



Sunset in Shajiao Village
Source: <https://www.vairtik.org/places/sha-kiu-tsuen>

Fishermen Landscape-From Water to Land

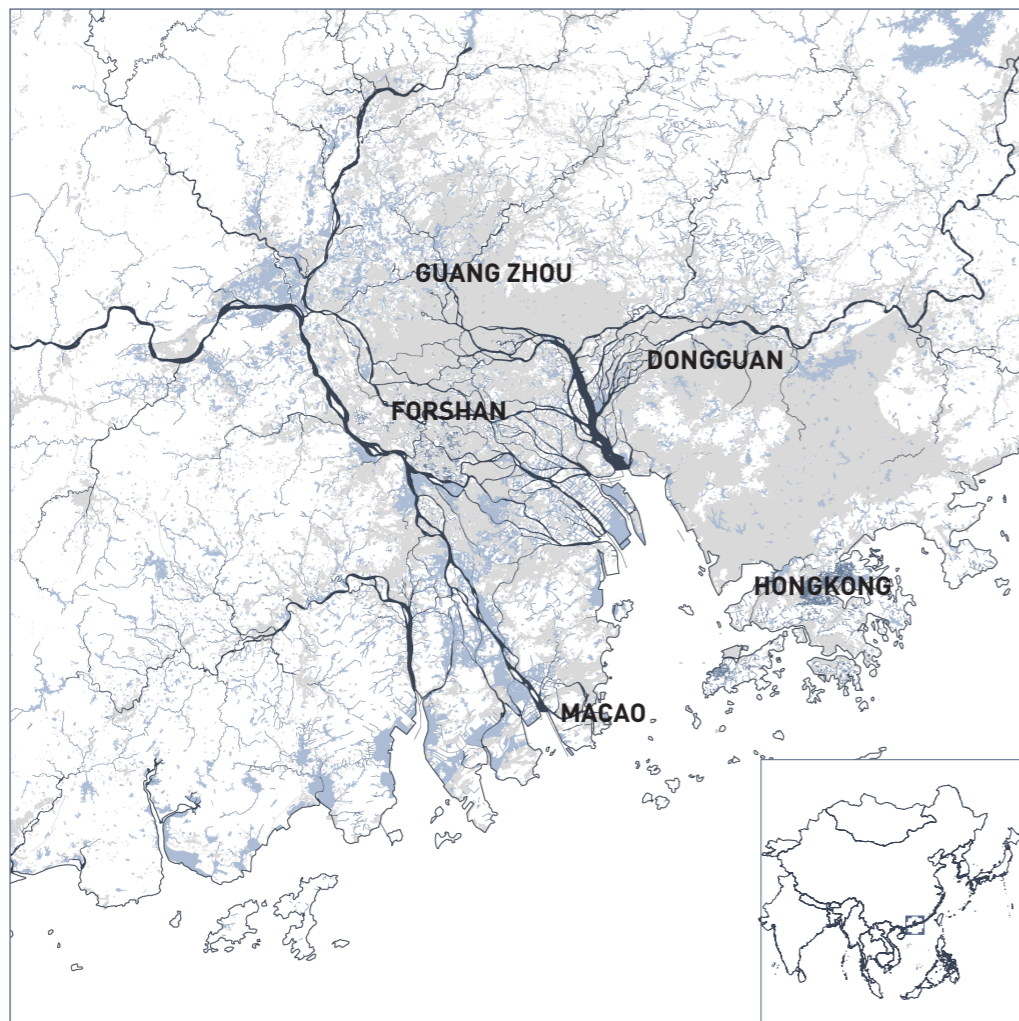
Develop resilient principles to rebuild gradient-landscape in PRD

Name: Huiyuan Zhang 5796733

Mentor: Steffen Nijhuis, Lei Qu

Lab: Designing resilient coastal landscapes

06.2024



The Pearl River Delta
Draw by author

Fishermen Landscape-From Water to Land

ABSTRACT

The Pearl River Delta (PRD) has always been one of the centers of gravity for China's economic development. Over the past few decades, the PRD has been undergoing urban development at an astonishing rate, but this development momentum has begun to wane in recent years. The development dividend initially gained from the manufacturing industry is gradually diminishing, and the whole region is facing a transformation. In order to meet the needs of the manufacturing industry, many rural villages have rented out their land to factories, and the living space for farmers and fishermen has been continuously reduced. Pollution brought about by the establishment of factories has also seriously affected the water system of the Pearl River, bringing about the extinction of aquatic organisms.

Not all groups of people have enjoyed the dividends of economic development in the Pearl River Delta. Especially the fishermen among the marginalized people, their living space and production sources are threatened by urban expansion. However, fishermen, as the first to settle in the Pearl River Delta and have lived on the land for thousands of years, have their unique wisdom about the land and the water system. Therefore, the project hopes to help the region achieve sustainable development from the perspective of the fishermen while ensuring their livelihoods.

The project has developed a core fishermen's habitat framework through theoretical research. Firstly, based on this framework, the project collected data and information on typical fishing villages classified the fishing villages in the Pearl River Delta (PRD) and summarized their specific elements. Secondly, the project selected one of the fishing villages for design exploration, exploring specific habitat modifications and area-specific planning strategies. Finally, the design logic implemented in the design exploration was utilized to explore the principles of the other two types of fishing villages, and a relatively feasible way of application was proposed.

Landscape has always embodied the mutual compromise between man and nature. In the past, humans have forced nature to make compromises, leading to the increasingly severe ecological degradation problems today. It is time to think differently about the relationship between man and nature, so the project hopes to help the residents of the Pearl River Delta, and nature reach a new coexistence through the means of landscape modification, which will no longer be a relationship of forcing one party to compromise, but rather a relationship of balanced development.



The inhabitants of this floating village in Datang Town are the Tan family. This ancient ethnic group is spread across southern China and earns its living on the waterways along the coast.

Source: LAM YIK FEI FOR THE NEW YORK TIMES
<https://cn.nytimes.com/china/20170124/china-tanka-river-people-datang/>

Fishermen Landscape-From Water to Land

CONTENT

CHAPTER 1 INTRODUCTION

- 1.1 Fascination
- 1.2 Problem Statement
- 1.3 Potential
- 1.4 Research Objective & Research Question
- 1.5 Report Structure

CHAPTER 2 THEORETICAL FRAMEWORK

- 2.1 Theory Background
- 2.2 Theoretical Framework

CHAPTER 3 UNDERSTANDING & ANALYSIS

- 3.1 History Background
- 3.2 Understanding
- 3.3 Three Types Fishermen Landscape
- 3.4 Conclusion

CHAPTER 4 DESIGN EXPLORATION

- 4.1 Introduction
- 4.2 Site analysis & Design principles
- 4.3 Vision for Lau Fau Shan area
- 4.4 Detail design

CHAPTER 5 PRINCIPLES & APPLICATION

- 5.1 Introduction
- 5.2 Principles & Application

CHAPTER 6 REFLECTION

- 6.1 Reflection on research questions
- 6.2 Conclusion

APPENDIX

References

Develop resilient principles to rebuild gradient-landscape in PRD



Fifteen-year-old Chan Wai Sing collects nets from his parents' fishing boat. Most of the young people in the Tanjia community do not plan to live on the water.

Source: LAM YIK FEI FOR THE NEW YORK TIMES
<https://cn.nytimes.com/china/20170124/china-tanko-river-people-datang/>

Fishermen Landscape-From Water to Land

Develop resilient
principles to
rebuild gradient-
landscape in PRD

CHAPTER 1 INTRODUCTION

- 1.1 Fascination
- 1.2 Problem Statement
- 1.3 Potential
- 1.4 Research Objective & Research Question
- 1.5 Research Framework

1.1 FACINATION

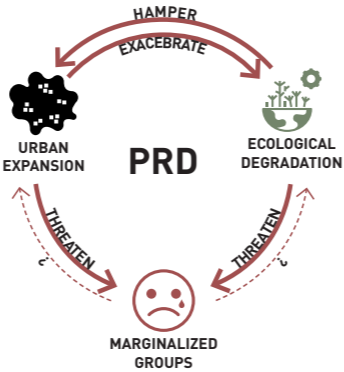
1.1.1 Rapid Urban development & Marginalized groups

In the past three decades, the Pearl River Delta (PRD) has developed rapidly, becoming one of the fastest-growing regions in the world. However, urban development activities such as river modification, dam construction, and land reclamation have seriously affected the lives of marginalized people.

These actions have disrupted the original transition from city to nature, exacerbating problems such as flooding, soil erosion, and water pollution. Because marginalized people live on the edge of the town, they are more vulnerable to natural threats because they do not have

sufficient economic income and live in poor conditions.

These uncontrolled urban expansions have compressed the urban space for farmers and fishermen. To cut costs, factories have purchased large amounts of rural land at lower prices to construct factories. Pollution from the factories enters the soil and water systems, seriously threatening the people's lives in the region.

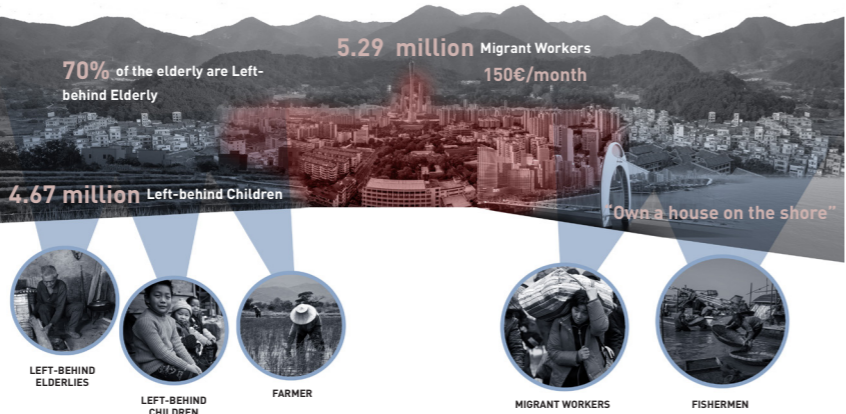


Top right: Unhealthy development patterns in PRD.

Drawn by author

Bottom right: Urban development in the Pearl River Delta has neglected the interests of many marginalized people.

Drawn by author



Pearl River Delta Cities

Source: Lennart Menger, Digit Magazine

<https://www.digitmagazine.com/articles/pearl-river-delta-region-copycats-or-center-innovation>

1.1 FACINATION

1.1.2 Traditional Fishermen-“Tan family”

The boat-dwelling people are an ancient ethnic group spread throughout southern China. They live on the coastal waterways and have always been on the margins of society. The way of life of the boat-dwelling people is disappearing as the overly rapid urban expansion of Guangdong Province swallows up these quiet towns. Cement factories belch smoke into the air, apartment buildings rise along the rivers, and the rivers are dredged, polluted, and overfished.

The boat-dwellers are still a distinct ethnic group. Guangdong Province has prospered, but the boat-dwellers are still at the bottom

of the heap. They live on the water for long periods and will do all their activities in the boat house, including eating, sleeping, and watching TV.

“Now fish have become scarce, and we are having a hard time living, but we are not educated, so we can only fish,” Mr. Chen said.

The next generation of existing boat-dwelling families no longer want to live on the water, and many are forced to live on the water for a living. But their way of life can inspire us, some models of people living in harmony with nature.

(Bailiang Chu, Adam Wu, 2017)

Left: Tidy up the clams you catch. The economy of this area is booming, but the Tanka people are still at the bottom. Thousands of them still live on the water off the coast of southern China, although the exact number is not known.

LAM YIK FEI FOR THE NEW YORK TIMES
<https://cn.nytimes.com/china/20170124/china-tanka-river-people-datang/>

Right: Repair of fishing boats. Fishermen now use outboard motors to move the river here or in and out of the bay, but the boats still look like relics from the last century. LAM YIK FEI FOR THE NEW YORK TIMES

LAM YIK FEI FOR THE NEW YORK TIMES
<https://cn.nytimes.com/china/20170124/china-tanka-river-people-datang/>



2023, Lingshui, Hainan, Xincun Fishing Port, Xincun Town, Tanjia Fishing Row is dotted.
Source: Visual China
<https://ujoy.net/topics/10412748>

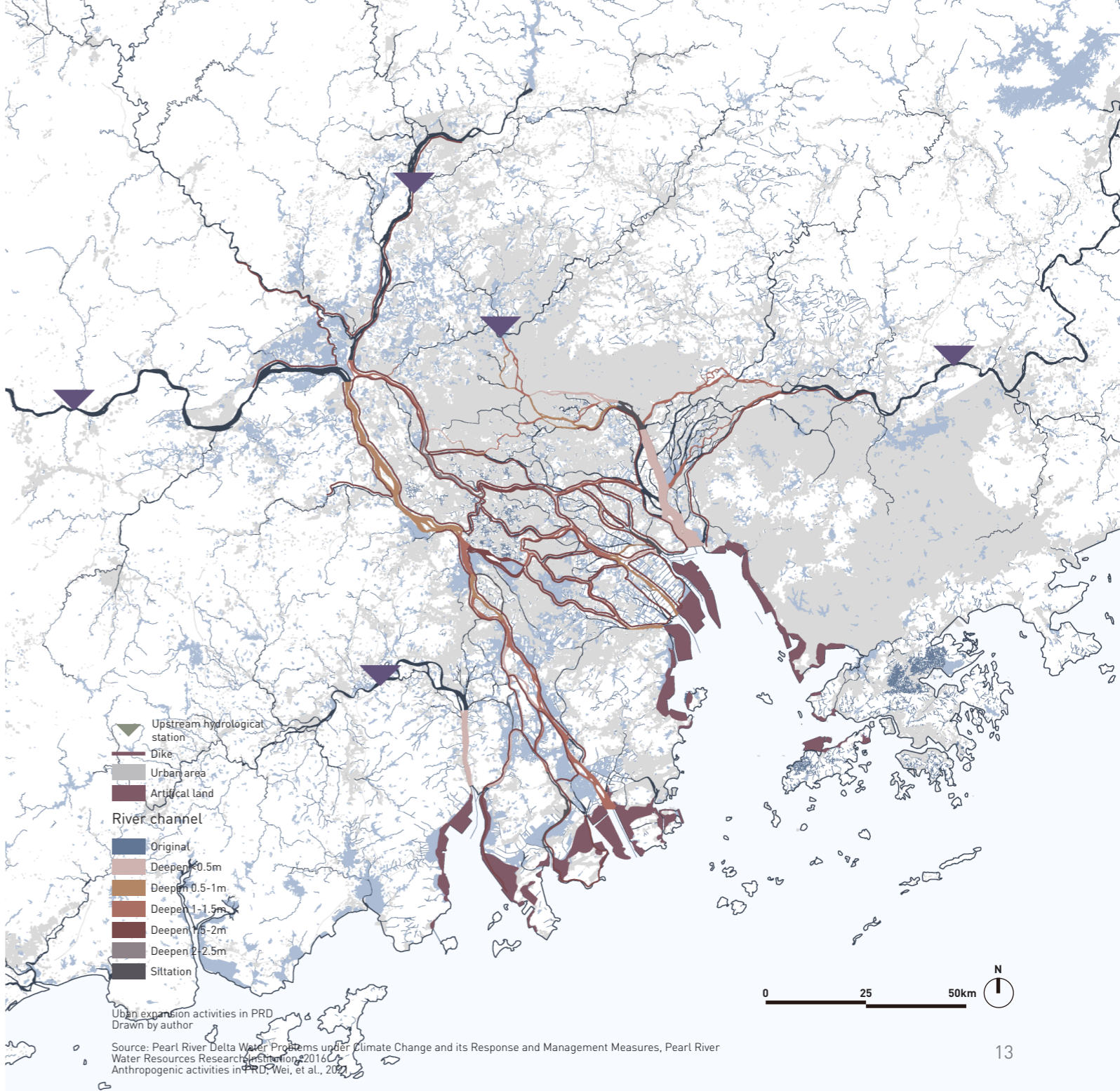
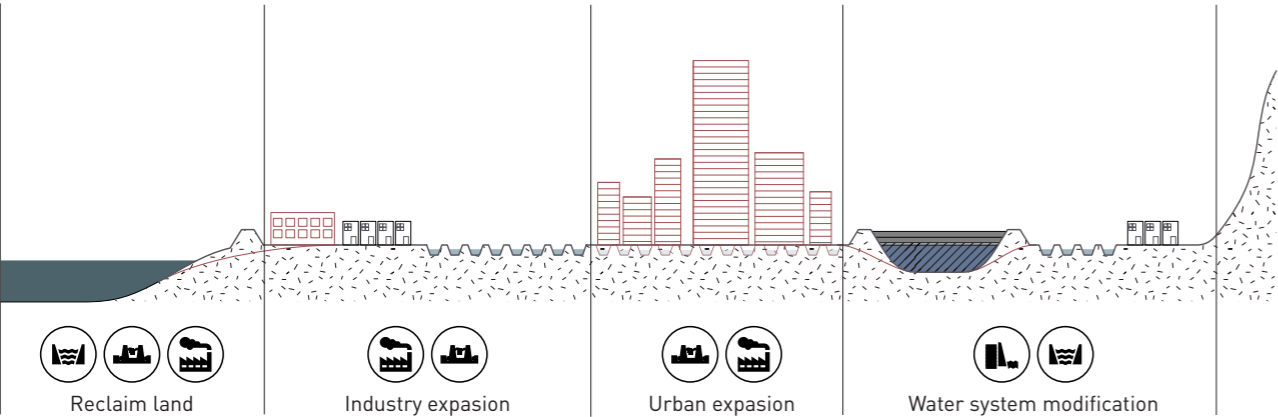
1.2 PROBLEM STATEMENT

1.2.1 Urban development ignores the joint advancement of economy and ecology.

In the past, the urban development model has always focused on economic development first, ignoring the ecological and environmental problems brought about by evolution. After economic development reaches a certain height, much time and money are spent on ecological restoration. Such a vicious cycle needs to be replaced by a new virtuous cycle.

On the one hand, urban sprawl continues to take over village land. Fishponds have been filled in, and high-rise buildings have been constructed. The living space of farmers and fishermen is constantly being reduced. On top of that, people are constantly reclaiming more and more

land from the sea. On the other hand, in order to ensure the regular operation of the city and to avoid flooding, dykes were built to control the water system. In order to ensure the passage of navigation and economic development, the river channels were constantly modified and deepened. These actions have ensured economic development but neglected environmental protection, making today's cities more fragile and vulnerable to natural disasters.



1.2 PROBLEM STATEMENT

1.2.1 Urban development ignores the joint advancement of economy and ecology.

Soil erosion

With the acceleration of urban processes, a new type of soil erosion - anthropogenic soil erosion - is widespread. Soil erosion is exacerbated by human expansion activities such as quarrying, transportation and road construction, development zones, and reclamation of slopes. [Huang, et al., 2001]

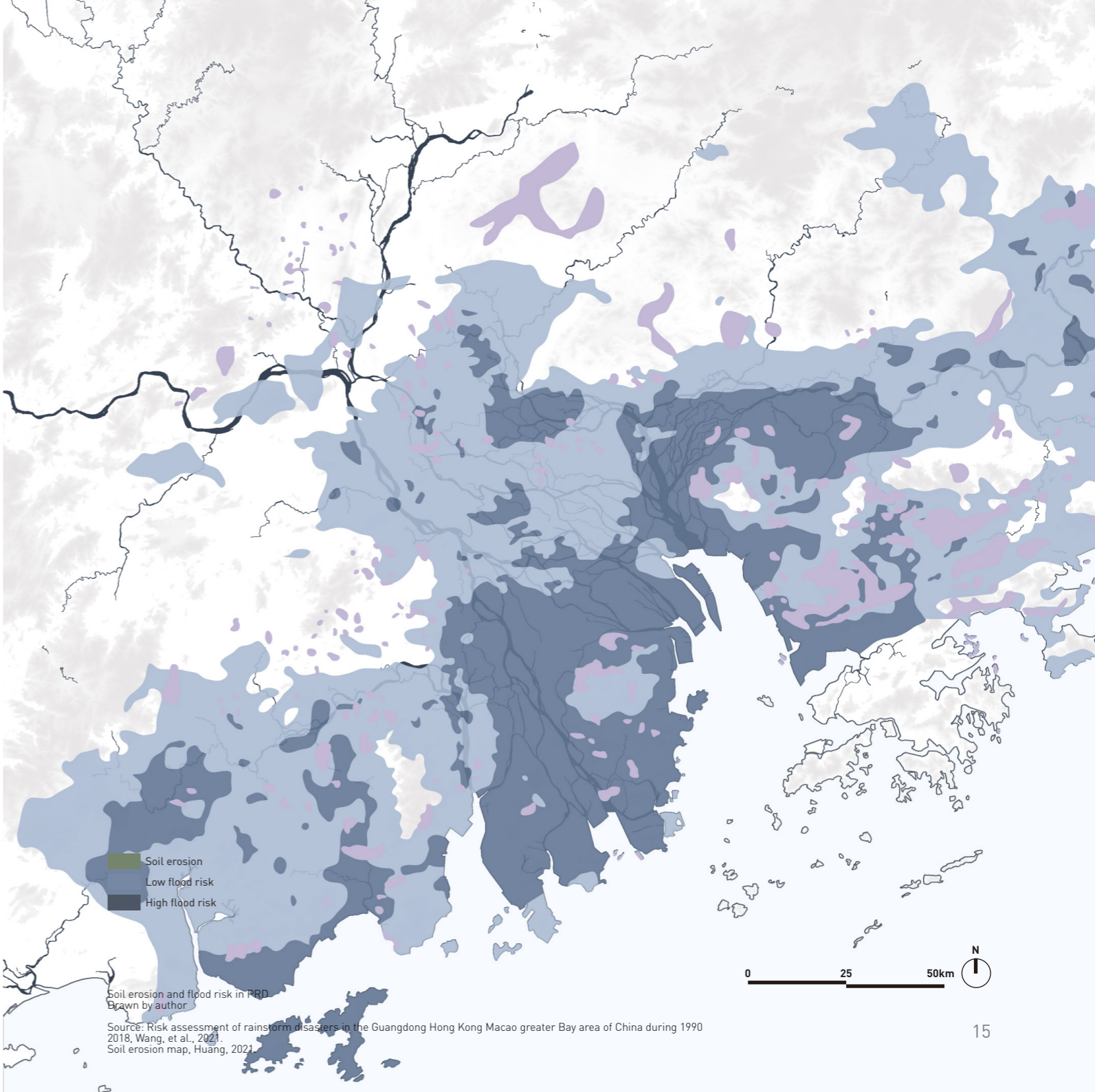
Flood

Increasing tides, rising sea levels, and land subsidence from development have contributed to the growing flooding problem in the Pearl River Delta region.

Flooding disasters have been frequent in Guangdong province in recent years. Torrential rains in May 2014 inundated more than 100 factories and stores in Dongguan, causing dozens of businesses millions of dollars worth of damage.2022 In June, Guangdong's average rainfall reached 621mm, the most for the same period since 1961.2023. The province has also been the scene of several flooding disasters. Shaoguan was one of the most challenging hit cities, with officials raising flood warnings to the highest level. Southeastern China suffered 470 million yuan (US\$70.2 million) in economic losses, and 43,300 hectares of crops were destroyed. [BBC News Chinese, 2022]

Left: Michael, S. (2019) A former rare earth mining site in Longnan county, Jiangxi province. <https://e360.yale.edu/features/china-wrestles-with-the-toxic-aftermath-of-rare-earth-mining>

Right: Liang, S. (2022) The area around Zhuliao Village of Yindi Village Committee has been surrounded by floods. Feilaixia Town, Qingcheng District. https://www.sohu.com/a/559241462_100116740



1.2 PROBLEM STATEMENT

1.2.1 Urban development ignores the joint advancement of economy and ecology.

Water pollution

The rapid development of the economy has brought a considerable pollution load to the marine environment, with land-based sources of pollution increasing year by year and marine environmental problems becoming more and more serious. Many new towns have sprung up around the Pearl River Delta due to economic development, resulting in a large amount of domestic sewage being discharged directly into the Pearl River Estuary. Eighty percent of the pollution in the Pearl River Estuary comes from land-based sources. Due to the declining resources of marine

fishing, aquaculture is on the rise. These aquaculture industries are located in coastal and estuarine waters, which have suffered from high aquaculture densities and overfeeding of bait, resulting in eutrophication of the water body. Twenty-two large-scale catastrophic red tides occurred between the Pearl River Estuary and Daya Bay from 1980 to 1990, and the red tides from late March to mid- and late April of 1998 caused up to 350 million yuan of economic losses to Guangdong and Hong Kong.

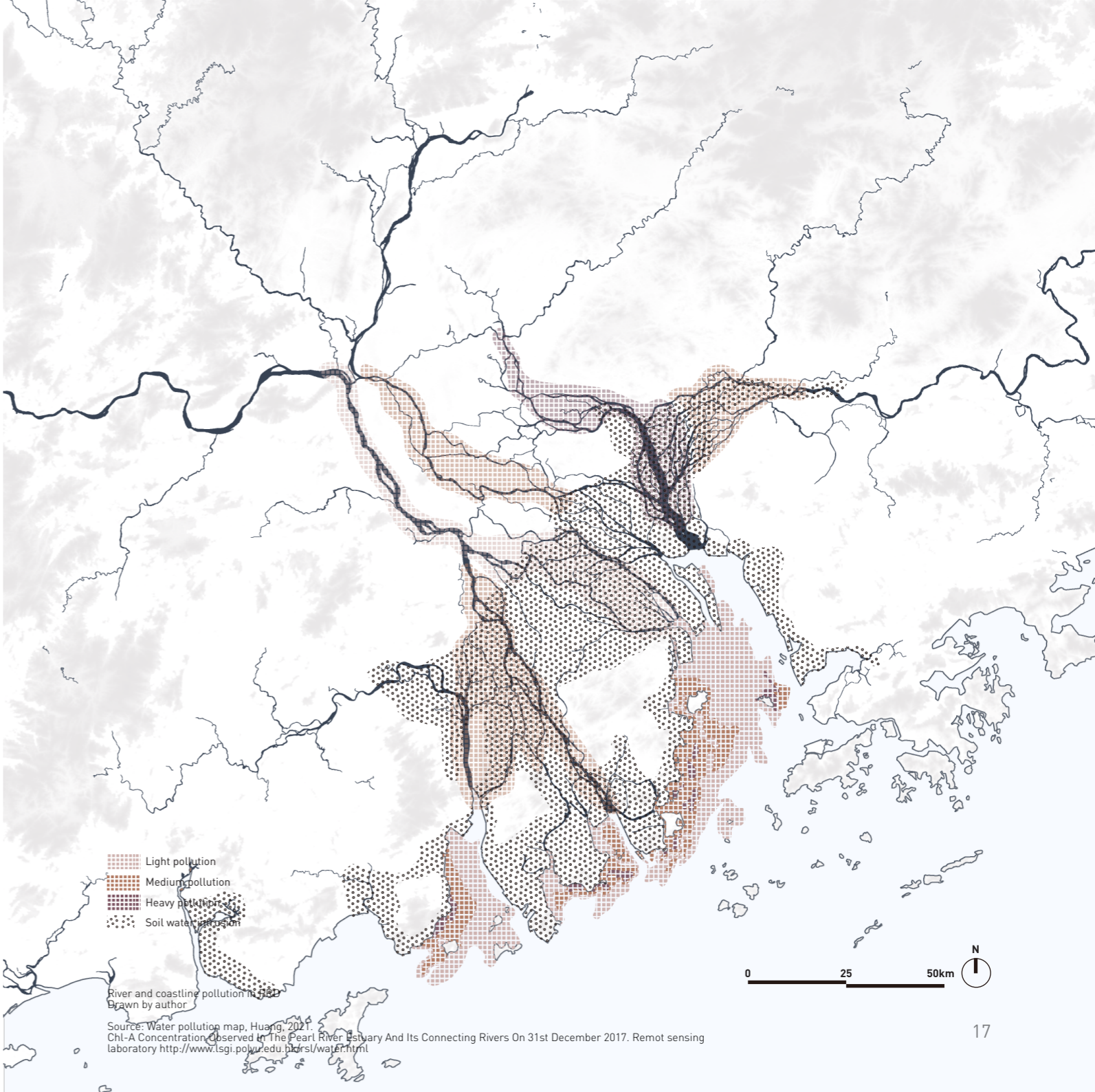
Soil water intrusion

In the past decade or so, the salty tide in the Pearl River Delta has become increasingly severe. The upwelling of salty tides directly affects the water quality of underground freshwater resources and exacerbates soil salinization. The salty tides during the dry periods in 2009, 2017, and 2021 were particularly severe, posing a significant threat to the urban water supply in the Pearl River Delta region.

(Marine Development and Management Magazine, 2005)

Left: The seawater of Yunlin Fangziliao Fishing Port was quickly flooded, and the employees of the fishing club were trapped and could not get out, and the freezer did not have time to move the high soaking water for reimbursement. (Photo/ Flip screen)

Right: Huang, H. & Zhang, Y. (2005) *A restaurant draws sewage pipes directly to the shore and discharges sewage continuously*. Guangdong province, China. <https://gd.sina.com.cn/hz/2016-05-26/city-hz-ifxsqxu4465530.shtml>



1.2 PROBLEM STATEMENT

1.2.2 Undervalued landscape

Fig A:Nalong River. Danxin Yuan, 2021 https://www.sohu.com/a/452418388_120438049
Fig B:2023, Lingshui, Hainan, Xincun Fishing Port, Xincun Town, Tanjia Fishing Row. Visual China. <https://ujoy.net/topics/10412748>
Fig C:The single largest resettlement housing project in Huadu District, Guangzhou was officially delivered. Chen Shushan. <https://www.gd.chinanews.com.cn/2023/2023-08-26/430117.shtml>



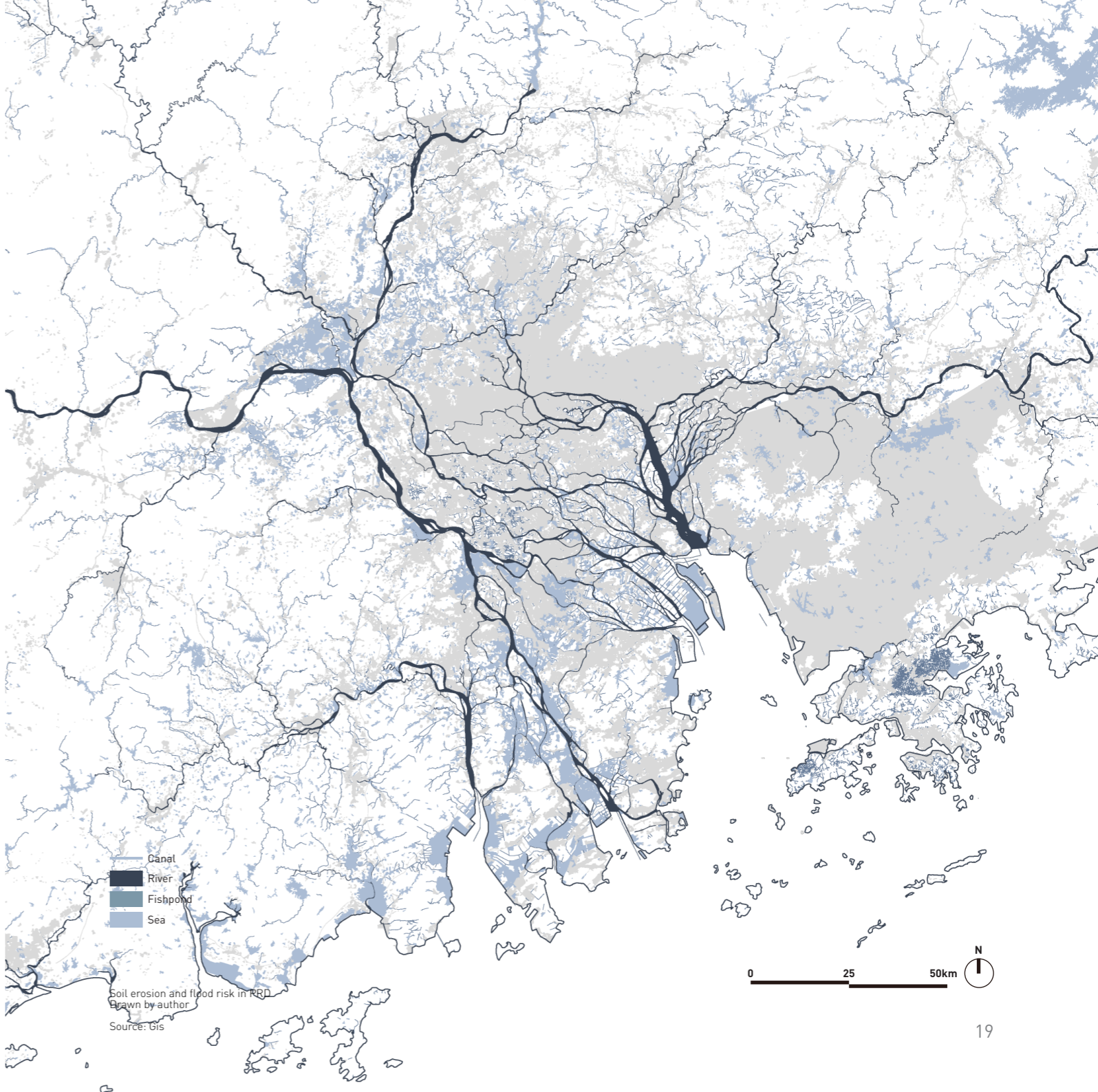
The landscape created by fishermen production and lifestyle is a potential social-ecological inclusive landscape. Fishermen relied on the original natural environment and fish resources to survive. As time went by, they further created various aquaculture methods, which can also be understood as “artificial fish habitats.” Fish habitat connects nature and society. Fishermen live extensively at the interface between water and land. Therefore, fishermen’s habitat is a gradient landscape that can be used to restore the gradually hard boundaries of the Pearl River Delta, thereby alleviating various natural problems caused by urban expansion and ensuring the safety of fishermen life.



The rich water resources of freshwater, brackish water, and the convergence of salt and freshwater have created diverse natural resources such as mudflats, wetlands, mangroves, marshes, seagrass beds, and so on. The area of shallow talks below 3m water depth is 76,000 hectares, and the total length of shoreline that can be developed and utilized as deep-water shoreline is more than 100km; the area of wetlands is 1,864,101.3 hectares.



To improve local fishermen's and rural residents' lives, the government's approach is to build clustered communities and high-rise buildings, provide fishermen and farmers with specific compensation for demolition, and let them give up their traditional lives and move directly into the city. These fishermen and farmers moved into the city, but they needed to gain skills to survive in the town and could not promote further urban development.



1.2 PROBLEM STATEMENT

1.2.3 The live of fishermen is under threat

In the thirty years of China’s reform and opening up, the Pearl River Delta in Guangdong Province has seen a rise in prosperity and a decline in livelihoods. The fishermen who live here are adrift in the “cracks” of the world of wealth, relying on the depleting fishery resources of the coastal rivers and springs to support their families.

In recent years, many news stories have been about pollution and the worrying living environment for fishermen. An example is Xinwan, Humen Town, Ivana City. The Humen City used to be one of the gathering places for fishermen in the Pearl River Estuary. But now, blackened seawater and almost extinct fish stocks make it difficult for fishermen here to maintain their livelihood. The Pearl River Delta has developed into a “global manufacturing center” in the last 30 years, and factories have sprung up along the Pearl River Estuary, especially in Dongguan and Humen. Industrial effluent is a derivative of this rapid and unhealthy urban development. When the tide recedes, a robust salty smell comes in: the smell brought by industrial pollution. These pollutants have drastically reduced the fish resources in the Pearl River Estuary.

As a fisherman, Li Jinfu has experienced this change deeply. Ten years ago, his fish could be sold to various hotels at a full range of inexpensive prices, but he also had to look at the face of the buyer. The number of fishermen has decreased, but his catch has mostly stayed the same. However, the demand for seafood in the community is still growing, and in the past,

those restaurants even needed to line up to book in advance.

The changing fortunes of fishermen in the Pearl River Estuary reflect the alarming reality of the changing water quality of the Pearl River. (Sina_Mobile, 2009)

The 2008 Guangdong Marine Environmental Quality Bulletin shows that the Pearl River Estuary has been the most polluted sea area in Guangdong Province in recent years and has become the second most polluted sea area in the country after Bohai Bay, with the trend of desertification expanding and spreading.

The bulletin also provides a series of figures to prove it. For the 97 outfalls monitored in 2008, the annual volume of sewage entering the sea from the outfall rivers increased by 12.6% compared with 2007. The coastal waters of the Pearl River Delta remain the central receiving waters for sewage entering the sea, accounting for 77.5% of the province’s sewage entering the sea.

Some pollutants from rivers entering the sea have been discharged in large quantities more than the standards for an extended period, resulting in severe pollution of the quality of seawater in the waters adjacent to nearly 90% of the critical outfalls, severe eutrophication of the water bodies in the neighboring waters, and continuous deterioration of the quality of the benthic environment.

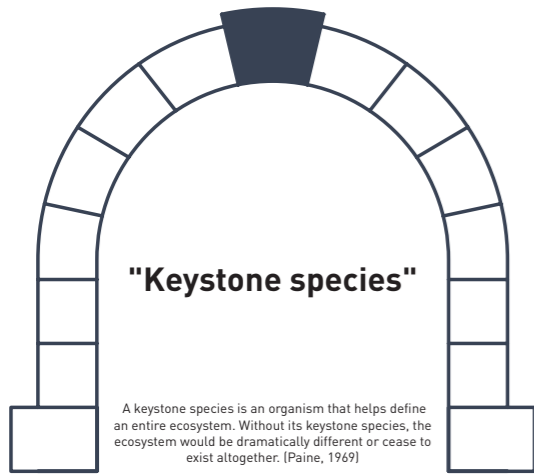
It is in the course of urbanization in the PRD region that the demand for land has

surged, resulting in the intensification of land enclosure, industrial pollution, and plundering of fishing, which has led to severe ecological pollution of offshore rivers and streams and the imminent depletion of fishery resources. People have promoted this disorderly expansion in pursuit of wealth, but how many of these fishermen at the bottom have enjoyed the dividends of economic development? The rising prices of goods and housing brought about by economic growth have made it impossible for them to go ashore and own a house in their lifetime. Even if they are lucky enough to catch the government’s relief policy, how can they survive on land without other life skills? These questions deserve our serious consideration.



Fig A,B,C,D ,E,F: Fishermen who have difficulty making ends meet and live in poor conditions. Guochen Wang. (2018) https://www.thepaper.cn/newsDetail_forward_2776414

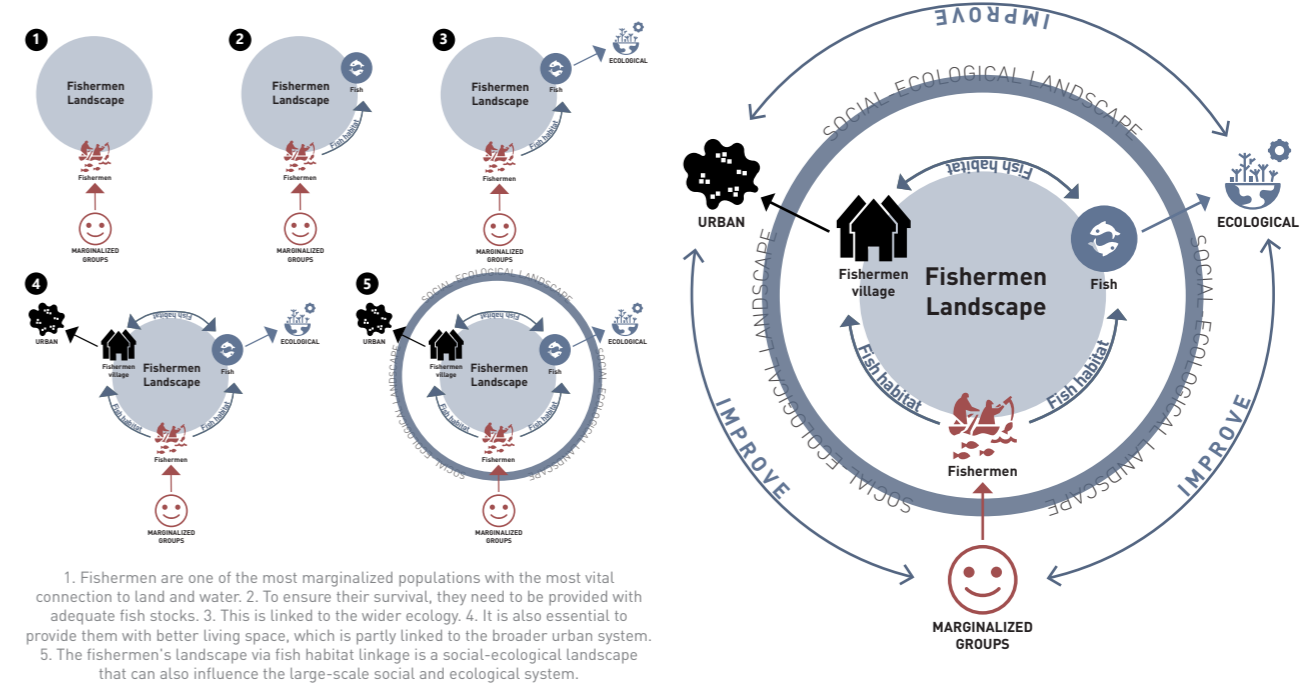
1.3 POTENTIAL



A keystone species is a species that, relative to the abundance of that species, can have a far more significant impact on the natural environment in which it is found than its abundance. (Paine, 1969) Keystone species have a vital role in maintaining the structure of ecological communities and can influence many other organisms in an ecosystem. Without keystone species, many species and even an ecosystem would disappear. Thus, the keystone species likes to have a vital arch stone in an arch, without which the arch would collapse, although this stone is under the slightest pressure. (Wikipedia contributors, 2024)

In this study, the fishermen are the "key stone species" in the Fishermen Landscape, which determines the composition of the fishermen landscape system. It determines the composition of the fishermen landscape system. To ensure the existence of fishermen, it is necessary to make sure that there are enough fish resources, either in the natural environment or provided by artificial culture. Secondly, it is also necessary to ensure that they have a suitable living environment. Fishermen are inextricably linked to these two aspects, and once the fishermen disappear, the fish resources and the associated villages will lose their necessity, and the fishermen landscape will also disappear.

The fishermen landscape as a socio-ecological inclusive landscape is very important for the sustainable development of the Pearl River Delta, linking the urban and ecological dimensions on a large scale and creating a new socio-ecological system.



1.4 RESEARCH OBJECTIVE & RESEARCH QUESTION

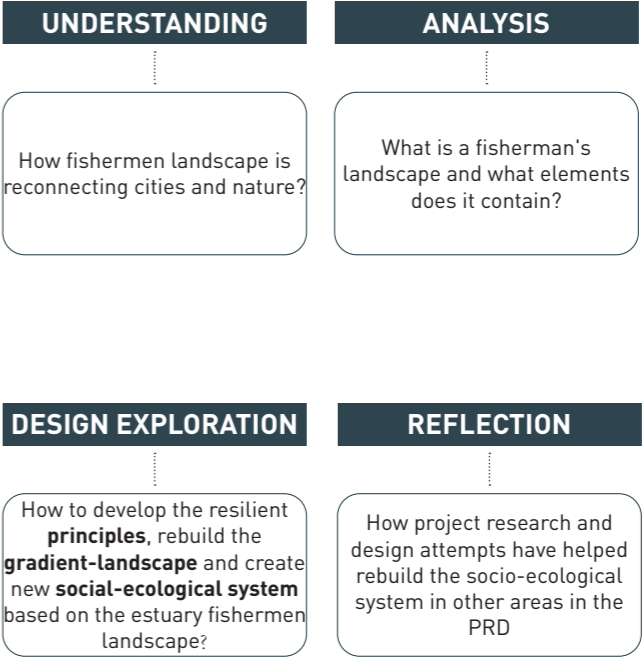
1.4.1 Research objective

RESEARCH OBJECTIVE

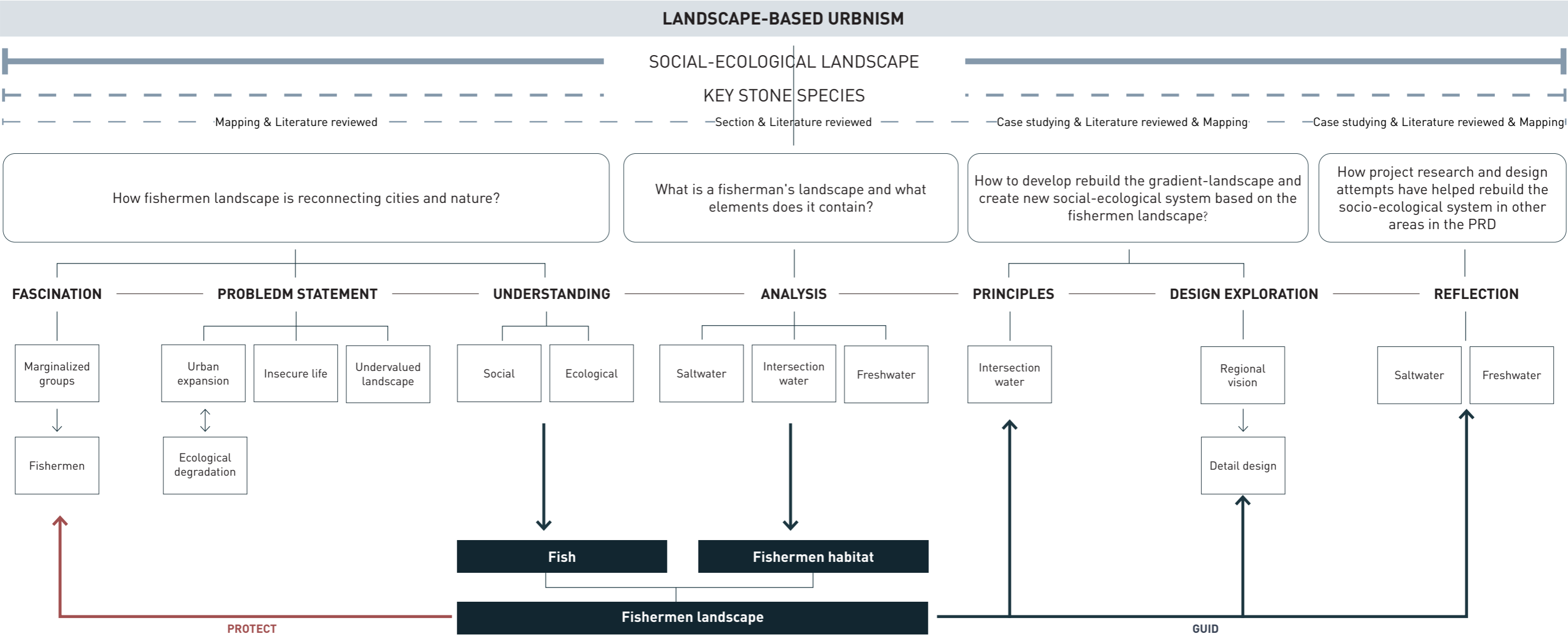
to create new **resilient design principles** and re-establish the **social-ecological system** in the Pearl River Delta to restore nature and ensure the survival of fishermen, further contributing to the sustainable development of the city.

