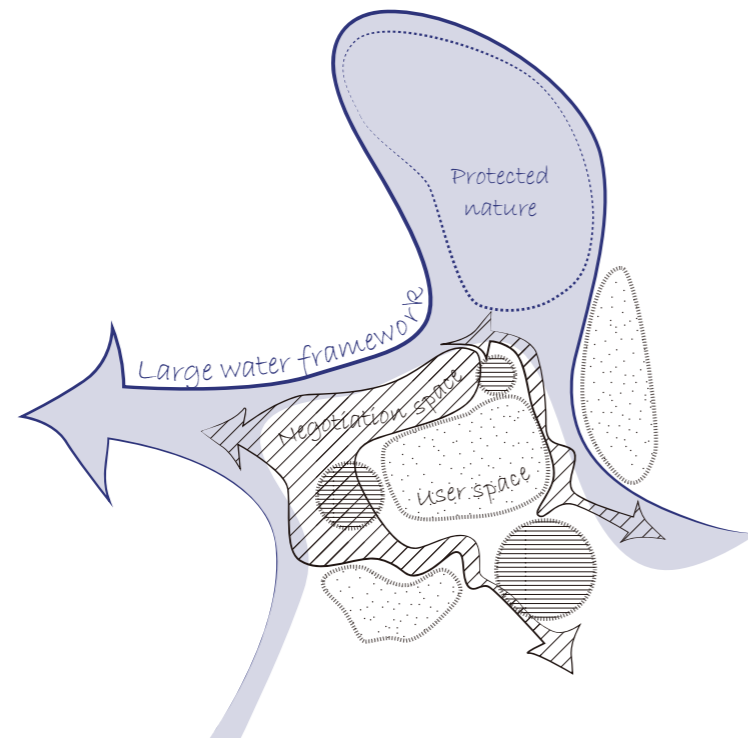
Decision supporting

STEP 5

Support decision-making from design strategy setup

PHASE IV

STEP 6



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## Sub-area spatial typologies

子区域空间类型

PHASE II

STEP 1

STEP 3

PHASE II

STEP 3

STEP 4

PHASE III

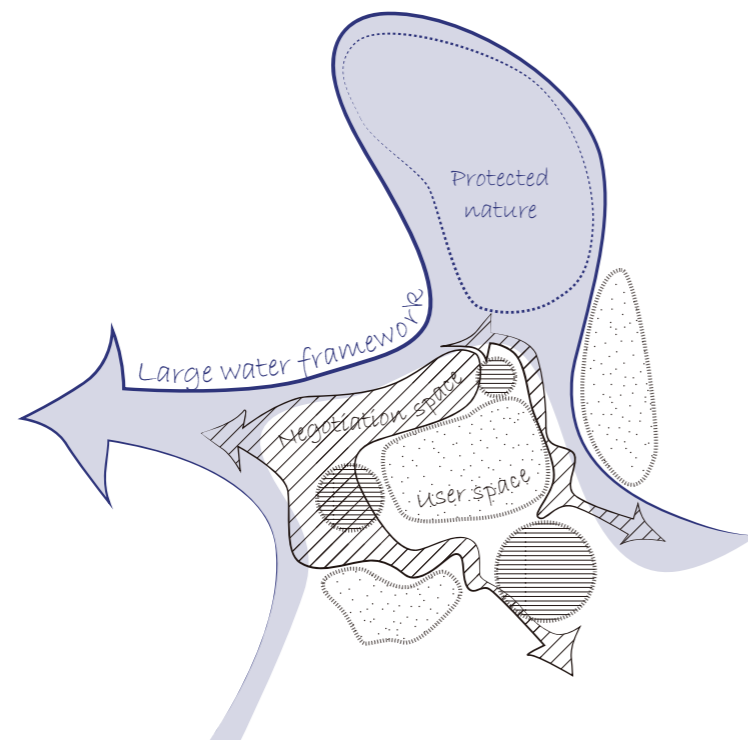
Decision supporting

STEP 5

Support decision-making from design strategy setup

PHASE IV

STEP 6



### Structure of design

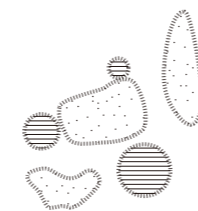
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Large water framework



Negotiation space



User space



**Inner delta** acts as an exchange interface with the lake at the downstream end of the river



**Protected nature** acts as the largest hydrological stabilization area that ensure the basic freshwater buffer capacity



**Clay river landscape** acts as an exchange interface with the other two types of areas, conditions changing frequently due to different tasks of surrounding areas



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## Sub-area spatial typologies

