DEVELOPING A RESILIENT XICHONG

P5

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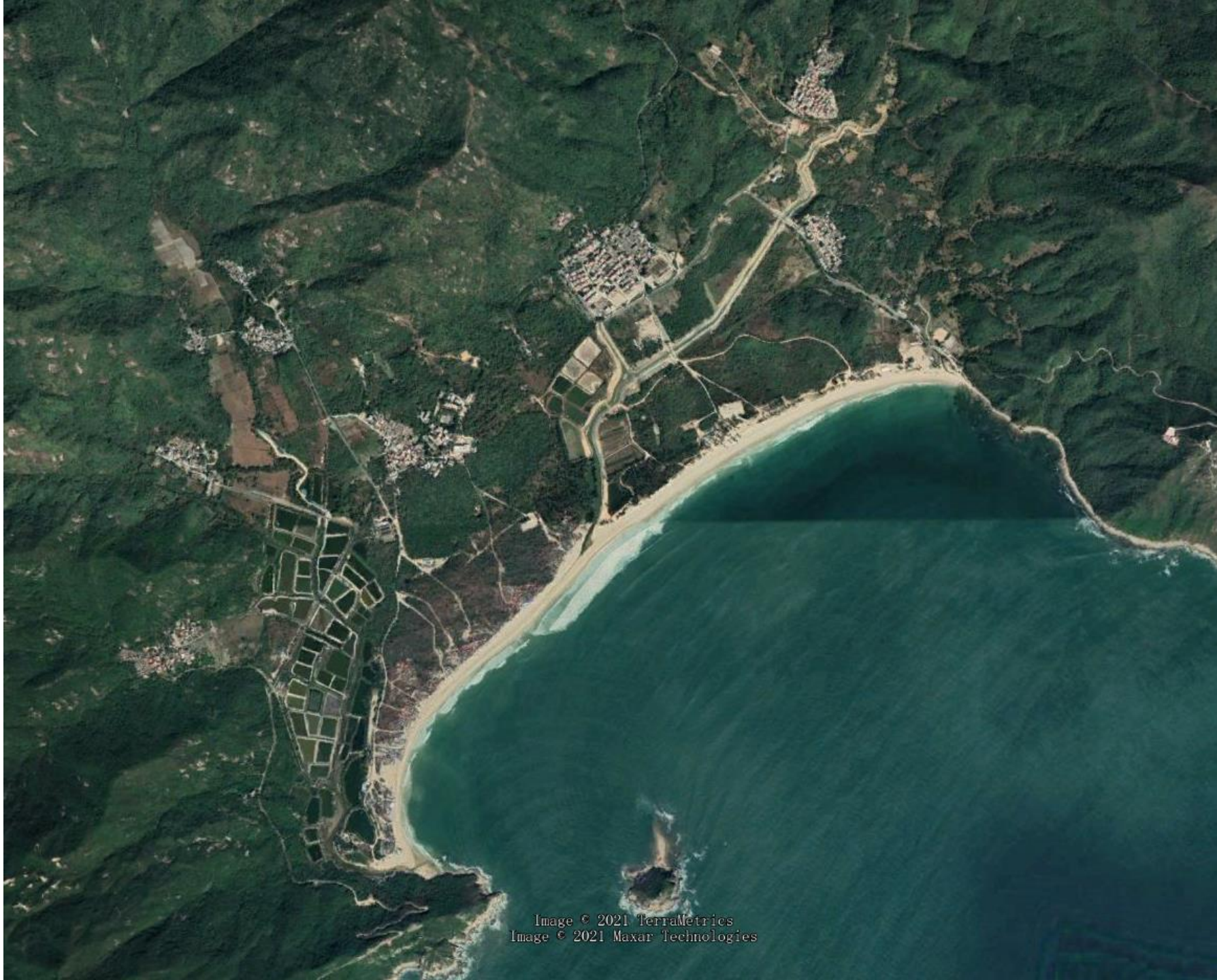
Location

The site is located in **Xichong**, Nan'ao Street, Dapeng New District, Shenzhen, Guangdong Province, Pearl River Delta, China.

It is on a peninsula, faces the sea and surrounded by mountains on three sides



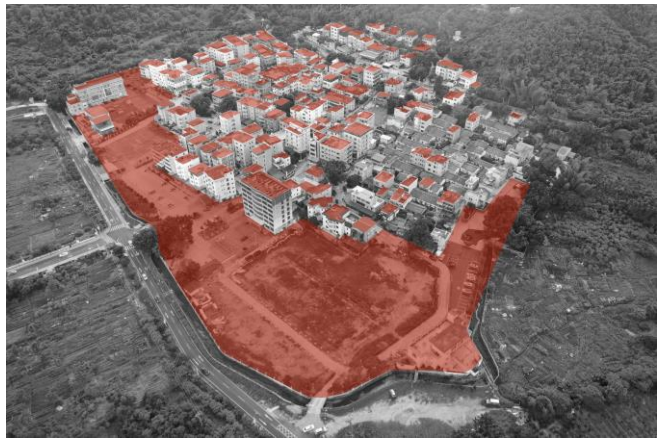
Fascination

Landscape Structure

Problem field

Rapid and uncontrolled expansion of the tourism industry

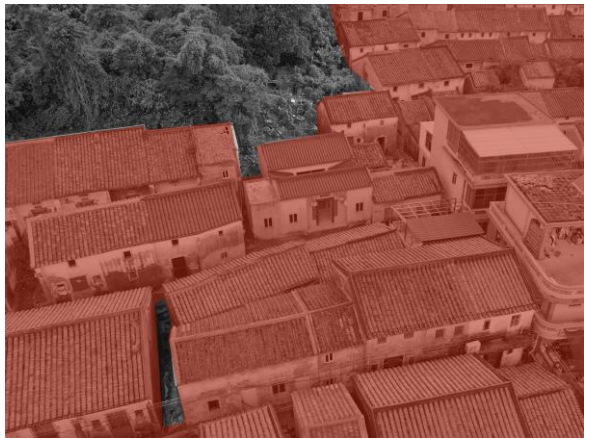
hurricane， storm and sea level rise



The tourism industry is expanding rapidly, with high-density hard paving and roofs appearing in large numbers

Many buildings are built near or on the beach, dramatic human activity intensify erosion

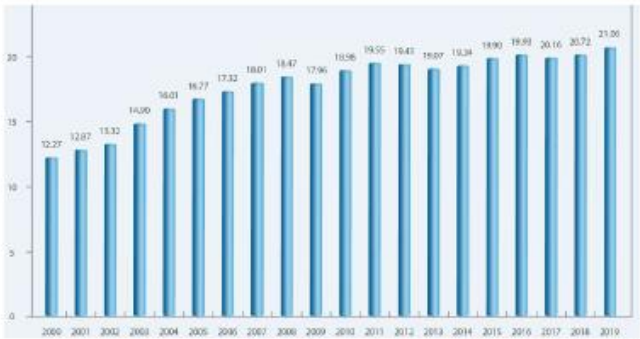
Shenzhen is very lack of pure fresh water resources



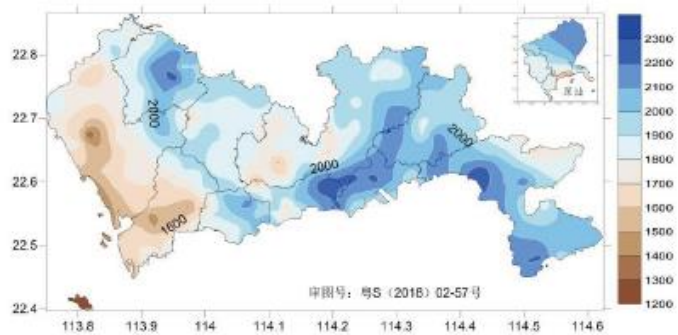
Traditional Hakka culture has not adapted to the rapid development of tourism

precipitation

ShenZhen pricipitation trends from 2000 to 2019
Source: Shenzhen Water Affairs Bureau



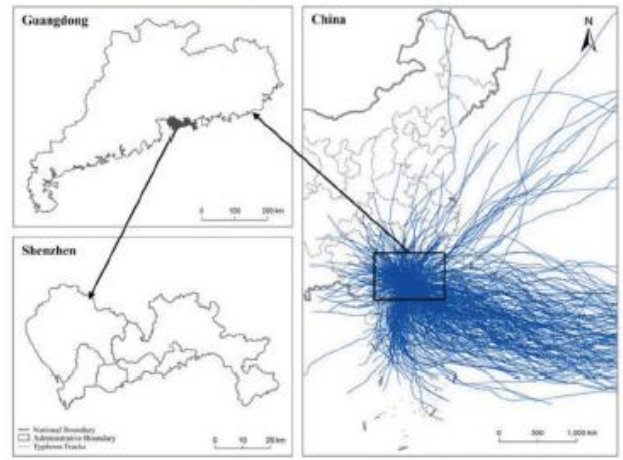
ShenZhen water demand from 2000 to 2019
Source: Shenzhen Water Affairs Bureau



Distribution map of cumulative rainfall in Shenzhen in 2019
Source: Shenzhen Meteorological Bureau

The precipitation in Shenzhen presents an obvious uneven distribution of time and space. Rainfall is sometimes a lot, sometimes very little, which can easily cause floods and droughts. At the same time, extreme climates such as typhoons will often bring heavy rains, especially in coastal areas.
With the increase of the population, the water consumption of residents is also increasing, and the demand for water quantity and water quality is also increasing.

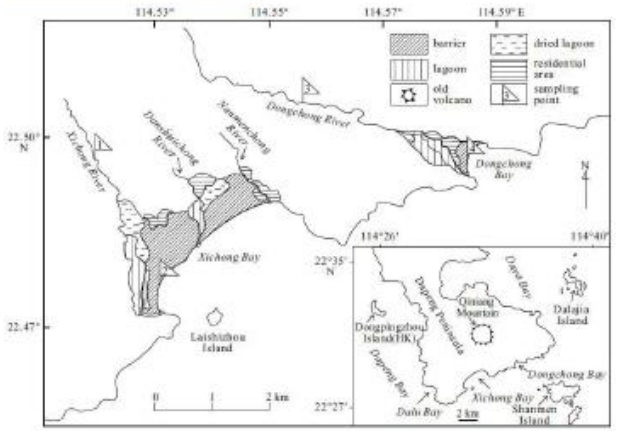
typhoon



typhoon in PRD
Source: TaoYe et al., 2016

There are typhoons in Shenzhen every year. In the past ten years, 18 major typhoons have hit Shenzhen. Typhoons can bring heavy rains, cause floods, raise water levels in a short time, bring storm surges, and threaten the lives of coastal and inland residents.

coastal erosion



coastal erosion in Xichong
Source: (Zhang Song et al., 2015)

In modern times, the sand of Xiyong Beach was manually excavated for construction purposes. As the sea level rises and human activities intensify, sand is gradually lost. Moreover, every time a typhoon occurs, a large amount of sand is taken away.

Problem statement

Xichong is in a phase of rapid territory transformation, the disorderly expansion of tourism, urbanization, and rigorous coastal climate change lead to an inadequacy of traditional culture, water sensitivity absence, and ecology decline, gradually showing an unsustainable development trend.

Research objective

the objective of this research is:

To create a **resilient landscape framework** that facilitates conditions, both on **regional scale and village scale**, for the development of **ecology, socio-culture and economy**?

Sub-questions

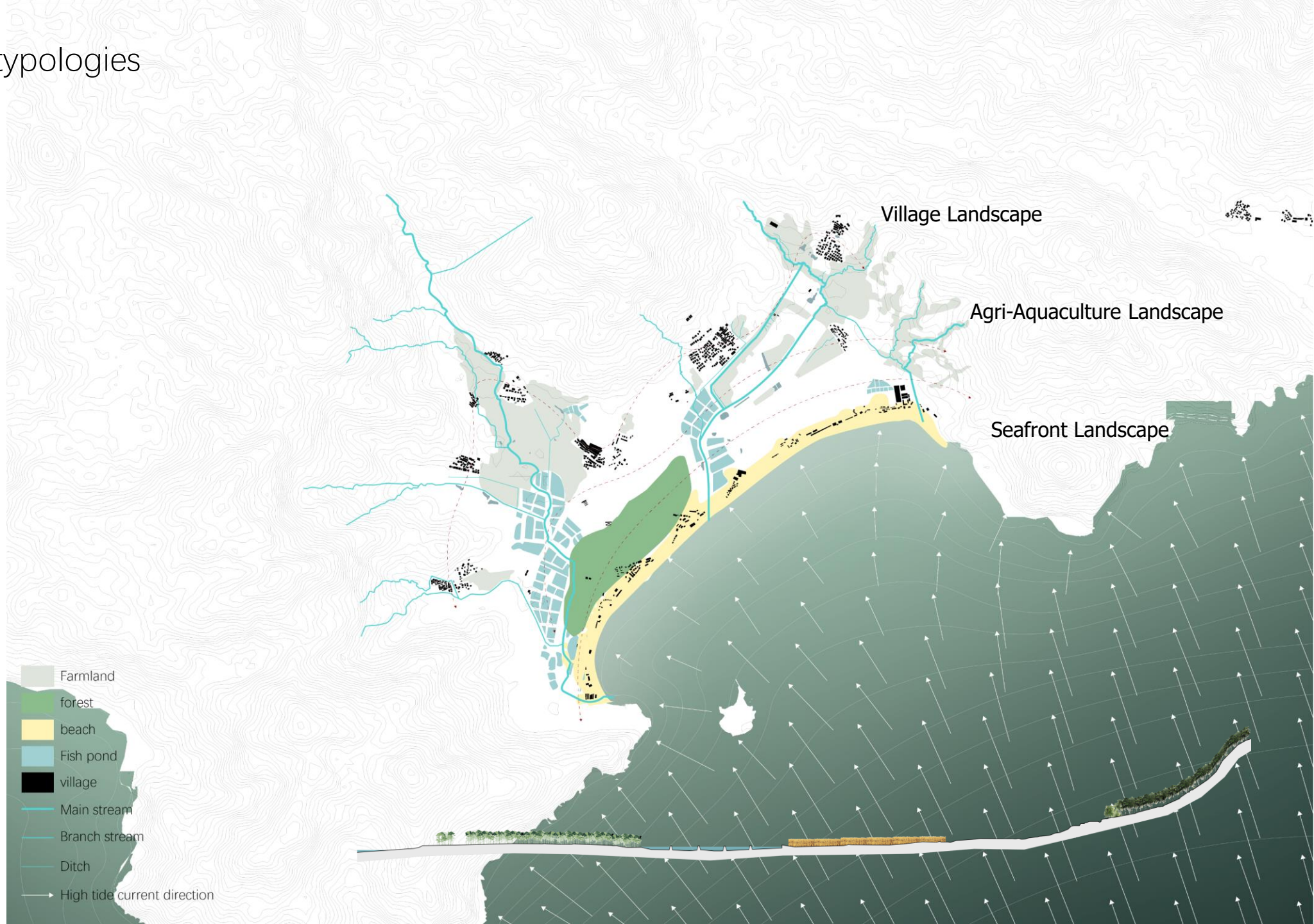
- Understanding Question
  How does the landscape systems in Xi Chong work in terms of economic, ecological, water management and socio-cultural aspects and how do they related to each other ?

- What to do Question
  What kind of principles could be utilized to provide an adaptive condition in relation to Xichong's characteristics ?

- Application Question
  How to apply design principles in different systems throughout multiple scales ?

- Reflection Question
  What are the lessons?