1.4 RESEARCH OBJECTIVE & RESEARCH QUESTION

1.4.2 Research questions



1.5 REPORT STRUCTURE





Permeable dam. Building with nature in Northern Java.

Sources: Bregje van Wesenbeeck, Deltares, reporting from Demak, Indonesia
<https://indonesia.wetlands.org/blog/building-with-nature-in-northern-java-taking-it-step-by-step/>

Fishermen Landscape-From Water to Land

Develop resilient
principles to
rebuild gradient-
landscape in PRD

CHAPTER 2 METHODOLOGY

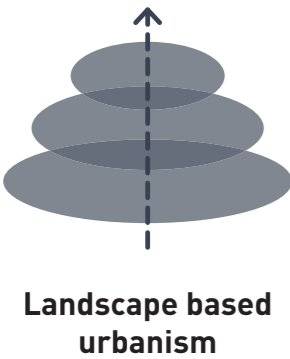
2.1 Theory Background

2.2 Theoretical Framework



2.1 THEORY BACKGROUND

2.1.1 Landscape-based urbanism



Guiding the development of urban space based on landscape is a crucial method to ensure the sustainable development of cities, also known as Landscape-based urbanism, which means:

- 1. Takes the regional landscape structure and associated processes as the foundation to guide and shape spatial developments and transformation;
- 2. Learns from landscape history and vernacular practice and makes use of the accumulation of indigenous and local knowledge (or traditional ecological knowledge);
- 3. Employs knowledge-based spatial design as an integrative, multi-scale and transdisciplinary approach and exploits the power of enabling digital technologies;
- 4. Develops resilient and adaptive spatial frameworks: robust landscape structures for the coherent development of the region (long-term strategy) and at the same time setting the scene for local projects (short-term intervention);
- 5. Creates and regenerates living systems in which (bio)diversity, cultural history, and multi-functionality lead to sociologically and ecologically inclusive and water sensitive urban landscapes.

(Nijhuis, 2023)

2.1 THEORY BACKGROUND

2.1.1 Landscape-based urbanism

Landscape-based urbanization guides both strategy formation and design exploration:

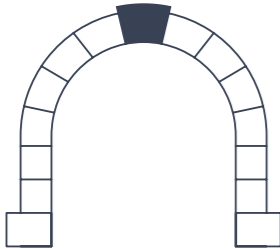
- 1. Understanding: Natural & Urban system
- 2. Identifying: Key Challenges & Opportunities
- 3. Visioning: Long-term Regional Perspective
- 4. Backcasting: Defining Design Strategies & Principles
- 5. Strategies & Principles
- 6. Exploring: Design Explorations Spatial Solutions
- 7. Developing: Short-term Strategic Projects & Action

(Nijhuis, 2023)



2.1 THEORY BACKGROUND

2.1.2 Key stone species



Key stone species

A keystone species is a species that, relative to the abundance of that species, can have a far more significant impact on the natural environment in which it is found than its abundance. (Paine, 1969) Keystone species have a vital role in maintaining the structure of ecological communities and can influence many other organisms in an ecosystem. Without keystone species, many species and even an ecosystem would disappear. Thus, the keystone species likes to have a vital arch stone in an arch, without which the arch would collapse, although this stone is under the slightest pressure. (Wikipedia contributors, 2024)

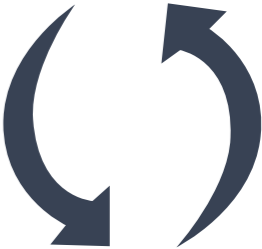
For the unique Fishermen landscape in the Pearl River Delta, fishermen are the keystone species in the ecosystem, without which the village system, fish habitats, and fishpond culture system associated with it would be significantly affected or even cease to exist.

Landscapes are quintessential social-ecological systems. Over the past 12,000 years, nearly three-quarters of the land has been affected by human activities. (Ellis, et al, 2021) Human activities have been influencing natural development patterns, both on temporal and spatial scales, and most of the landscapes we now see are the product of both humans and nature. (Pearson & Gorman, 2023).

However, in the past, due to a lack of understanding of the synergistic development of humans and nature, the world is now faced with a severe problem of natural degradation. In the past, natural resources were often thought of as infinitely renewable, a bottomless reservoir. Humans took for granted plants and animals as resources to be allocated at will. (Barrière 2019) However, this behavior has led to severe natural degradation, and the current state of the world's depleted fisheries is a prime example of ecological degradation due to overexploitation of natural resources. (FAO, 2014)

2.1 THEORY BACKGROUND

2.1.3 Social-ecological landscape



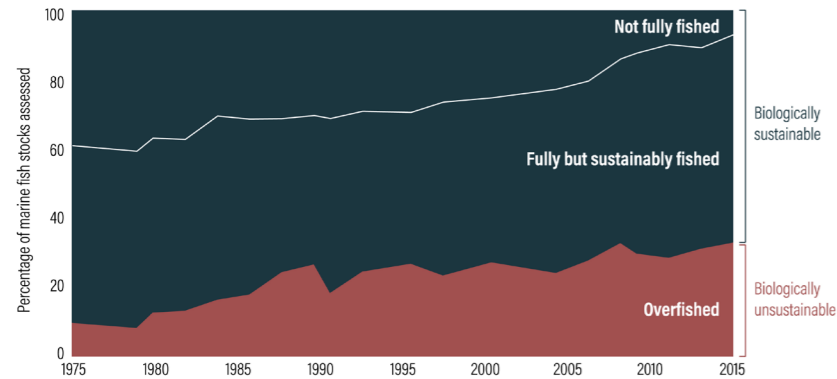
**Socio-ecological
inclusive landscape**

These status quo situations have forced human beings to reconceptualize the impact of human beings on ecosystems and rethink the way human beings develop. In recent years, people have begun to explore the coexistence of human society and natural ecosystems. (Barrière 2019) The viability of social and ecological systems is an interdisciplinary study, and landscape as a typical social-ecological system has an important research value. Based on the study of the history of land use around the globe, empowering indigenous and local communities in environmental management is an effective way to protect global ecosystems. (Ellis, et al, 2021)

In the case of the fishermen landscape in the Pearl River Delta (PRD), the protection of indigenous fishermen is also about protecting the fish habitats associated with them, thereby protecting the ecosystems of the PRD and mitigating the natural degradation of the region.

2.1 THEORY BACKGROUND

2.1.4 Coastal Habitat Conservation



The proportion of overfished stocks has increased over the last four decades.
Sources: FAO 2018, <https://research.wri.org/wrr-food/course/increase-fish-supply-synthesis>

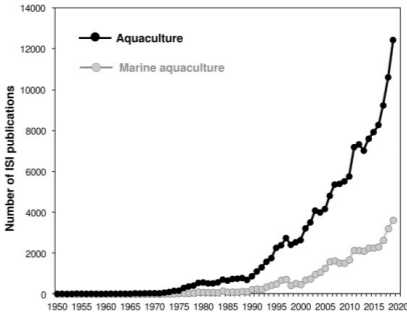
Human activities such as overexploitation, urban pollution, and coastal destruction are threatening marine ecosystems. Coastal areas provide about 70% of the world's ecosystem services, and more than 25% of these have been altered by human activities. Nearly 20% of the world's artificial coasts have altered the original intertidal ecological zones, and these areas face serious ecological degradation. In order to ensure the sustainable and smooth development of human society, the conservation of coastline habitats has become a research priority for many scientists in recent years. This is especially true for areas such as coastal lagoons, estuaries, and bays, where ecosystem richness, diversity, and productivity are

high. The implementation of ecological engineering interventions in these areas is an effective means of integrating cities with nature and improving the livelihoods of coastal residents and local ecosystems. (Espinosa & Bazairi, 2023)

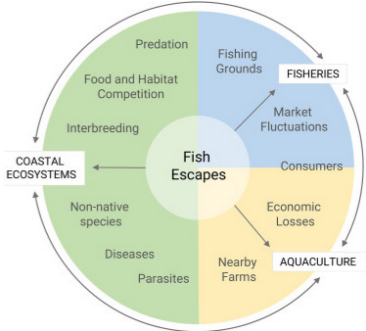
In particular, more attention needs to be paid to areas with large-scale aquaculture. The mariculture sector in these areas faces considerable challenges, particularly about conservation methods. Currently, relatively rational and effective management approaches include integrated multi-trophic aquaculture (IMTA), recirculating aquaculture systems (RAS), and the use of new resources (e.g. amphibious crustaceans) to reduce eutrophication problems associated with aquaculture. (Guerra-García, et al., 2023)

2.1 THEORY BACKGROUND

2.1.4 Coastal Habitat Conservation



Number of ISI scientific publications dealing with aquaculture and mariculture according to web of science, January 21, 2021
Sources: Guerra-García, et al., <https://www.sciencedirect.com/science/article/pii/B9780323856133000037#f0015>



Environmental and socio-economic impacts of fish escapes from aquaculture
Sources: Guerra-García, et al., <https://www.sciencedirect.com/science/article/pii/B9780323856133000037#f0015>

2.2 THEORETICAL FRAMEWORK

Firstly, landscape-based urbanism as a guiding theory is the framework foundation of the whole research project, running through all the parts, from understanding and analysis to design exploration. Since the contradiction between urban economic development and natural degradation is becoming more and more apparent in PRD, the project tries to think about how to protect the production and life of the marginalized people in PRD and, at the same time, mitigate the natural degradation from a landscape perspective.

Then, based on the theory of socio-ecological inclusive landscape, the integration of social and natural characteristics of landscape gives it the ability to influence regional urban and ecological systems. At the same time, the theory also emphasizes the importance of empowering local indigenous people and their communities to protect local ecosystems. Therefore, the project focuses on the fishermen, a unique group of marginalized people in PRD. Their production and living history is a microcosm of human adaptation and transformation of the PRD's water system.

Moreover, the keystone species theory reinforces that fishermen are essential for PRD's social and ecological system. The fishermen are the keystone species of the fishermen's landscape. In order to ensure the livelihood of fishermen, it is necessary to provide them with the necessary resources to protect their livelihoods, such as a good quality village environment and enough fish resources. In this framework, it is vital to study the fish habitat. Therefore,

when analyzing the fishermen's landscape, the project follows the fish habitat types and classifies the fishermen's landscape into three categories: brackish water, freshwater, and salt water.

In the design exploration part, the project chooses the fishermen's landscape in salt and freshwater convergence as the testing type. The project first focuses on analyzing the habitats of fishermen and fish. Then, according to the above framework, principles are developed according to the spatial types of the landscape they contain. The principle creates a new fishermen's landscape in the coastline and river canal through permeable dams and branch dikes. The new fishermen's landscape will help reconnect the site's social-ecological system and promote the site's sustainable development.

The design exploration part of the project, from small to large, further demonstrates that fishermen, as keystone species, create a unique fishermen's landscape, which links the social and ecological systems by the fish habitat. Finally, as a socio-ecological inclusive landscape, the fishermen's landscape could create new urban and ecological systems on a regional scale.

LANDSCAPE-BASED URBINISM

Guiding the development of urban space **based on landscape** is a crucial method to ensure the sustainable development of cities. [Nijhuis, 2023]

SOCIAL-ECOLOGICAL LANDSCAPE

Empowering indigenous and local communities in environmental management is an effective way to protect global ecosystems. [Ellis, et al, 2021]

KEY STONE SPECIES

A keystone species is a species that, can have a far more significant impact on the natural environment in which it is found than its abundance. [Paine, 1969]

FISH HABITAT RESTORATION

The implementation of ecological engineering interventions is an effective means of integrating cities with nature. [Espinosa & Bazairi, 2023]

PROBLEM STATEMENT

Mapping & Literature reviewed

UNDERSTANDING

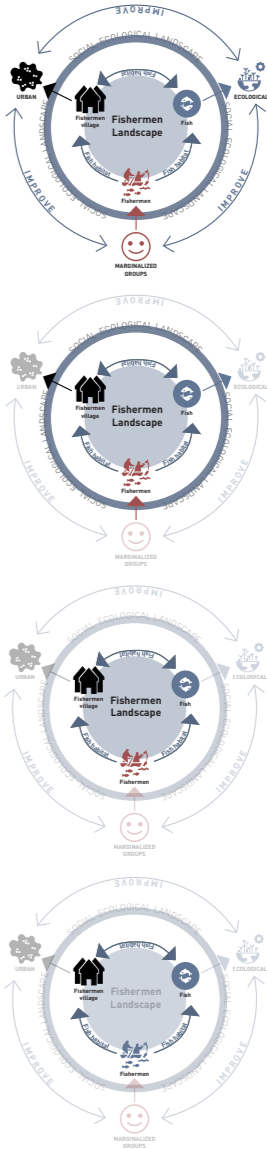
Section & Literature reviewed

ANALYSIS

Case studying & Literature reviewed & Mapping & Section

PRINCIPLES

Case studying & Literature reviewed





The fish pond in Tai Sang Wai, Yuen Long dried up, and mud holes of different sizes appeared.

Sources: Photo by netizens Peter Yung and Simon Yeun
https://hk.on.cc/hk/bkn/cnt/news/20180603/bkn-20180603163319425-0603_00822_001.html

Fishermen Landscape-From Water to Land

Develop resilient
 principles to
 rebuild gradient-
 landscape in PRD

CHAPTER 3 UNDERSTANDING & ANALYSIS

3.1 History Background

3.2 Understanding

3.3 Three Types Fishermen Landscape

3.4 Conclusion

3.1 HISTORY BACKGROUND

3.1.1 From water to land

As a typical group of fishermen in the Pearl River Delta, the boat-dwelling people can represent the historical changes of the fishermen in the PRD.

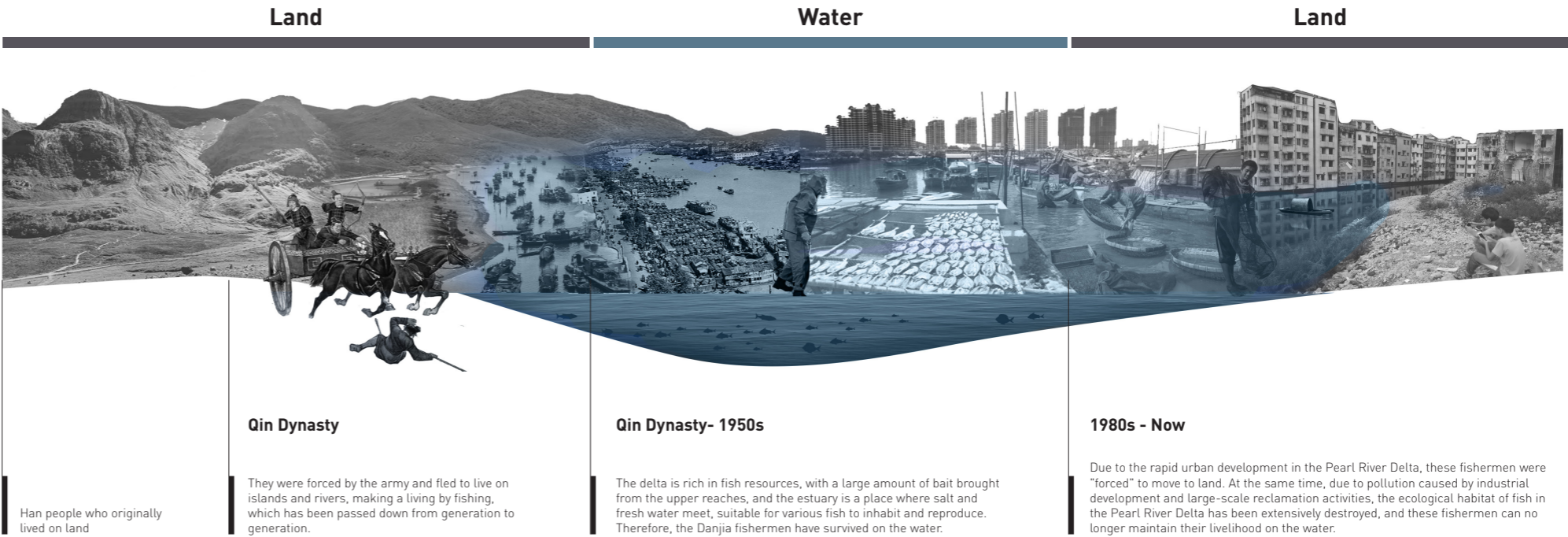
Initially, they lived on land, but during the Qin Dynasty, due to wars and regime changes, some exiled people were forced to migrate to live on the water. Fortunately, the rich water system and diverse natural environment of the Pearl River Delta brought about abundant fish resources—this part of the exiled people who went to the water survived by fishing.

After the Ming and Qing Dynasties, the boat-dwelling people had to consider transformation due to a period of sea ban policy along the southeastern coast, coupled with taxation on fisheries and bullying by the gentry. Part of them engaged in commerce, and part of them turned to aquaculture.

In recent decades, the rapid urbanization

of the Pearl River Delta has further oppressed the fishermen’s living space. The unlimited expansion of cities and the pollution of water bodies brought about by industrial development have made it difficult for fishermen to maintain their livelihood. Today, only a few boat-dwelling fishermen can be found in individual areas.

In fact, boat-dwelling fishermen epitomize the PRD’s changing relationship between humans and nature. The difficult survival situation of the boat-dwelling fishermen is now the same as that of many marginalized people in the PRD, who try to come to the big cities to gain more opportunities. However, their meager income and poor living space make them more vulnerable to flooding, pollution, and disease.



Histroy changes of Danjia family
Drawn by author

3.1 HISTORY BACKGROUND

3.1.2 Social-ecological landscape

Studying where they now gather can lead to a better understanding of the relationship between fishermen and the natural environment. At one time, boat-dwelling people were distributed all along the coasts of Southeast Asia. However, nowadays, they are found only in a few areas. One such settlement in the Pearl River Delta is Datang Town. Datang Town is located in the middle reaches of the Beijiang River in the Pearl River Delta water system. The water quality is good, and the water surface is relatively calm. However, now Datang Town is also facing environmental degradation problems that threaten the livelihood of boat-dwelling families. Years of river deepening have changed the surrounding soil and water environment, and the problem of soil erosion in the neighborhood has become increasingly severe. Frequent passage of cargo ships and human activities of nearby villages leasing land to build factories are deepening the pollution of the Beijiang River.

Data shows that the waters around Datang Town can still maintain relatively good water quality due to the existence of the nearby "Sixianjiao". Sixianjiao is a natural waterway that connects the Xijiang and Beijiang rivers. The existence of this waterway allows the two rivers to exchange water naturally, ensuring the quality of the water in the area. The waterway also serves as a passageway for many fish migrations. In addition, because the waterway affects the flow dynamics of the two rivers, the Beijiang section on the north side of the waterway is relatively calm, allowing fish to spawn and live here. These conditions ensure fish survival in this area and allow boat-dwelling families to congregate here.

This part of the study demonstrates the importance of fish habitat to the fishermen landscape, where nature and humans are connected through fish habitat to form a socio-ecological landscape.

Fishermen



In the past, fishermen were found along the coasts of China and in Vietnam, where the **abundance of fish** was able to support their livelihoods.

Fish habitat



Due to urban sprawl, water pollution and other problems that have **reduced fish production**, **one of the fishermen who have always lived on the water** only exist in some areas nowadays.

Nature



Take the fishing village of Datang as an example, due to the existence of natural waterways, the water quality is good and the water surface is calm, which is suitable for **fish spawning and survival**, so the fishermen can live here.

Location site of Danjia family
Drawn by author

3.2 UNDERSTANDING

3.2.1 Gradient landscape & New social-ecological system

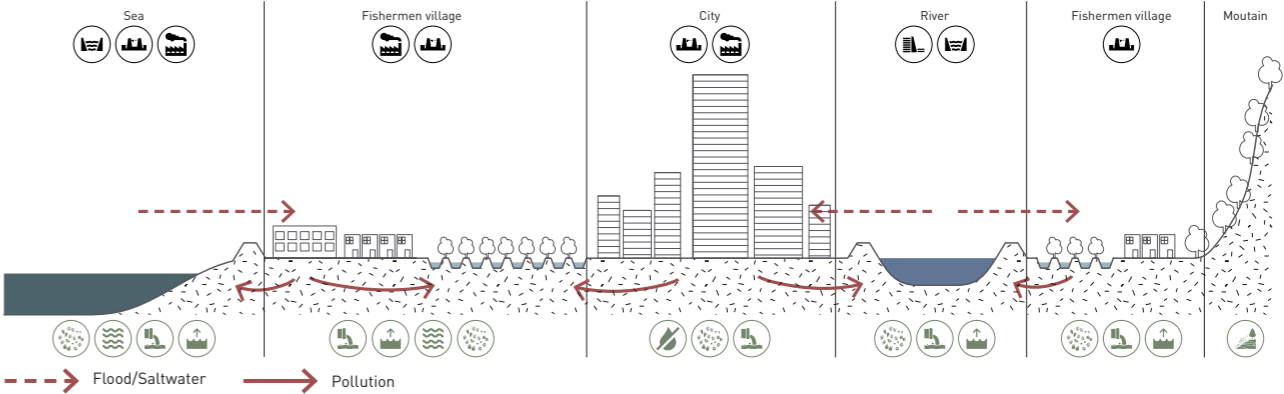
Urban expansion in the Pearl River Delta has destroyed the original gradient landscape; land reclamation has been carried out continuously in order to obtain more land for the construction of more factories; and river channels have been modified in order to promote economic development and increase the carrying capacity of navigation. These activities have destroyed the original natural transition, resulting in insufficient transition zones between nature and the city. The lack of adequate buffer zones between cities and nature has exacerbated the problem of regional natural degradation. Floodwaters thus backed up more violently into the city, causing severe economic damage.

Sewage from cities and factories also lacks a transition zone for purification and flows directly into the natural environment, threatening the survival of all kinds of plants and animals.

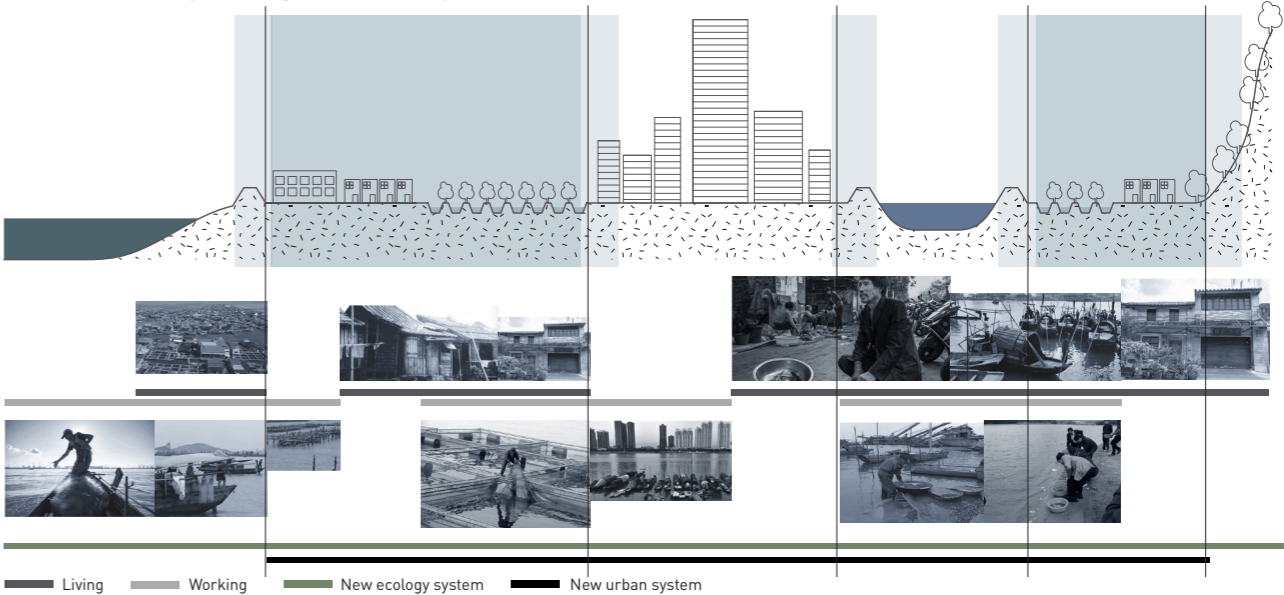
The fishing village is in the area of the original gradient landscape, between nature and the city. Through the study, it is found that the fishermen's production and life run through the natural and urban areas. They live near the water and invent different living spaces according to different water environments, such as boathouses, fish raft houses, and water rafts. Besides going out to catch fish, they also try to build up farmland and fish ponds according

to different soil and terrain conditions. In addition to fishing, they also try to build farmland and fish ponds according to different soil and terrain conditions. In addition, they also enter the city to process and sell fish products. Combined with the understanding of fishermen landscape in the previous section, fishermen landscape includes fishermen, village, and fishes, which are connected through fish habitat to form a unique socio-ecological inclusive landscape. Therefore, the fishermen landscape has the ability to link the natural and urban systems, thus forming a new ecology and urban system for the sustainable development of the PRD region.

Lack of gradient landscape

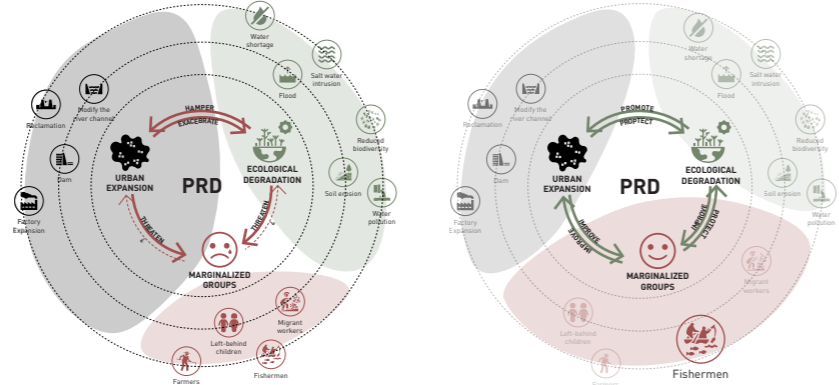


Fishermen landscape - New gradient landscape



Left: Current development mode
Drawn by author

Right: More sustainable development mode
Drawn by author



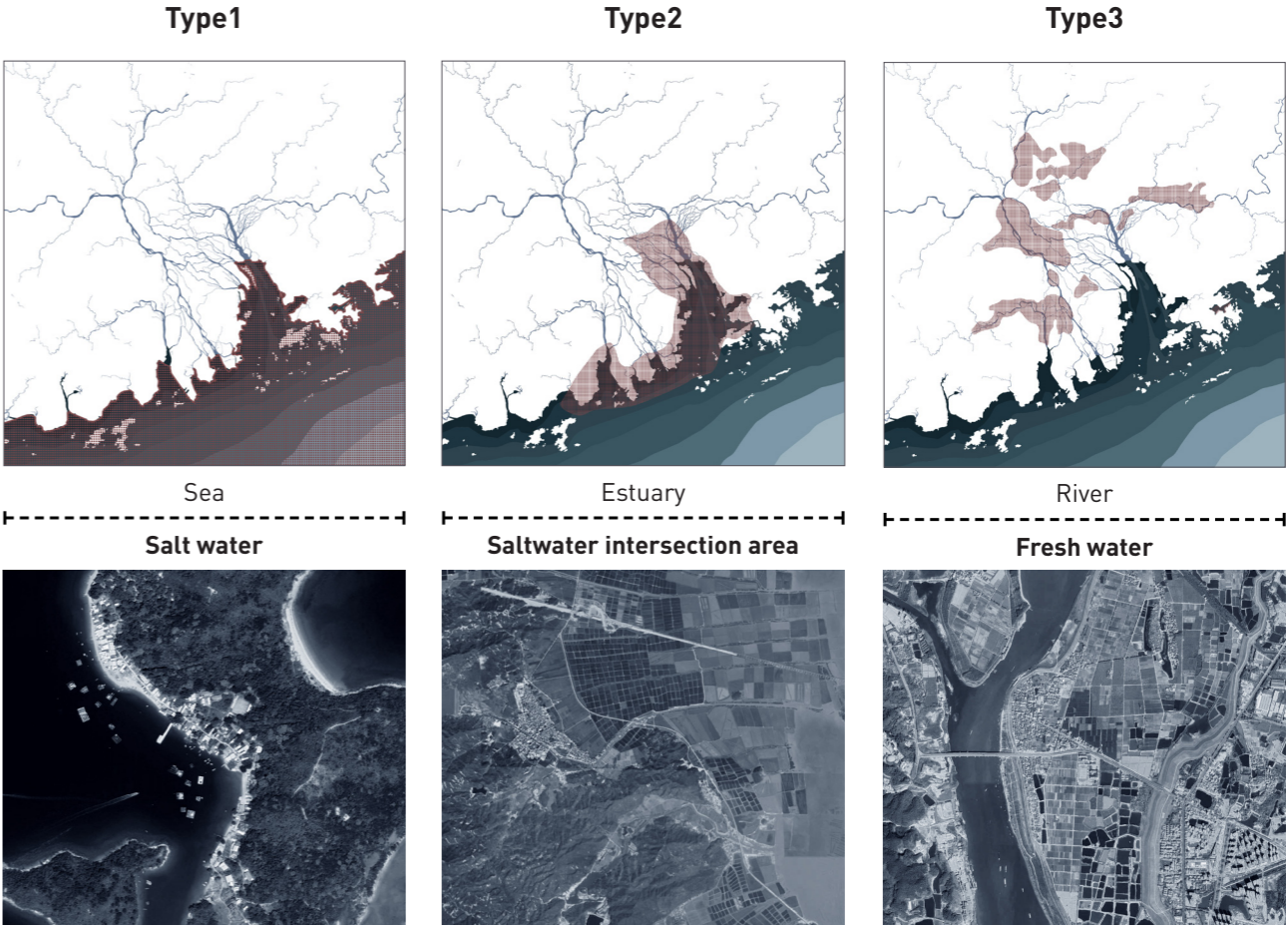
3.3 THREE TYPES OF FISHERMEN LANDSCAPE

3.3.1 Introduction

Based on the previous discussion, fish habitat is an important part of the fishermen landscape, which connects fishermen, villages, and fish, therefore, when studying the types of fishermen landscape, the project categorizes the fishermen landscape according to the types of fish habitat. The fish habitat in the Pearl River Delta (PRD) is closely related to the type of water body. As an estuarine delta, the water bodies in the PRD include three types, which are freshwater, saltwater, and brackish water. Therefore, the project also categorized the fishermen landscape into the three types mentioned above, i.e. fresh water type (river), saltwater and freshwater intersection type (estuary), and saltwater type (sea).

From the satellite map on the right, it can be seen that the fishermen villages corresponding to the three types show three completely different spatial patterns of landscape. Sea water type villages are mainly in the form of strips, which are distributed at the edge of the island, and there are many mariculture nets and fish rafts in the water area; ESTUARY type villages are larger in scale compared to seawater type villages, and there is an obvious transition pattern from land to water. This transition pattern is characterized by villages, farmland, and fish ponds, and the closer to the water, the larger the scale of the fish ponds. freshwater type villages have a more pronounced farmland texture, which is related to the typical mulberry ponds in the Pearl River Delta, and the villages are usually located behind the dykes.

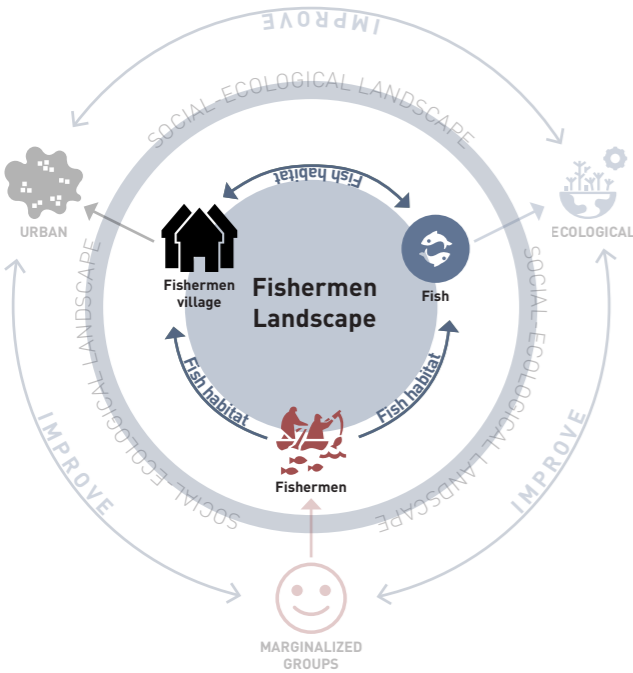
For the three types of villages, the project subsequently selected 12 typical villages for each type to study and generalize the landscape space.



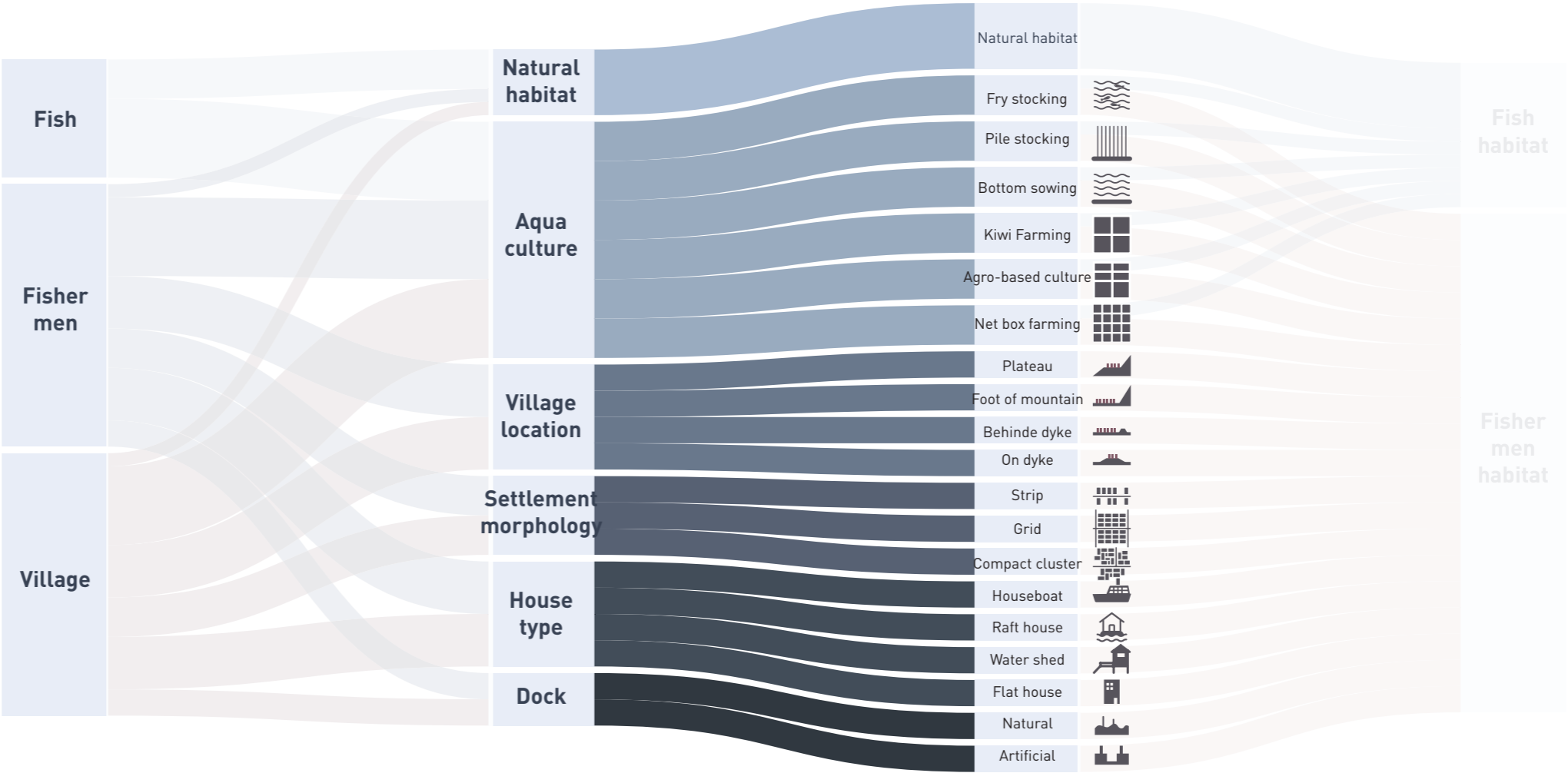
Typical fishermen village
Source: Google earth

3.3 THREE TYPES OF FISHERMEN LANDSCAPE

3.3.1 Introduction

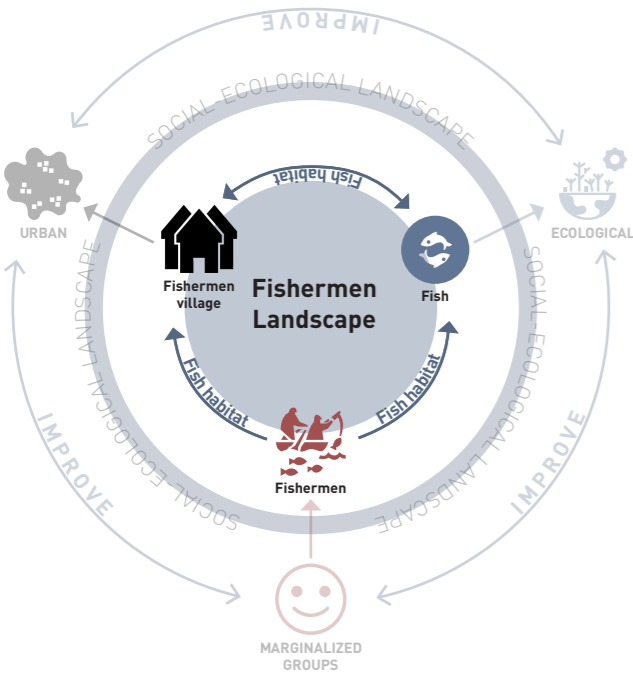


Starting from the three elements of fish, fishermen, and village, we identified six categories of elements by reviewing relevant data: natural habitat, aquaculture, village location, settlement morphology, house type, and dock. By studying a certain number of villages, we have exemplified and created icons for each of the following six categories, and we will organize and summarize them in the following study.

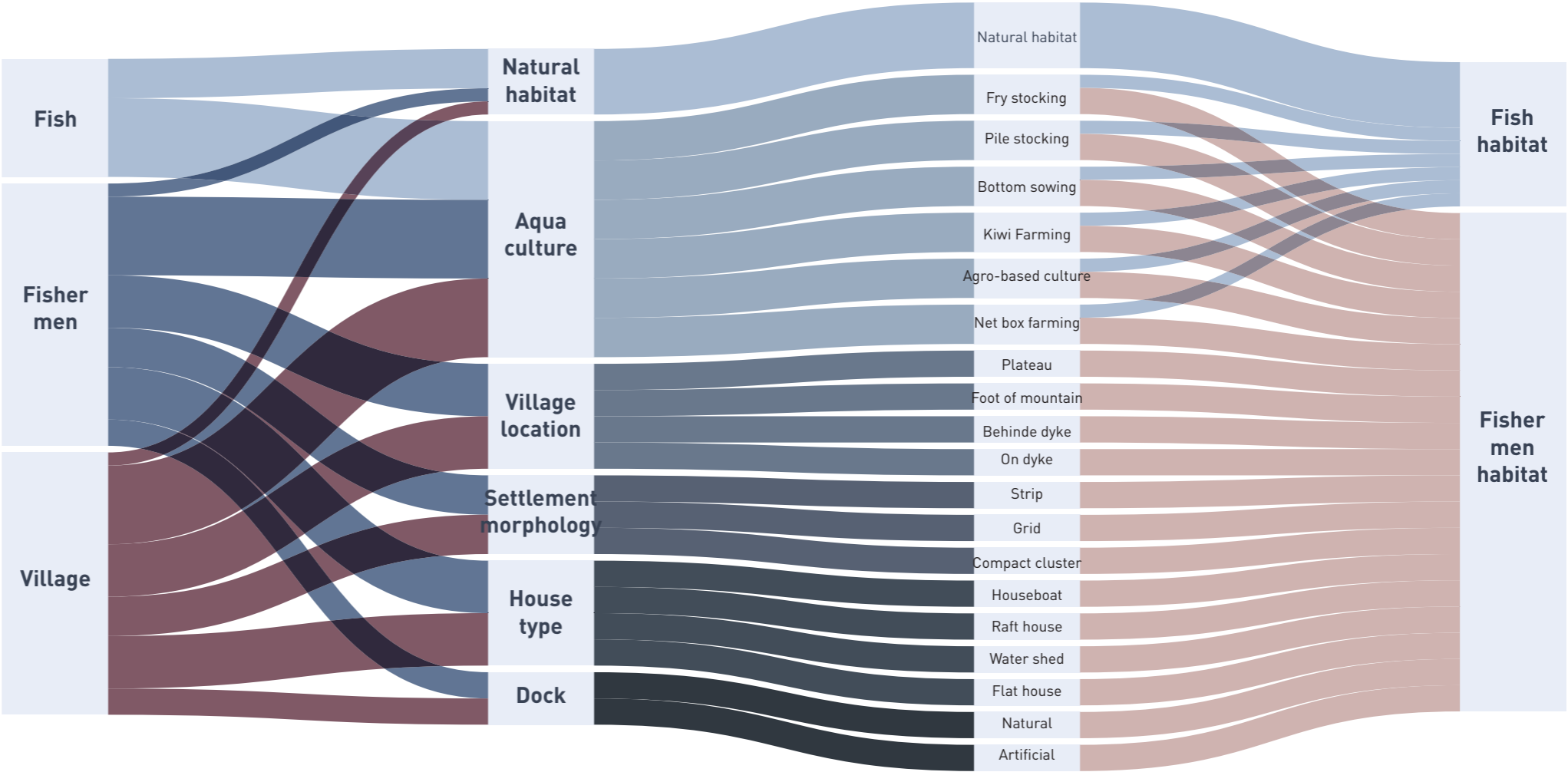


3.3 THREE TYPES OF FISHERMEN LANDSCAPE

3.3.1 Introduction



In addition to the listing of elements, it is even more important to understand the connections between these elements. From the diagram on the left, it can be seen that there is an intersection between fish, fishermen, and village and the six categories of elements, which can also be summarized as fish habitat and fishermen's habitat. this understanding will be guiding for the subsequent development of design principles. This understanding is a guide for the subsequent development of design principles.



3.3 THREE TYPES OF FISHERMEN LANDSCAPE

3.3.2 Saltwater type

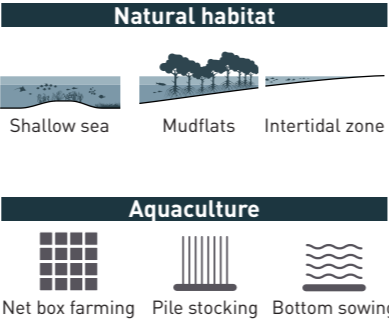
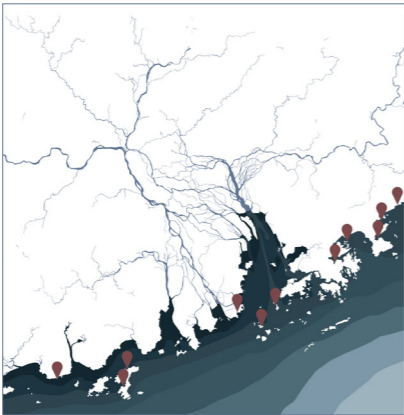
The twelve villages are located at Yanzhou Island, Dongsheng Village, Aotouwei, Beiweichang in Shenzhen, Au Pui Tong, Plover Cove, Wanshan, Dong'ao Island, Macao, San Chau Wan, Sha Tsui and Shatiban. Similar villages are located throughout the Pearl River Delta and along the coast of Guangdong Province, mostly at the foot of the mountains in natural or artificial sheltered harbors.

The natural habitat in the coastal marine environment is mainly shallow sea water, mudflats, and intertidal zones. The primary aquaculture practices of fishermen are net box farming, pile stocking, and bottom sowing.

The scale of this type of fishing village is more varied, as some small fishing villages have been transformed into artificial wharves after urbanization and expansion, and the villages have been re-planned into concentrated clusters. Where large-scale expansion is impossible due to land constraints, the villages retained the original strip-like form.

Left: twelve typical saltwater type villages. Drawn by author

Right: Conclusion of natural habitat and aquaculture in saltwater area. Drawn by author



Typical village	Village location	Settlement morphology	House type	Dock	Typical village	Village location	Settlement morphology	House type	Dock

3.3 THREE TYPES OF FISHERMEN LANDSCAPE

3.3.2 Saltwater type

The natural habitats in the coastal seawater environment are mainly shallow seawater, mudflats, and intertidal zones. Local fishermen have invented specific aquaculture methods for different seawater depths and original natural environments. In the mudflats zone, the fishermen invented floating rows under which shallow water nets raise fish. The intertidal zone is mainly for the culture of shellfish.

At the same time, fishermen have also invented different living environments. In the seawater zone, fishermen choose boat houses and pontoon rafts, while water rafts dominate in the near-land area, gradually transitioning to flat houses villages.

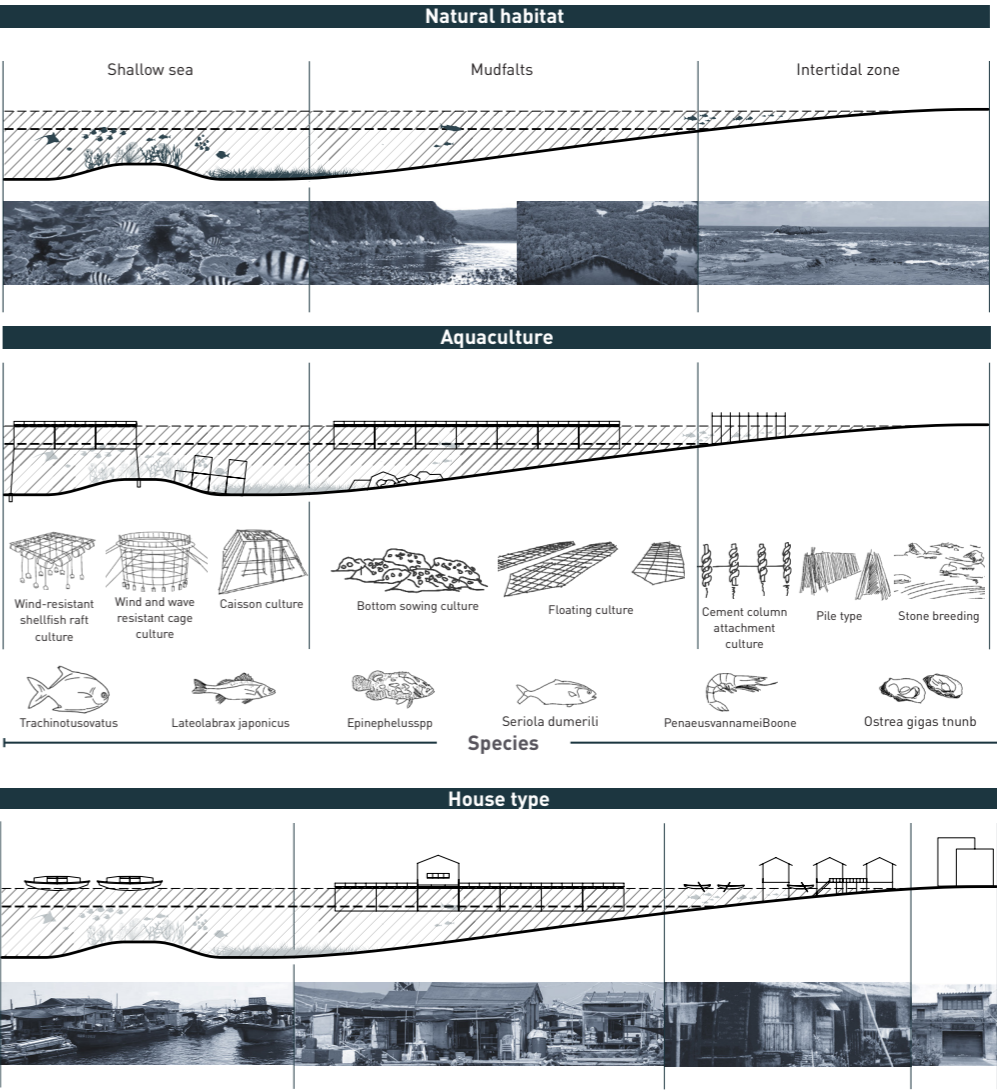
In summary, saltwater type villages can be summarized into two categories, as shown in the figure below. First type of villages are located at the foot of mountains; striped along the coastline; both man-made and natural jetties are present; shacks can occur near natural jetties; floating devices are present in natural harbors or behind man-made breakwaters. Second type of villages will be striped along contours; some villages on flat land in high-density clusters; predominantly natural jetties; more shacks.