子区域空间类型

PHASE II

STEP 1

STEP 3

PHASE II

STEP 3

STEP 4

PHASE III

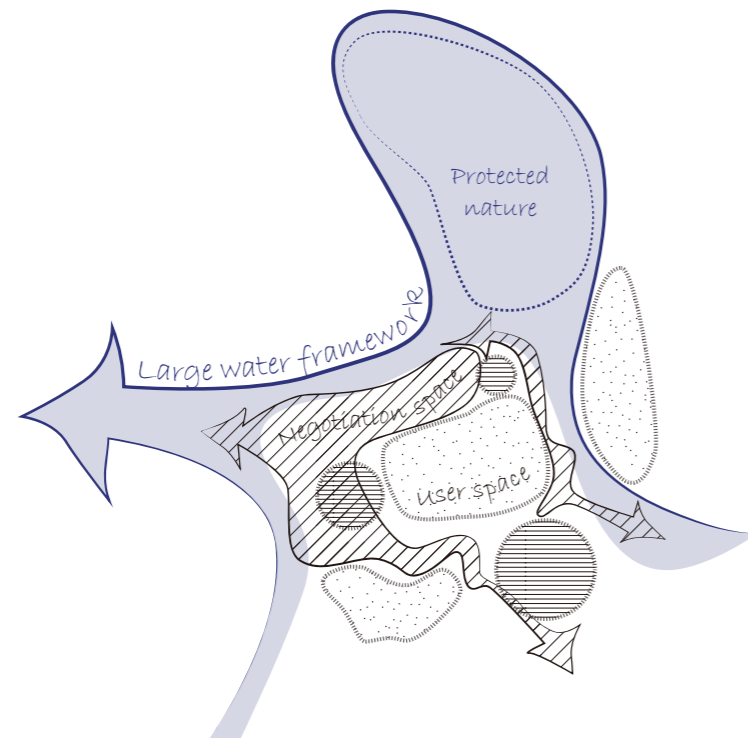
Decision supporting

STEP 5

Support decision-making from design strategy setup

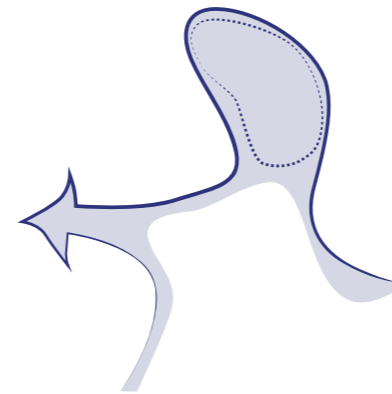
PHASE IV

STEP 6



### Structure of design

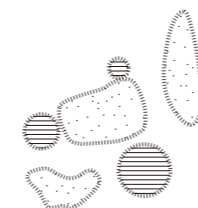
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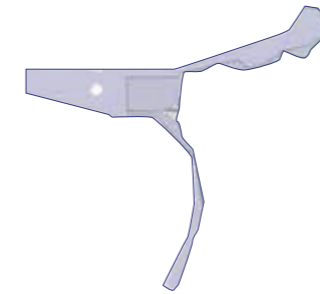
Large water framework



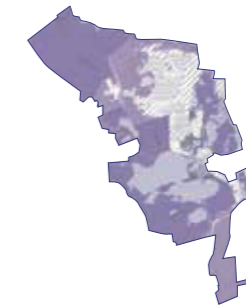
Negotiation space



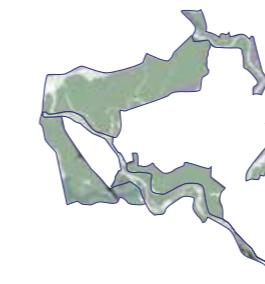
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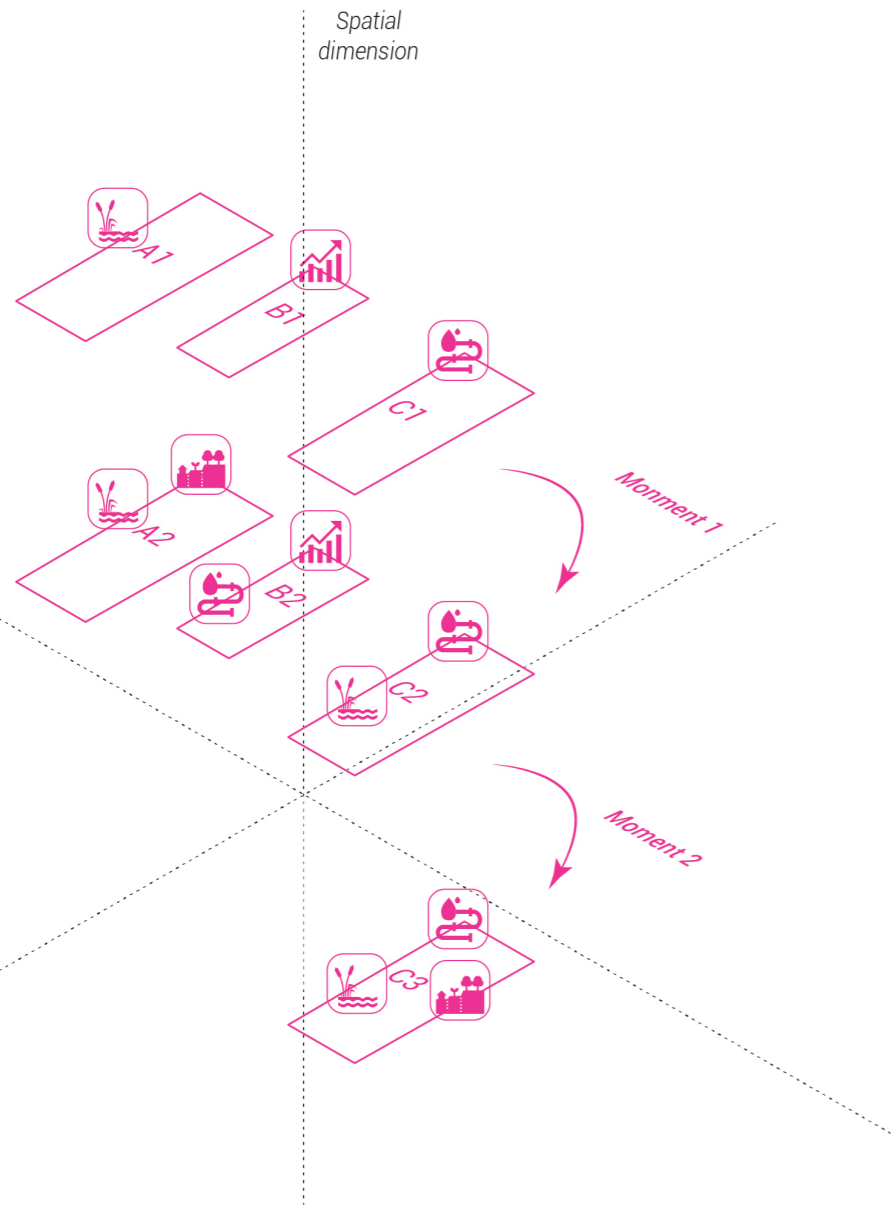