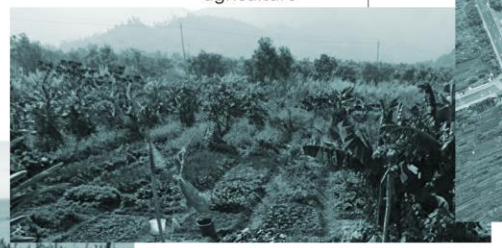
Three landscape typologies



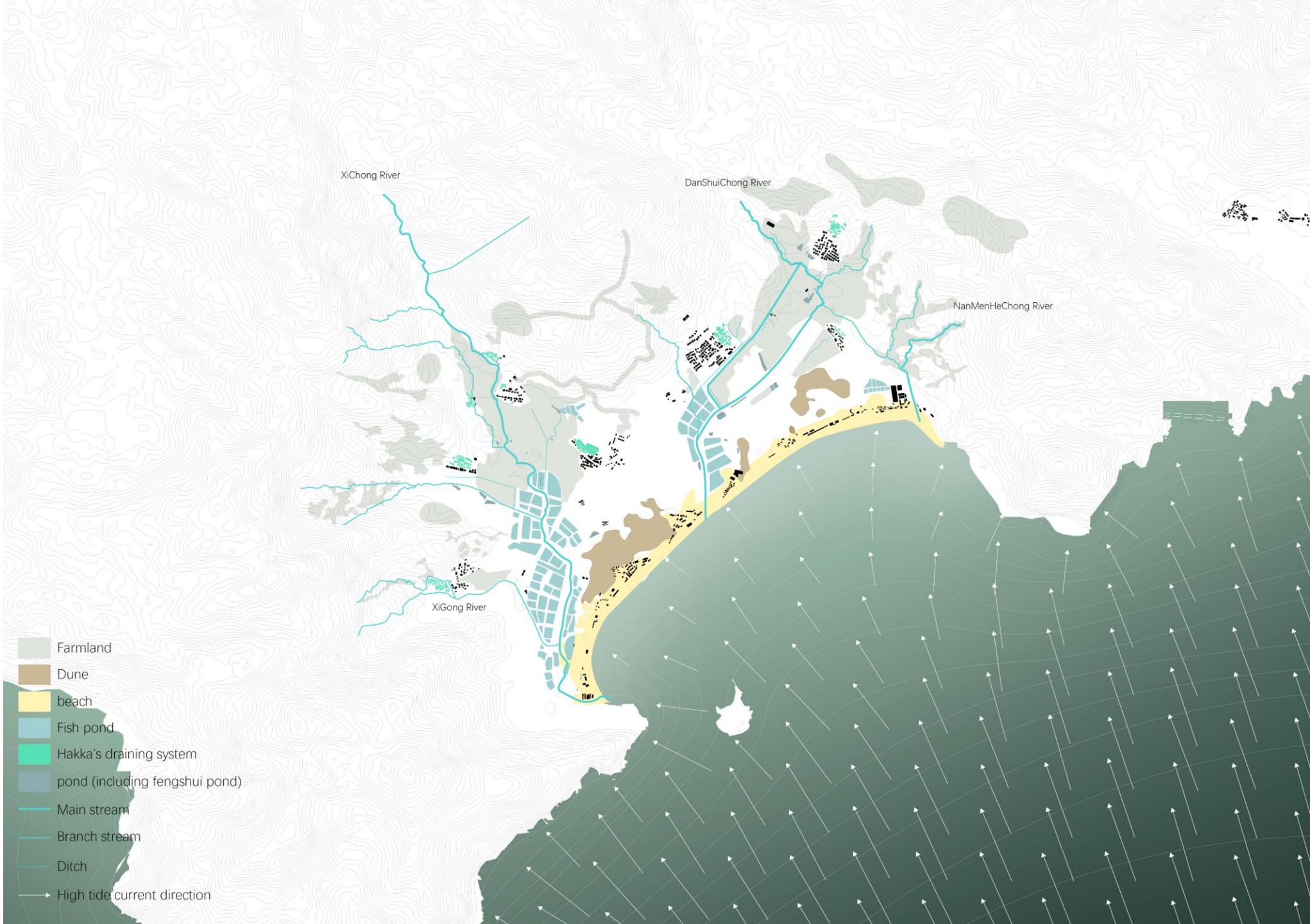
Seafront Landscape

Agriculture & Aquaculture Landscape

Village Landscape



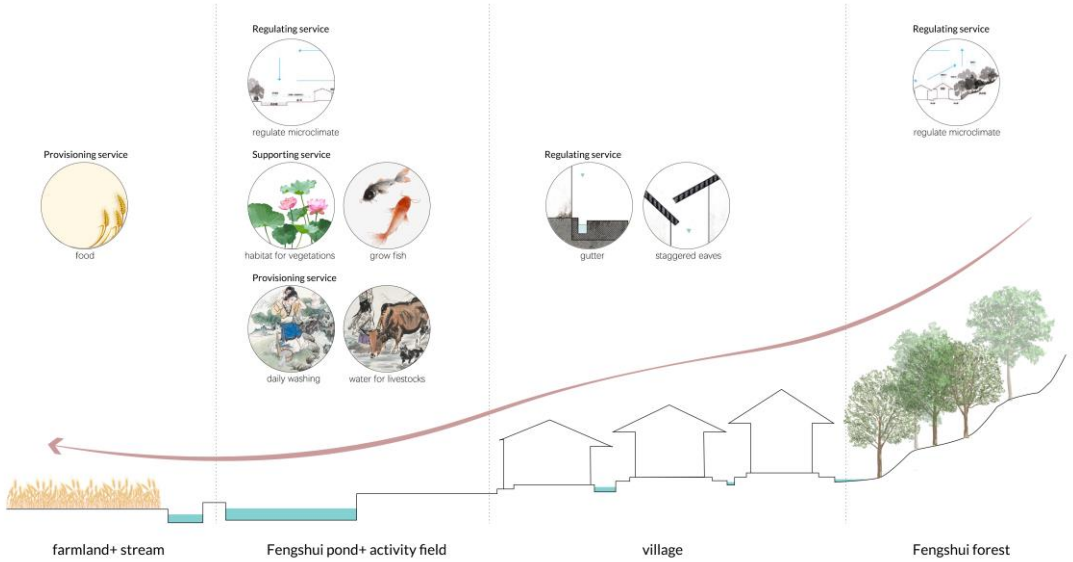
Village landscape



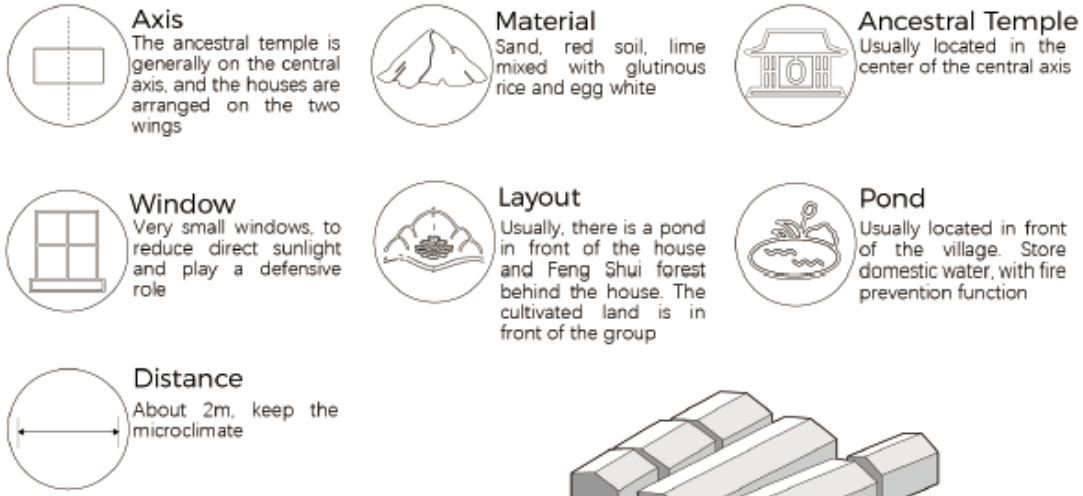
– culture loss

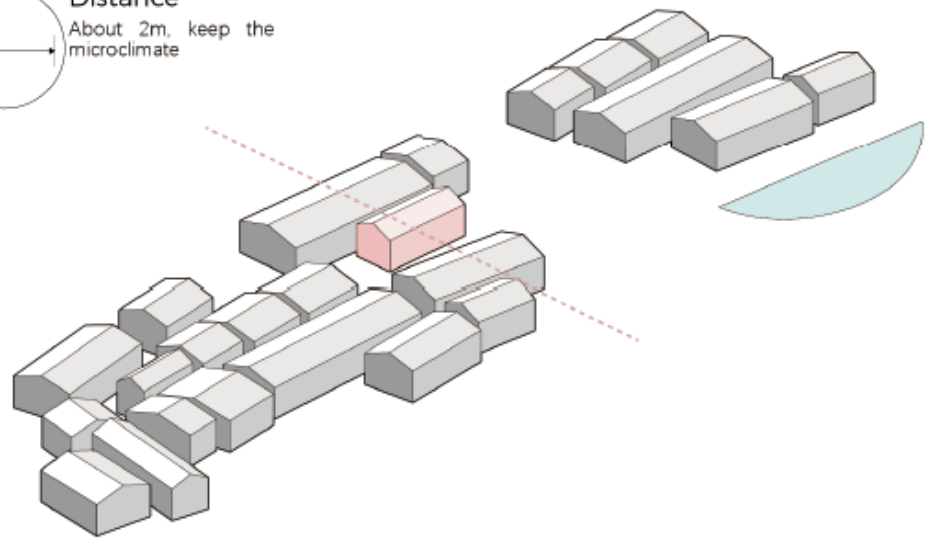
Performances and gatherings in Hakka festivals
Source: Internet

Tradition culture loss



Hakka's traditional water utilization





Hakka layout

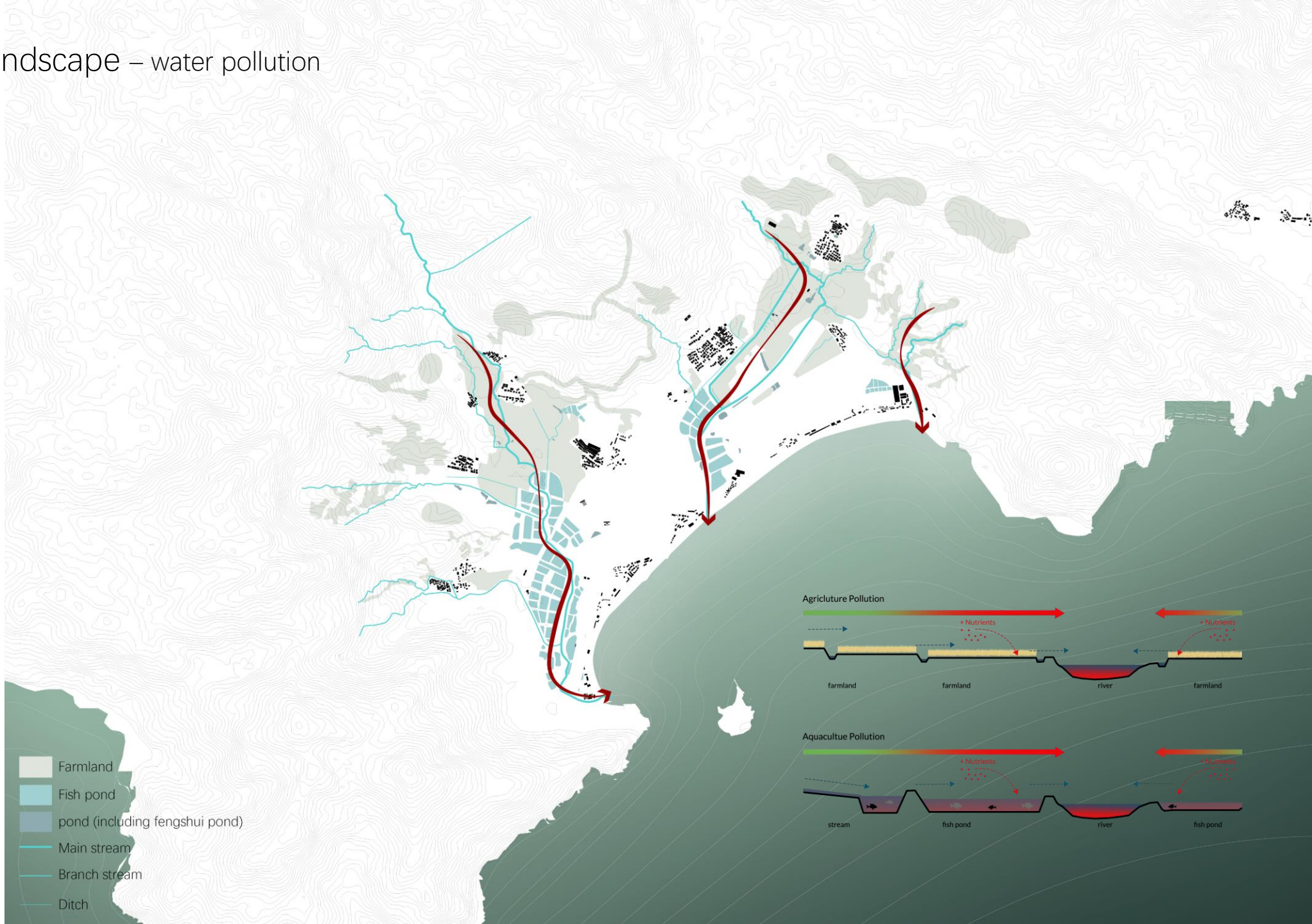
Tradition layout under threatened

– water sensitivity absence

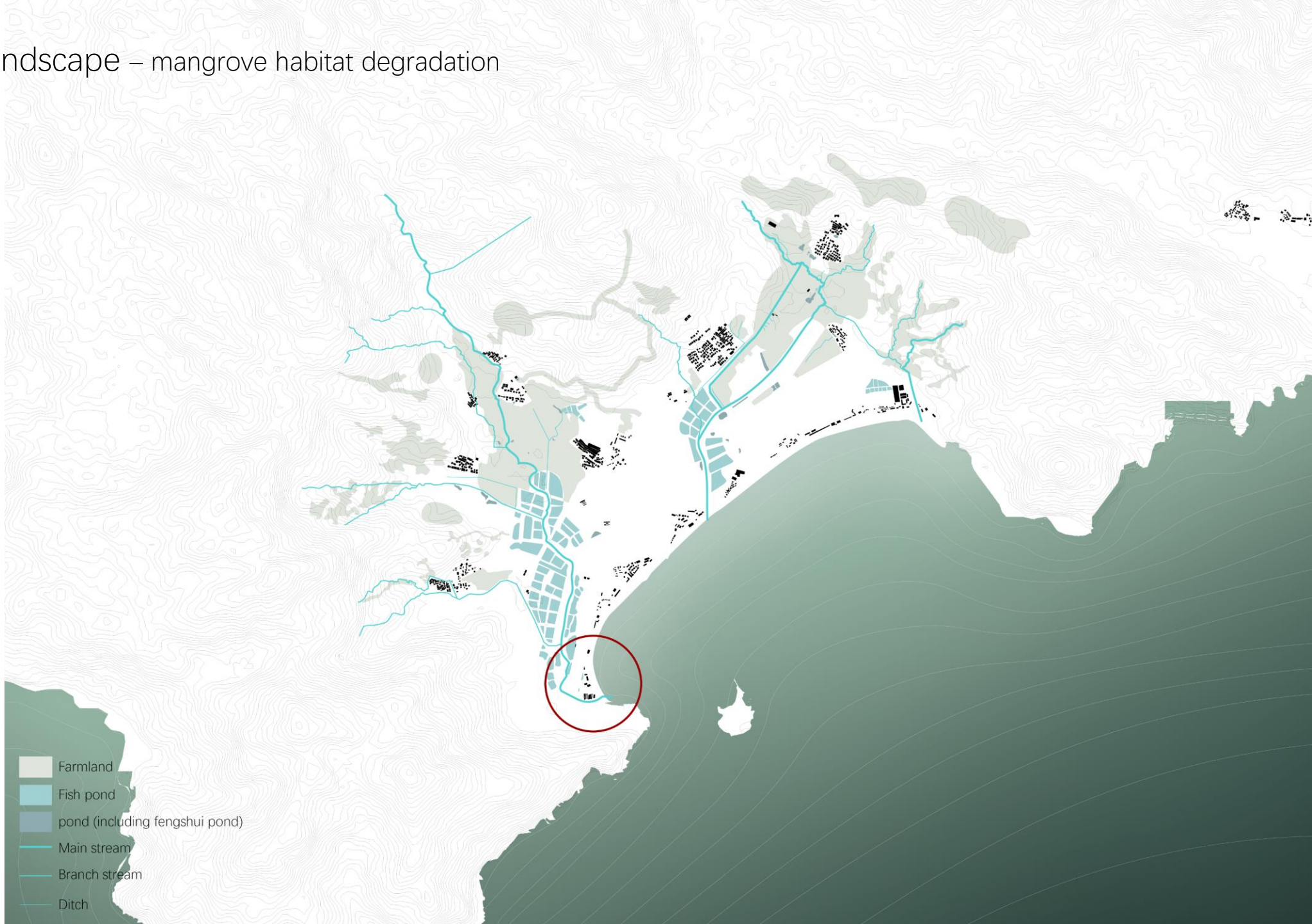
Hakka's traditional water management

Disappeared fengshui pond

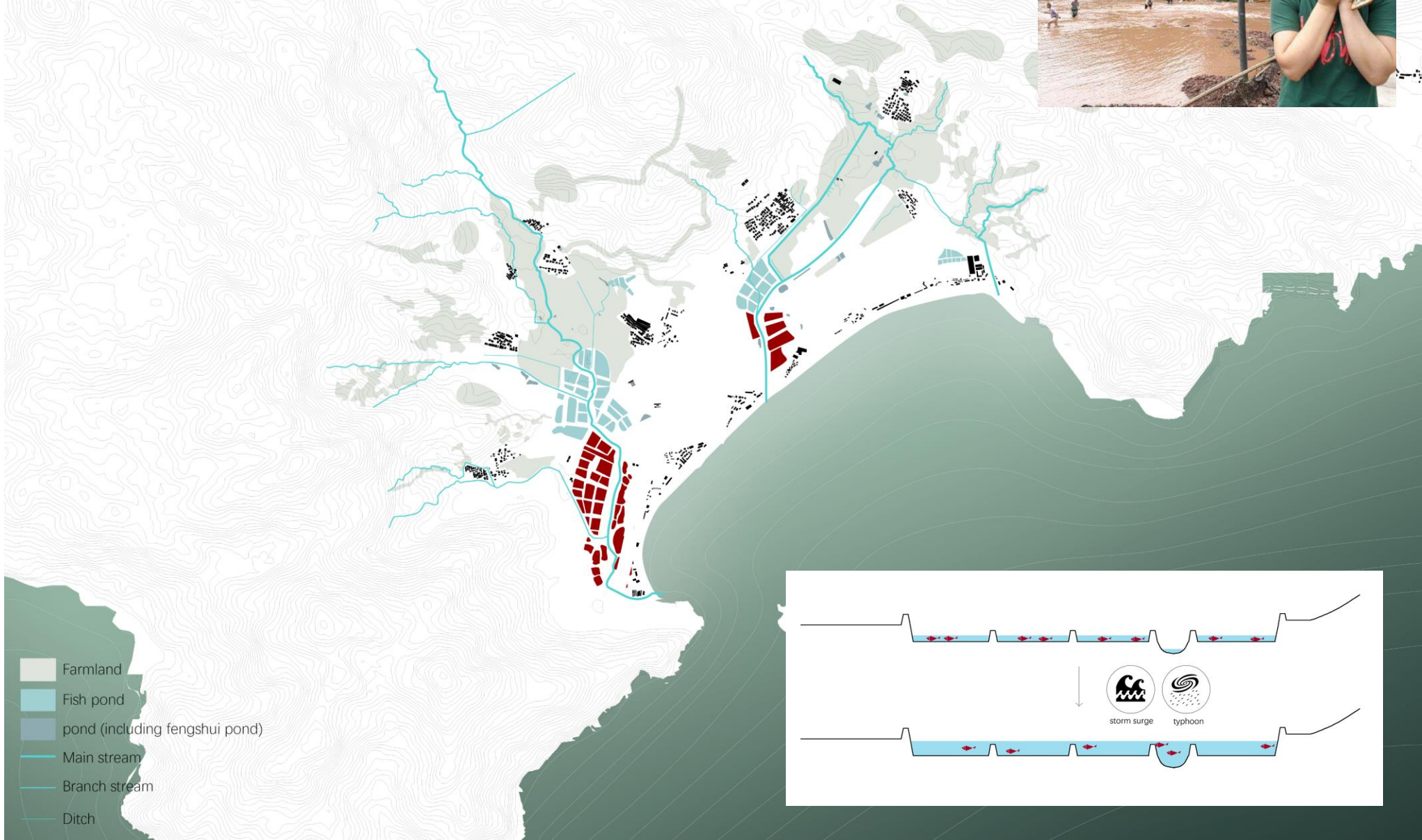
Agri-Aquaculture landscape – water pollution



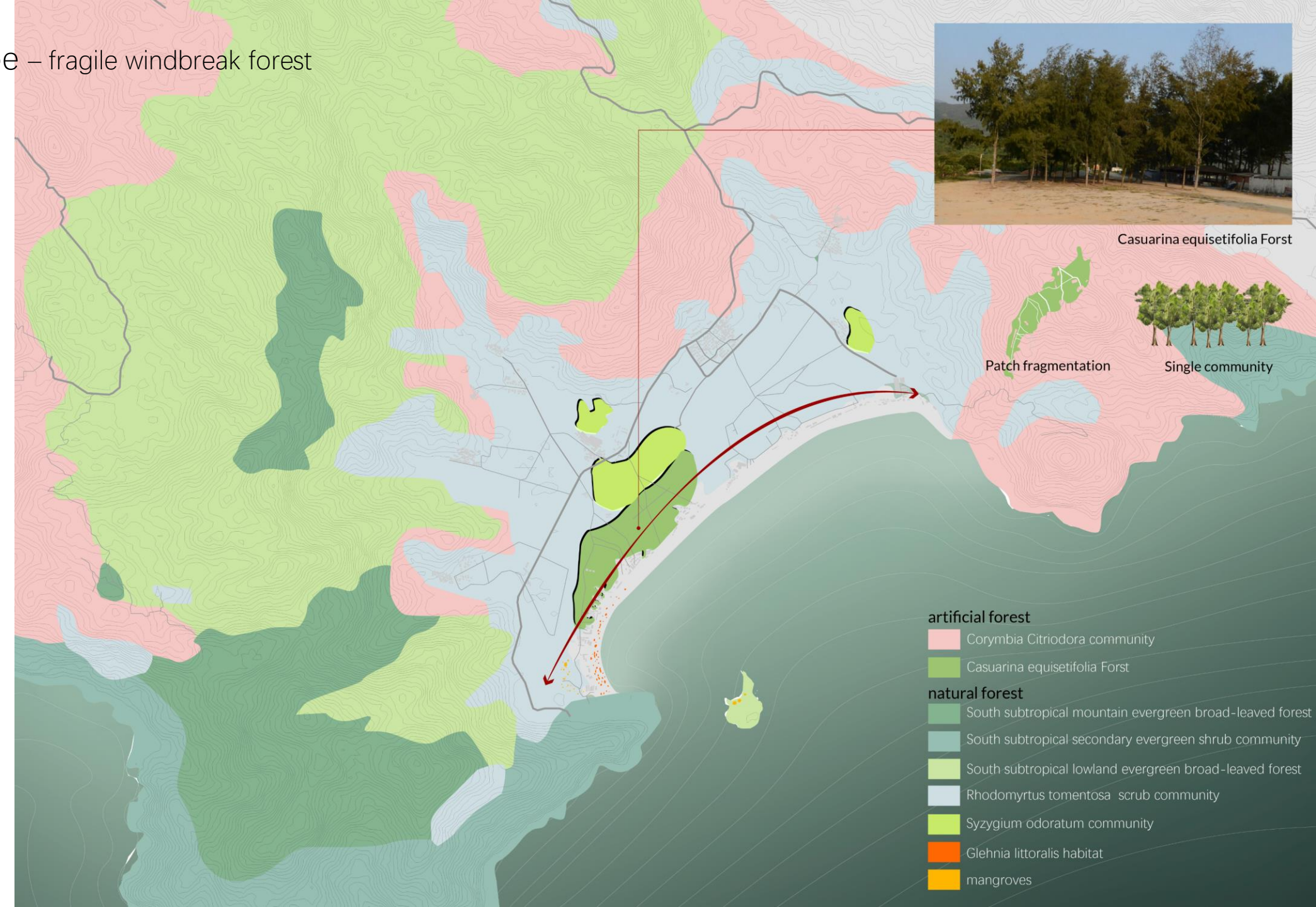
Agri-Aquaculture landscape – mangrove habitat degradation