Left: vilage pattern 1-Villages are located at the foot of mountains; striped along the coastline; both man-made and natural jetties are present; shacks can occur near natural jetties; floating devices are present in natural harbors or behind man-made breakwaters.

Drawn by author

Right: village pattern 2-Villages will be striped along contours; some villages on flat land in high-density clusters; predominantly natural jetties; more shacks.

Drawn by author



Natural habitat, aquaculture and house type conclusion. Drawn by author

3.3 THREE TYPES OF FISHERMEN LANDSCAPE

3.3.3 Intersection water type

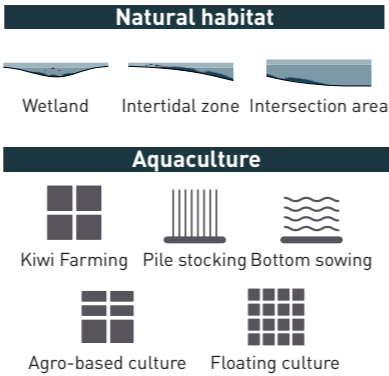
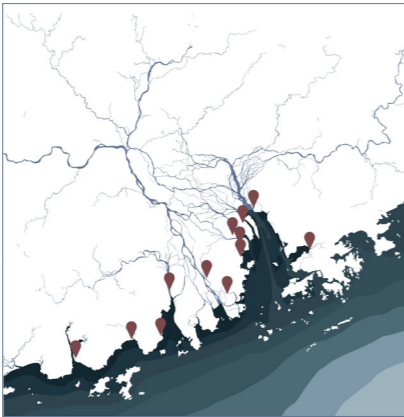
Twelve typical villages are located in Cheung Sha Wan, Fan Wo Kong, Nam Mian Village, Wan Ha, Chung Hau, Shih Ha, Kai Tau Kok, Shen Wan Town, Kwan Luen, Kong Mun, Tsing Lung, and Kwong Hoi Wan.

The natural habitat of the estuarine salt and freshwater interface includes freshwater wetlands, intertidal areas, and intersection water areas. Central aquatic practices are kiwi farming, pile stocking, bottom sowing, agro-based culture, and floating culture.

This type of village includes two main types: one is dominated by fishponds extending from land to water, with large villages at land boundaries and small-scale villages along waterways. The other category is dominated by agricultural land, most of which was created by the enclosure of the sea.

Left: twelve typical estuary type villages. Drawn by author

Right: Conclusion of natural habitat and aquaculture in intersection water area. Drawn by author



Typical village	Village location	Settlement morphology	House type	Dock	Typical village	Village location	Settlement morphology	House type	Dock

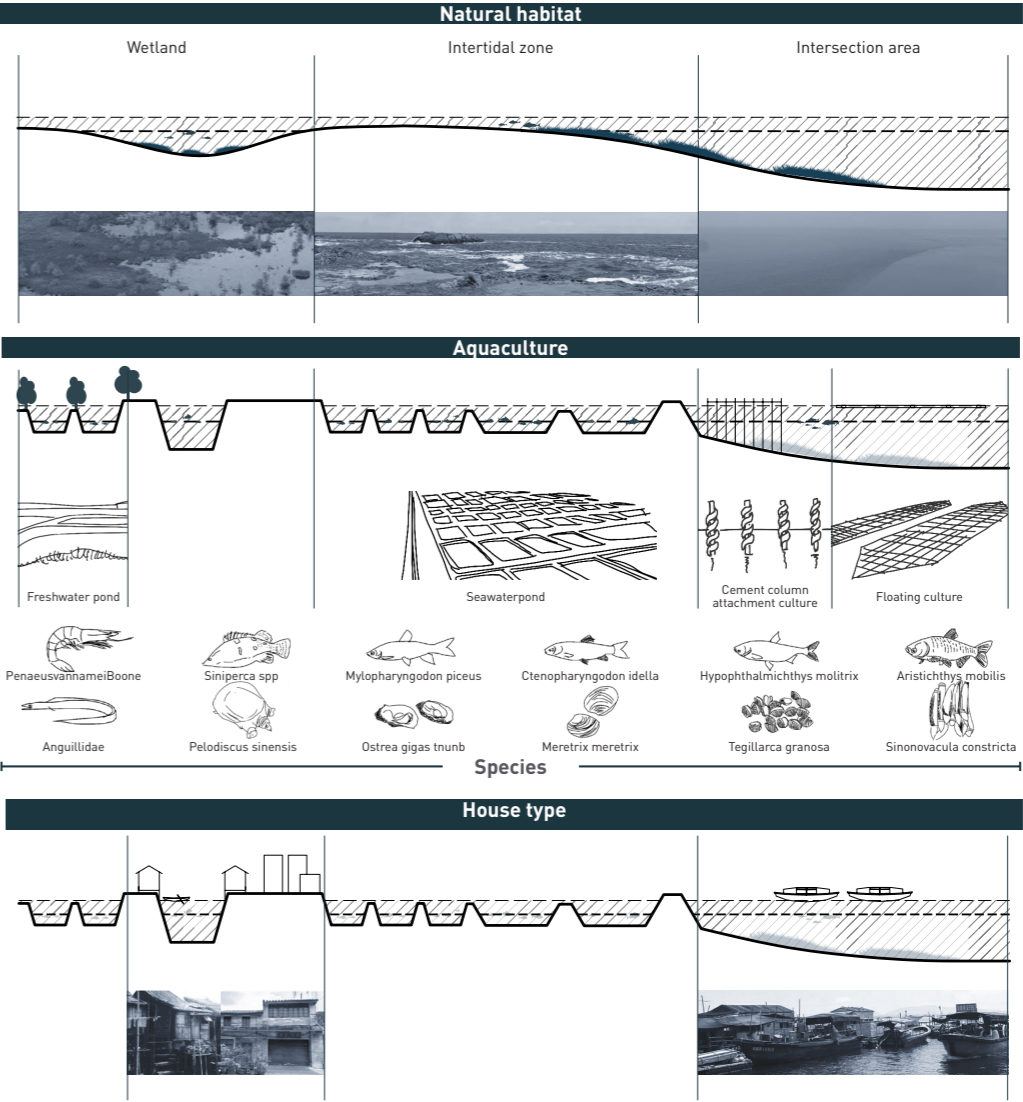
3.3 THREE TYPES OF FISHERMEN LANDSCAPE

3.3.3 Intersection water type

The natural habitat at the salt and freshwater interface of the estuary consists of the freshwater wetland, the intertidal area, and an intersection water area. Fishermen in the region corresponding to the wetland mainly engage in freshwater aquaculture, which gradually transitions to brackish water fishpond aquaculture and marine aquaculture. The estuary is a good area for shellfish, especially oysters, due to the intersection of fresh and salt water. The villages are mainly water rafts and flat houses.

This type of village can also be summarized into two categories, as shown below. One is the transition from land to water, which consists of villages, farmland, and large fishponds. The scale of the fishponds becomes more extensive as they get closer to the water. There are large oyster rafts outside the fishponds. Dense clusters dominate the villages in the land portion. There are strips of villages scattered along the river, and these villages

have a natural form of pier on the side of the buildings near the river to facilitate the fishermen's labor. The large-scale enclosure of the sea creates the second type. Based on the original topography, people built dykes on top of the sediments to enclose large areas of agricultural land. The villages are distributed along the dykes and waterways in a strip-like pattern.



3.3 THREE TYPES OF FISHERMEN LANDSCAPE

3.3.4 Freshwater type

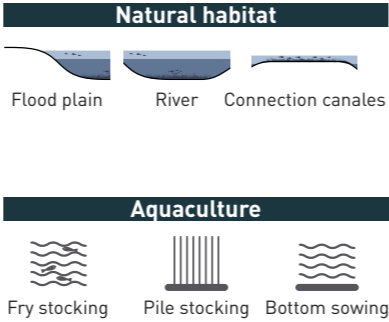
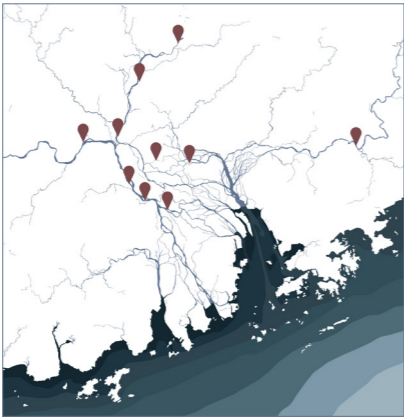
Freshwater-type villages are located in the middle and upper reaches of the Pearl River system. The twelve villages are located in Baimiao, Sanshui, Baeni, Dongping, Pingsha, Sanshan, Anfu, Jintouhu, Shijian, Lubao and Datang.

The natural habitat of the Freshwater area includes floodplains, rivers, and connection canales, and the leading aquatic practices are fry stocking, pile stocking, and bottom sowing.

The fishing villages in this area are closely connected to the dyke, with most of the villages immediately behind the dyke and a few extending beyond the dyke to the sedimentary barge. This is due to the fact that the fishermen in this part of the village need to travel through the river to outside waters for their fishing activities. The morphology of fishponds in this type of fishing village is significantly different from the previous two types, with fishponds more closely related to agricultural land, related to the unique mulberry fishpond system in the PRD.

Left: twelve typical freshwater type villages. Drawn by author

Right: Conclusion of natural habitat and aquaculture in freshwater area. Drawn by author



Typical village	Village location	Settlement morphology	House type	Dock	Typical village	Village location	Settlement morphology	House type	Dock

3.3 THREE TYPES OF FISHERMEN LANDSCAPE

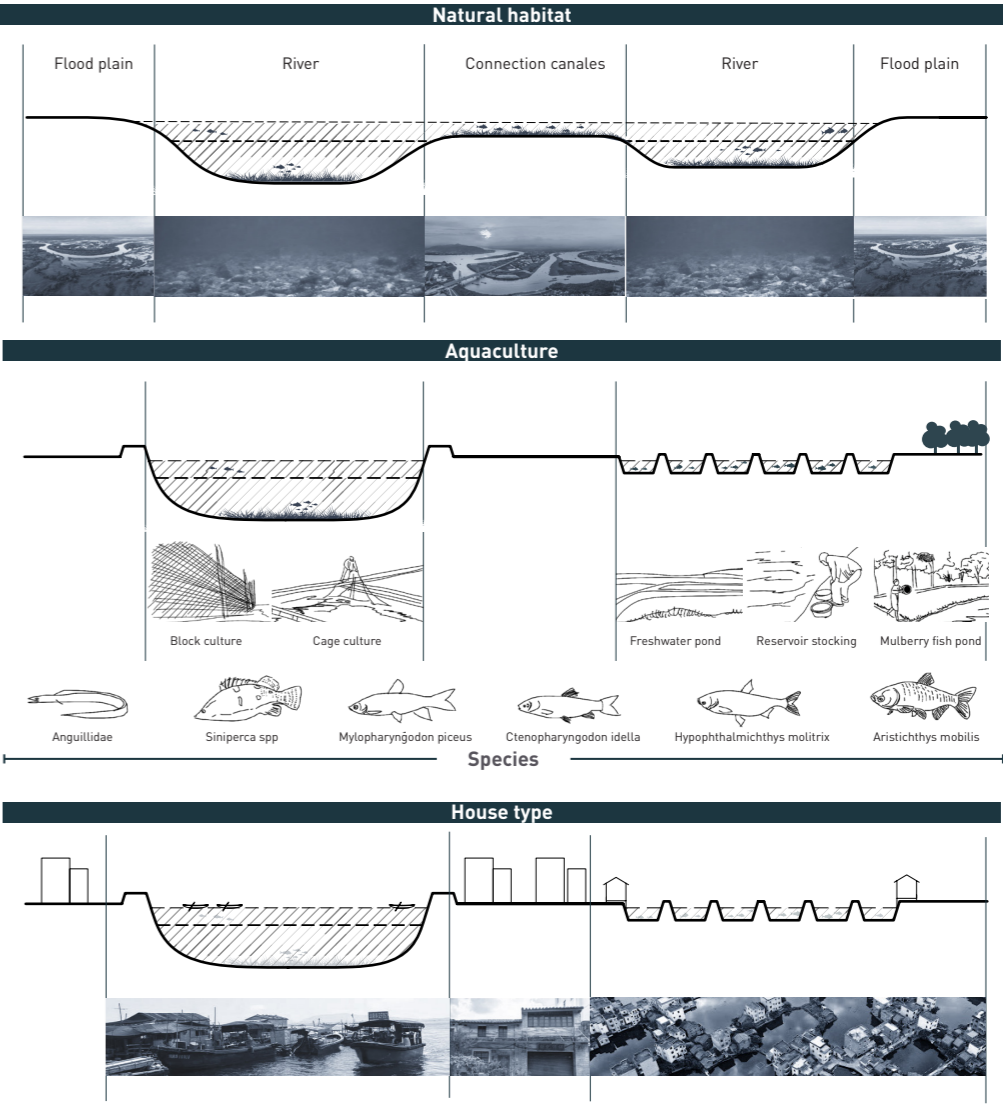
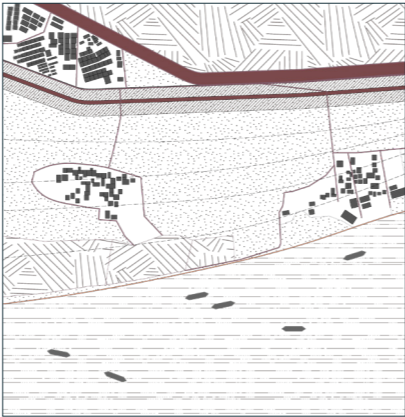
3.3.4 Freshwater type

The natural habitat of the freshwater area includes flood plains, rivers, and connection canales, and the abundant freshwater resources have led to the rapid development of freshwater fishponds in these areas, with sangai fishponds being a typical type of culture. Fishermen also use the river for block culture and cage culture, and there are many reservoirs built to ensure water for agriculture, in which fishermen also engage in reservoir stocking. The villages in this part of the country are primarily flat houses of a clustered type, with a few buildings close to the ponds in the form of watercraft. Freshwater-type villages are summarized as follows.

Freshwater-type villages are summarized in the following two types. One type exists close to the dyke and is in the form of clusters, where farmland is interspersed with fishponds. Some villages will be located at the junction of fishponds, making it easier for fishermen to manage many fishponds. The other type of village is based on the development of the first type of village. It extends beyond the dyke, where the fishermen have a closer relationship with the river and are more dependent on the river for aquaculture.

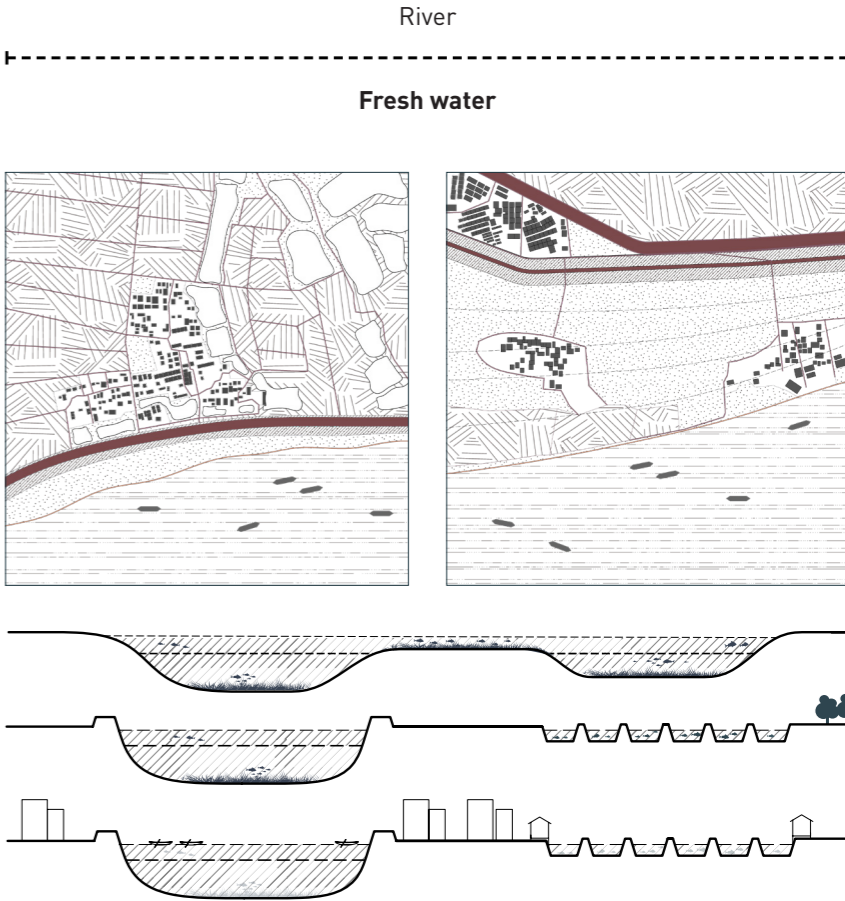
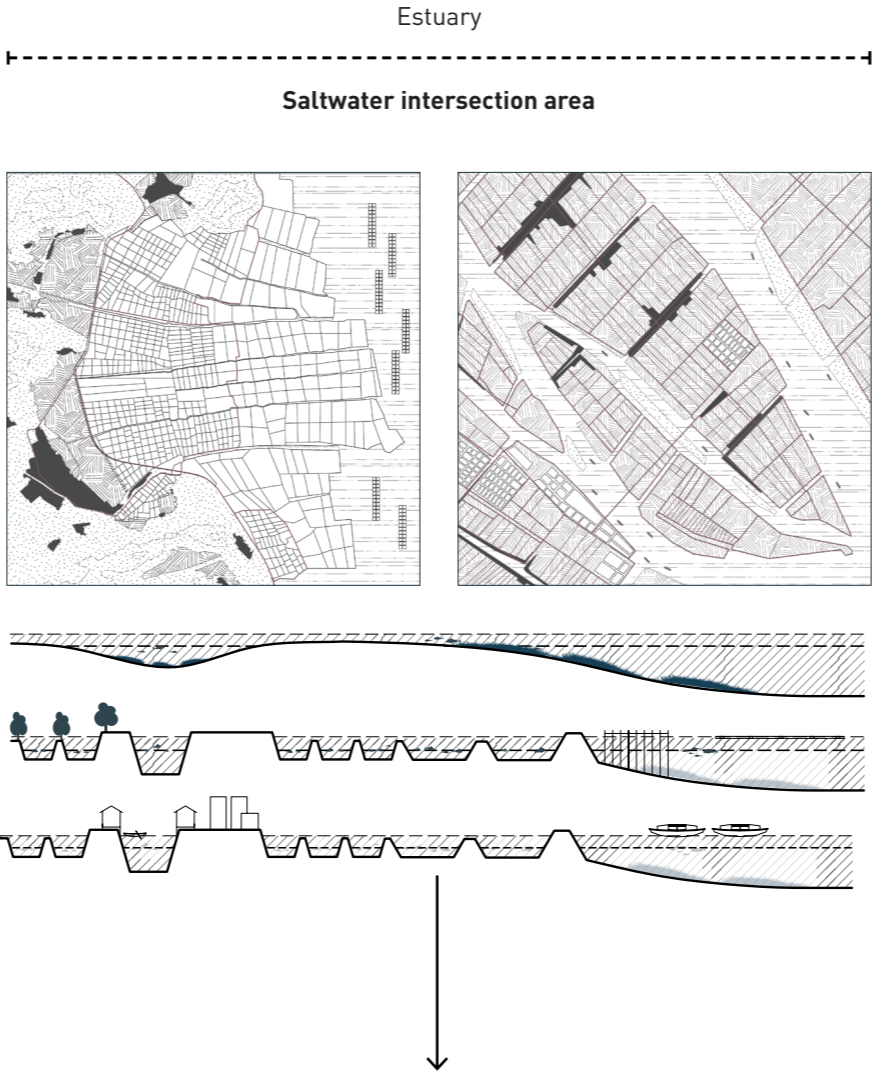
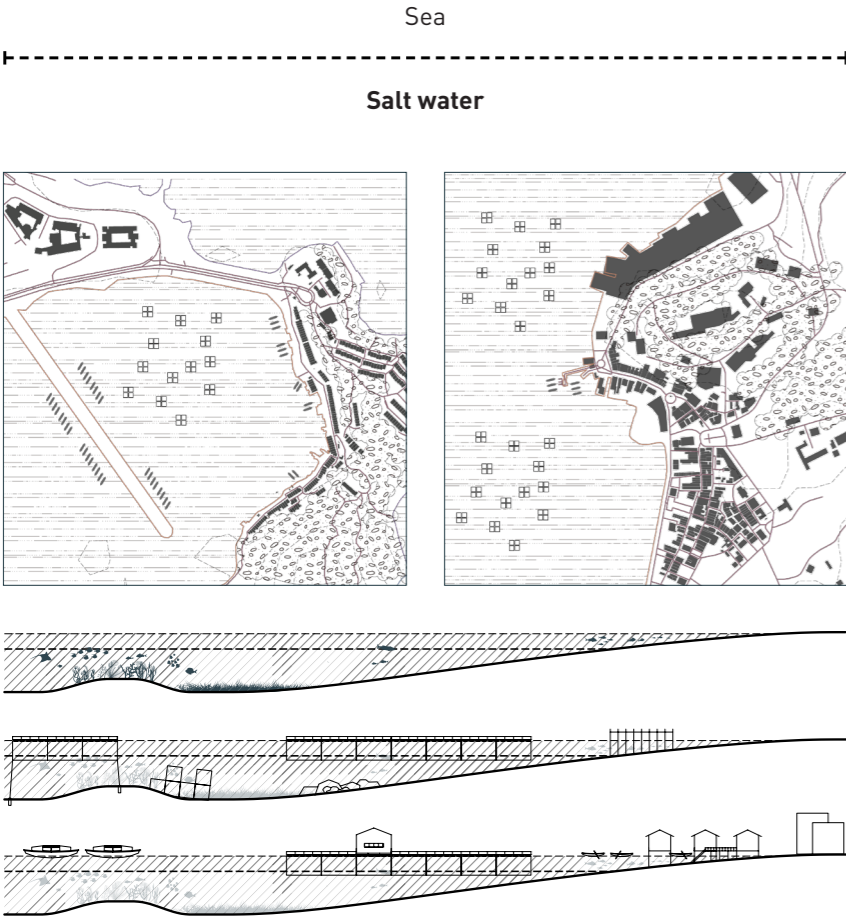
Left:One type exists close to the dyke and is in the form of clusters, where farmland is interspersed with fishponds. Some villages will be located at the junction of fishponds, making it easier for fishermen to manage many fishponds.

Right: The other type of village is based on the development of the first type of village. It extends beyond the dyke, where the fishermen have a closer relationship with the river and are more dependent on the river for aquaculture.



Natural habitat, aquaculture and house type conclusion.
Drawn by author

3.4 CONCLUSION





The picture shows an abandoned oyster field in Pak Nai, Hong Kong, where nature researchers have discovered a natural recovery of biodiversity.

Sources: Photo by Shanshan Gao
<https://chinadialogueocean.net/zh/5/93869/>

Fishermen Landscape-From Water to Land

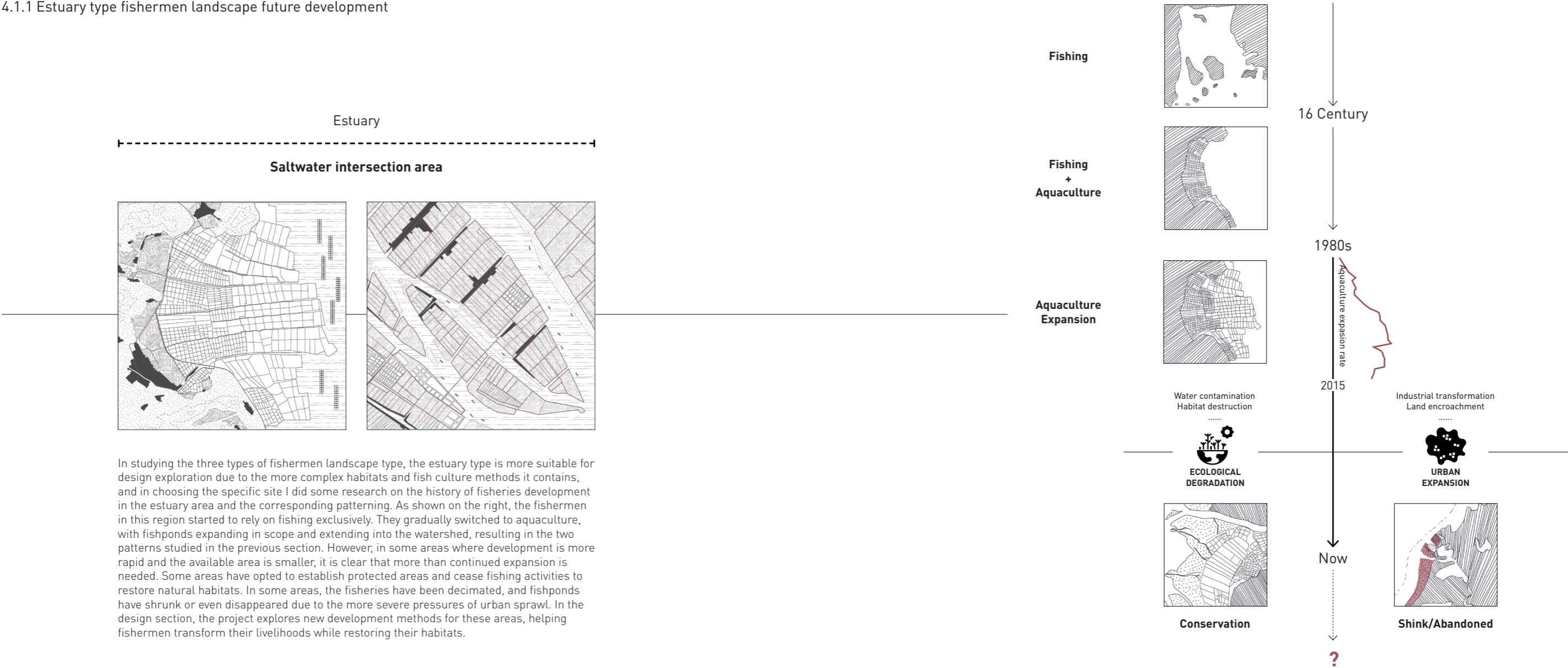
Develop resilient principles to rebuild gradient-landscape in PRD

CHAPTER 4 DESIGN EXPLORATION

- 4.1 Introduction
- 4.2 Site analysis& Design principles
- 4.3 Vision for Lau Fau Shan area
- 4.4 Detail design

4.1 INTRODUCTION

4.1.1 Estuary type fishermen landscape future development



4.1 INTRODUCTION

4.1.2 Typical site-Lau Fau Shan

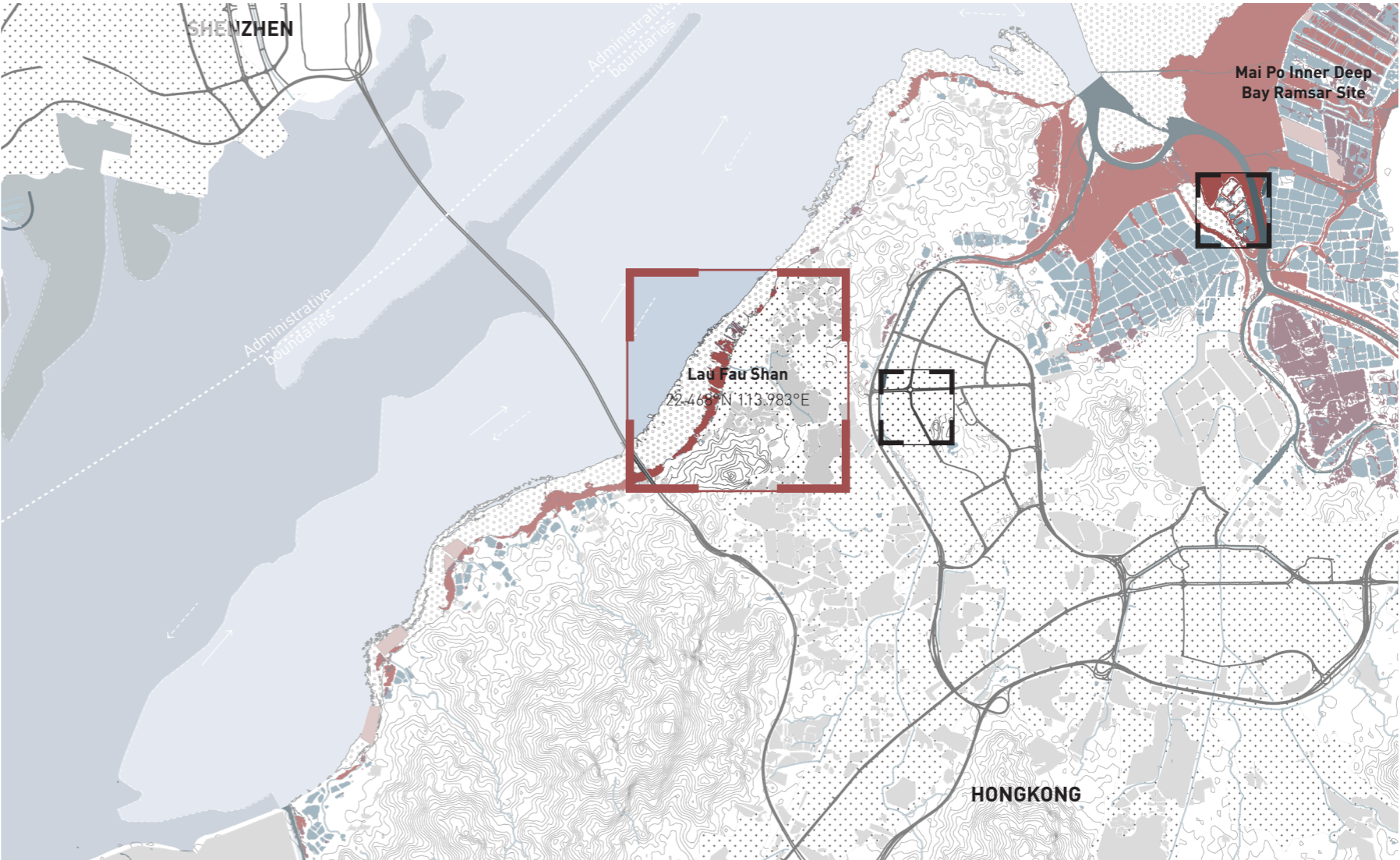
Nam Sang Wai-Natural degradation



Tin Shui Wai-Urban expansion



Hong Kong, one of the fastest-growing cities, has a more pronounced conflict between nature and the city. At the same time, the history of Hong Kong's development is also inseparably related to fishermen. In Shenzhen Bay, thousands of oyster rafts can still be seen, with abandoned bamboo rafts floating on the sea surface, obstructing the passage of navigation channels. Despite the large number of oyster rafts, this does not mean that the fishermen have a good life, and the fishermen on the Hong Kong side still face difficulties. Take nam sang wai and tin shui wai as an example; in the last fifty years of development, due to natural degradation and urban expansion, the fishponds on this side of Deep Bay have gradually turned from their initial natural form into a closed form, and eventually degraded into a desert or expropriated for residential use. It is urgent to explore a new way out for the fishermen here.

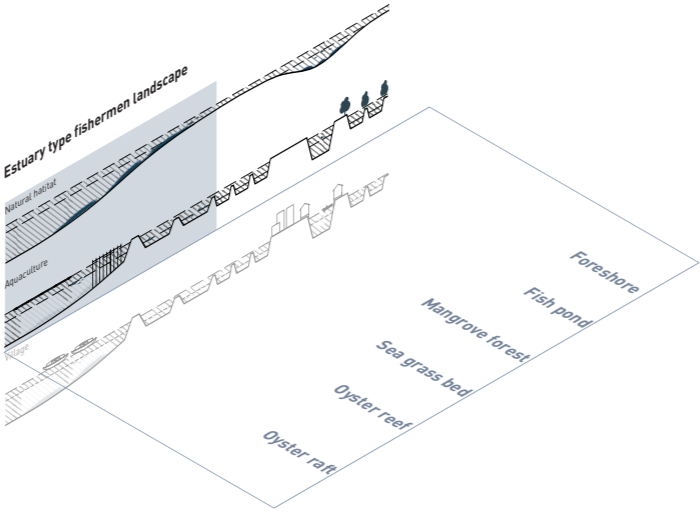


4.2 SITE ANALYSIS & PRINCIPLES DEVELOPMENT

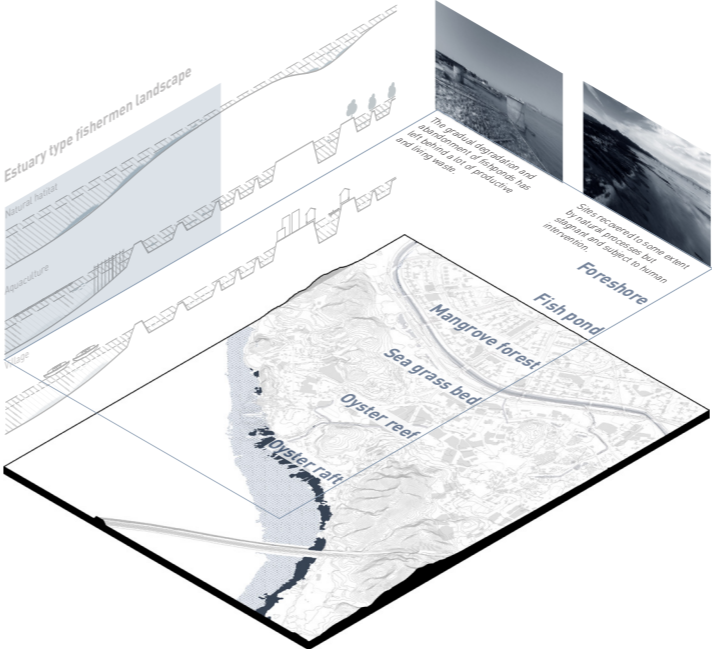
4.2.1 Design strategy generation based on research findings and site analysis

In the conclusion of the research section, the fish habitats and fishermen's habitats involved in the estuary-type fishermen landscape are summarized. Evaluating the status of the corresponding habitat types for the site class can guide the next step in generating the design principle.

Taking the coastline fish habitat as an example, the coastal portion of the habitat from water to land consists of oyster rafts, oyster reefs, seagrass beds, mangrove forests, fish ponds, and foreshore. In the Lau Fau Shan area, the coastal oyster reef in the area does not exist, the fish ponds are disappearing due to natural degradation and urban development, the mangrove forest and seagrass bed need to be protected, and there is a lot of fishery waste near the foreshore. In response to this situation, the project proposes the following design principles



Step 1 Examples of fish habitats involved based on the findings of the study section



Step 2 Assessment of the site based on habitat types



Step 3 Developing design principle based on the status of the site

4.2 SITE ANALYSIS & PRINCIPLES DEVELOPMENT

4.2.2 Fish habitat analysis and principles-Coastline area

Based on the findings of the research component, the project categorized the fish habitat into coastline and river basins.

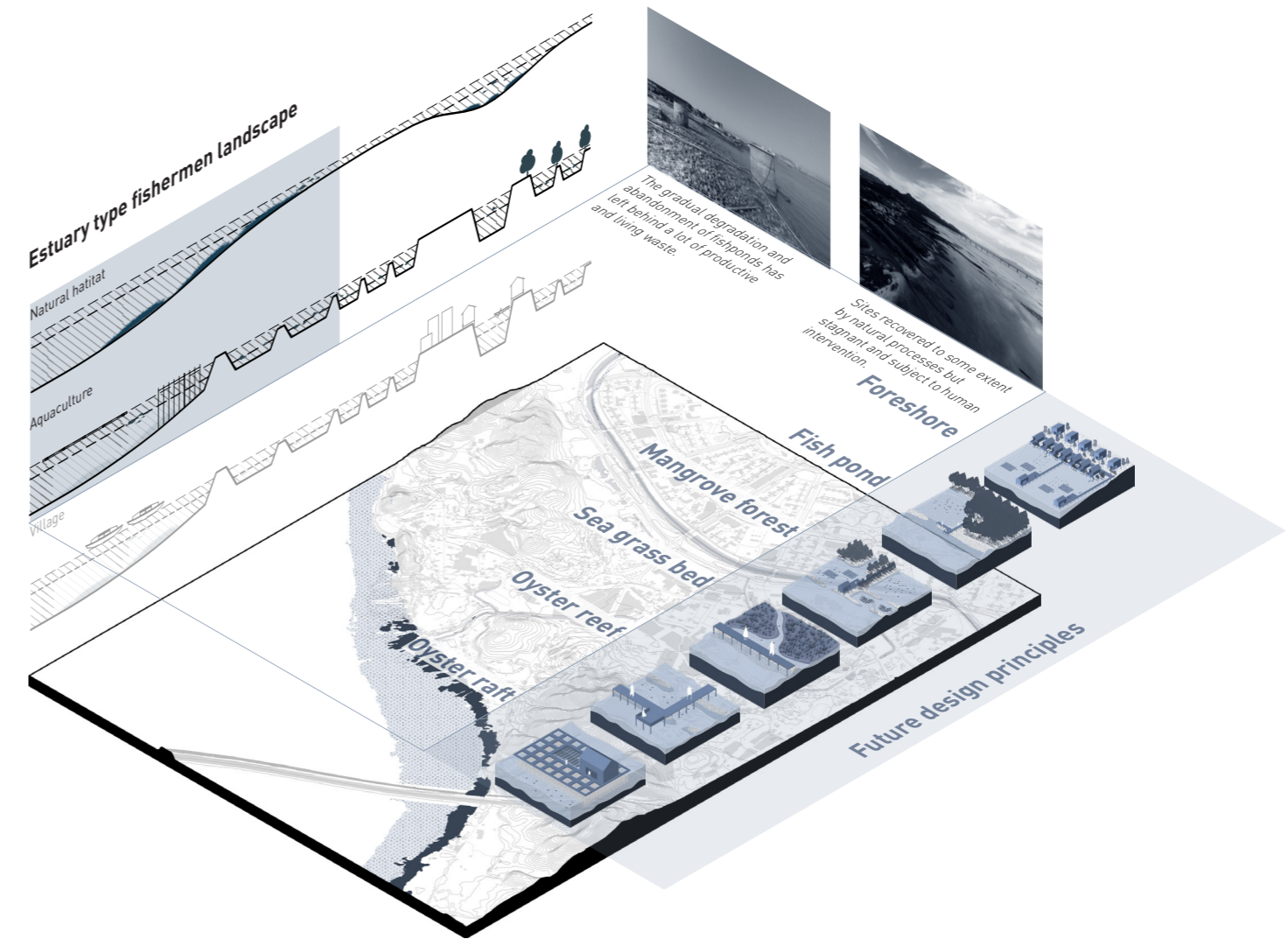
In the coastal zone, the natural fish habitat consists of an oyster reef, sea grass bed, mangrove forest, and foreshore, while the artificial fish habitat consists of an oyster raft and a fish pond. The mapping of this zone shows that the natural habitat along the coastline is homogeneous, except for a small portion of mangrove forest. Much of the mangrove forest is muddy and shallow. Many fishing waste and oyster shells were piled up at the junction of land and shore. Fishponds along the shoreline have almost wholly disappeared, and the large number of oyster rafts in the distance has caused congestion in the waterway, severely reducing the light transmission rate of the seawater and affecting the benthic organisms.

In response to this situation, the project

proposes design strategies for six types of habitats:

1. deletion of some oyster rafts, suspension of purifying algae under the rafts, and establishment of activity and living spaces on the rafts for tourism;
2. reorganization and stacking of the oyster reefs to create space for fish and amphibians to live; and
3. use of oyster shells to create small dykes to protect the growth of the seagrass beds in the interior, which can also be used as dykes in the future. In the future, sightseeing trestles can also be built on the dykes.
4. Restore or create part of the fishponds, using the tidal effect to allow for the natural entry of fish fry, and the restored mangrove forests and seagrass beds around the periphery to provide habitat and nutrients for fish.
5. Help the mangrove forests along the shoreline to recover and expand into natural habitats for fish by catching

sedimentation through the permeable dams.
6. Reserve space for the foreshore and utilize fishermen's water rafts for house design to reserve space for future sea level rise and mangrove retreats.



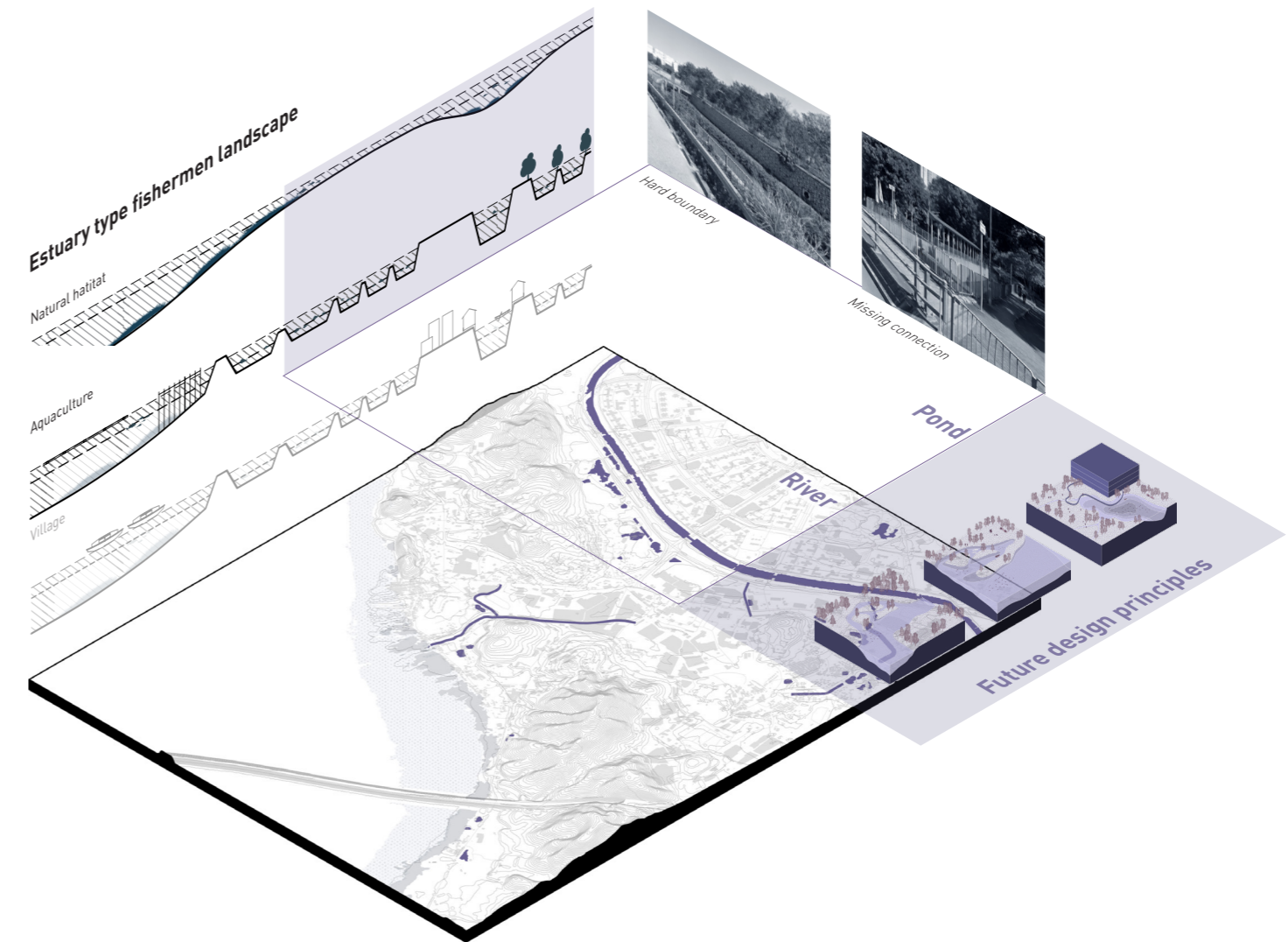
4.2 SITE ANALYSIS & PRINCIPLES DEVELOPMENT

4.2.3 Fish habitat analysis and principles-River system

The Lau Fau Shan area consists of several rivers, degraded ditches, and ponds formed by degraded fishponds. The river on the north side is an essential part of the area, serving as the boundary between the city and the area and as a link between the inner city and the Mipo eco-region on the north side. However, the current state of the river is worrying. The river has a hard border on both sides; the vegetation around it needs to be managed and maintained, and the walkway on both sides does not provide a view of the other side of the river due to the vegetation. Many of the channels in the area have been blocked due to the expansion and construction of the industrial zone, and only a few of them still exist. The ditches are all enclosed by iron fences and have little ecological or landscape benefit.

The design strategy, therefore, focuses on reshaping the main river channel, enriching the landscape along the river

by stacking stones and dykes to create space for fish to live and spawn. Soften the boundaries and increase the sight lines to allow residents to access the river landscape. Connecting the ditches in the area and restoring the system's circulation will also facilitate the formation of coastal brackish water habitats and create more diverse spaces for fish. Then, degraded ponds can be stored as wetlands or urban parks, depending on their location with the river. This type of green space can absorb rainwater and feed it into the river to replenish the freshwater of the system as a whole, as well as serve as a space for fishermen's activities and marketplaces.