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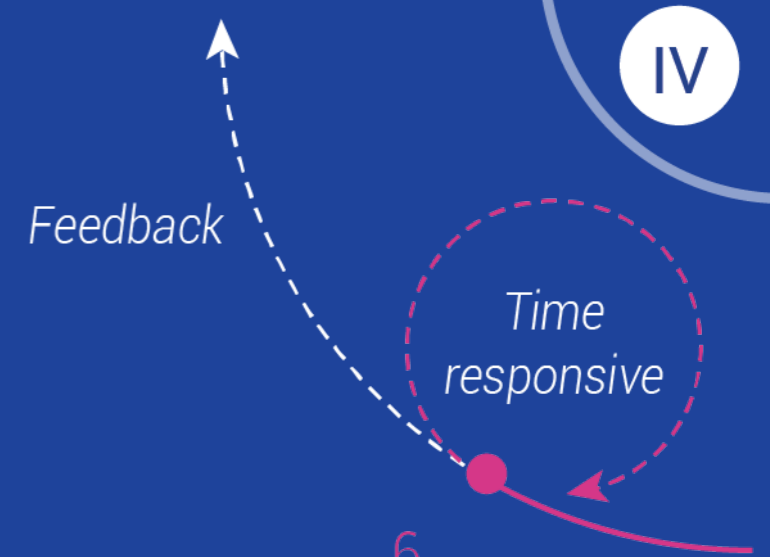


**Built area**  
acts as a functionality area with mainly urban area, transition depends on the condition of negotiation space

