BREATHING LAKE

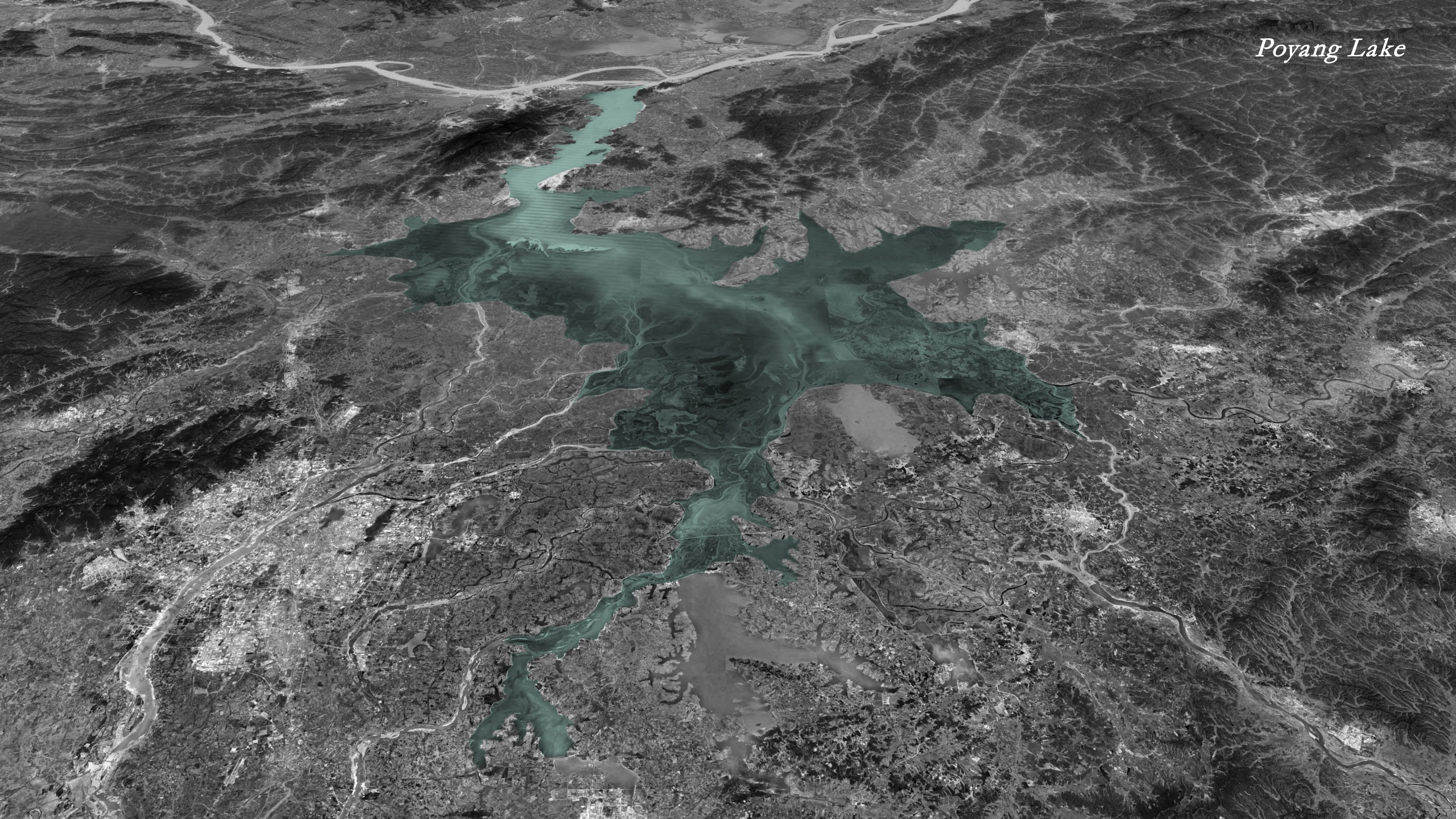
A RURAL ADAPTIVE SELF-CIRCULATING NATURAL-SOCIAL SYSTEM WELCOMING WATER DYNAMICS

Antong Huang

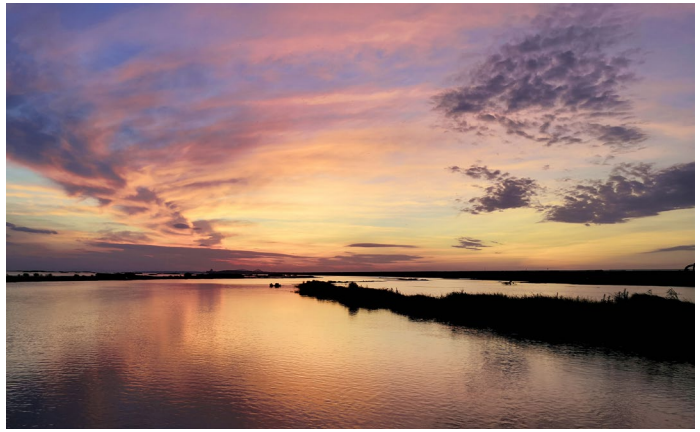
Circular Water Stories

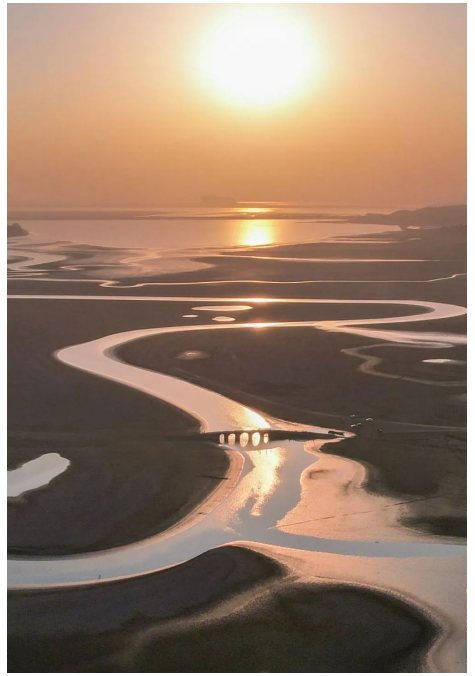
First mentor: Inge Bobbink
Second Mentor: Ulf Hackauf