4.2 SITE ANALYSIS & PRINCIPLES DEVELOPMENT

4.2.4 Fishermen habitat analysis and principles

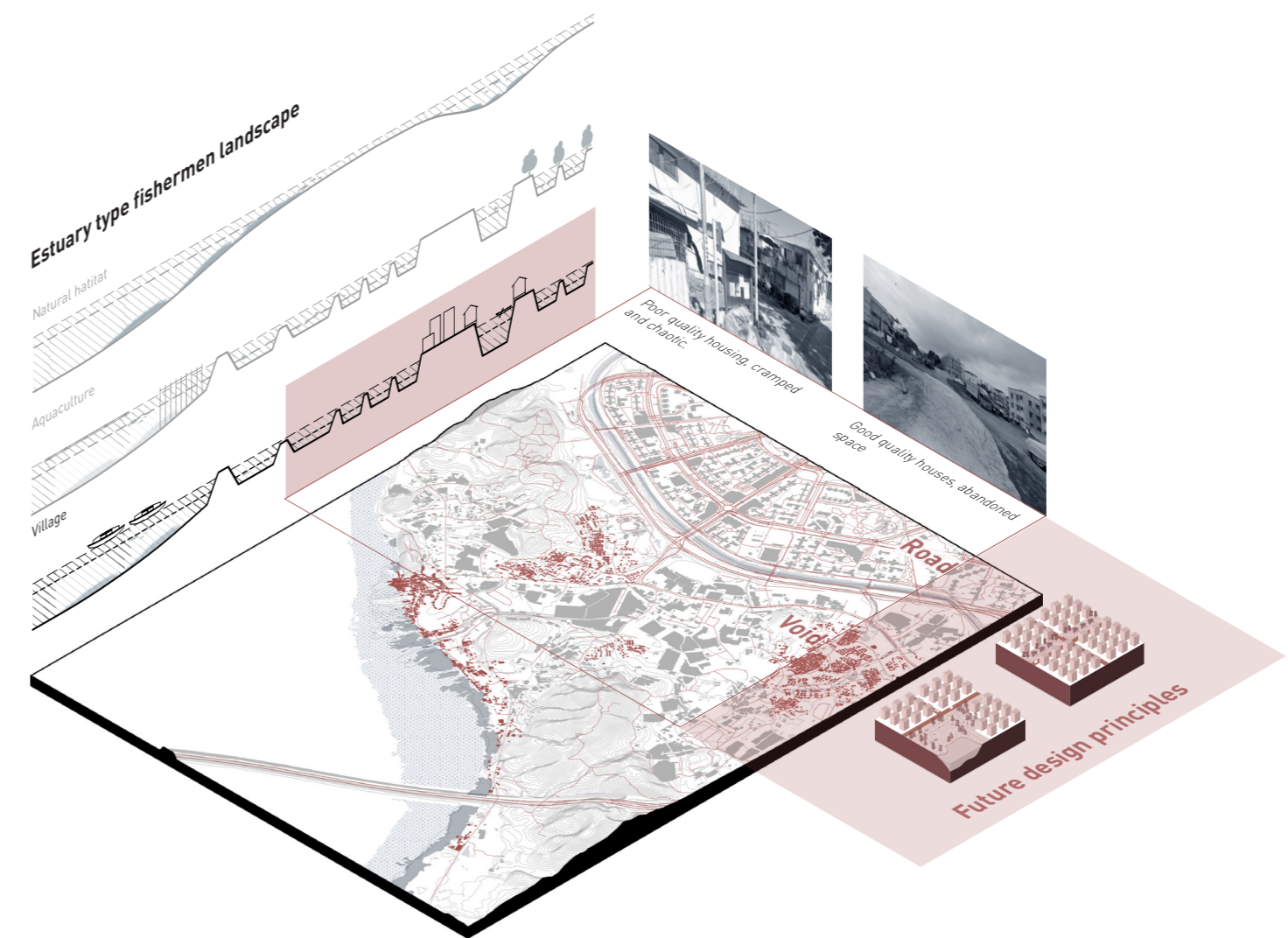
Fishermen's habitat is also an essential part of the fishermen's landscape. In this area, the concentrated coastal villages and strip villages are in relatively poor condition, with a high density of houses and many improvised houses. The villages in the land's interior are in relatively good condition and can be seen to have undergone renovation and planning.

However, many of the dwellings are self-built, and the outlying roads and urban open spaces are not well utilized. Villagers have arbitrarily allocated parking lots in front of their buildings, and many fragmented green areas are chaotic with vegetation, with construction waste piled up randomly around the periphery. The whole area needs planning and renewal.

With the rapid development in the past fifty years, many factories have occupied most of the land in this area. The original farmland belonging to farmers has been

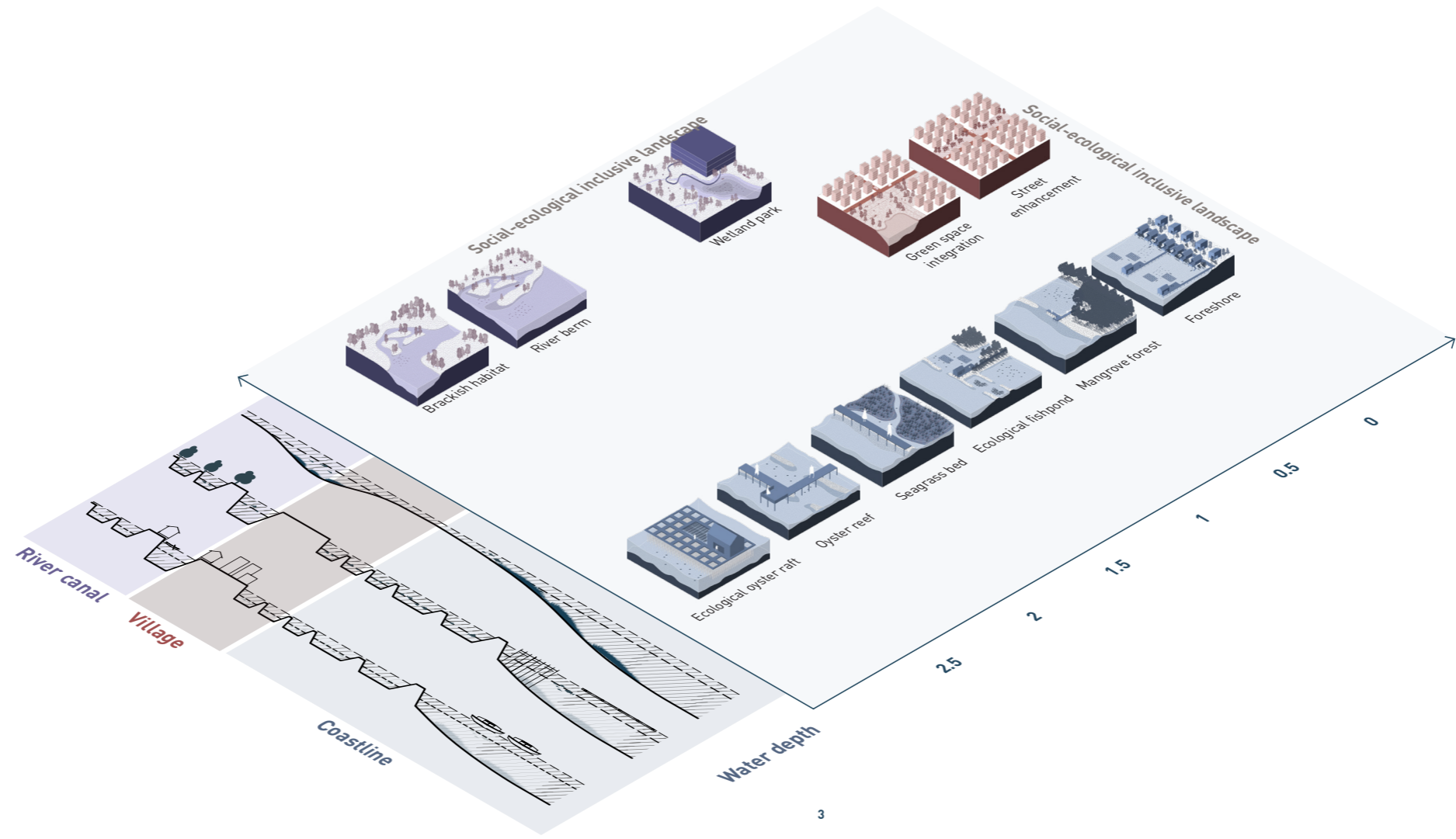
drastically reduced, and there is no transition zone between the industrial area and the village, only some tin walls.

The village's design strategy consists of two main categories. The first is to plan the roads within the village, utilizing the space on both sides of the main roads for community activities and seafood markets. The second is consolidating parking lots, repositioning roads, and integrating fragmented green spaces and open spaces to create community parks. The presence of these green spaces can replenish freshwater resources within the water system, as well as serve as spaces for resident activities and outside gatherings.



4.2 SITE ANALYSIS & PRINCIPLES DEVELOPMENT

4.2.5 Site analysis & Principles conclusion



The above analysis of the site and the proposed design strategy makes the integration of the right side of the conclusion possible. The overall site transformation strategy consists of three main components: the fish habitat, which includes the coastline area, the river canal area, and the village area. From water to land presents a transition. These design principles combine to form a complete fishermen landscape, a socio-ecological inclusive landscape.

4.2 SITE ANALYSIS & PRINCIPLES DEVELOPMENT

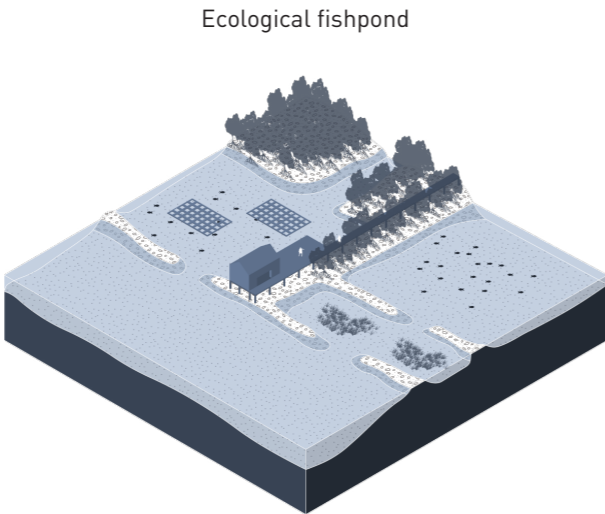
4.2.6 Social-ecological inclusive design principles

Three typical principles are selected here for elaboration.

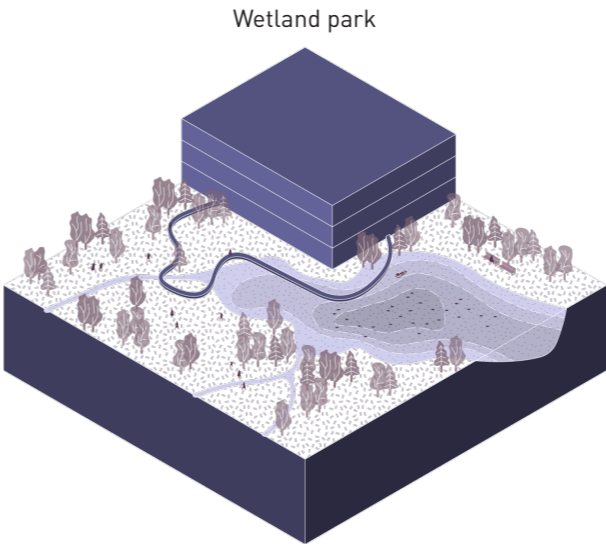
The ecological fishpond can sequester carbon and purify water from an ecological aspect while providing a shelter, baiting farm, and seeding farm for fish and amphibians. In the social aspect, it can allow fishermen to continue commercial fishery activities, increase jobs and attract tourists.

Similarly, the wetland mark in the river area will still provide an ecological habitat for fish. In the social aspect, it is an integral part of the green city; as a composite park, it will contain seafood marks and some community centers where fishermen can sell seafood and related products. Fishermen can sell seafood and related secondary products such as oyster sauce and dried oysters.

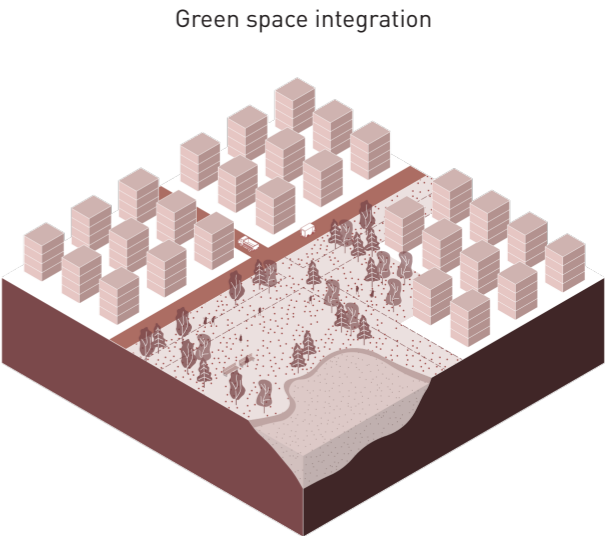
The green space integration principle for the village is also an essential part of the green city, which enhances the connection with the outside world and protects the village from the expanding industrial area. Ecologically, these green spaces can replenish fresh water and increase biodiversity.



- | | | |
|-----------------|--------------|--------------------|
| Fixed carbon | Oyster farm | Jobs |
| Denitrification | Seeding farm | Recreation |
| Shelter | Purification | Commercial fishery |
| Bait farm | | |



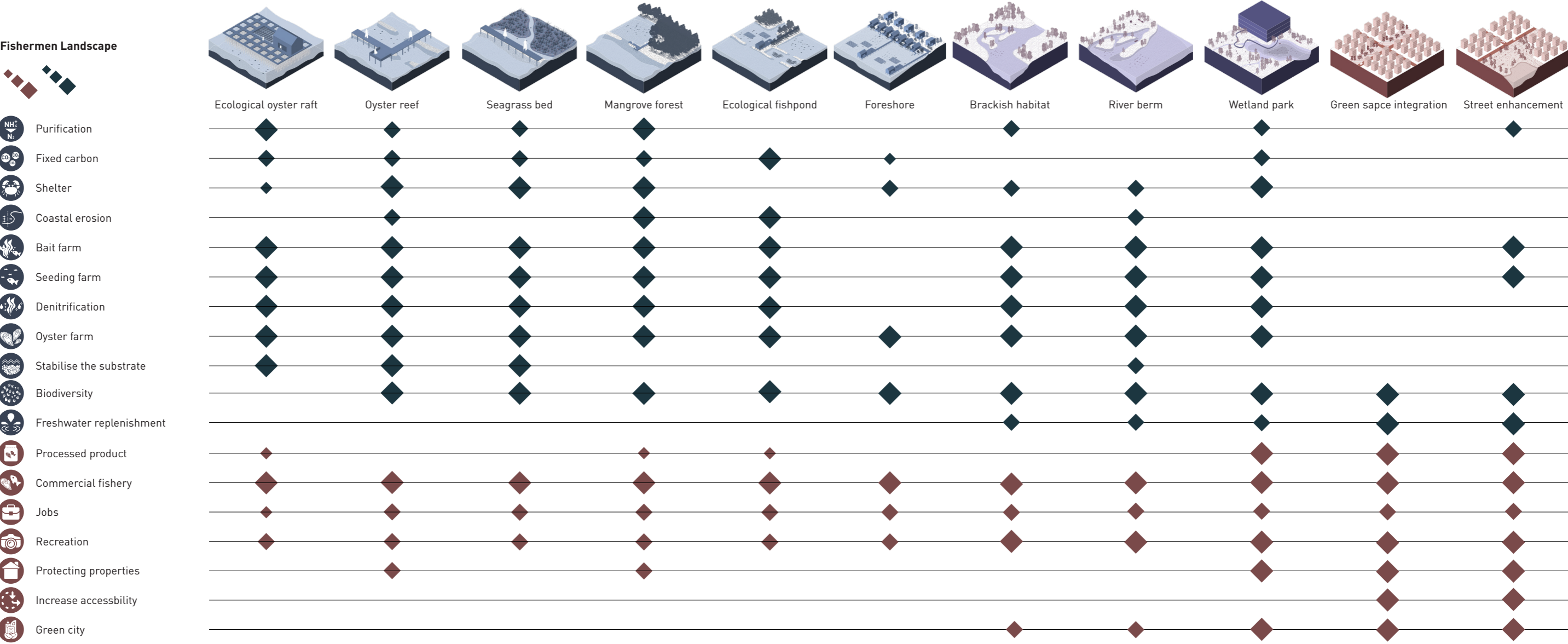
- | | | |
|--------------|--------------------|------|
| Fixed carbon | Recreation | Jobs |
| Shelter | Green city | |
| Bait farm | Processed product | |
| Purification | Commercial fishery | |



- | | | |
|--------------|--------------------------|------------------------|
| Purification | Freshwater replenishment | Recreation |
| Seeding farm | | Protecting properties |
| Bait farm | | Increase accessibility |
| Biodiversity | | Green city |

4.2 SITE ANALYSIS & PRINCIPLES DEVELOPMENT

4.2.6 Social-ecological inclusive design principles



4.3 VISION FOR LAU FAU SHAN AREA

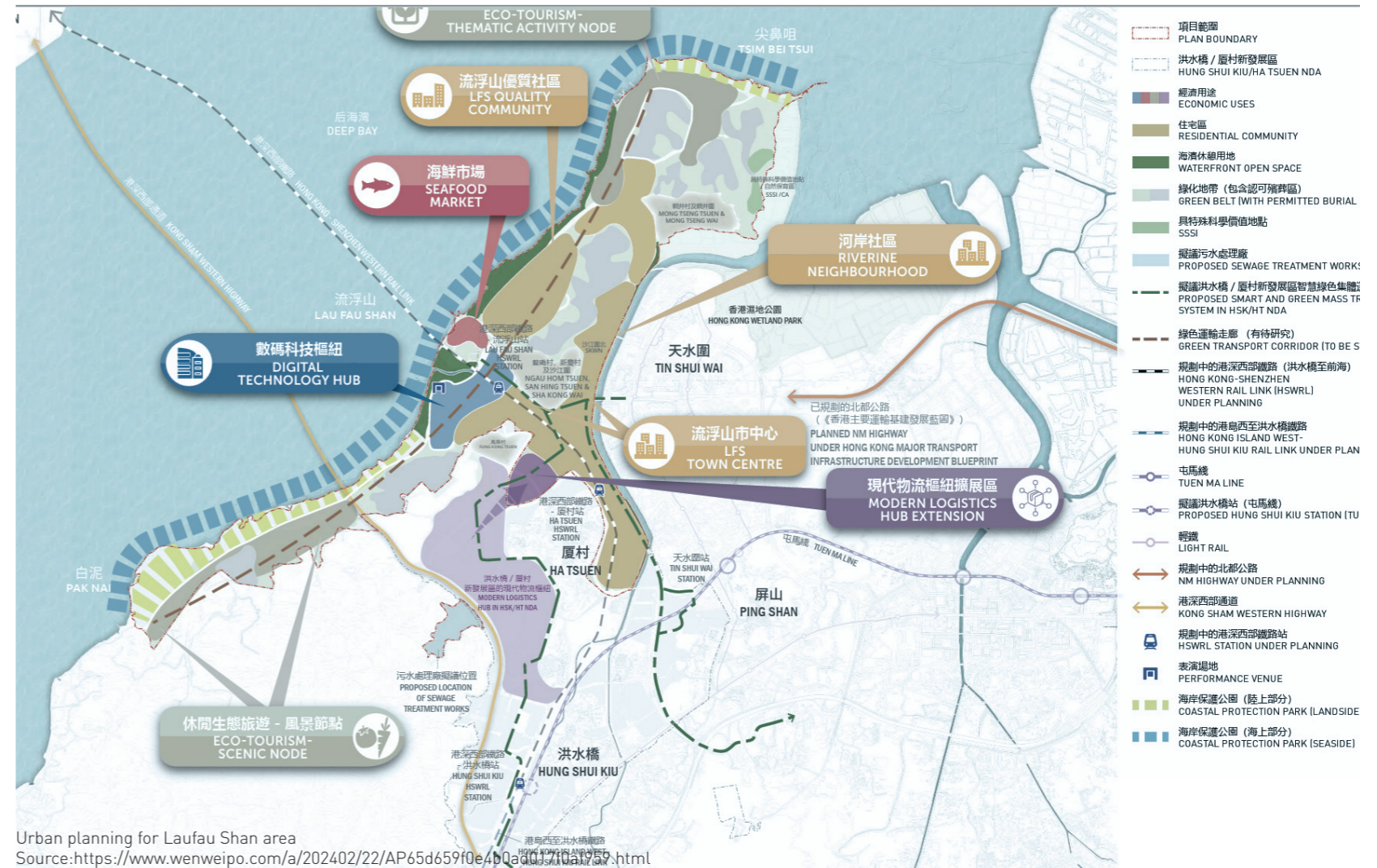
4.3.1 Introduction

Before planning for the site, the project studied and researched a number of planning proposals that had been put forward. The government plans to turn Lau Fau Shan into a digital technology hub and add 53,000 residential units. The plan also emphasizes the design of a 4.8km waterfront tourism belt. The Development Bureau has indicated that it will reference Singapore's experience and model the planning of Pak Nai and Tsim Bei Tsui on the planning of Sentosa Island.

By studying the planning intention of the Development Bureau and the plan on the right, we can see that the government intends to transform the blocks except for the fishing villages. However, the fishing villages have been neglected to a certain extent. If they are ignored, these fishing villages will become urban villages one after another, surrounded by high-rise buildings, and the fishermen will lose their original sense of belonging. However, these

villages are exactly what this project wants to focus on. Focusing on these fishing villages and the surrounding environment can better match the government's regional planning and integrate the fishing villages into the future blue-green system. At the same time, the project also thinks about the blue-green structure and landscape design of the coast, which can help the construction of the future coastal green corridor.

To summarize, the fishermen landscape planning and design with fishermen as the core is not detached from the government's direction for the region's future development but is a kind of refinement to help the region transition to a high-tech, environmentally friendly urban area.



Urban planning for Laufau Shan area
Source: <https://www.wenweipo.com/a/202402/22/AP65d659f0e4b0add07f0a9559.html>

4.3 VISION FOR LAU FAU SHAN AREA

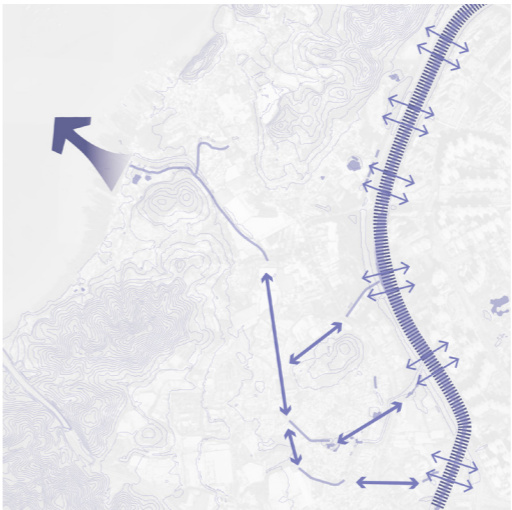
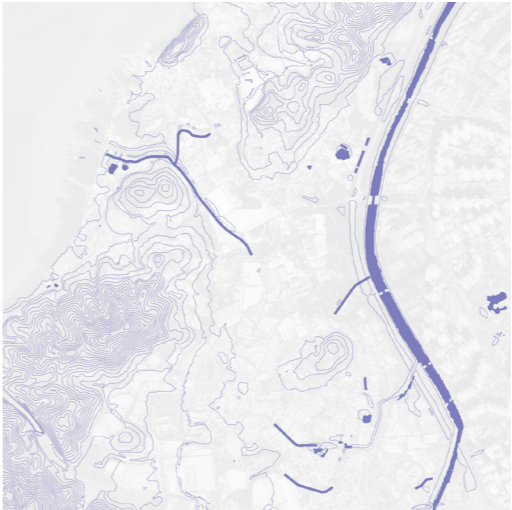
4.3.1 Introductjion

The modifications to the Lau Fau Shan area will follow the categorization discussed above, including the coastline, river basin, and village. Based on the existing conditions, the coastline area will be subdivided into various habitat spaces, including oyster reefs, seagrass beds, and mangrove forests to enhance the transition from water to land. This transition will, in part, provide the necessary space for fish to reproduce and grow. Reconnecting the destroyed canals and adding a new green buffer between the river and the town will help create a new water system that will channel fresh water to the coast and facilitate the formation of brackish water. The scattered villages will be reconnected and oriented to the landscape space of the coast. Restoring part of the agricultural land, increasing the landscape space inside the villages, and enhancing the green and activity space on both sides of the road will help establish a new green city system.

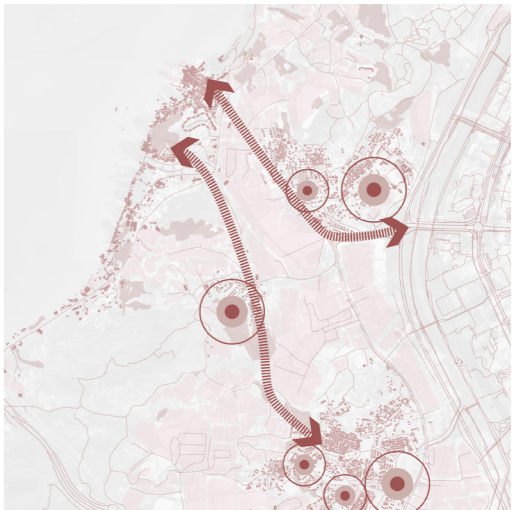
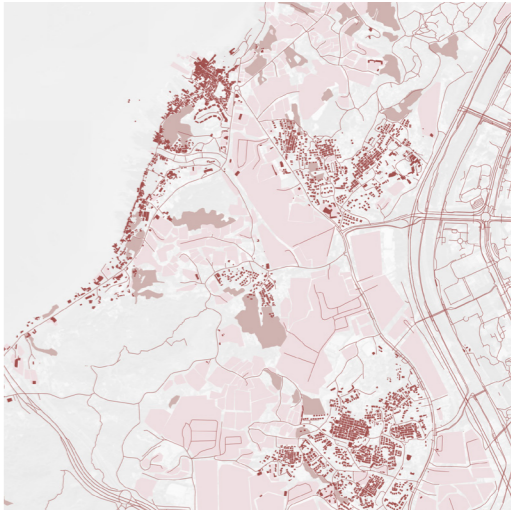
Coastline



River



Village



4.3 VISION FOR LAU FAU SHAN AREA

4.3.2 Current situation

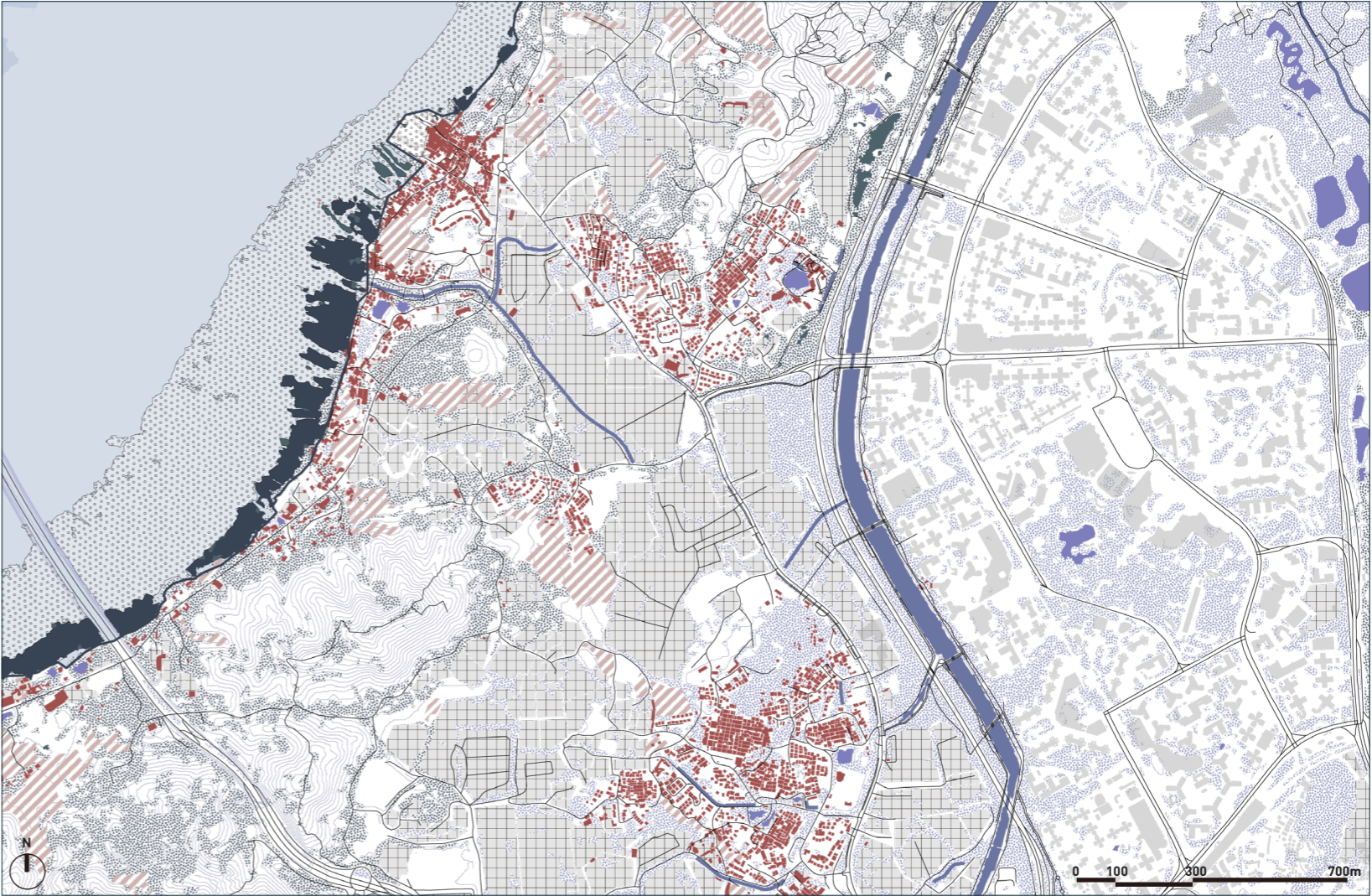
On the right is the current situation of Lau Fau Shan. First, the mangrove forests along the coast are not in good condition, and many shoals need to be better utilized and protected. If this continues, this part of the shoal will be in danger of being polluted and disappearing. At the same time, there are many scattered fishing villages along the coast, and the status of these villages could be better, so it is essential to think about the transition between these villages and the natural boundaries.

Secondly, there needs to be more work on the region’s design and management of the aqueducts. The original canal system has been filled in due to years of unregulated expansion of the industrial area, resulting in many disconnected canals. Fresh water from the whole area is mainly discharged through underground pipes to the partially functioning drains and the sea. This has aggravated the coastal pollution problem and wasted many freshwater resources.

In addition, the existing agricultural land has gradually shrunk, and the fishing villages are surrounded by many large-scale industrial zones, making the living environment for the fishermen poor. As a result of the uncontrolled expansion of industrial zones, many abandoned urban lands have appeared. These lands are scattered around the villages, piling up a lot of industrial and fishery waste, which is undoubtedly a waste of resources.

Last but not least, the whole area needs to be practiced with the city’s eastern side. The river divides the two areas, but the landscape along the river blocks the view and needs a guideline type to guide tourists and pedestrians into it. The river is not well used at the landscape level.

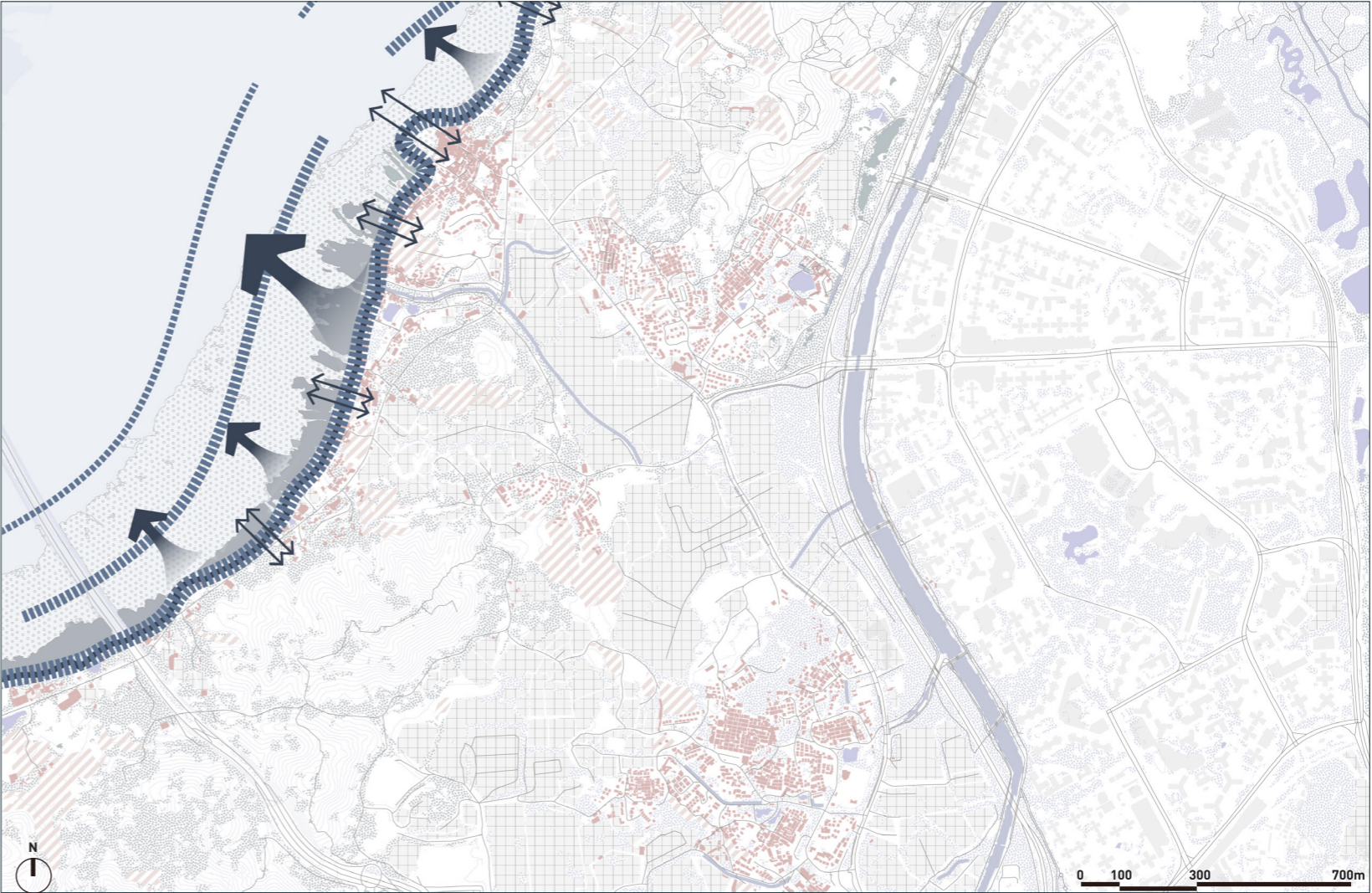
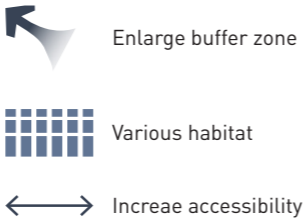
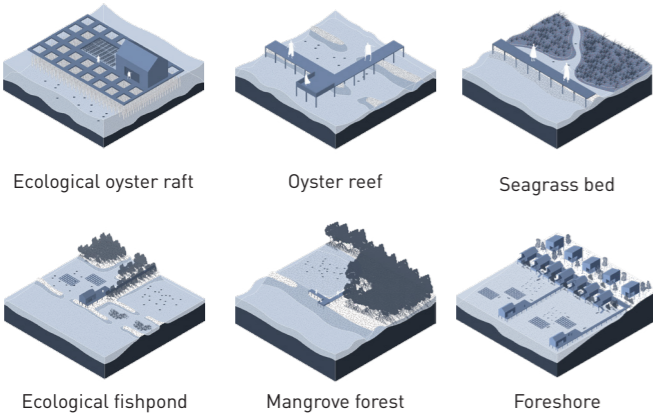
- Soft edge
- Mangrove
- Saltmarsh
- River/Canal
- Pond
- Urban green
- Wood/ Shrub land
- Farmland
- Villages
- Industry area



4.3 VISION FOR LAU FAU SHAN AREA

4.3.3 Fish habitat-Coastline area

In the principle development phase, the project proposes a coastal transformation strategy. It aims to enrich the coastal fish habitat types from water to land by including six categories: ecological oyster raft, oyster reef, seagrass bed, ecological fishpond, mangrove forest, and foreshore. These habitats incorporate fish species. These habitats combine fish habitats and fishermen's production and life and strengthen shoals' ecological and social benefits based on the full utilization of coastal shoal resources.



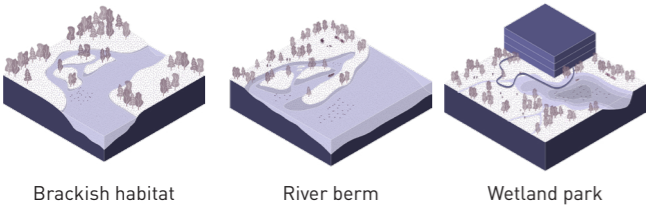
4.3 VISION FOR LAU FAU SHAN AREA

4.3.4 Fish habitat-River area

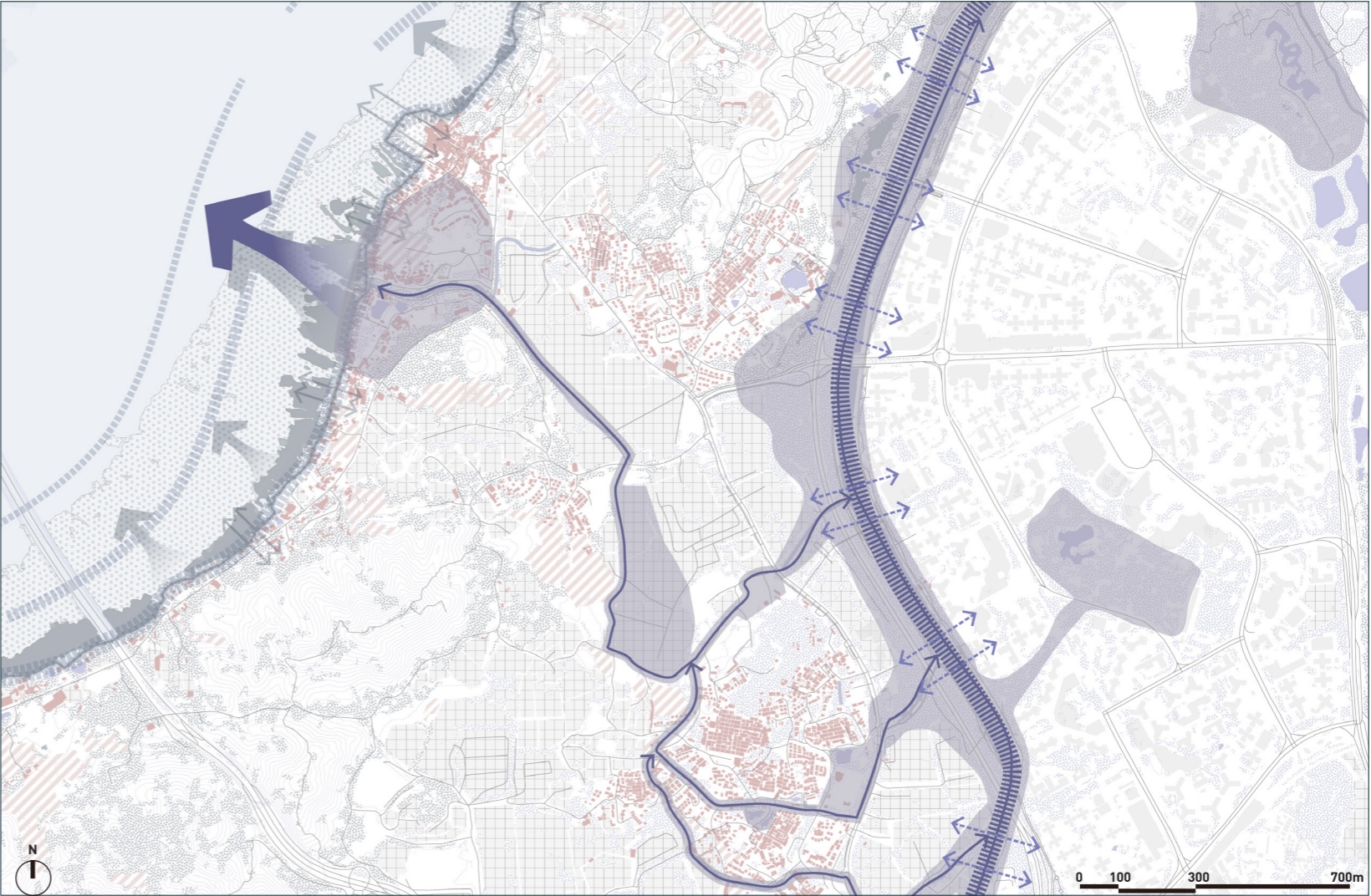
The idea for the River area has aspects:

Firstly, the design of the green spaces on both sides of the main river easternmost side of the river, including softening the boundaries and beds in a variety of river berms and the addition of wetland parks on both sides, which will connect with the river to create productive and foraging areas for fish. At the same time, these modifications can also utilize currently abandoned urban green spaces, re-vegetate and manage them, and open up views of both sides of the river to attract tourists.

The next step is to connect the waterways within the site. On the one hand, connected waterways can improve the monolithic landscape of the area and, in combination with the green spaces around the waterways, can create green spaces suitable for residents' activities. On the other hand, these spaces can increase infiltration, collect fresh water and improve the ecological quality of the area. This freshwater will collect and flow to the coast, creating an environment with different salt concentrations to ensure the survival of different fish species and creating the possibility of new oyster farming models.



- Enlarge buffer zone
- Various habitat
- Reconnect canal
- Visual guid
- Urban green land



4.3 VISION FOR LAU FAU SHAN AREA

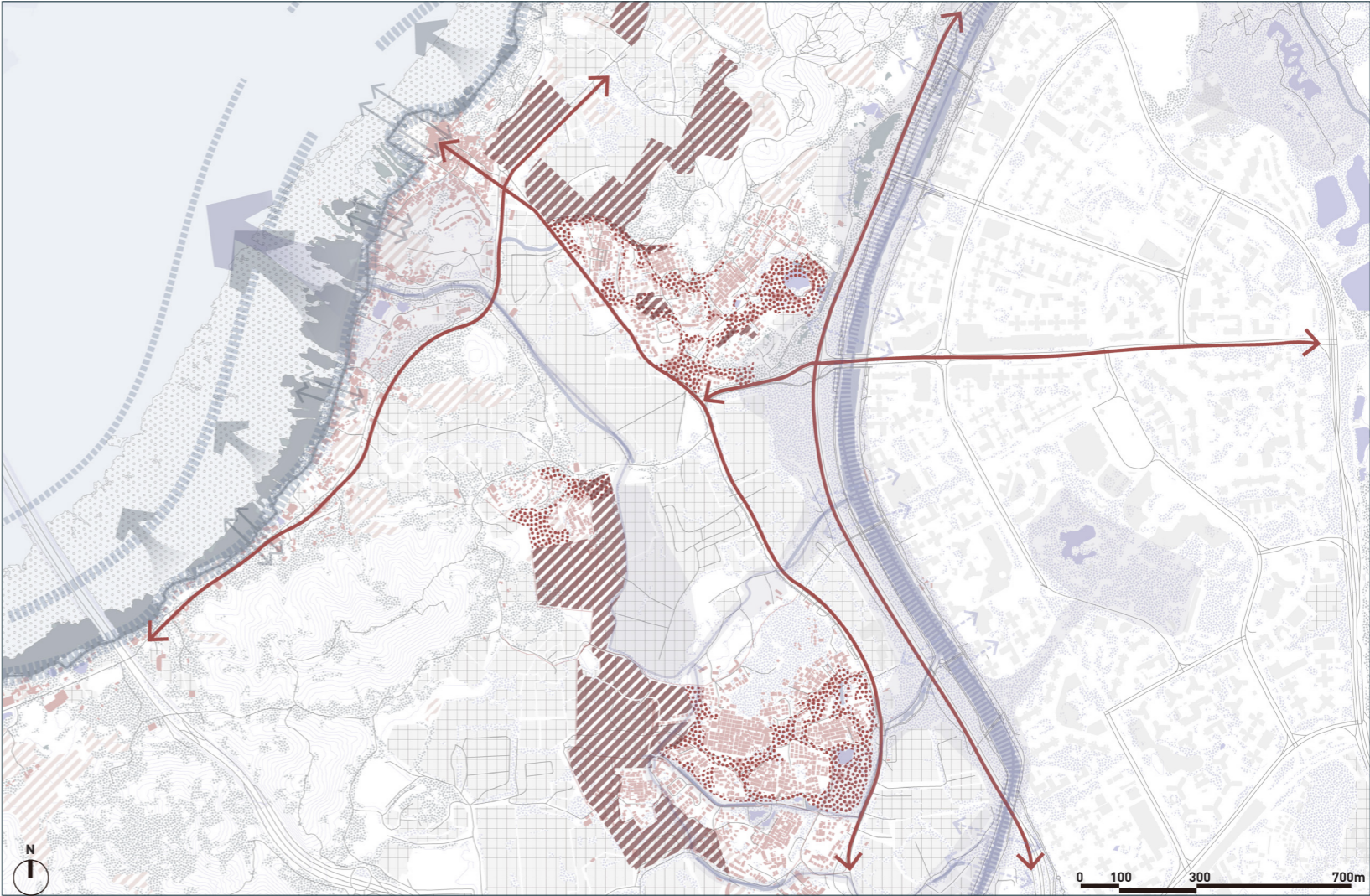
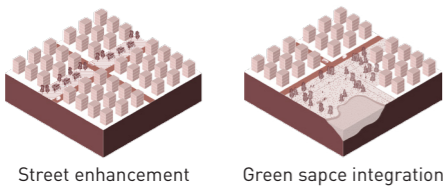
4.3.5 Fishermen habitat-Villages

The idea of remodeling the village part consists of three main aspects:

The first is the road connection. There is little planning and design on both sides of the roads, and there is a lot of fallen vegetation and garbage, which blocks the view and reduces accessibility. The project will re-design the main roads to ensure the tourism industry’s subsequent planning and promote economic development.

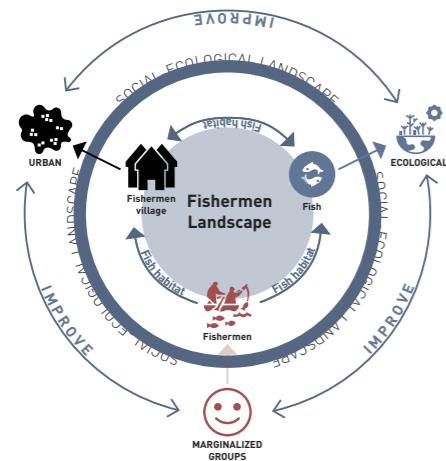
Secondly, by reorganizing the roads and spaces within the village, the project will link up the chaotic and abandoned open spaces and create a public space for villagers to have daily rest and sell their aquatic products.