Phase 4: Strategy implementing



Step 6  
Implement adaptive  
design strategies at  
the local level



6  
Implement adaptive  
design strategies at  
the local level

# PHASE IV Strategy Implementing

第四阶段：策略实施

# Local intervention

本地干预措施

PHASE II

STEP 1

STEP 3

PHASE II

STEP 3

STEP 4

PHASE IV

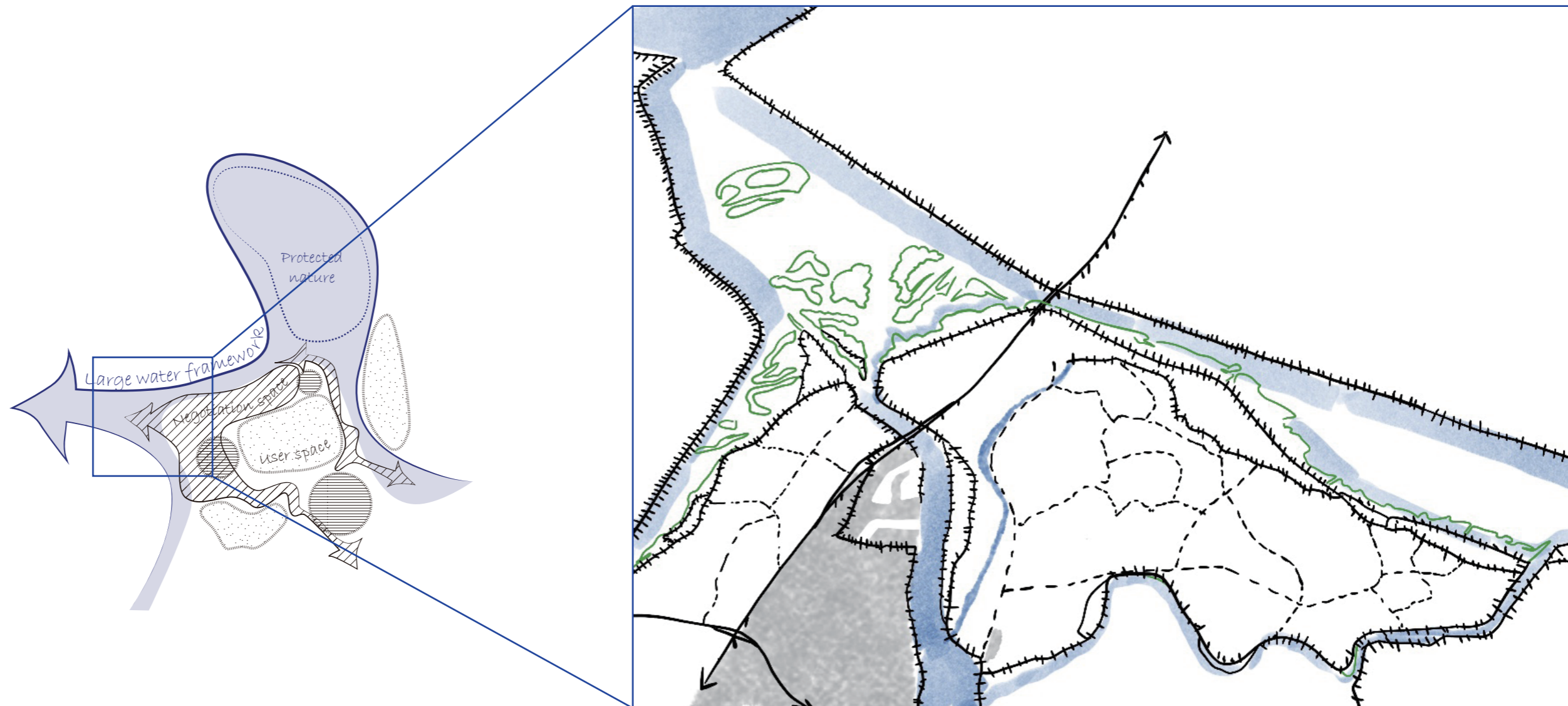