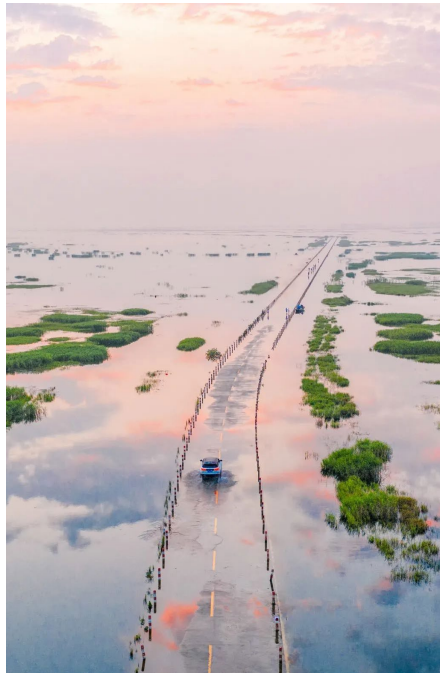
2024


Poyang Lake

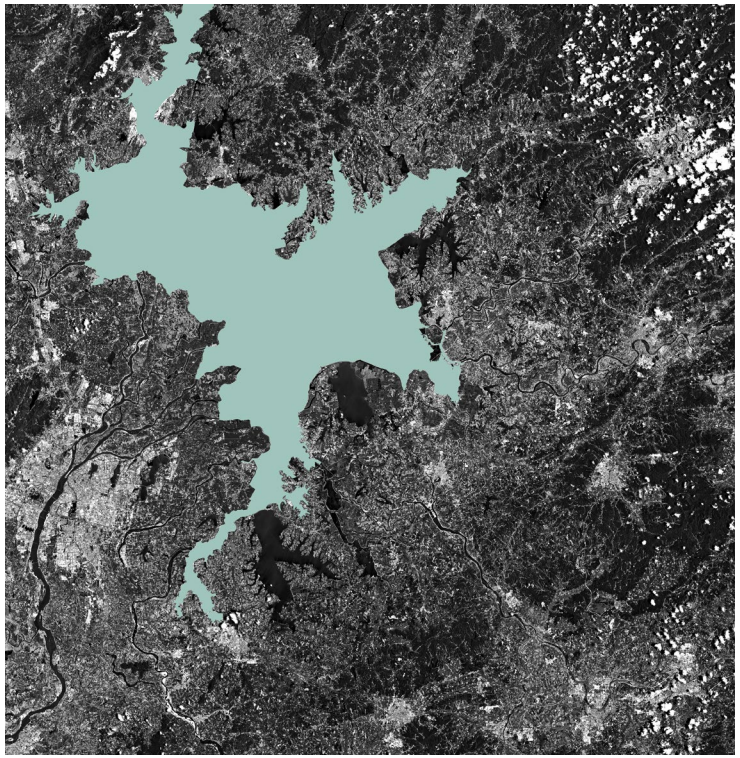
Fascinations: Nature's Vastness

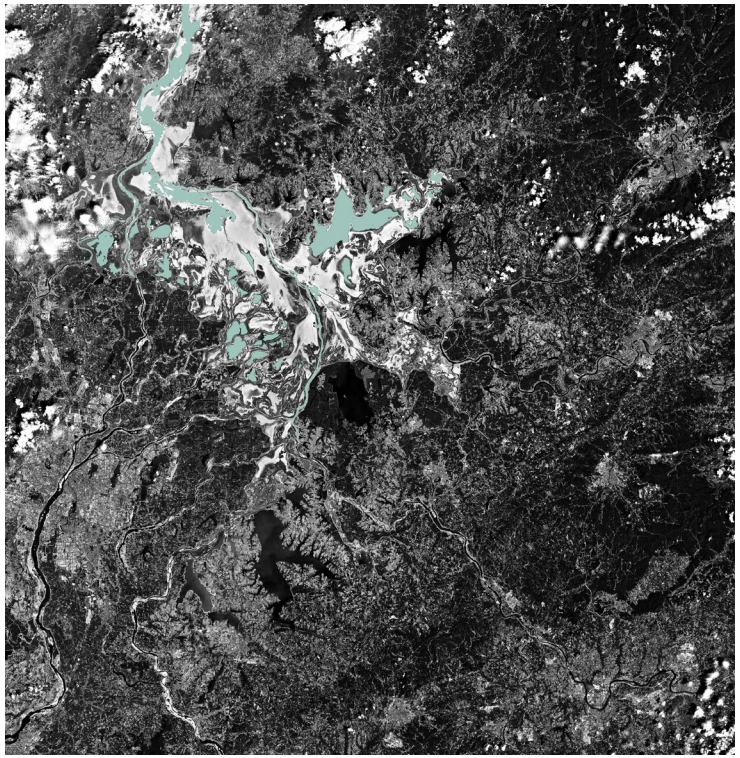


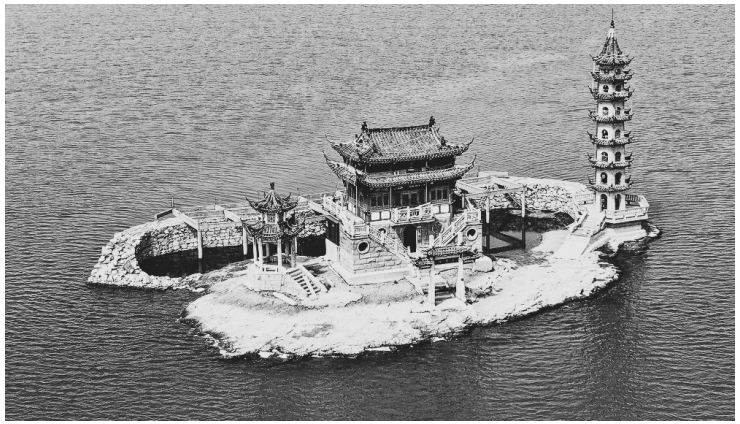




Fascinations: A Lake with Grace and Danger

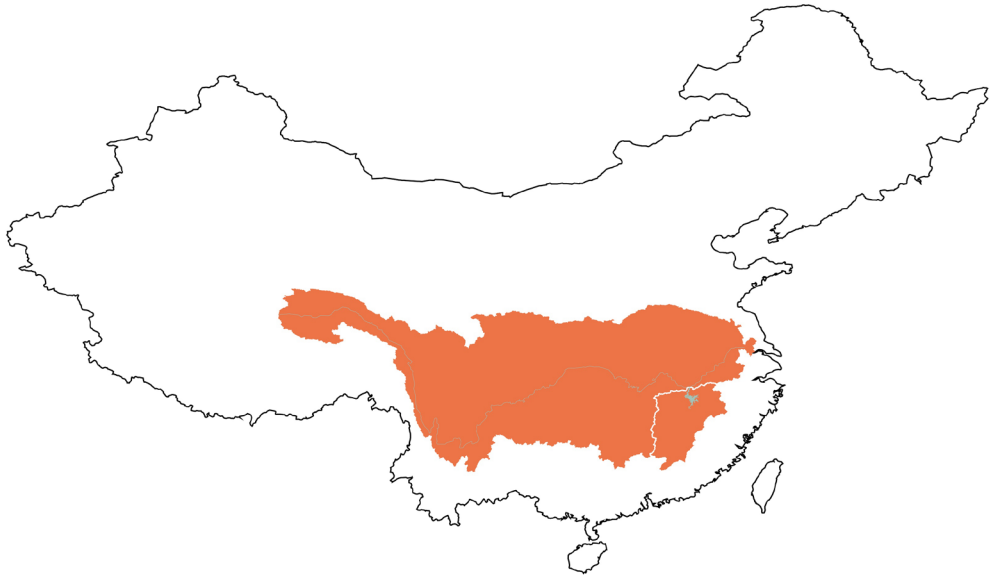




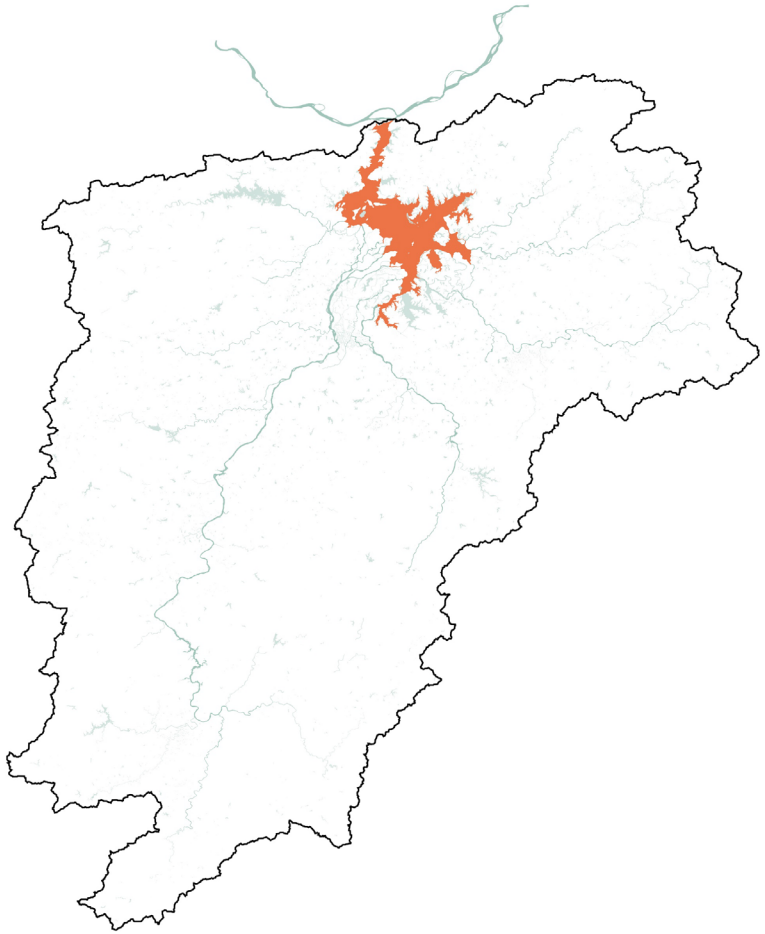


Fascinations: Living by the Water

Location

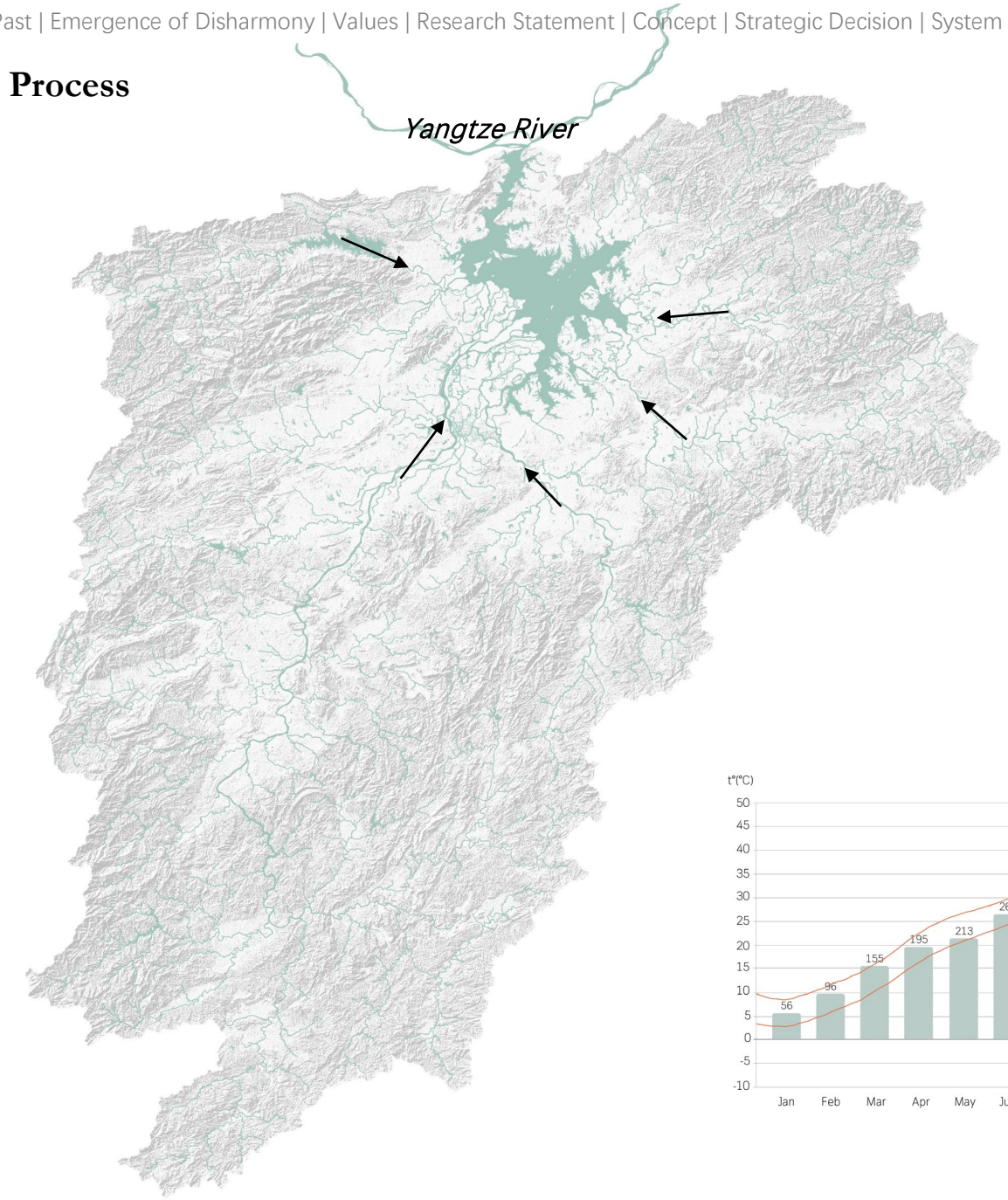


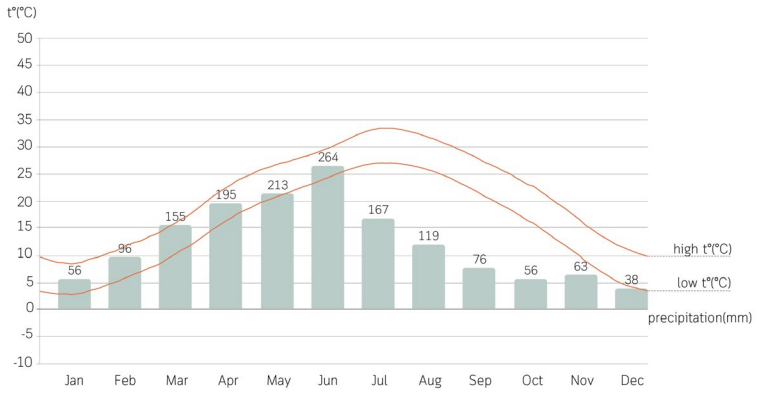
Yangtze River Basin, China



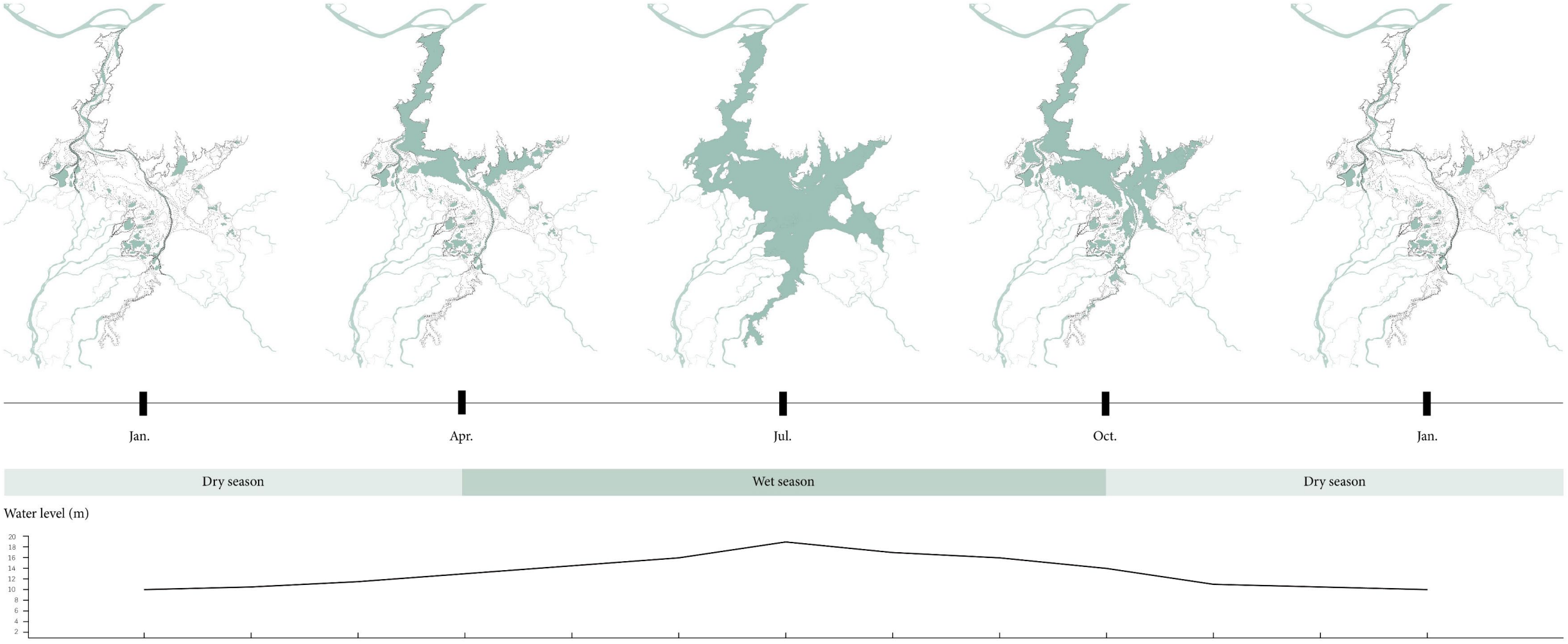
Poyang Lake Basin

Seasonality / Hydrological Process

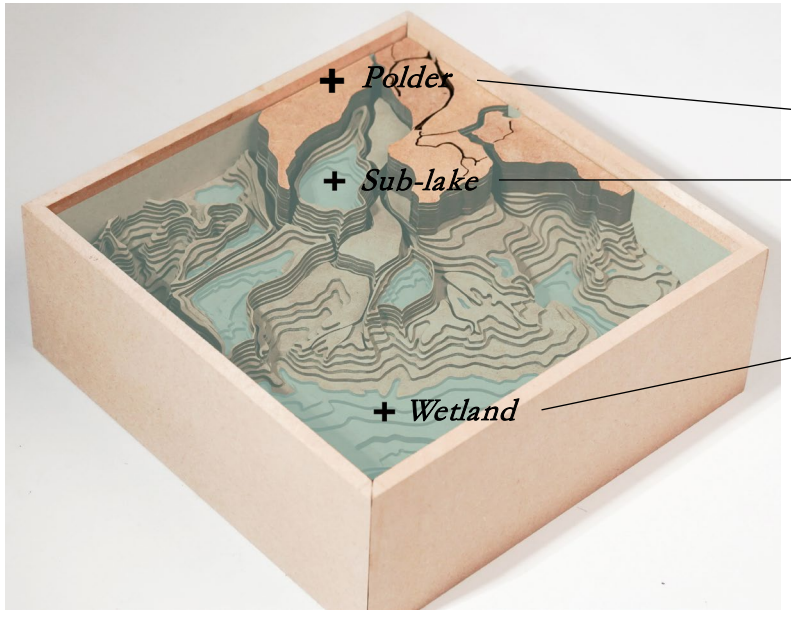


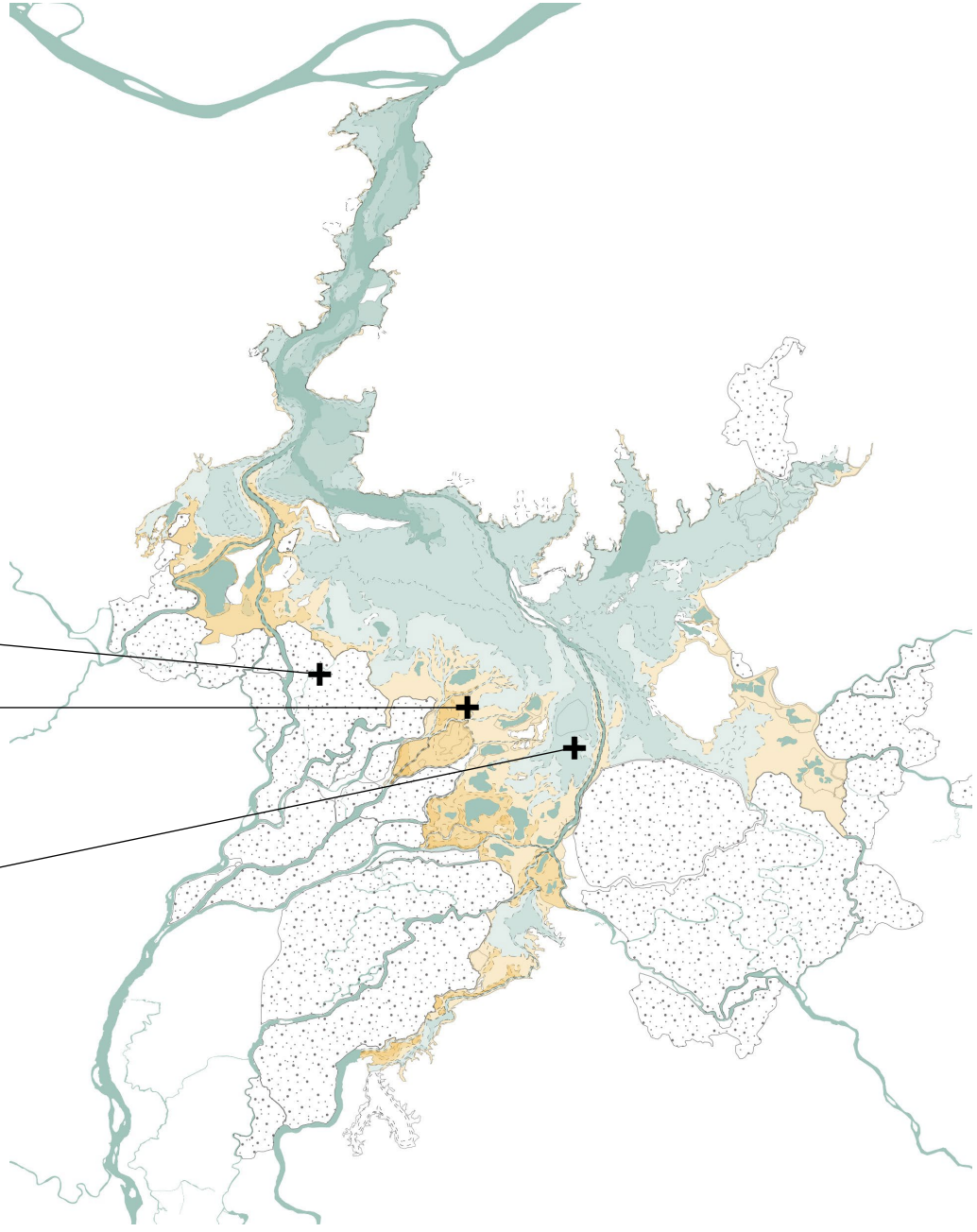


Seasonality / Hydrological Process



Typical Lake Topography & Landscapes



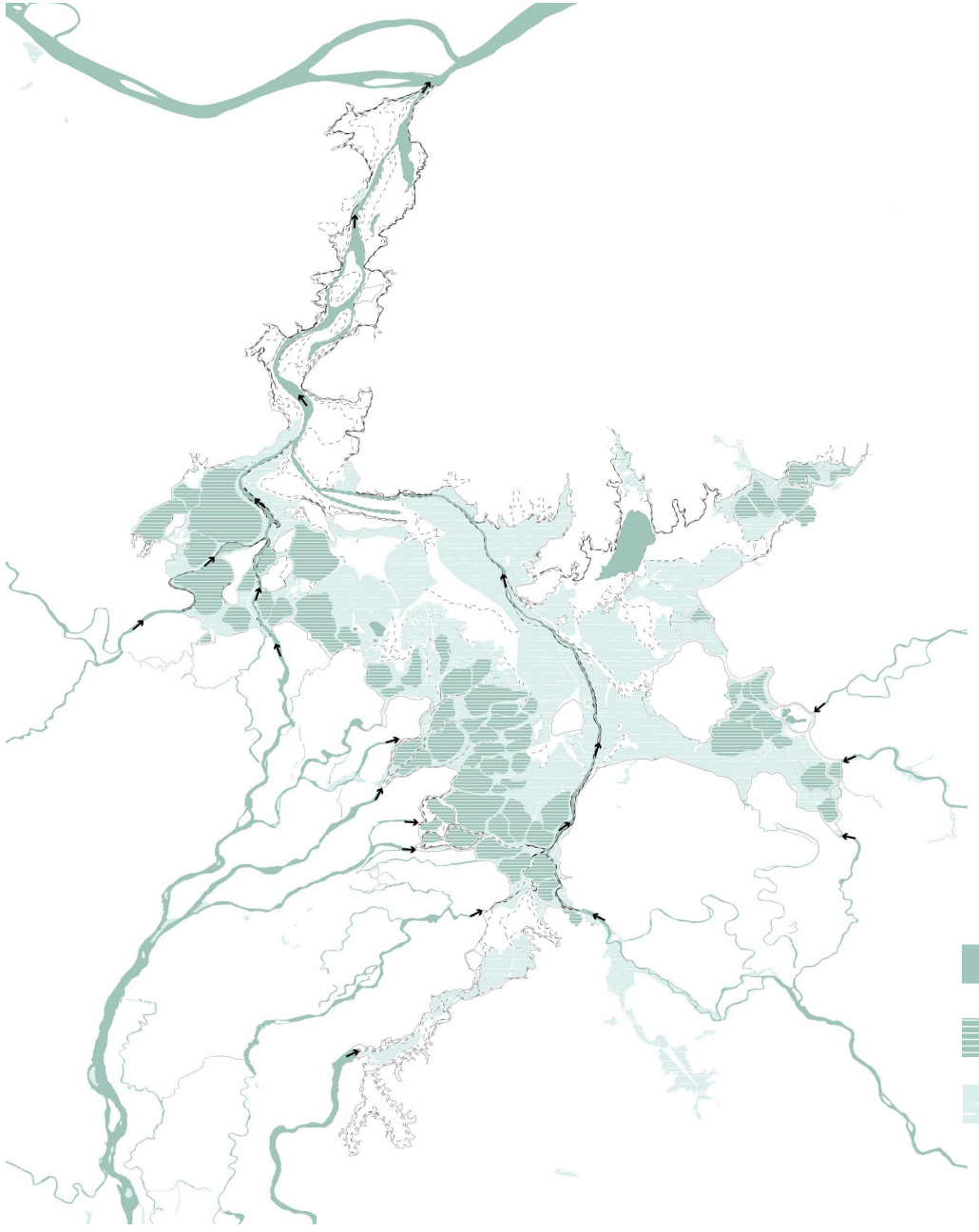


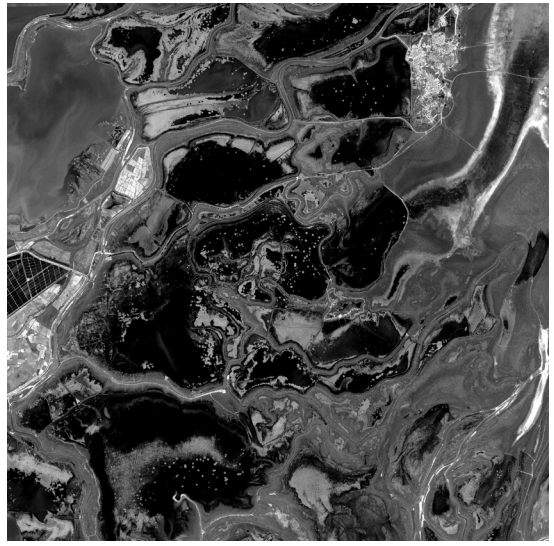
Wet Season: Agriculture

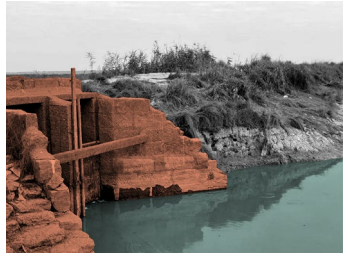
Water

Polder: agriculture

Dry Season: Fishery



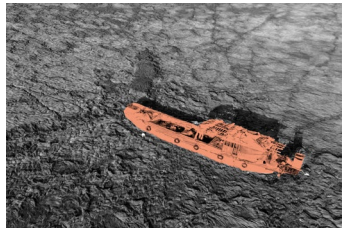




1 Build the dike and sluice

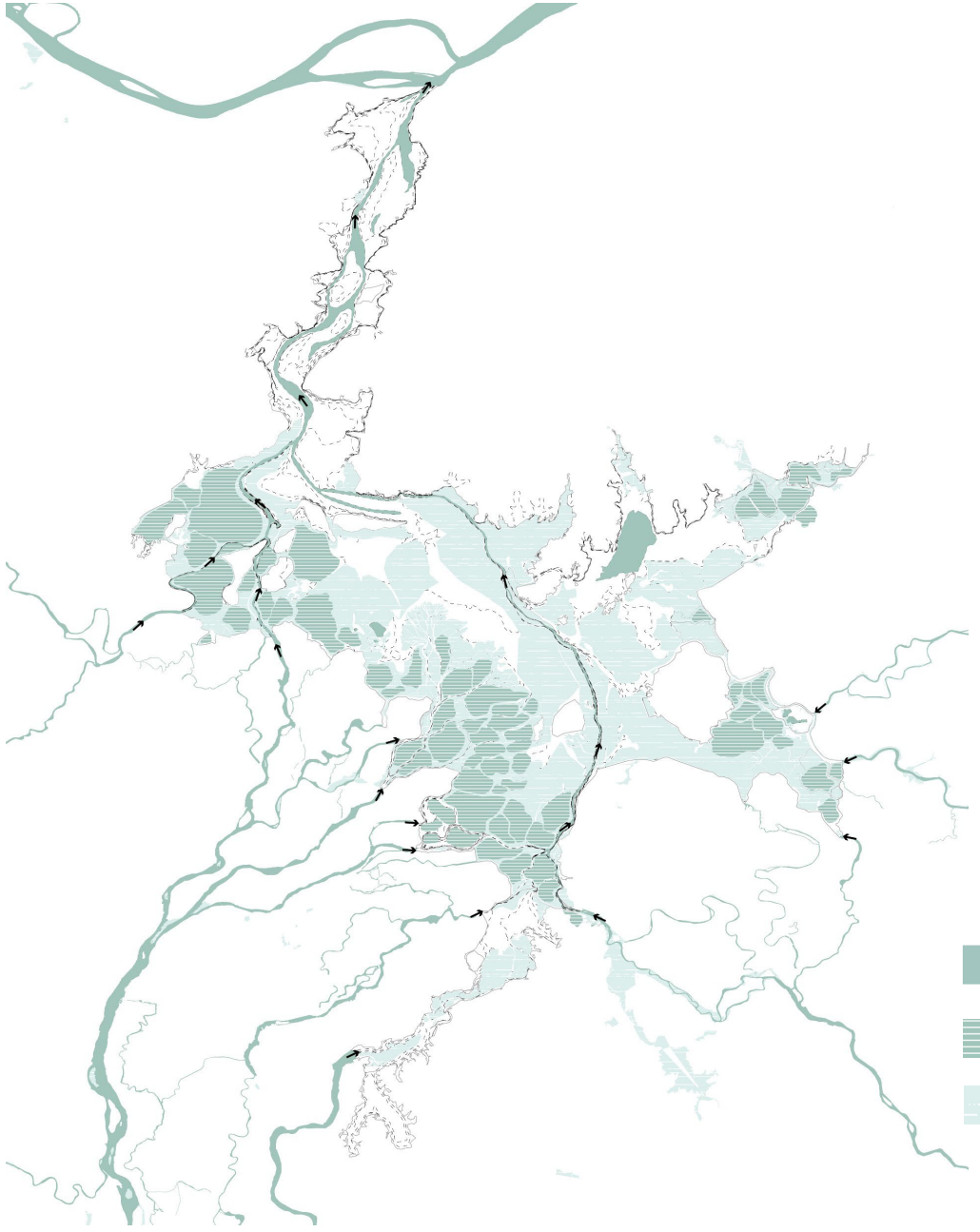
2 Open fishing for bigger fishes

3 Drain the lake to catch the remaining fish

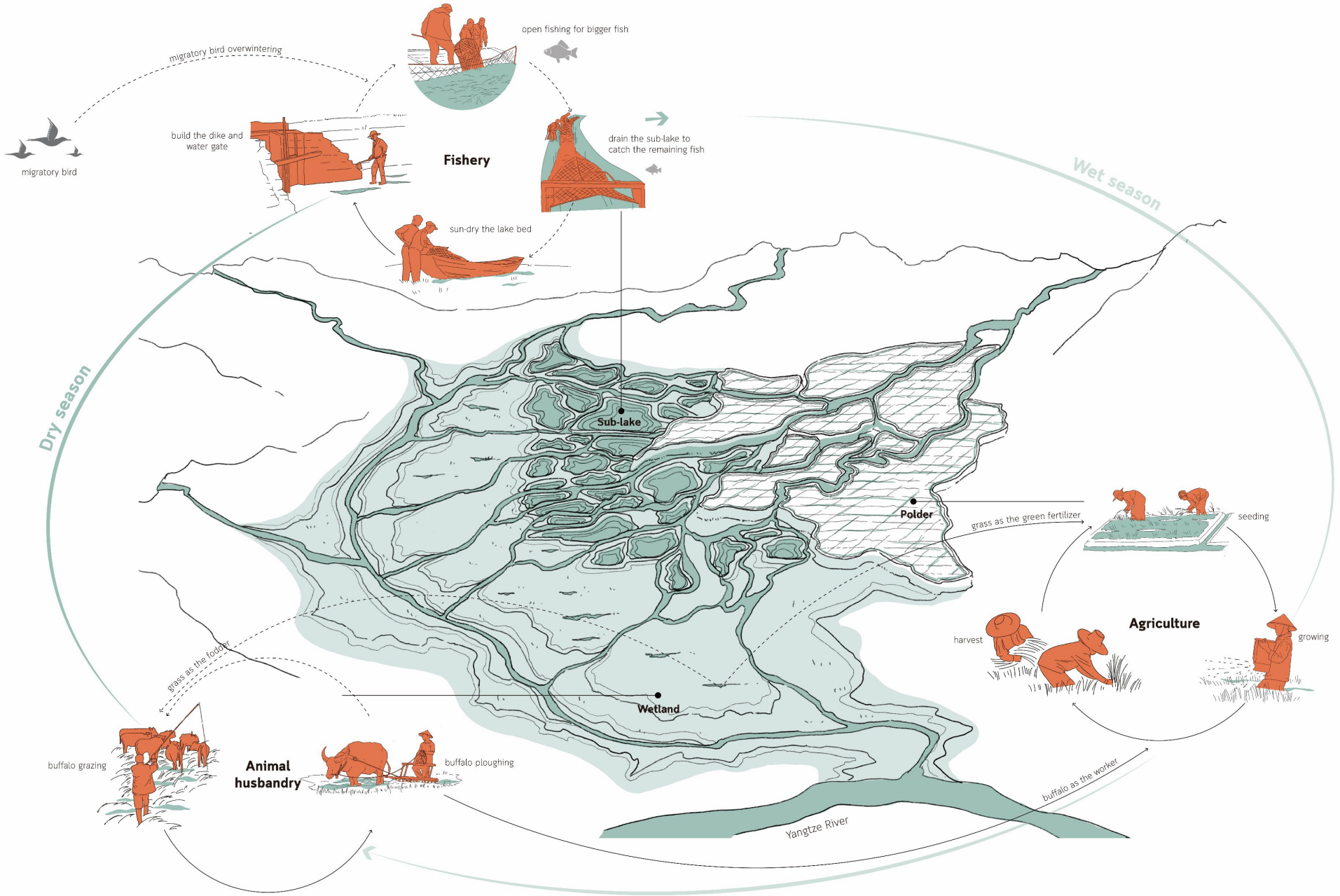


4 Sun-dry the lake bed

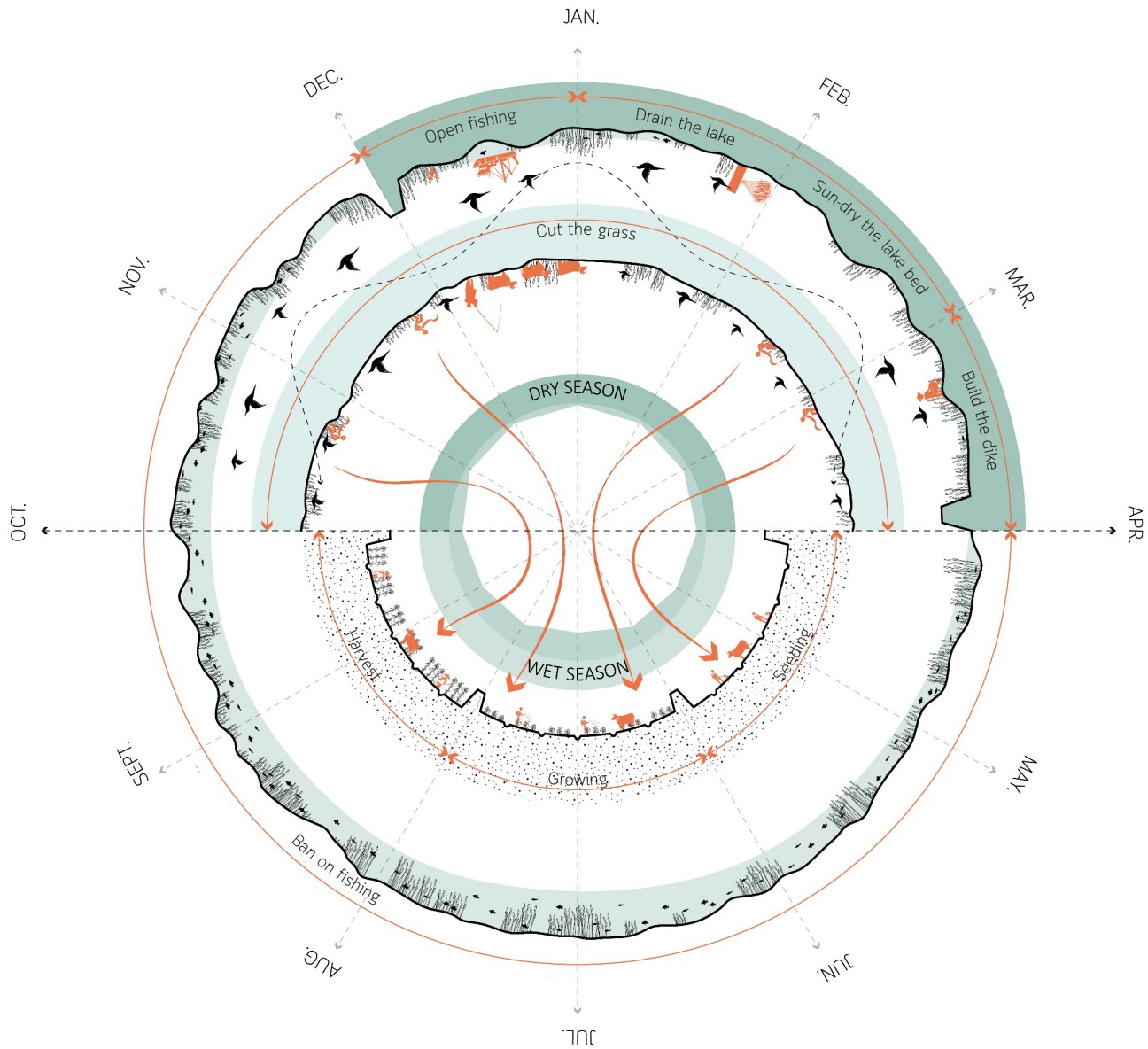
Dry Season: Animal Husbandry



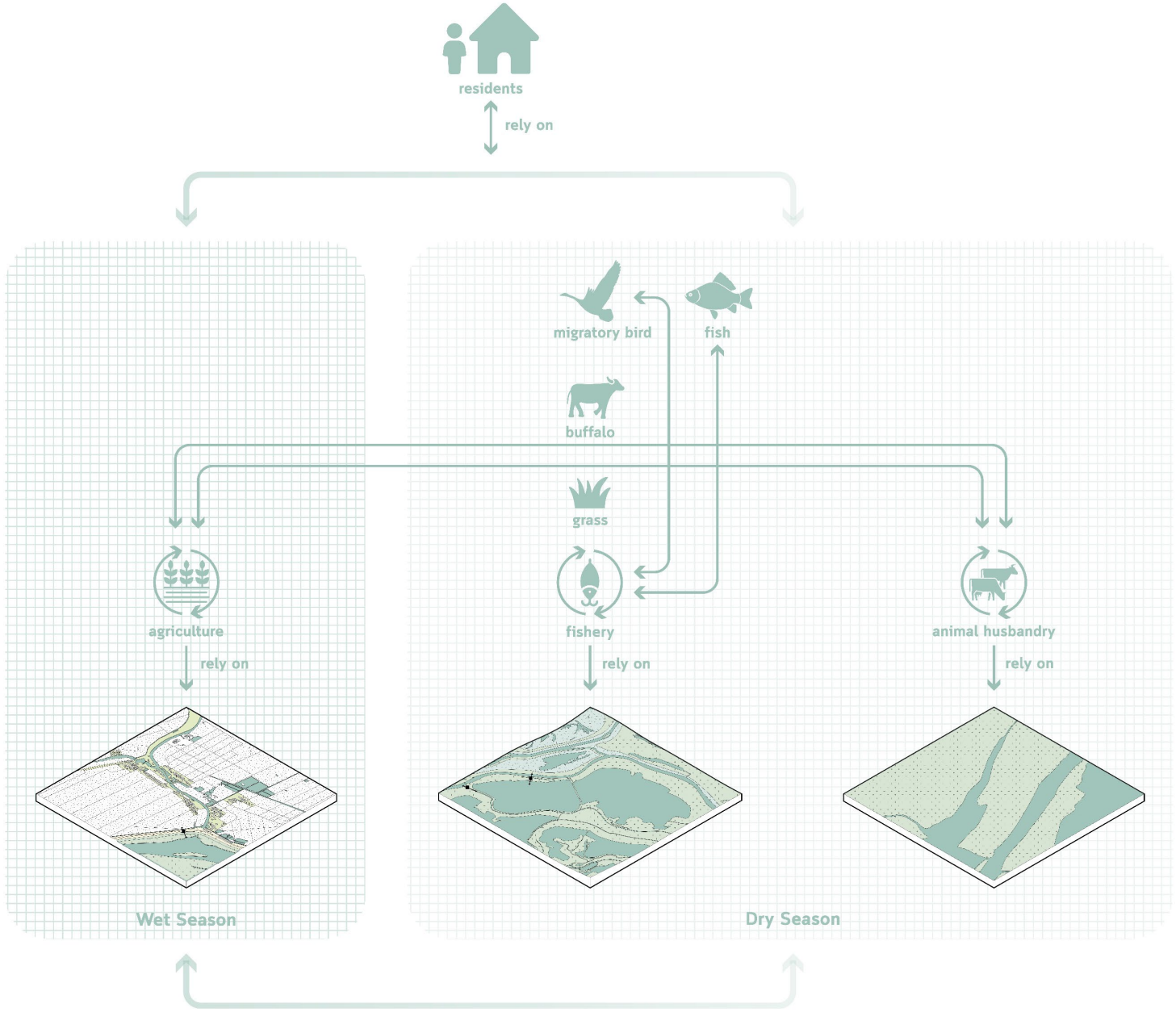
Traditional Water System

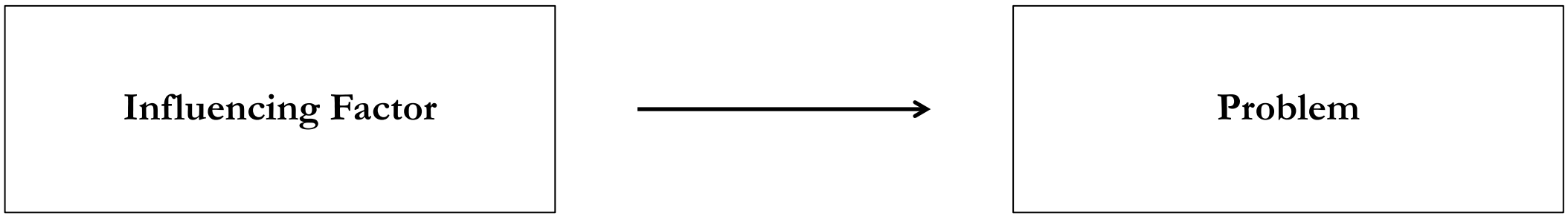


Water Rhythm



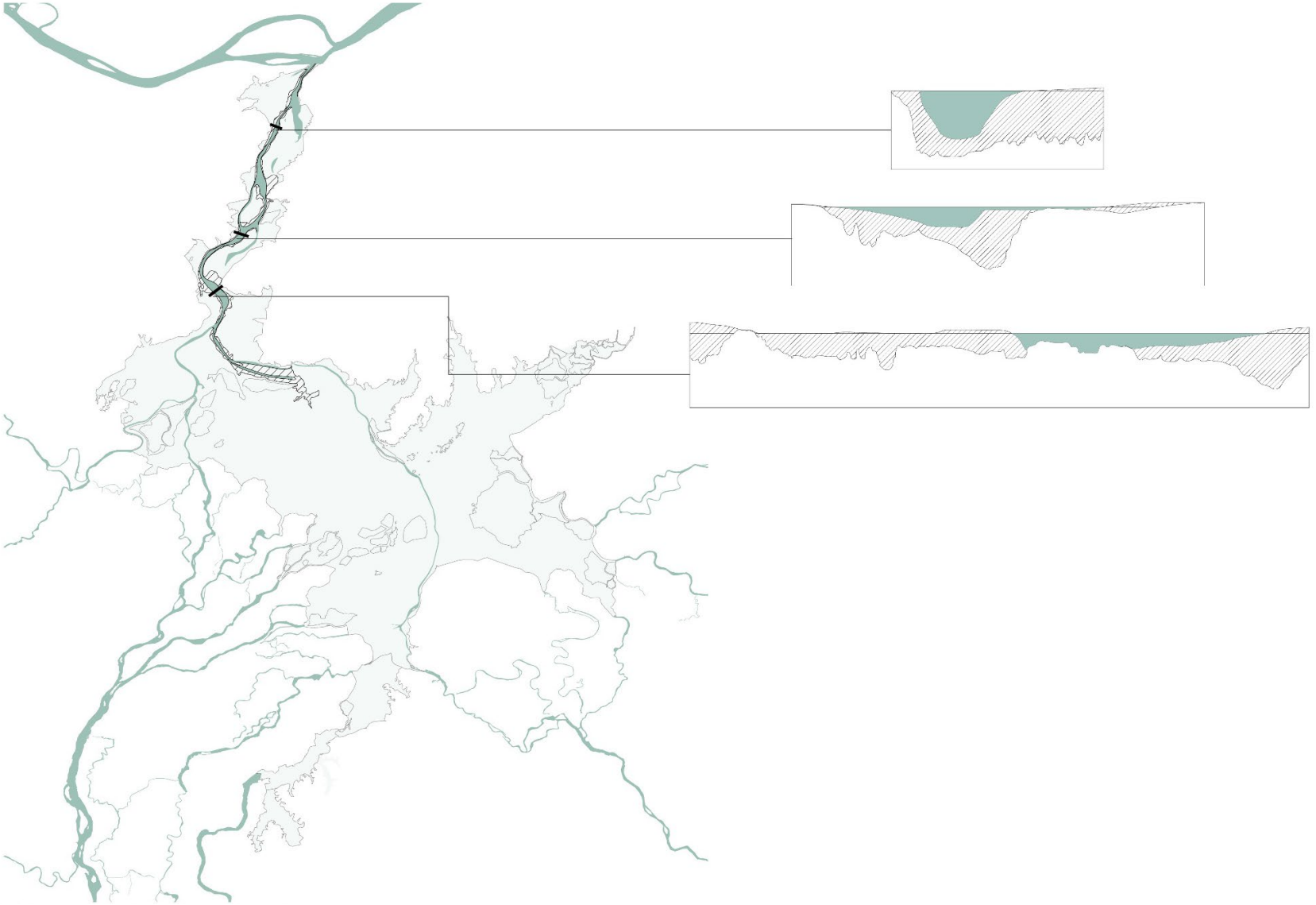
Original Cycle



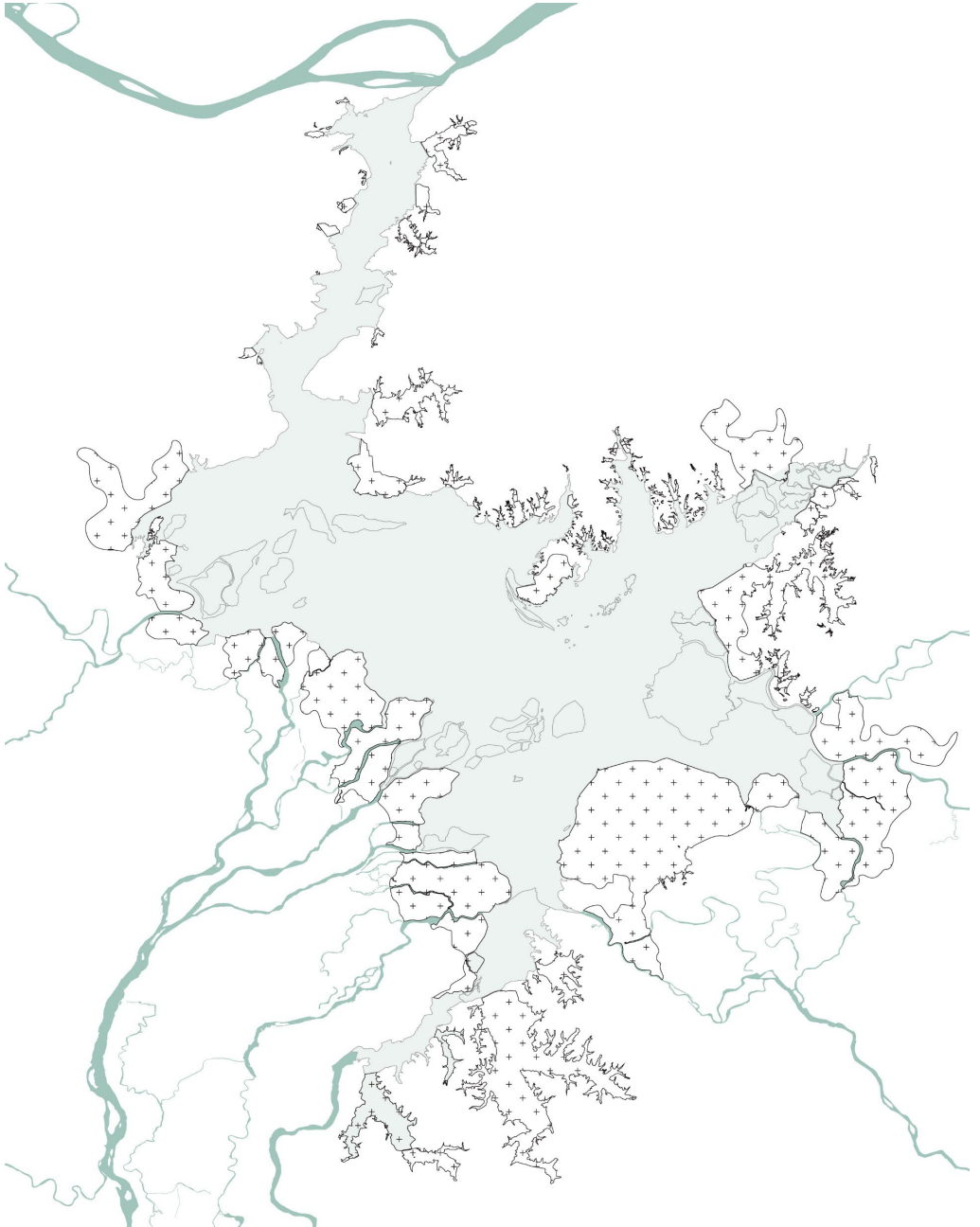

Influencing Factor
Problem

Influencing Factor1: Construction of Three Gorges Dam

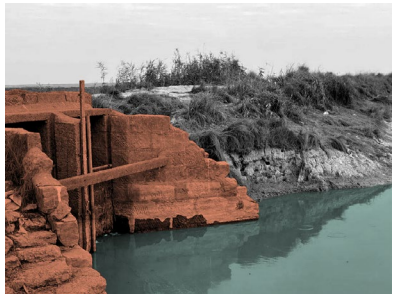
Influencing Factor2: Sand Mining



Influencing Factor3: Land Reclamation



Influencing Factor4: Over-use of Fish Stocks



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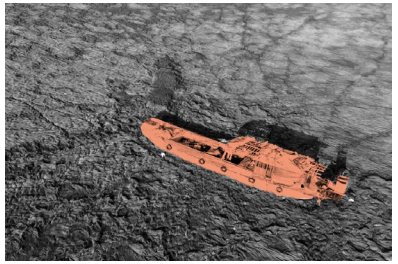

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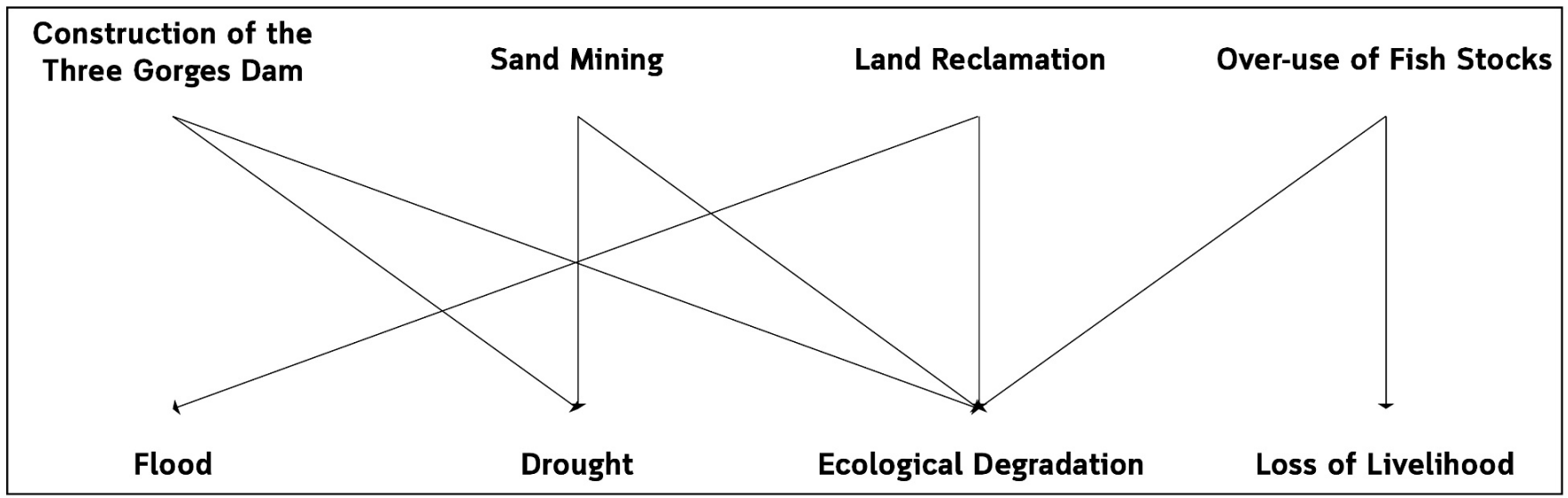
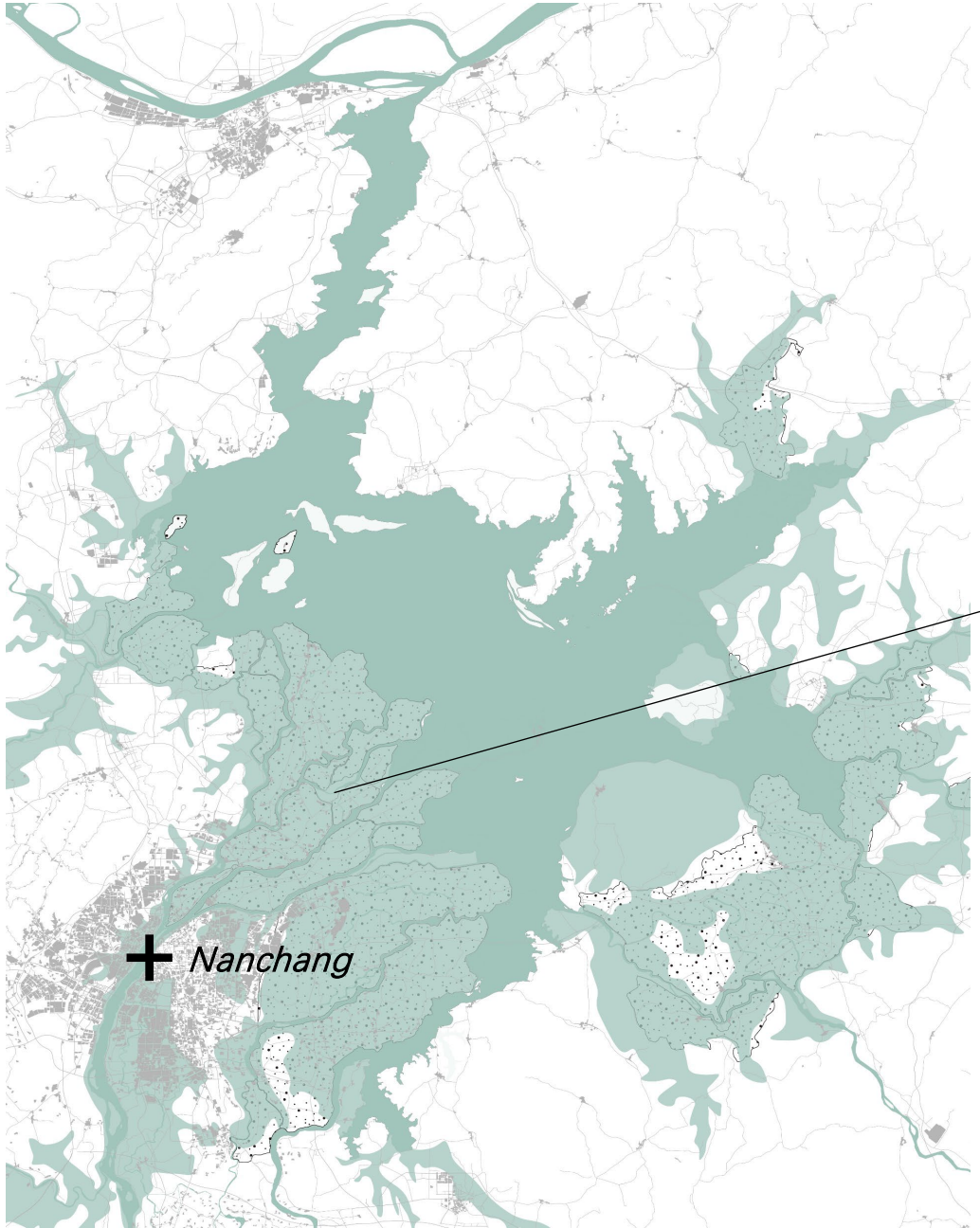
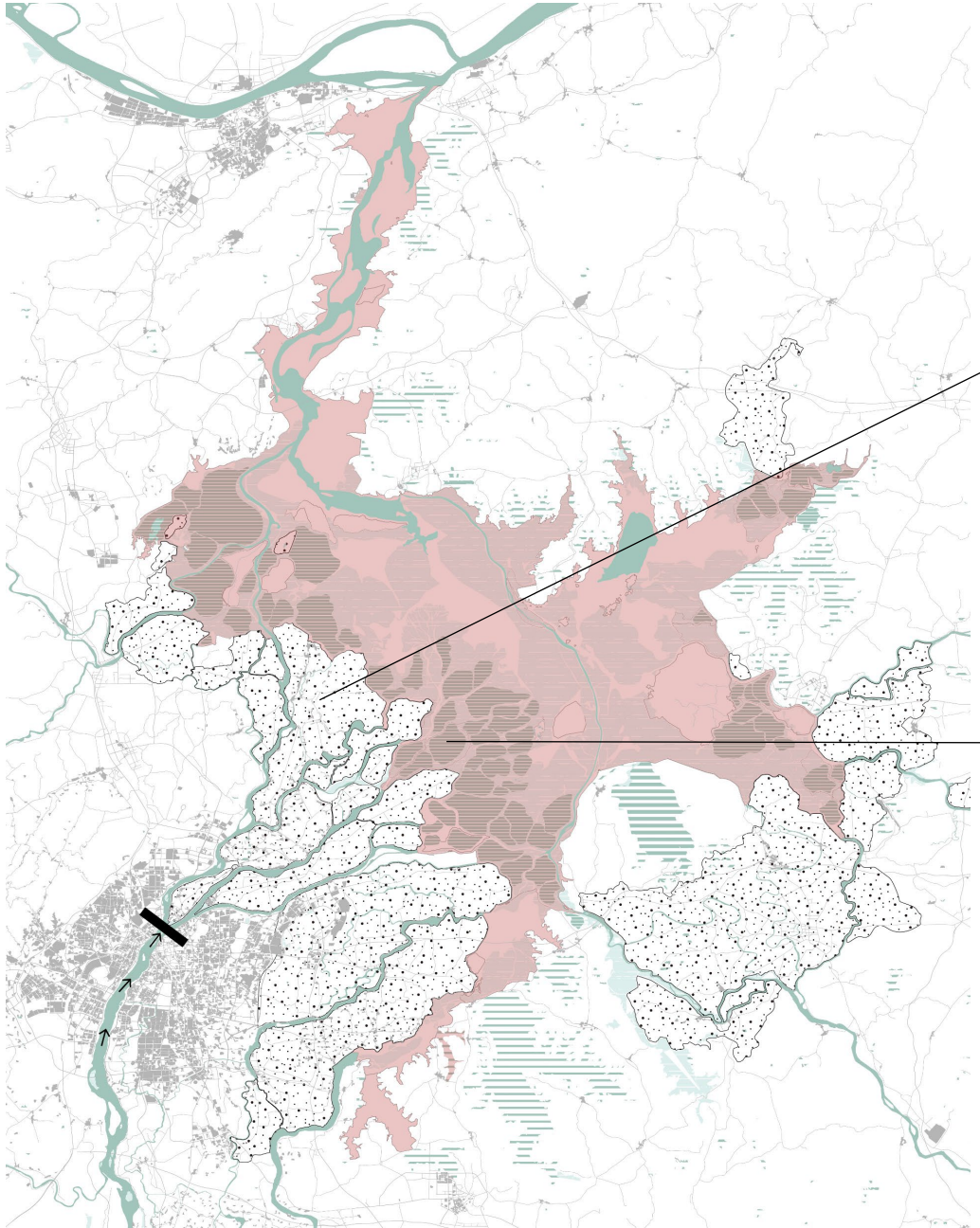

Construction of the Three Gorges Dam
Sand Mining
Land Reclamation
Over-use of Fish Stocks
Flood
Drought
Ecological Degradation
Loss of Livelihood

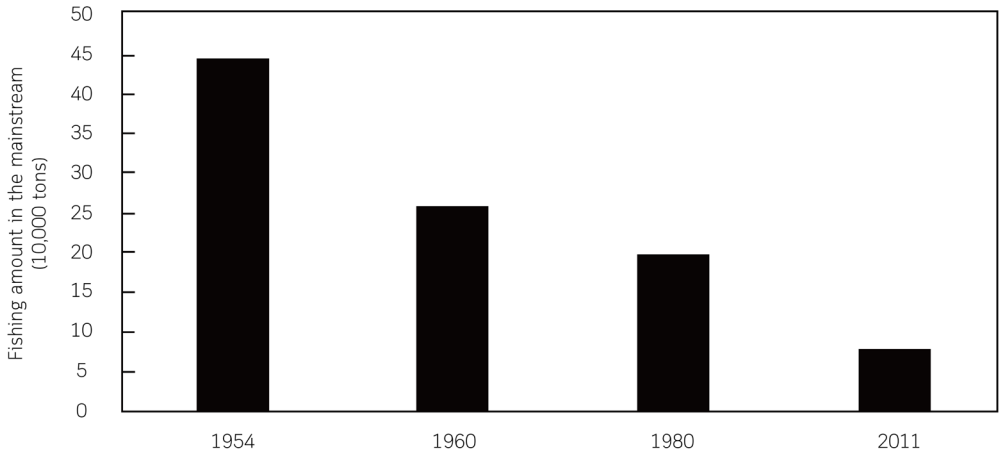
Problem1: Flood



Problem2: Drought



Problem3: Ecological Degradation



Problem4: Loss of Livelihood

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China to push 10-year fishing ban in Yangtze waters

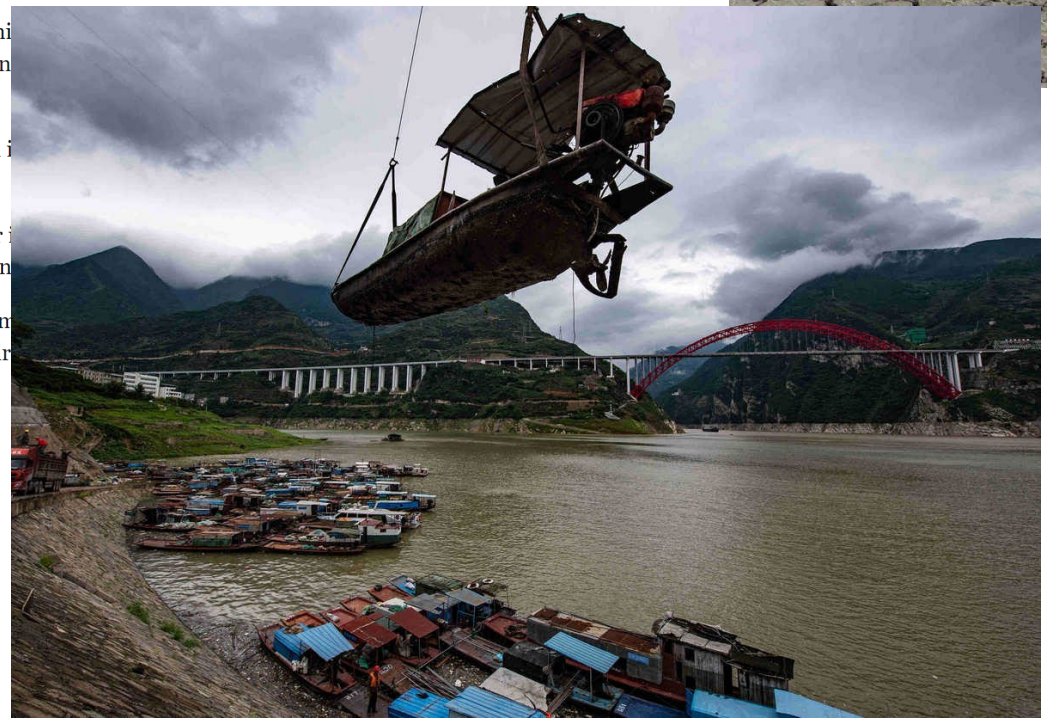
Updated: March 21, 2024 21:41 english.www.gov.cn

The State Council rolled out a guideline for further implementing the 10-year fishi
accelerate the ecological restoration of aquatic biodiversity and water environmen
21.