Last, part of the farmland can be restored, especially at the foot of the hill. This will ensure the villagers’ production and livelihood as well as collect rainwater to increase infiltration. These farmlands and public spaces within the village will also be connected to the green space along the river to form a complete green space system.



4.3 VISION FOR LAU FAU SHAN AREA

4.3.6 Final vision for Lau Fau Shan area



Starting from fishermen and ending with the improvement of the regional socio-ecological system

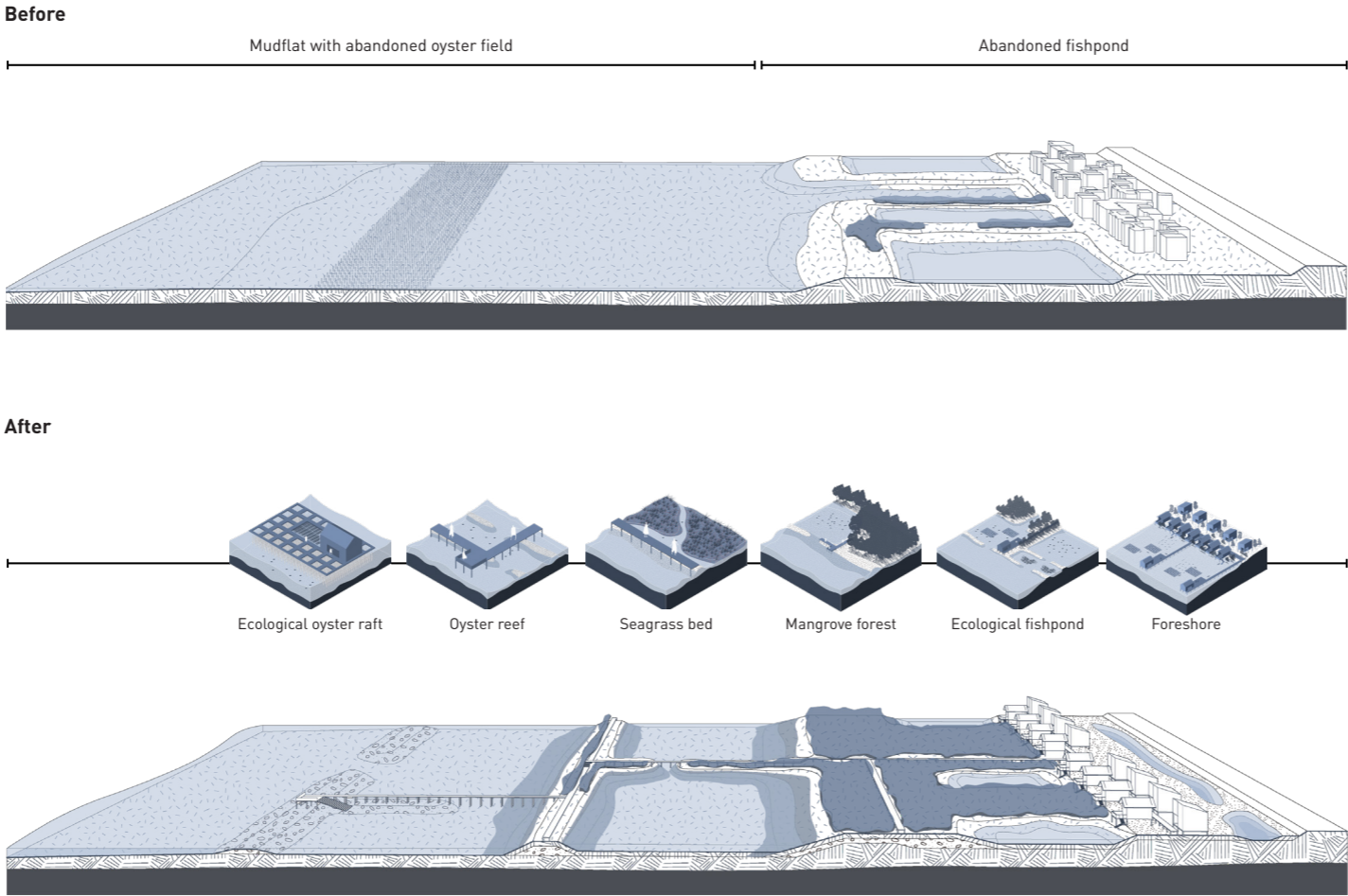
Through these three levels of re-planning, a new vision for the Laufau Shan area has been created on the right-hand side. The new blue-green system can be seen around the fishing village. Much of the land can still be used for high-tech industries and residential development. The new blue-green system will form a new skeleton to ensure the ecological resilience of the area and promote the sustainable development of the area.



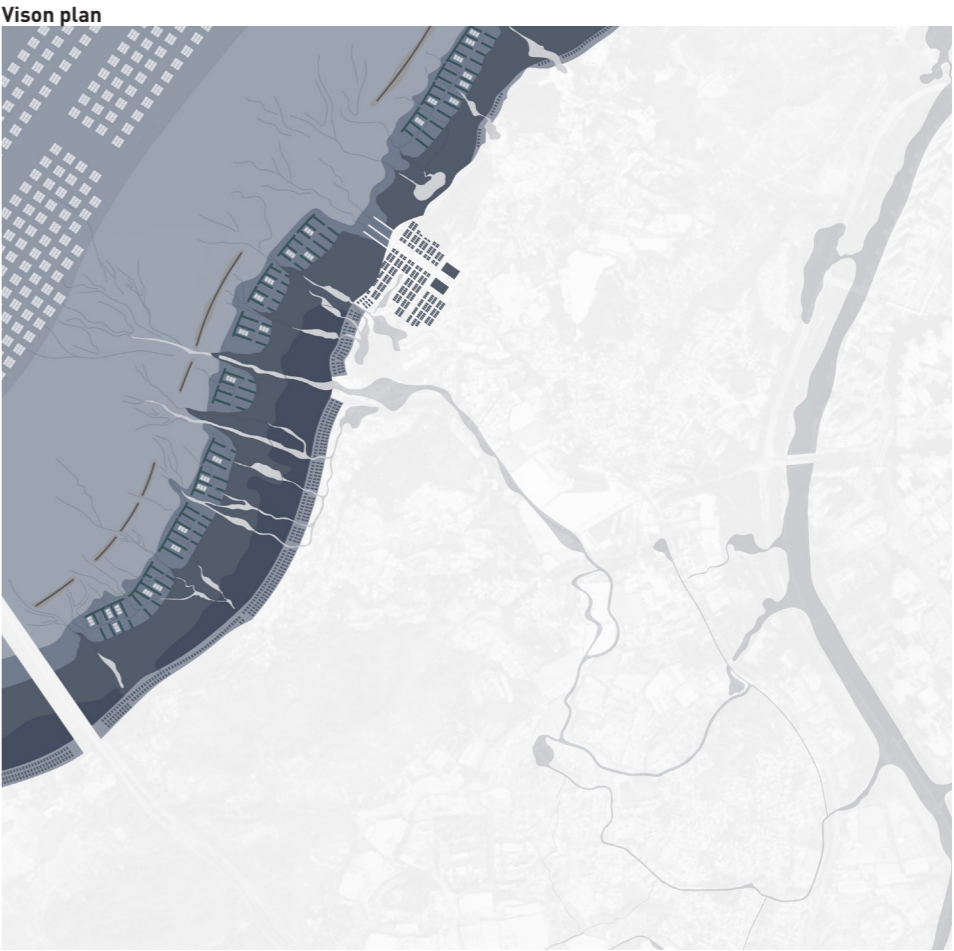
4.3 VISION FOR LAU FAU SHAN AREA

4.3.7 Coastline area

Currently, there are many abandoned fishponds along the coast, and the accumulation of fishery garbage hinders the recovery of mangrove forests.

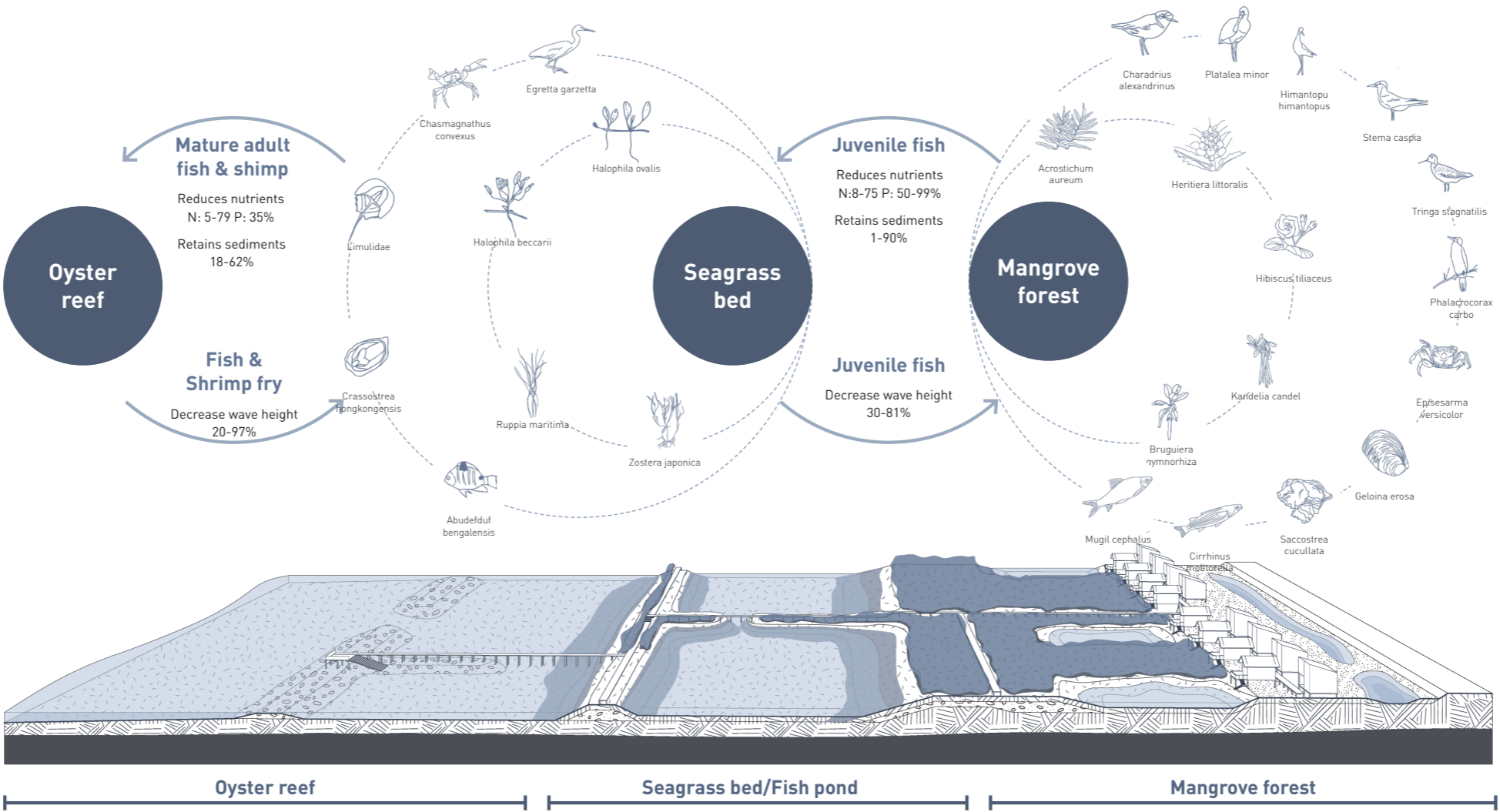


The redesign will create a rich fish habitat, ensuring coastal organisms' survival and promoting the coastal fishery's continued development.



4.3 VISION FOR LAU FAU SHAN AREA

4.3.7 Coastline area synergistic eco-efficiency

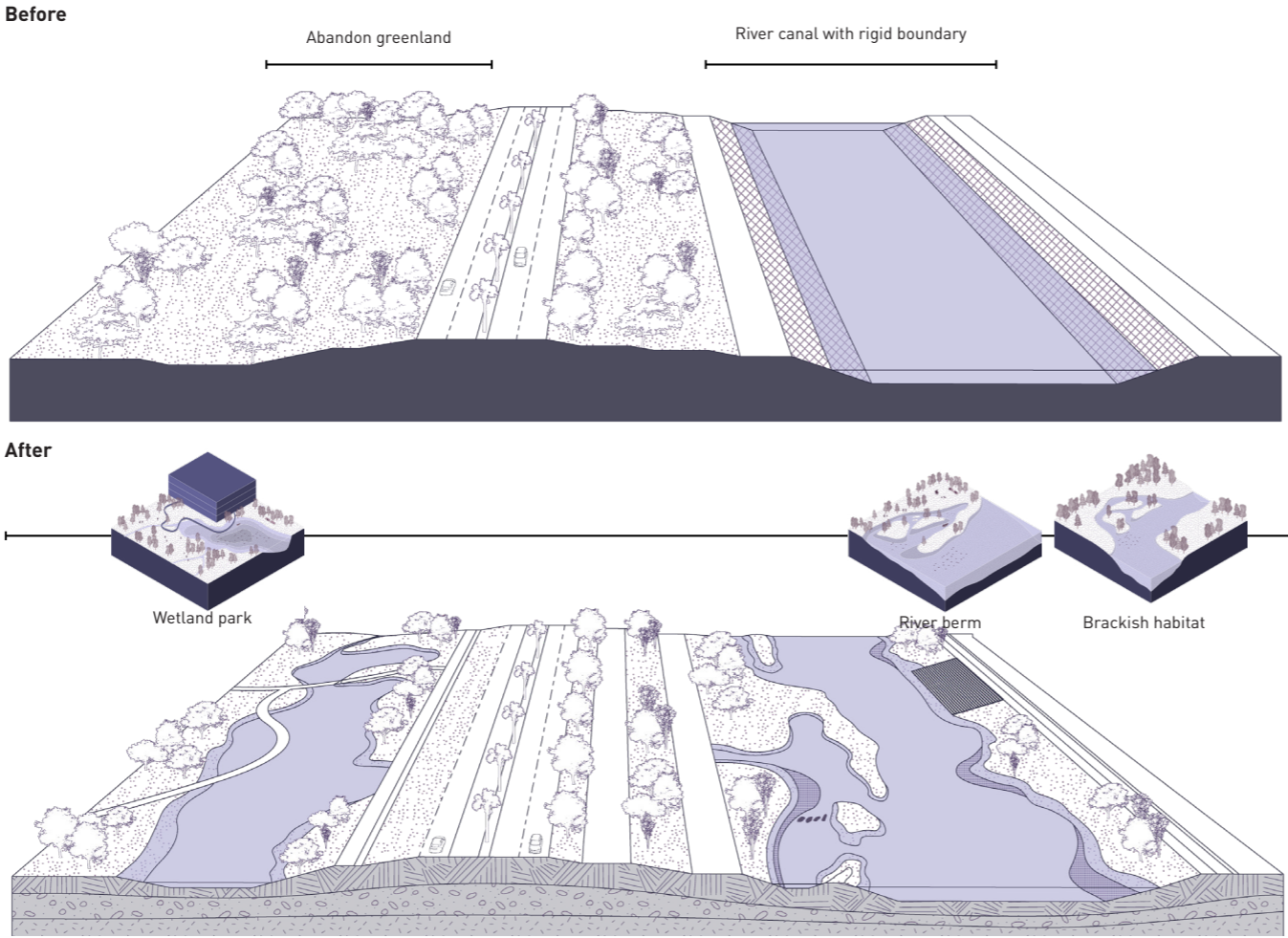


The oyster reef, seagrass bed, and mangrove forest will dominate the new coastal landscape. These three natural habitats involve unique flora and fauna but, more notably, combining all three for systemic ecological benefit. For fish, adult fish and shrimp in the ocean spawn in the oyster reef, and juvenile fish use the tides to travel to the seagrass bed and mangrove forest, which provides food and space for juvenile fish. Adult fish that have reached a certain level of maturity will return to the ocean here. In addition, the three types of habitats support and protect each other. Combining the three can reduce excess nutrients, retain many sediments, and decrease waves to protect the coast.

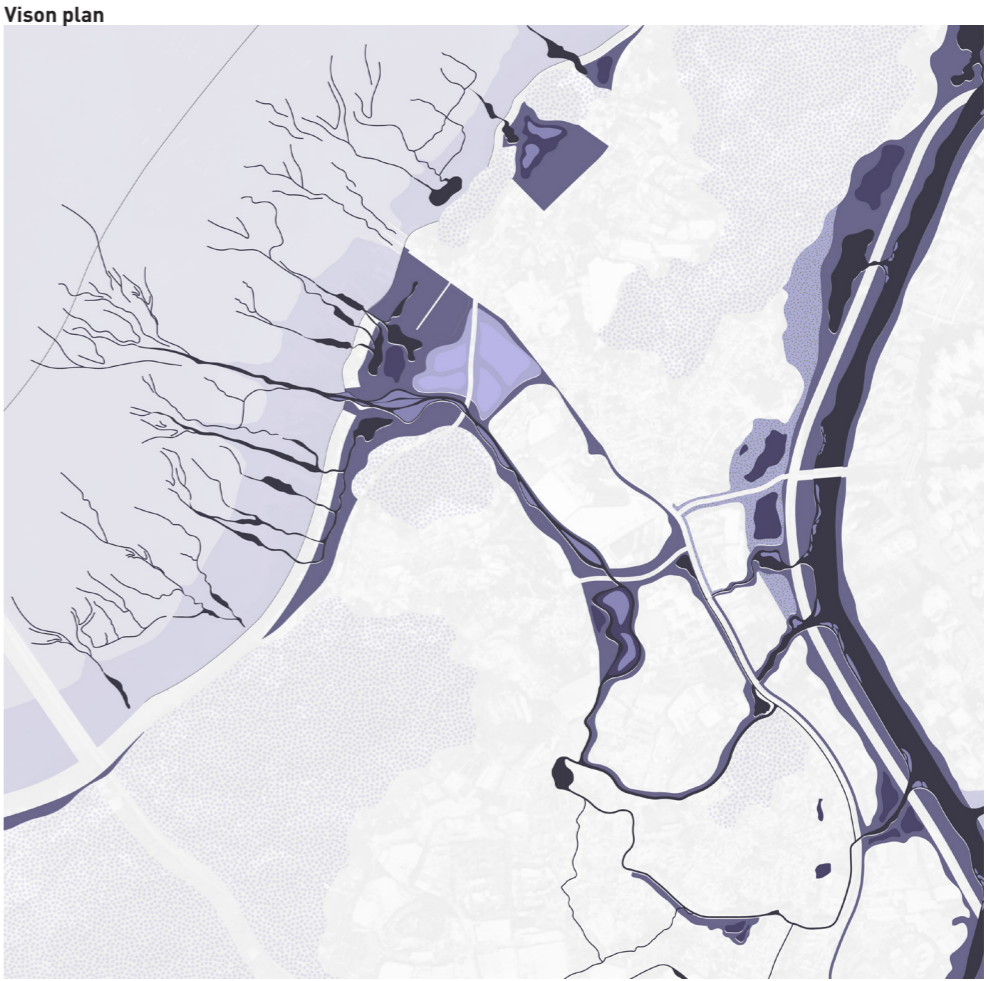
4.3 VISION FOR LAU FAU SHAN AREA

4.3.8 River basin

There is a large amount of derelict green space around the existing river channel, with abundant but chaotic vegetation that obstructs views on both sides of the road. The boundaries of the river are mainly hard-paved, and the accessibility and usability of the river landscape are poor.

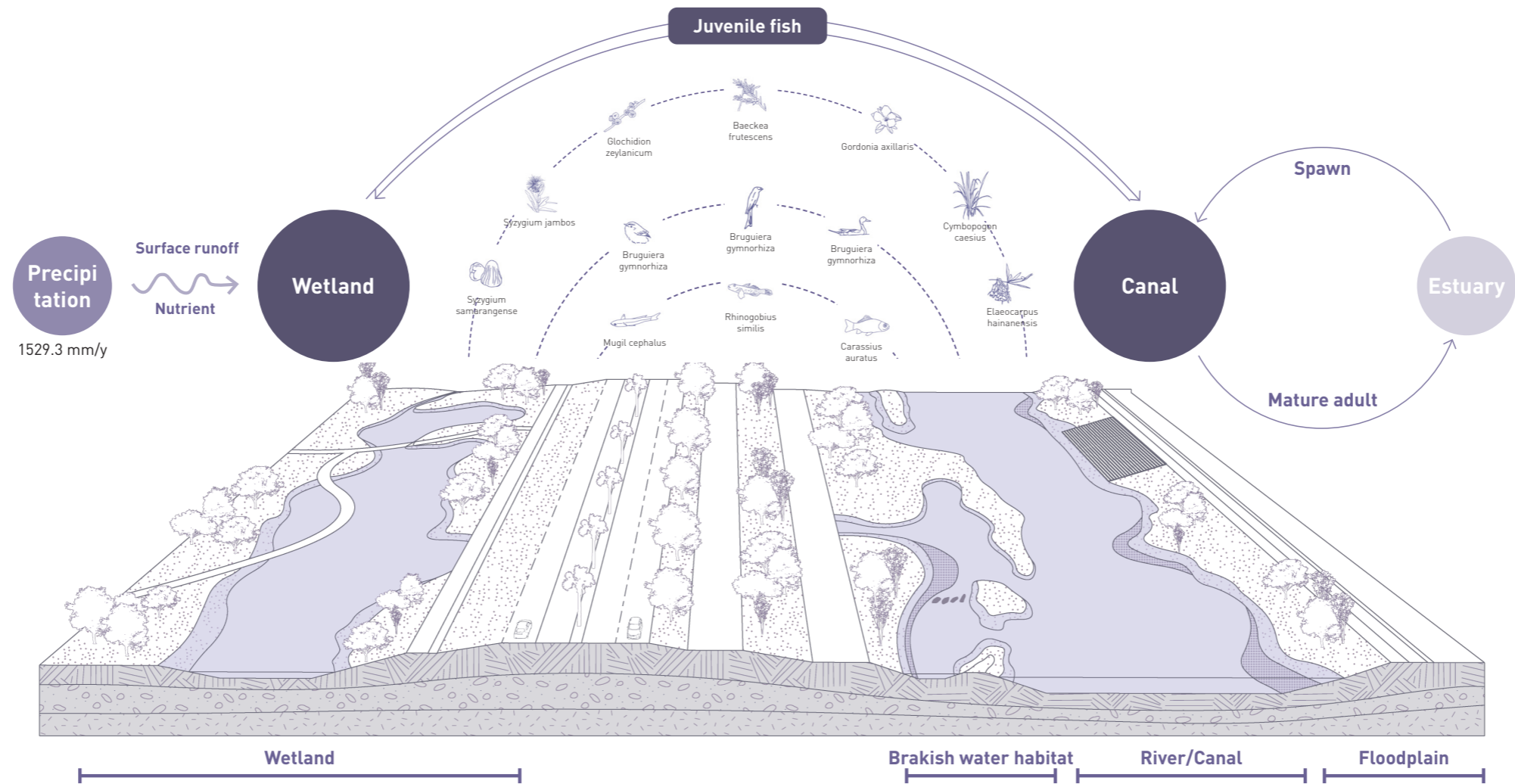


The renovation will increase the accessibility and usability of the landscape on both sides of the river and, at the same time, connect the surrounding wetland water bodies to provide feeding and survival space for fish.



4.3 VISION FOR LAU FAU SHAN AREA

4.3.8 River basin synergistic eco-efficiency

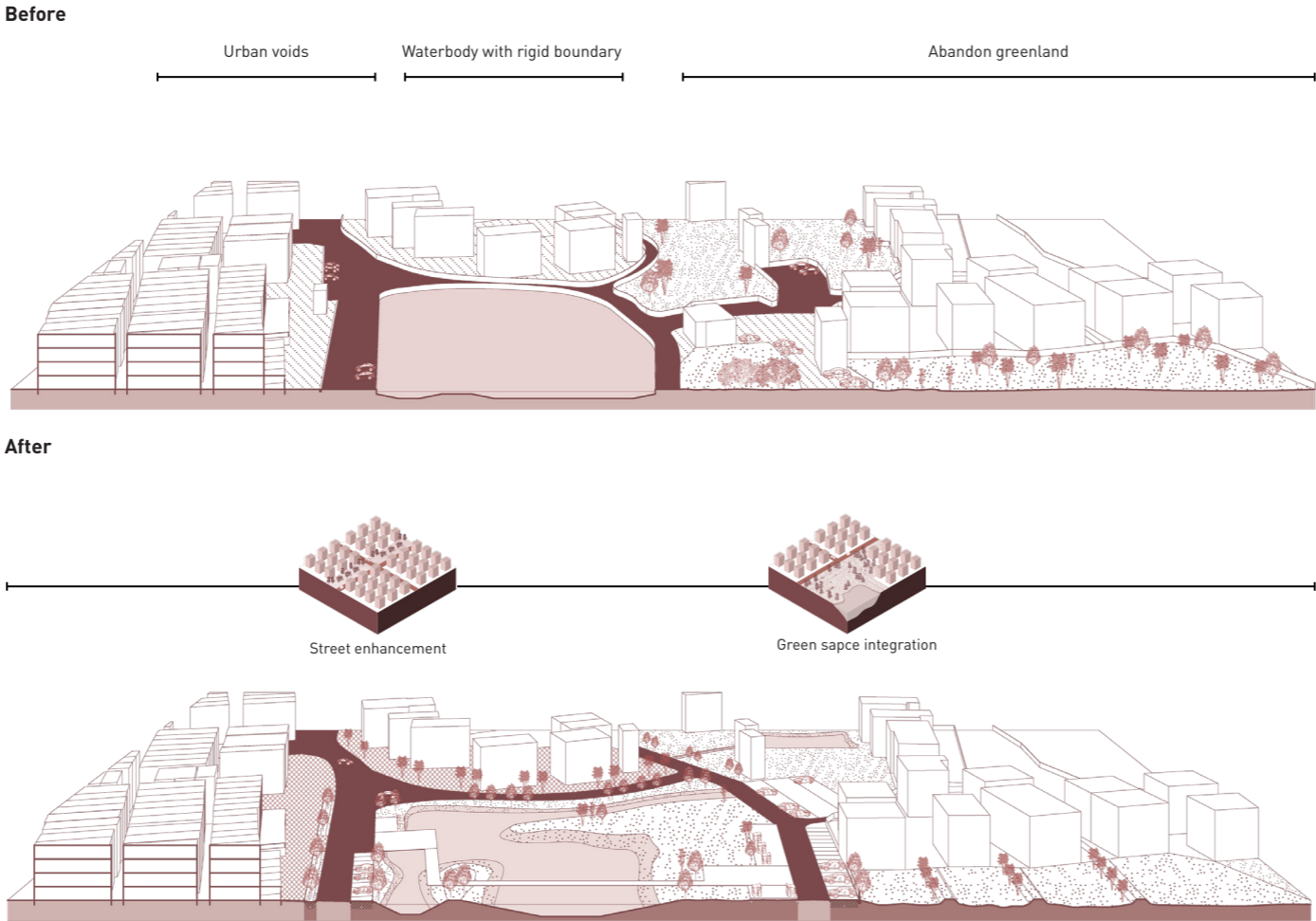


There is also a need for reconnection within the river basin system. Fish at the mouth of the river will travel through the canal to the middle and upper reaches to spawn. At the same time, precipitation and runoff bring large amounts of nutrients into the rivers and wetlands. Juvenile fish travel through the connecting channels to the wetlands and other habitats to feed and grow. Eventually, adult fish can return to the estuaries and oceans through the channels.

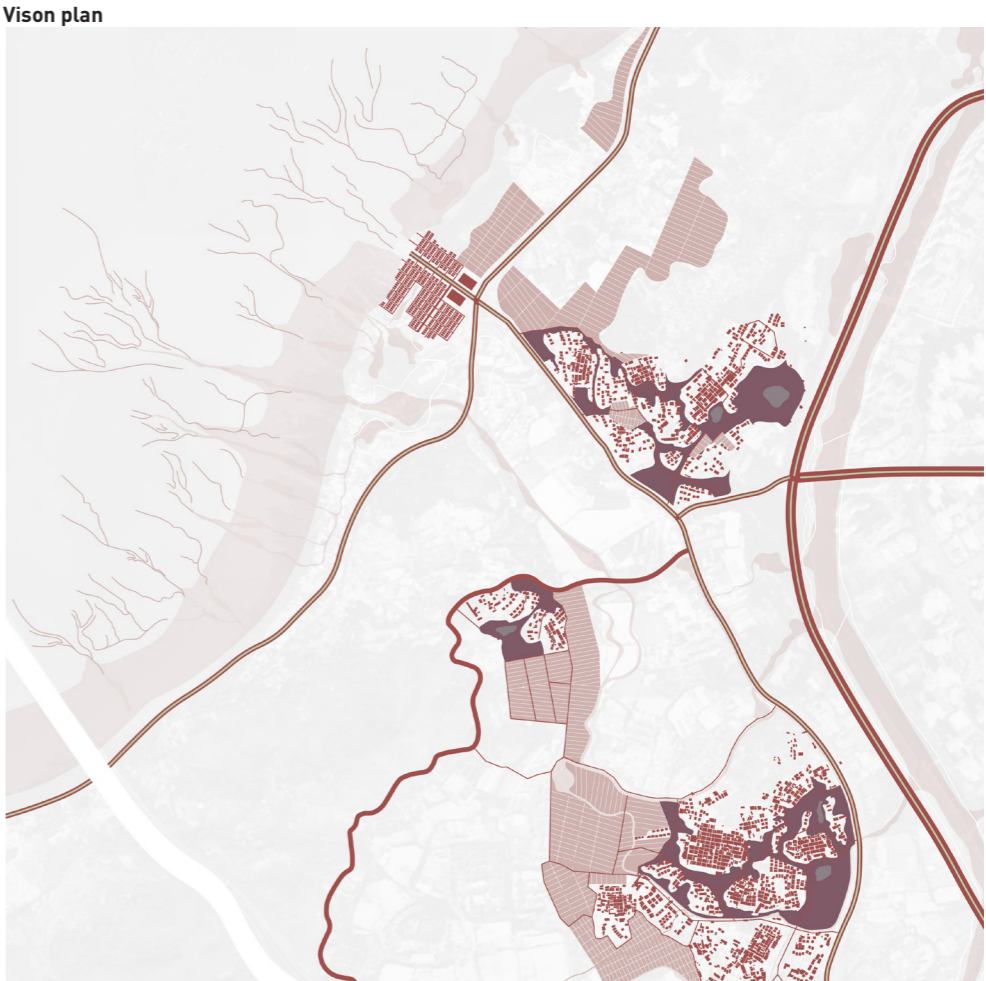
4.3 VISION FOR LAU FAU SHAN AREA

4.3.9 Village

Currently, the village roads are in disarray, vehicles are parked haphazardly, the few landscaped spaces are unmanaged, and the vegetation is in disarray. The water body also needs more utilization and landscape design.



After the renovation, the village's green space can be integrated and used, and the open space along the street can be utilized for fishermen's resting and selling activities, thus improving the living environment of the fishermen.



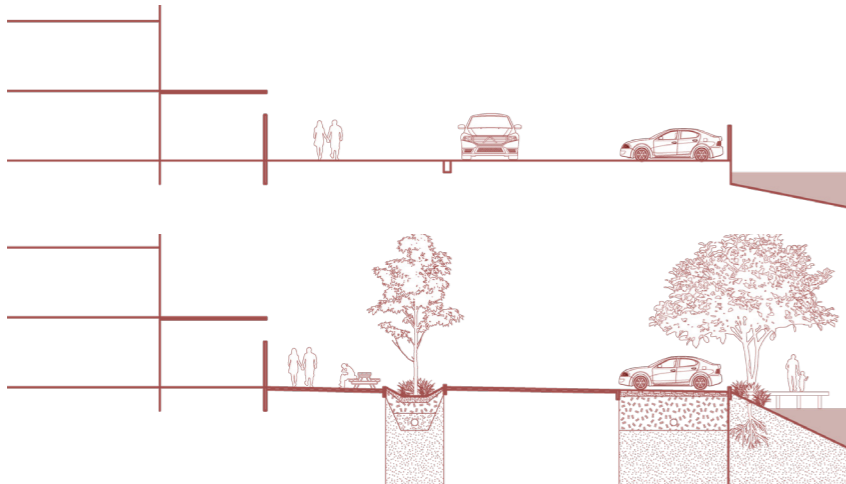
4.3 VISION FOR LAU FAU SHAN AREA

4.3.9 Village

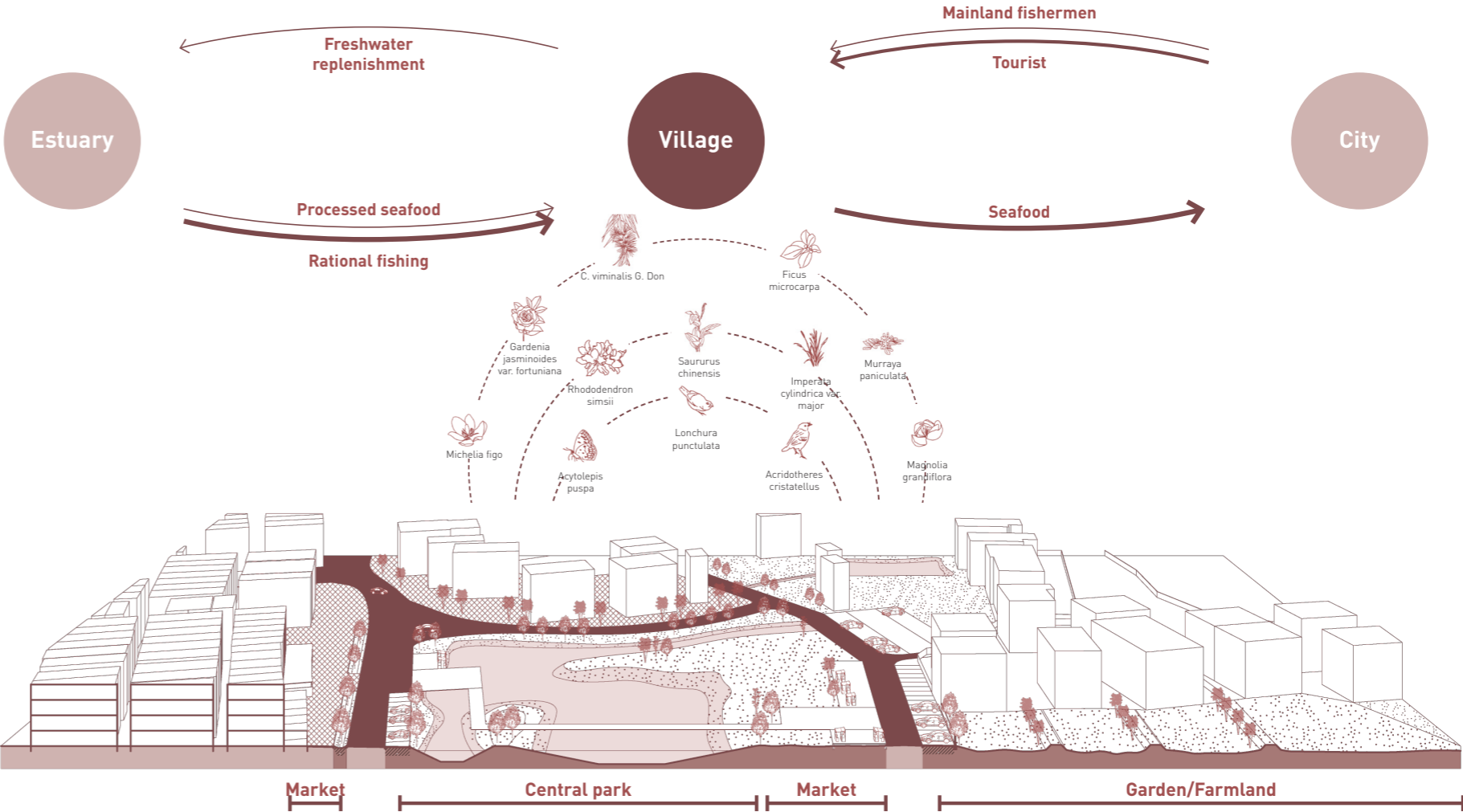
Reorganize roads and consolidate space



Utilization of space along the street

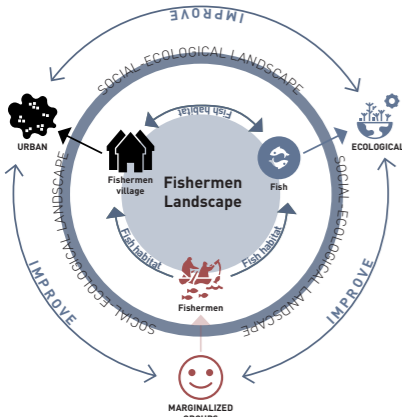


The Villages need more connections to the outside world and public spaces for activities. After re-routing and integrating the green spaces, the village will have a new greenland system. This system will help replenish freshwater resources to a certain extent and serve as a transit point between the city and the coast. During the fishing season, hired fishermen will be able to pass through the village to the coast, and tourists will be able to visit the coast. The fishermen can quickly transport their catch to the city and sell some seafood inside the villages.

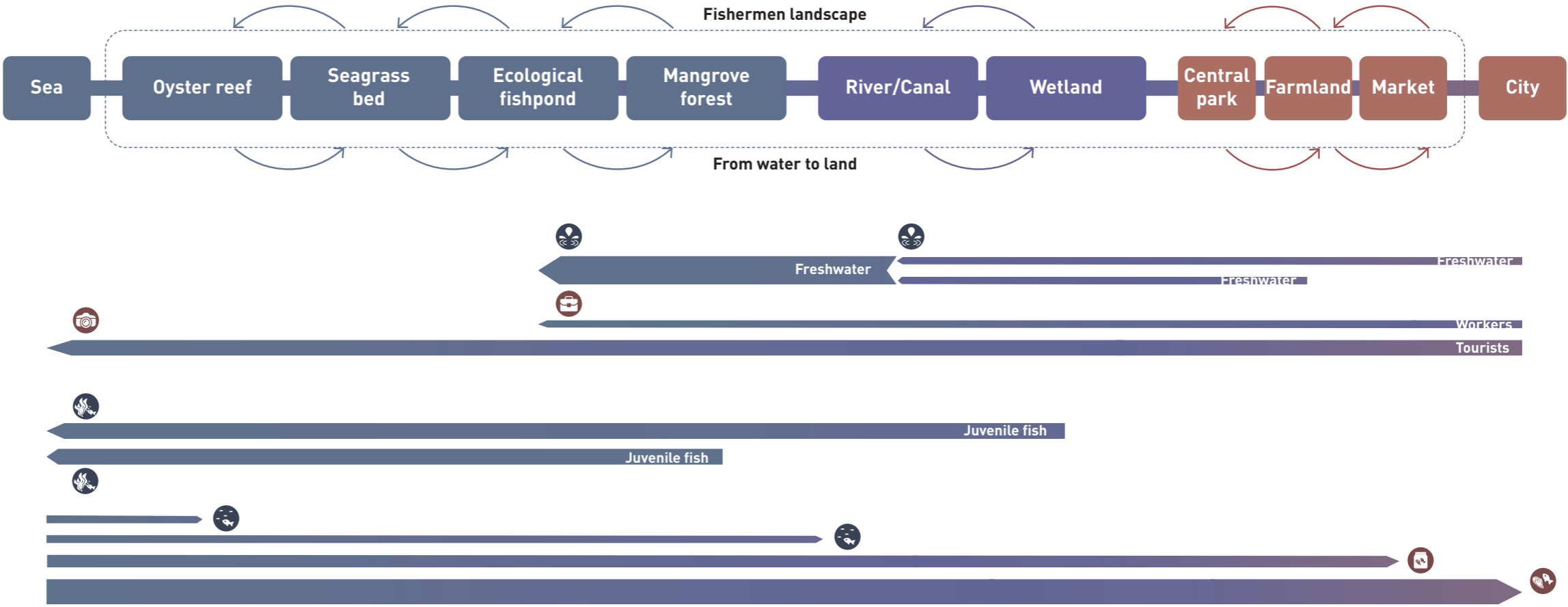


4.3 VISION FOR LAU FAU SHAN AREA

4.3.10 Comprehensive system

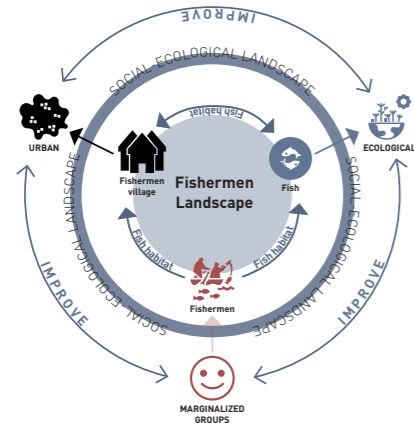


In addition to communication within the various systems, the whole area as a fisherman's landscape is a comprehensive system. Rainwater from the city and the villages flows into the sea through the canal. Relevant workers can be hired from the city to the villages and fishponds, and visitors can reach the various landscapes in the area. For fish, the juvenile fish will grow, and reproduce in various parts of the water system, partly returning to the sea. Adult fish also return to the system to reproduce, and the seafood that people catch can be quickly reprocessed and sold or transported directly to the city.



4.4 Detail design

4.4.1 Introduction



Saltwater-Coastline

Sustainable oyster industry



Sustainable oyster industry

Freshwater-River

Sustainable oyster industry



Sustainable oyster industry

Fishermen-Village

The following section will be zoomed in to where the river meets the coast to create a specific landscape design. The project chose this section because it brings together the coastline area, the village area, and the river area, and it is a concrete representation of how all three are connected through the fish habitat. The oyster habitat is an integral part of the landscape for the fishermen in this area.



4.4 Detail design

4.4.2 Oyster industry



Fertilization

Old oyster industry model:

There are two critical technical problems with the current traditional farming model:

Firstly, the culture cycle is long; it takes three years from seedling picking, 24 months for seedling preservation in low and medium-salinity areas, and six months for fattening in high-salinity areas.

Secondly, the mortality rate is high during the seedling preservation period April to September is the breeding period for oysters every year . During this period, if drought is encountered, the rainy season is delayed, the oysters will die in large areas, and the success rate of seedling preservation will be less than 20%.



New oyster industry model:

The new program techniques are as follows:

- (1) Monitor the number of larvae in the water column in May-June and place attachments for seedling harvesting when larval densities peak in the low salt zone;
- (2) Next, at the end of the seedling harvesting period in September, move the seedlings to the high-salt zone for float-fishing until they reach seed oyster size in March of the following year;
- (3) In April, the middle oysters are moved to the low-salt zone for seedling preservation until September;
- (4) In October, the oysters are moved to the high salt zone for fattening and can be marketed after 5-6 months.

The advantage of the new program is that it avoids the probability of large-scale death, improves the survival rate of seedlings, and shortens the cultivation cycle, which has better economic benefits.



4.4 Detail design

4.4.3 Oyster industry

The pictures on the right show how the new program was implemented at the site.

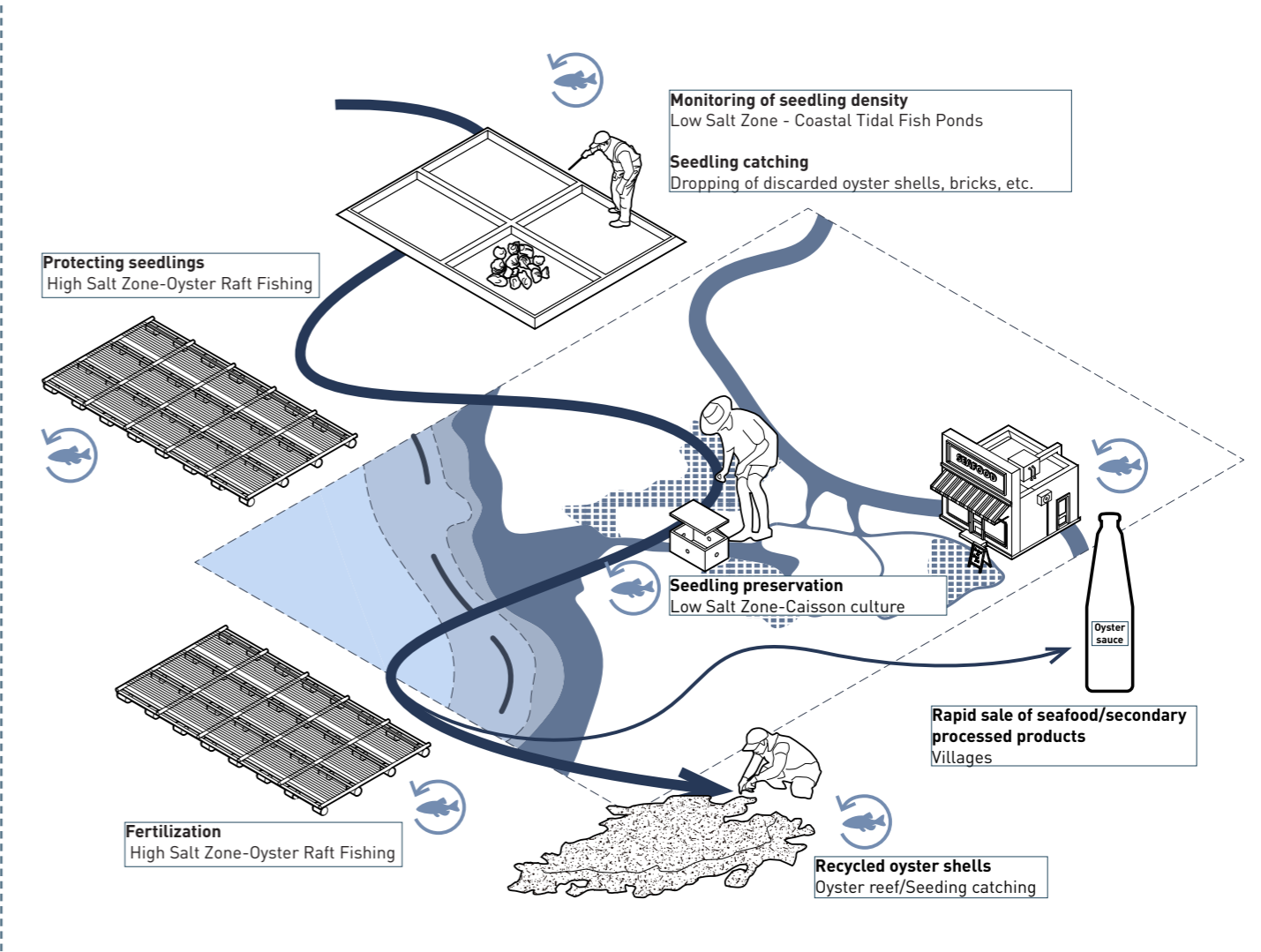
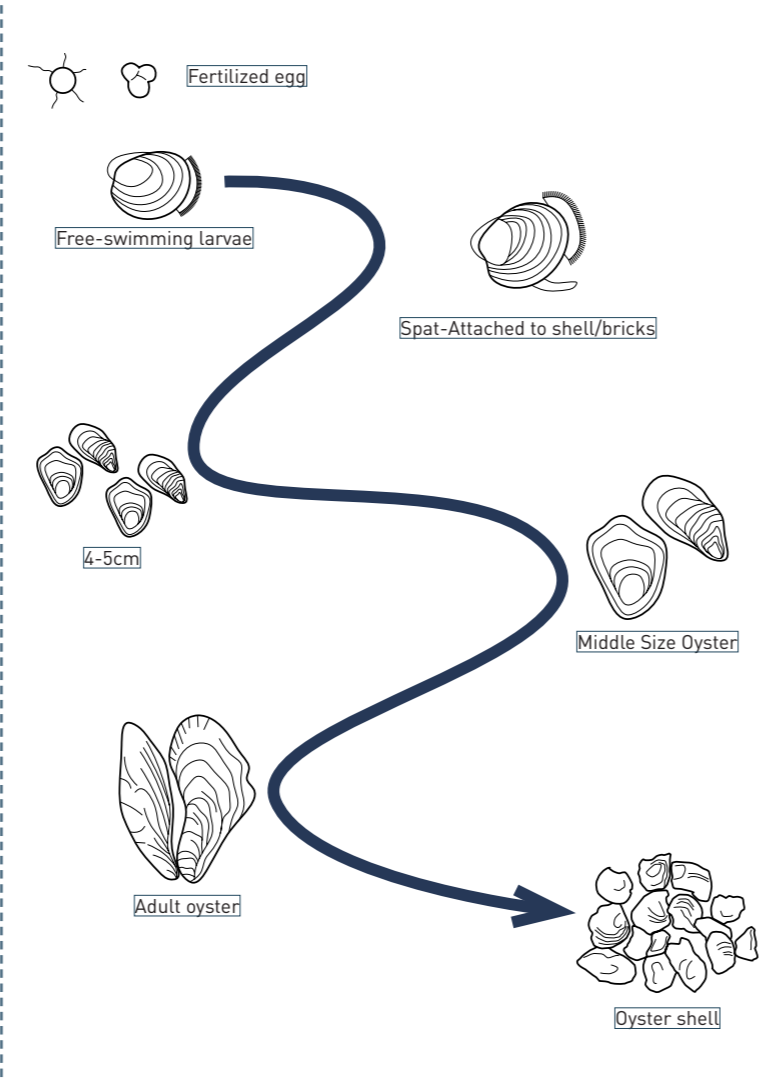
Step 1: Monitor the number of larvae in the water column in May/June and place attachments for harvesting when larval densities peak in the low salt zone. This step will be carried out in coastal tidal fishponds as well as estuaries, where the ebb and flow of the tide can bring in fry produced by mature oysters fished from afar and where the wisdom of the kiwi can be applied to capture oyster fry naturally.