STEP 6

PHASE IV

Strategy Implementing

STEP 6

Implement adaptive design strategies at the local level



# Adaptive measures

## 适应性策略

PHASE II

STEP 1

STEP 3

PHASE II

STEP 3

STEP 4

PHASE IV

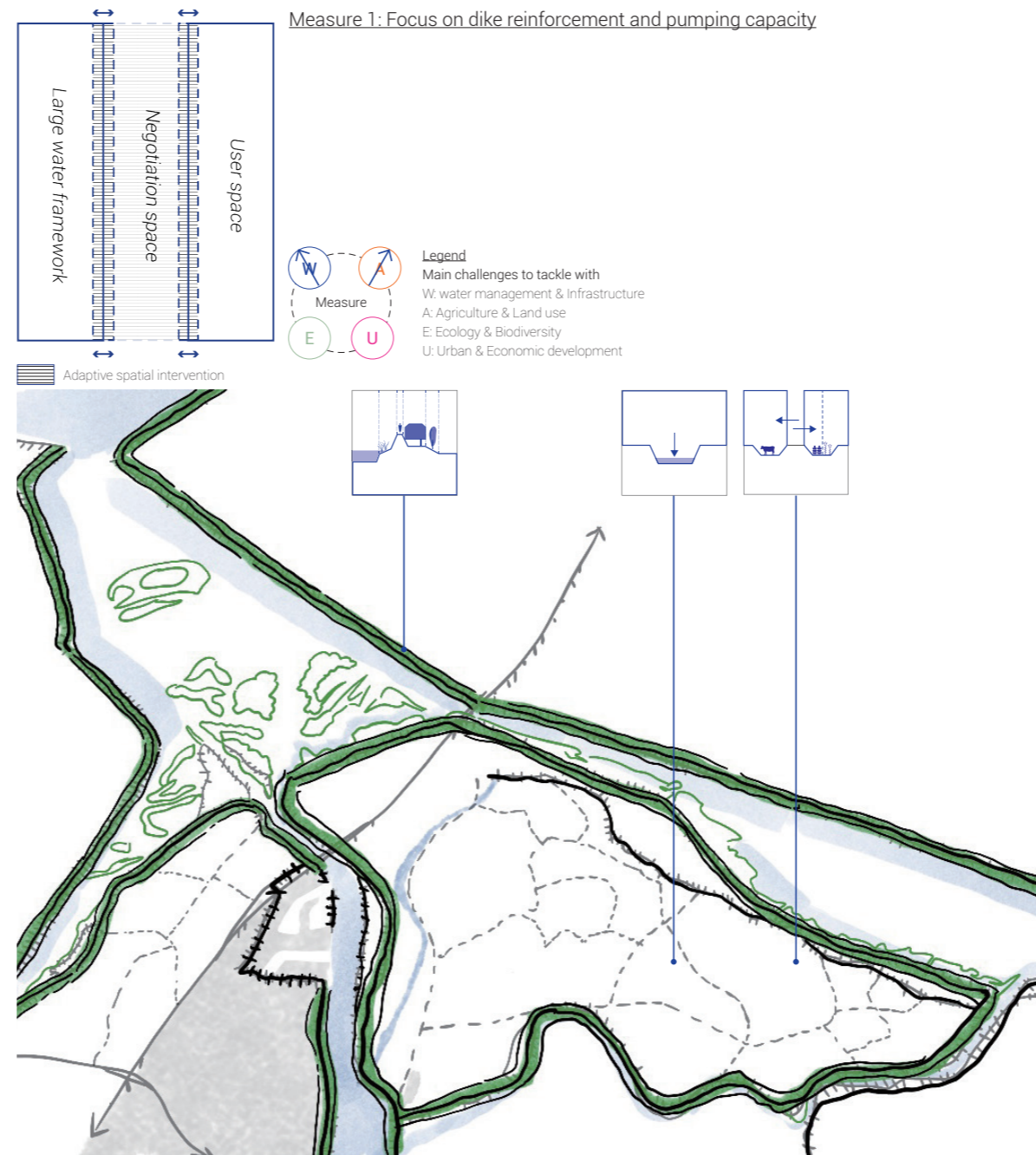
STEP 6

PHASE IV

Strategy Implementing

STEP 6