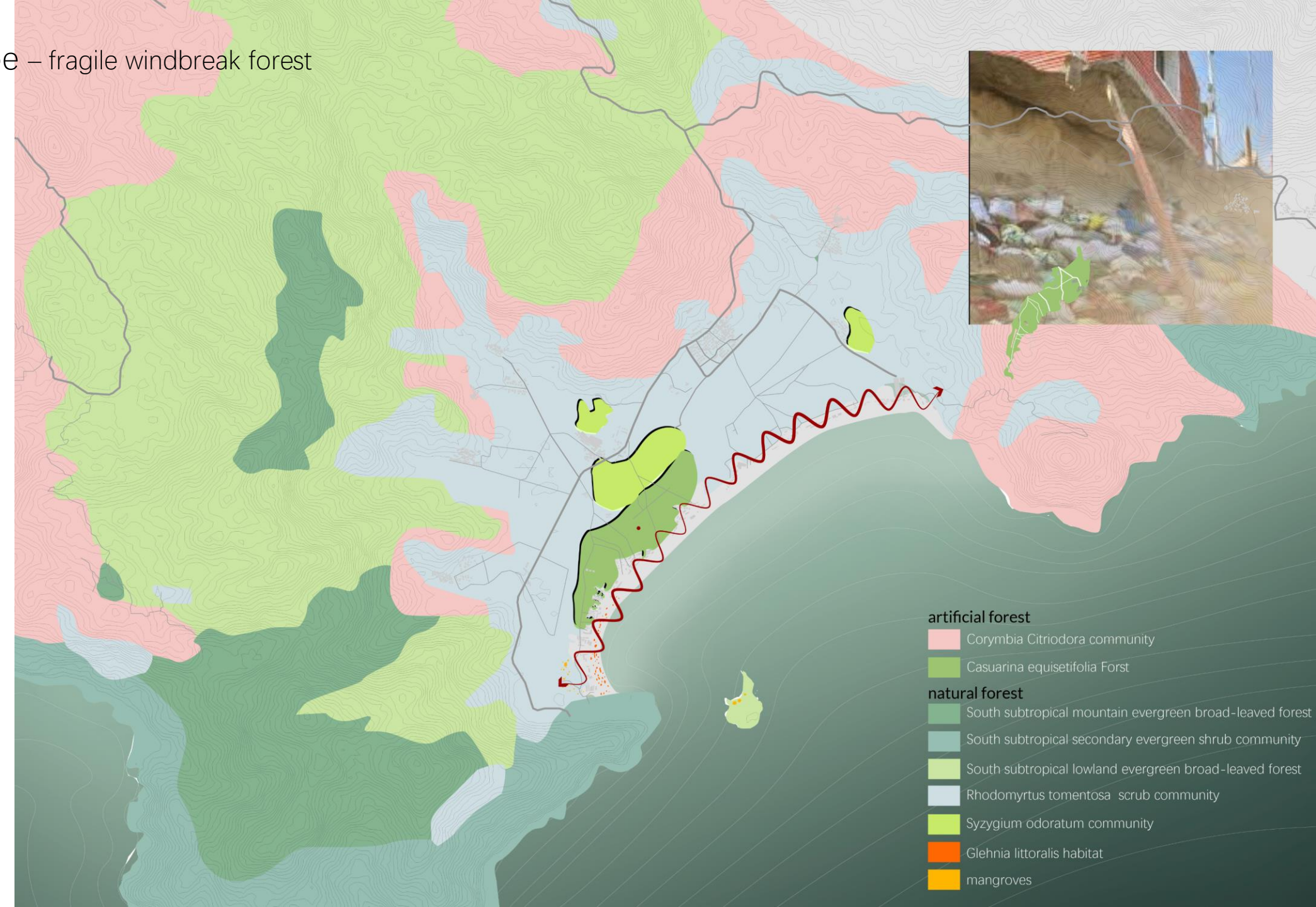
Agri-Aquaculture landscape – potential risk of being flooded



Seafront landscape – fragile windbreak forest



Seafront landscape – fragile windbreak forest

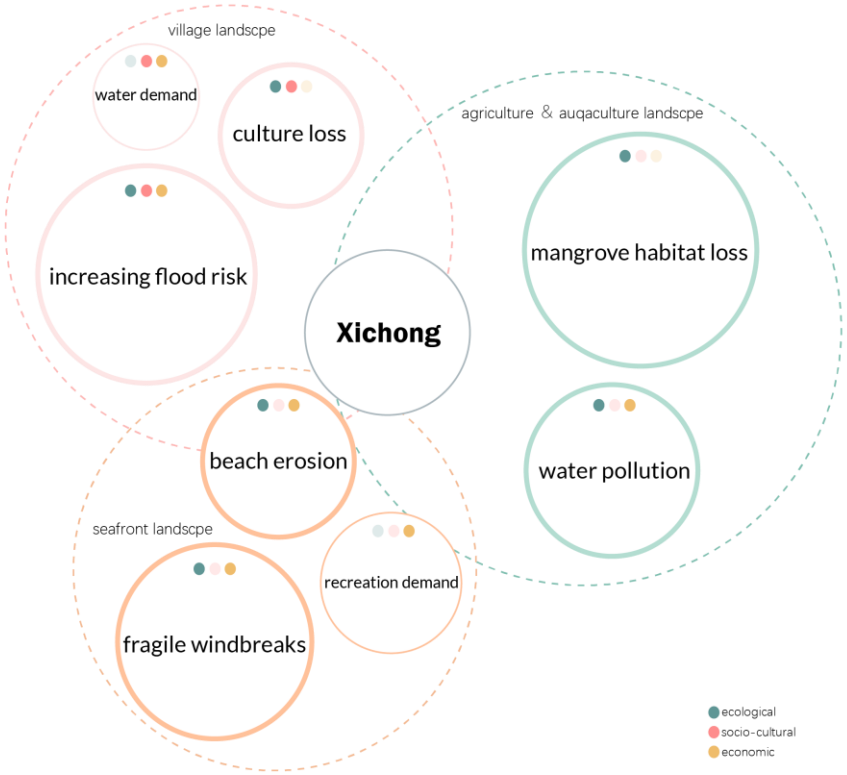


Seafront landscape – beach erosion

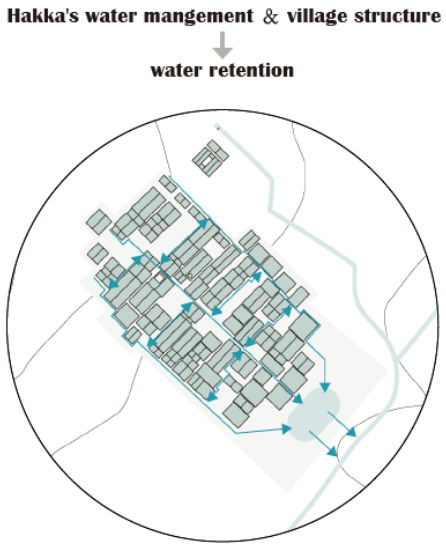
artificial forest
- Corymbia Citriodora community
- Casuarina equisetifolia Forst

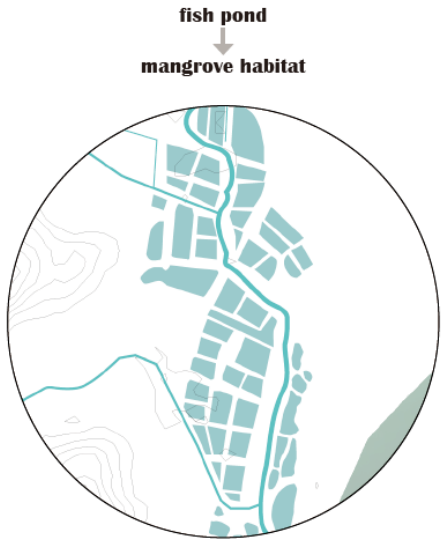
natural forest
- South subtropical mountain evergreen broad-leaved forest
- South subtropical secondary evergreen shrub community
- South subtropical lowland evergreen broad-leaved forest
- Rhodomyrtus tomentosa scrub community
- Syzygium odoratum community
- Glehnia littoralis habitat
- mangroves

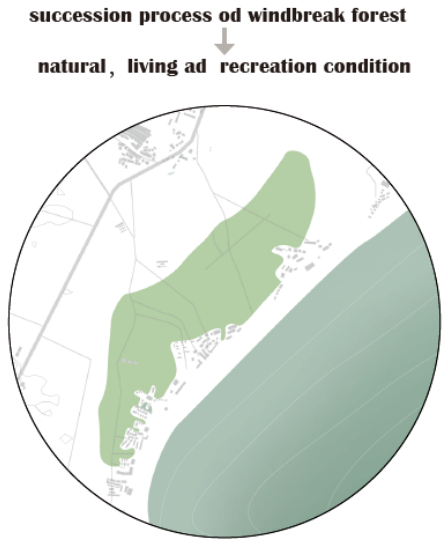
Challenges and potentials



challenges







potentials

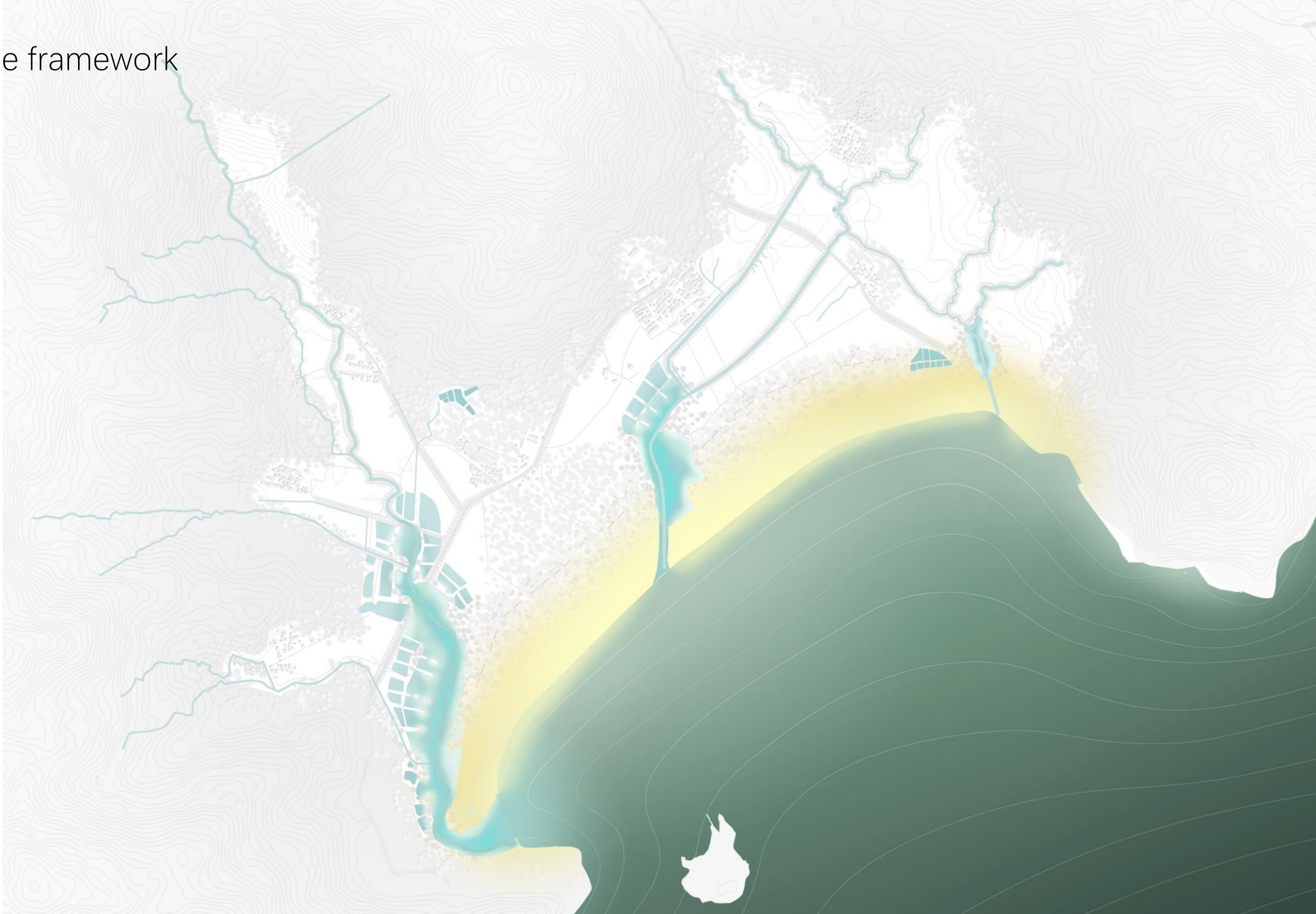
In Conclusion

landscape framework as solution

Landscape framework can work as a robust basic structure
that provide multiple services for human and nature, and
provide conditions for future development