Step 2: The young oysters are then moved to the high salt zone after the harvesting period in September to be float-fished until they reach seed oyster size in March of the following year. Many oyster rafts already existed on the site and could be utilized directly.

Step 3: Move medium oysters to the low-salt zone in April for seedling retention until September. This part will be accomplished primarily in the riverine portion of the site, where salinity is lower than the coastline. The amount of water brought in from upstream promotes oyster growth, and the oysters purify the water to ensure the quality of the water discharged into the Bay.

Part 4: Starting in October, the oysters will be moved to the high-salinity area for fattening and will be ready for market in 5-6 months. This part can still be done using existing oyster rafts.

Finally, in addition to fresh oysters, discarded oyster shells can be recycled locally to build oyster reefs or used as sinking row attachments to catch fry. Some of the oysters can be directly made into dried oysters or processed into oyster oil for quick sale in the village to improve the quality of life of the fishermen.



4.4 Detail design

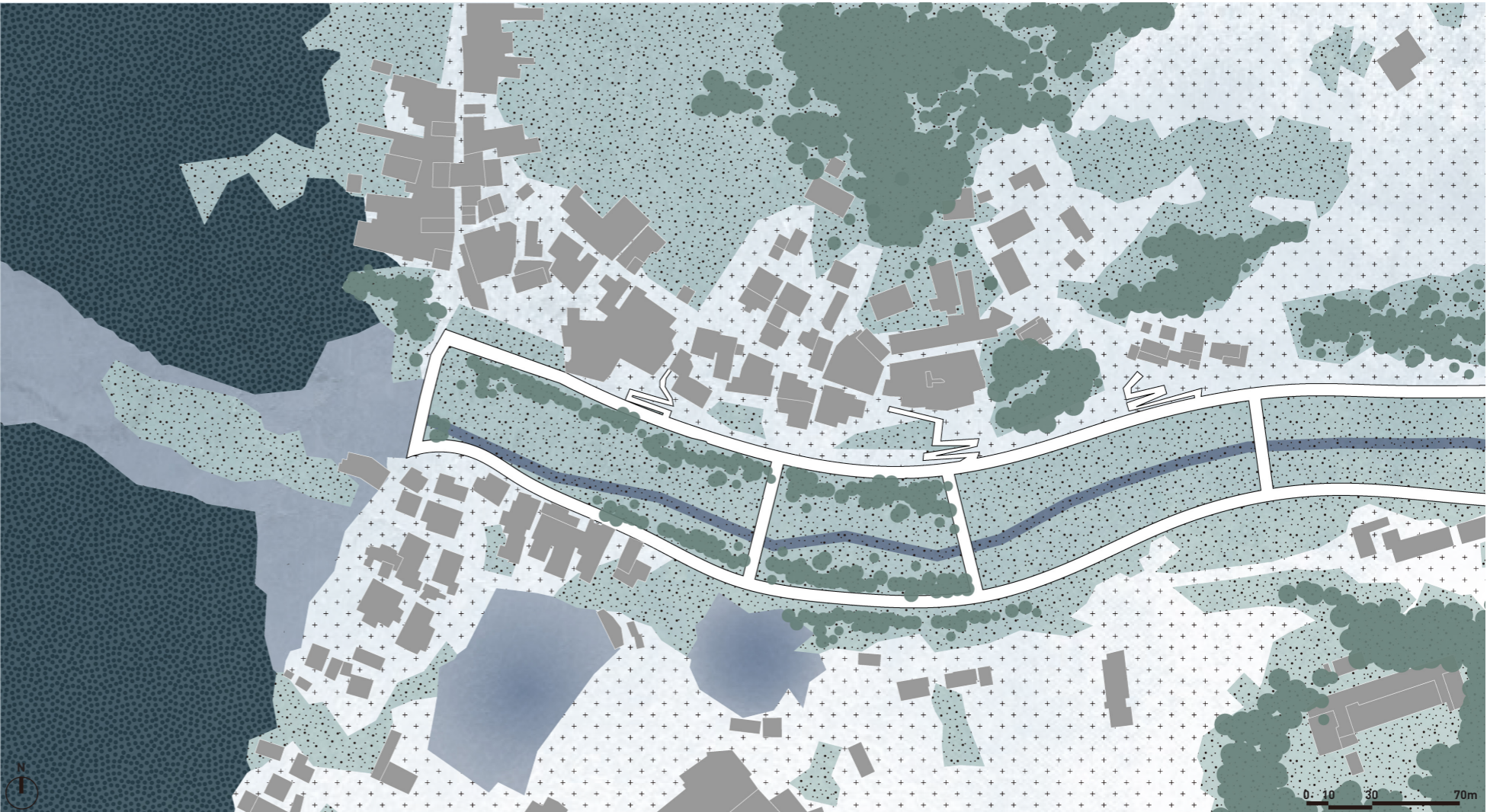
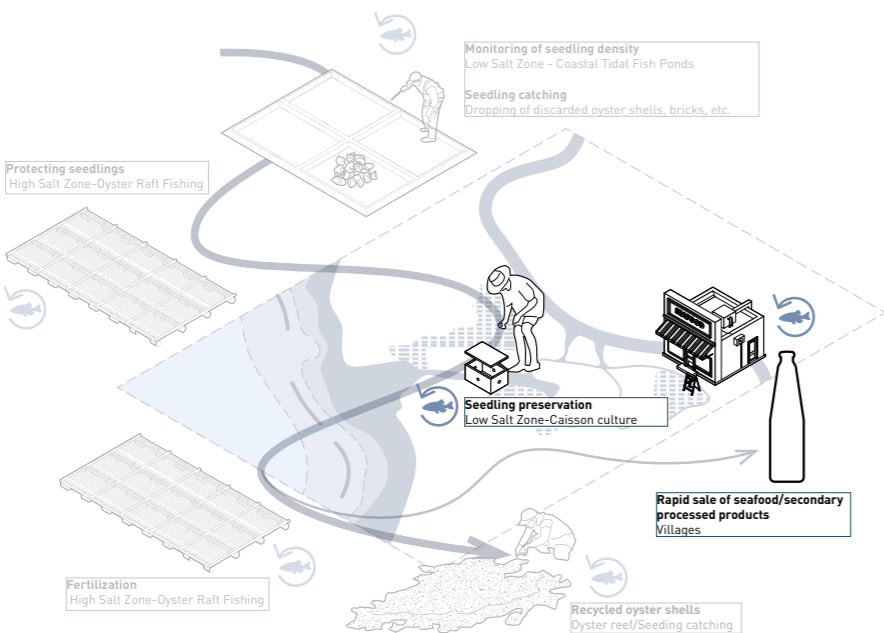
4.4.4 River habitat & Villages-Current situation

Existing situation:

There is a lot of drelict green space around the village. There is no usable public space within the villages. The narrow canal, with the western bank obstructed by unmanaged vegetation flooding. The east side of the river is dominated by hard banks with poor accessibility and utility.

Design ideas:

The river and the surrounding fishponds and wetlands will be the future site for the intermediate nursery stage and a place for villagers to go out and fish, harvest the finished oysters, and sell and process them.



4.4 Detail design

4.4.4 River habitat & Villages-Design ideas

Design points:

The river will be connected to the surrounding fishponds and wetlands, allowing rainwater to be purified and collected. It will also serve as a nursery for oysters. The trestle will also connect these areas, making it easy for fishermen to manage and tourists to move around.

The green spaces around the village will be connected, and the green space on the north side will become the back garden of the village for residents to relax and dry their seafood. The green garden space will also become a transition between the village and the wetland park, allowing visitors and villagers to have a space where they can interact with each other but with a certain degree of isolation so as not to disturb each other.

An ecological dock will be designed on the west side to communicate with the coast so fishermen can go to sea. Purification measures will also purify the runoff that flows through the village and into the sea.



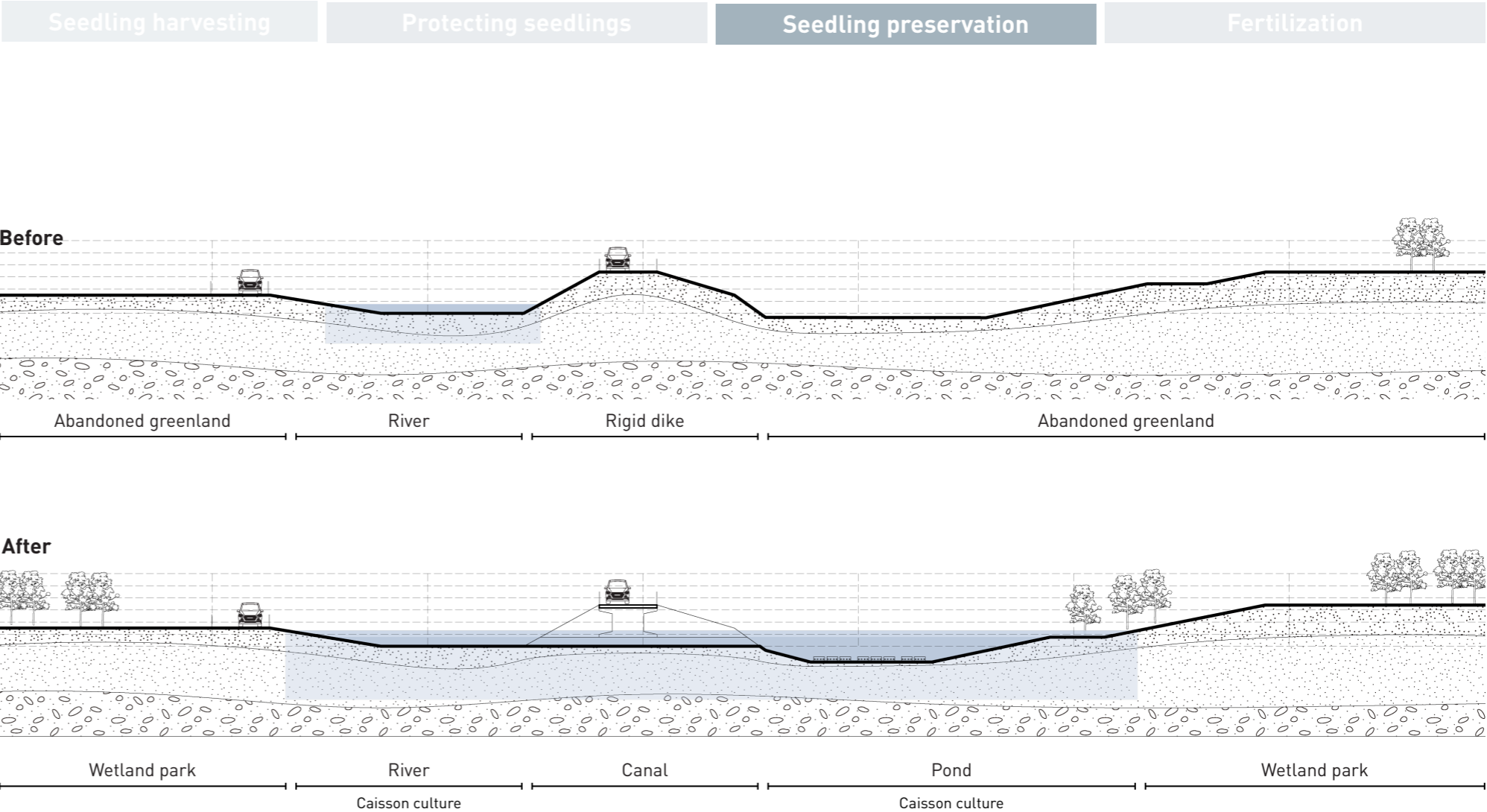
4.4 Detail design

4.4.5 River habitat & Villages-River habitat



The existing riverbank is single, and two elevated roads separate the river from the village, protecting the village from flooding to a certain extent and reducing accessibility.

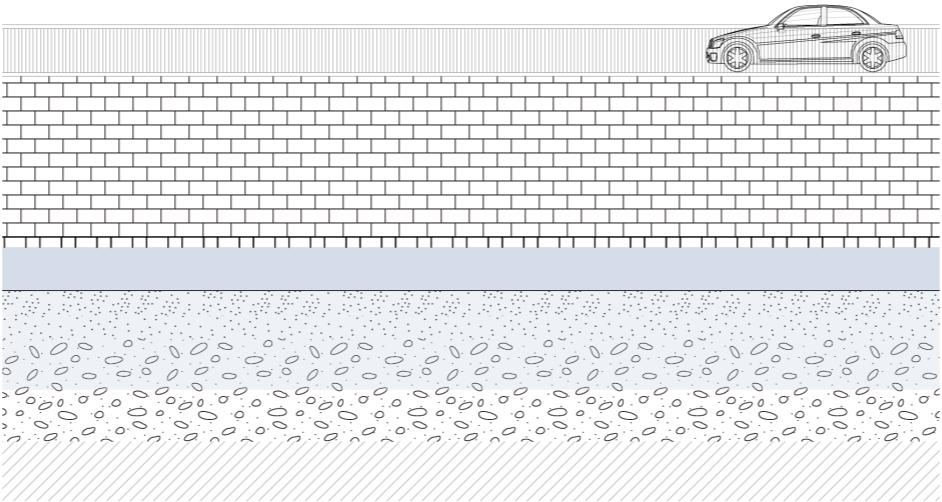
The design hopes to open up the relationship between the river and the surrounding green space, increase the existing topographical changes, and add wetlands and ponds so that the skills to replenish the groundwater can also serve as a place for the oyster farming industry, which is convenient for fishermen's production and life.



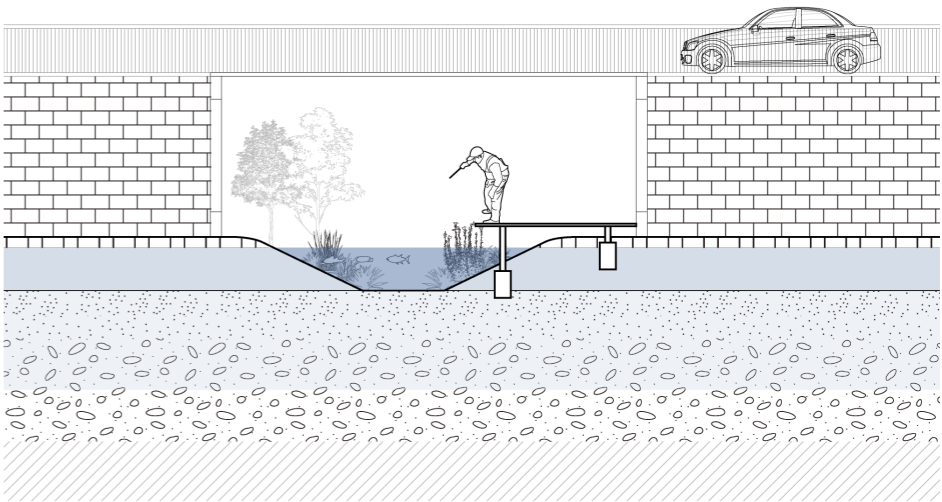
4.4 Detail design

4.4.5 River habitat & Villages-River habitat

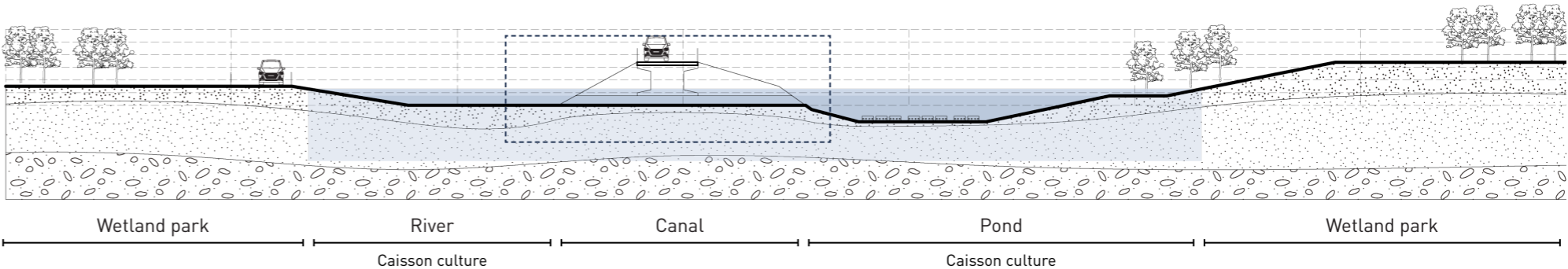
Before



After



The right side is mainly a detailed design for the canal that connects the river and the wetland. The existing monolithic riverbank and the two elevated roads separate the river from the village, reducing accessibility and usability. The design will open up both sides of the road where necessary. At the same time, the canal side will be designed with a trestle to facilitate the fishermen's daily production activities.



4.4 Detail design

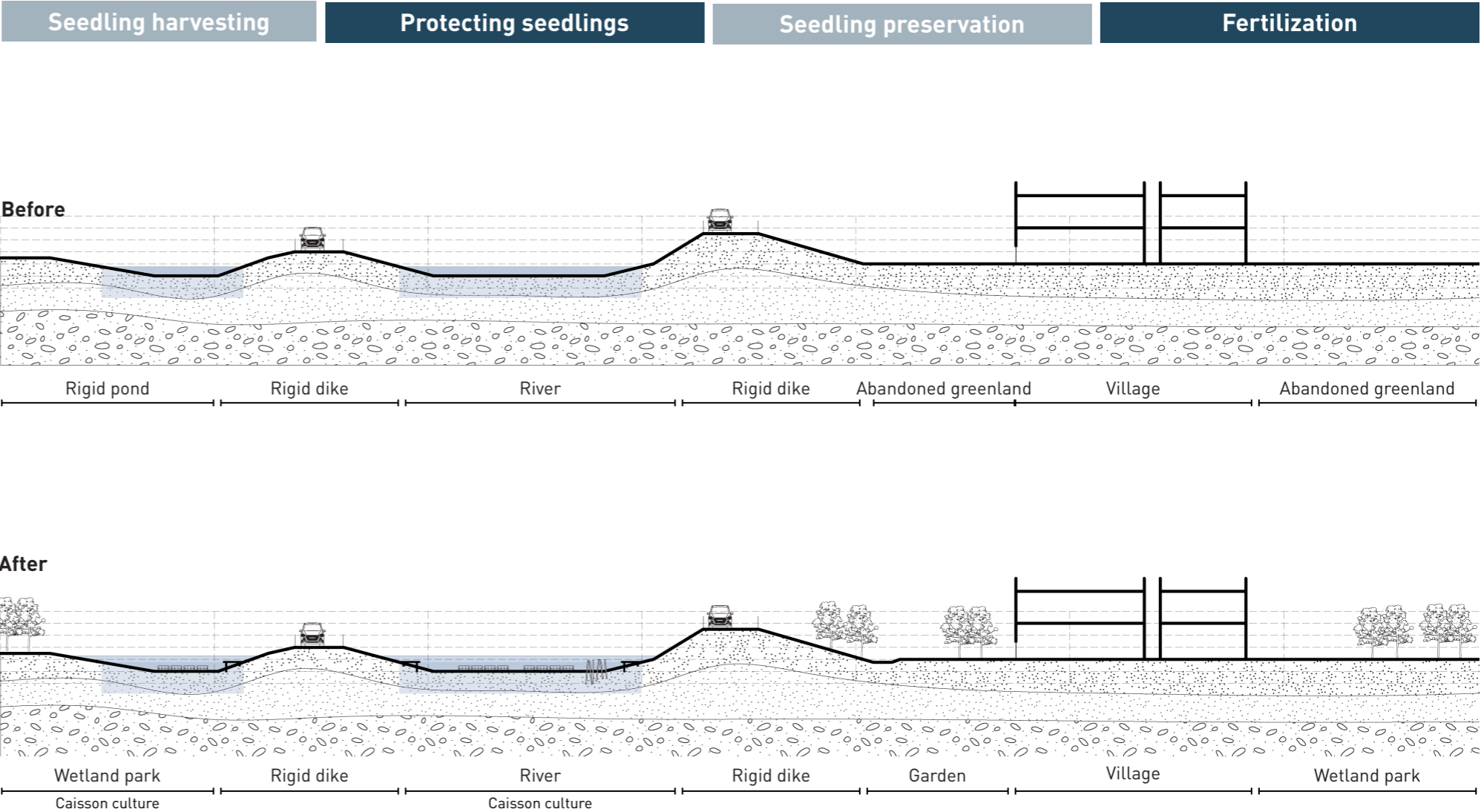
4.4.5 River habitat & Villages-River habitat



In addition to the existing closed river channel, the green spaces in front and behind the village have yet to be well designed and utilized.

The design will increase the trestle and activity space on both sides of the river and soften the river boundary by using existing waste materials such as tree branches and stones on the site to provide food and habitat for fish and birds.

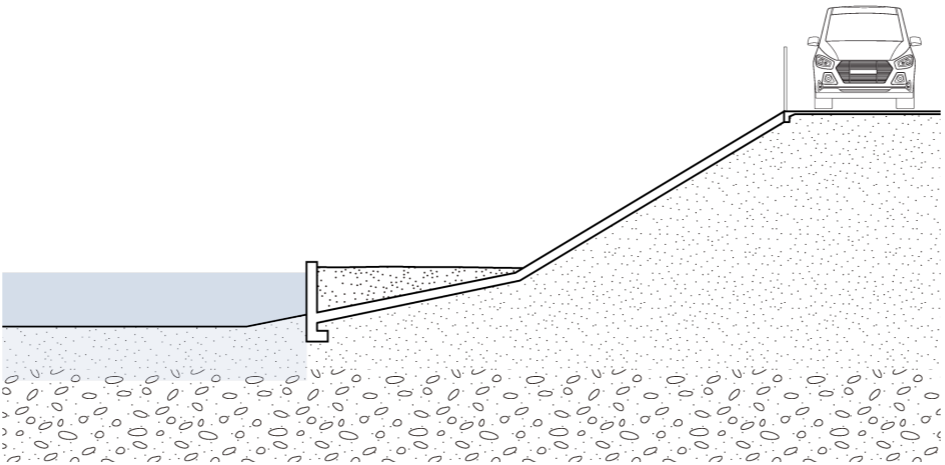
The small green area in front of the village will be transformed into small gardens, and the large green area at the back will be reused to create a park in the future in conjunction with the needs of the large public buildings in the vicinity.



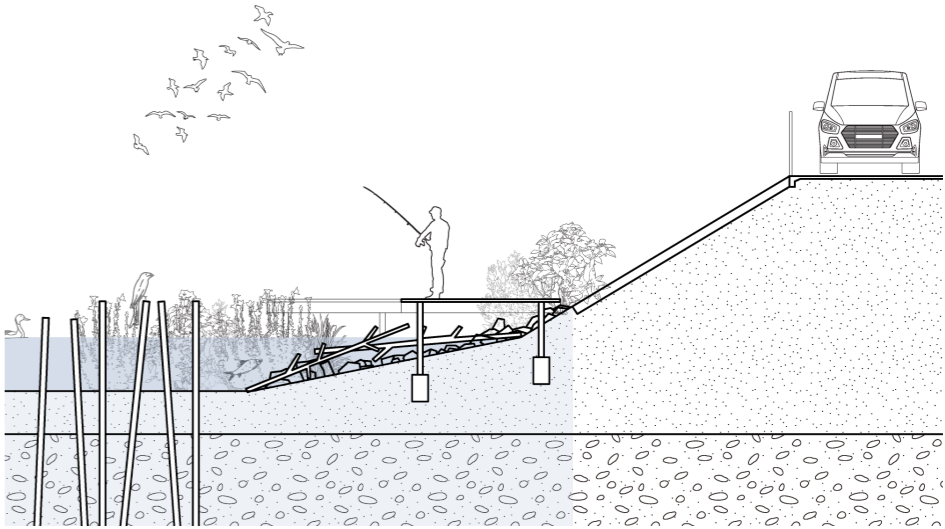
4.4 Detail design

4.4.5 River habitat & Villages-River habitat

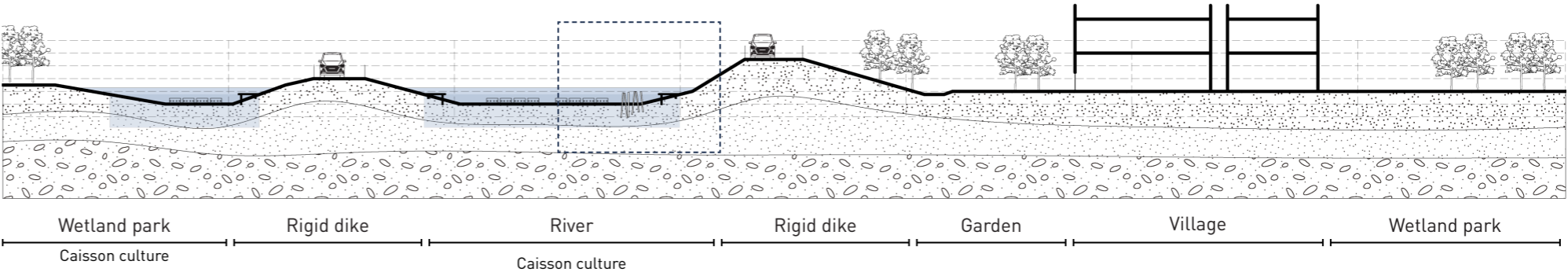
Before



After

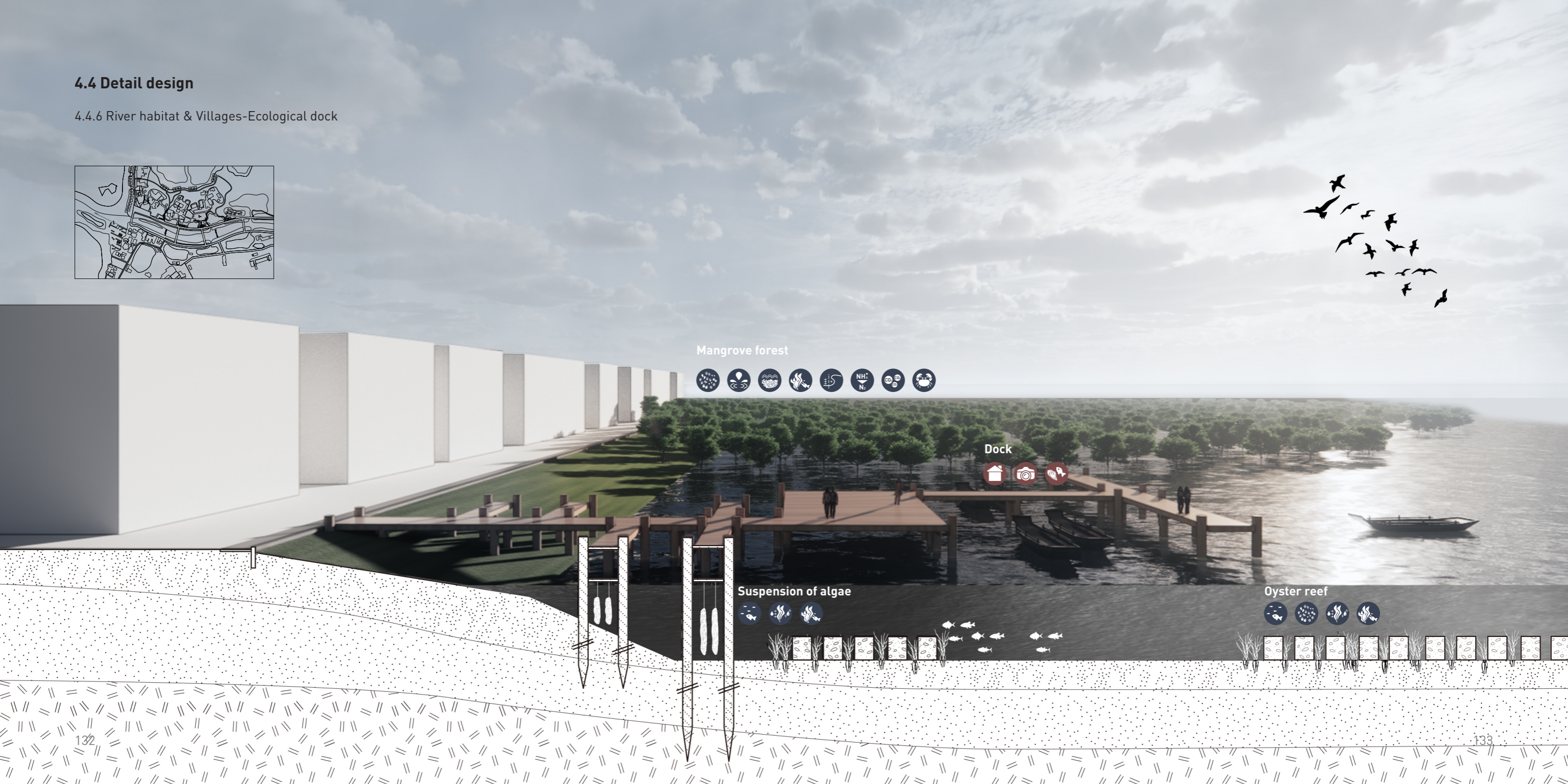
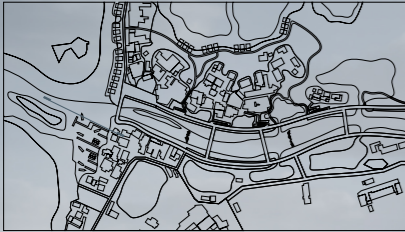


On the right side is the detailed design of the barge, which removes part of the existing rigid boundary and softens the river boundary with waste materials such as branches and stones on the site to provide food and habitat for fish and birds.



4.4 Detail design

4.4.6 River habitat & Villages-Ecological dock



Mangrove forest



Dock



Suspension of algae



Oyster reef



4.4 Detail design

4.4.1 Raft & Villages-Village gardens



Wetland



Raft houses



Resting gardens



Seafood processing



4.4 Detail design

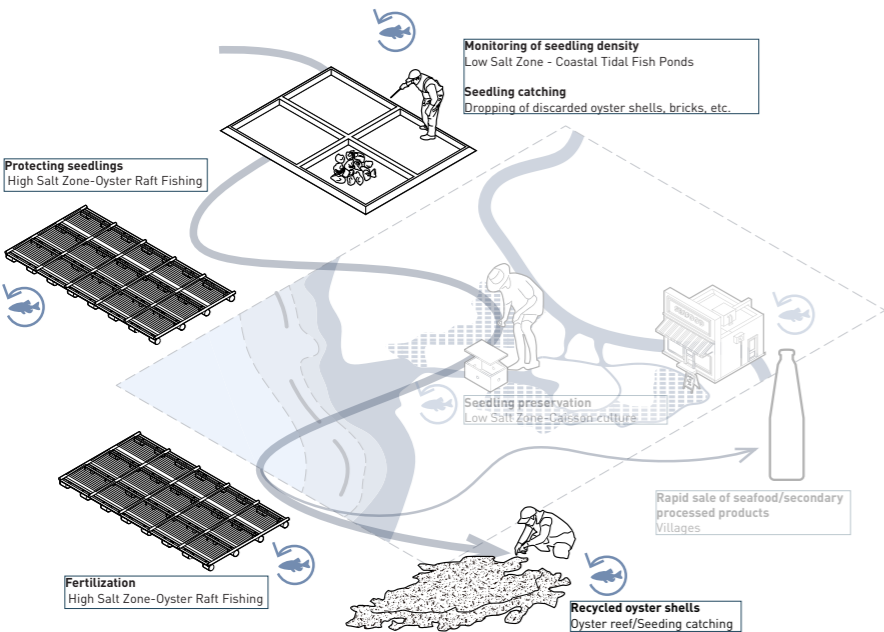
4.4.8 Coastline habitat & Villages-Current situation

Existing situation:

The coast has a valuable mud flat resource that has not been well utilized. Many abandoned oyster fields occupy this shallow area, and environmental organizations have begun to clear the land of abandoned oyster piles, which could be used to create oyster reefs to provide habitat for marine life. The abandoned fishponds near the land are littered with fishery waste and shells, and the mangrove forests are in a poor state of restoration.

Design ideas:

By constructing a permeable dam and partially stacking the terrain, a more suitable environment for mangrove restoration can be created. Ecological fishpond, seagrass bed, and the oyster reef can help people better utilize the resources of the shoal to create a rich fish habitat and help the site improve ecological benefits.



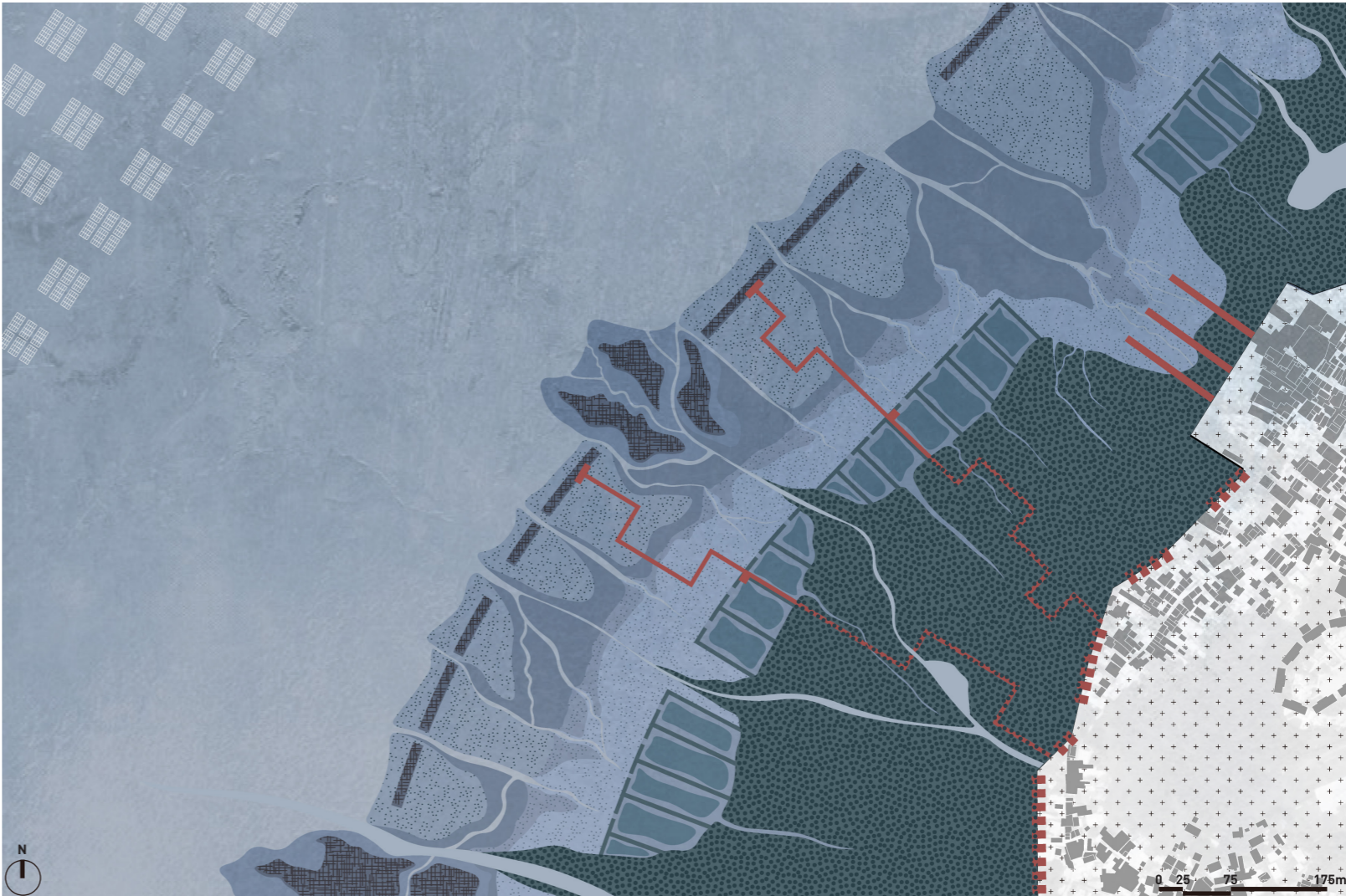
4.4 Detail design

4.4.8 Coastline habitat & Villages-Design ideas

Design points:

Coastal sites are an essential part of the implementation of the new oyster aquaculture model, as high salt zones and tidal ponds along the coast can help capture oyster fry. The oyster rafts in the distance are essential for seedling retention and fertilization. Discarded oyster shells can be recycled for oyster reefs or used to capture oyster fry. The remodeling of coastal habitats will increase ecological benefits while maintaining the livelihoods of fishermen.

The following section describes the strategies through which coastal landscapes will be restored and reshaped and how they will evolve.

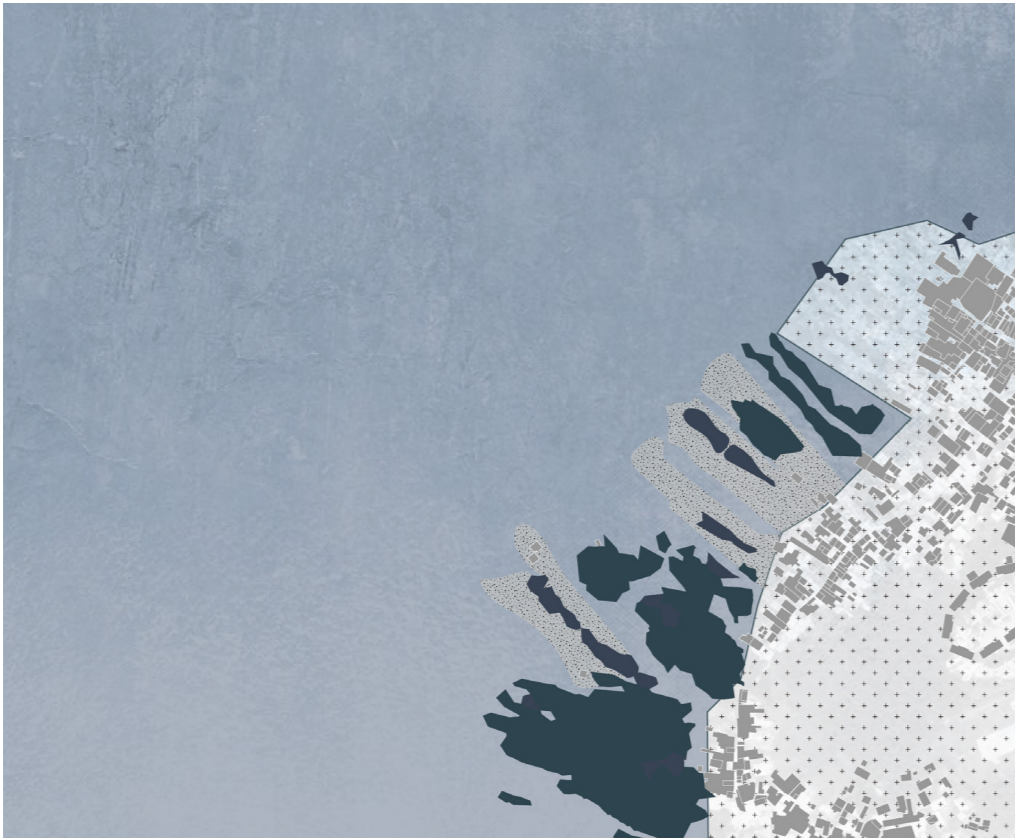


4.4 Detail design

4.4.8 Coastline habitat & Villages-Current situation

Many abandoned oyster fields occupy this shallow area, and environmental organizations have begun to clear the land of abandoned oyster piles, which could be used to create oyster reefs to provide habitat for marine life. The abandoned fishponds near the land are littered with fishery waste and shells, and the mangrove forests are in a poor state of restoration.

Plan



Section



Section perspective



4.4 Detail design

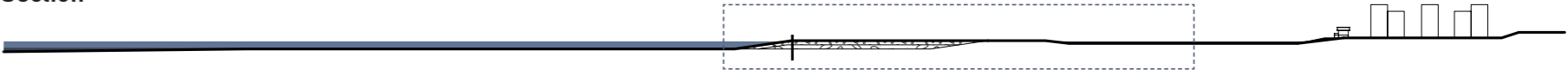
4.4.8 Coastline habitat & Villages-2-3 years

The first step is to restore the mangroves along the coast. By constructing permeable dams, the site will capture more sediment. However, the sediment captured by building dams alone will not be sufficient to support mangrove restoration in 2-3 years. So, what needs to be done before constructing these permeable dams is to utilize the existing abandoned oyster piles and other fishery waste at the site to raise the terrain.