Implement adaptive design strategies at the local level



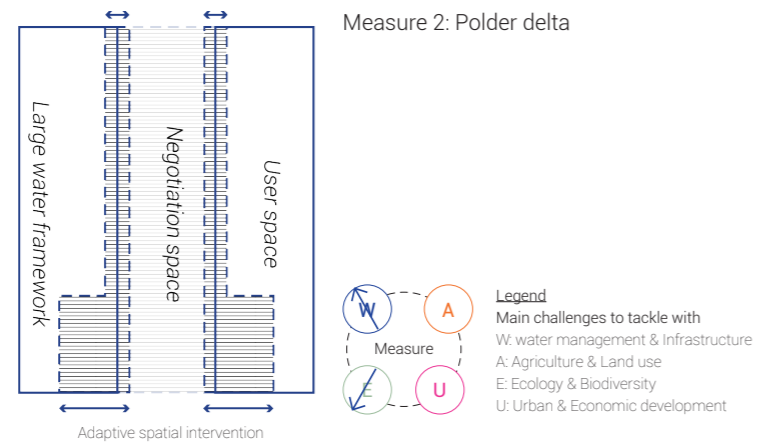
# Adaptive measures

## 适应性策略

PHASE II

STEP 1

STEP 3



PHASE II

STEP 3

STEP 4

PHASE IV

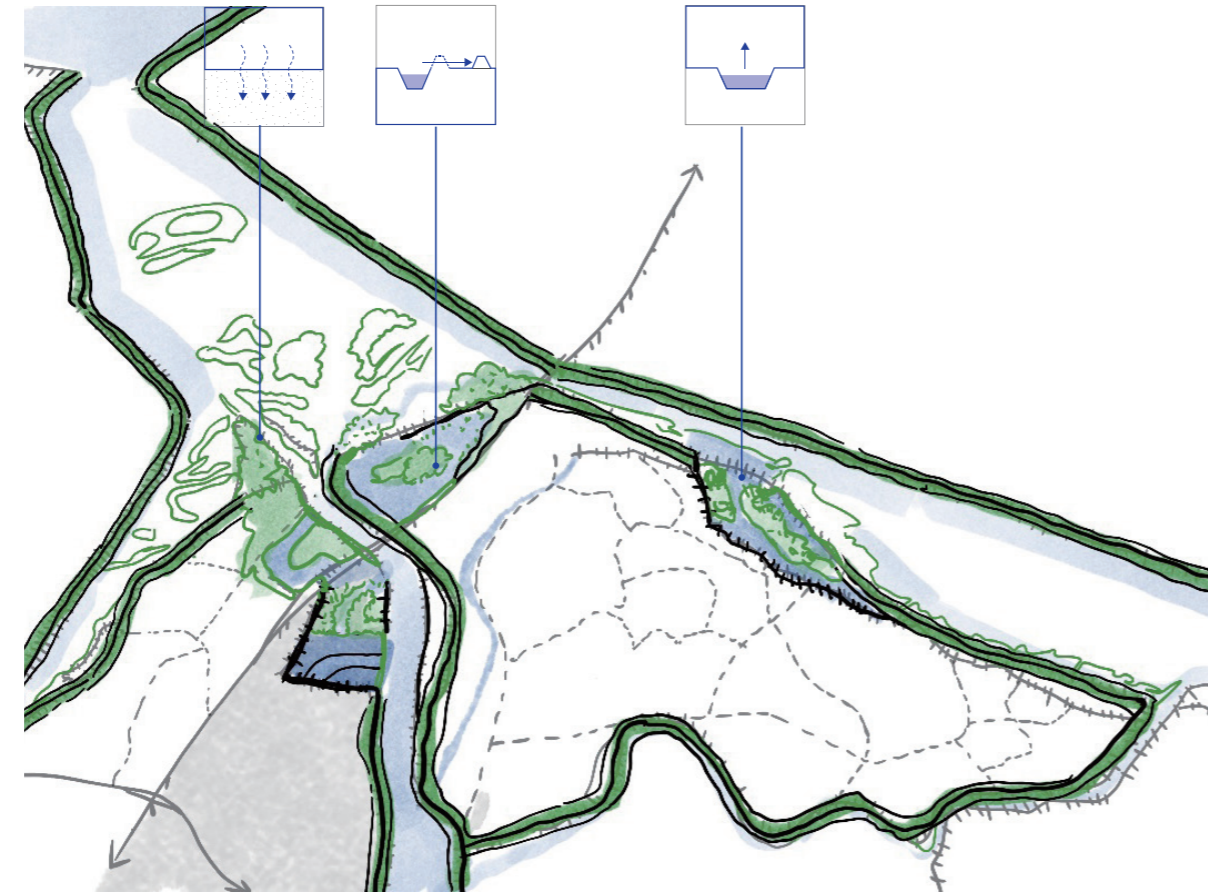
STEP 6

PHASE IV

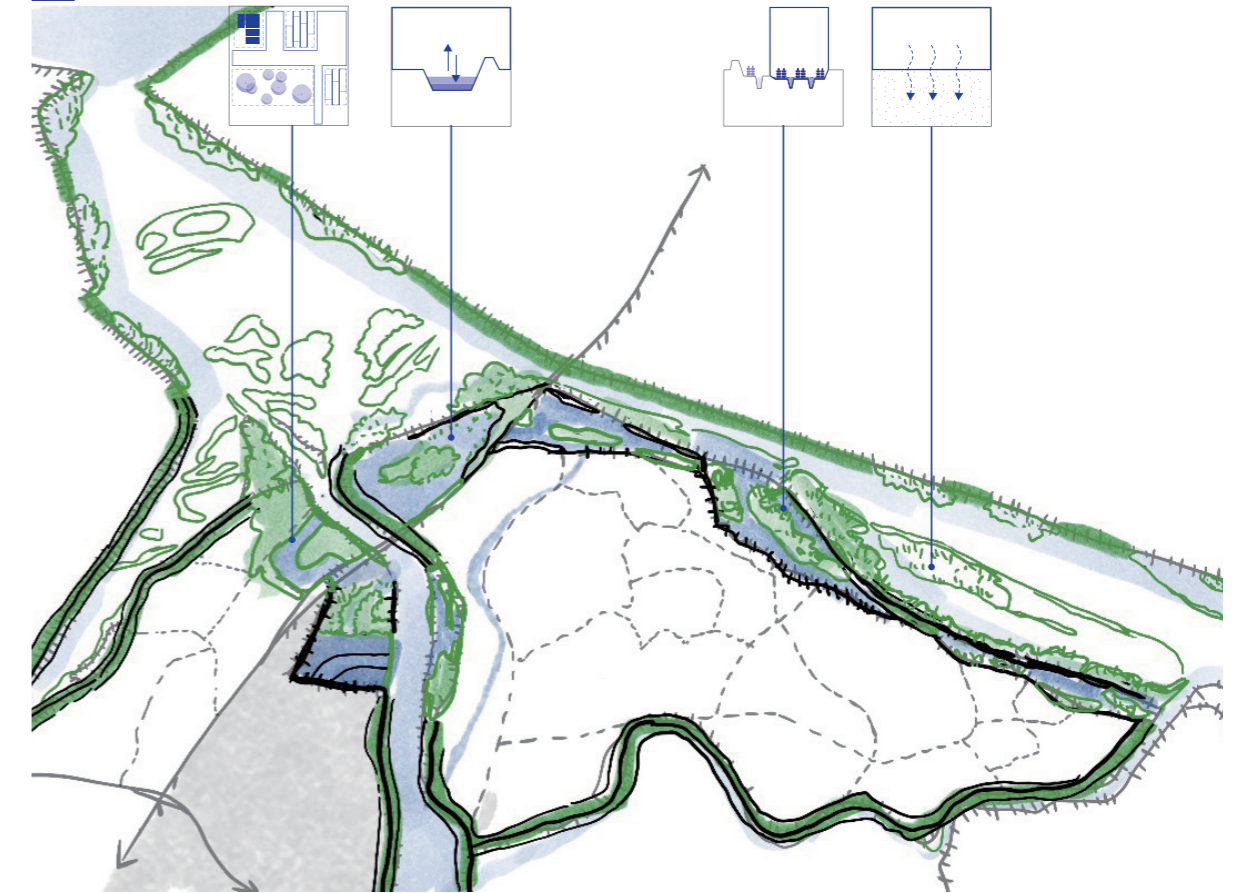
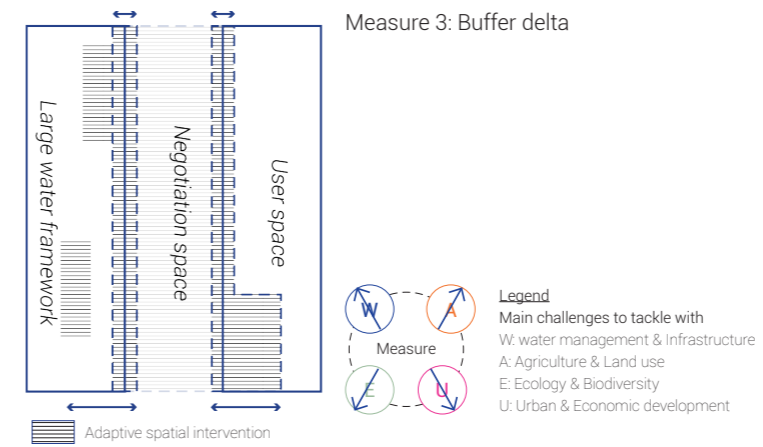
Strategy Implementing