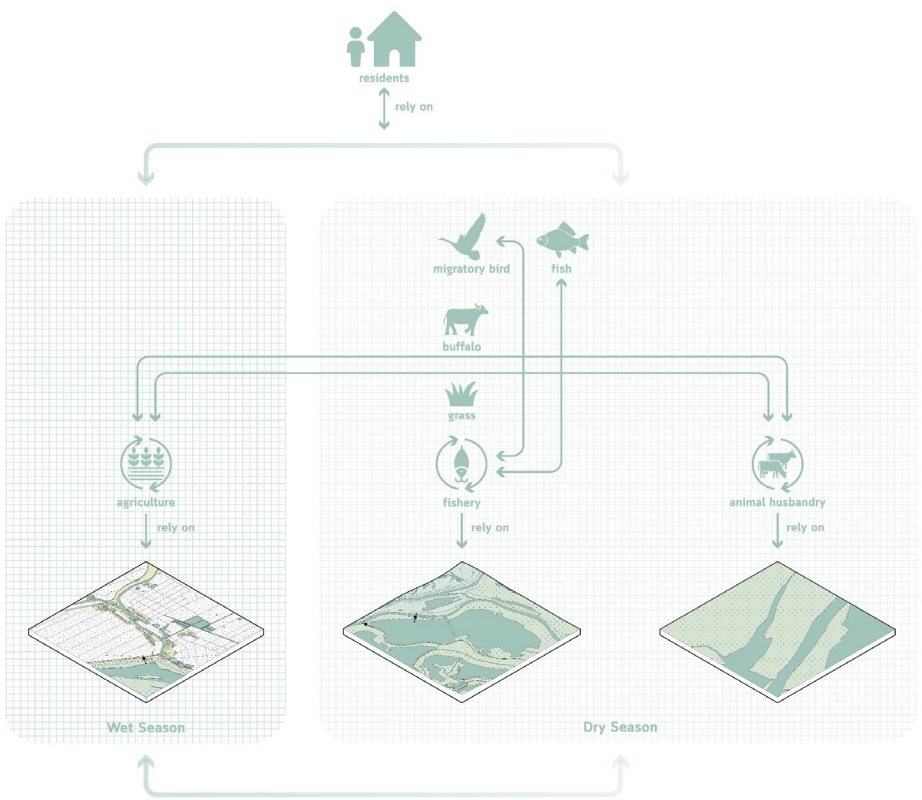
Relevant local governments at all levels should bear the primary responsibility in i
major political task, the circular said.

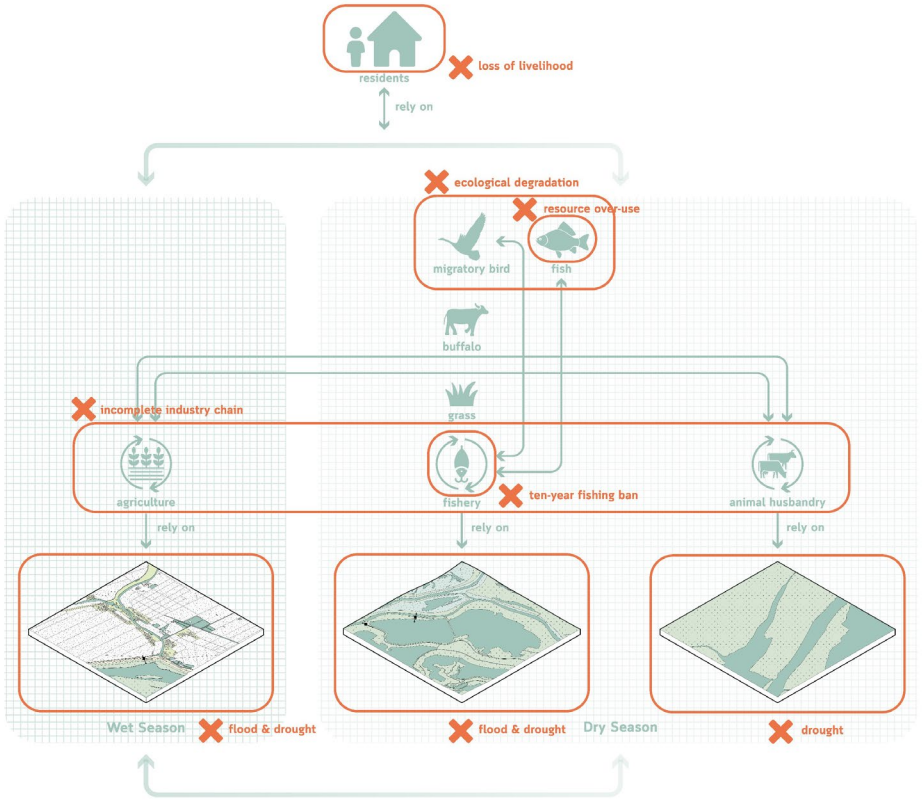
The Ministry of Agriculture and Rural Affairs should work together with member
to supervise and guide the work of resettling retired fishermen, monitoring law en

The circular also urged establishing a dynamic and targeted assistance mechanism
fishermen in need and intensifying efforts to provide employment services to retir

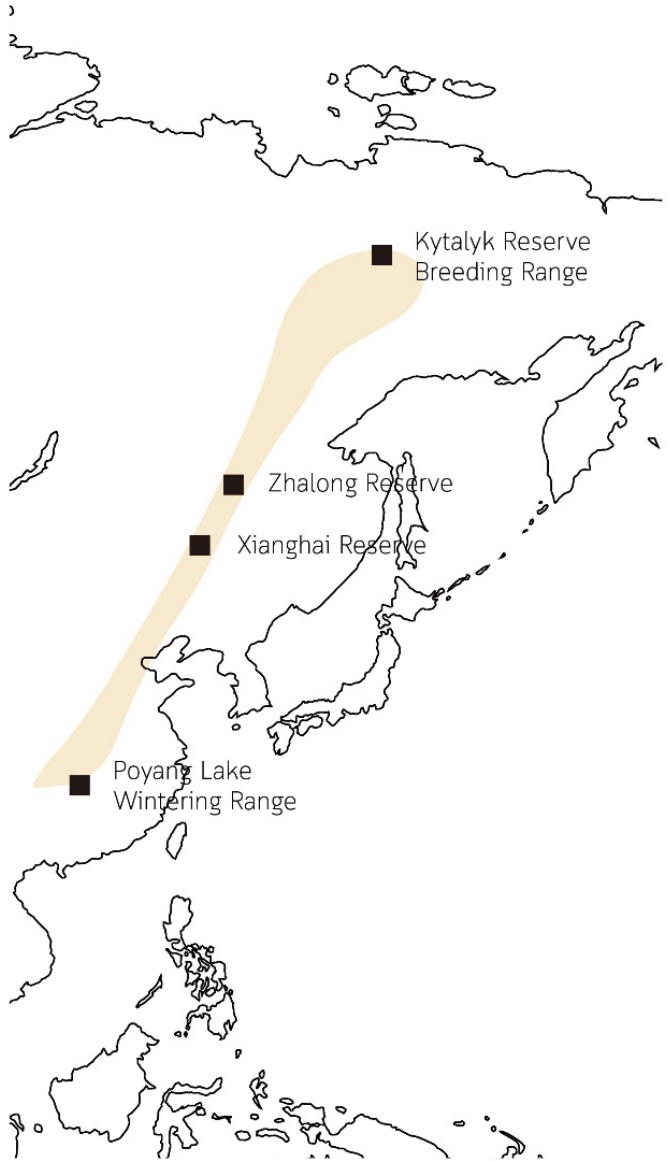


Broken Cycle



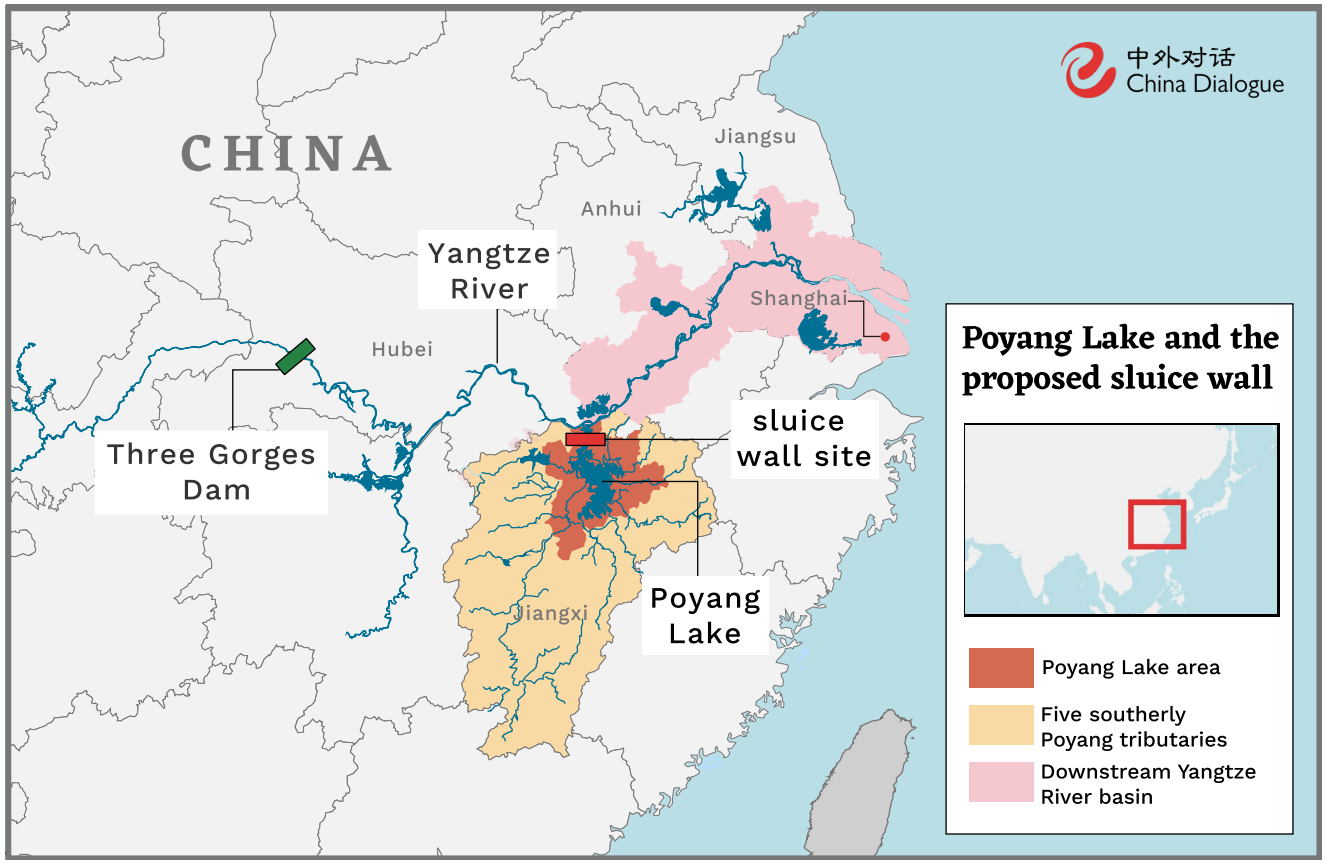


Ecological Value



Spatial Value

Poyang Lake Water Conservancy Hub Project & Argument



WWF

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WWF Suggests to Suspend the Poyang Lake Water Control Project

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Posted on 25 July 2014 |

WWF was recently informed that the Poyang Lake Water Control Project (hereinafter referred to as the dam project) has been submitted to the National Development and Reform Commission (NDRC) for approval. WWF has been highly concerned about the demonstration process of the dam project, and now it is the time for WWF to further clarify its position toward the dam project.

WWF holds the view that, before the scientific research of Poyang Lake's ecological function and a sufficient demonstration of the environmental impacts of the construction is excuted, the dam project should be suspended. In the meantime, a dam-free project is supposed to be the best option for Poyang Lake to sustain a healthy ecological system.

Research Questions

How can landscape architectural tools be implemented to create a sustainable, circular landscape, ensuring livelihood and enhancing the spatial quality of Poyang Lake?

What are the values of the traditional water system and how can they be applied to future landscapes?

What specific spatial principles can be used to address the issues of flooding, drought, ecological degradation, and loss of livelihood at Poyang Lake, and how to integrate them to build the holistic landscape system with scale continuum?

How will the proposed design impact the future landscape of Poyang Lake?

Theoretical Framework

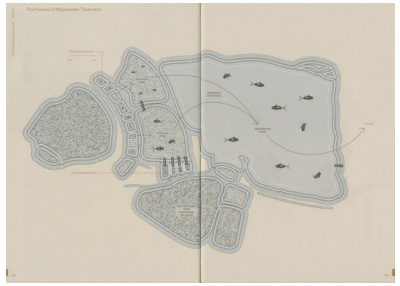
Systems Theory

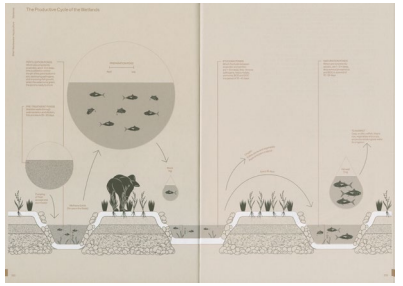
- Landscape as a system
- Systematic approach

Landscape Resilience

- Welcoming dynamics

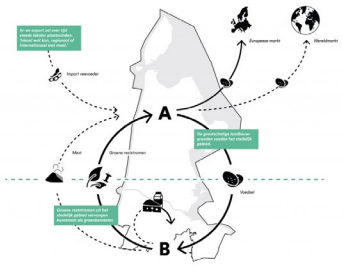
Theory

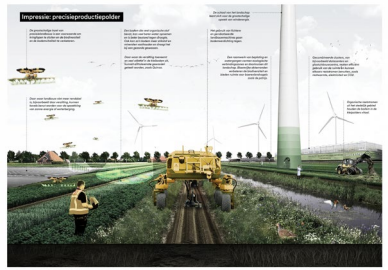




WASTE WATER AQUACULTURE — MULTI-FUNCTION

DE CIRKEL ROND — CIRCULATION

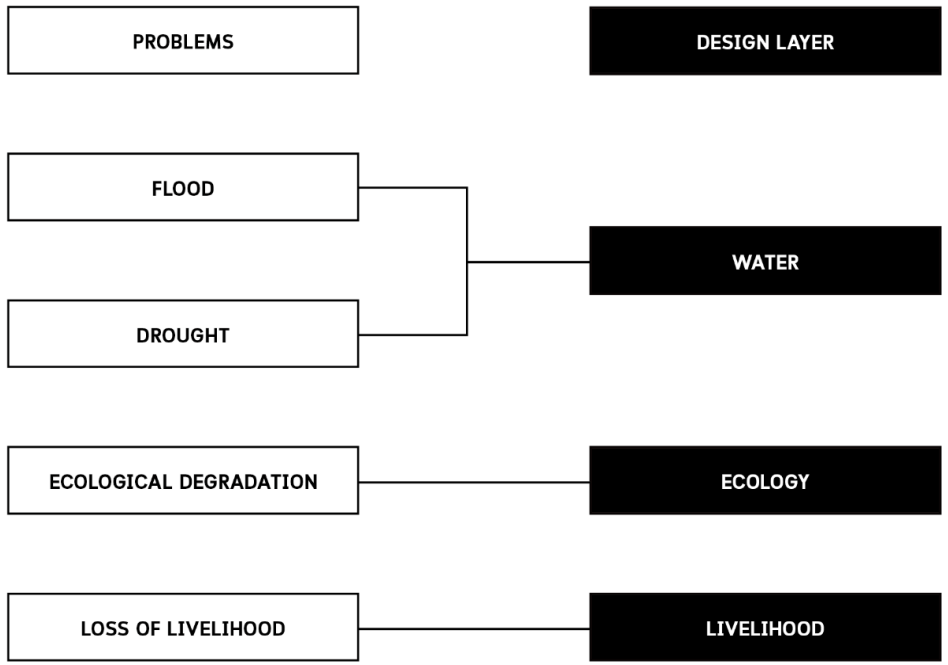




Case study

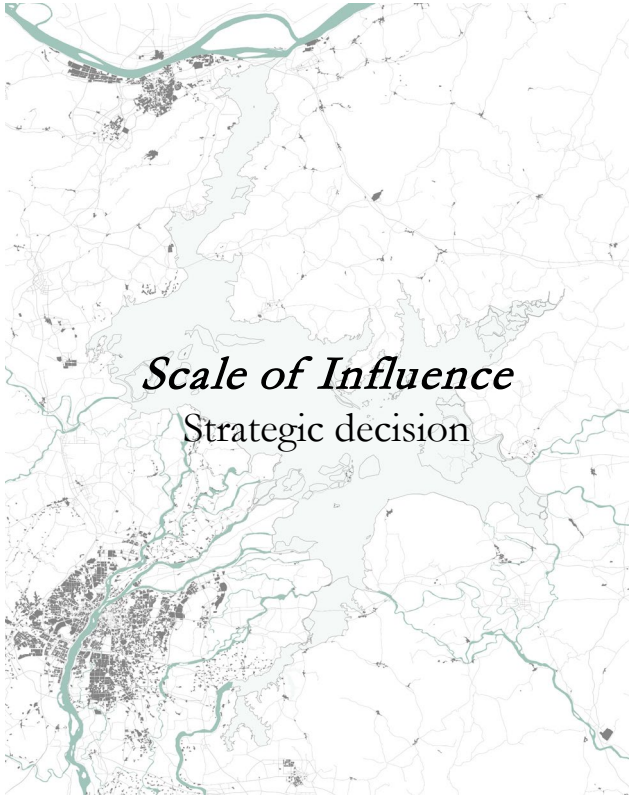
Design Approach

Working through scales / typologies

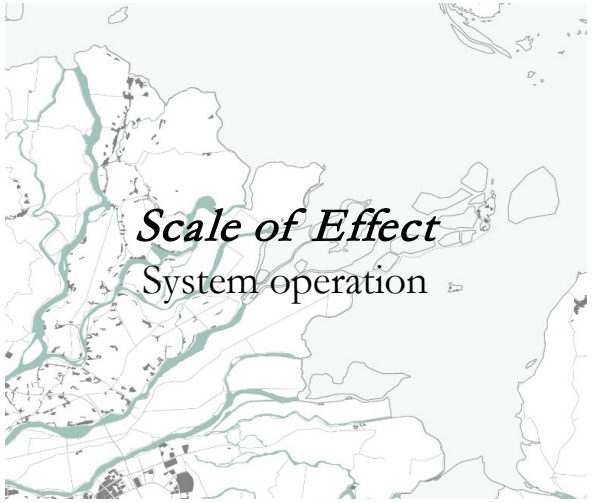


Design Approach

Working through scales / typologies



Scale of Influence
Strategic decision

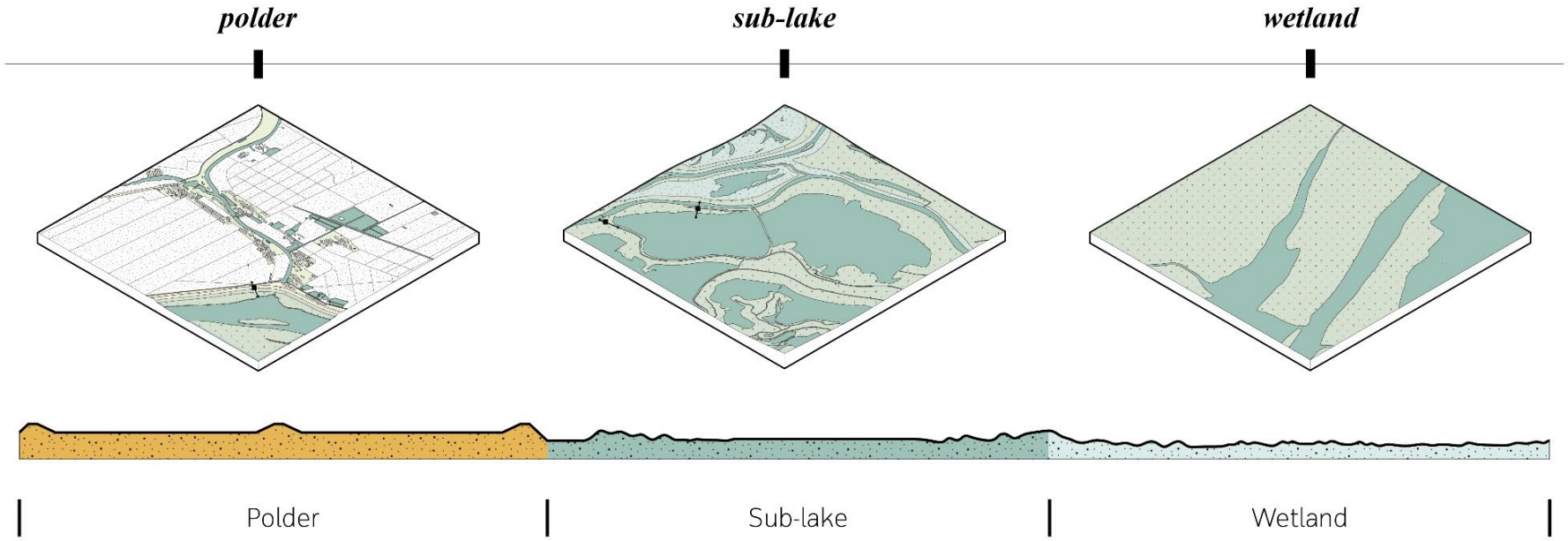


Scale of Effect
System operation

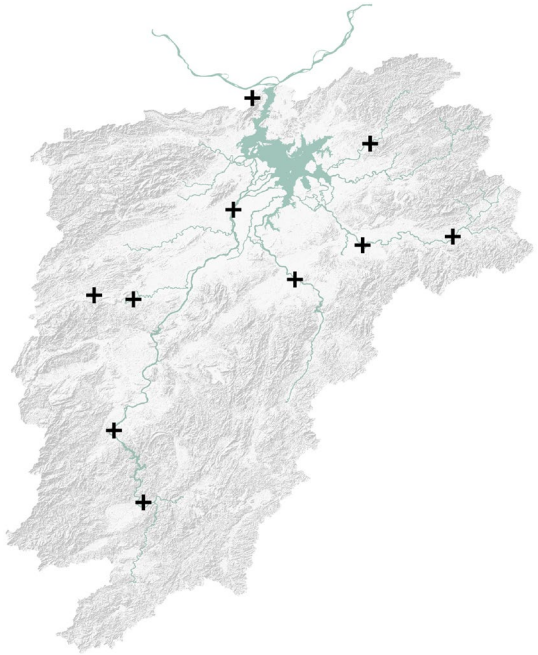
Scale of Control
Experiencing the landscape

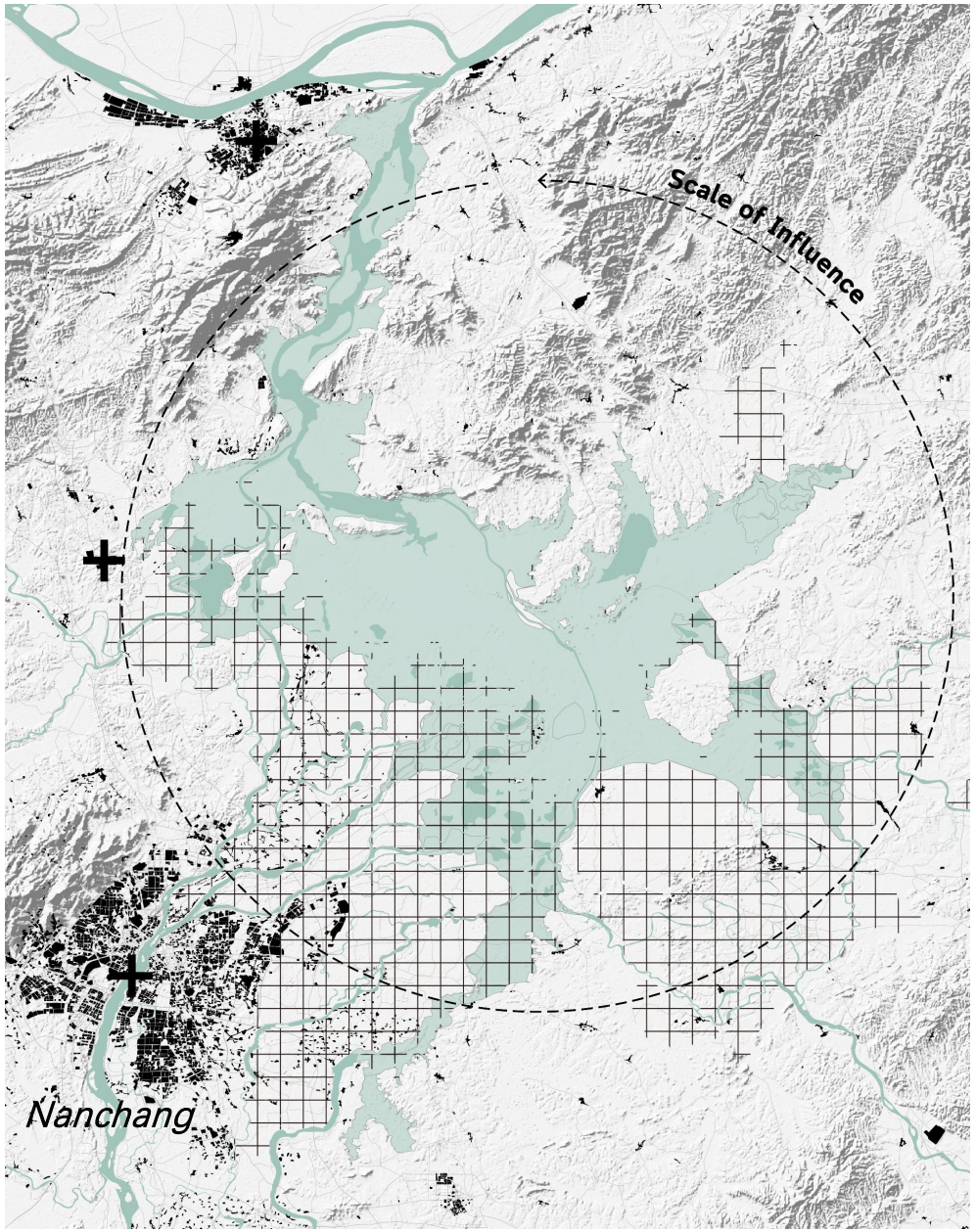
Design Approach

Working through scales / typologies



Potential in Rural Areas

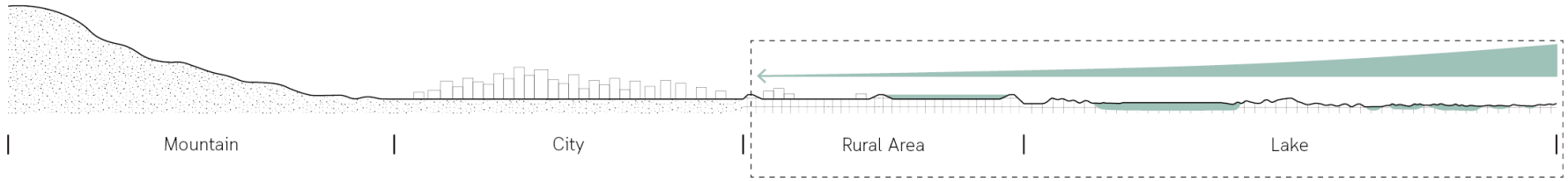




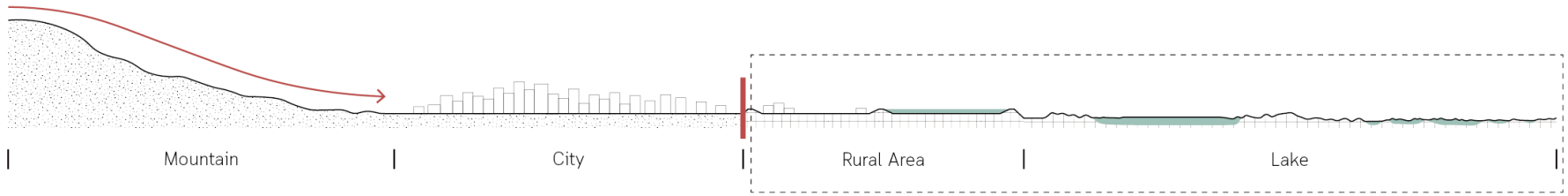
potential area

Potential in Rural Areas

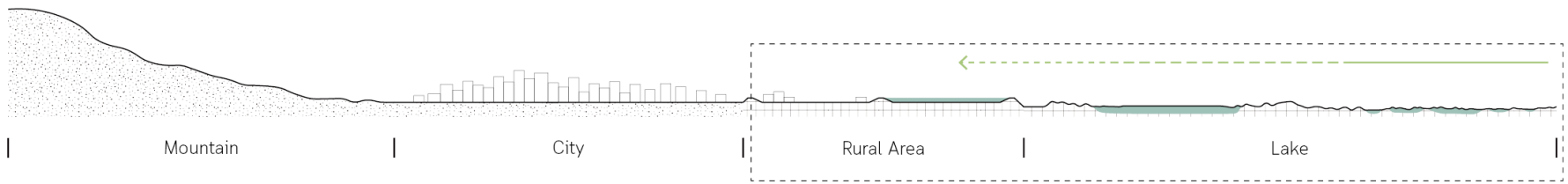
Flood: Rural Area as Resilient Water Space



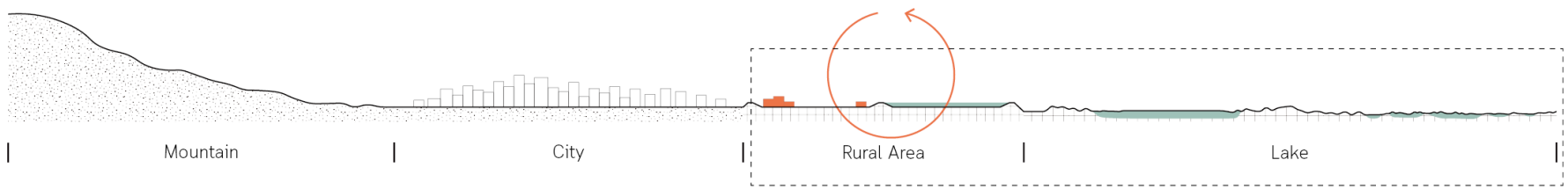
Drought: Rural Area as Water Storage Space