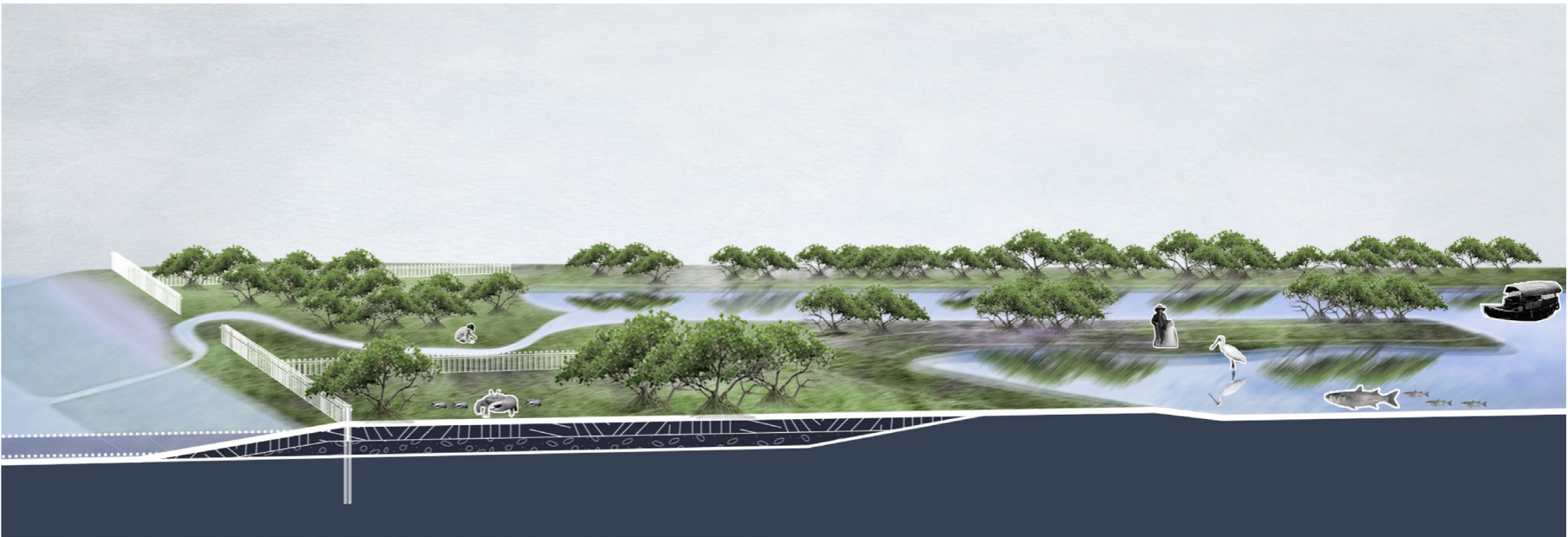
Plan



Section



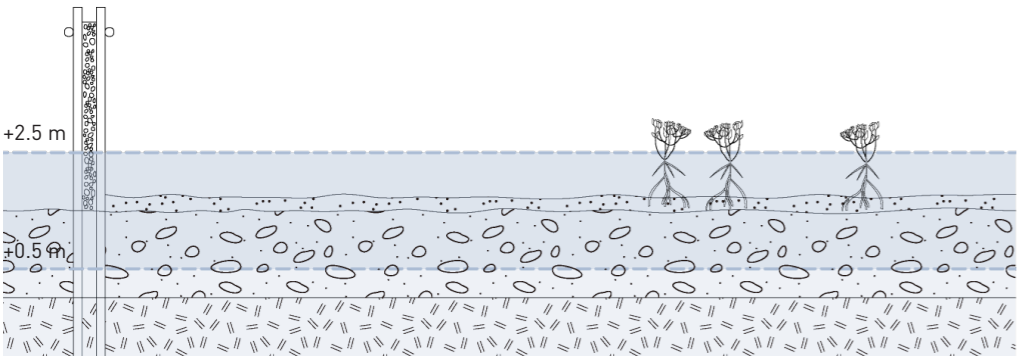
Section perspective



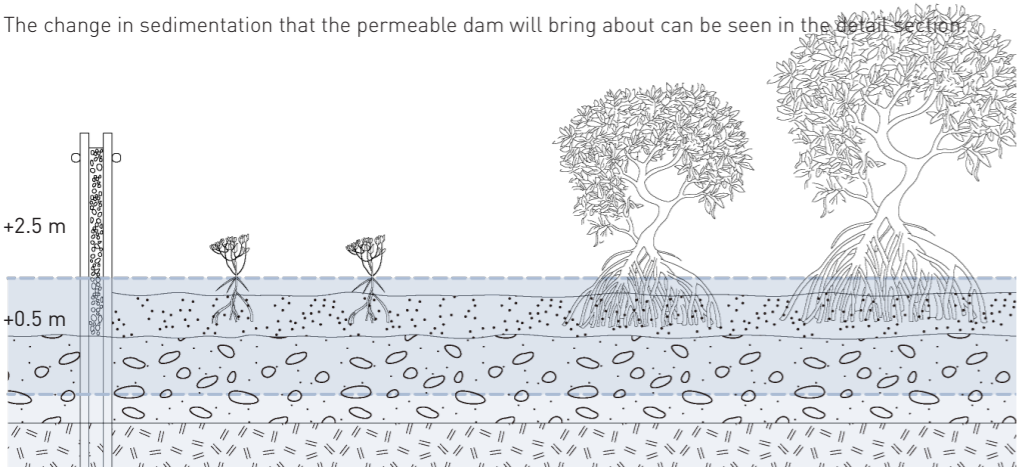
4.4 Detail design

4.4.8 Coastline habitat & Villages-2-3 years

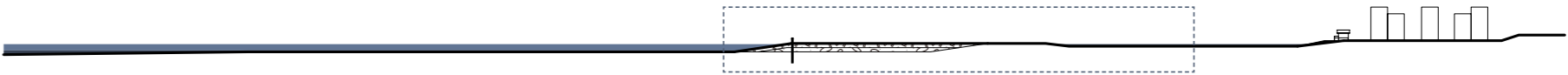
Detail section



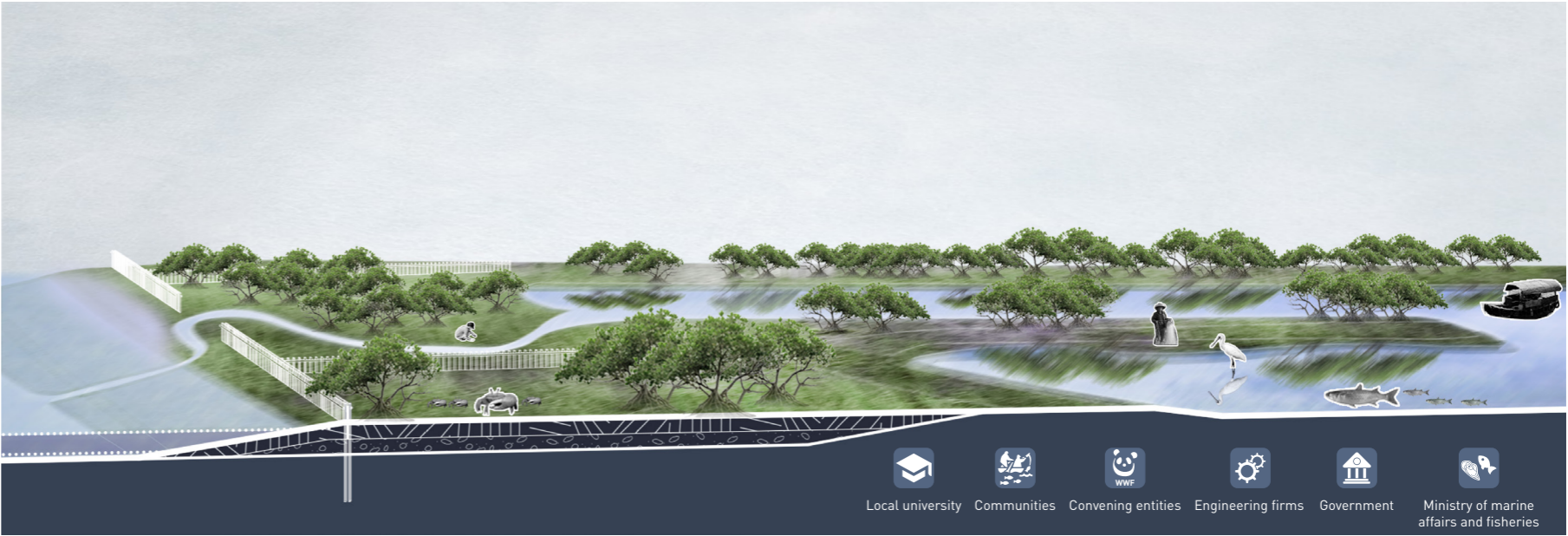
The change in sedimentation that the permeable dam will bring about can be seen in the detail section.



Section



Section perspective

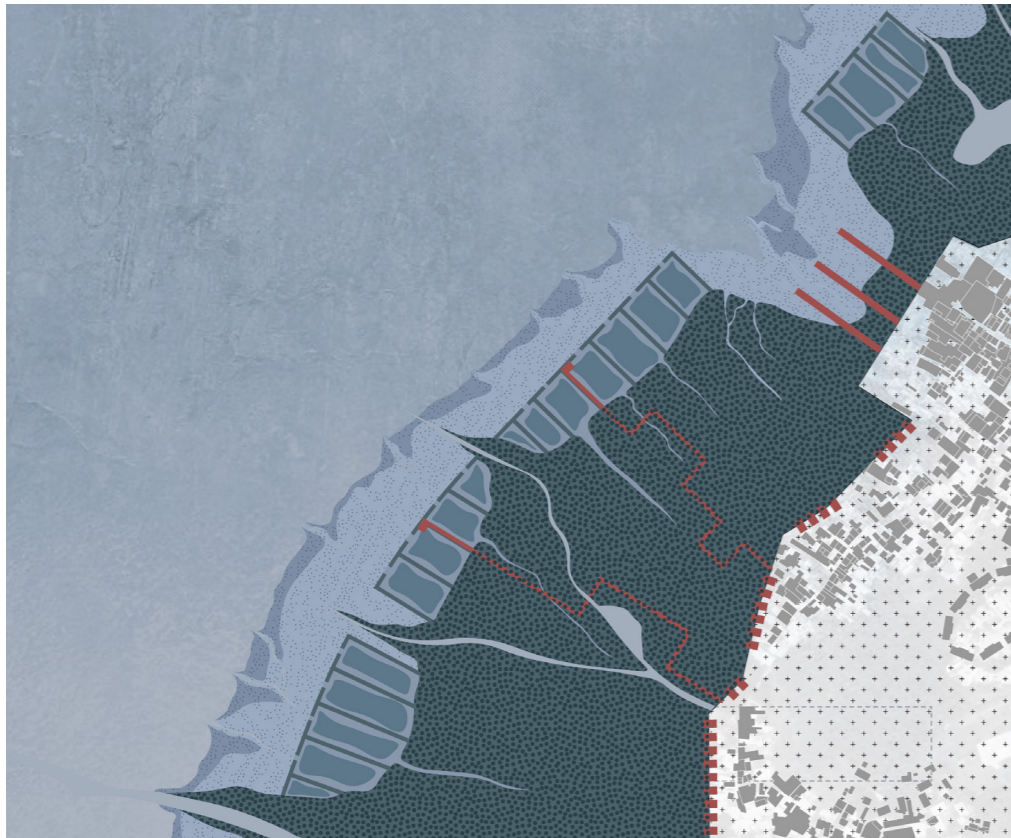


4.4 Detail design

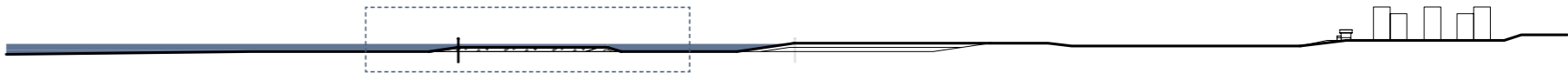
4.4.8 Coastline habitat & Villages-5-6 years

Since the permeable dam is made up of bamboo and shrubs, it will gradually disappear unless maintained for a long time. So, after 2-3 years, the first coastal dam will disappear naturally. At this point, the second step can be taken. Create small dams on the far side of the mangrove to create tidal fishponds and build new permeable dams on the outside of the fishponds. The new deposits will create a more suitable environment for the seagrass beds to grow. The seagrass beds and the mangroves provide nutrients for the fishponds, and the tidal action allows for the exchange of material between the ocean and these small fishponds.

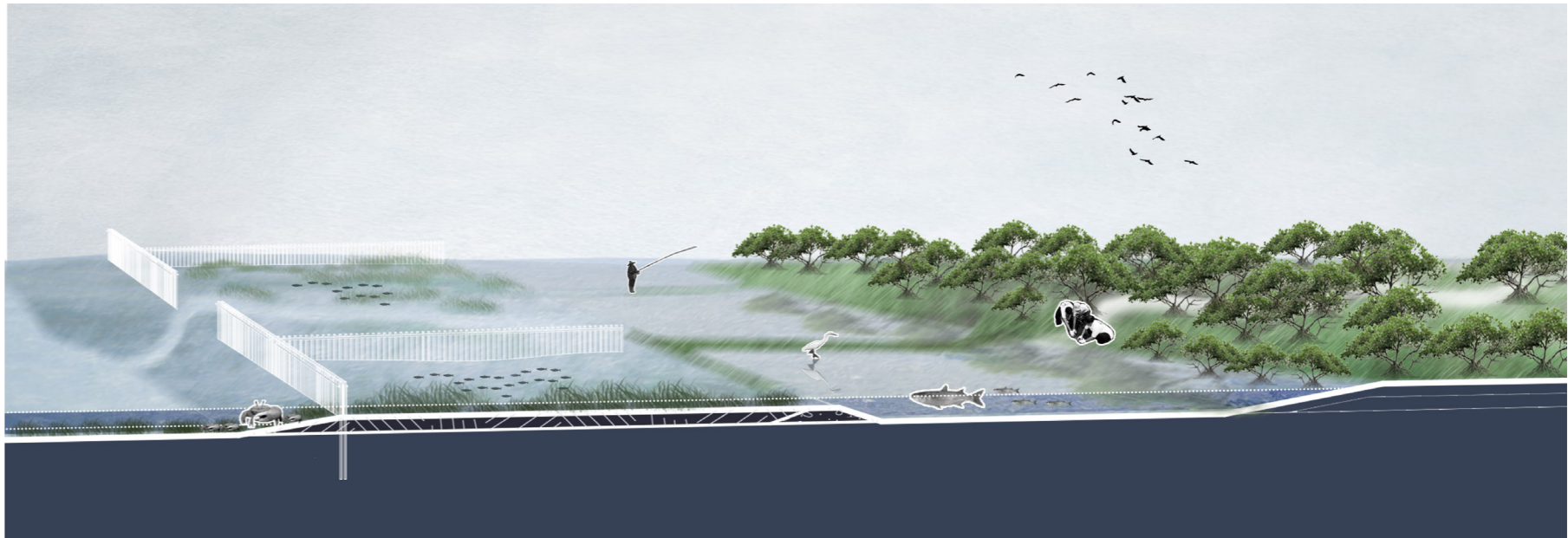
Plan



Section



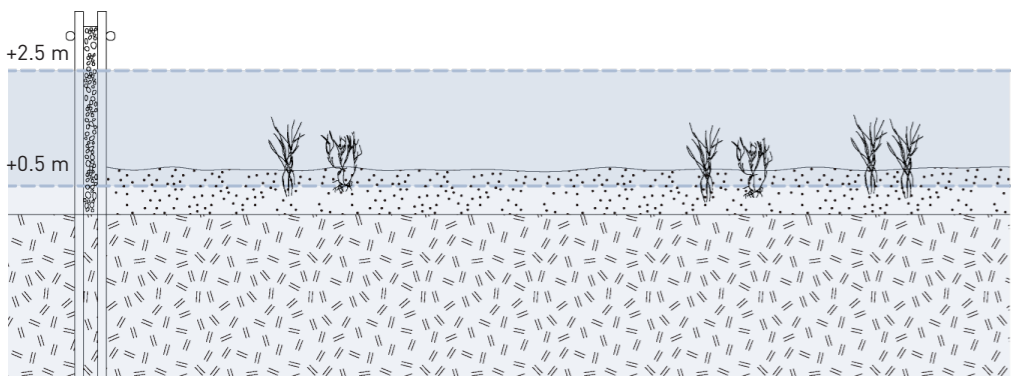
Section perspective



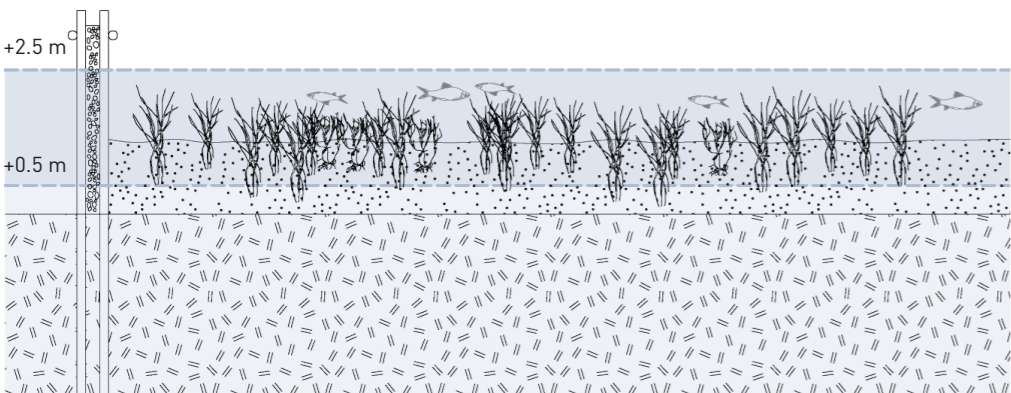
4.4 Detail design

4.4.8 Coastline habitat & Villages-5-6 years

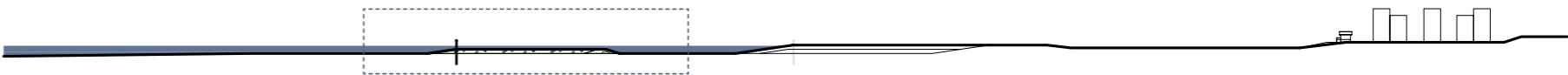
Detail section



The change in sedimentation that the permeable dam will bring about can be seen in the detail section.



Section



Section perspective

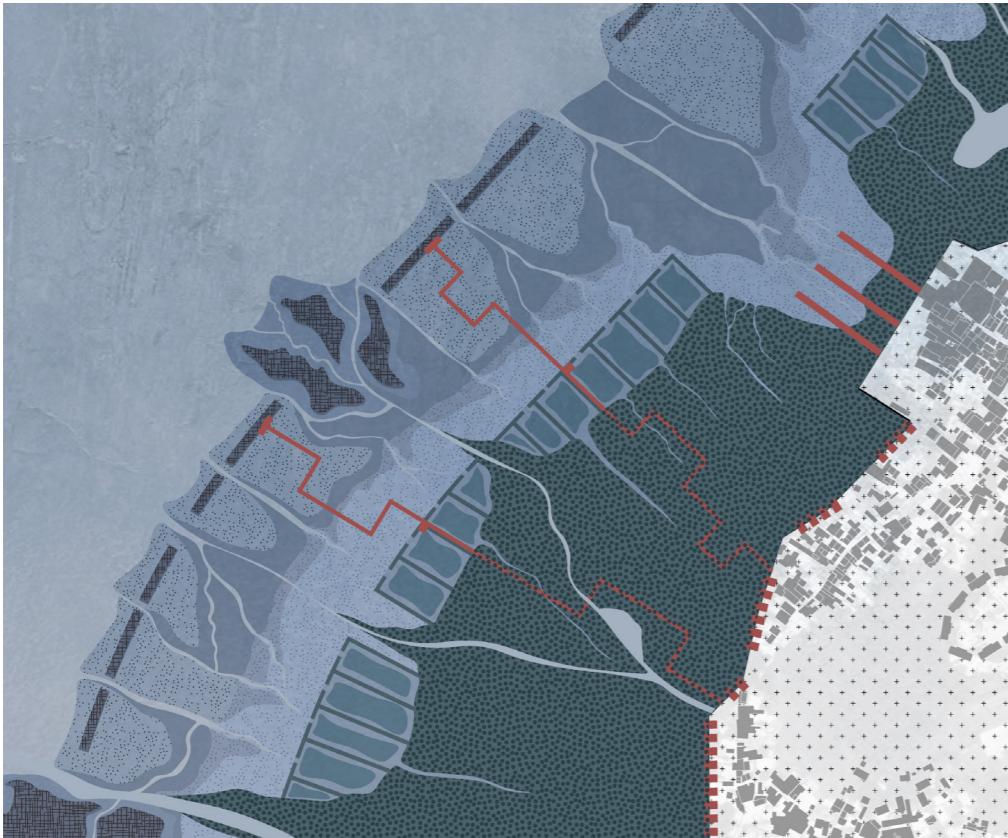


4.4 Detail design

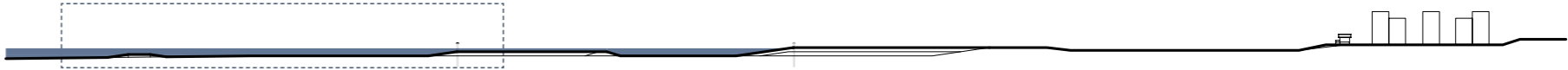
4.4.8 Coastline habitat & Villages-10 years

Once the second permeable dam has naturally dissipated, a third part of the modification can be carried out by constructing oyster reefs in appropriate locations, which will further protect the coast from erosion and also protect fish habitats such as mangrove seagrass beds that have already been established. These oyster reefs will also change the depositional patterns and protect the shoal habitats.

Plan



Section



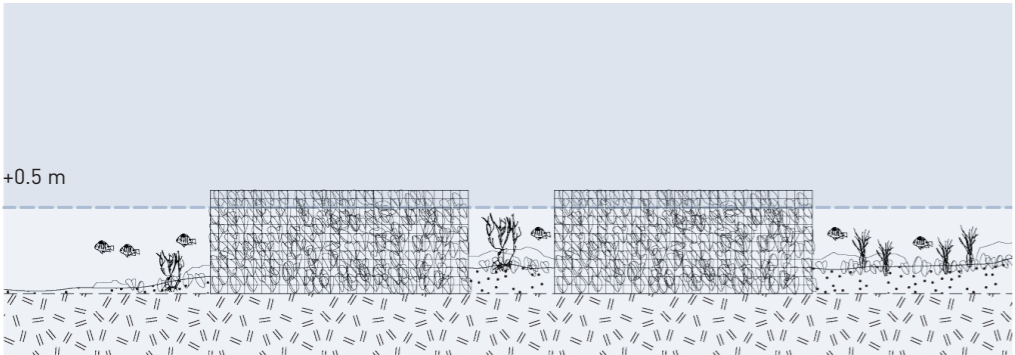
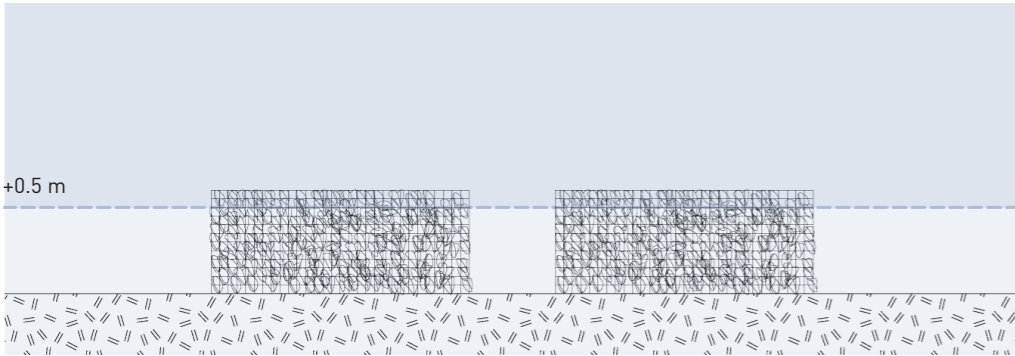
Section perspective



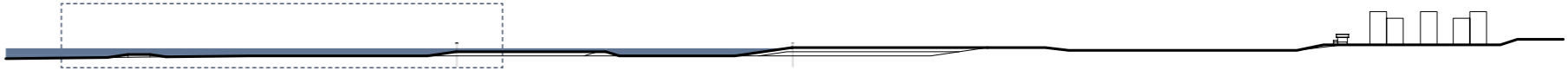
4.4 Detail design

4.4.8 Coastline habitat & Villages-10 years

Plan



Section

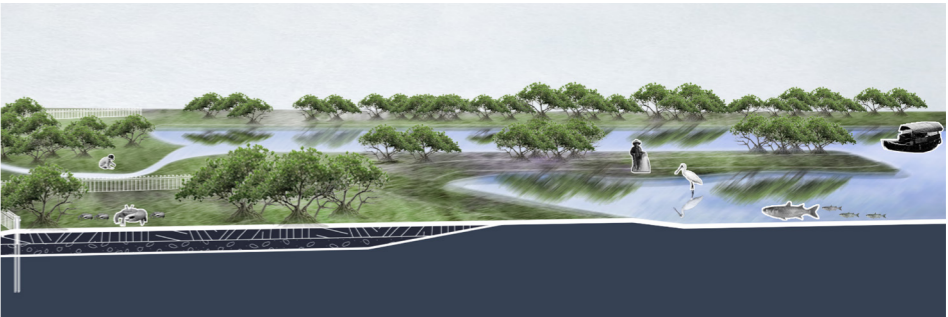
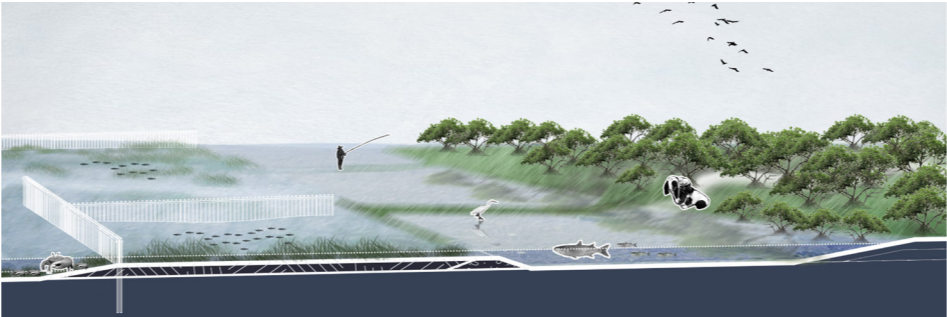
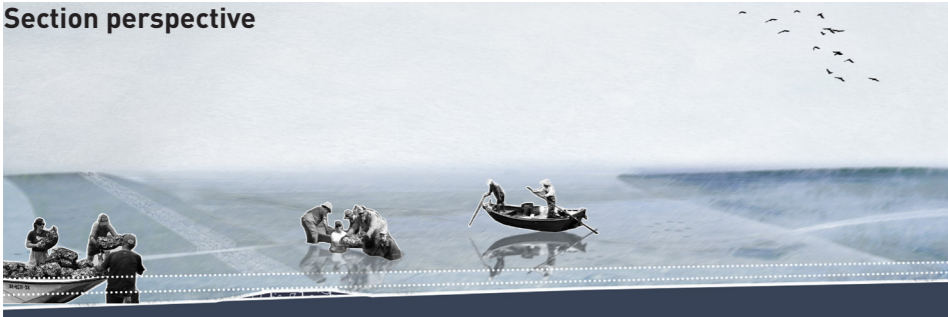
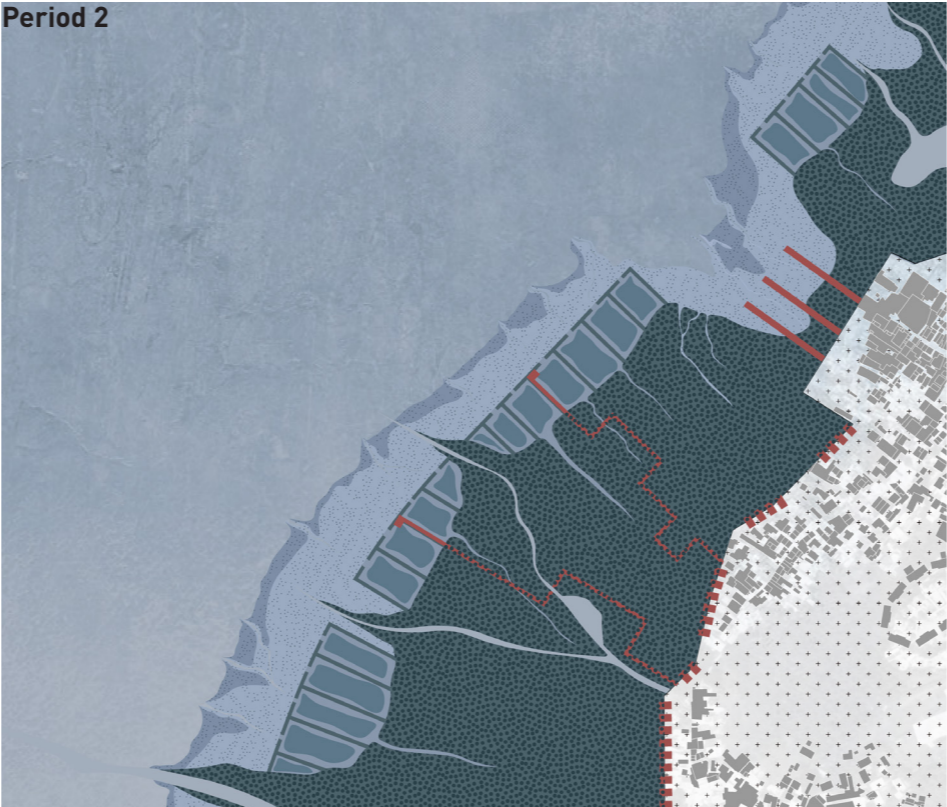
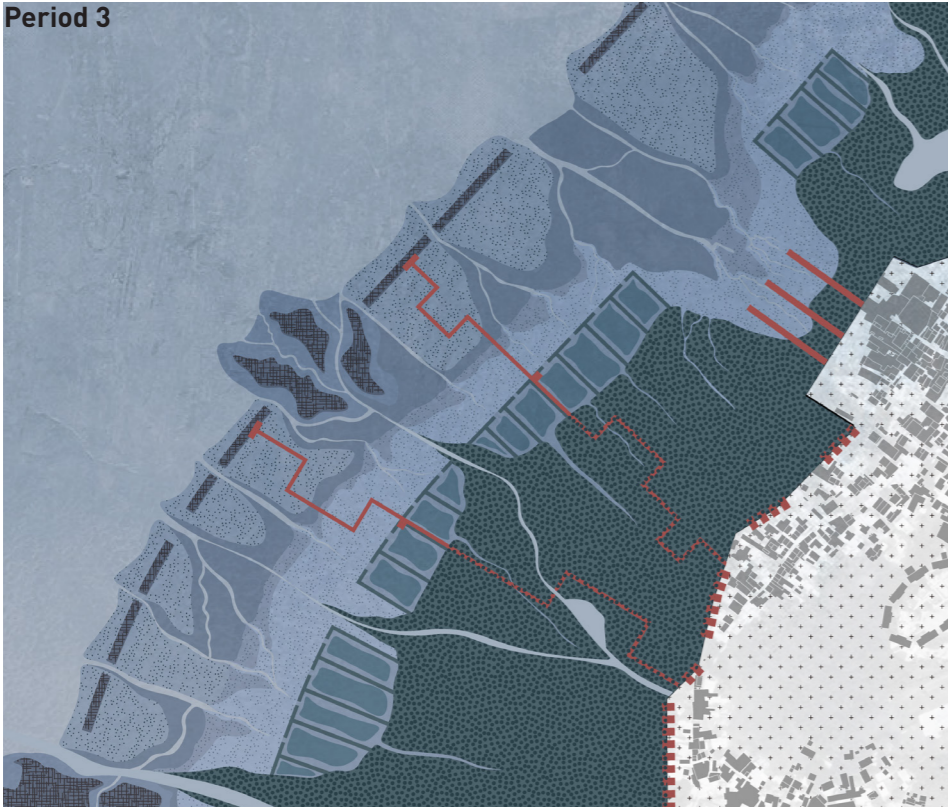


Section perspective



4.4 Detail design

4.4.8 Coastline habitat & Villages



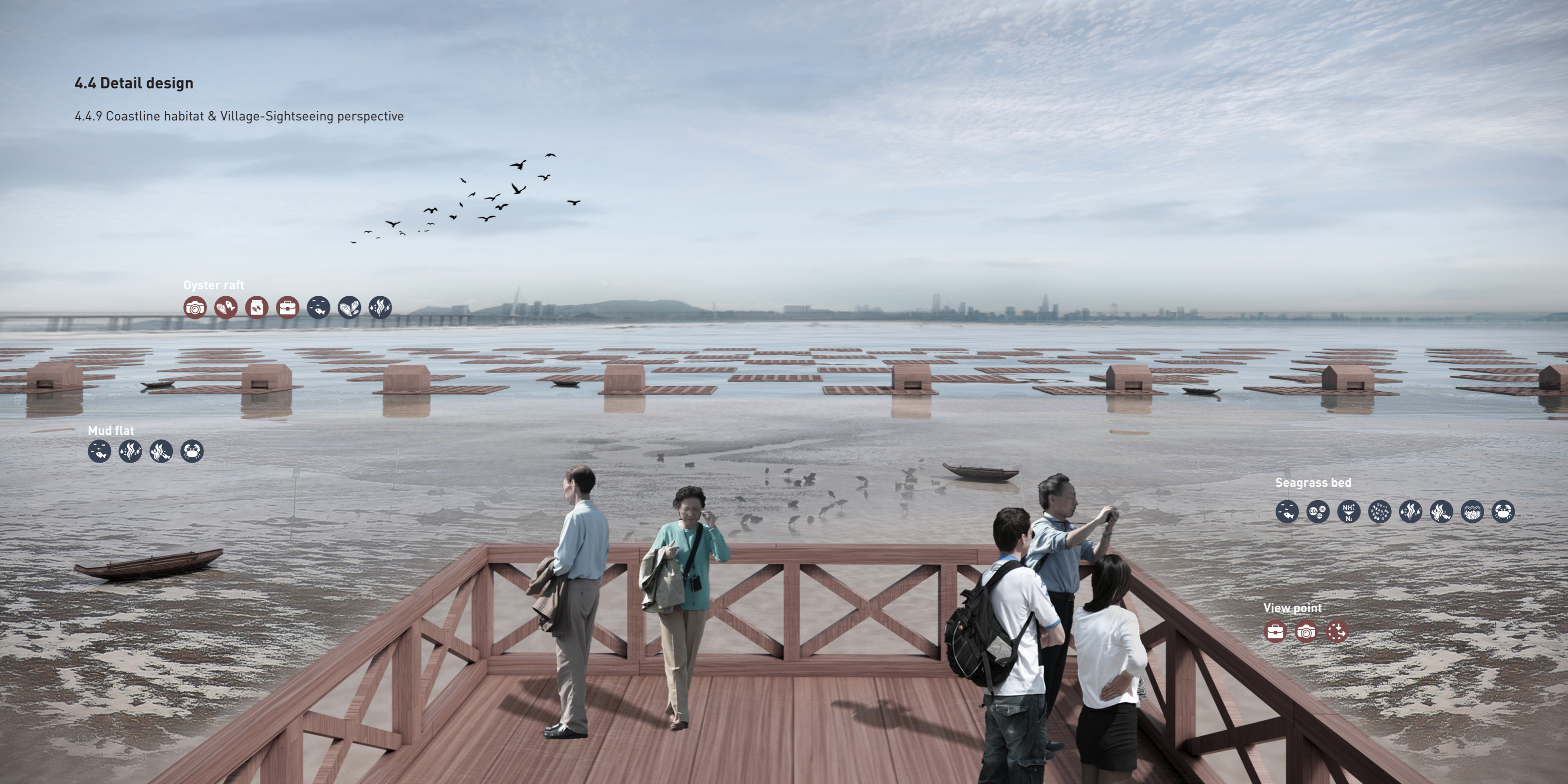
4.4 Detail design

4.4.9 Coastline habitat & Village-Sightseeing perspective



4.4 Detail design

4.4.9 Coastline habitat & Village-Sightseeing perspective



Oyster raft



Mud flat



Seagrass bed



View point



4.4 Detail design

4.4.10 Birdview-Current situation



4.4 Detail design

4.4.10 Birdview-After design

- Purification
- Fixed carbon
- Shelter
- Coastal erosion
- Bait farm
- Seeding farm
- Denitrification
- Oyster farm
- Stabilise the substrate
- Biodiversity
- Freshwater replenishment
- Processed product
- Commercial fishery
- Jobs
- Recreation
- Protecting properties
- Increase accessibility
- Green city





Nanshan, Shenzhen

Sources: https://mapio.net/pic/p-9256458/?utm_content=cmp-true

Fishermen Landscape-From Water to Land

Develop resilient principles to rebuild gradient-landscape in PRD

CHAPTER 5 PRINCIPLES & APPLICATION

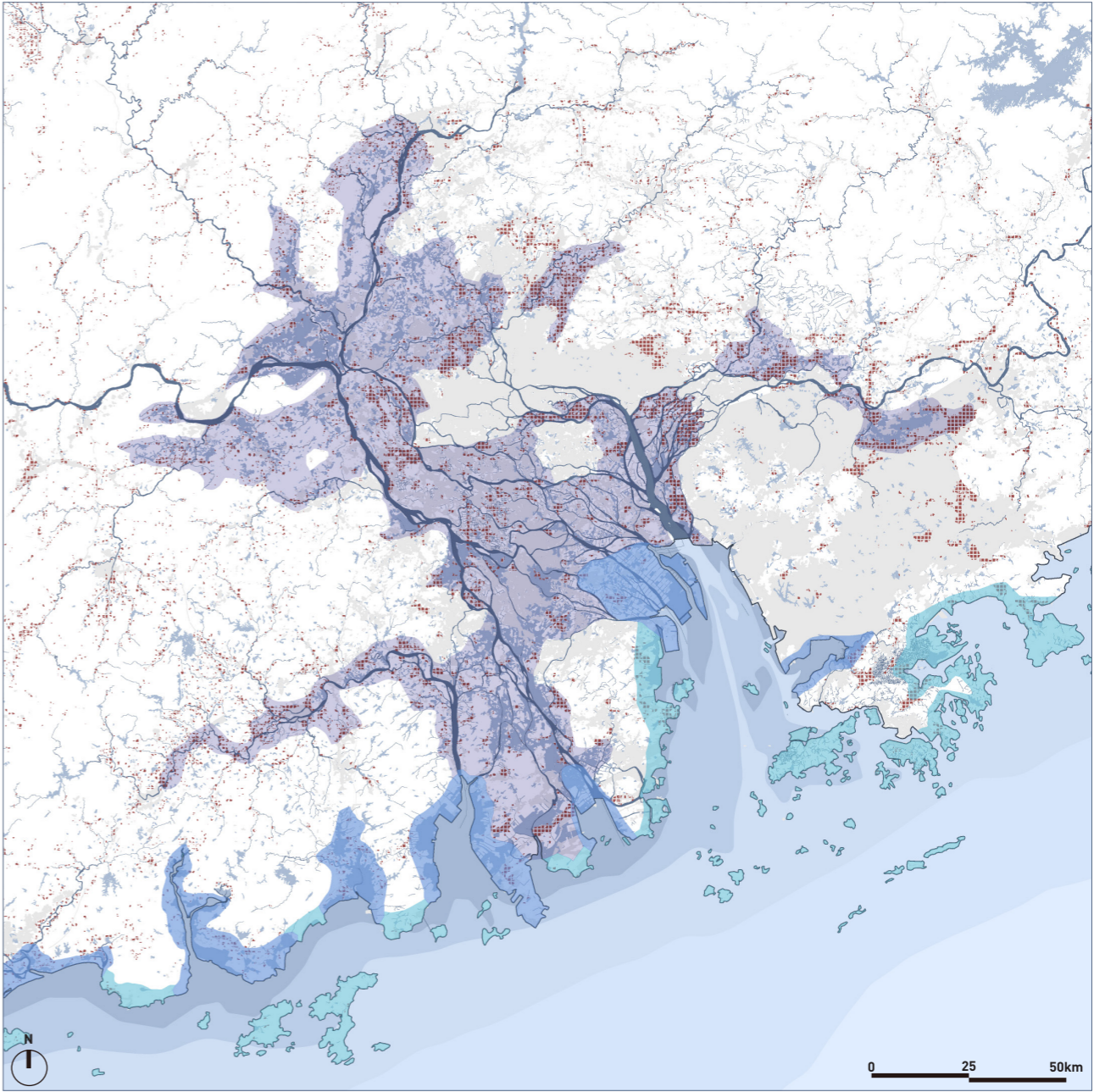
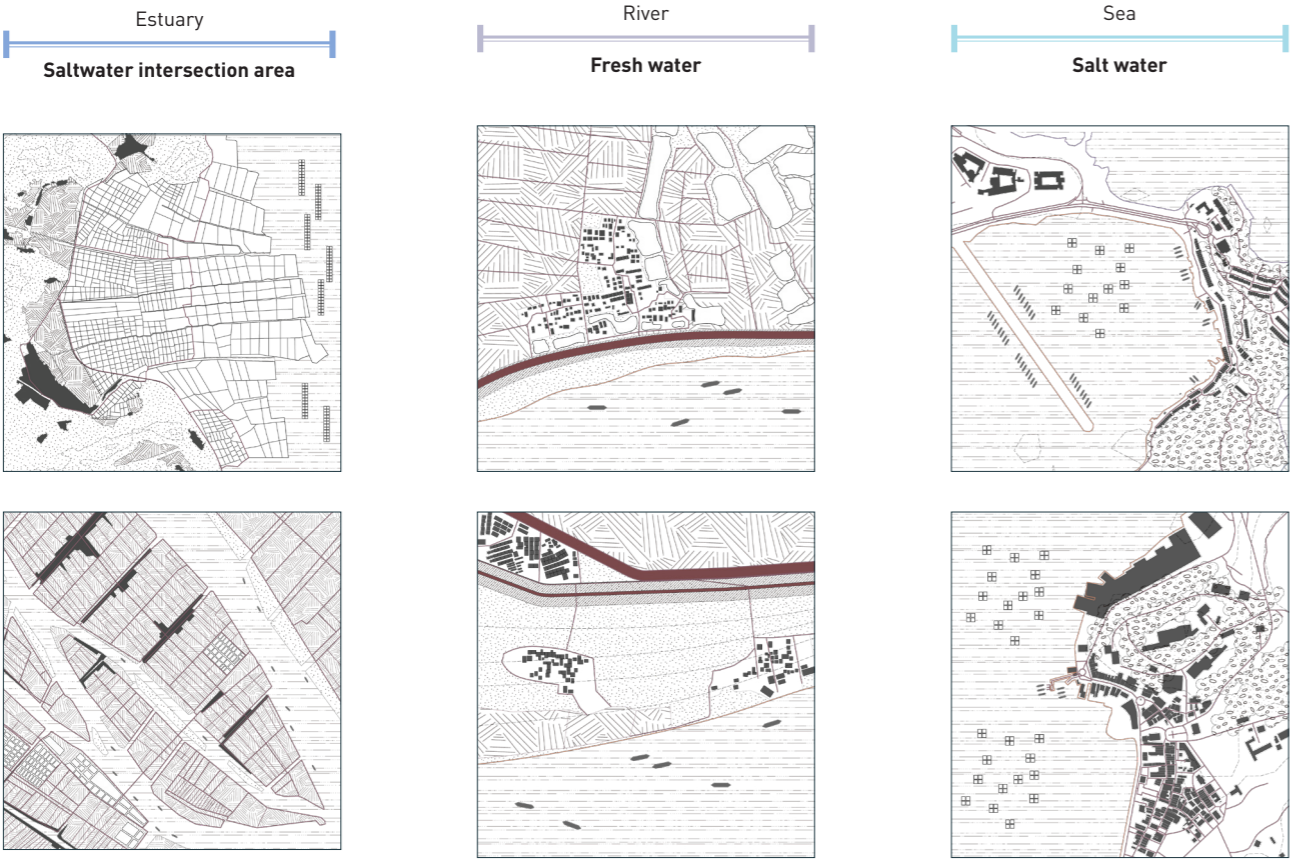
5.1 Introduction

5.2 Principles & Application

5.1 Introduction

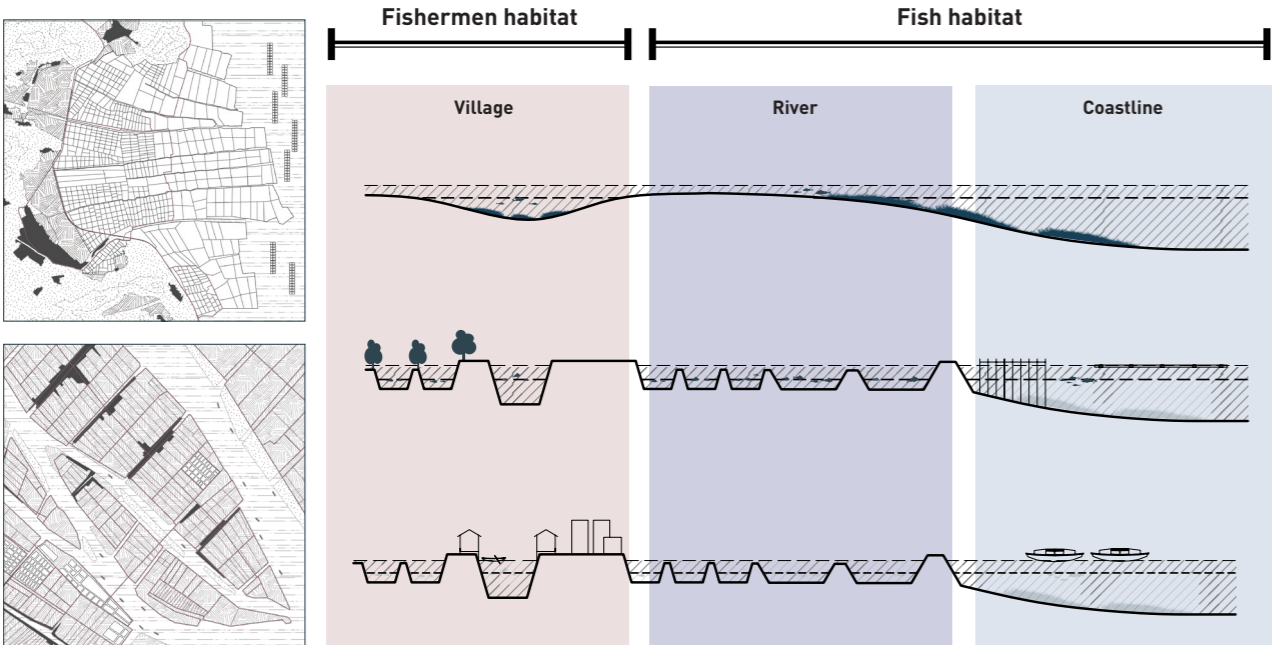
The project attempts to improve the ecological conditions of the Pearl River Delta by creating a rich fish habitat from the fishermen's perspective. Through the design exploration, the project proposes the habitats needed for the estuary type of fishing villages as well as the transformation measures. This chapter will propose the corresponding transformation strategies for the other two types of fishing villages based on the design logic attempted in the design exploration.

For several reasons, the project could not complete the mapping of all corresponding principals, but the relevant habitat types are exemplified for reference.

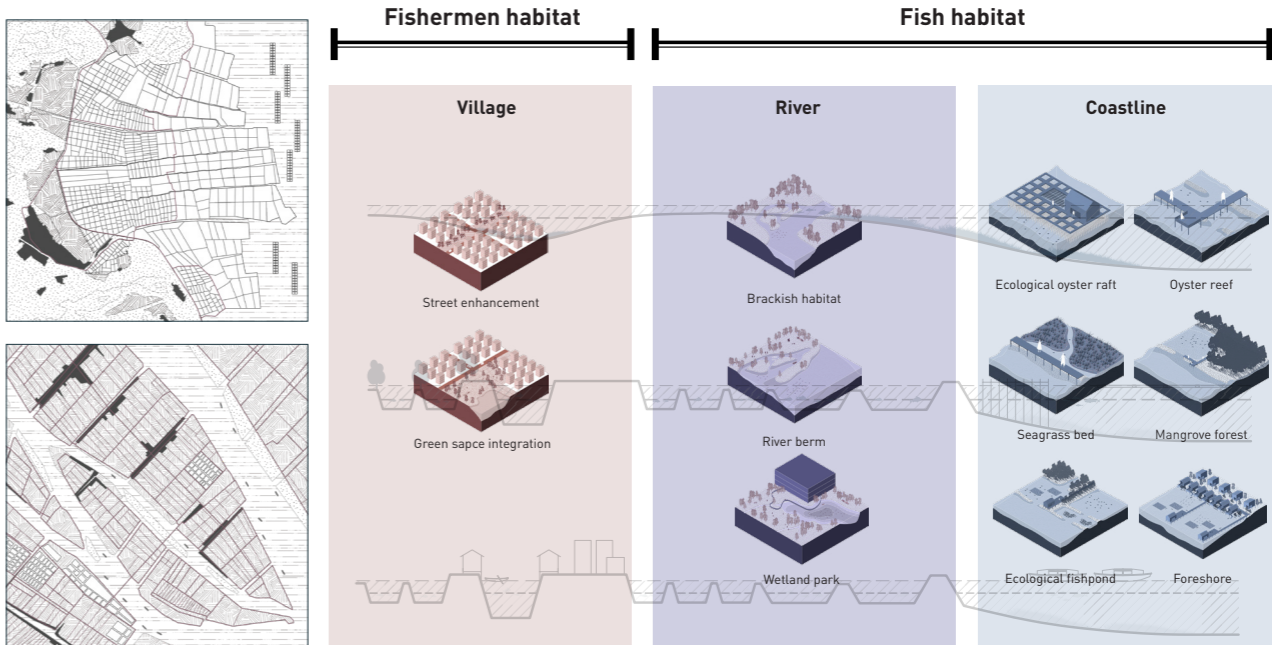


5.2 Principles & Application

5.2.1 Estuary type



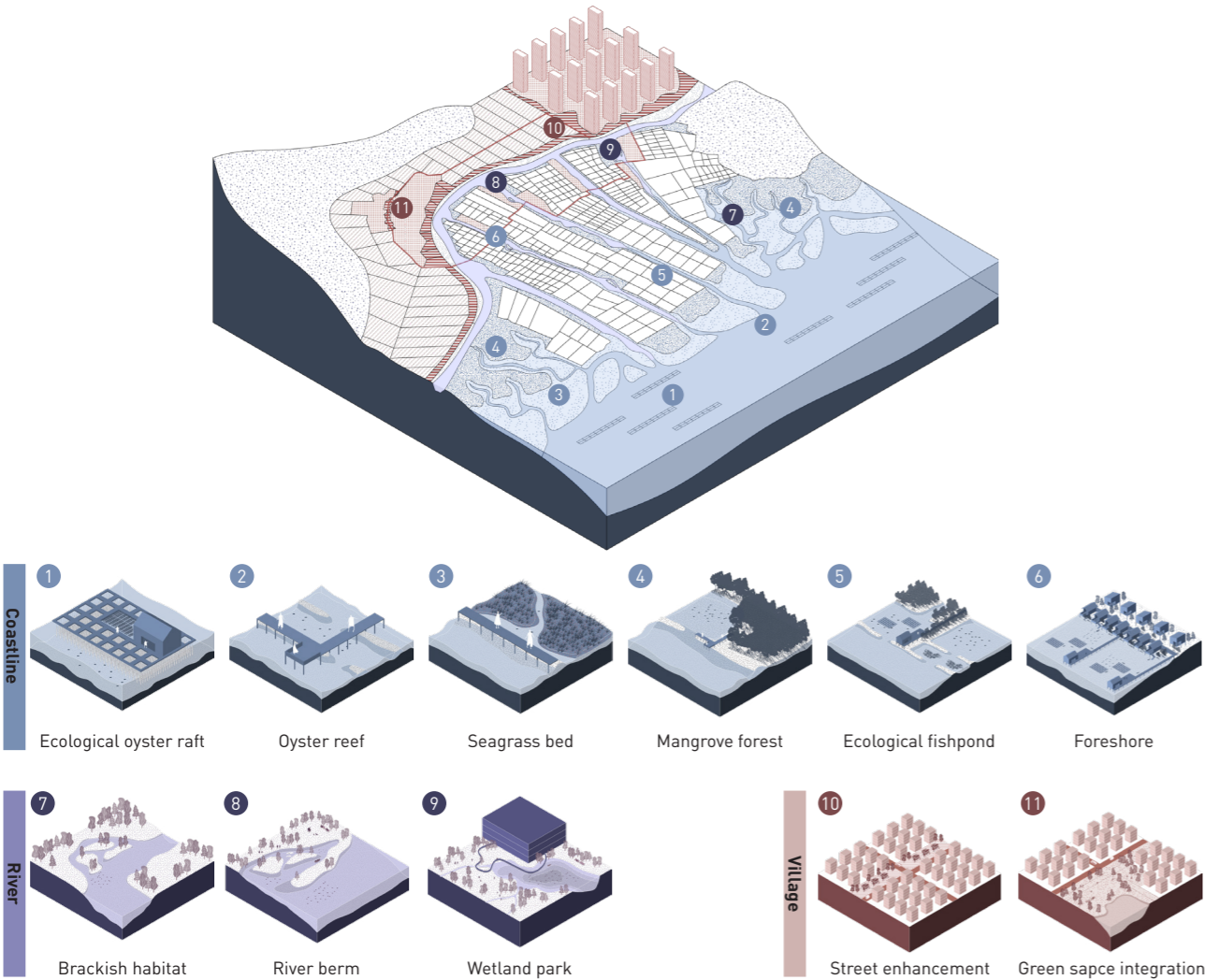
For estuary-type villages, the fish habitat can be divided into coastline and river areas.