STEP 6

Implement adaptive design strategies at the local level



Measure 3: Buffer delta



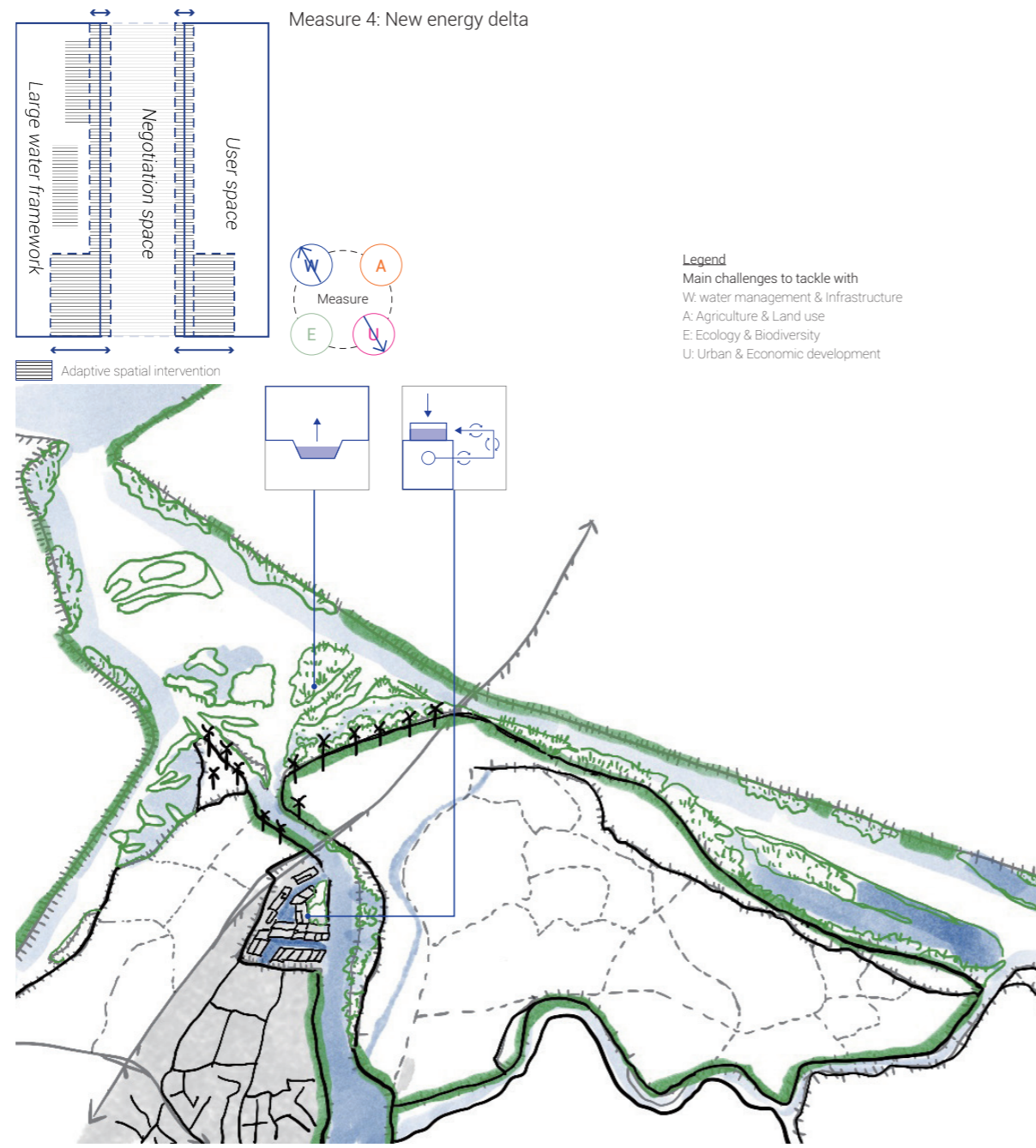
# Adaptive measures

适应性策略

PHASE II

STEP 1

STEP 3



PHASE II

STEP 3

STEP 4

PHASE IV

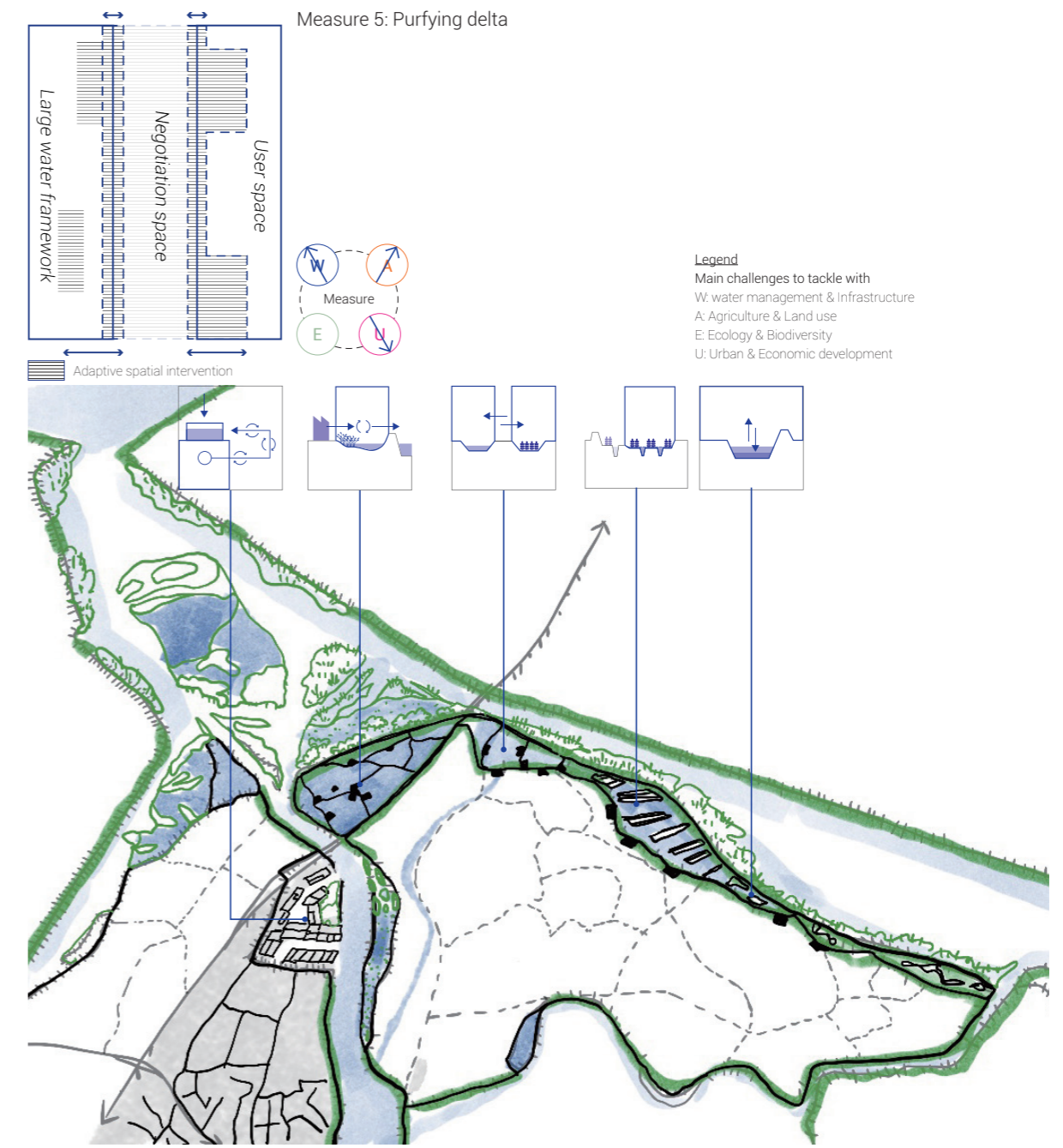
STEP 6

PHASE IV

Strategy Implementing

STEP 6

Implement adaptive design strategies at the local level