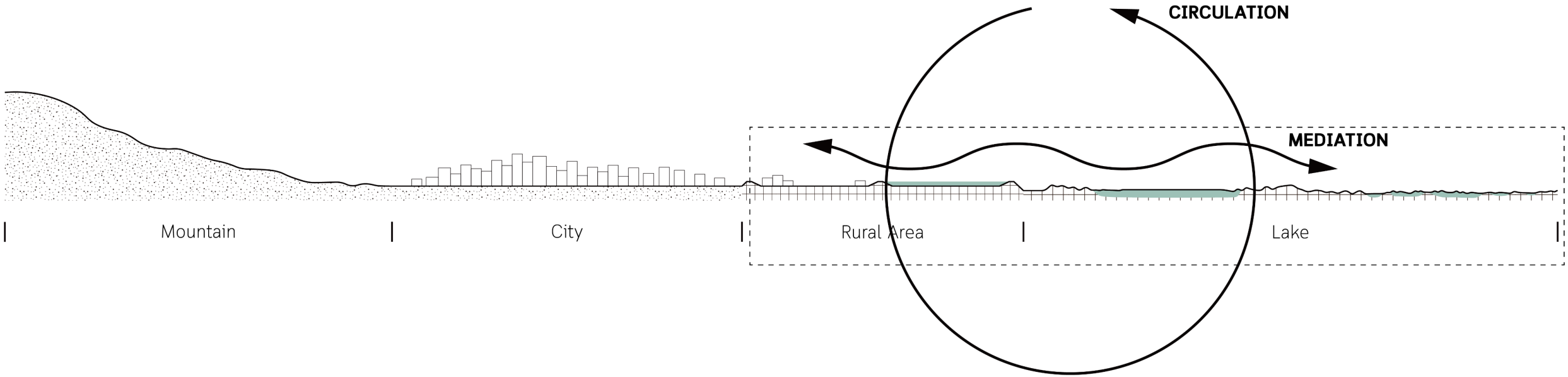
Ecology: Rural Area as Ecological Buffer Zone



Livelihood: Rural Area as Innovative Production Area



Concept: A Rural Self-Circulation and Mediation System



4 Strategies

Basic adjustment through physical space / Water issue

1 Transform/Abandon part of the polder

Increase the capacity of the lake

2 Deepen the lakebed

1 Deepen sub-lakes with low ecological quality
2 Keep sub-lakes with high ecological quality

Constructed depressions

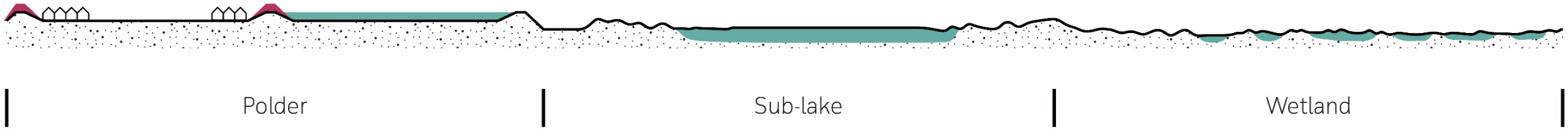
Polder | Sub-lake | Wetland

4 Strategies

Basic adjustment through physical space / Water issue

Raise the dike & Efficient water use

Protect the crucial polder & Reducing upstream water use



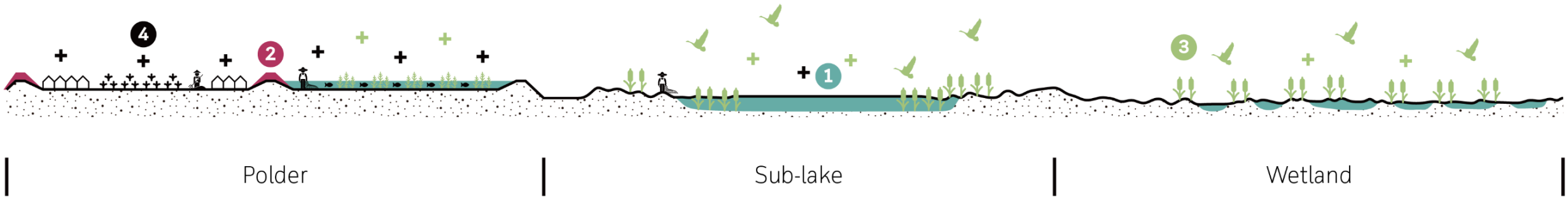
4 Strategies

Activate the livelihood

Intensive utilization of land

Increase the capacity of the lake

Improve the ecological value



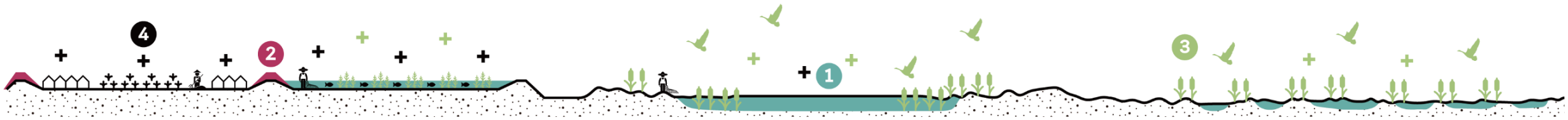
4 Strategies

Activate the livelihood

Intensive utilization of land

Increase the capacity of the lake

Improve the ecological value



Polder | Sub-lake | Wetland

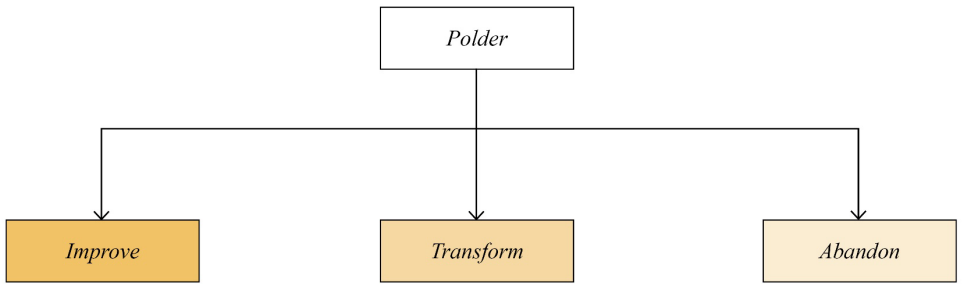
Improve

Transform / Abandon

Deepen / Keep

Constructed depression

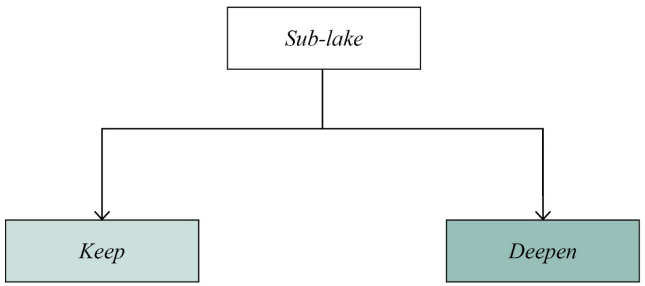
Design Frame



Improve: Improve the crucial polder in productivity, water efficiency and flood protection.

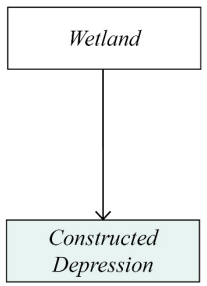
Transform: Transform the relatively valuable polder into a flexible space, adjusting according to the wet and dry seasons.

Abandon: Abandon the almost worthless polder, and cancel the maintenance.



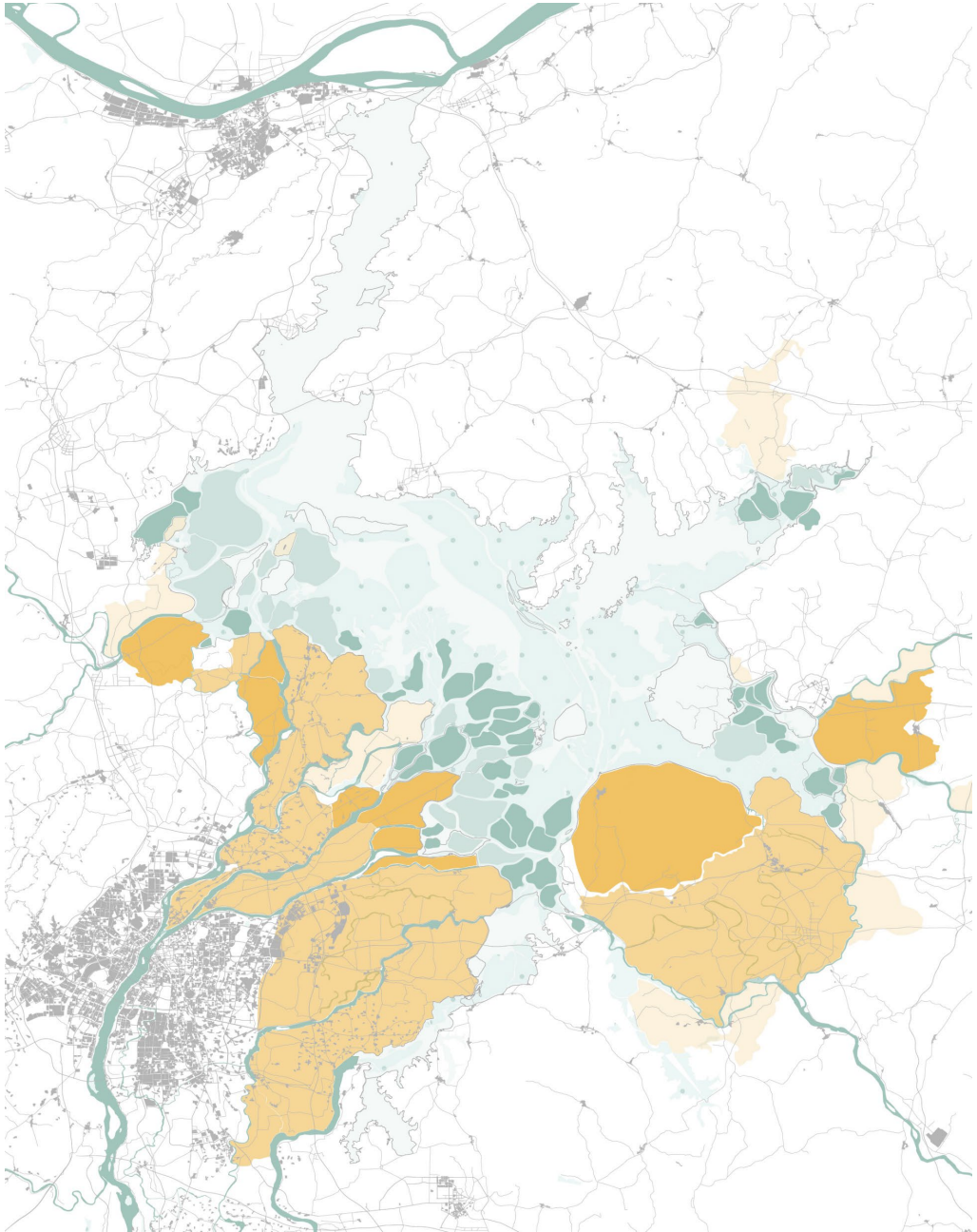
Keep: Maintain sub-lakes with high ecological value, supplemented by vegetation restoration.

Deepen: Deepen the sub-lakes with low ecological value, adding water management methods to regulate water levels for different functions.



Constructed depression: adding artificial depressions to the wetland.

Scale of Influence: Strategic Decision



Decision making:
Polder- Government decision / Flood risk
Sub-lake - Ecological value

Polder
- transform
- improve
- abandon

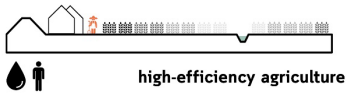
Sub-lake
- deepen
- keep

Wetland
- constructed depression

Spatial Principles

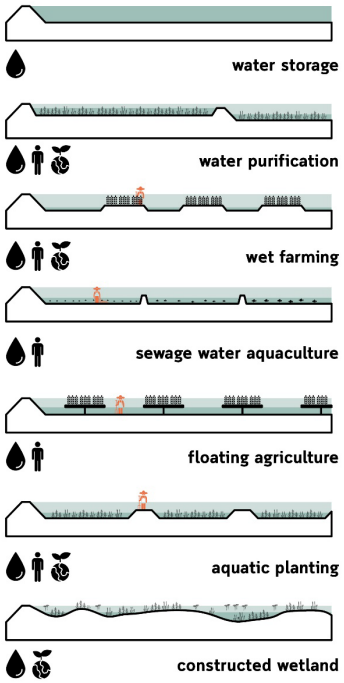
Polder

Improve



high-efficiency agriculture

Transform



water storage

water purification

wet farming

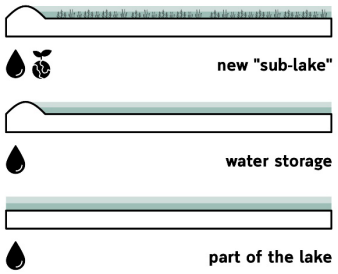
sewage water aquaculture

floating agriculture

aquatic planting

constructed wetland

Abandon



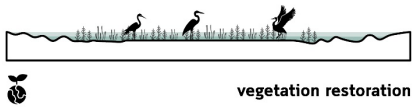
new "sub-lake"

water storage

part of the lake

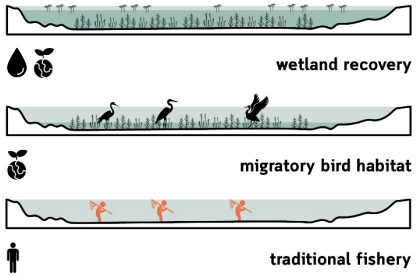
Sub-lake

Keep



vegetation restoration

Deepen



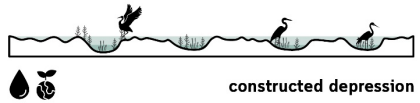
wetland recovery

migratory bird habitat

traditional fishery

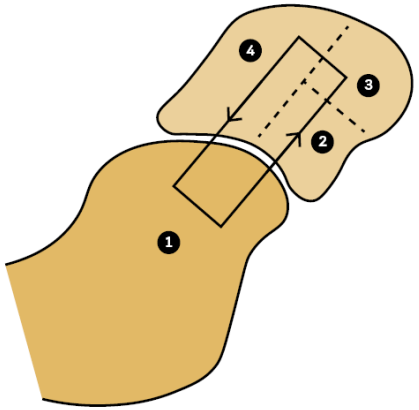
Wetland

Constructed Depression



constructed depression

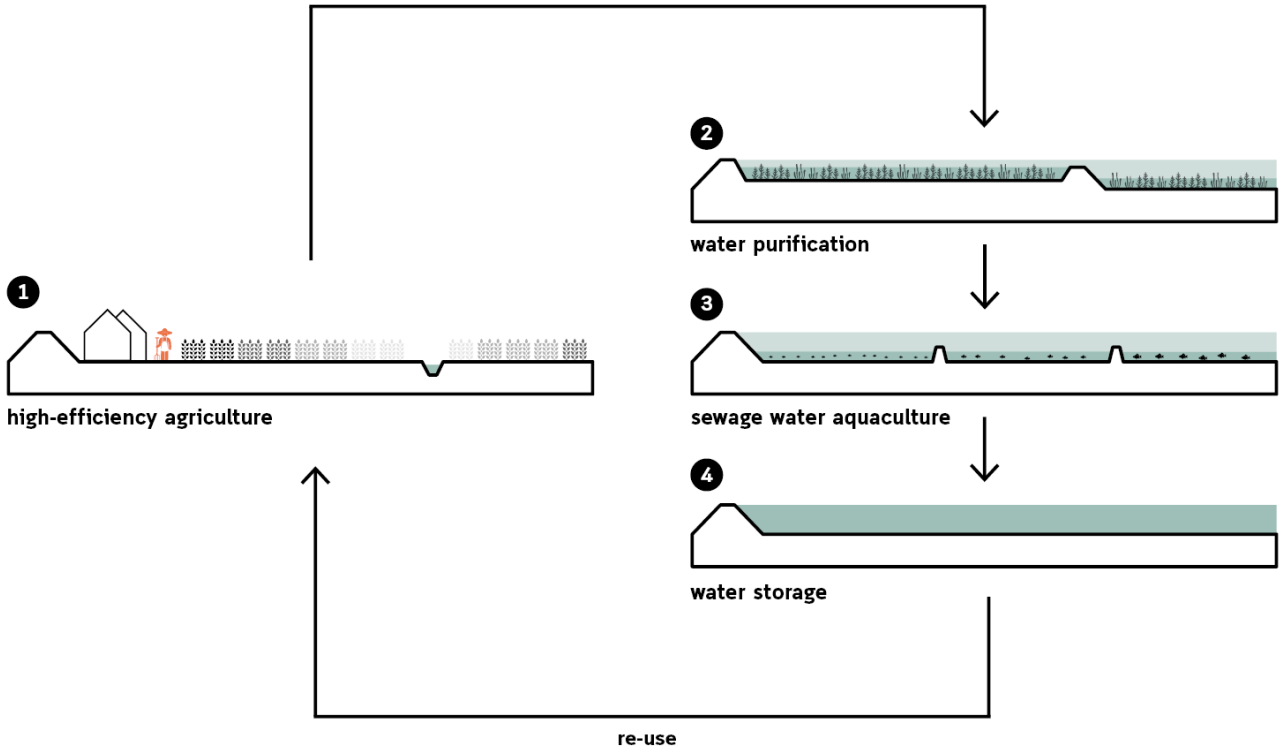
Sub-cycles



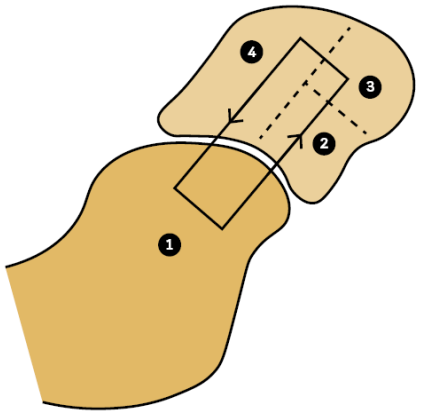
Connected polders

- Connected water system
- Single polder separated by dikes

Cooperative Circulation System A



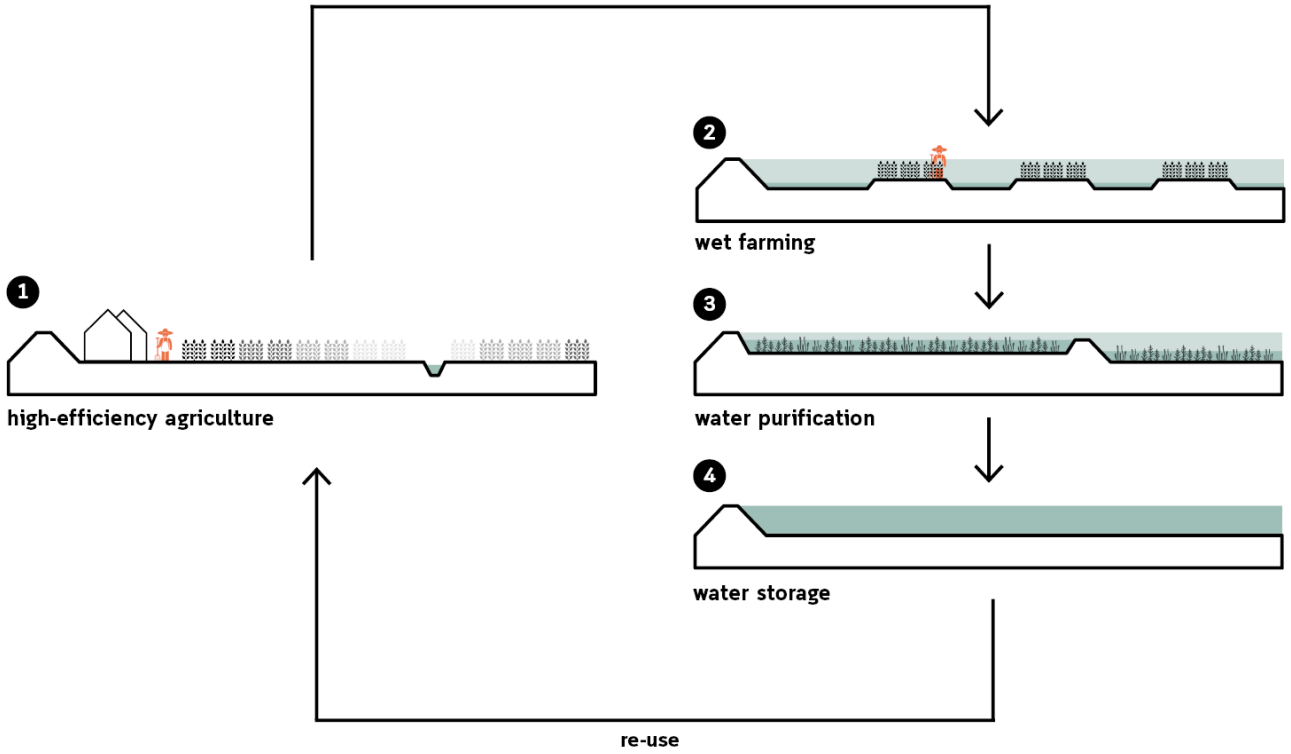
Sub-cycles



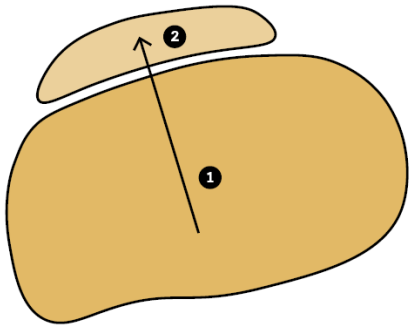
Connected polders

- Connected water system
- Single polder separated by dikes

Cooperative Circulation System B



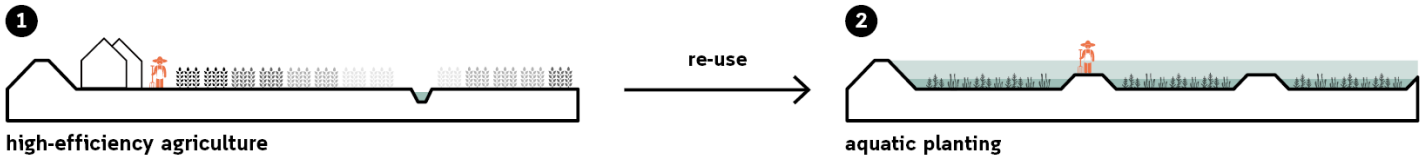
Sub-cycles



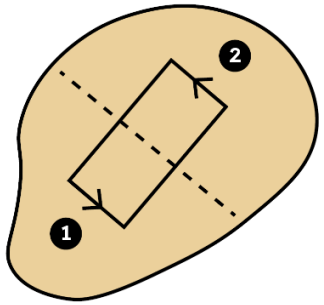
Semi-connected polders

- Separated water system
- Single polder separated by dikes

One-way Water Re-use System



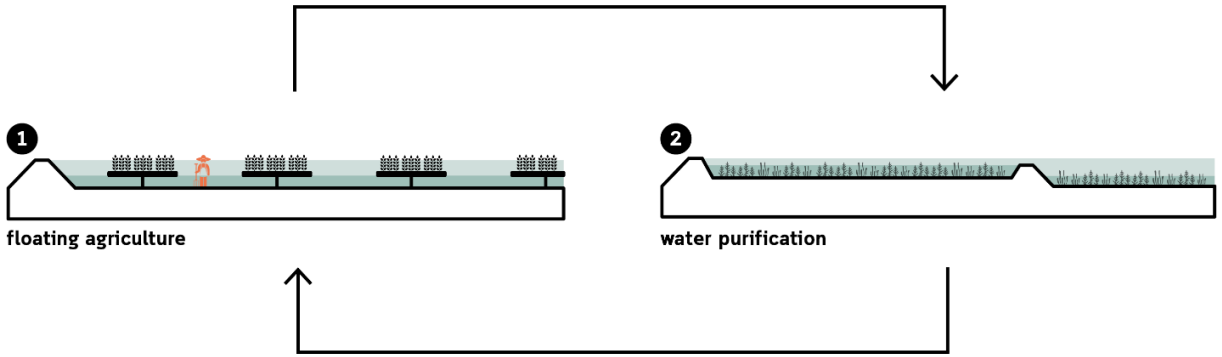
Sub-cycles



Separated polders

- Single polder

Self-Circulation System

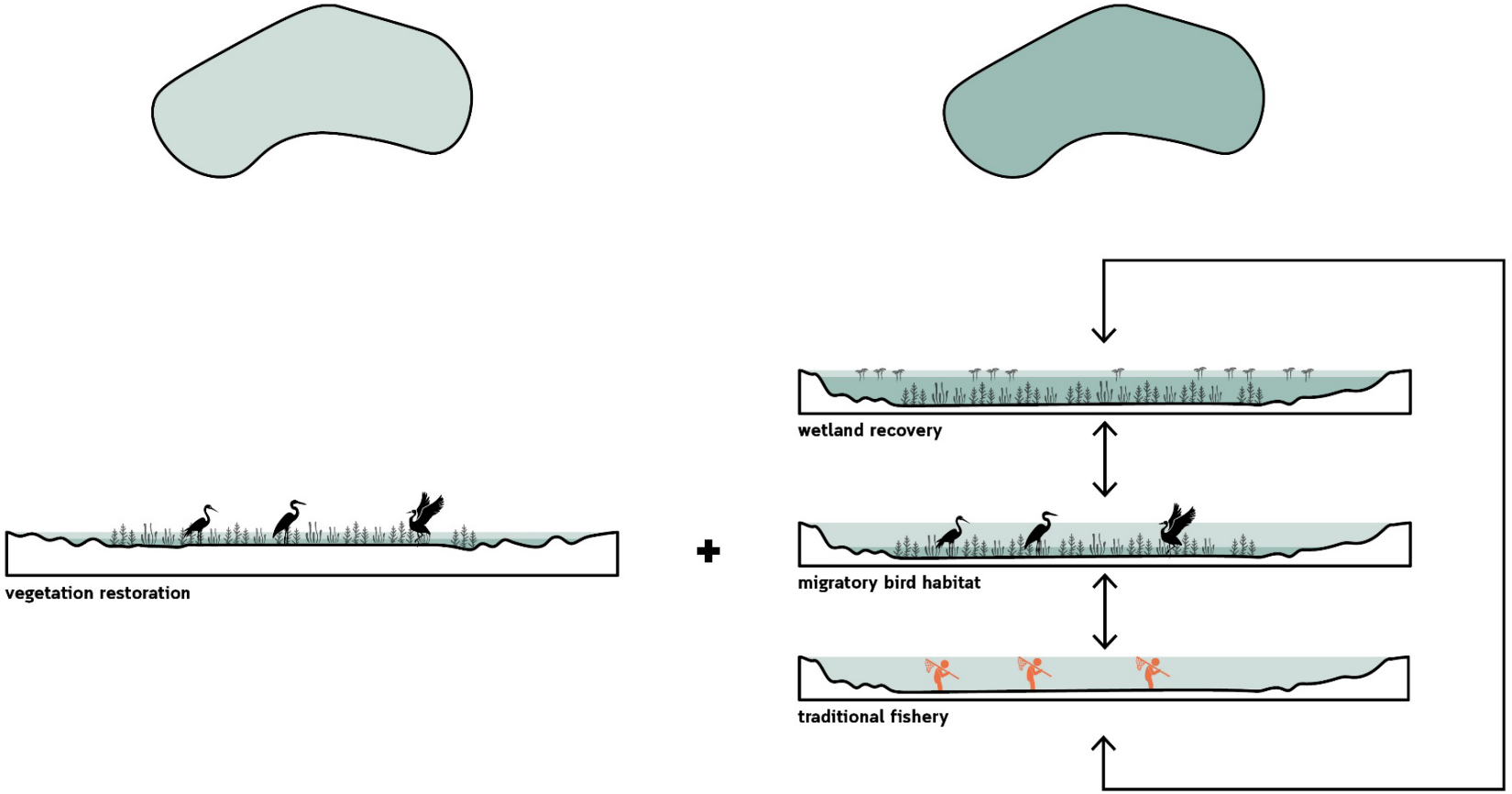


Sub-cycles

Natural Circulation System

Kept Sub-lake

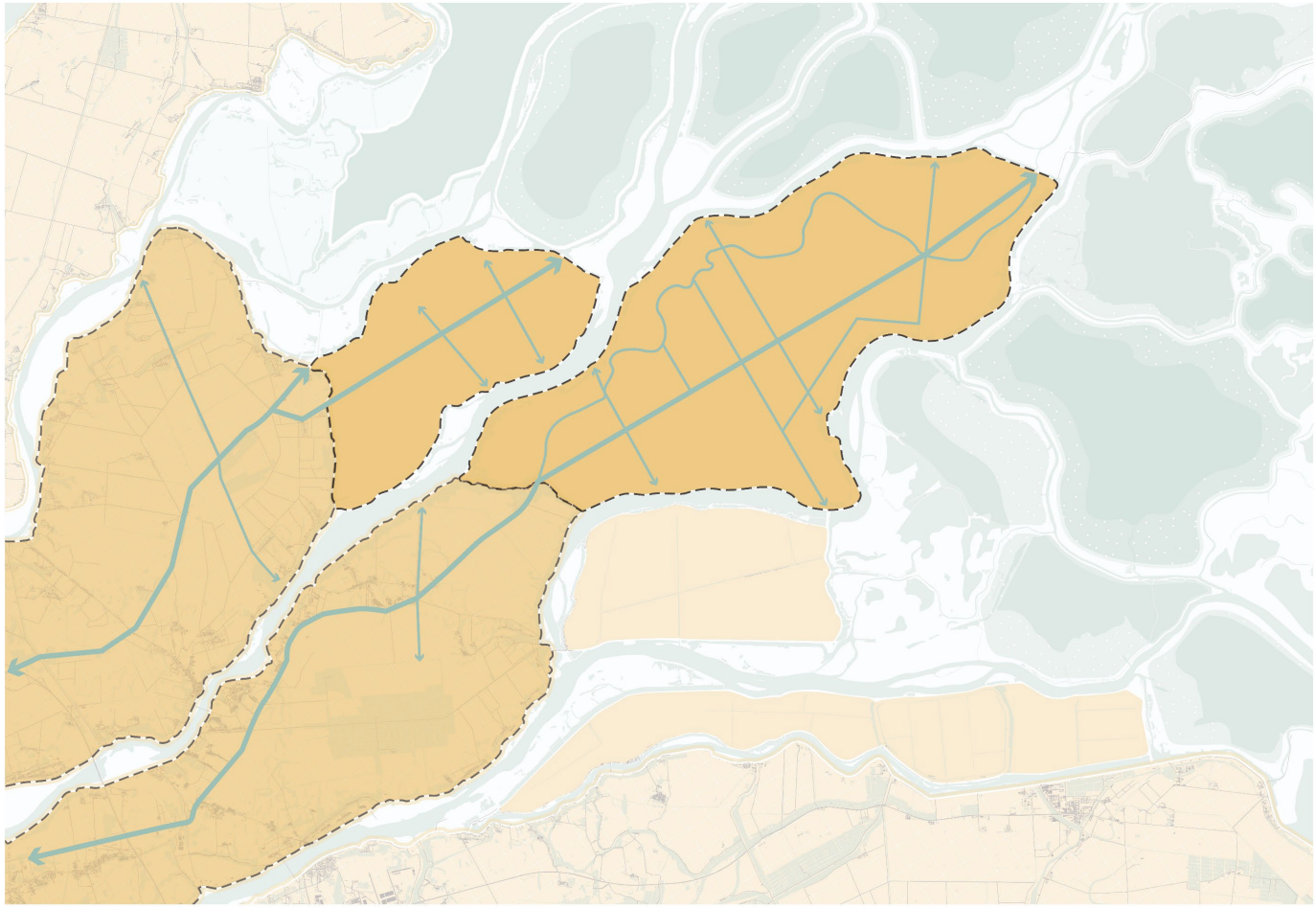
Deepened Sub-lake



Functional cycle (per 5 years)