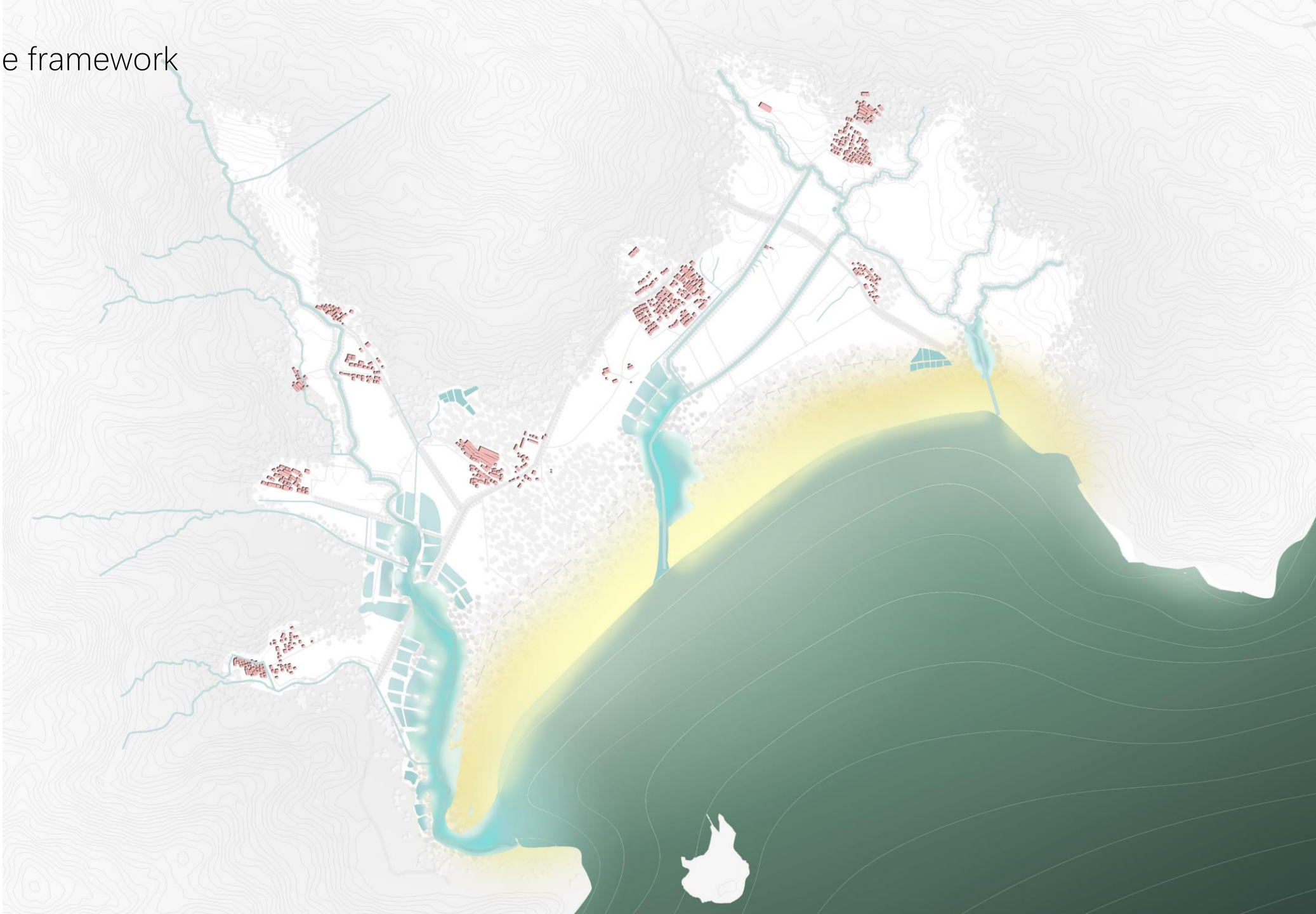
Proposed landscape framework

Water Network



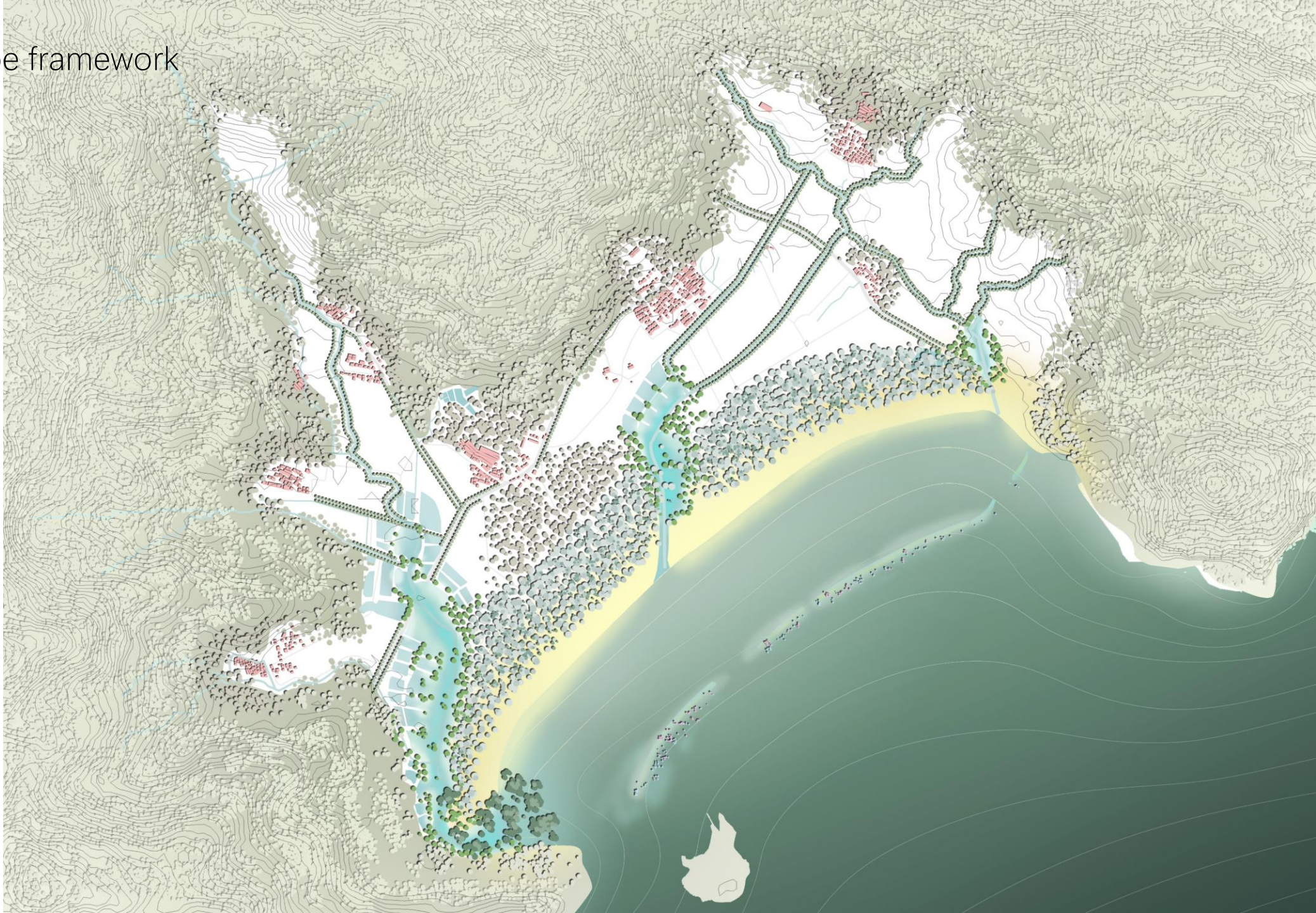
Proposed landscape framework

Village Structure



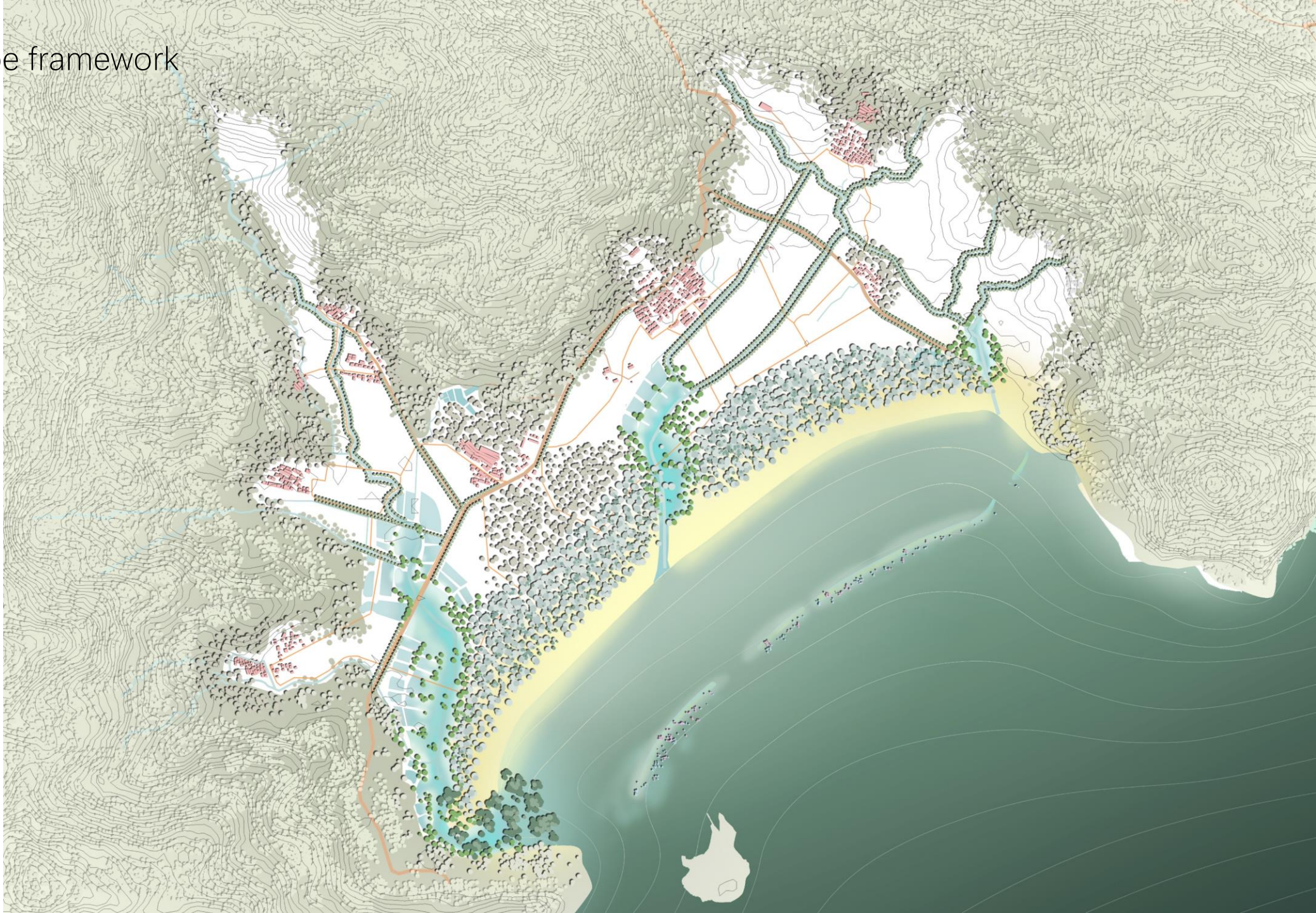
Proposed landscape framework

Vegetation Network



Proposed landscape framework

Mobility Network



Proposed landscape framework

Economic System

Design assignment

On the regional scale, to create **a resilient landscape framework** that provides conditions for the economic, ecological, and socio-cultural development of Xichong

on village scale

- Improve water sensitivity and spatial quality, paying attention to socio-culture aspect

on mediem scale

- Transform existing aquaculture system to a multifultional one which can improve water resilience and ecological environment

- Explore a resilient model in the seafront zone that harmonize windbreak forest development with housing, and reduce beach erosion

Case study and literature review

Guiyuan village

Windmark beach

Neighbourhood

Natural preservation

Infrastructure design responding to nature

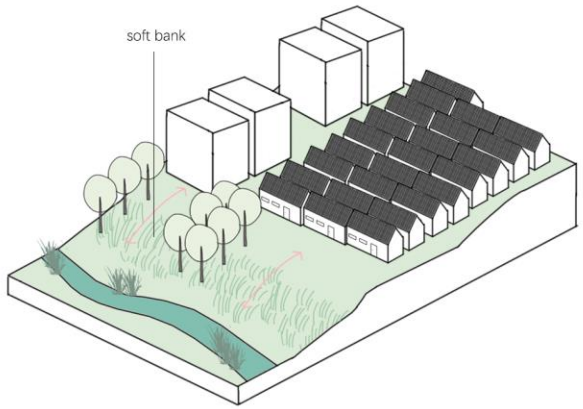
Beach walk

Neighbourhood

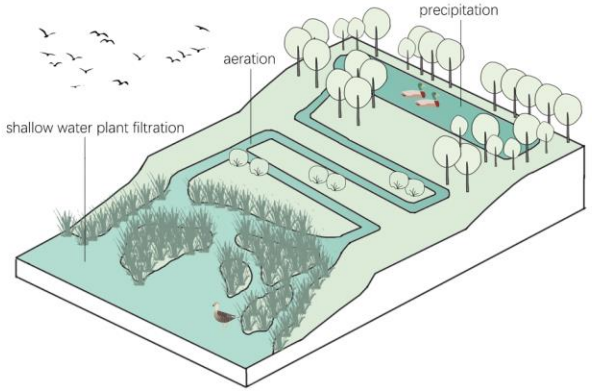
Natural preservation

Cultural preservation

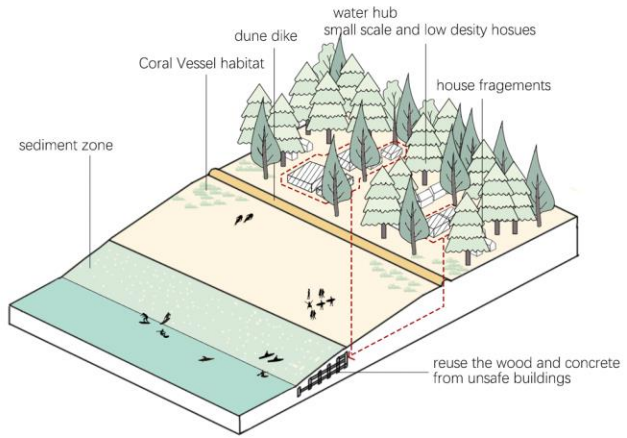
Design principle



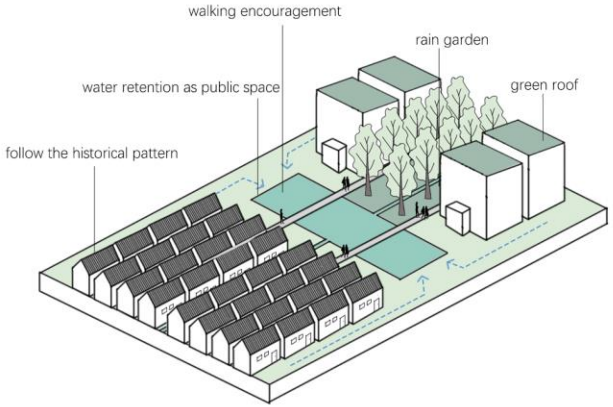
Soft Bank



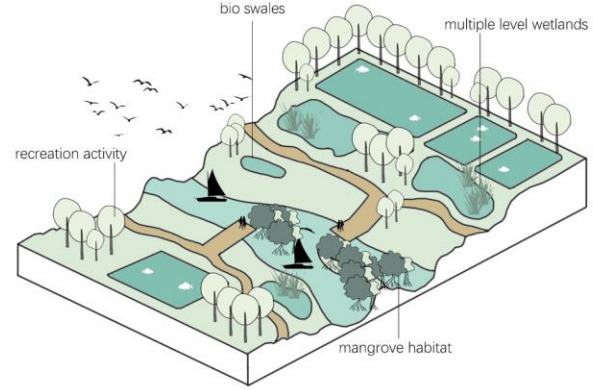
Multi-stage Purification



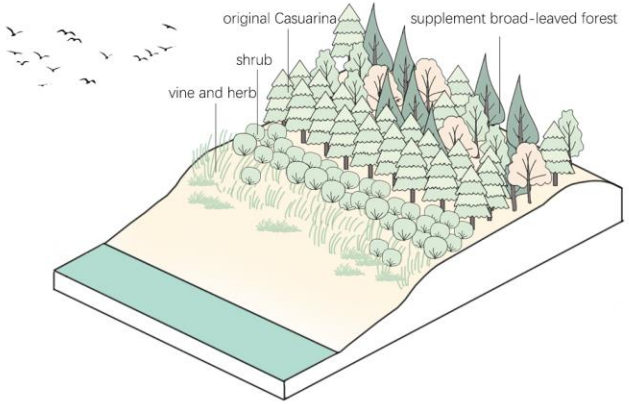
Eco-friendly Coastal Development



Water Resilient



Naturalized Fish Pond



Multi-layer Windbreak

Village landscape

Aquaculture and agriculture landscape

Seafront landscape

Design exploration on local scale

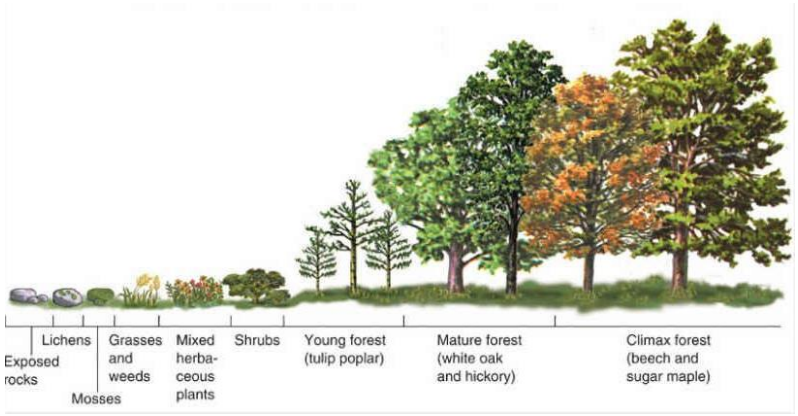
Design Exploration on **Windbreak Forest**

Block A sea front landscape

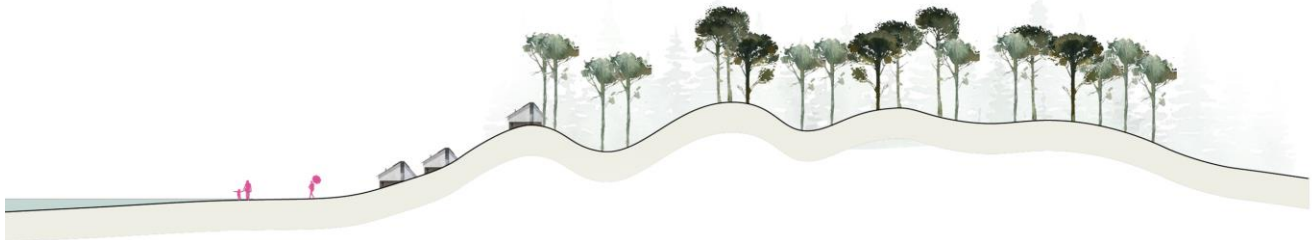
Focus on ------

1. build an **ecological sound windbreak forest and** let **housing** be part of it
2. improve **beach erosion**

Ecological strategy



succession



let it grow

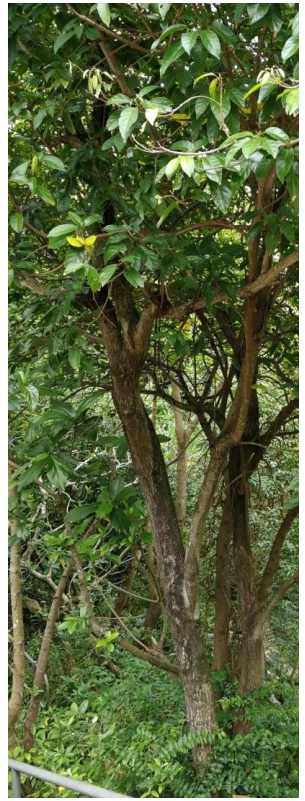
&

sow

Casuarina equisetifolia Forst.

Single species

Casuarina equisetifolia Forst.



Sterculia lanceolata

Liriodendron chinense Sargent.

Ficus microcarpa Linn. f.

Mixed forest

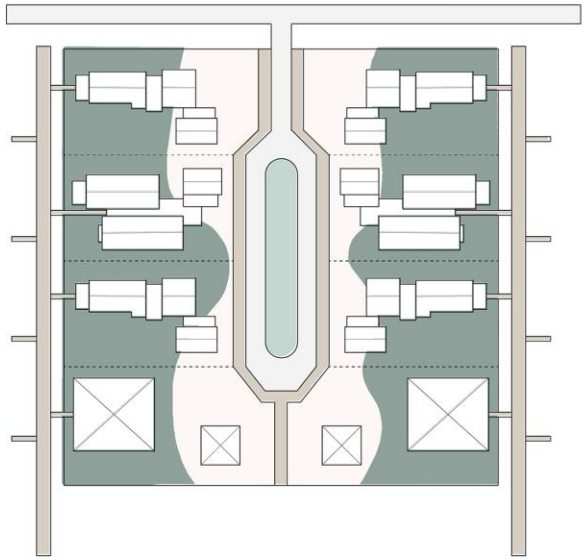
Housing strategy

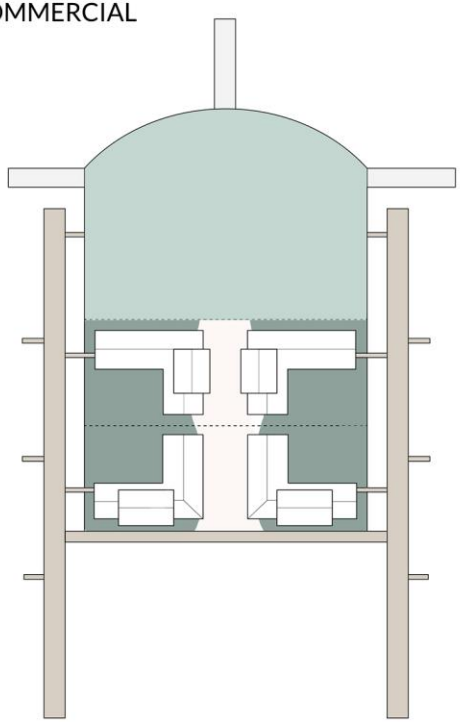
LIVING

COMMERCIAL

living lot

Human activities such as traffic and parking are mainly concentrated in the direction of the front yard, and the backyard is used for the succession of plant communities. The backyard is connected to a wooden walkway leading to the beach.





mobility lot

It is a transportation hub connecting inside and outside. It mainly undertakes parking and commercial functions and can accommodate about 200 cars

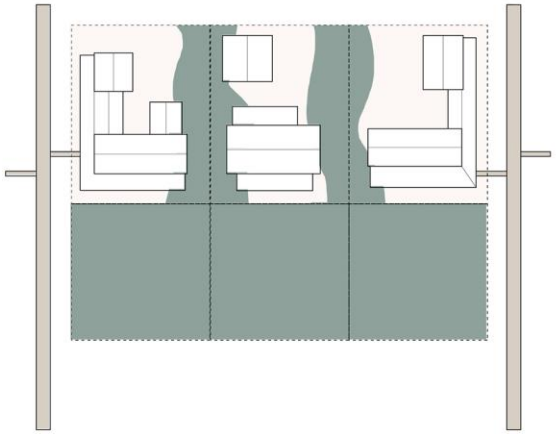
Paved surface: 30~40%
Succession area: 60~70%

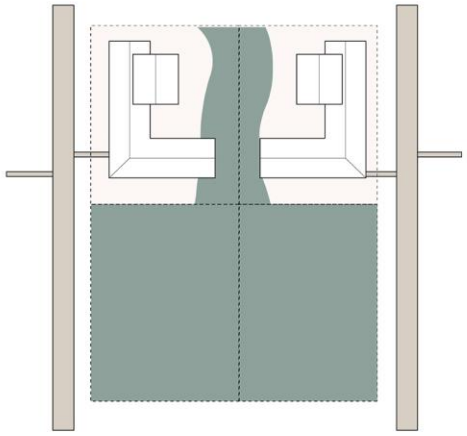
OFF-BEACH

NEAR-BEACH

alternative lot

It can be adapted to people's needs and developed for residential or commercial functions. It can also be used as short-term rental housing.





commercial lot

Beach frontage, ideally located for commercial functions such as restaurants and hotels

tree layer (parking)
multi-layer
activity zone
wooden path
motorway

LOW

The combination of commercial and a small amount of residential lot can basically meet the tourism and residential needs of the site.