# Adaptive pathway and feedback

适应性路径和反馈

PHASE II

STEP 1

STEP 3

PHASE II

STEP 3

STEP 4

PHASE IV

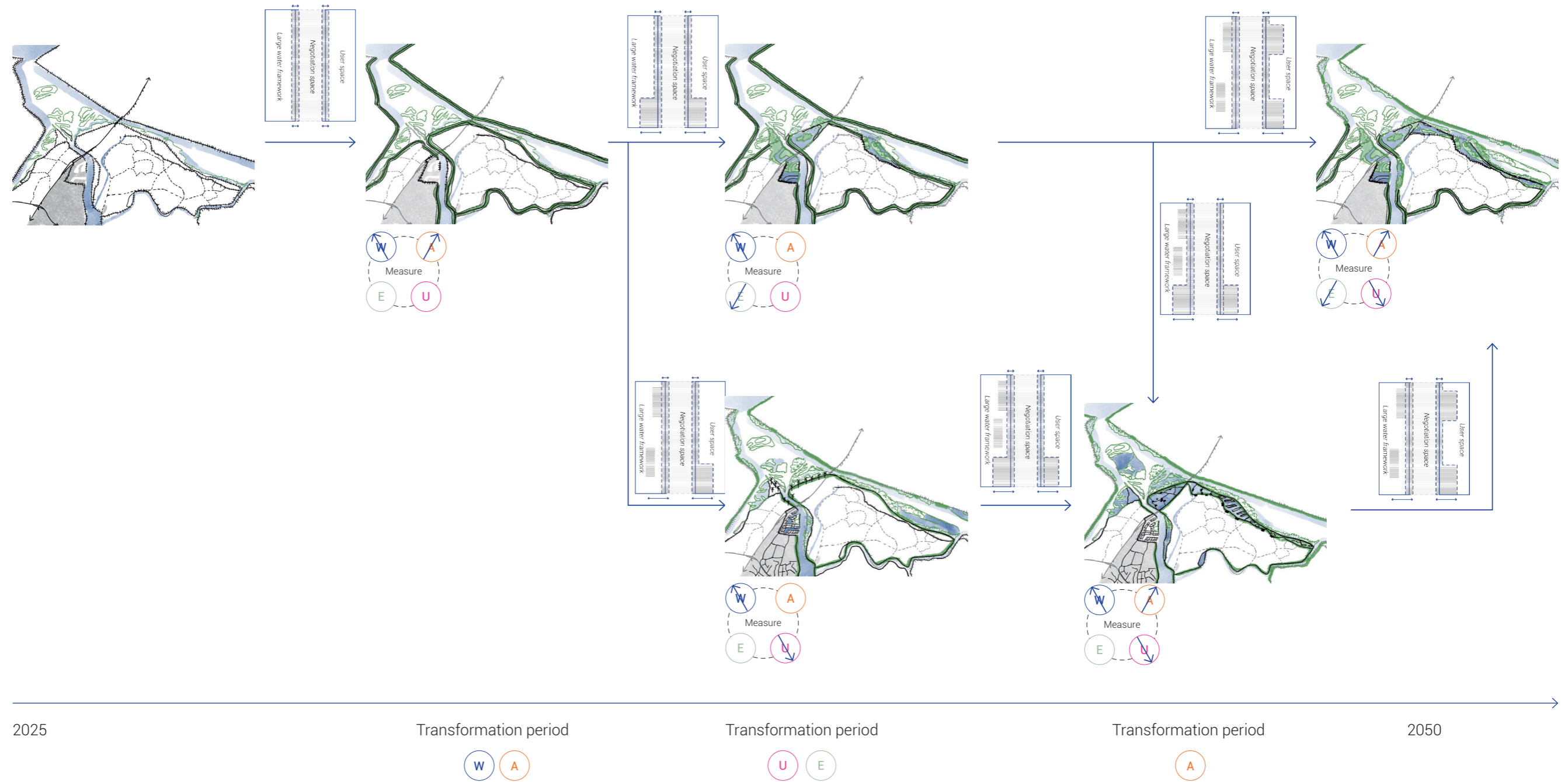
STEP 6

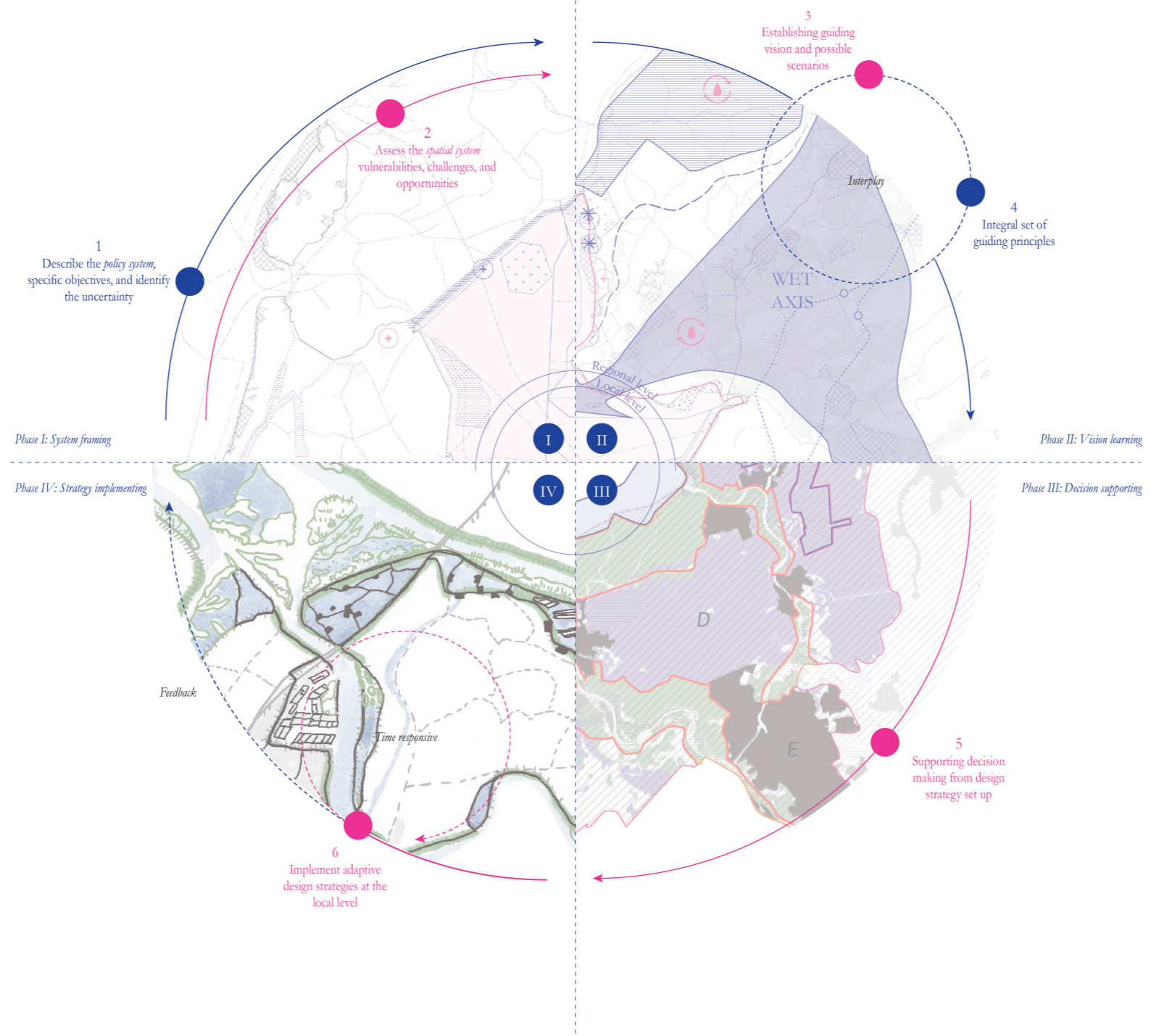
PHASE IV

Strategy Implementing

STEP 6

Implement adaptive design strategies at the local level







*"Water is the connecting element."  
-Agenda IJsselmeer Area 2050-*