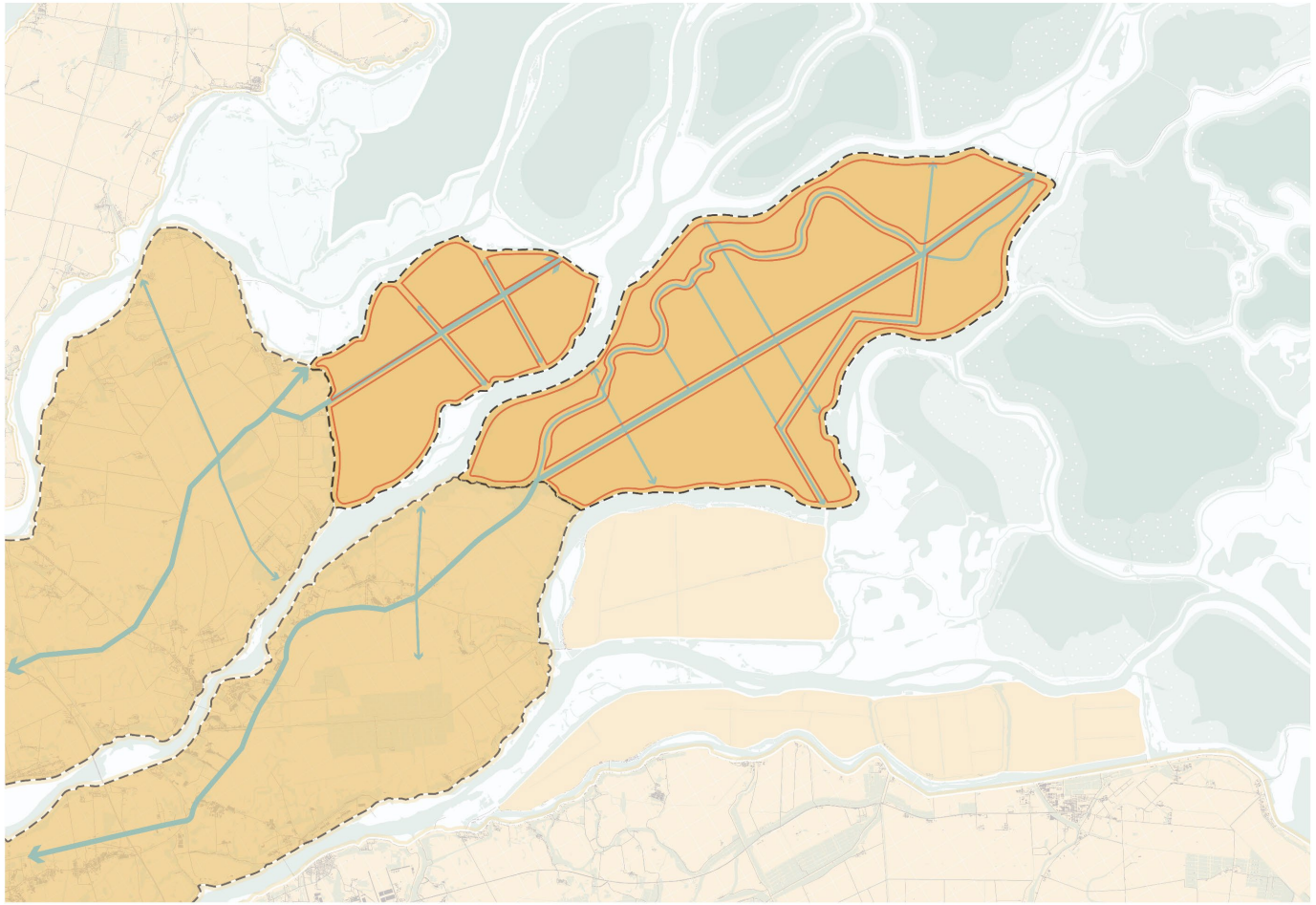
Implement: Polder

1 Analyze the original water structure



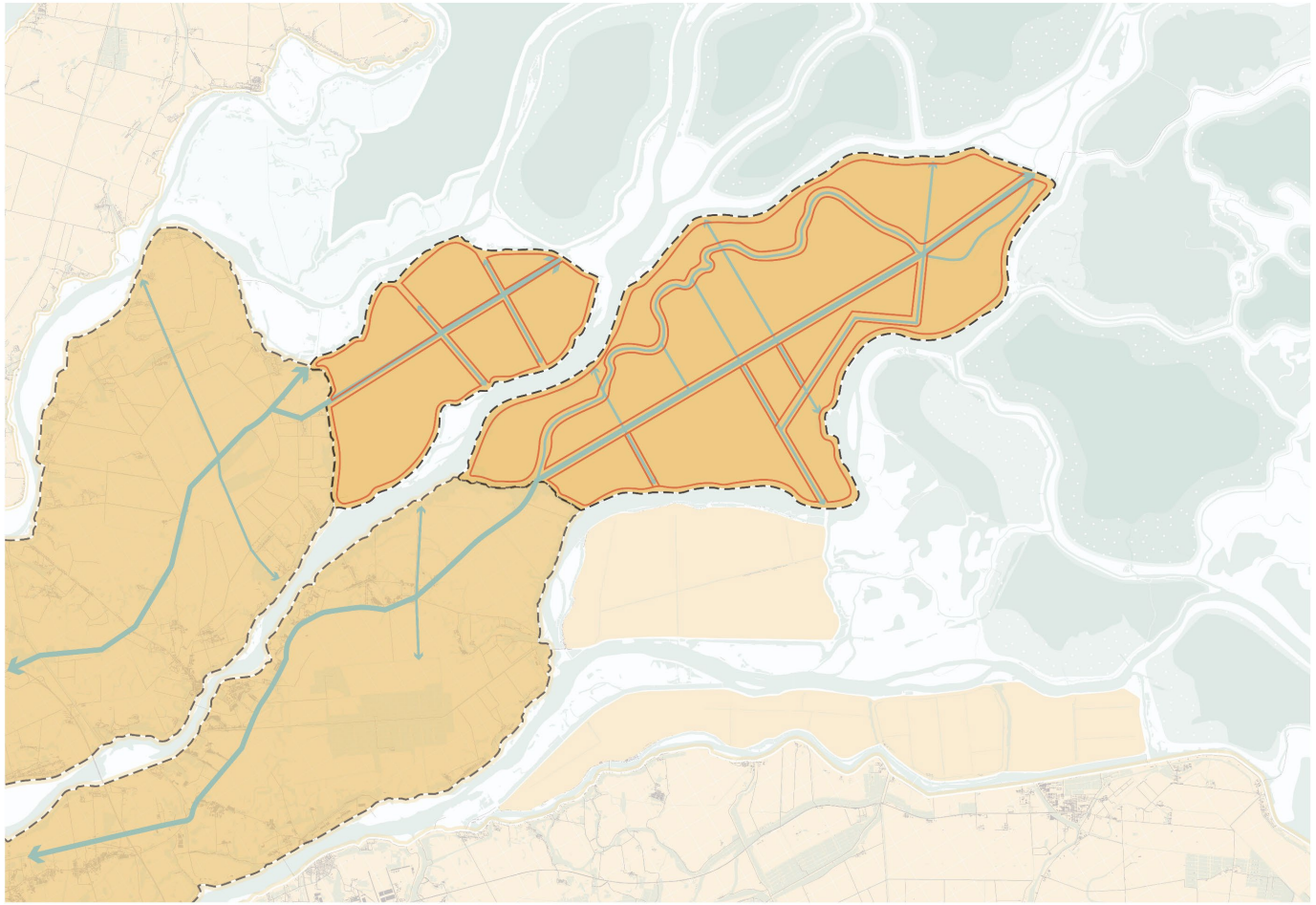
Implement: Polder

2 Build the dike along the water structure



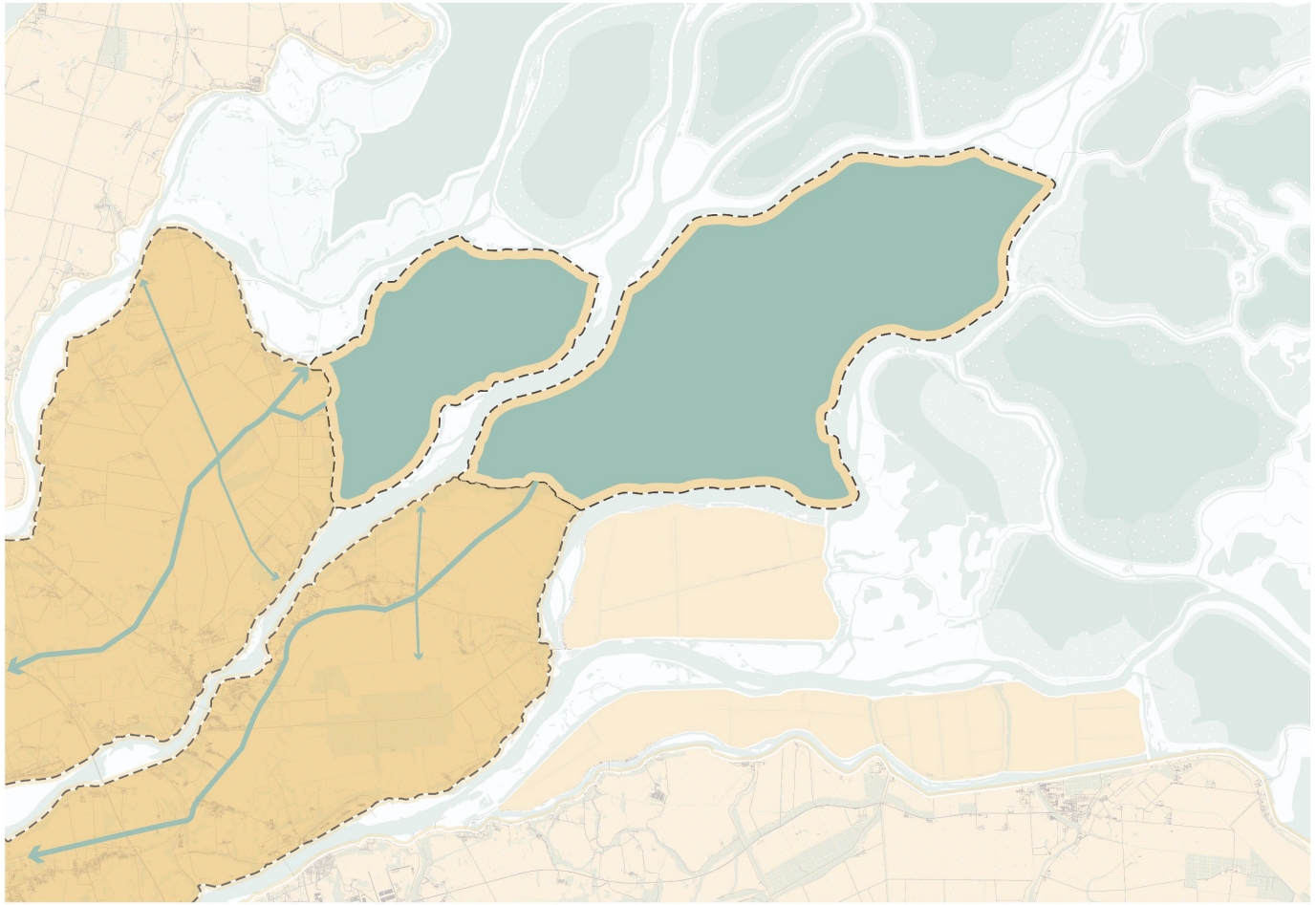
Implement: Polder

3 Build subsidiary dikes for specific function



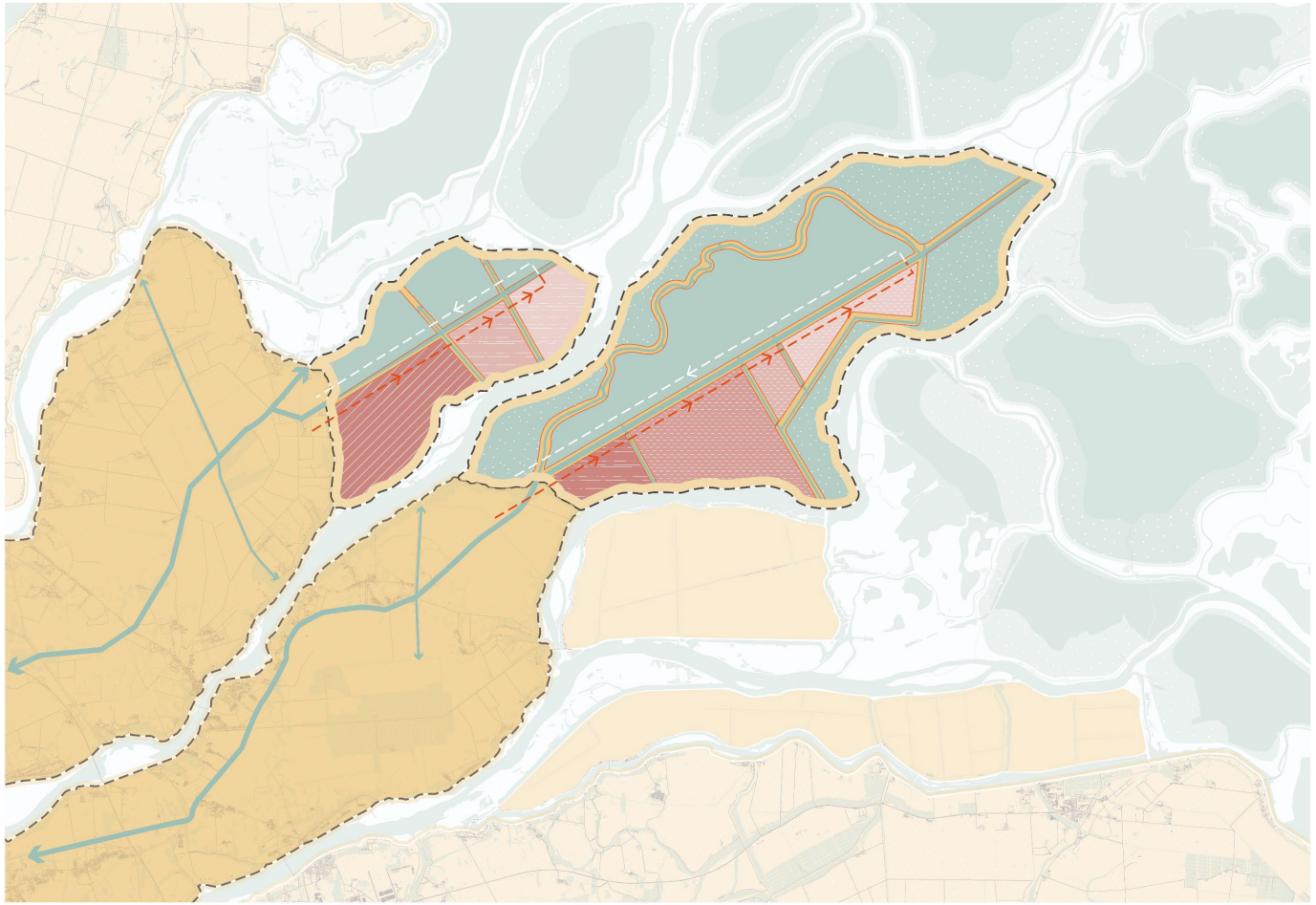
Implement: Polder

4 Wet season: Let the water in



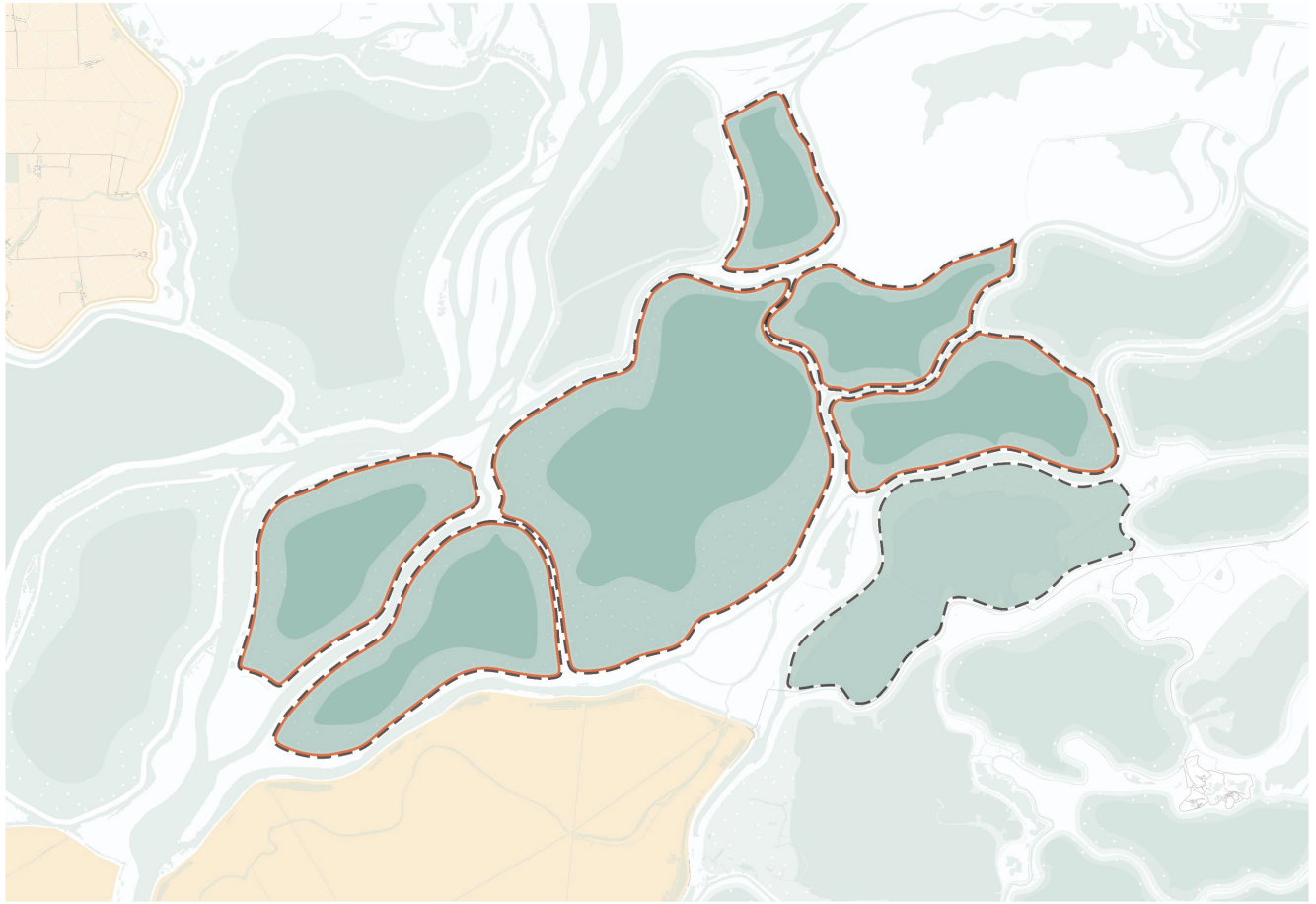
Implement: Polder

5 Dry season: water was left in shallow ponds



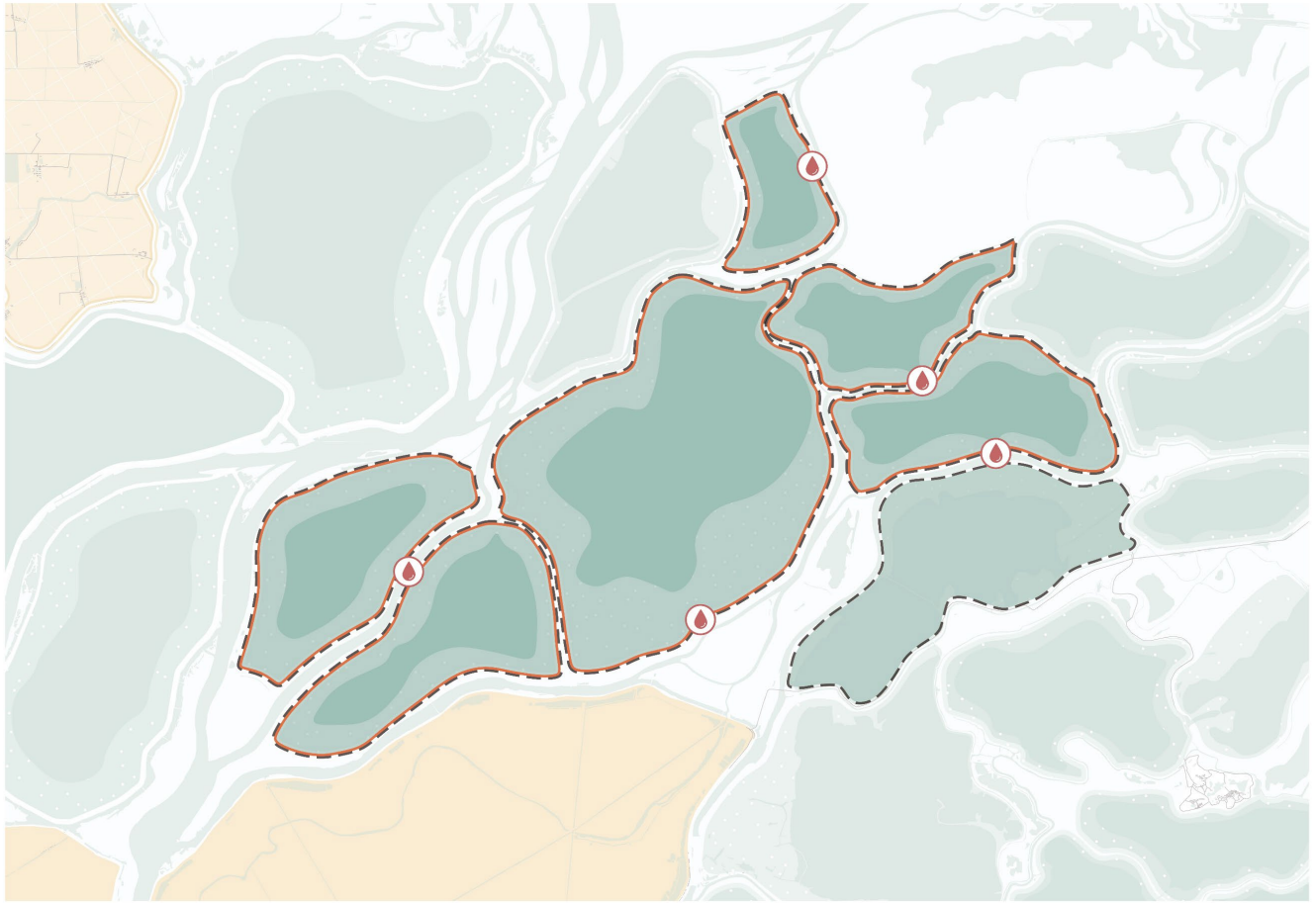
Implement: Sub-lake

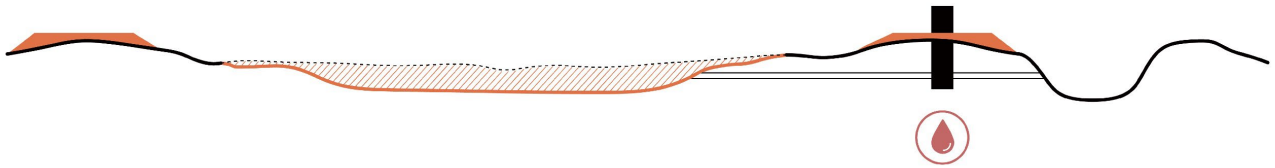
1 Reinforce the dike &
Deepen the sub-lake



Implement: Sub-lake

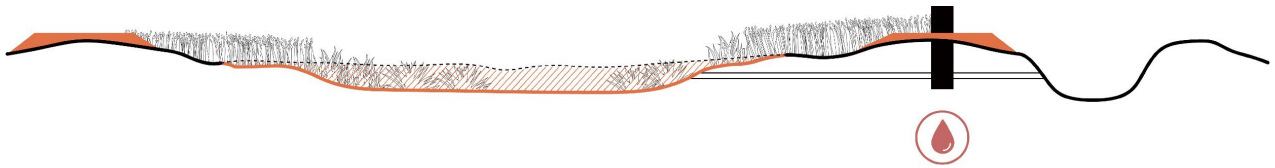
2 Build the sluice





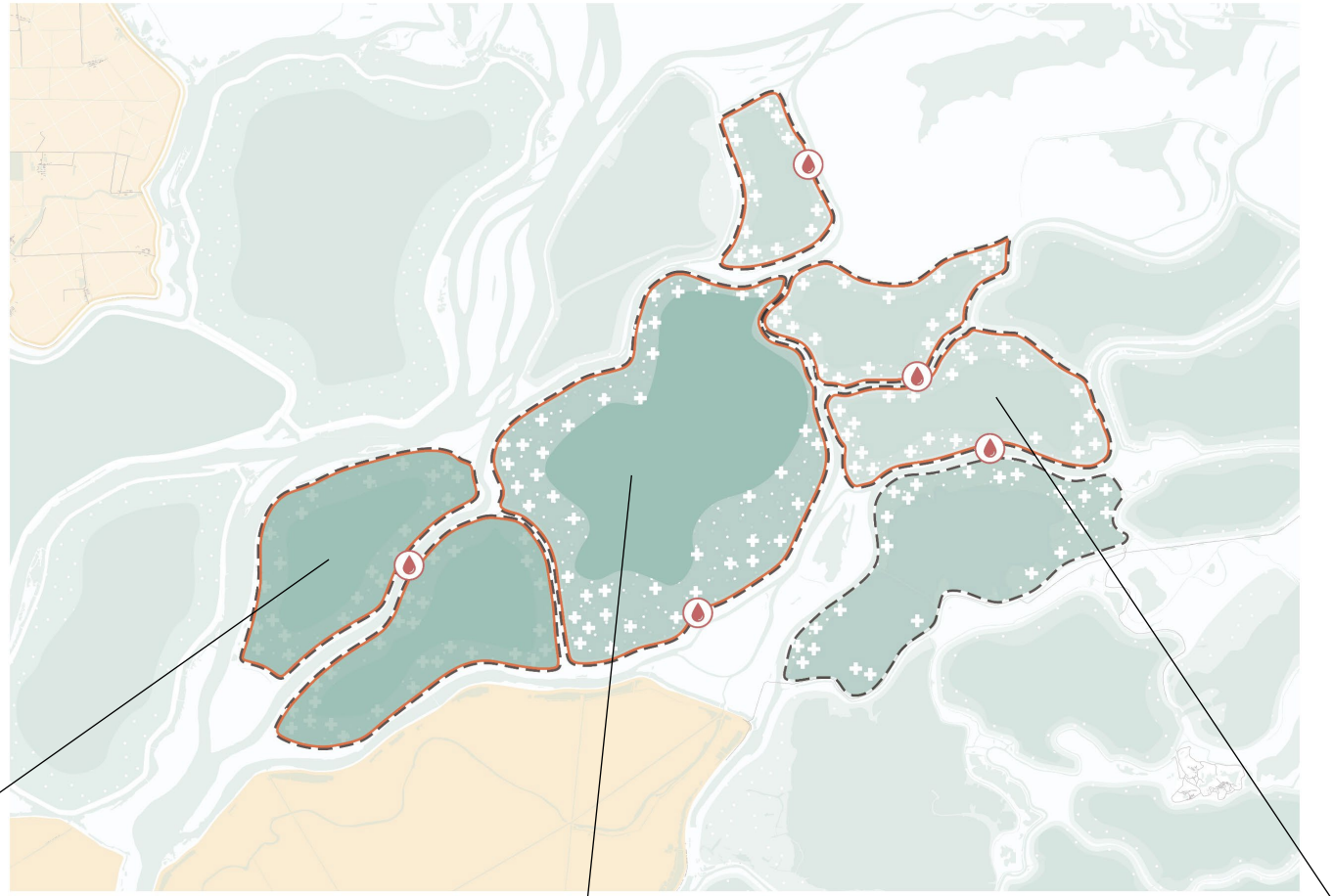
Implement: Sub-lake

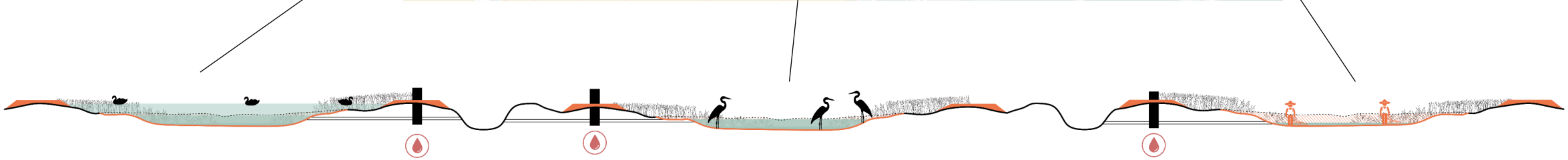
3 Vegetation restoration



Implement: Sub-lake

4 Zoning & Cycle





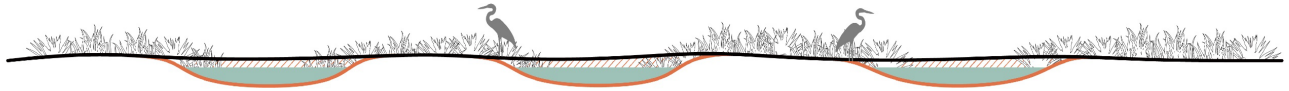
Deep water: wetland recovery

Sallow water: migratory bird habitat

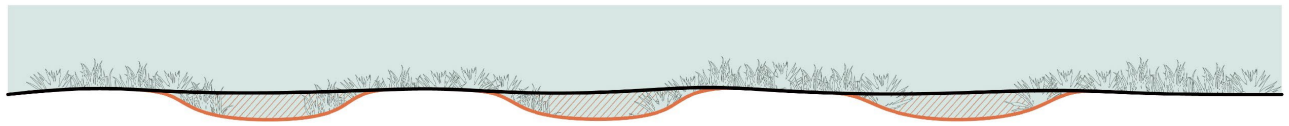
Drained: sustainable fishery

Implement: Wetland

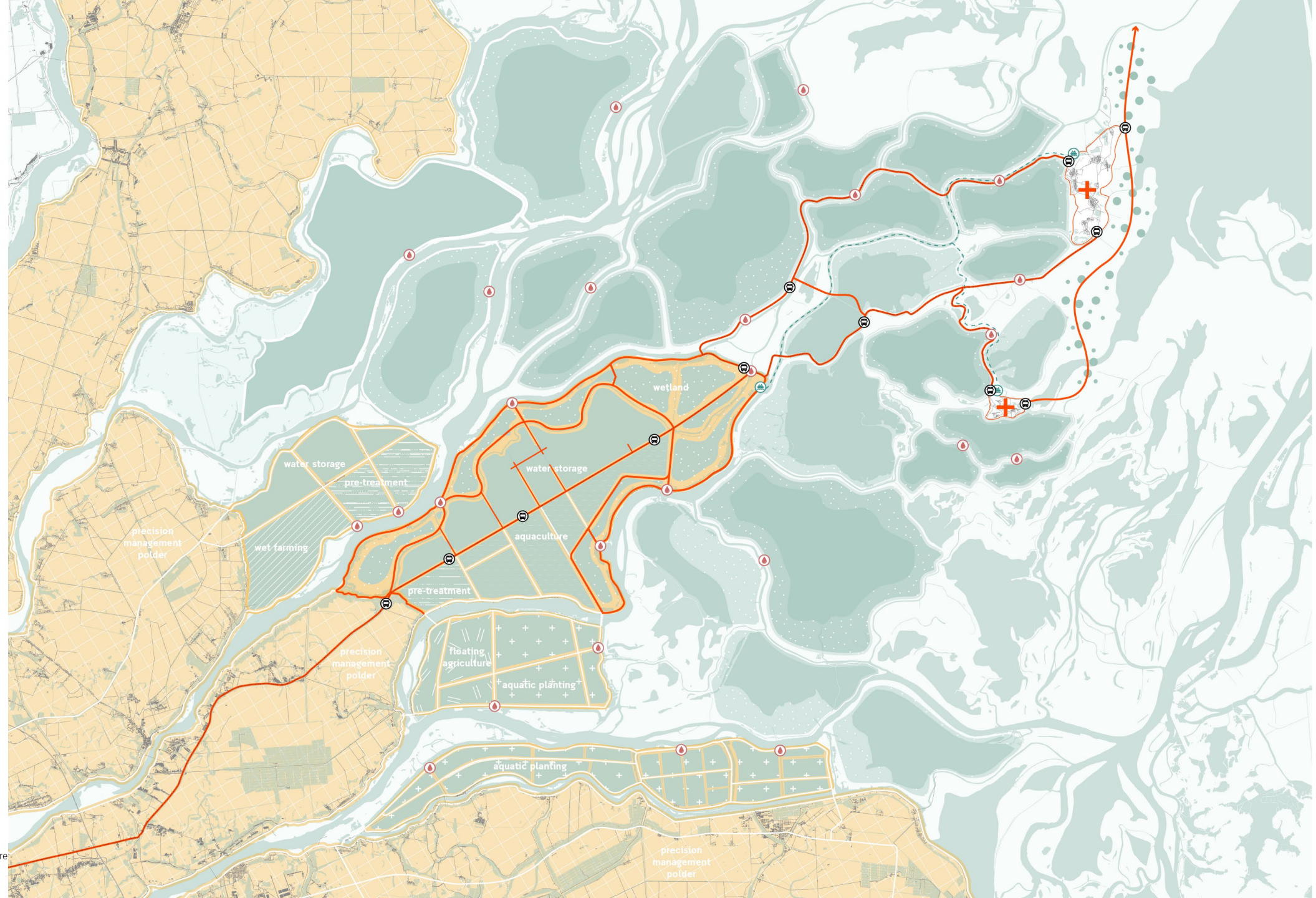
Dry season: Habitat for migratory bird



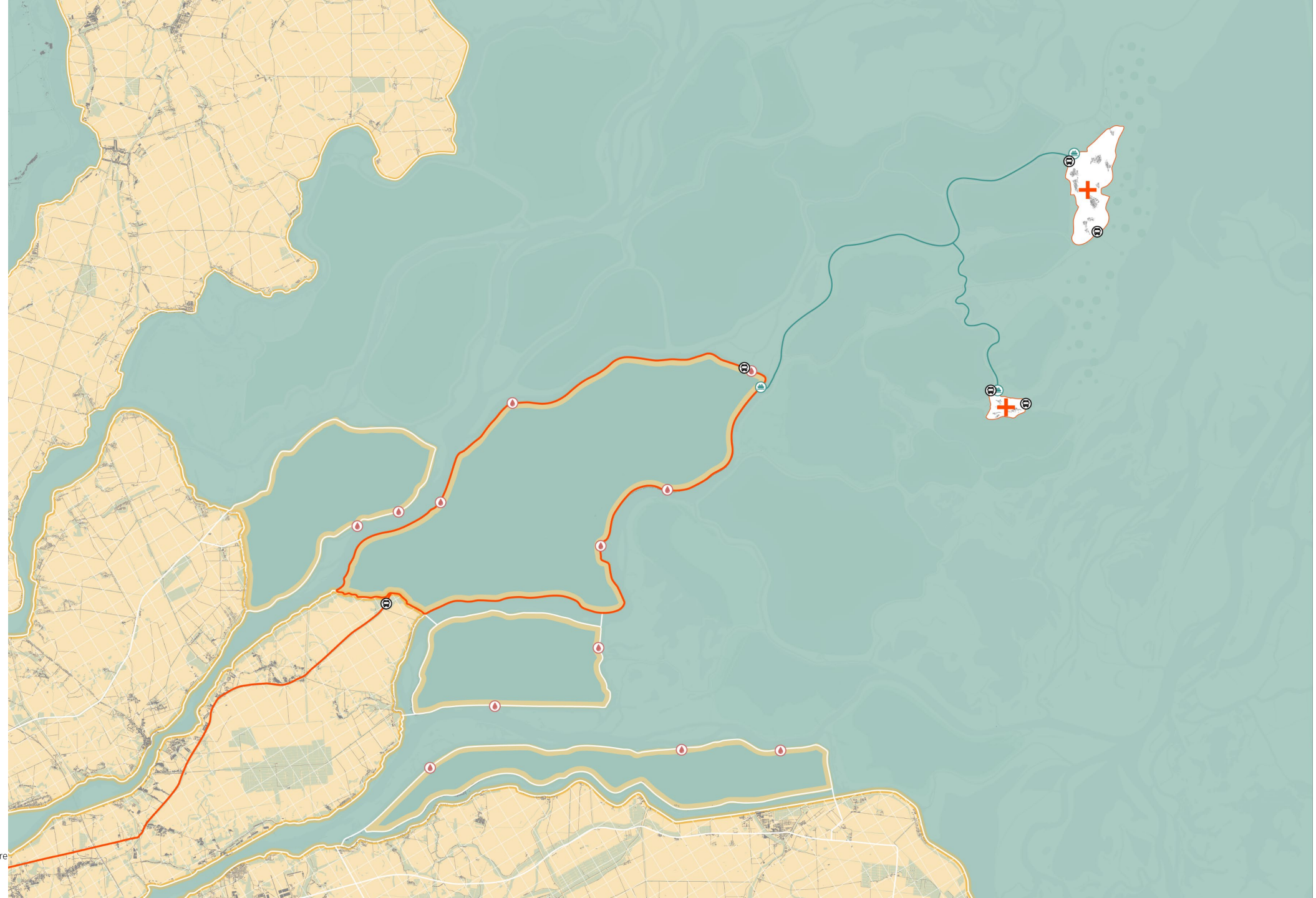
Wet season: Vegetation grow



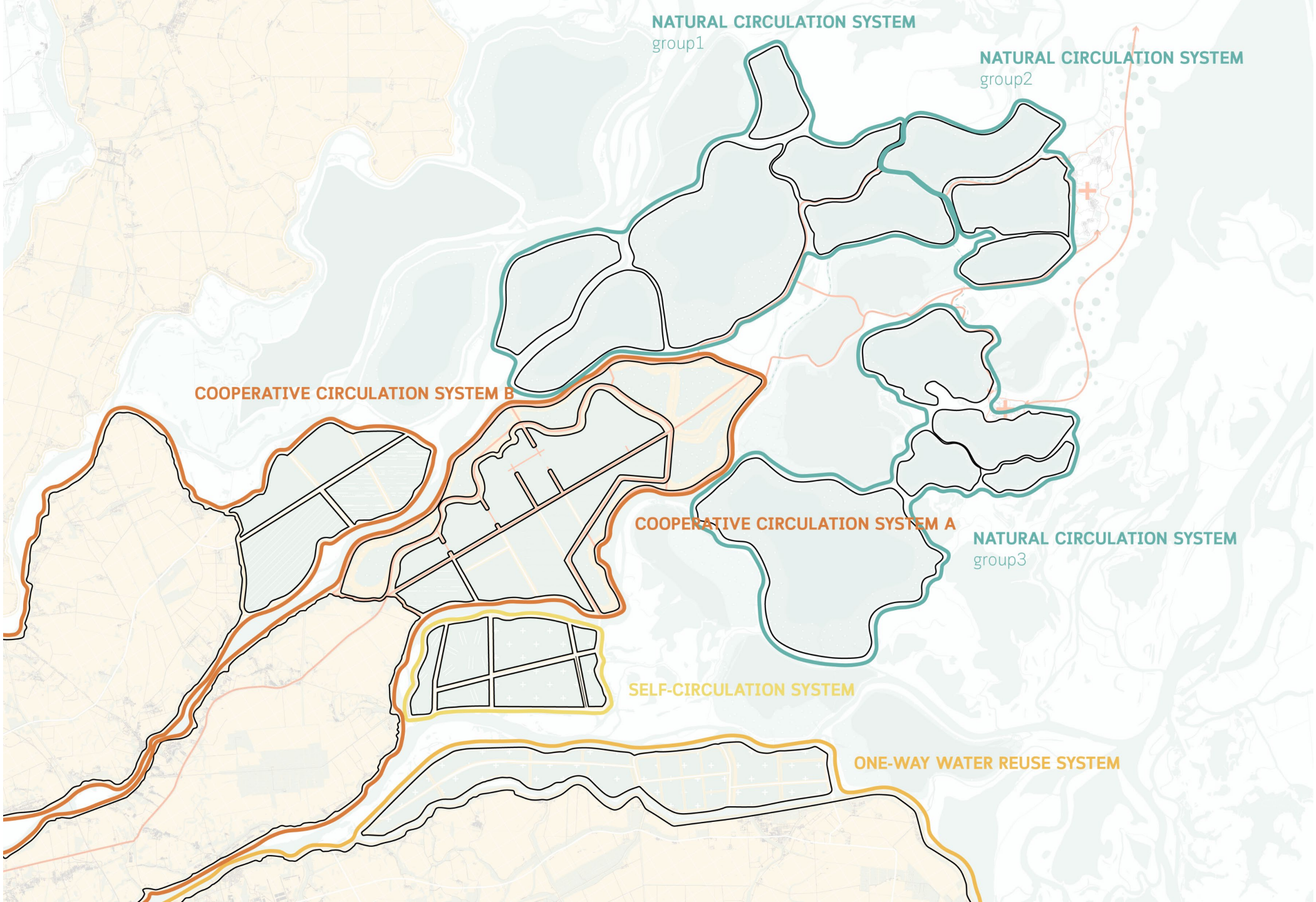
Dry season


wetland
water storage
pre-treatment
wet farming
precision management polder
water storage
aquaculture
pre-treatment
floating agriculture
aquatic planting
precision management polder
aquatic planting
precision management polder
pumping station
bus stop
water bus stop
villages
visitor routing
daily use routing
bus line
water bus line
aquatic planting
floating agriculture
pre-treatment
waste water aquaculture
wet farming