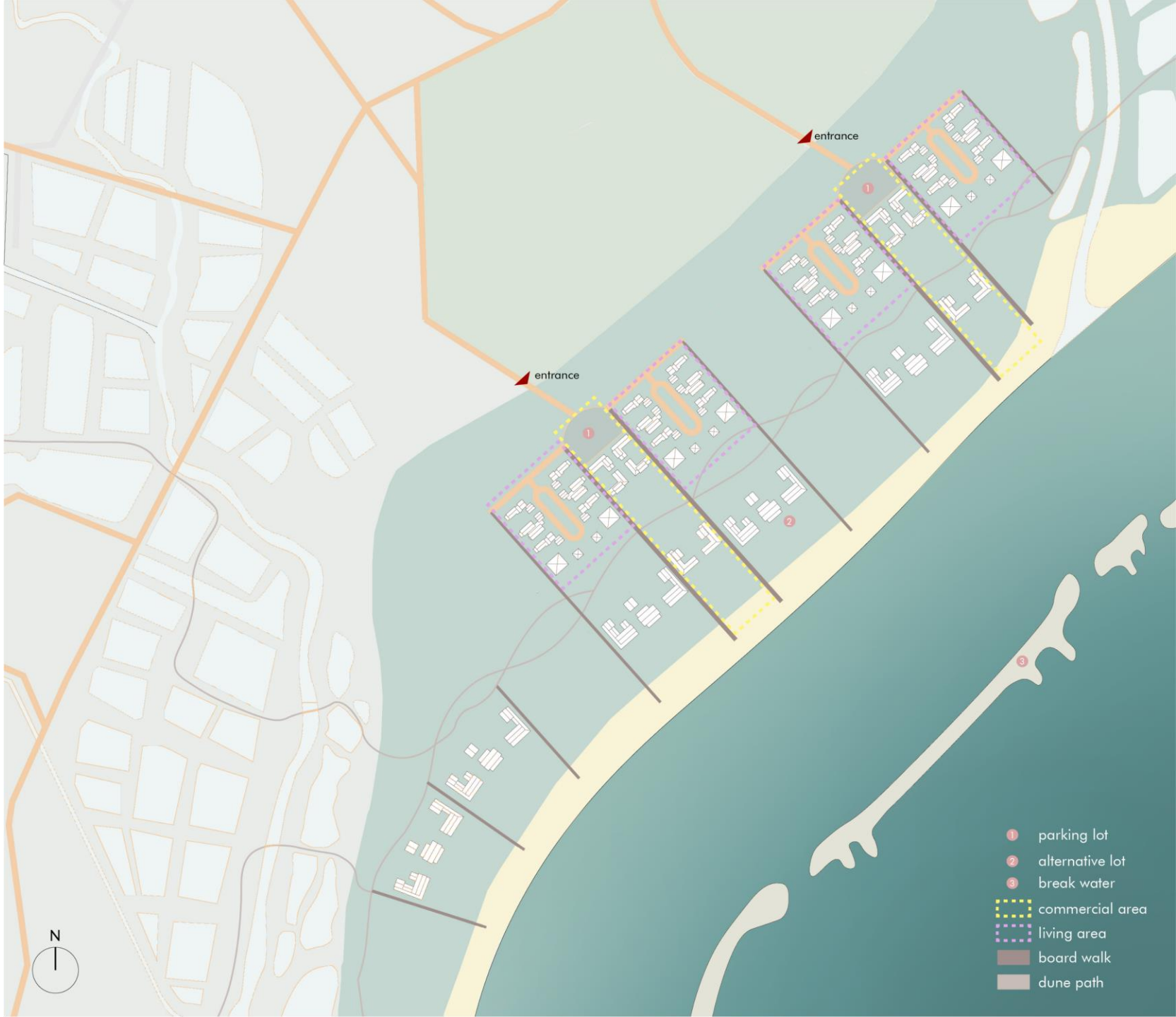
MEDIUM

Increase building density appropriately to meet more residential or commercial needs while ensuring windbreak forest development

HIGH

Maximizing the accommodation of residential and commercial functions, the development space of windbreaks may be limited or at risk of being inadequate

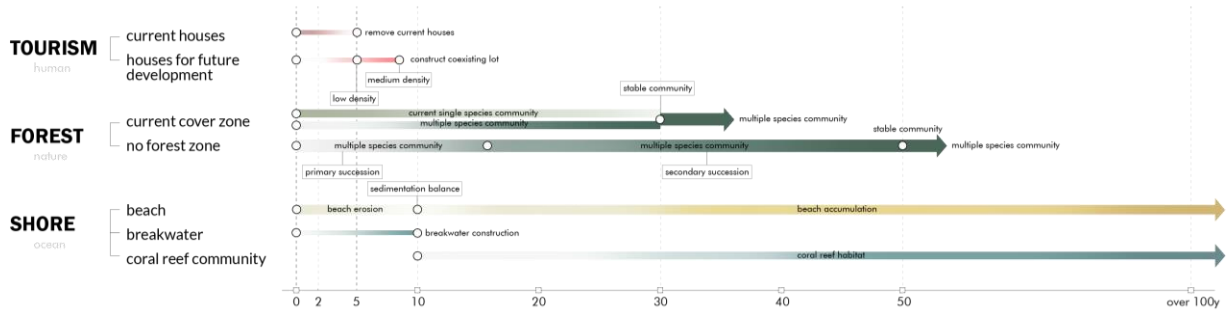
Proposed plan

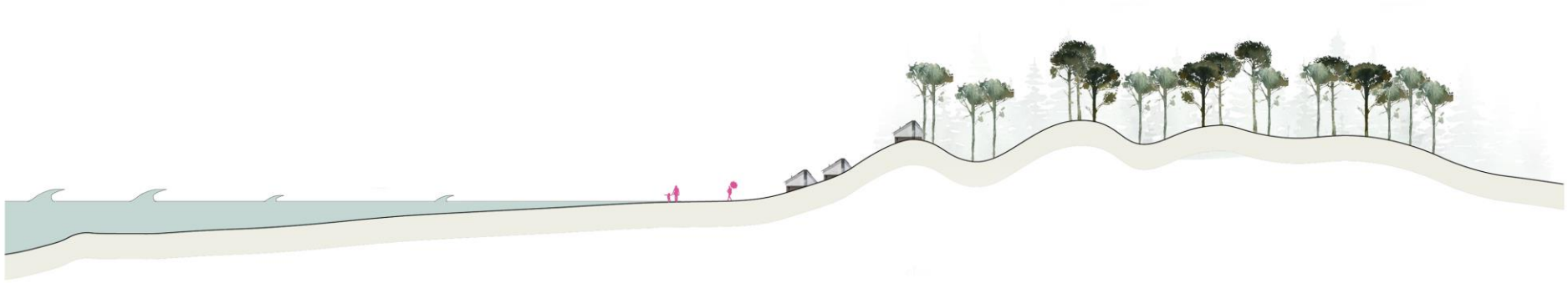


Now

Nature: Single species community

Human: Business on the beach and in front of the windbreak forest





0-2 y

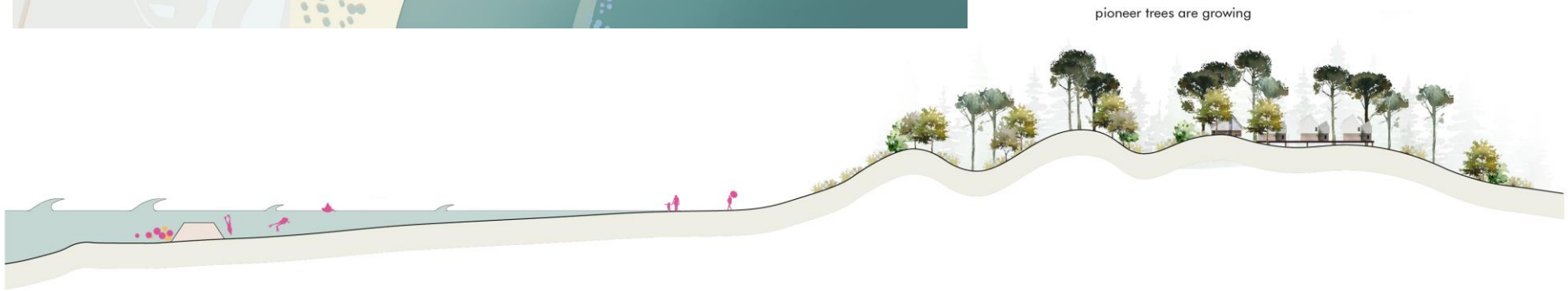
Nature: Preparation for other species to grow (sowing / let it grow)

Human: Move houses inside

2-20 y

Nature: Other pioneer species are growing

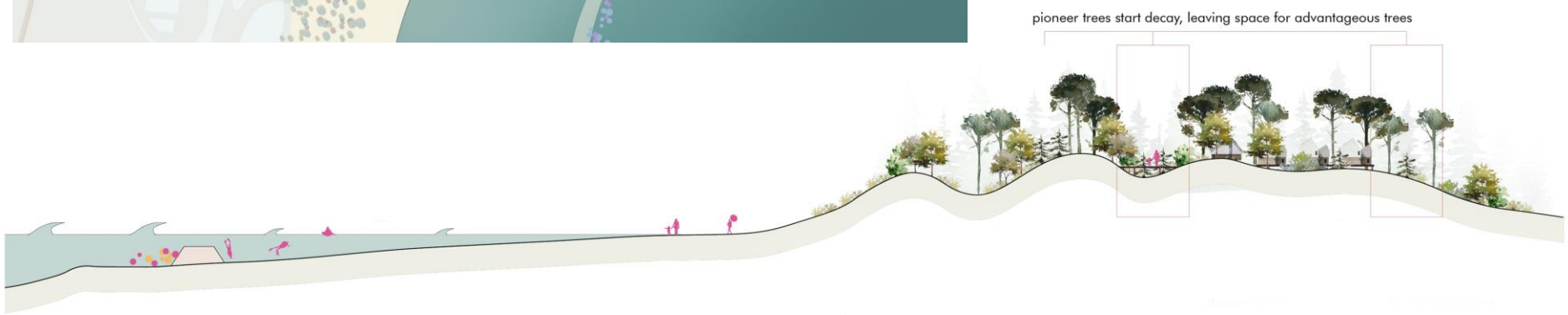
Human: ----------



20-40 y

Nature: Pioneer tree species have provided a good growing environment for dominant species. Pioneer tree species are beginning to decline and diverse dominant species are beginning to grow.

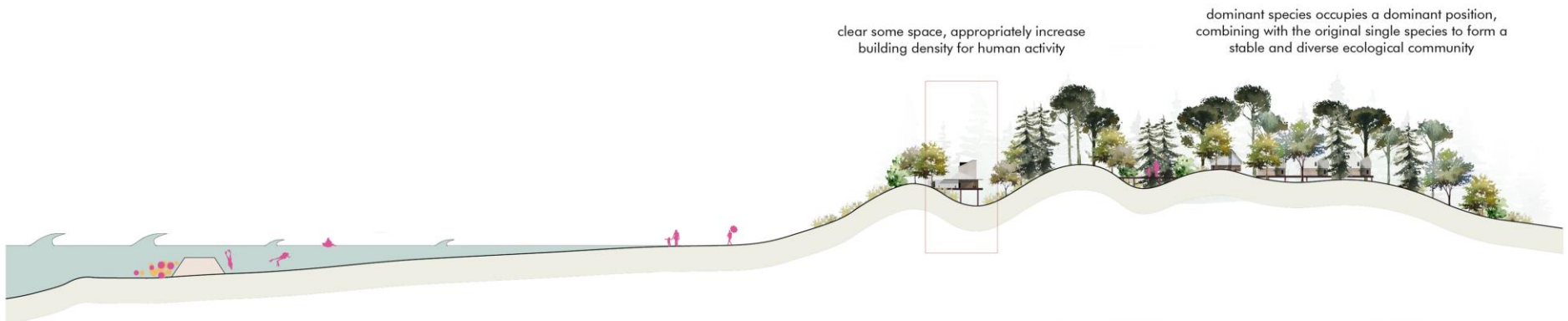
Human: ----------



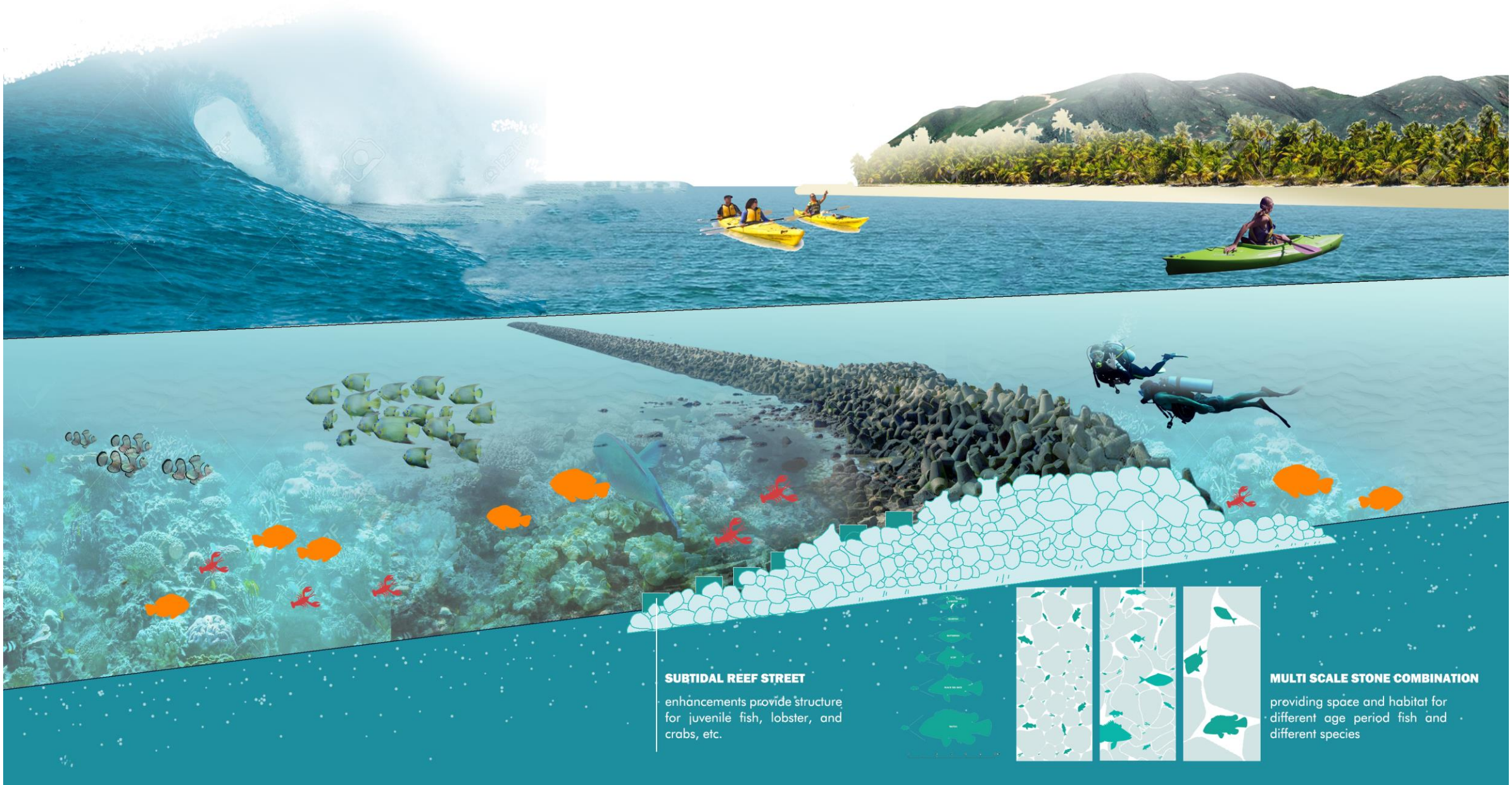
40-50 y

Nature: Multiple dominant tree species will mature and form an ecological sound ecosystem with the original single species community

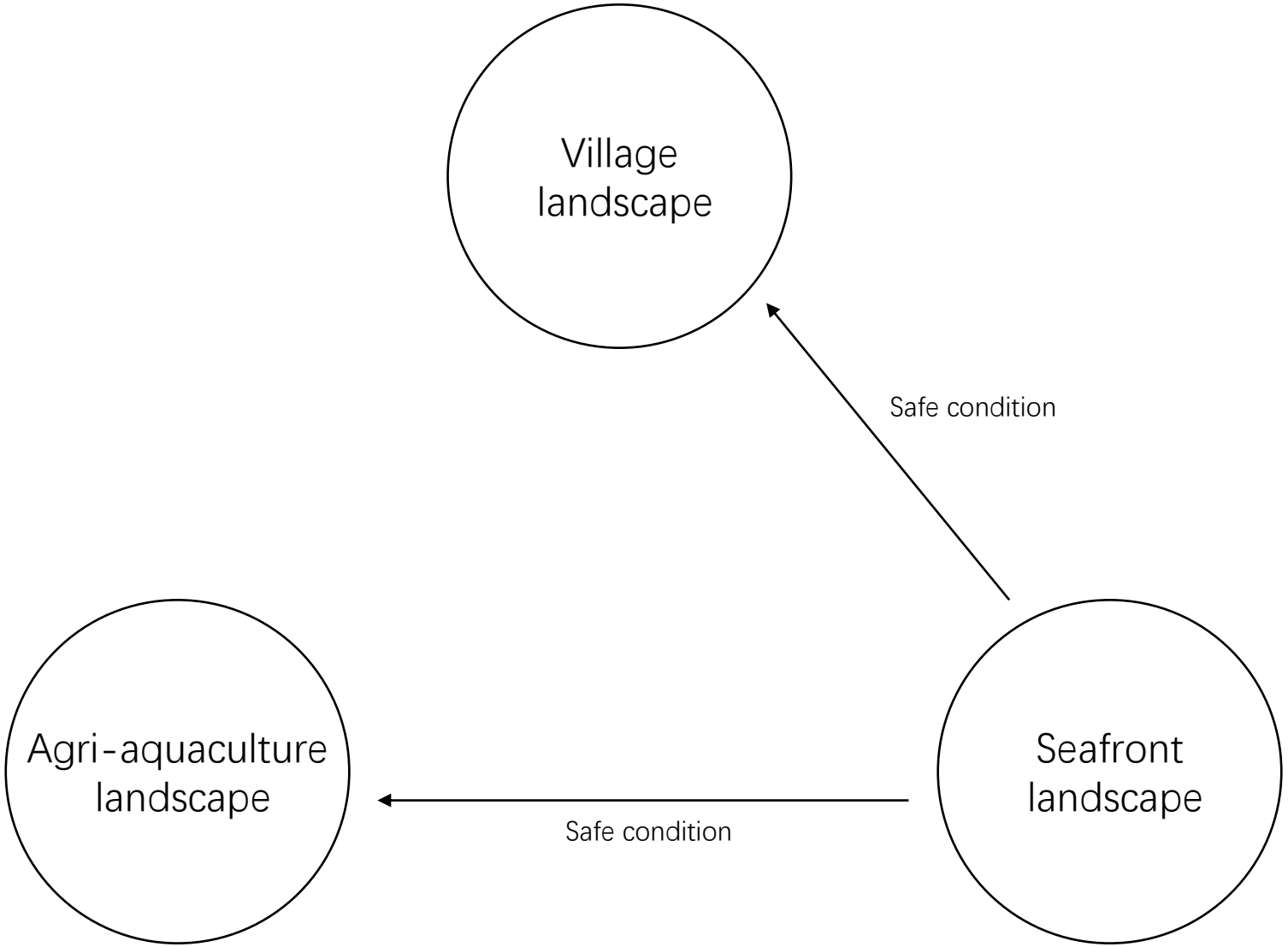
Human: Appropriate increase in building density



Erosion strategy



Conclusion



Let it grow/ let nature work

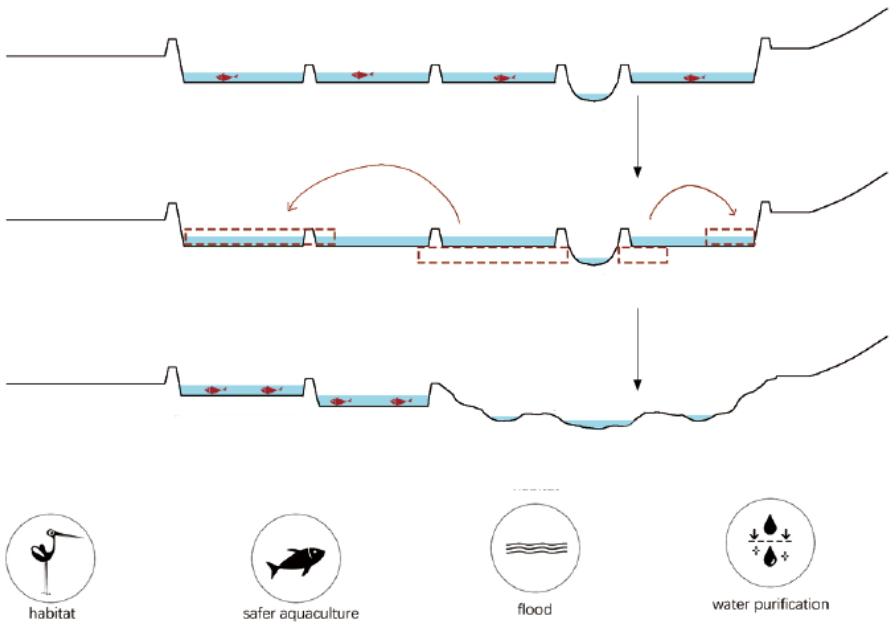
Design Exploration on **Fish Pond**

Block B agri-aquaculture landscape

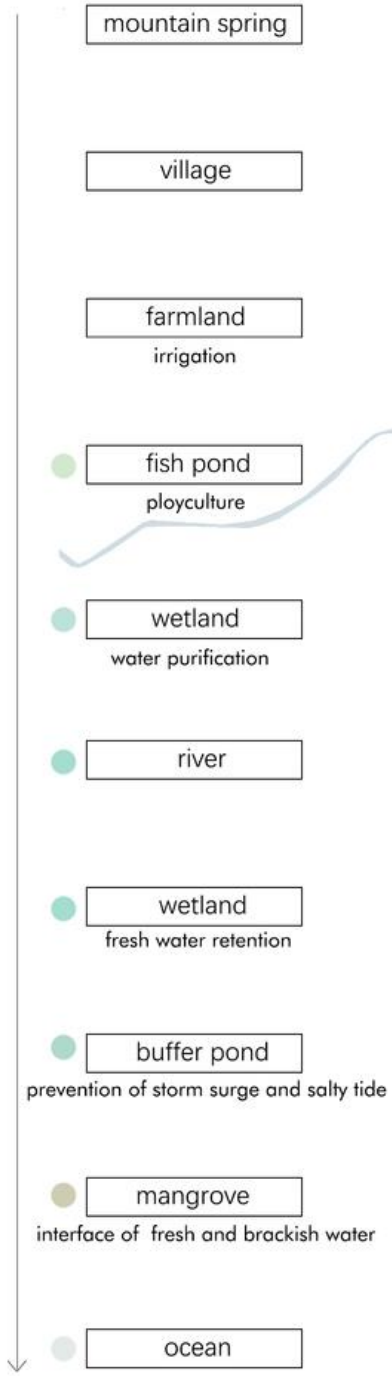
Focus on improve ------

1. the **water flow** in various aspects (quality, quantity, ecological value)to enhance the its resilience
2. **connectivity** between beach and hinterland

Water flow strategy



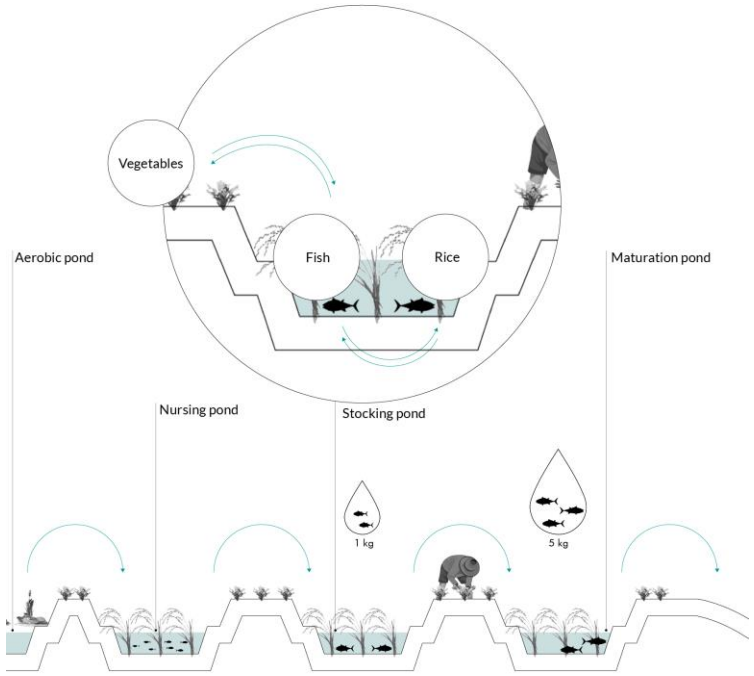
adjust the earth work to smooth the gradient