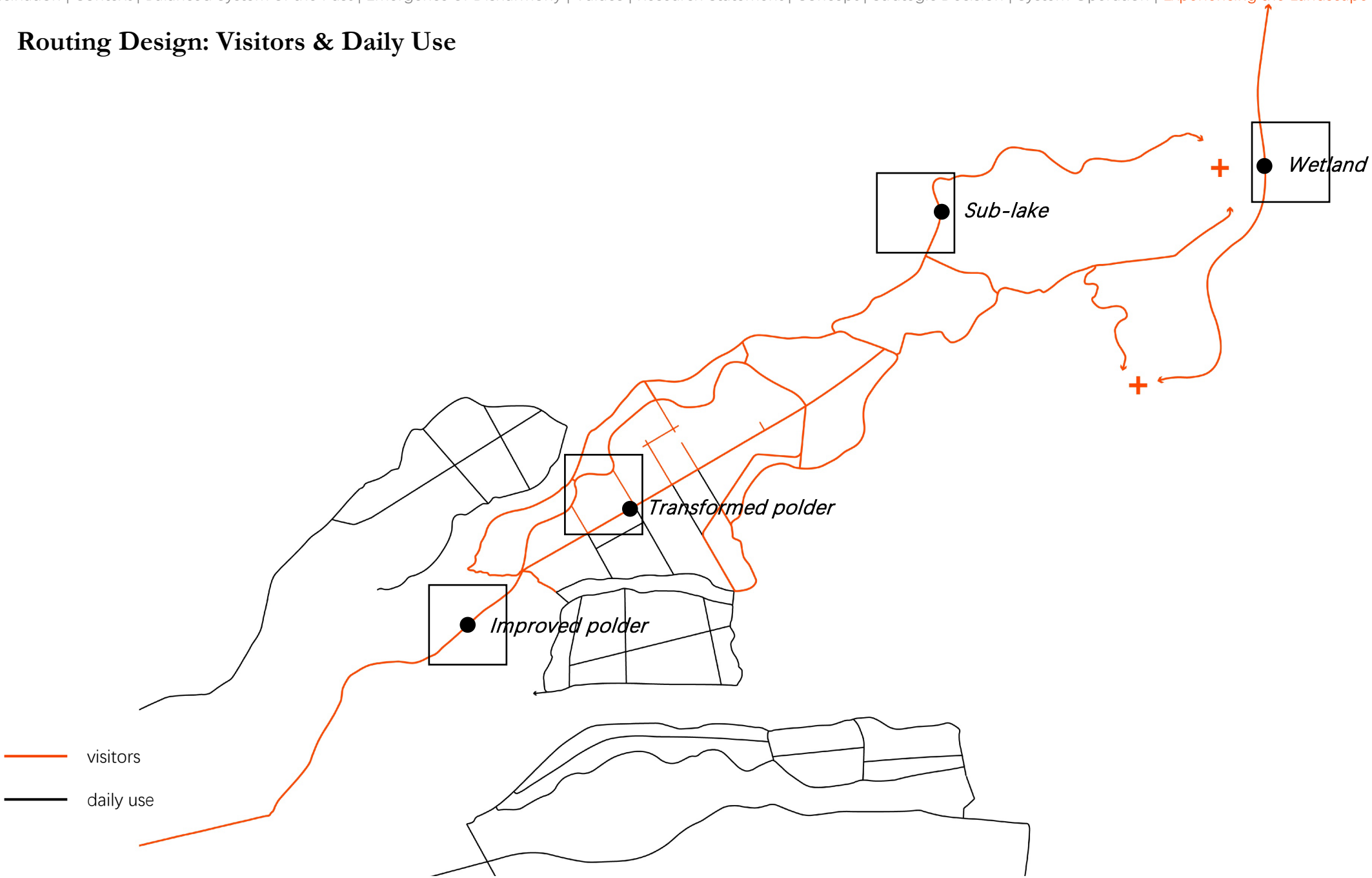
Wet season


pumping station
bus stop
water bus stop
villages
visitor routing
daily use routing
bus line
water bus line
aquatic planting
floating agriculture
pre-treatment
waste water aquaculture
wet farming

Sub-cycle Distribution

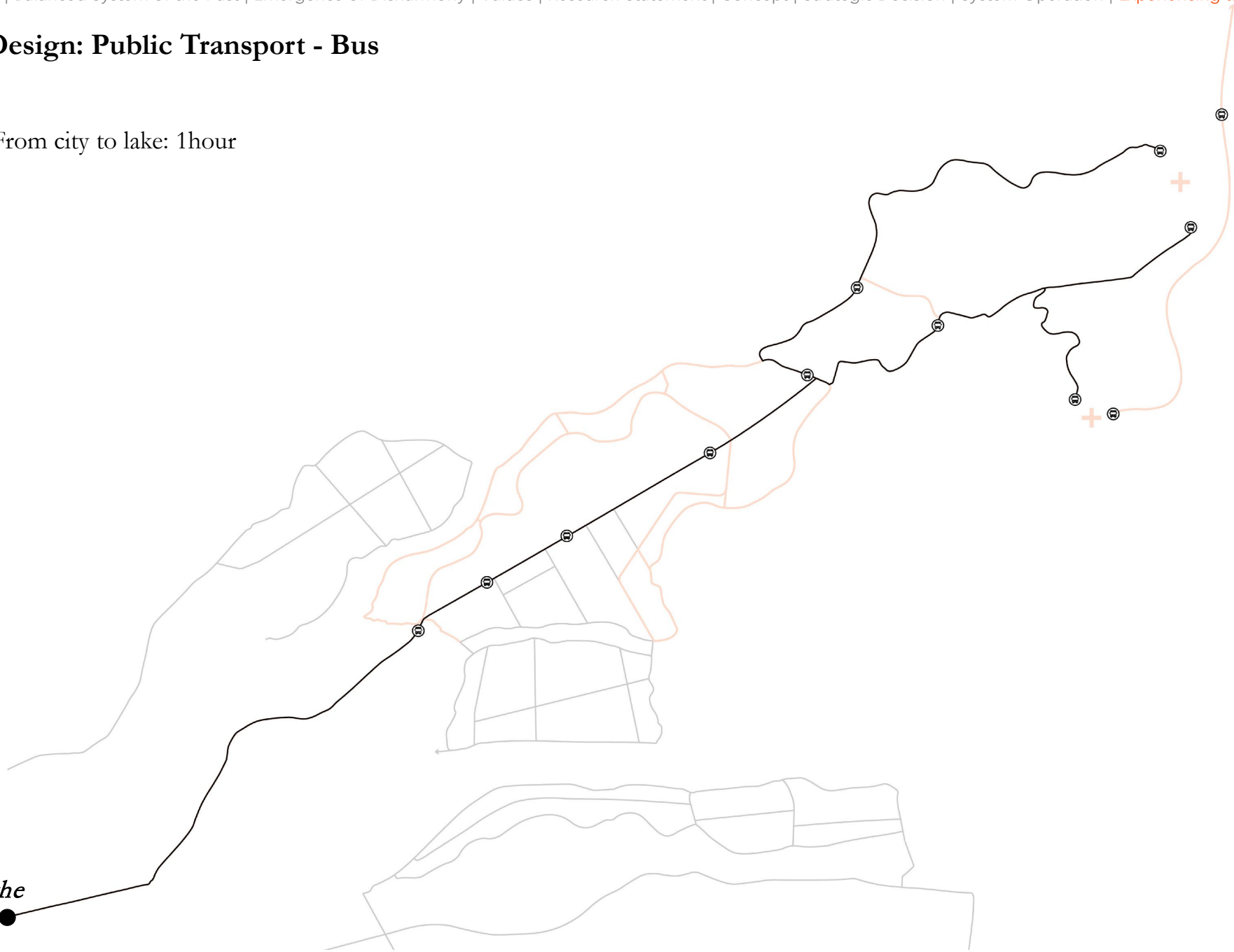


Routing Design: Visitors & Daily Use



Routing Design: Public Transport - Bus

From city to lake: 1hour

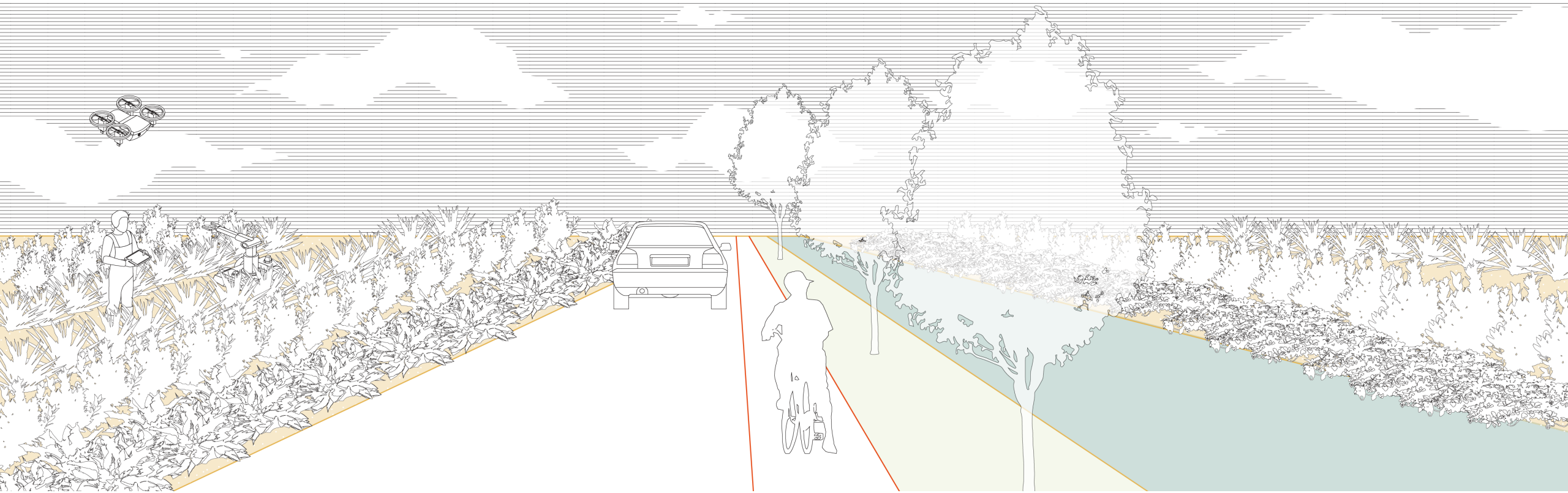


Connected with the city bus system

Routing Design: Public Transport – Water Bus (only wet season)

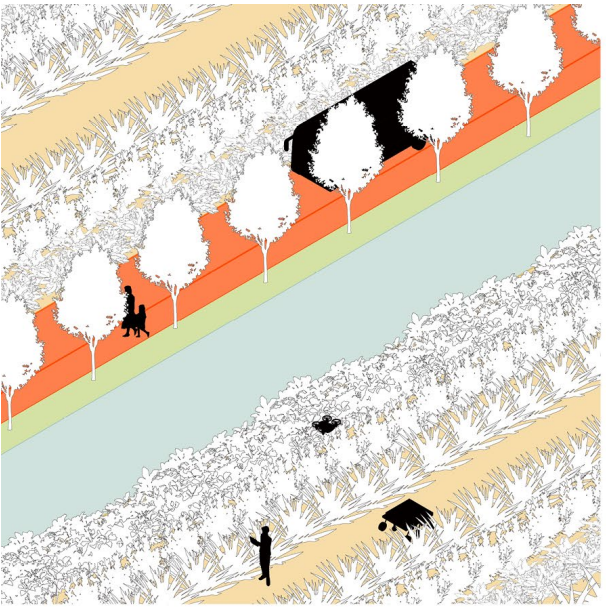
Efficient Productive Polder

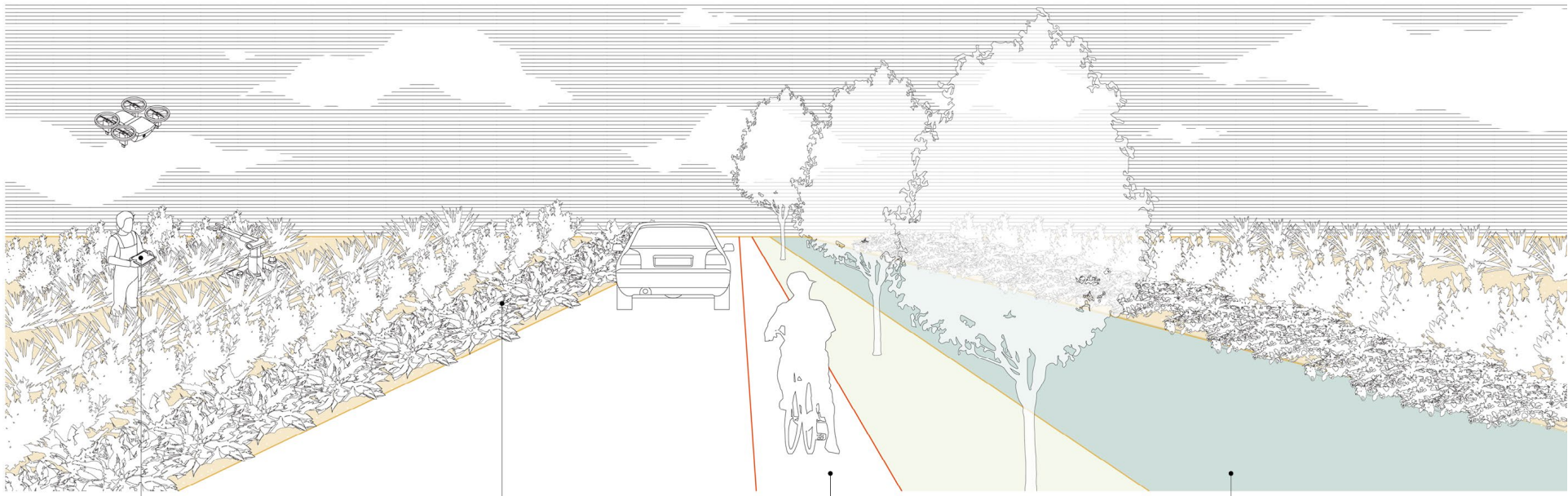
Improved Polder



Efficient Productive Polder

Improved Polder





Material selection:

recycled plastic road

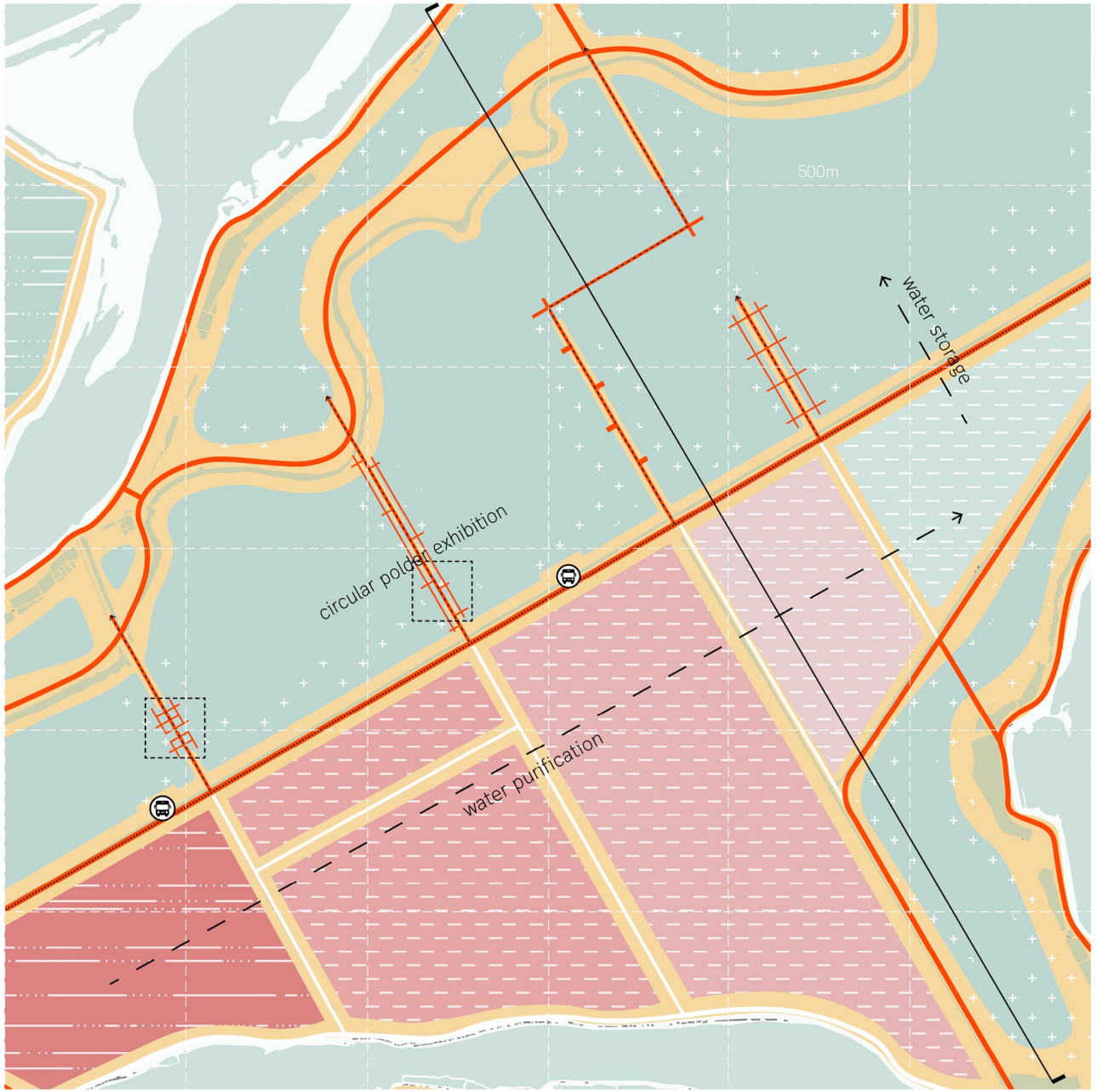
Crop selection:

Oryza sativa → *Arachis hypogaea* *Medicago sativa* *Camellia sinensis* *Lycium chinense* *Oryza sativa*

(Species with efficient water requirements and higher economic values)

Sustainable Productive Polder

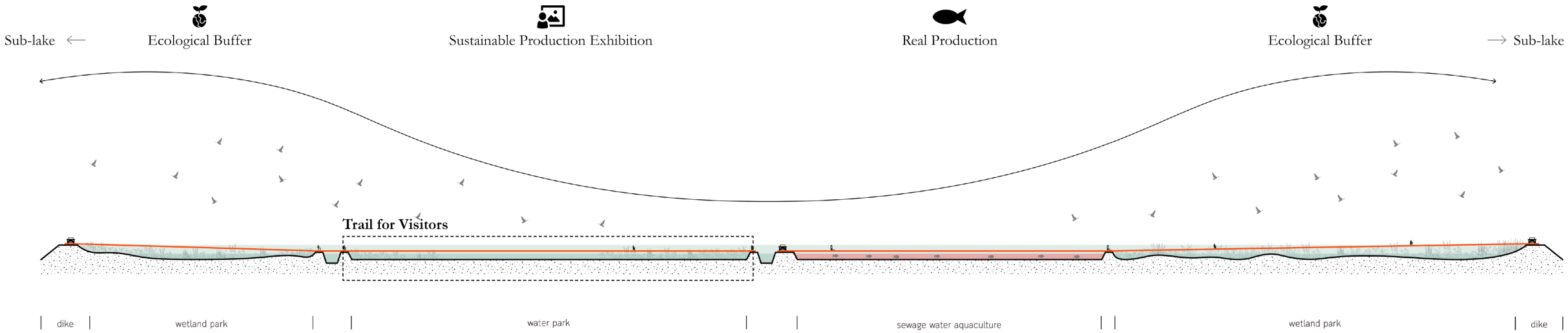
Transformed Polder

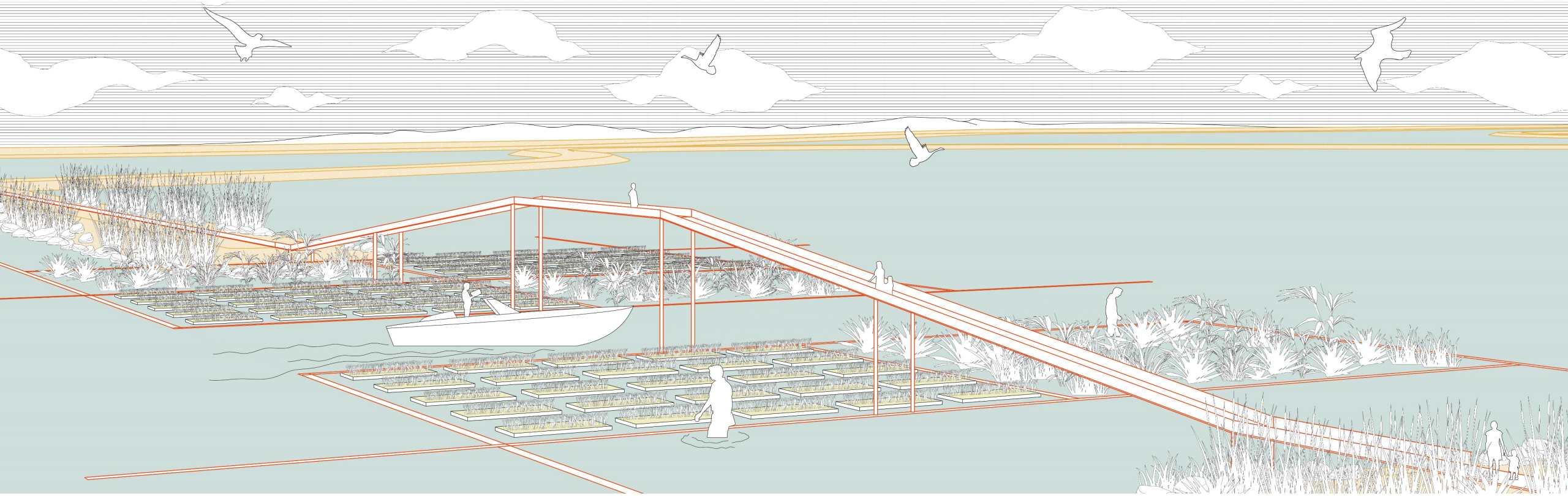


- bus stop
- visitor routing
- daily use routing
- bus line
- aquatic planting
- pre-treatment
- sewage water aquaculture (preparation pond)
- sewage water aquaculture (stocking pond)
- sewage water aquaculture (maturation pond)
- sewage water aquaculture (harvest pond)

Sustainable Productive Polder

Transformed Polder





Sustainable Productive Polder

Trail of self-circulation system

Water purification plant selection:


Typha orientalis

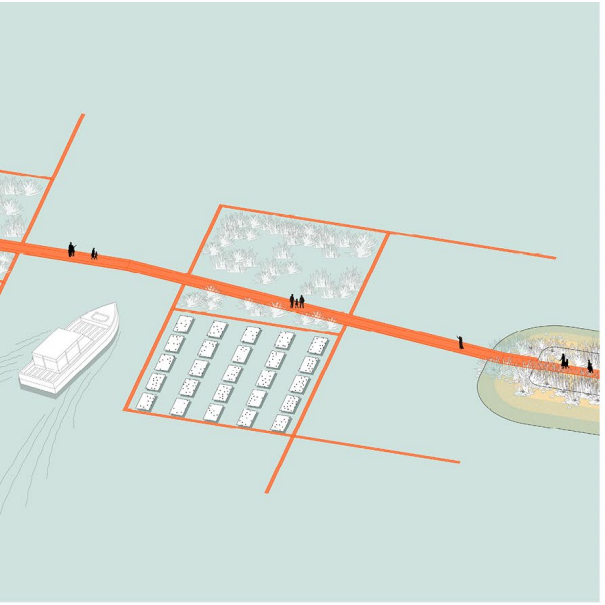

Juncus effusus

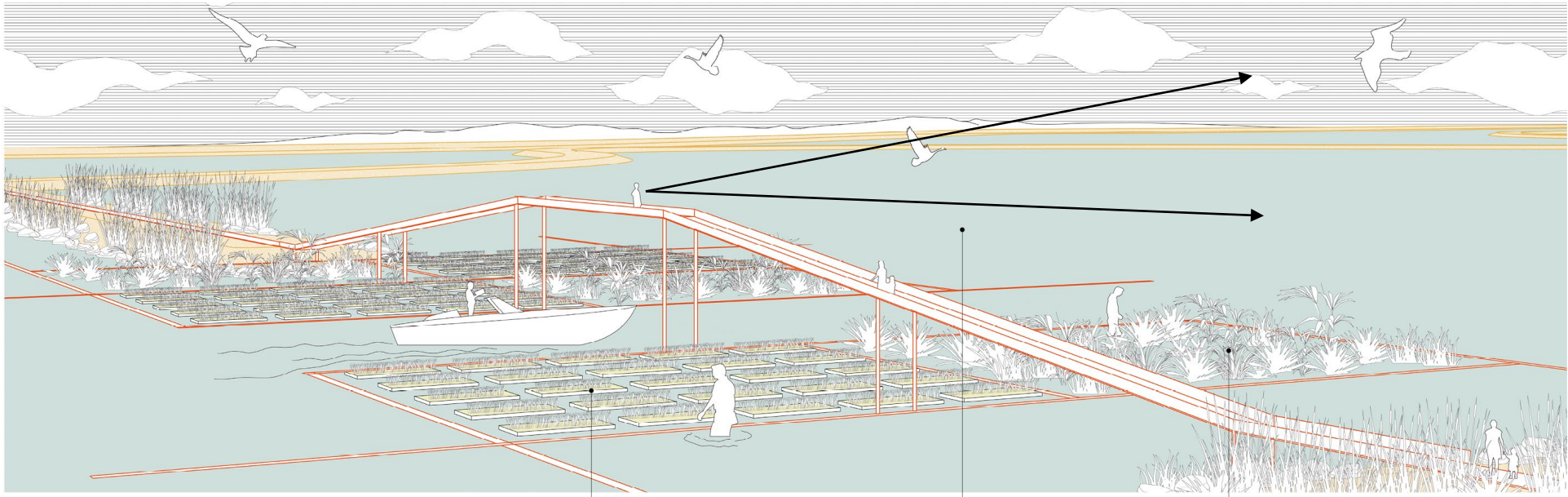

Iris tectorum


Nymphaea


Antirrhinum majus

Emerged plant | Floating plant | Submergent plant





Floating Agriculture | Water Storage | Aquatic Planting

Material selection:


recycled plastic panels

Floating agriculture crops selection:


Amaranthus tricolor

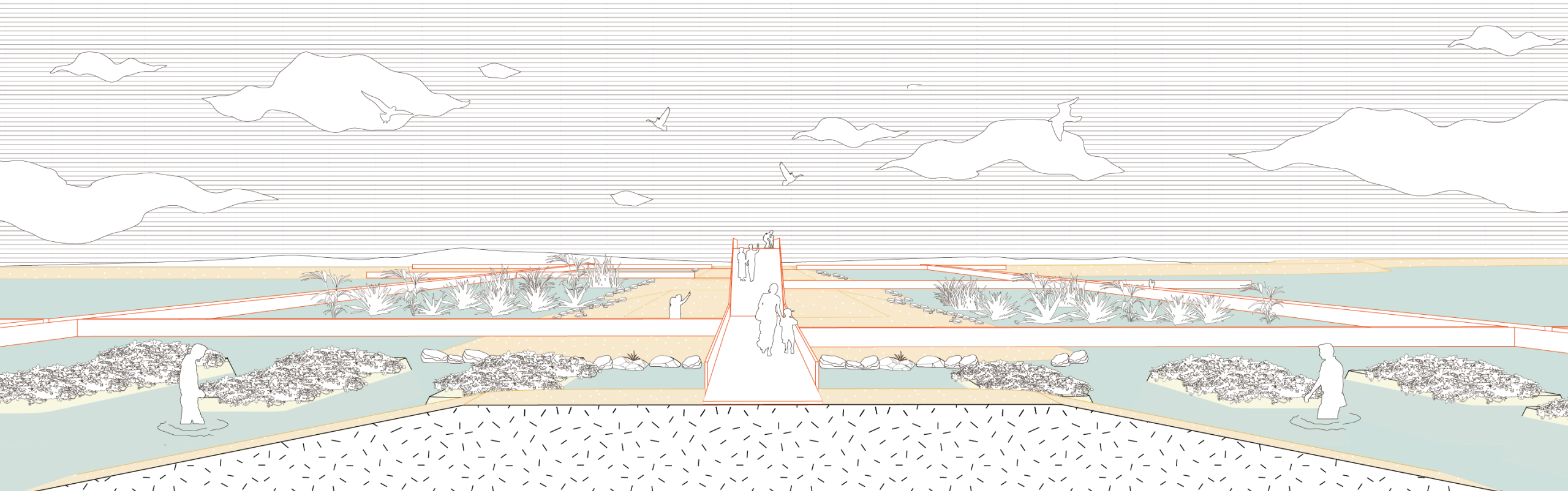

Brassica Campestris


Abelmoschus esculentus


Capsicum annum


Hyacinthus orientalis

(species suitable for floating agriculture with economic and ornamental value)



Sustainable Productive Polder

Trail of cooperative circulation system B

Water purification plant selection:


Typha orientalis

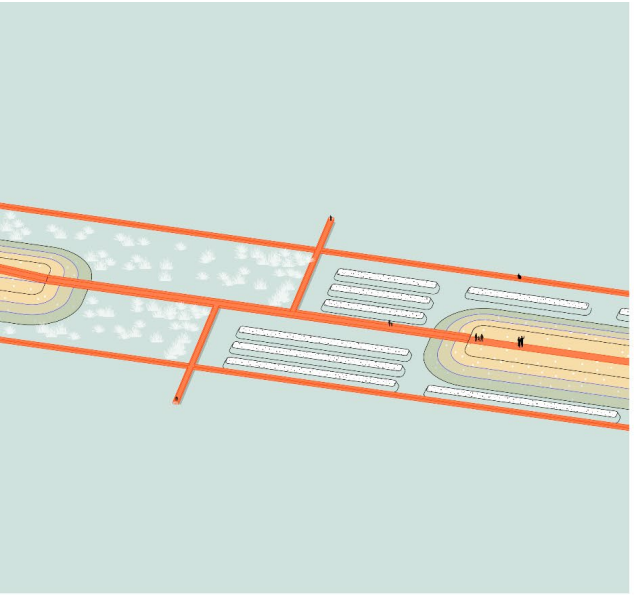

Juncus effusus

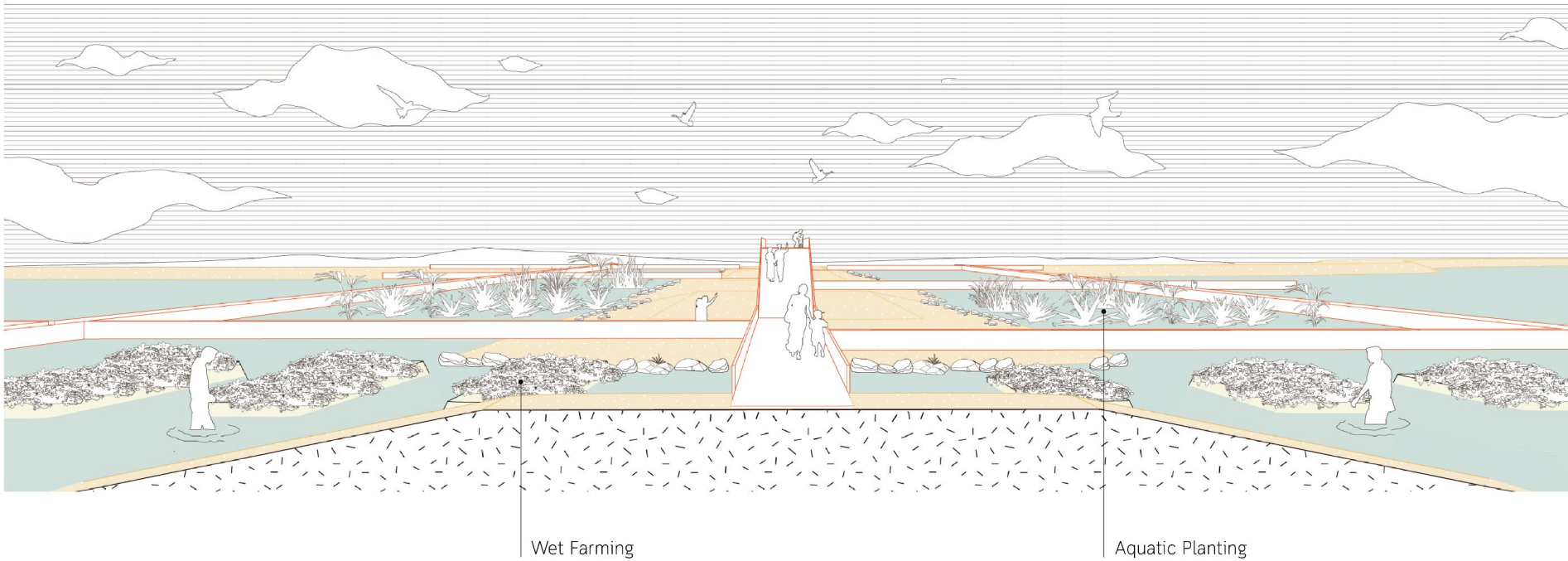

Iris tectorum


Nymphaea


Antirrhinum majus

Emerged plant | Floating plant | Submergent plant





Material selection:


recycled plastic panels

Wet farming crops selection:


Eupatorium cannabinum


Filipendula ulmaria


Nasturtium officinale

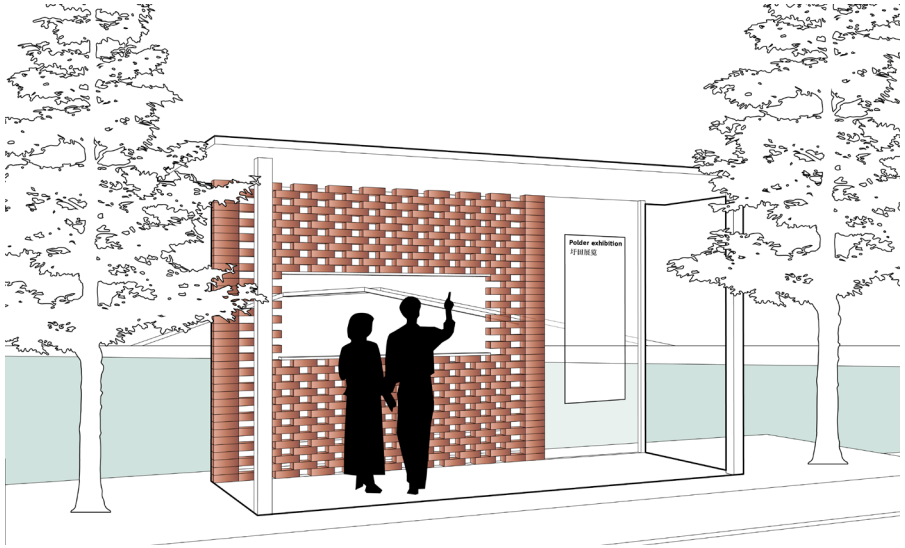

Cardamine pratensis

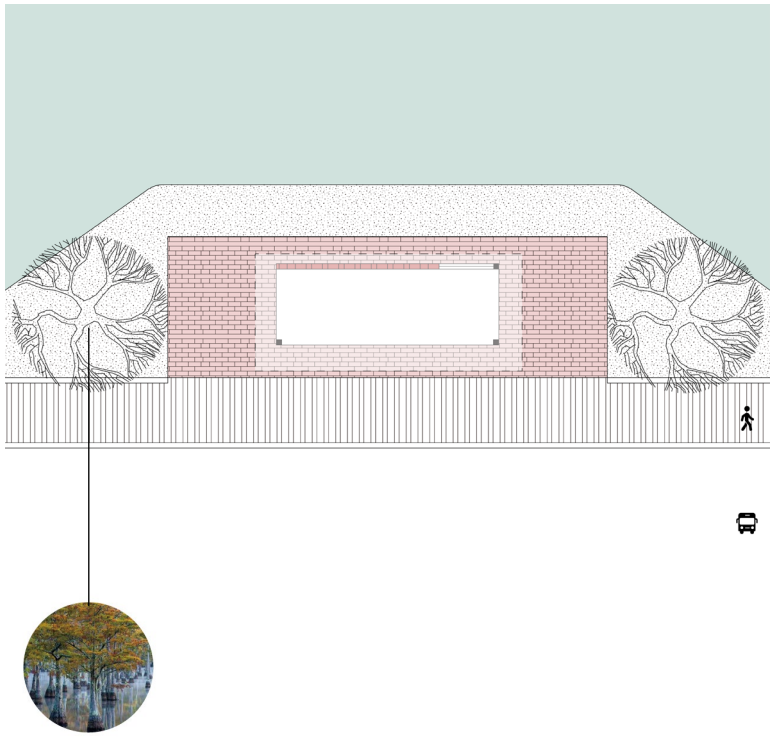

Mentha aquatica

(species suitable for wet farming with economic and ornamental value)

Landmarks: Imply landscape changes

Bus stops - Polder

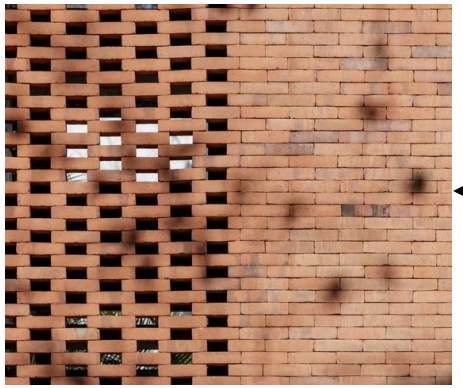




Taxodium ascendens

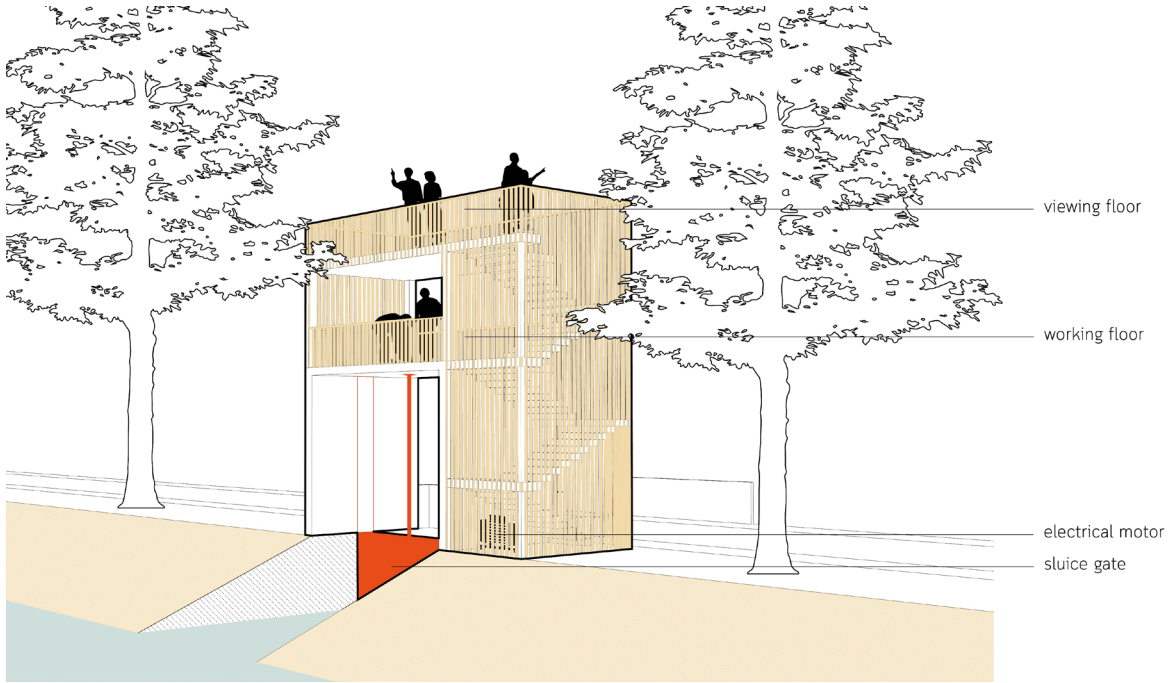
Local building:

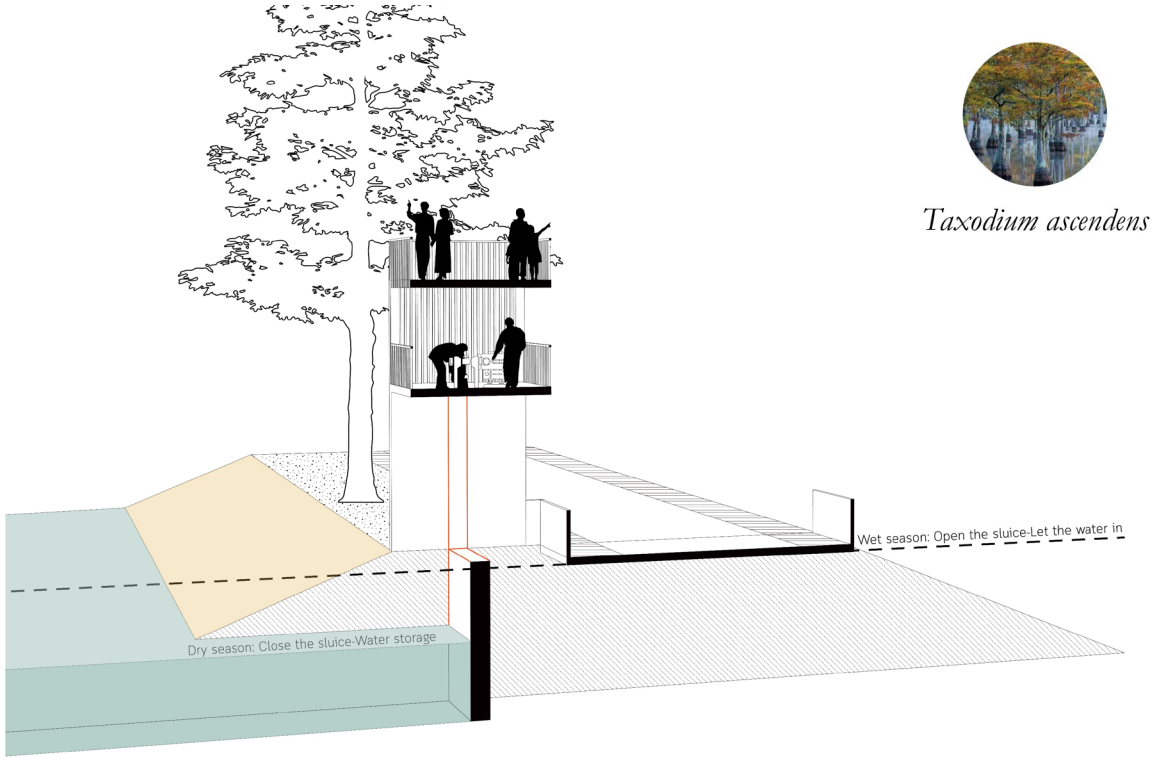
Material selection:



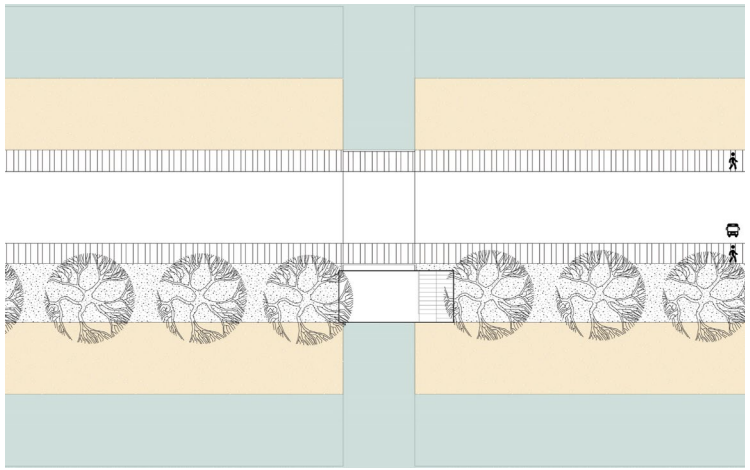
Landmarks: Imply system operation

Sluice

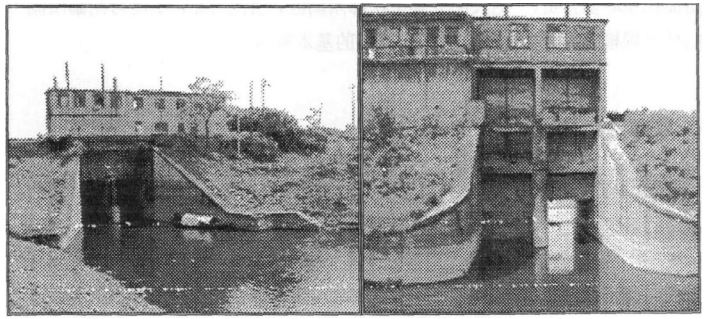




Taxodium ascendens



Traditional sluice:



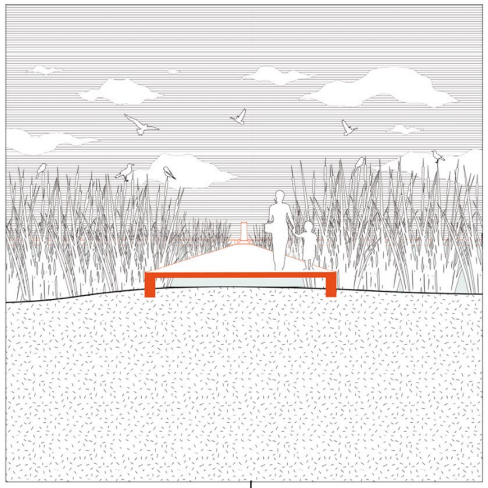
Into the Lake

Into the Lake

Material selection:

recycled plastic panels

Planting characteristic: high, enclosed



Phragmites australis

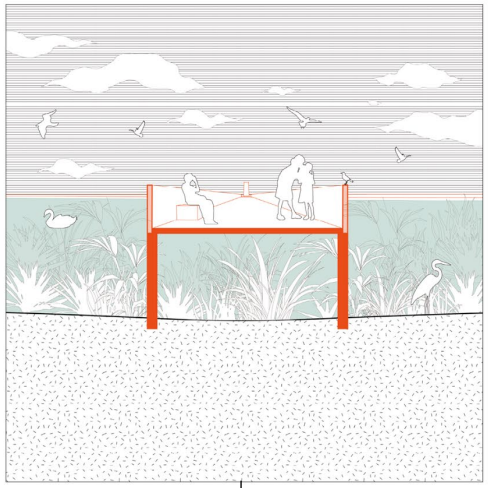
Typha orientalis

Imperata cylindrica

Carex

Zizania latifolia

Planting characteristic: ornamental, purifying, semi-open



Phragmites australis

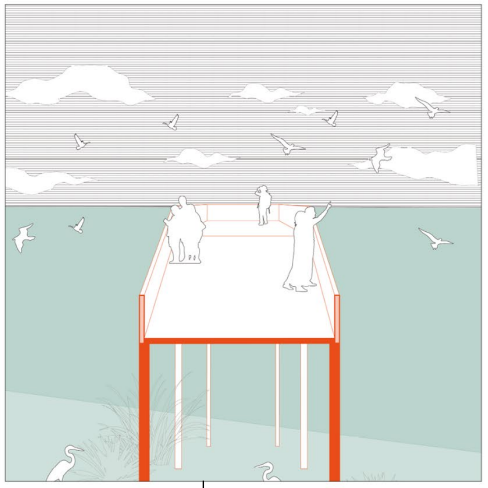
Iris pseudacorus

Pontederia cordata

Lythrum salicaria

Colocasia esculenta

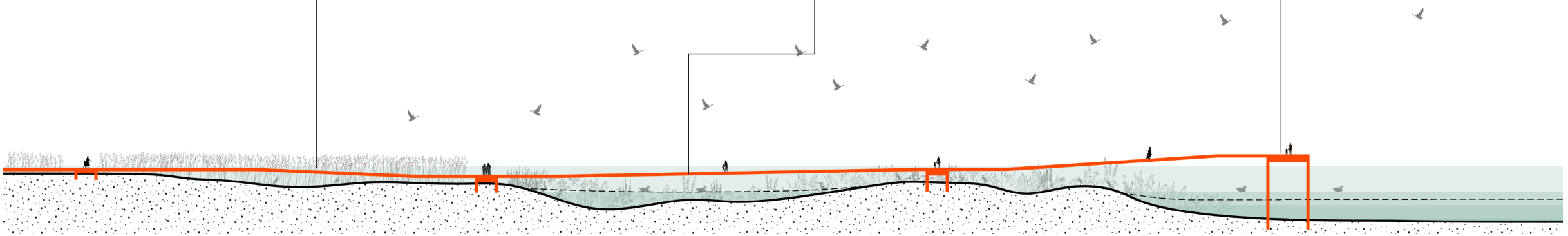
Planting characteristic: submerged, open



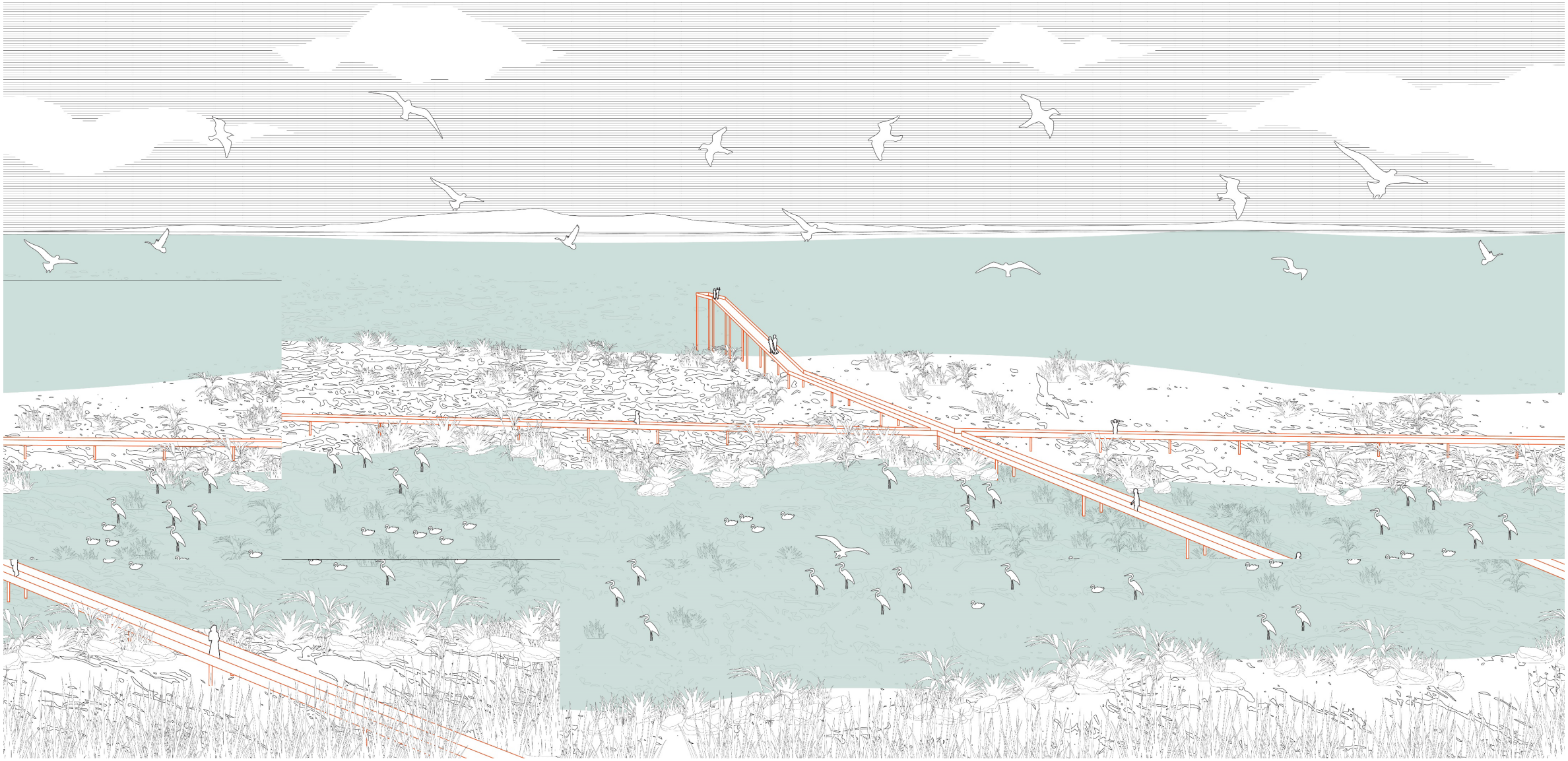
Antirrhinum majus

Hydrilla verticillata

Pontederia cordata

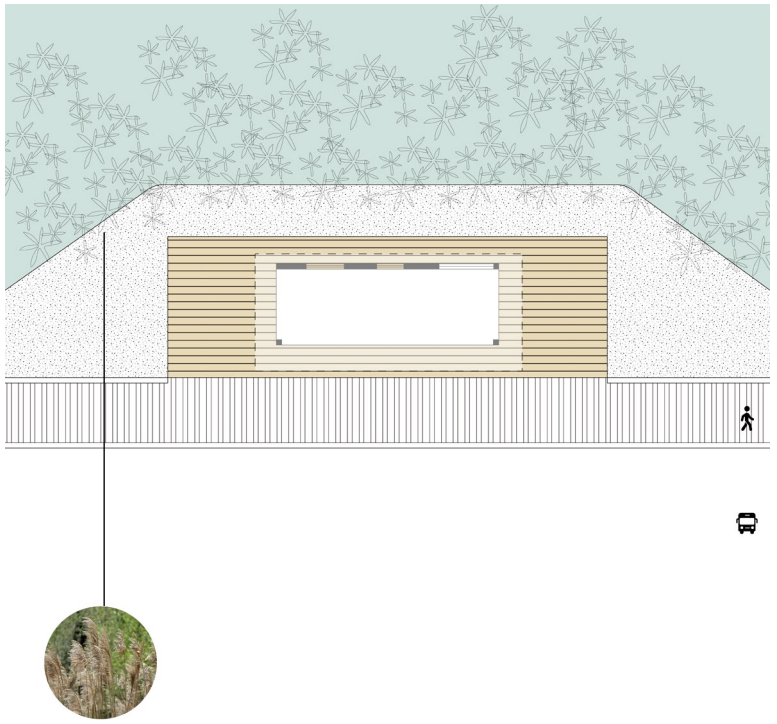


reeds area | aquatic plants area | deep water



Landmarks: Imply landscape changes

Bus stops – Sub-lake & Wetland



Phragmites australis

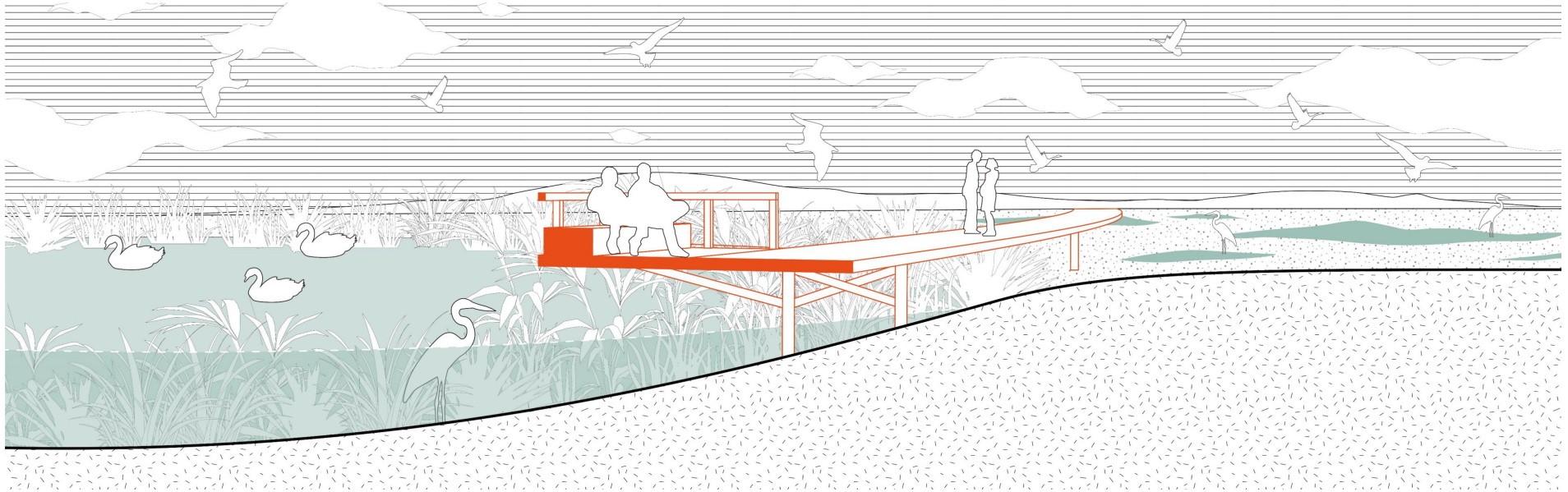
Sub-lake photo:

Material selection:

Sea of Grass

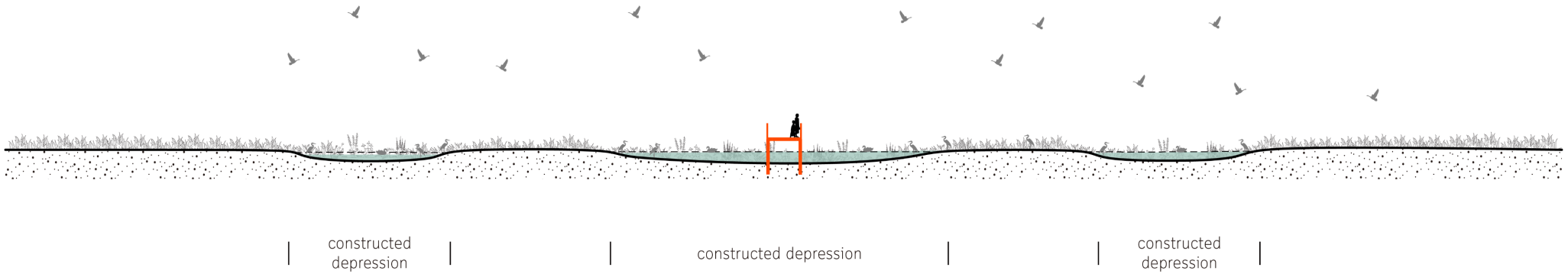
Material selection:

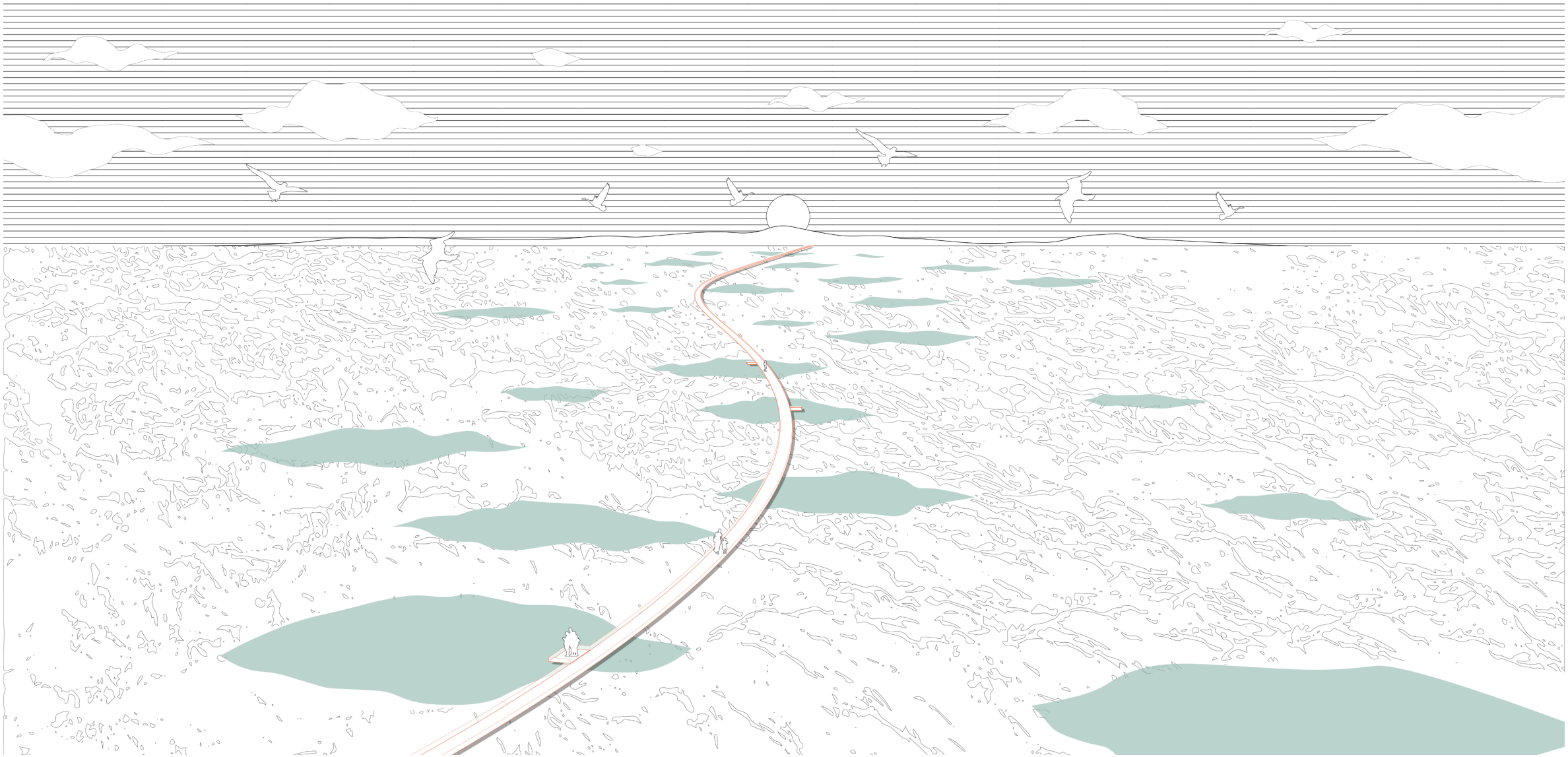
recycled plastic panels



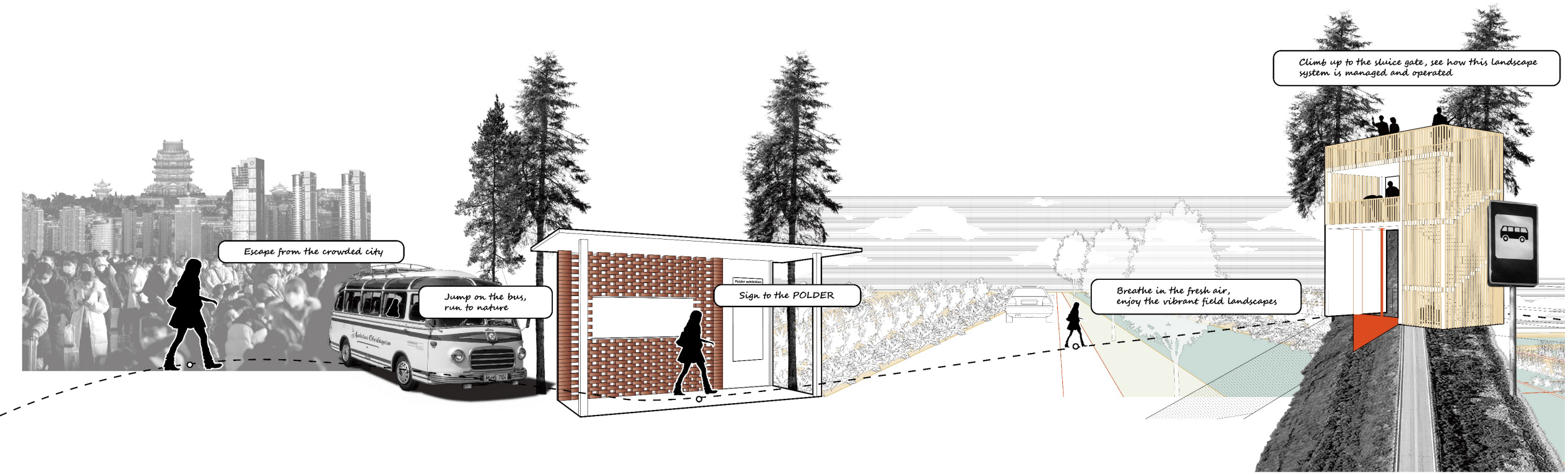
Carex

Pontederia cordata



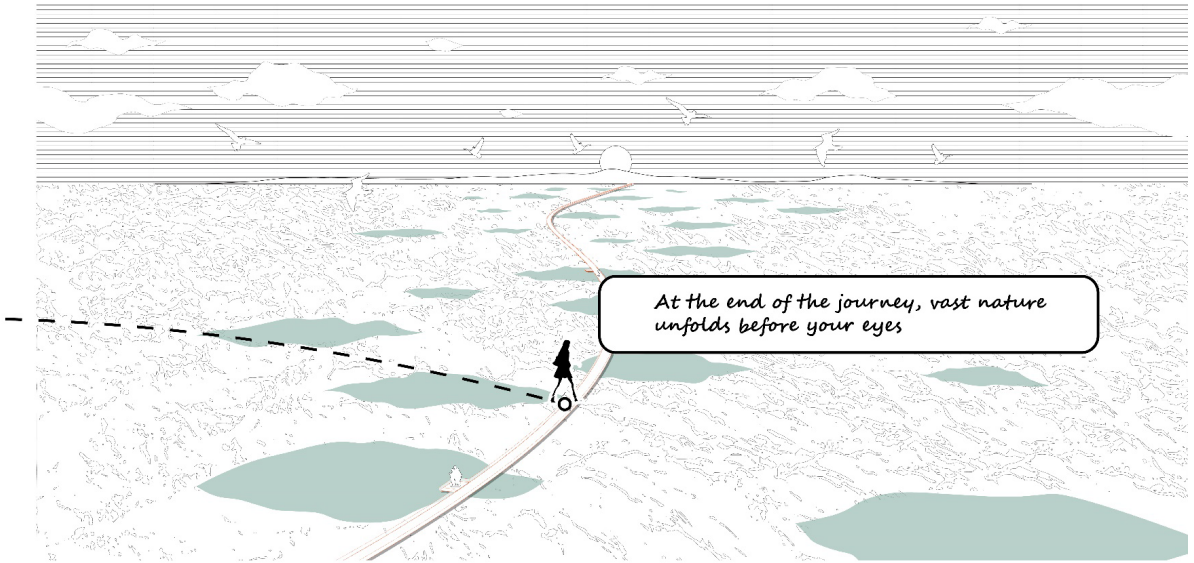


From Crowded City to Vast Nature



From Crowded City to Vast Nature

From Crowded City to Vast Nature



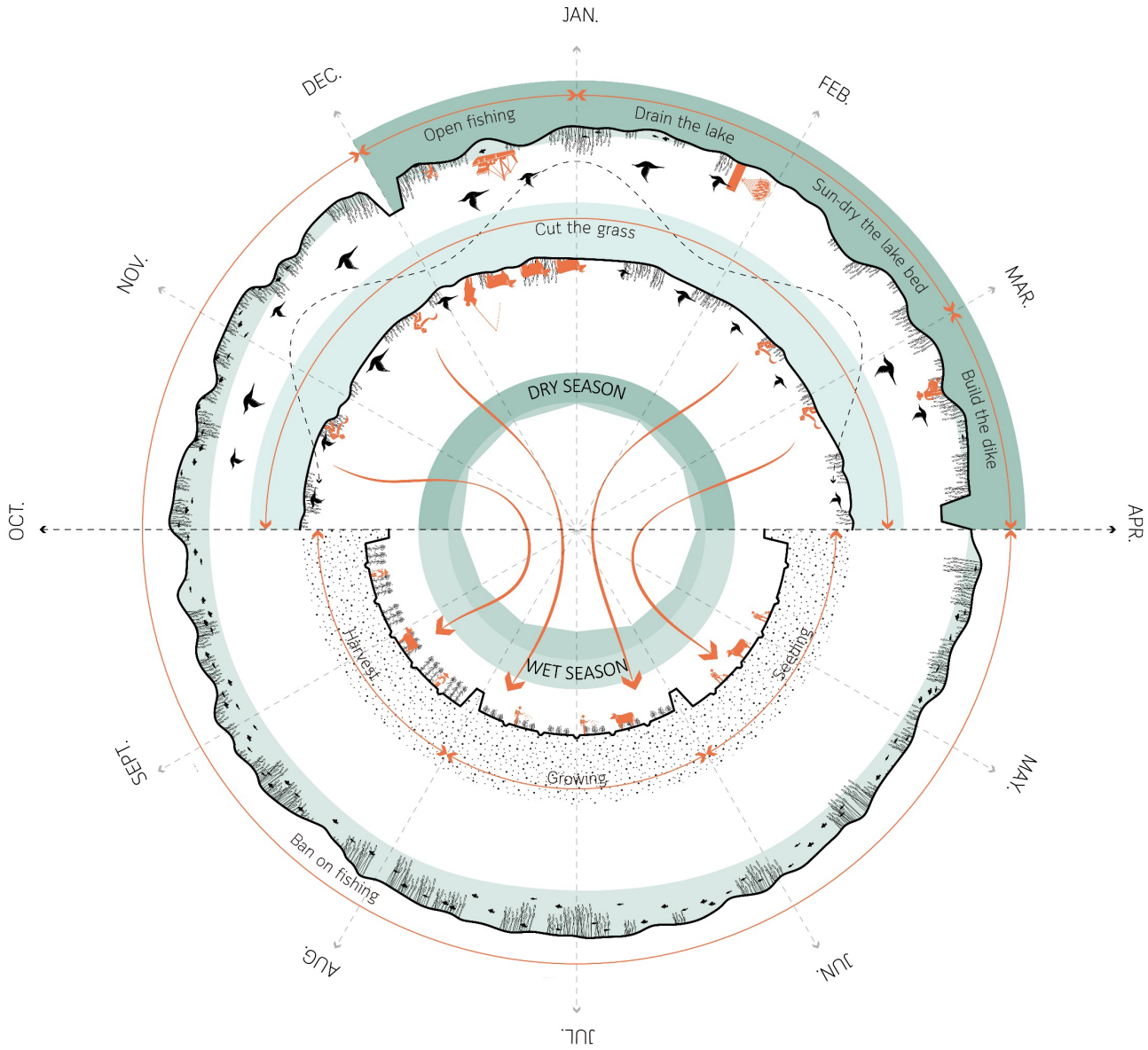
Conclusion

Estimated Results on Water Issues

WET SEASON:	extreme water level	≈	**-1.8m**	⬇
	water storage capacity	≈	**+5.628×10¹² L**	⬆
	severe water event(20.5m)→18.7m *extreme water event(19.5m)→17.7m*			
DRY SEASON:	water storage capacity	≈	**+1.407×10¹² L**	⬆

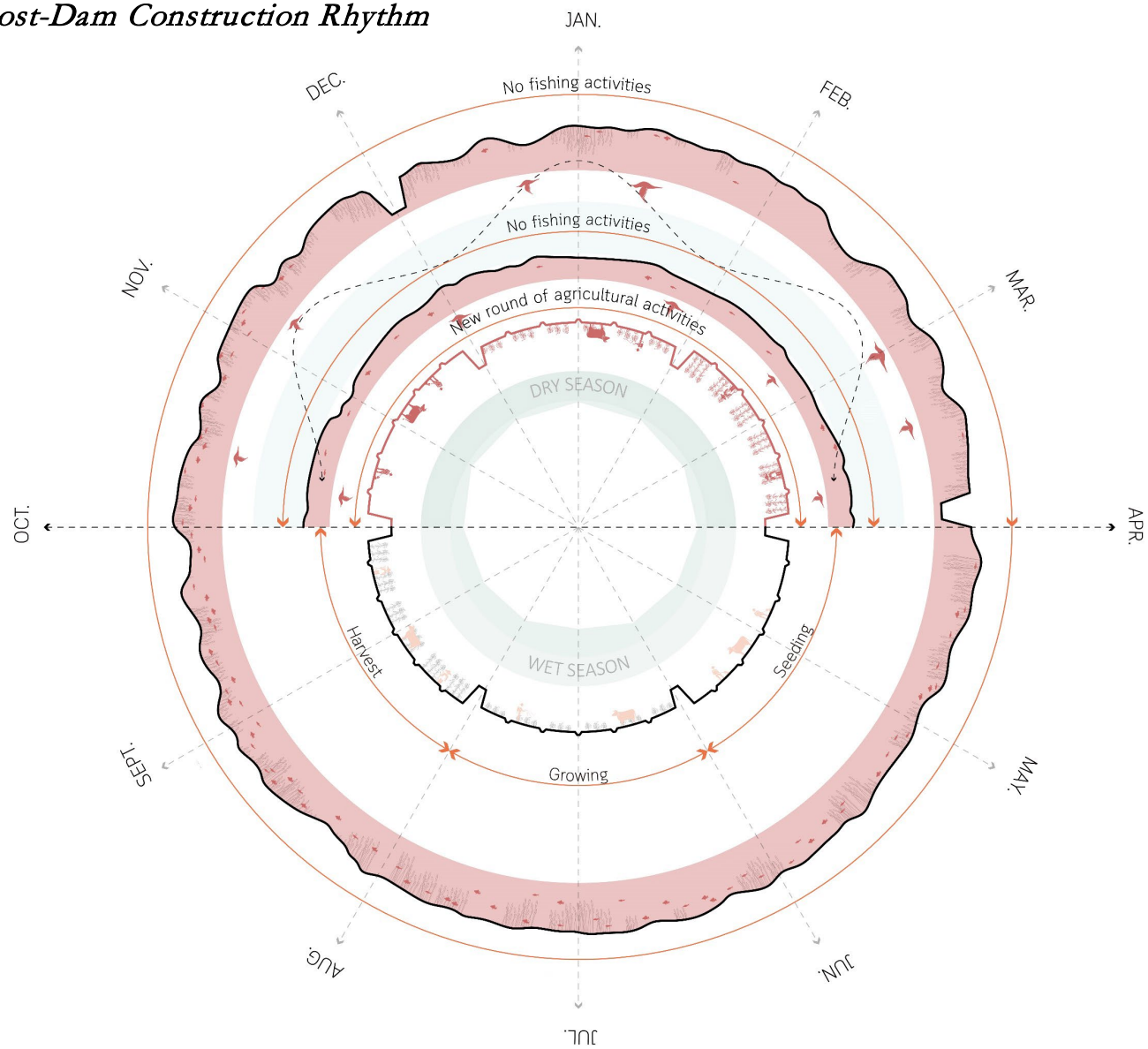
Conclusion

Water Rhythm – original rhythm



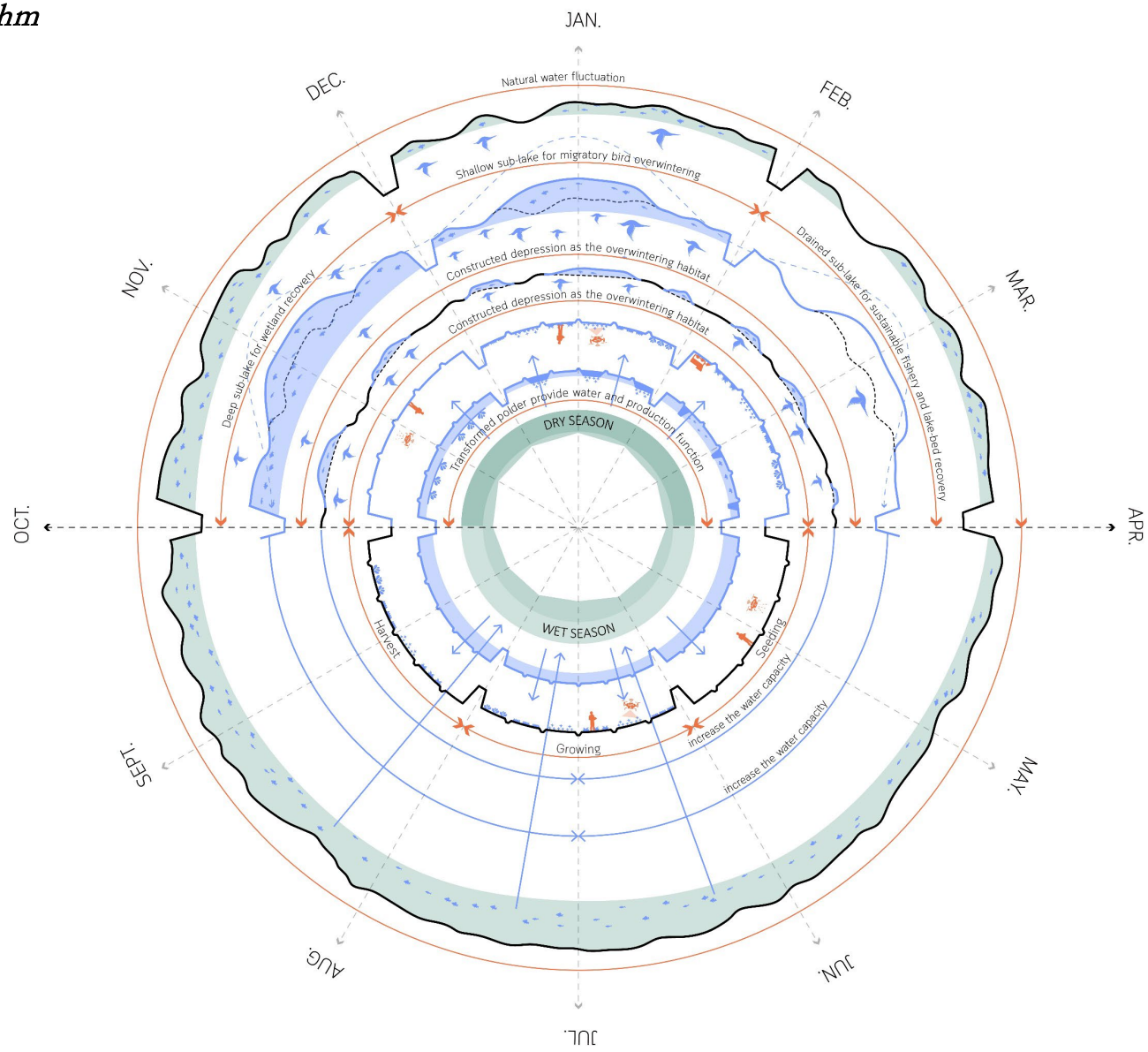
Conclusion

Water Rhythm – Hypothetical Post-Dam Construction Rhythm



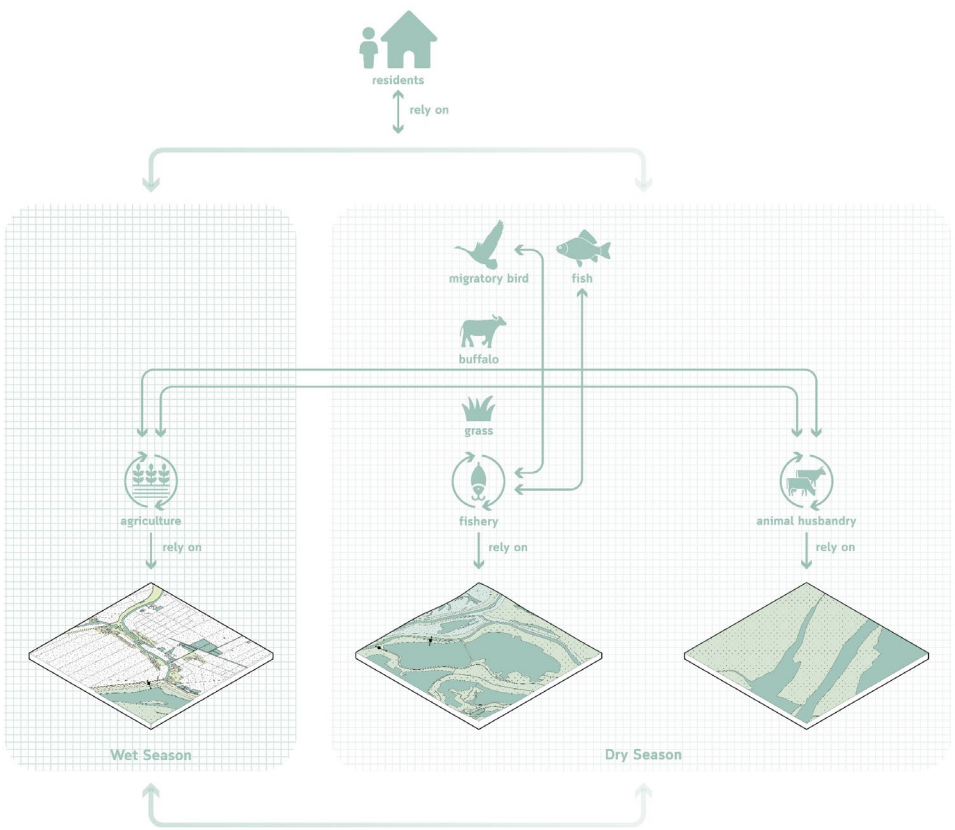
Conclusion

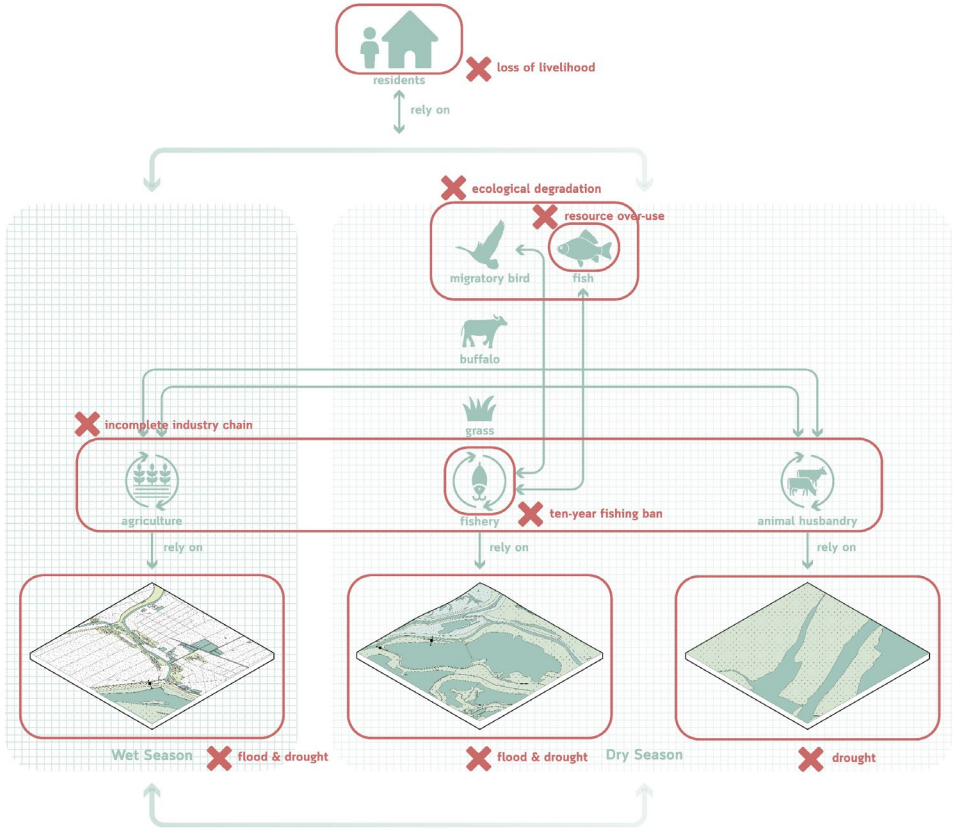
Water Rhythm – Designed Rhythm



Conclusion

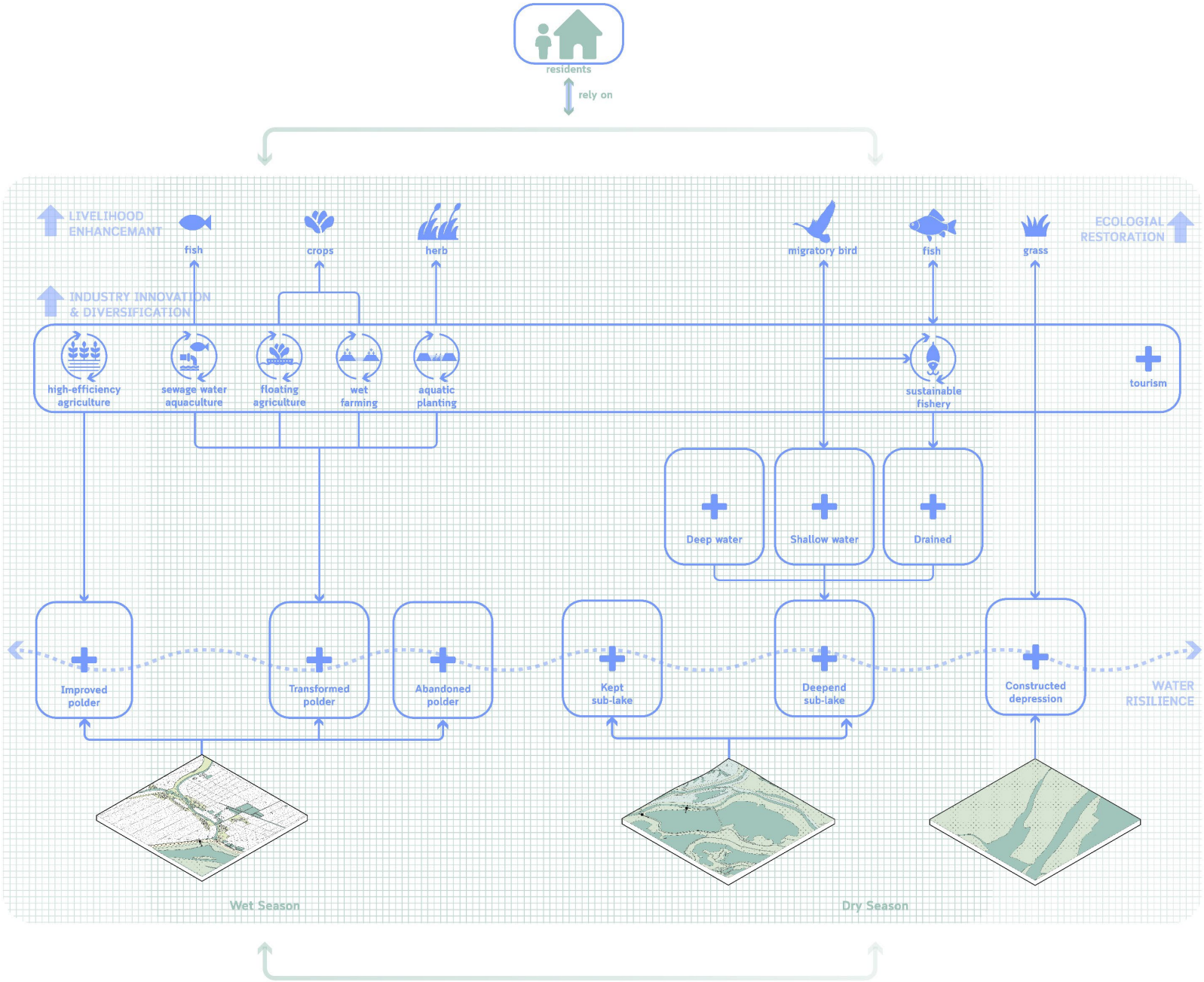
System Cycle





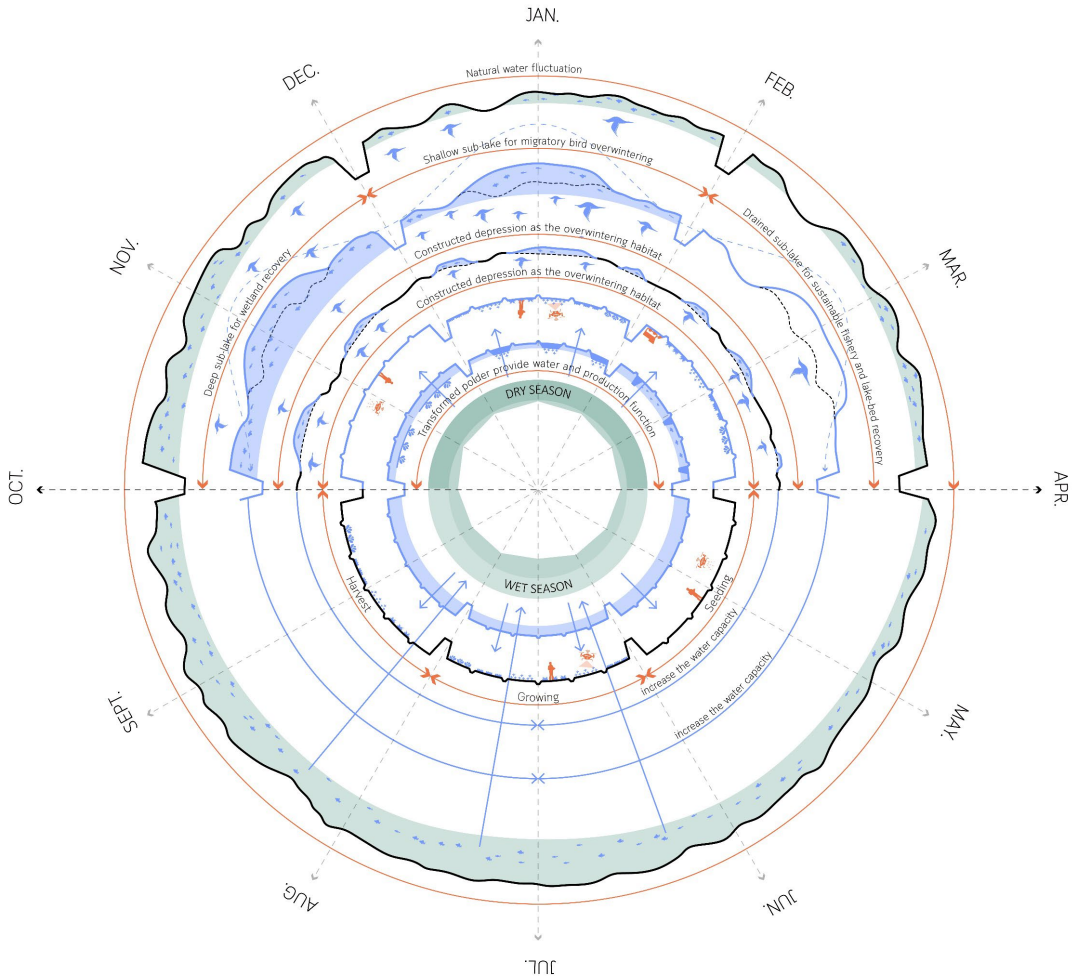
Conclusion

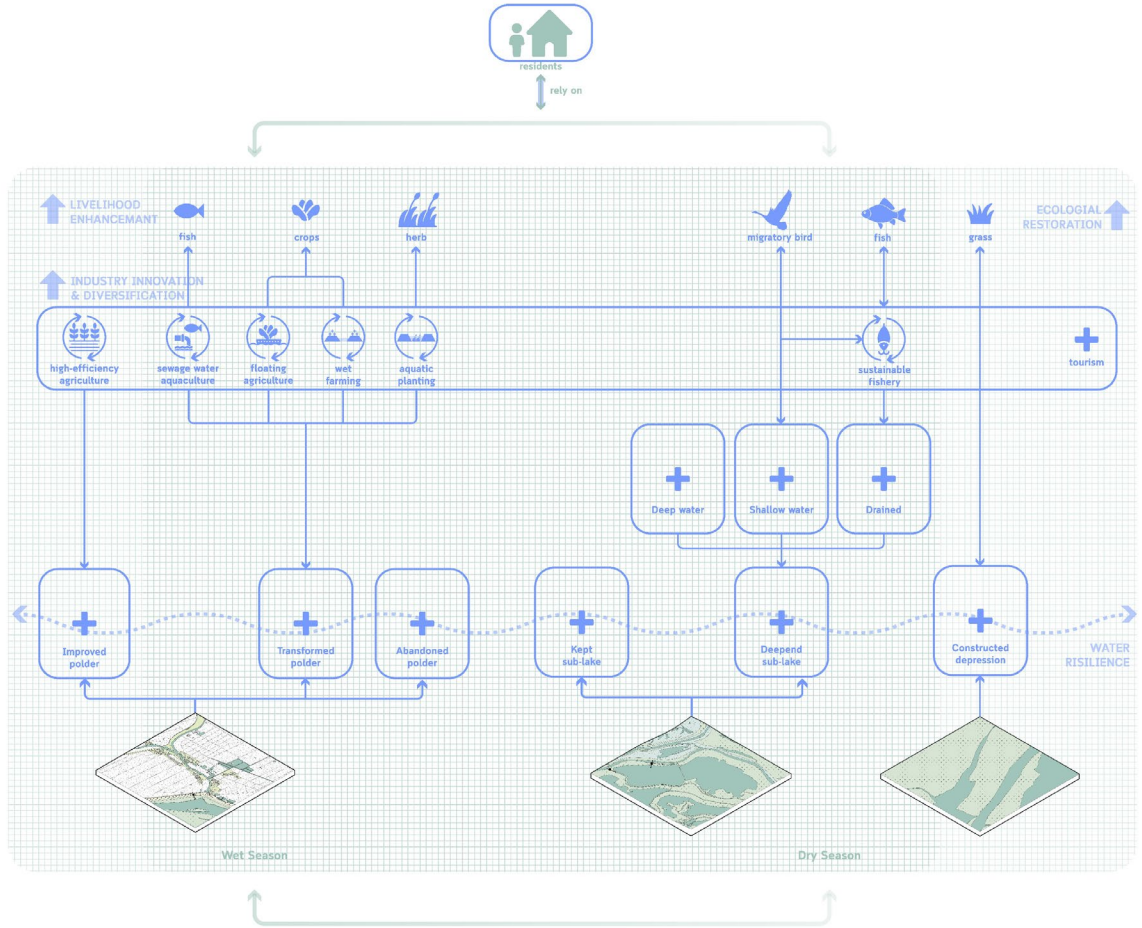
System Cycle

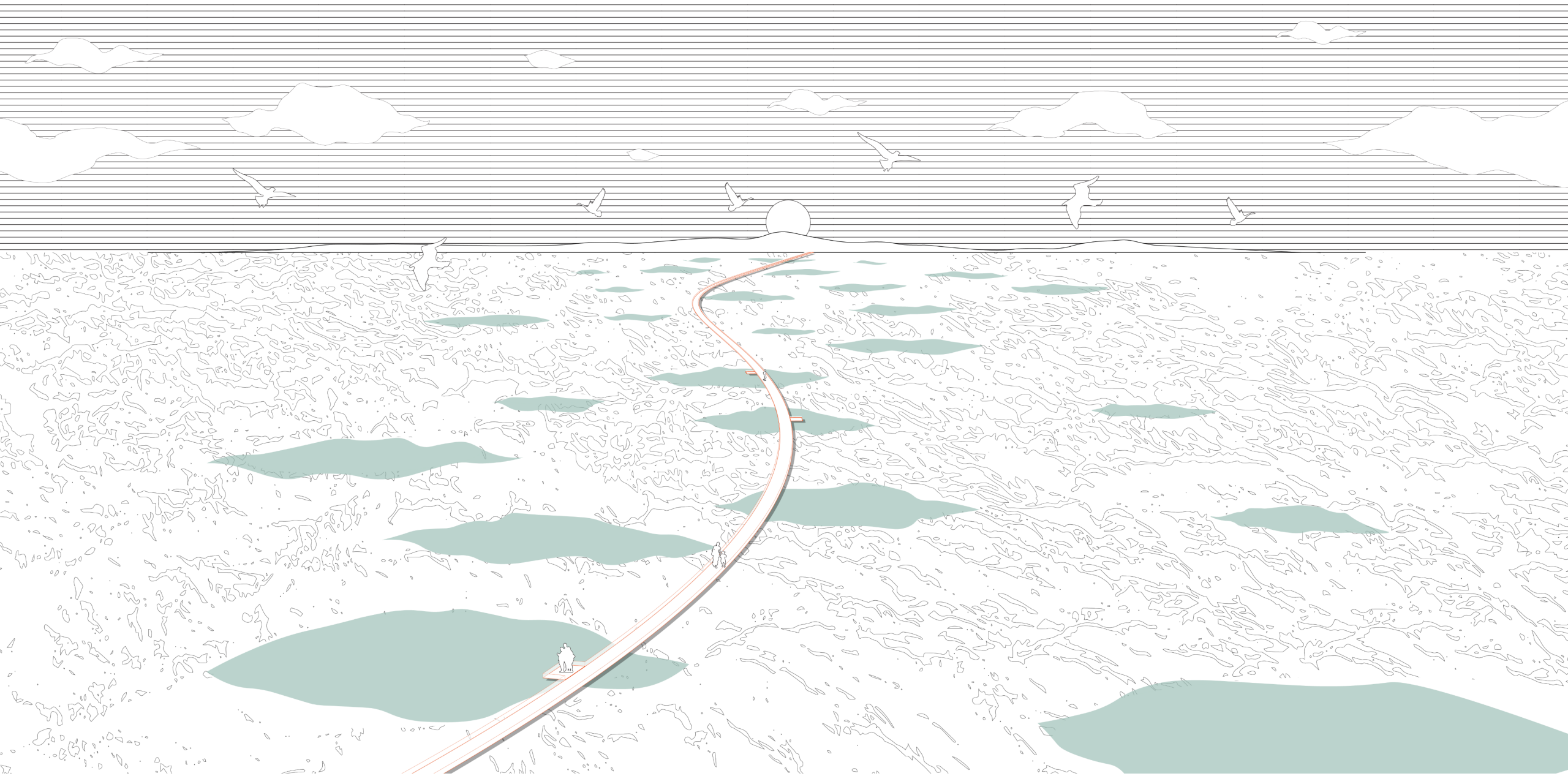


Conclusion

How can landscape architectural tools be implemented to create a sustainable, circular landscape, ensuring livelihood and enhancing the spatial quality of Poyang Lake?







Thank you.