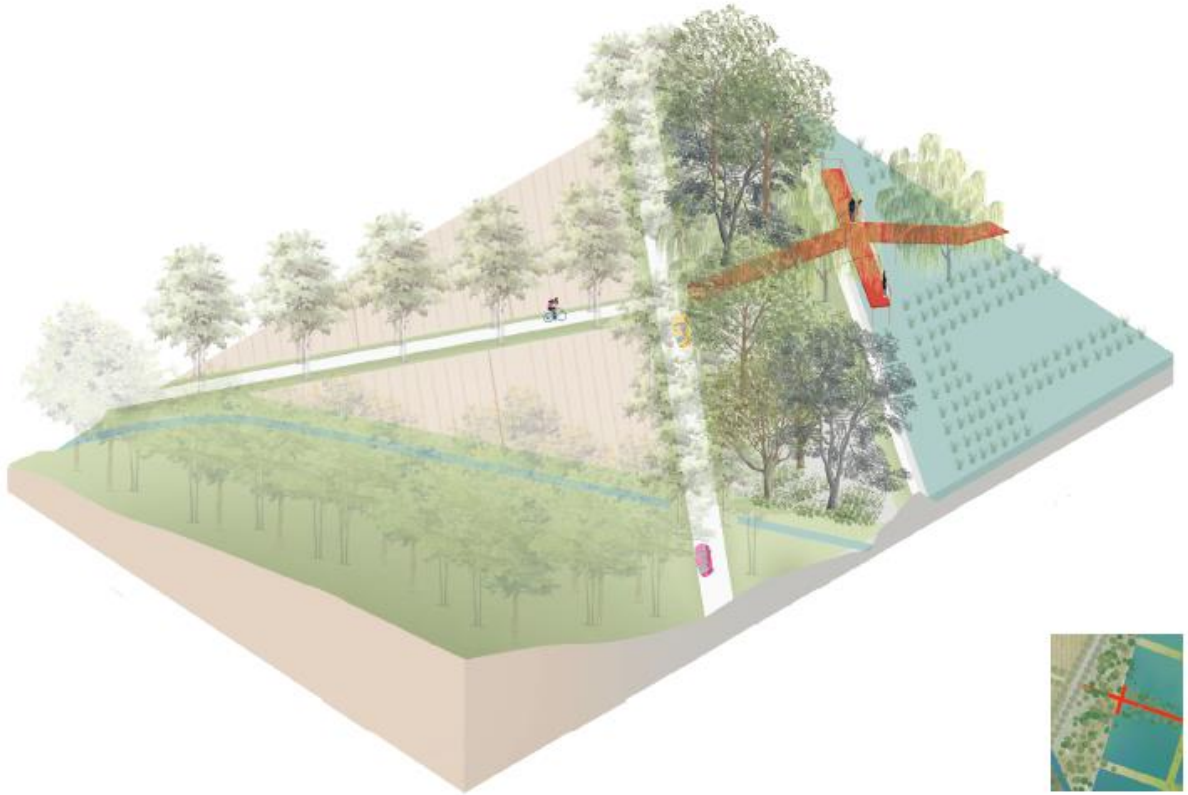
water flow

Mobility strategy

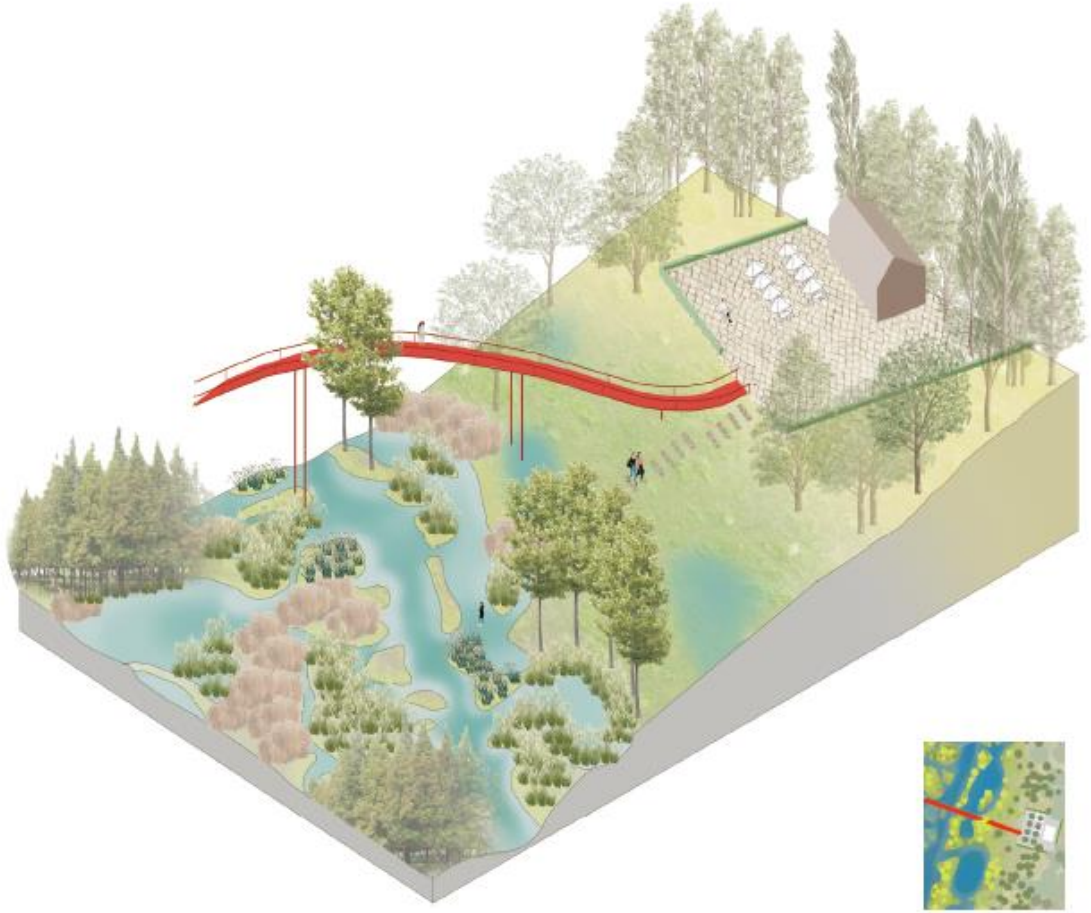
Proposed plan



– interface A



– interface B



Pinus massoniana Lamb

Casuarina

Mikania micrantha Kunth

Pennisetum purpureum Schum

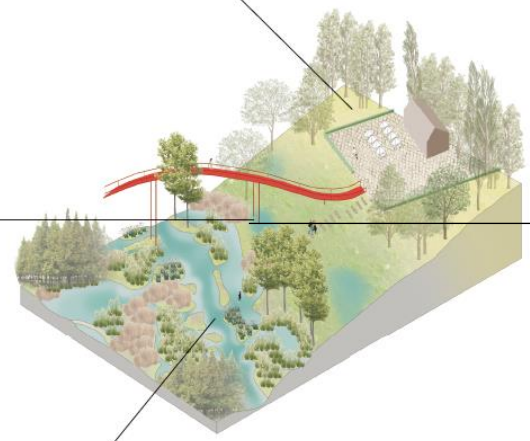
Taxodium distichum

Glyptostrobus pensilis (Staunt.) Koch

Imperata cylindrica

Pennisetum purpureum Schum

Reed



Horornis fortipes

Sinosuthora webbiana

Pinus massoniana Lamb

Garrulax canorus

Phalacrocorax carbo

Ardeola bacchus

Charadriiformes

Ceryle rudis

Mugil cephalus

Ctenopharyngodon idella

Hypophthalmichthys

Mylopharyngodon piceus

– interface C

Ardea sinensis

Nycticorax nycticorax

Alcedo atthis

Periophthalmus cantonensis

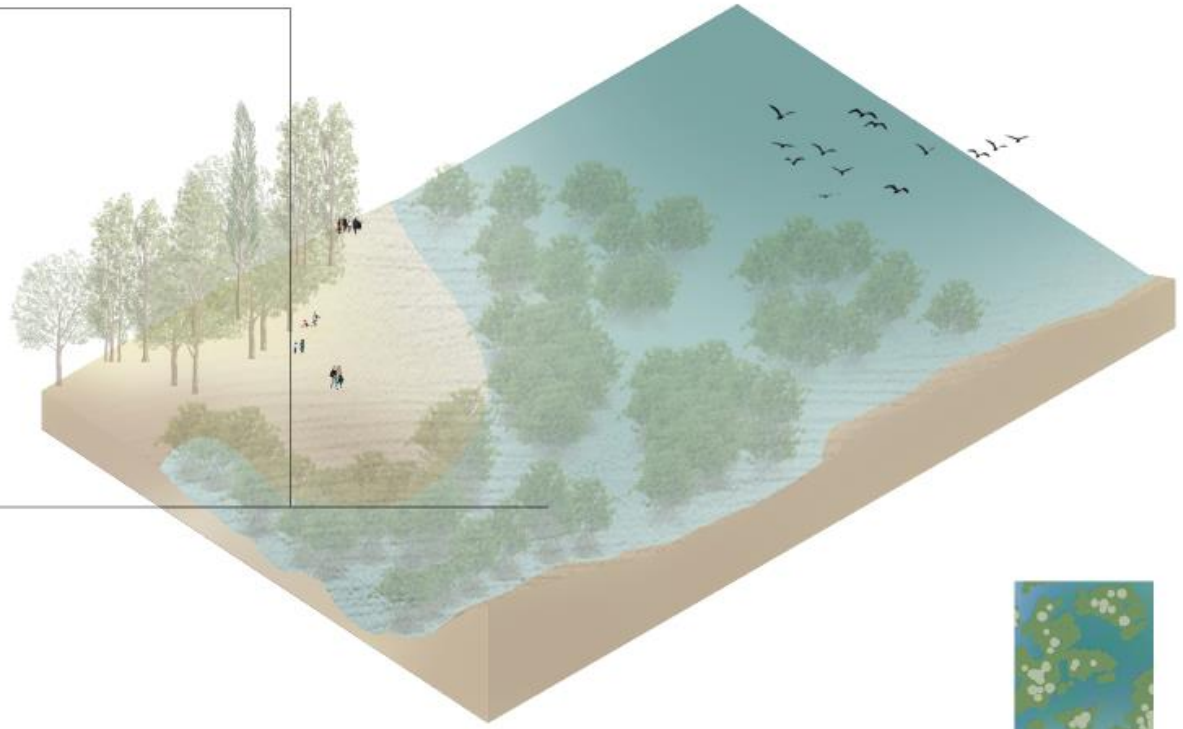
Uca

Cynoglossus puncticeps

Metapenaeus ensis

Bostrychus sinensis

Aristichthys nobilis



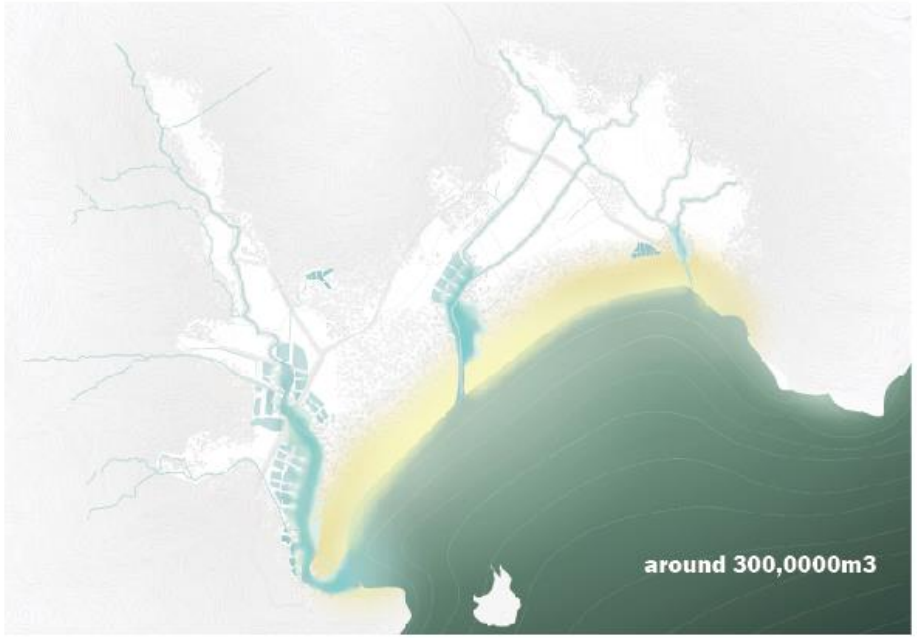
Water retention and utilization

Light rain < 50mm/3h

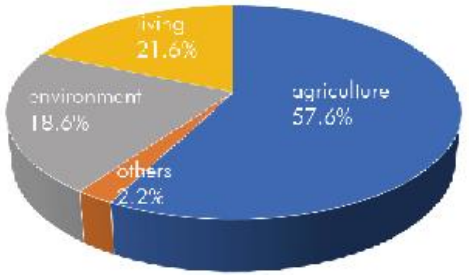
Meidum and heavy rain 50~100mm/3h

Storm < 100mm/3h

Water storage capacity

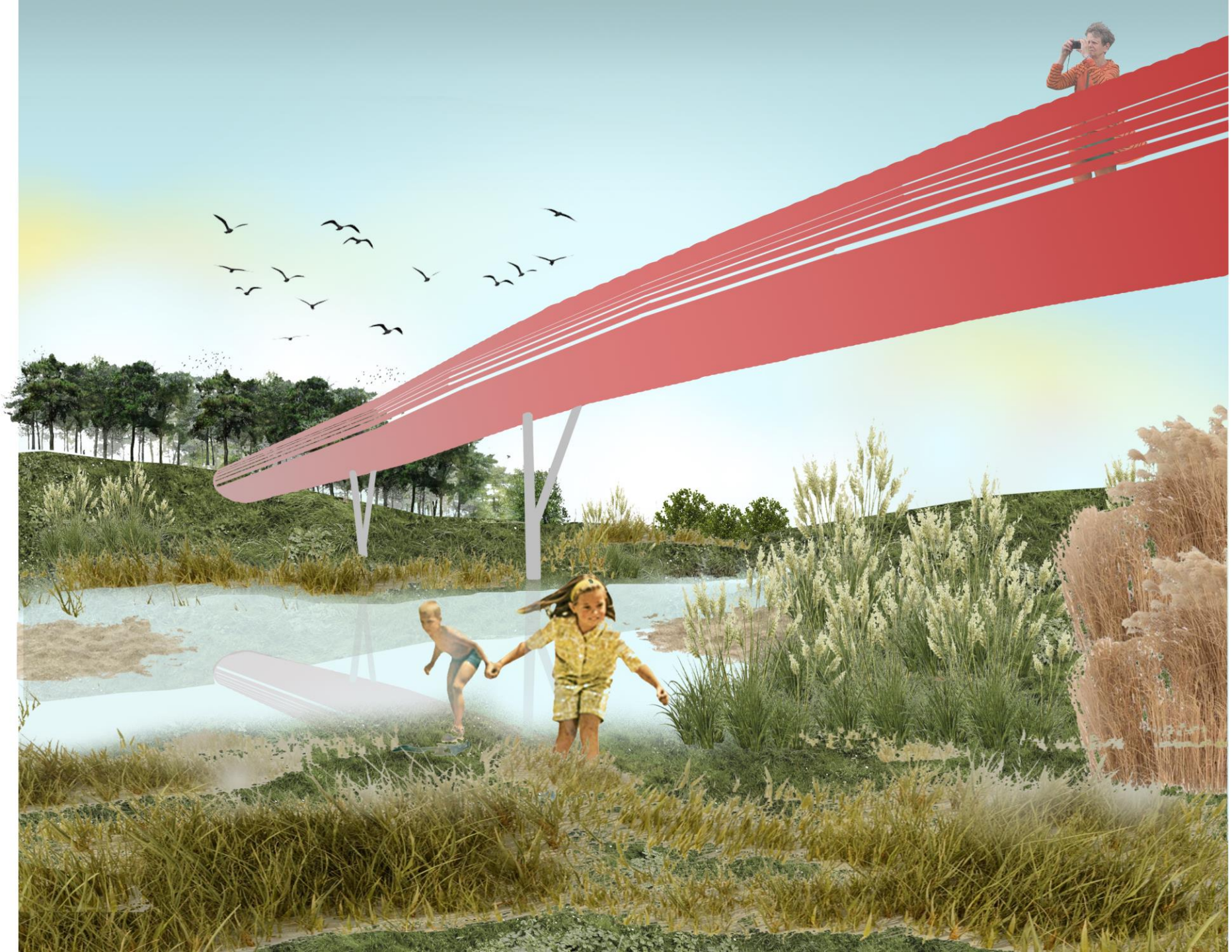


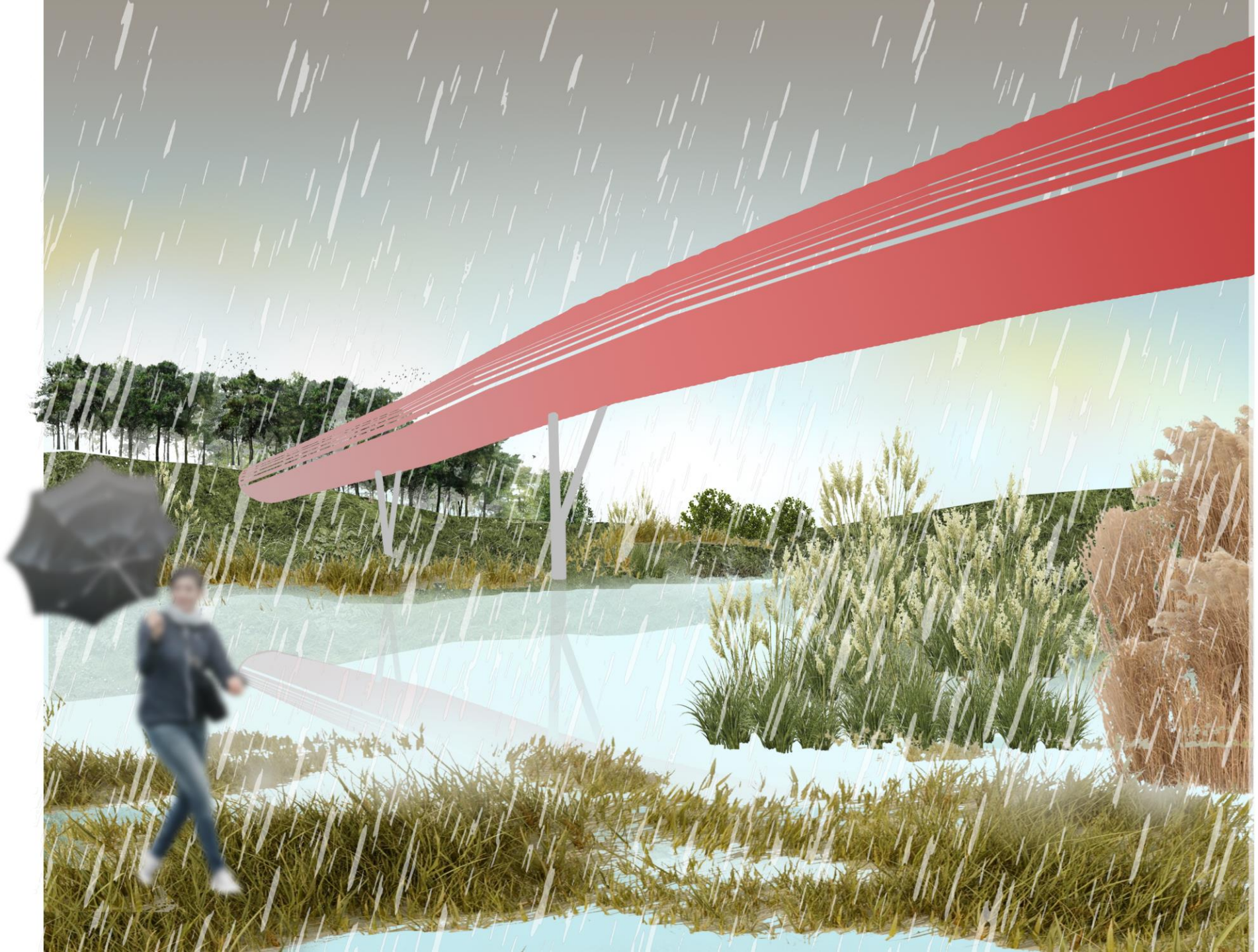
Water utilization



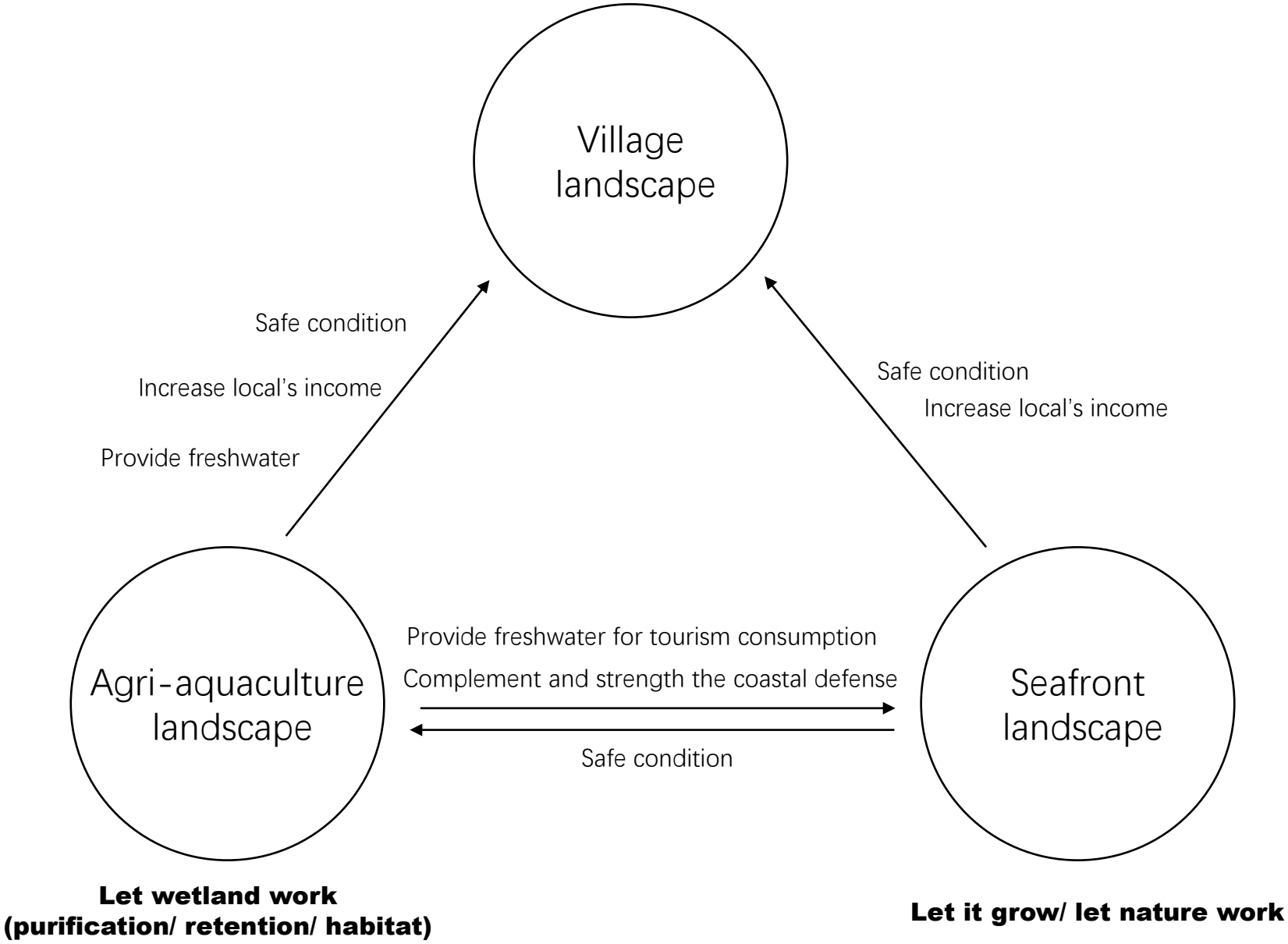
+1000~1500 people

agriculture, aquaculture, ecology, tourism and villager





Conclusion


Village landscape
Safe condition
Increase local's income
Provide freshwater
Safe condition
Increase local's income
Agri-aquaculture landscape
Provide freshwater for tourism consumption
Complement and strength the coastal defense
Safe condition
Seafront landscape
Let wetland work (purification/ retention/ habitat)
Let it grow/ let nature work

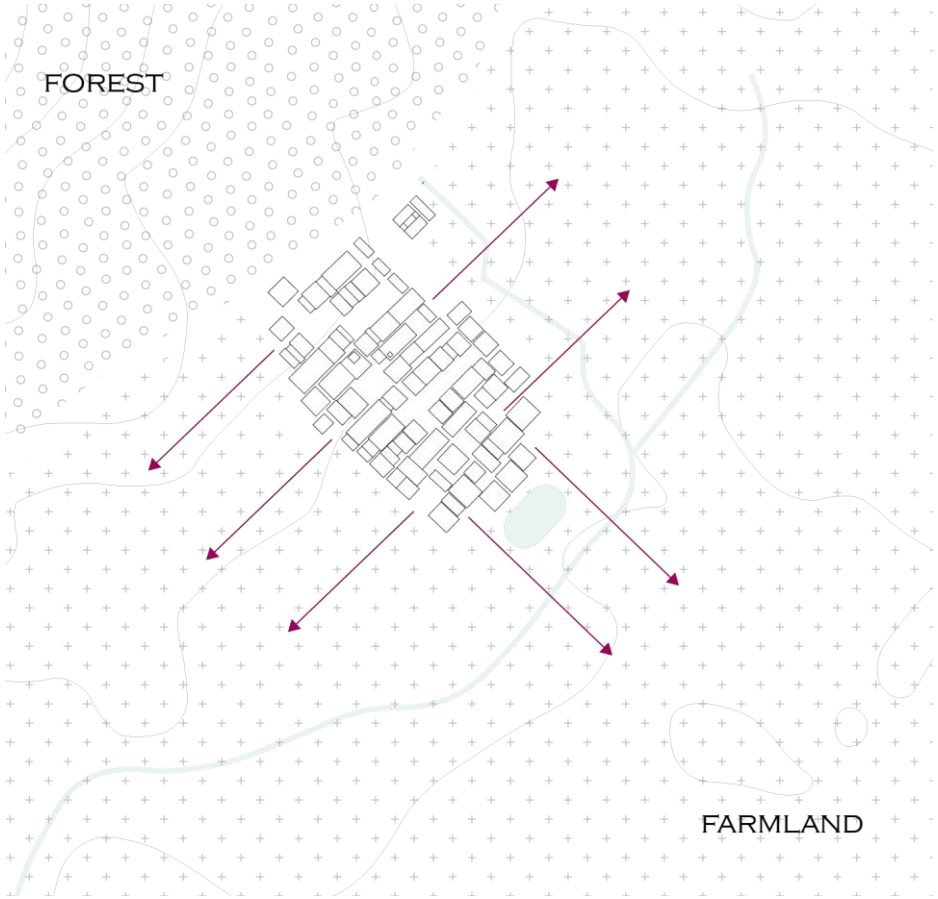
Design Exploration on **Hakka Village**

Block C village landscape

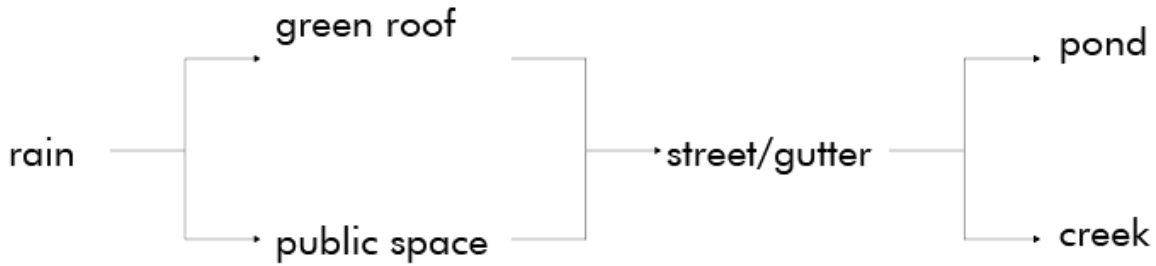
Focus on improve ------

1. the **water sensitivity**
2. **public space** considering social-culture aspect
3. **connectivity** with the whole area

Water management and connection with landscape in history

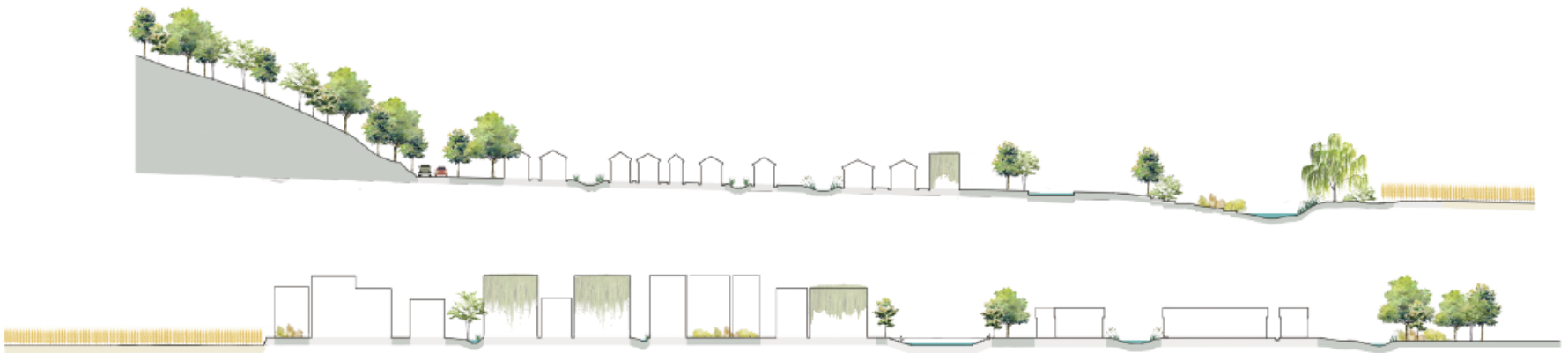


Water Strategy



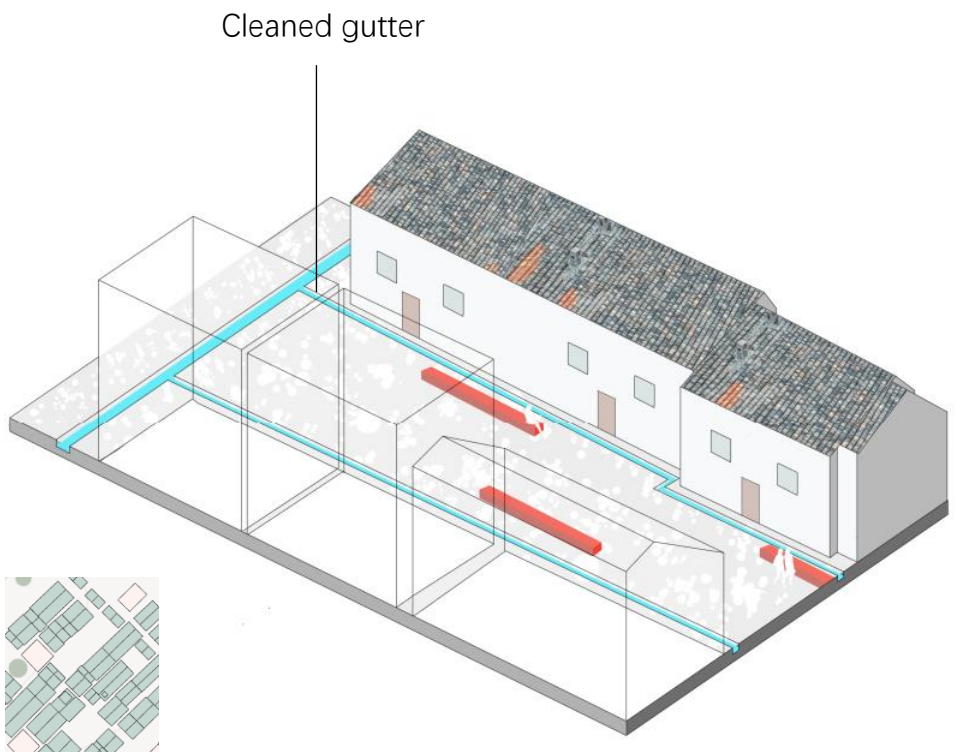
bioswale

Connectivity Strategy

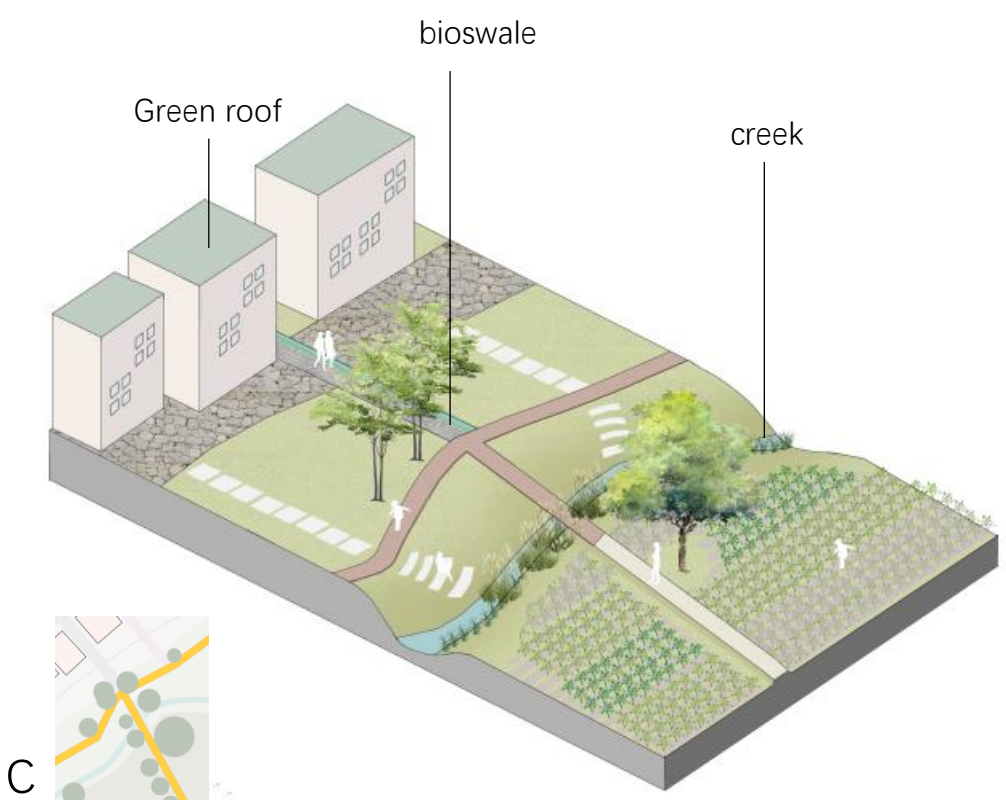


Proposed plan

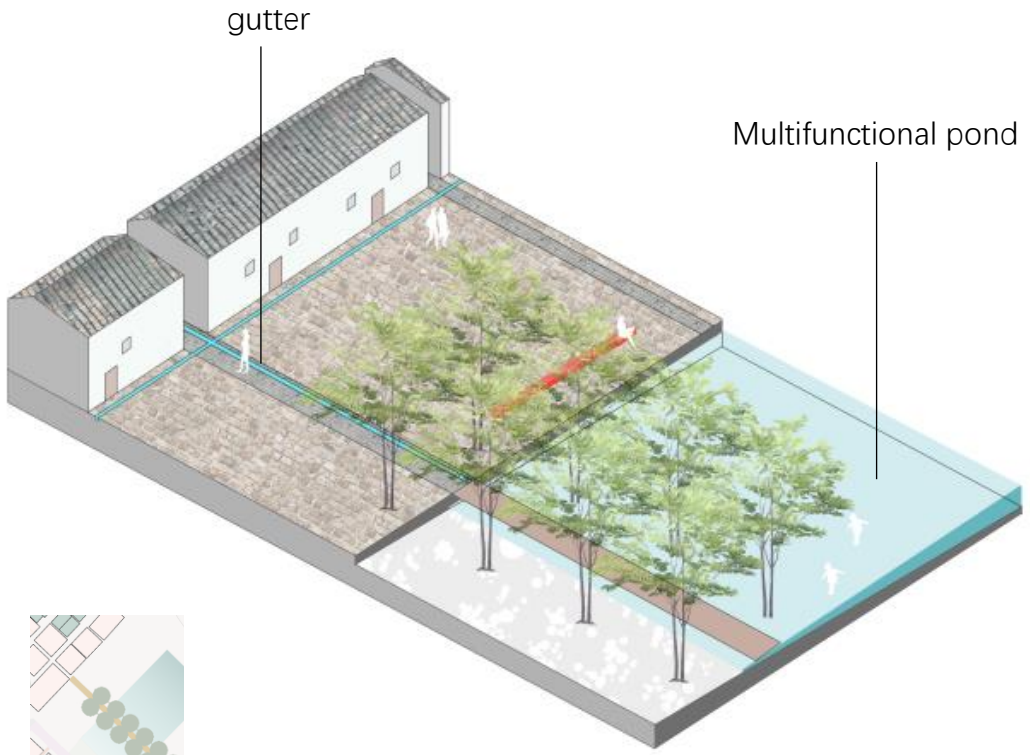
– interface A & B



– interface C & D



C



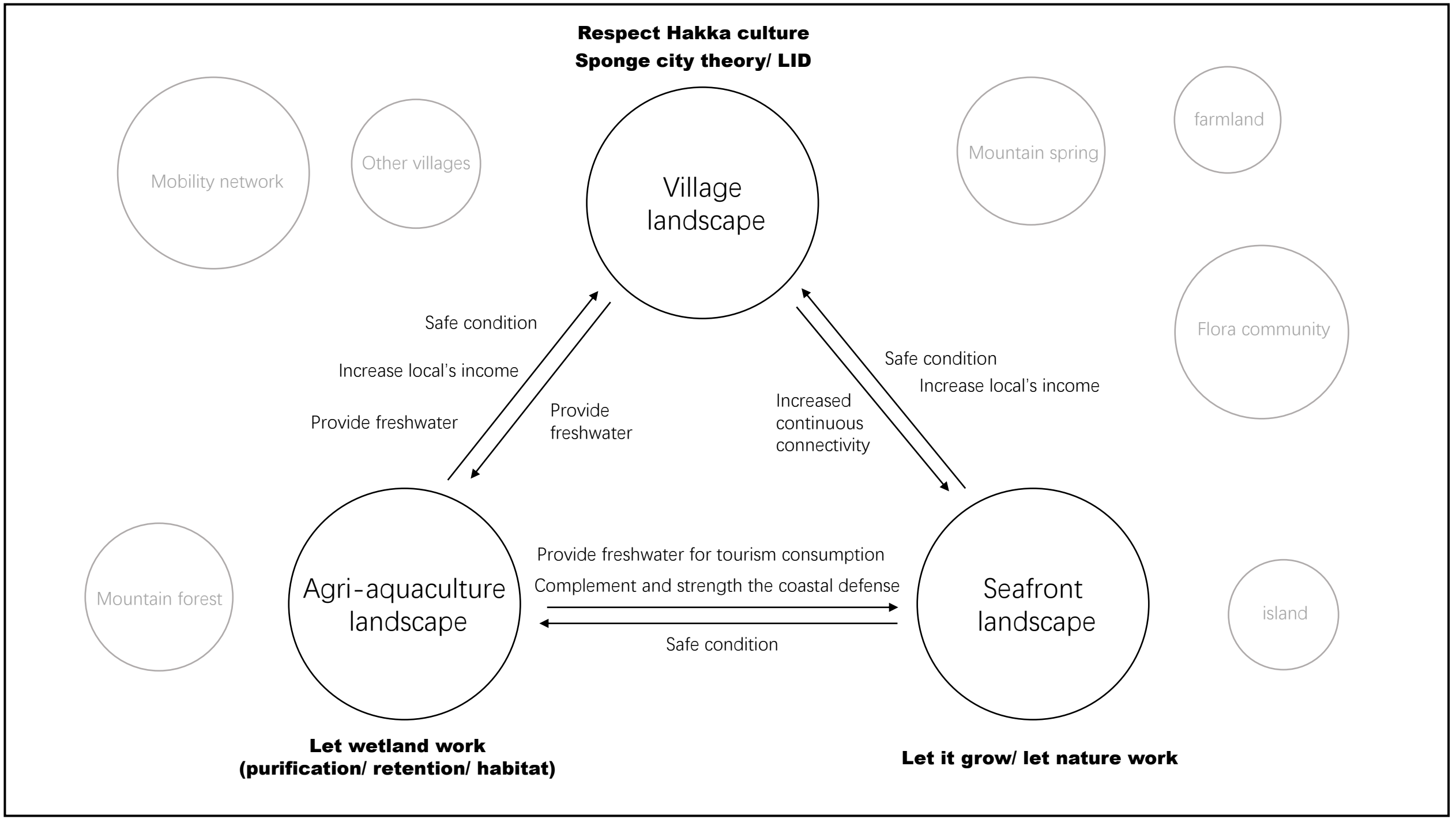
D

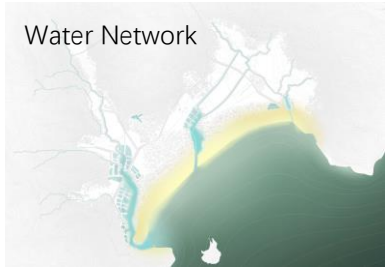
Conclusion

Respect Hakka culture
Sponge city theory/ LID

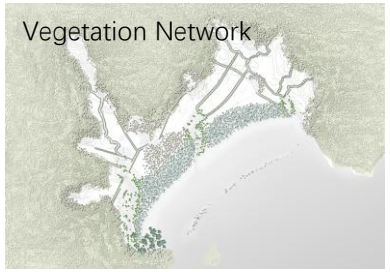
Let wetland work
(purification/ retention/ habitat)

Let it grow/ let nature work


Respect Hakka culture
Sponge city theory/ LID
Mobility network
Other villages
Village landscape
Mountain spring
farmland
Flora community
Safe condition
Increase local's income
Provide freshwater
Provide freshwater
Safe condition
Increase local's income
Increased continuous connectivity
Mountain forest
Agri-aquaculture landscape
Provide freshwater for tourism consumption
Complement and strength the coastal defense
Safe condition
Seafront landscape
island
Let wetland work
(purification/ retention/ habitat)
Let it grow/ let nature work


Water Network


Village Structure


Vegetation Network


Mobility Network


Economic System

Stake holders

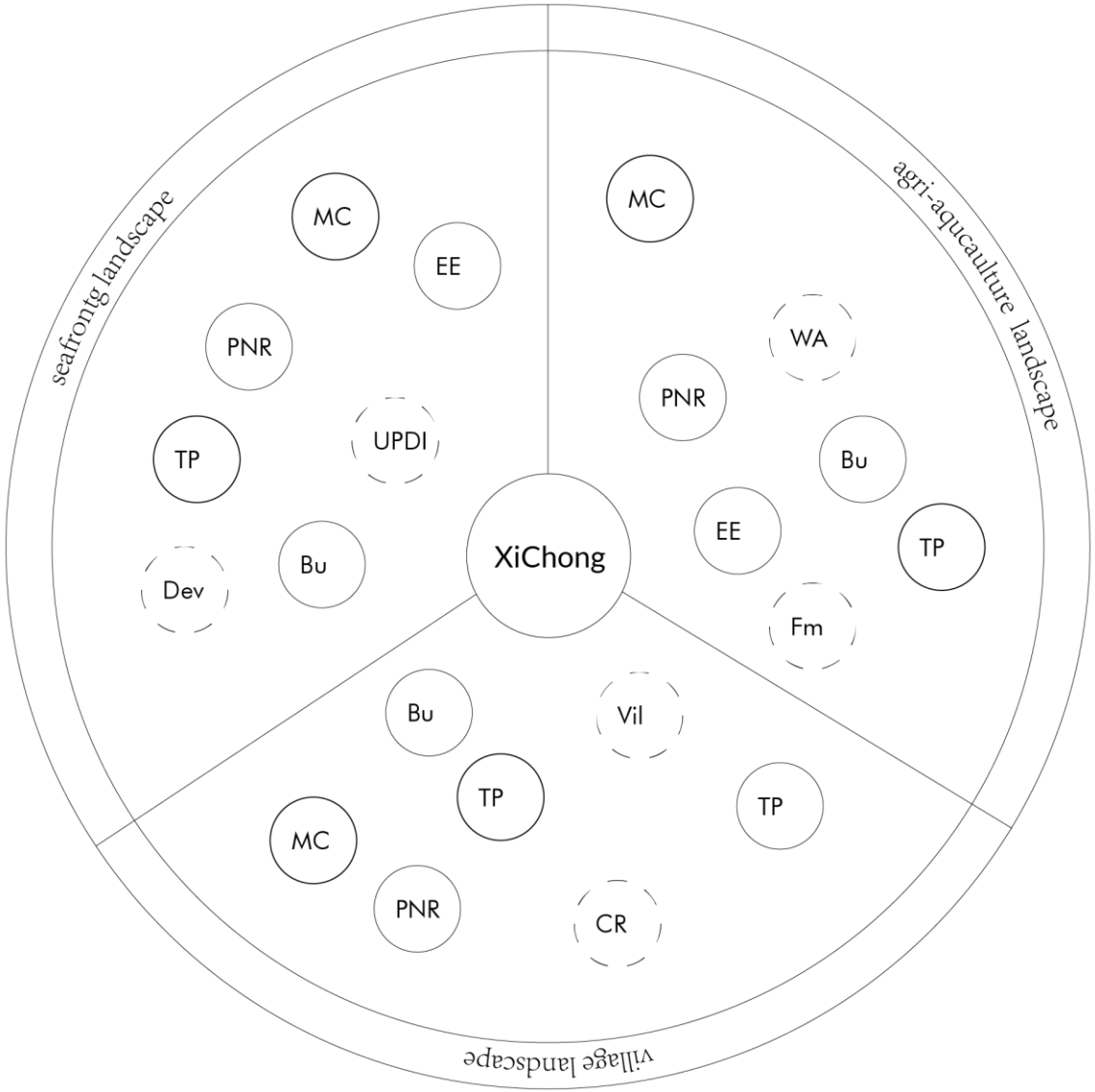
Stakeholder Engagement

`Developers (Hotels/Restaurants)(Dev)
`Businessman (Bu)
`Farmers (Agri-Aquaculture) (Fm)
`Villagers (Vil)
`Shenzhen Planning and Natural Resources Bureau (PNR)
`Shenzhen Ecological Environment Bureau (EE)
`Shenzhen Water Affairs Bureau (WA)
`Shenzhen Dapeng New District Management Committee (MC)
`Shenzhen Urban Planning and Design Institute (UPDI)
`Shenzhen Transportation Bureau (TP)
`Shenzhen Cultural Relics Bureau (CR)

Stakeholders related to all three landscape typologies

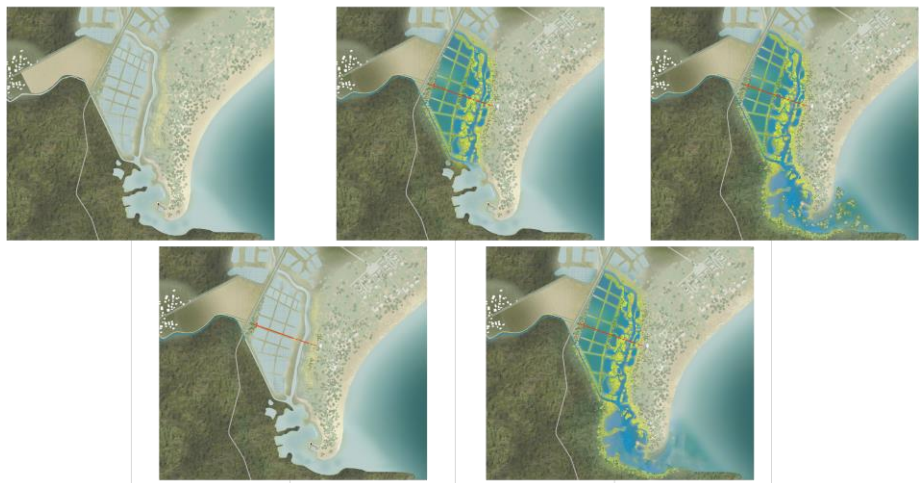
Stakeholders related to two landscape typologies

Stakeholders related to only one landscape typologies



Design through time

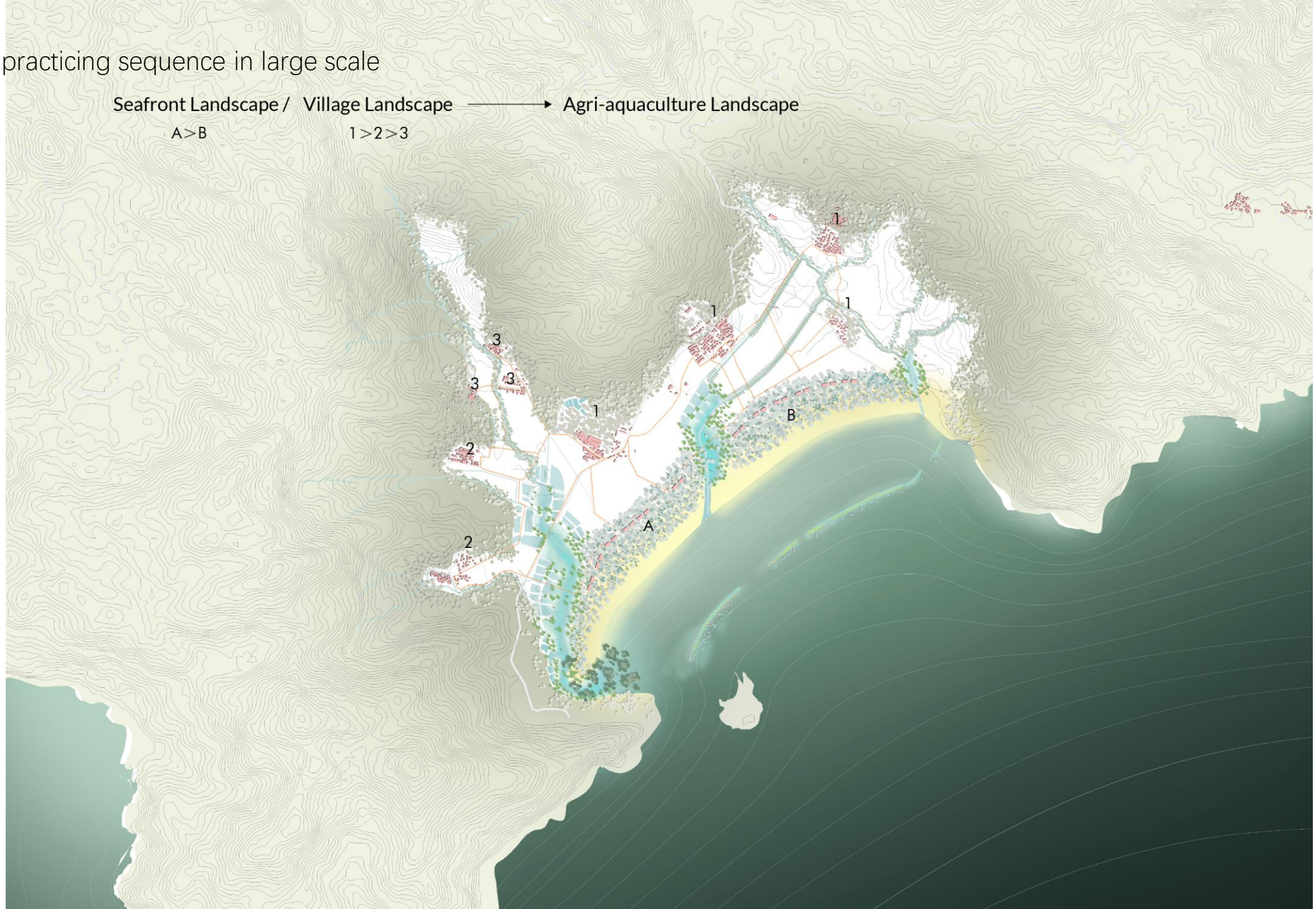
	2021		2025		2050	2100
STEP	**1**	**2**	**3**	**4**	**5**	**6**
Actors:	MC EE PNR	MC TP PNR EE	MC Dev UPDI PNR Bu EE	MC PNR EE	MC Dev UPDI PNR EE	MC PNR EE
Objectives: (and reasons)	·Stop new construction activities ·Investigate the growth of trees	·Keeping assessibility by removing some roads and add walking routes	·Prioritize the renovation of commercial buildings to ensure the sustainability of coastal businesses ·Commercial activity moves inside	·Construction of breakwaters offshore	·Under the condition of ensuring ecological priority, additional houses are built appropriately to add as much economic value as possible	·Windbreak forest maintenance ·Breakwater maintenance
Benefits:	·ecological benefits	·ecological benefits ·economic benefits	·ecological benefits ·economic benefits	·ecological benefits	·economic benefits ·social benefits	·ecological benefits



	2021	2025	2030	2035	2100
STEP	**1**	**2**	**3**	**4**	**5**
Actors:	MC Fm	MC TP Bu PNR EE	MC Fm WA PNR EE	MC PNR EE WA	MC PNR EE
Objectives: (and reasons)	·Appropriate reduction of aquaculture in preparation for fish pond renovation and paradigm shift	·Prioritize construction of landscaped bridges and service centers to improve connectivity and accessibility	·Naturalize fish ponds to build wetlands for water purification ·Aquaculture paradigm shift to diversified ploy culture	·After a period of water purification, the quality of fresh water is improved and can be stored. Buffering salty tides on the one hand and providing habitat on the other	·Remove the sluice gates and restore the natural confluence of salt and fresh water. Mangroves take decades or even centuries to form.
Benefits:		·economic benefits	·ecological benefits ·economic benefits	·ecological benefits	·ecological benefits

	2021	2025	2030
STEP	**1**	**2**	**3**
Actors:	MC PNR CR	MC PNR Bu CR TP Vil	MC PNR CR
Objectives: (and reasons)	·Clean up the traditional water system of Hakka people to prepare for the construction of a new water system ·Restrict southeast traffic and traffic inside to prepare for traffic adjustments ·Restoration of Hakka buildings to improve the quality of space	·Restructuring of motorized routes and new pedestrian routes to connect other villages and beaches ·Improve the street space within the village to increase its water sensitivity and connectivity to the outside world	·Improve the interface of the traditional Hakka village, such as the pond space in front and the pocket park on the west side, to increase the attractiveness
Benefits:	·socio-culture benefits	·ecological benefits ·economic benefits ·socio-culture benefits	·economic benefits ·socio-culture benefits

----- practicing sequence in large scale



Conclusion & Reflection

Conclusion

the objective of this research is:

To create a **resilient landscape framework** that facilitates conditions, both on **regional scale and village scale**, for the development of **ecology, socio-culture and economy**?

Sub-questions

- Understanding Question
  How does the landscape systems in Xi Chong work in terms of economic, ecological, water management and socio-cultural aspects and how do they related to each other ?

- What to do Question
  What kind of principles could be utilized to provide an adaptive condition in relation to Xichong's characteristics ?

- Application Question
  How to apply design principles in different systems throughout multiple scales ?

- Reflection Question
  What are the lessons?

Three Landscape Typologies

Village

Cultural identity loss
Sponge capacity absence

Agri-aquaculture

Ecological decline
Water pollution
Flood rick

Seafront

Housing in danger
Fragile windbreak forest
Beach erosion

Resilient Principles

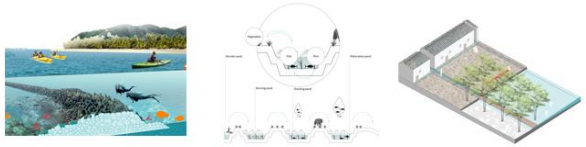
Principles related to water, ecology, economy and social-culture are integrated to fit three landscape typologies

Respect culture and let nature do the work

Village	Agri-aquaculture	Seafront
Sponge City Theory LID	Ploy culture Wetland purification	Let it grow

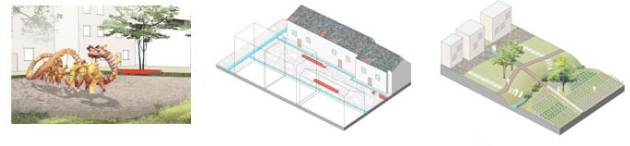
Landscape as a whole
Cross scale
Connecting with each other

Economic



Ecological & Water

Social-culture



Reflection

There are some limitations:

1.About the quantity of water.

Reflection

There are some limitations:

1.About the quantity of water.

2.About coastal erosion.

Reflection

There are some limitations:

1.About the quantity of water.

2.About coastal erosion.

3.About other landscape elements.


THANK YOU