The three main categories of habitat can then be refined into different habitats and targeted recommendations for retrofitting.

5.2 Principles & Application

5.2.1 Estuary type

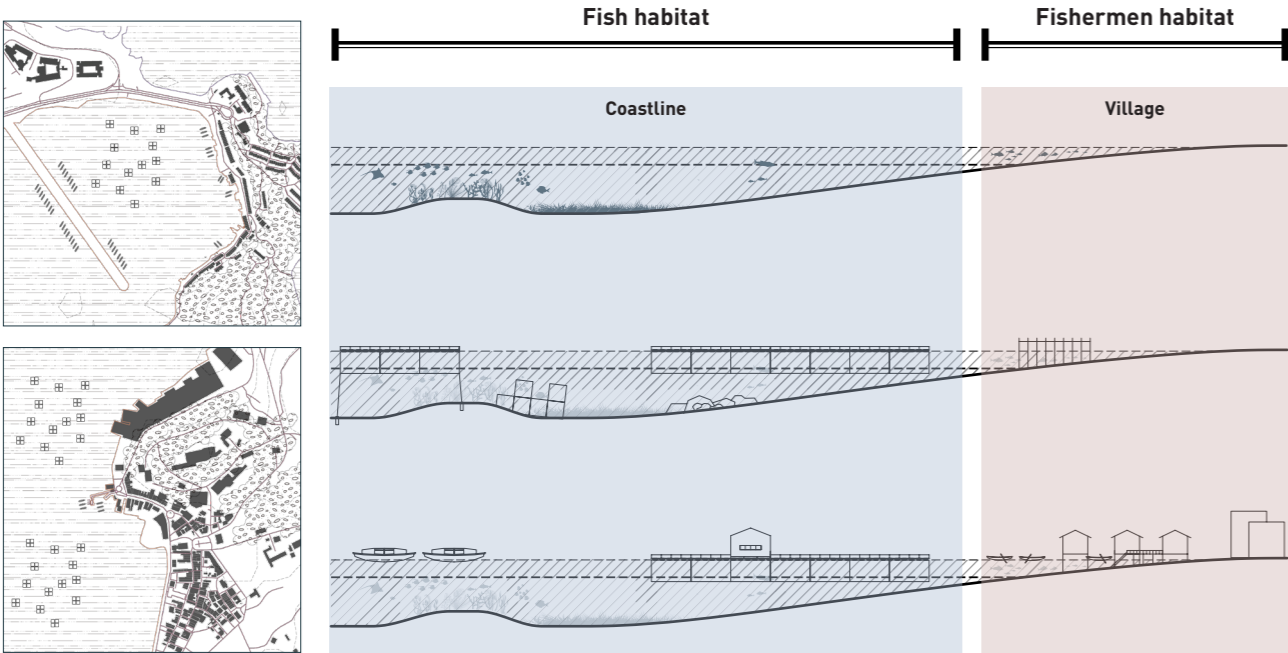


The pattern base of the diagram on the right is a summary of the research section for an estuary-type village. It shows the site where the specific principle is applied.

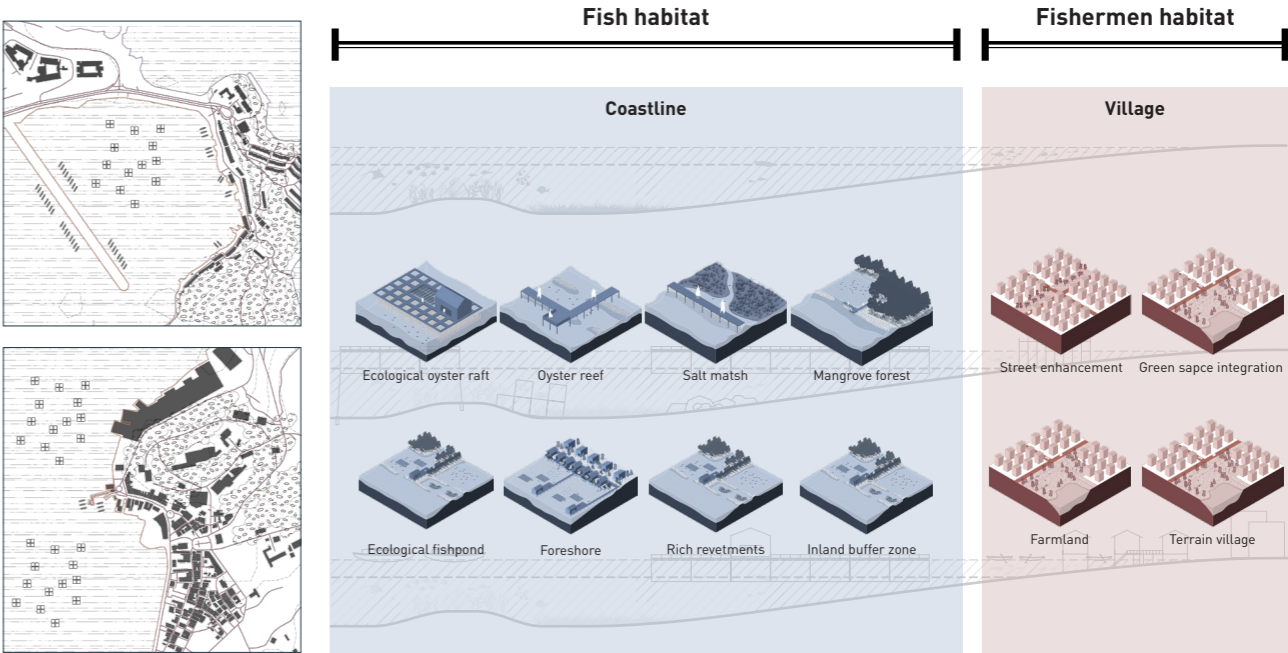


5.2 Principles & Application

5.2.2 Saltwater type



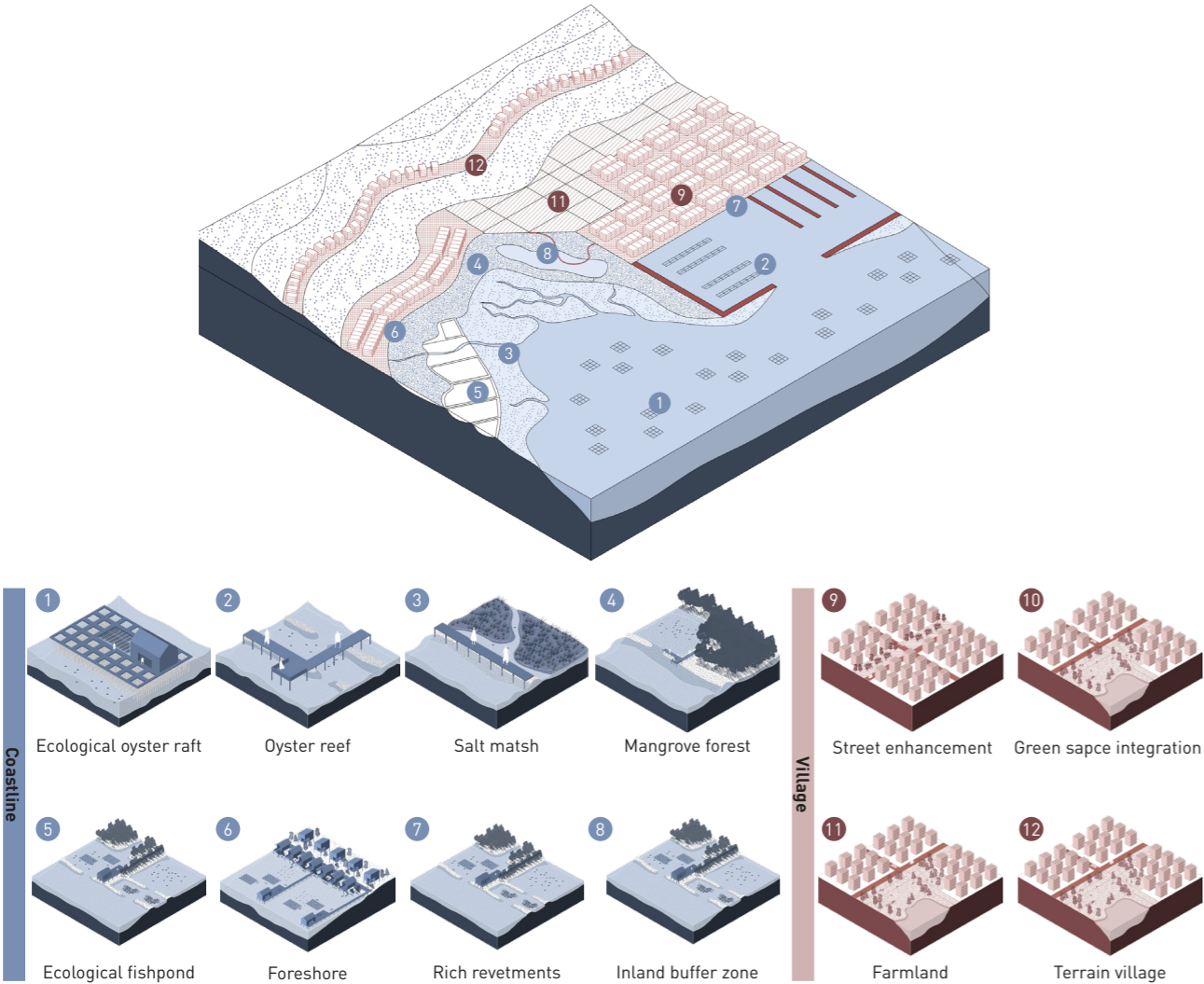
For saltwater-type villages, the fish habitat mainly about the coastline area.



The two main categories of habitat can then be refined into different habitats and targeted recommendations for retrofitting.

5.2 Principles & Application

5.2.2 Saltwater type

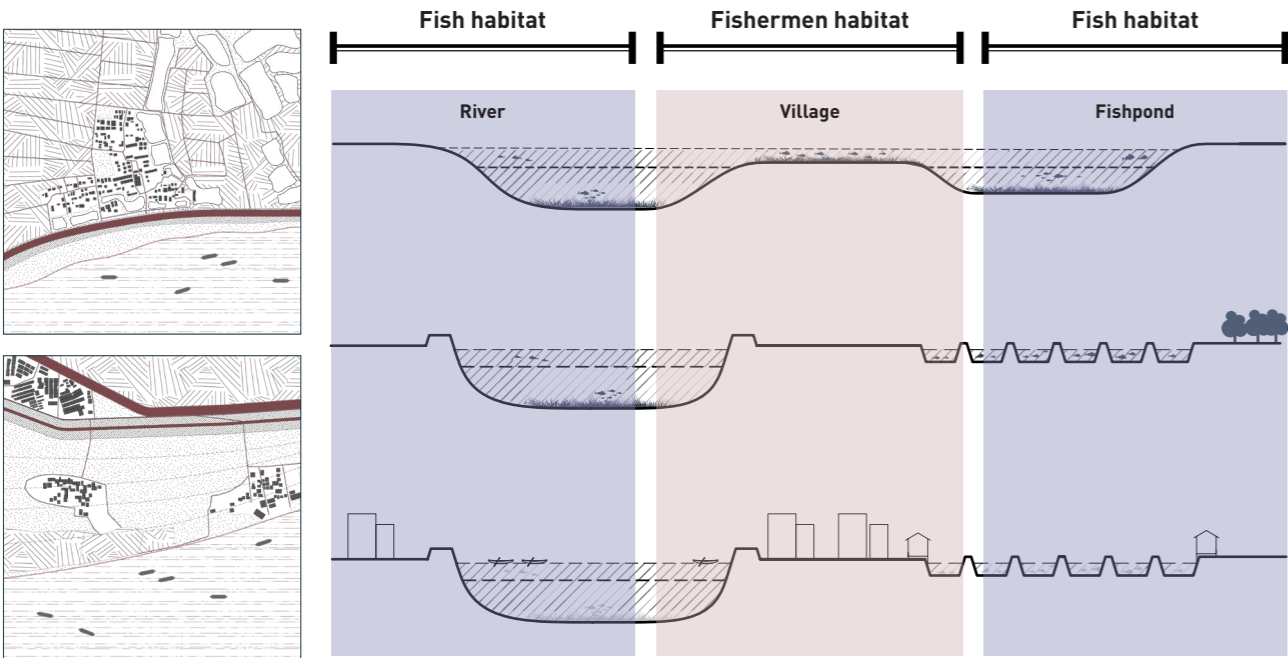


The pattern base of the diagram on the right is a summary of the research section for the saltwater-type village. It shows the site where the specific principle is applied.

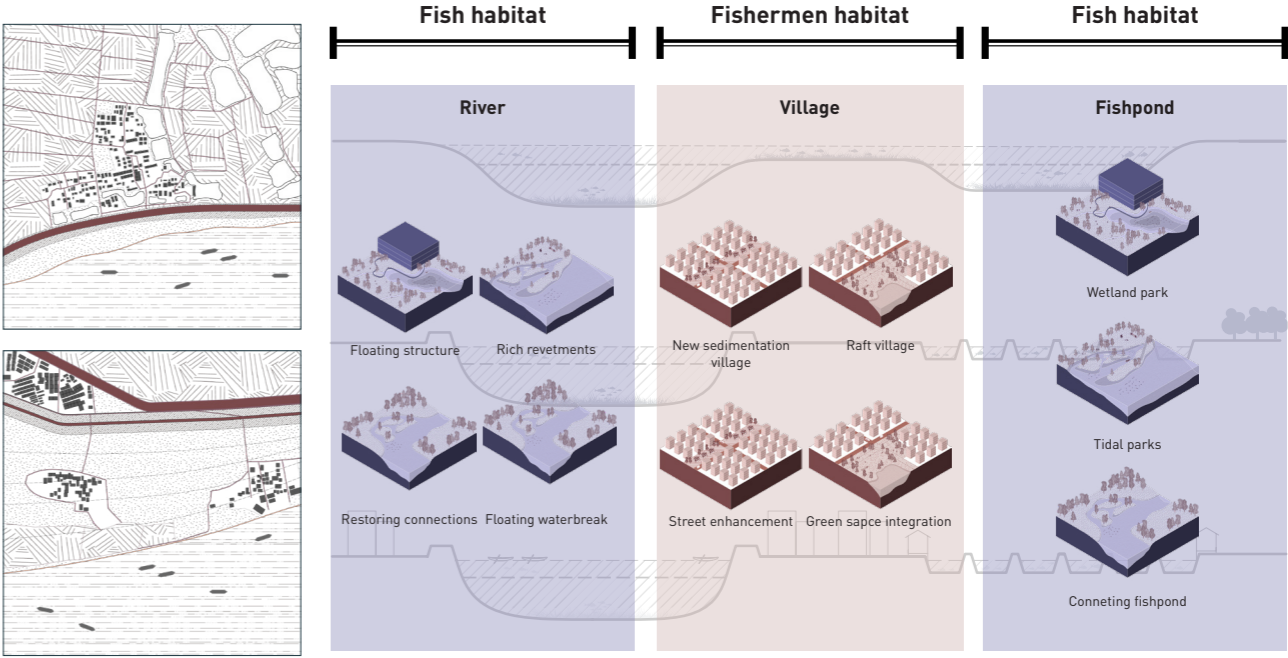


5.2 Principles & Application

5.2.3 Freshwater type



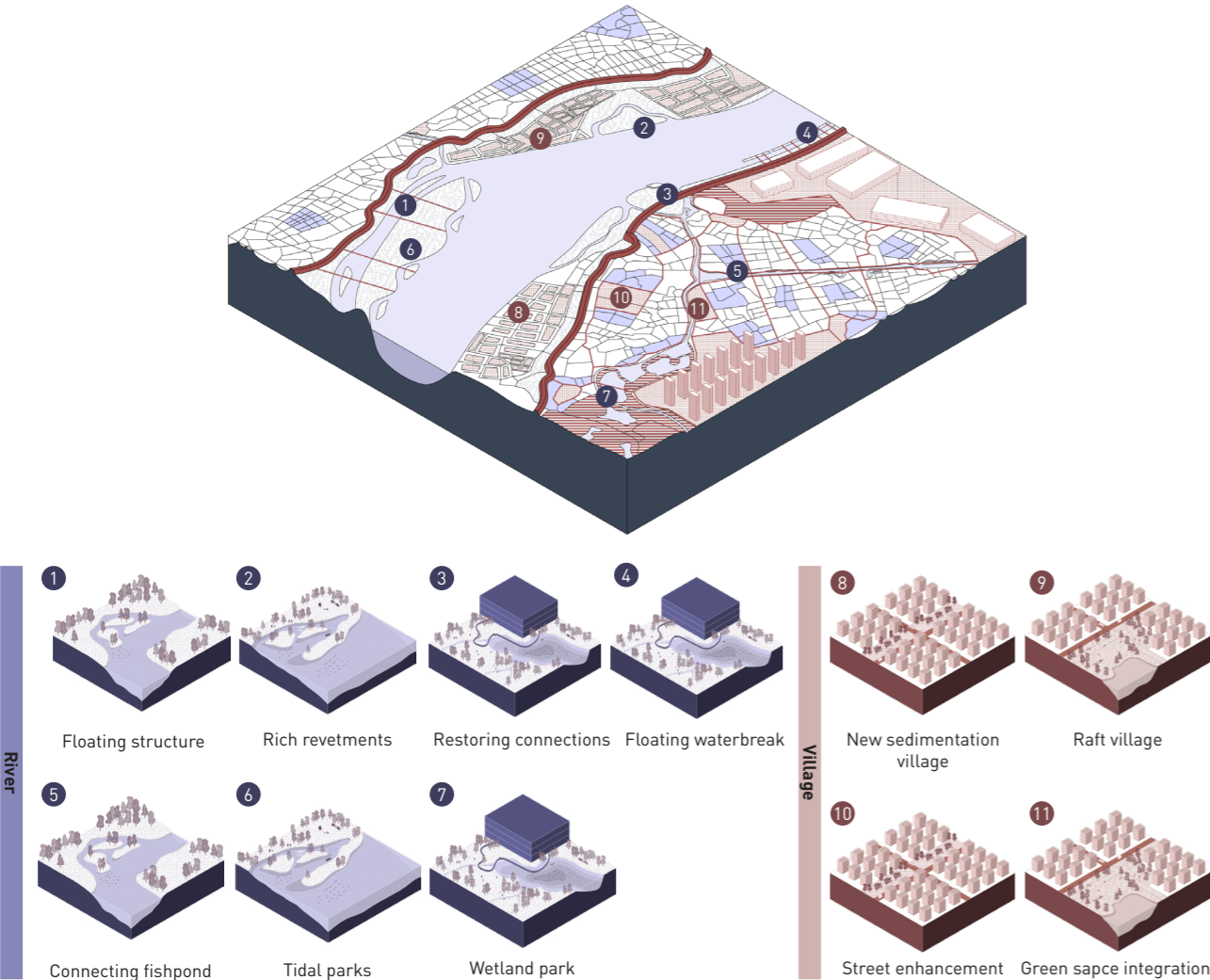
For freshwater-type villages, the fish habitat mainly about the river area.



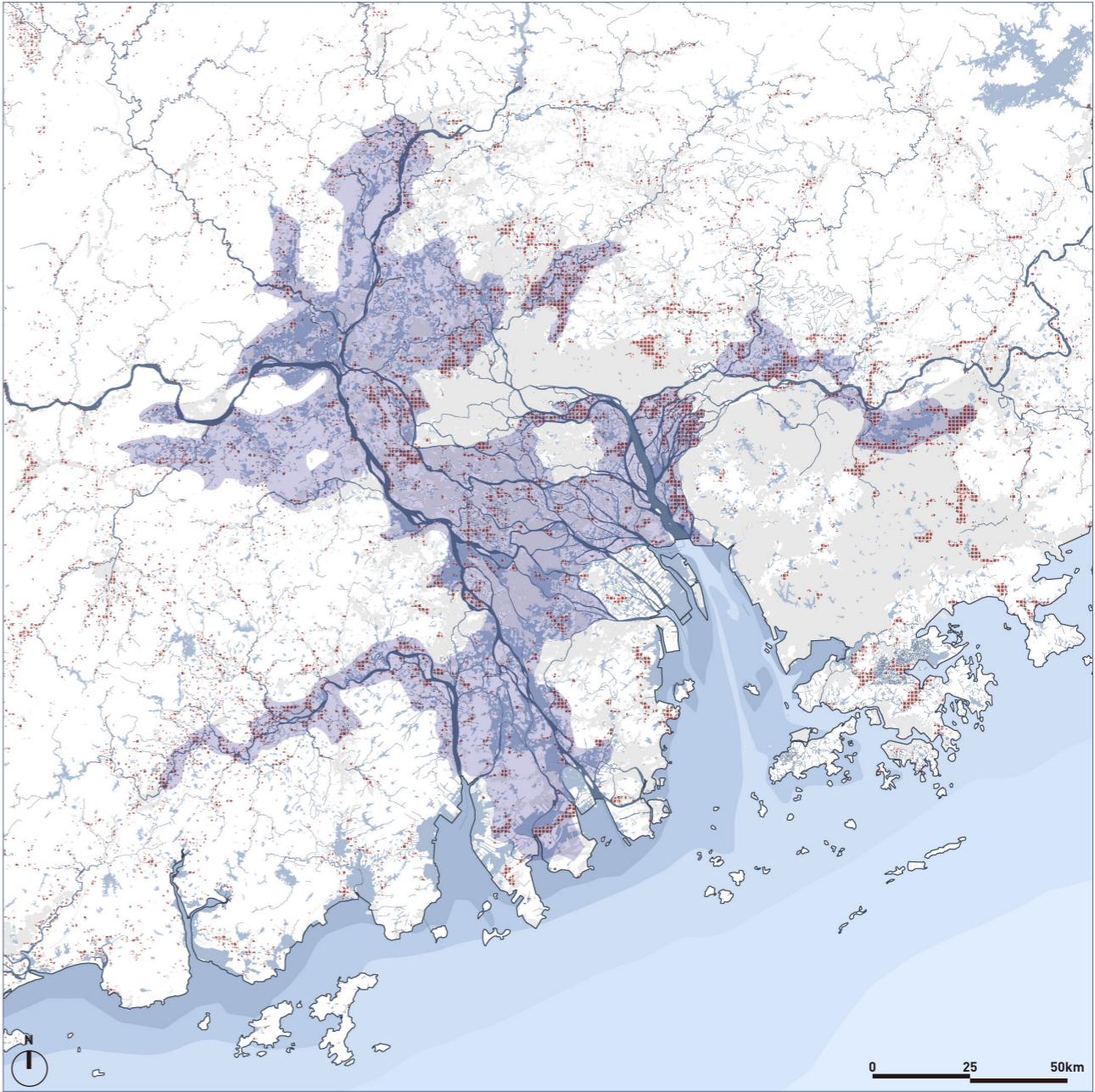
The two main categories of habitat can then be refined into different habitats and targeted recommendations for retrofitting.

5.2 Principles & Application

5.2.3 Freshwater type



The pattern base of the diagram on the right is a summary of the research section for the freshwater-type village. It shows the site where the specific principle is applied.





Shaqiao Village

Sources: V'air hongkong <https://www.vairhk.org/places/sha-kiu-tsuen>

Fishermen Landscape-From Water to Land

Develop resilient principles to rebuild gradient-landscape in PRD

CHAPTER 6 REFLECTION

6.1 Reflection on research questions

6.2 Conclusion

6.1 Reflection on research questions

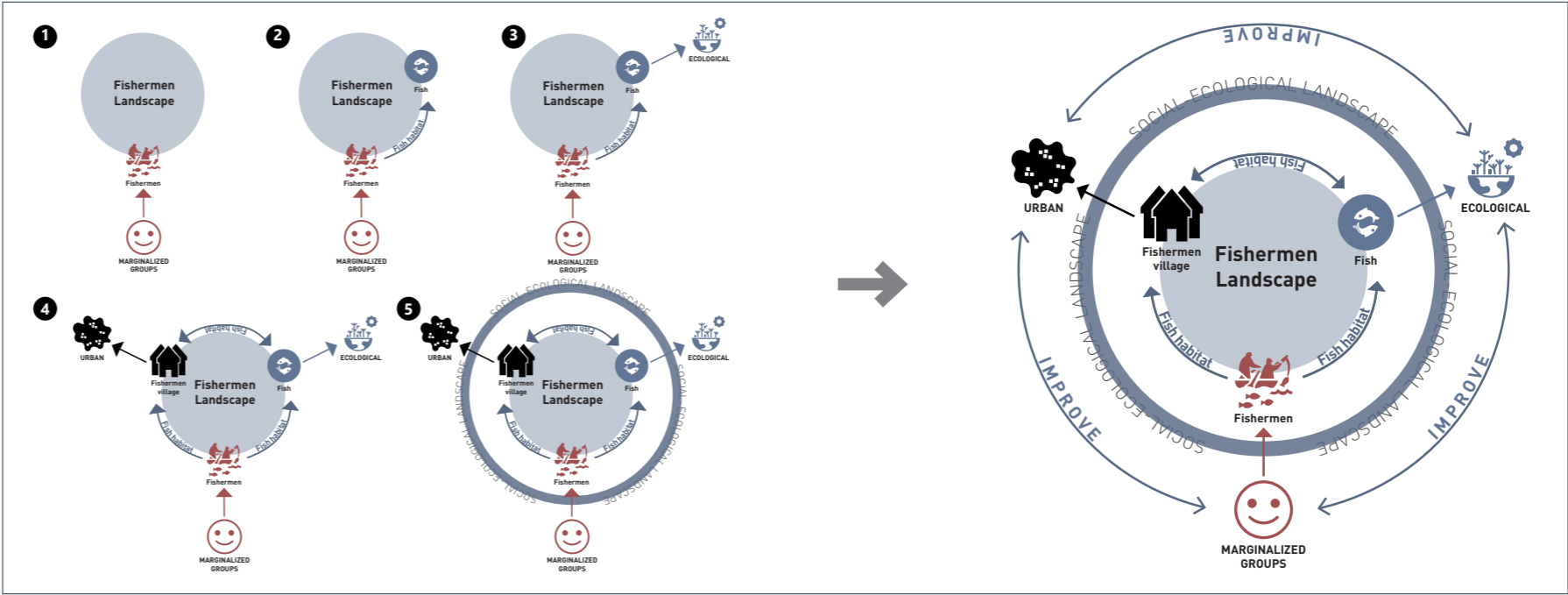
6.1.1 Sub-question1

How fishermen landscape is reconnecting cities and nature?

Based on landscape-based urbanism, socio-ecological inclusive landscape, keystone species, coastline habitat reservations theory, and a review of the Pearl River Delta's current situation and fishermen's production and living conditions, the project generates the core fishermen landscape concept. This concept explains how the fishermen landscape affects cities and nature on a large scale, as described below:

- 1. Fishermen are one of the most marginalized populations with the most vital connection to land and water.
- 2. To ensure their survival, they need to be provided with adequate fish stocks.
- 3. This is linked to the wider ecology.
- 4. It is also essential to provide them with better living space, which is partly linked to the broader urban system.

5. The fishermen's landscape via fish habitat linkage is a social-ecological landscape that can also influence the large-scale social and ecological system.



6.1 Reflection on research questions

6.1.2 Sub-question2

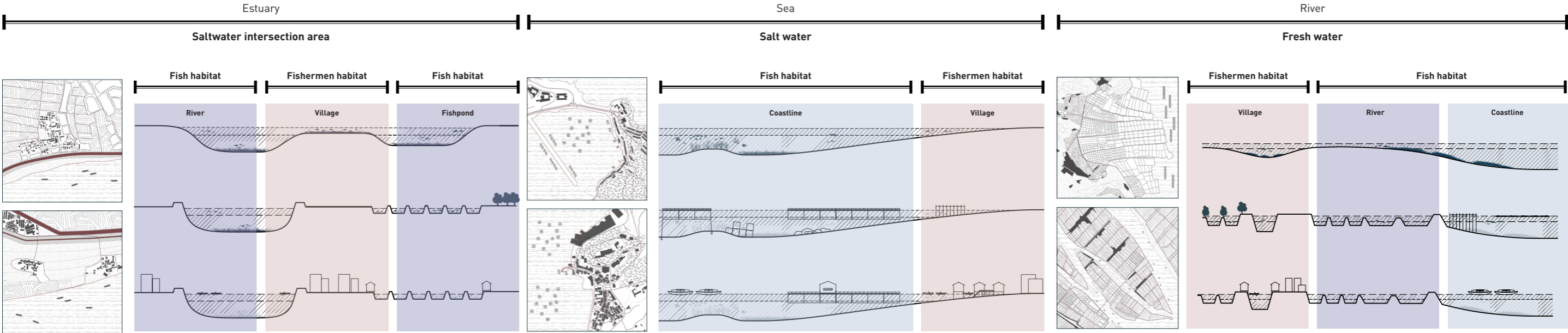
What is a fisherman's landscape and what elements does it contain?

In order to answer this question, the project first exemplifies the fish habitat involved in the fishermen's landscape and the relevant elements of the fishermen's habitat. The elements include natural habitat, aquaculture method, village location, settlement morphology, house type, and dock type. Secondly, based on the previously mentioned elements, the project summarizes the three main types of fishing villages: freshwater type, intersection water type, and saltwater type. Each type is expressed through sections for natural fish habitat, aquaculture method, and house type. The plan incorporates these elements to reflect their combined form.

Saltwater type: First type of villages are located at the foot of mountains; striped along the coastline; both man-made and natural jetties are present; shacks can occur near natural jetties; floating devices are present in natural harbors or behind man-made breakwaters. Second type of villages will be striped along contours; some villages on flat land in high-density clusters; predominantly natural jetties; more shacks.

Intersection water type: One is dominated by fishponds extending from land to water, with large villages at land boundaries and small-scale villages along waterways. The other category is dominated by agricultural land, most of which was created by the enclosure of the sea.

Freshwater type: The fishing villages in this area are closely connected to the dyke, with most of the villages immediately behind the dyke and a few extending beyond the dyke to the sedimentary barge. This is due to the fact that the fishermen in this part of the village need to travel through the river to outside waters for their fishing activities. The morphology of fishponds in this type of fishing village is significantly different from the previous two types, with fishponds more closely related to agricultural land, related to the unique mulberry fishpond system in the PRD.



6.1 Reflection on research questions

6.1.3 Sub-question3

How to develop the resilient **principles**, rebuild the **gradient-landscape** and create new **social-ecological system** based on the estuary fishermen landscape?

In the first step, principles were proposed based on the findings of the research section and site characterization projects. For example, for the estuary type, the fish habitat consists of a foreshore, fish pond, mangrove forest, seagrass bed, oyster reef, and oyster raft. Evaluating these habitats can help generate matching principles.

In the second step, different combinations of these principles can create different gradient landscapes and contribute to the ecological benefits of the system.

The third step is to apply these combinations and principles to the site to address current problems of the site. All three processes are categorized by fish habitat and fishermen habitat according to the elements of the fishermen landscape.

In the end, a new vision will be obtained, which is the new social-ecological system.

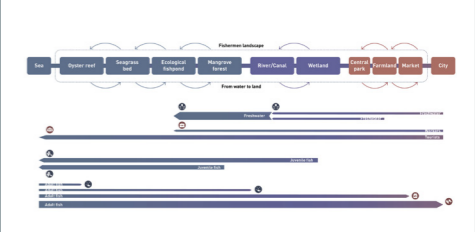
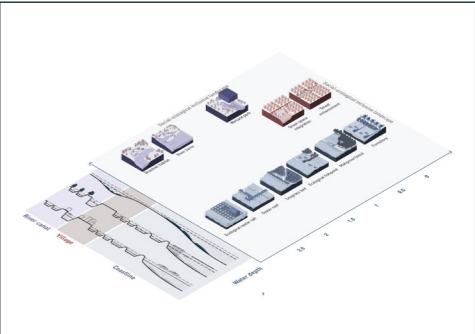
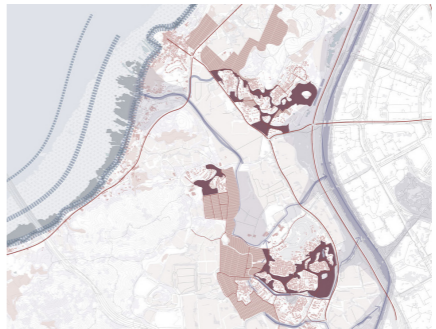
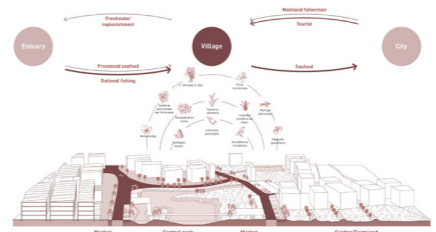
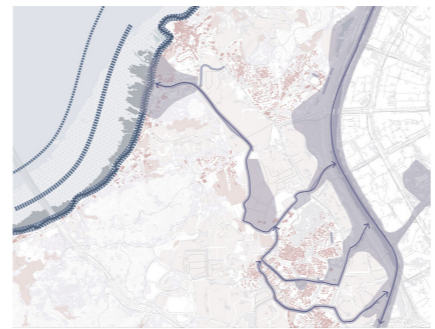
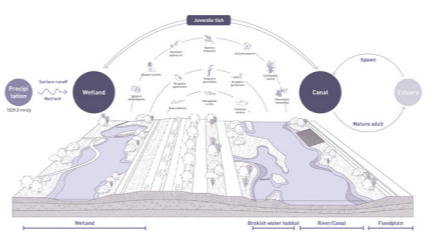
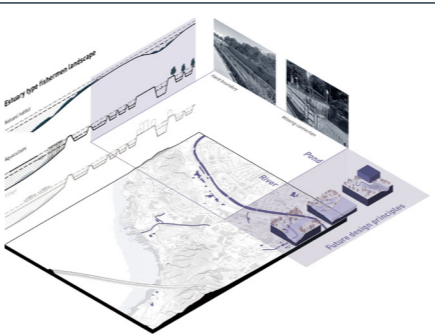
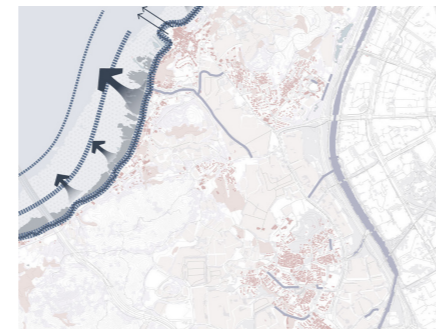
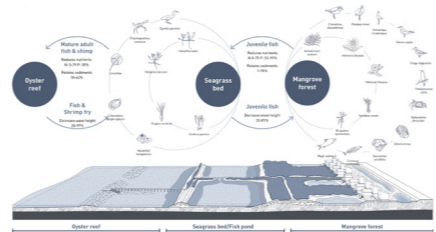
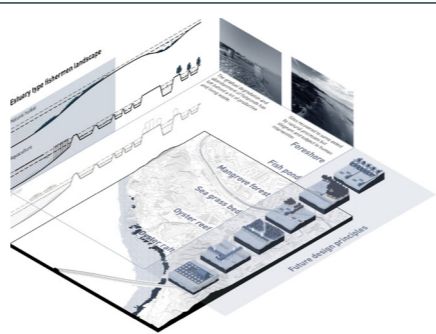
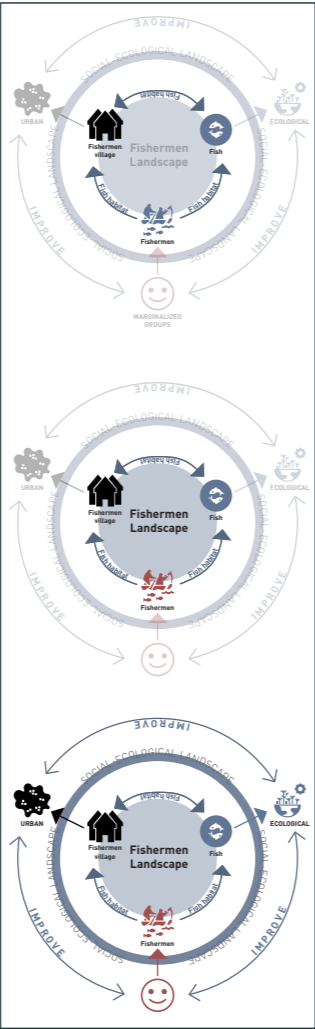
Scale

Theoretical framework

Fish habitat

Fishermen habitat

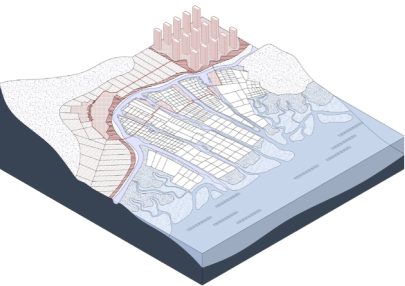
Social-ecological inclusive landscape



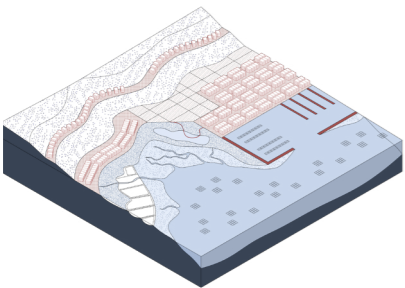
6.1 Reflection on research questions

6.1.3 Sub-question4

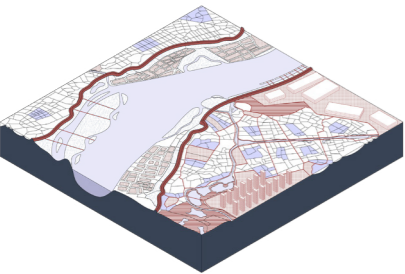
How project research and design attempts have helped rebuild the socio-ecological system in other areas in the PRD



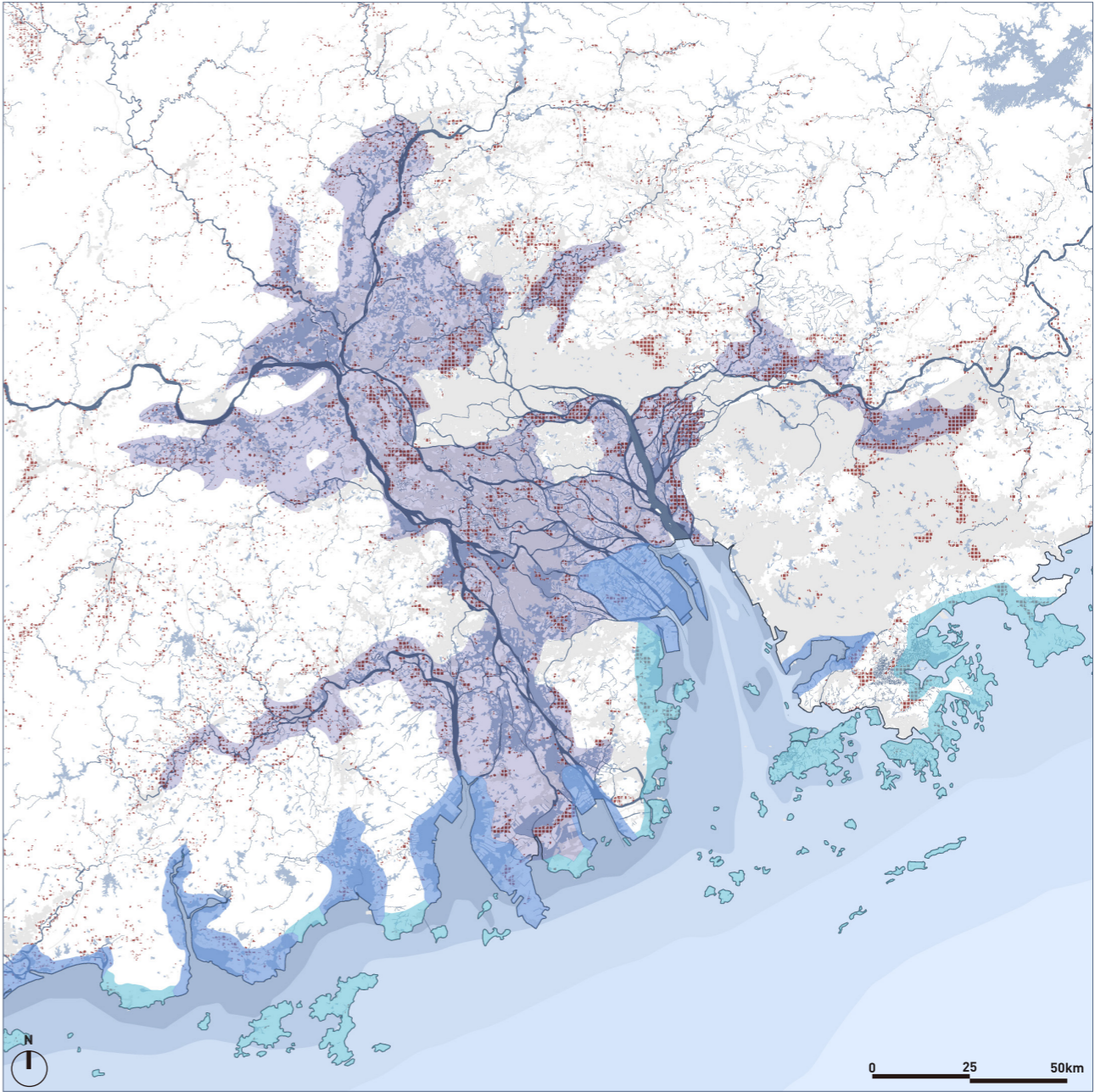
The estuary-type villages are mainly faced with the continuous enclosure of the sea and the expansion of fish ponds. Hopefully, several habitat modifications for fishermen and fish will suggest new research and development directions for the fisheries industry in the PRD. This project will likely lead to new research and development directions for the fisheries industry in the PRD. At the same time, habitat restoration will also increase wild fish populations and allow fishermen to fish wisely to compensate for the losses caused by the cessation of fish pond expansion. Many villages are isolated from the city and have rigid boundaries, and these areas also need some landscaping to enhance the surrounding environment, attract tourists, and stimulate local economic development.



Saltwater villages have both natural and hard boundaries. Some of the villages are still natural transitions, but many of those near the city are artificial marinas, so the principles will also apply to the different types. At the same time, most of these villages are located at the foot of the mountains, so it is essential to utilize the space between the mountains and the mountain runoff and freshwater resources. This fresh water may bring different fish stocks to the fishermen.



Freshwater-type villages exist in abundance in the Pearl River Delta (PRD) water system and have been developed for two millennia based on the Sangkat fishpond system. However, in the face of severe environmental degradation and urban sprawl, these fishponds and fishing villages are in need of new changes. The water systems within these villages are relatively complex, but because of these complex waterways and fishponds, these villages have great potential for storing freshwater resources. In addition, the uncontrolled development of earlier industries has led to severe pollution problems in these villages today. Therefore, the impact of industrial pollution on the water environment needs to be addressed when considering the transformation of these villages.



6.2 Conclusion

The landscape reflects a constant compromise between man and nature. The development of human society in the last decades has been undeniably vast and rapid, and humanity is proud of its apparent conquest of nature and the enormous economic benefits it has gained from it. However, humans have only been forcing nature to compromise, and when a critical mass is reached, nature remembers its way of "retaliating" - rapid natural degradation.

Soil erosion, floods, and red tides are all warning signs of nature. In the face of these catastrophes, marginalized populations bear the brunt of the threat. They are the first to bear the brunt of urban development without enjoying the dividends of economic development. The landscape as a stage for the joint expression of man and nature should start with these disadvantaged groups, putting their survival and protection first. This is what the project tries to do.

Based on the theories of landscape-based urbanism and socio-ecological inclusive landscape, the project establishes the concept of a fishermen's landscape, with fishermen as the critical point. Fishermen landscape integrates the elements of fish, fishermen, and village, forming a unique

landscape system in the Pearl River Delta, and has the potential to influence the overall blue-green framework of the region. By studying the landscape elements of the fishermen landscape and conducting site-specific design exploration, the project attempts to prove that landscape design from the perspective of marginalized people has a significant role in helping the transformation of the Pearl River Delta's future development.

In the future, hoping more landscape scholars and designers will pay more attention to these marginalized and disadvantaged groups and create a new utopia for them.

APPENDIX

References

Paine, R. T. (1969). A note on trophic complexity and community stability. *The American Society of Naturalists* 103(929), 91–93. <https://doi.org/10.1086/282586>

Wikipedia contributors. (2024, February 4). Keystone species. Wikipedia. https://en.wikipedia.org/wiki/Keystone_species#cite_note-paine1969-1

Ellis, E. C., Gauthier, N., Klein Goldewijk, K., Bliege Bird, R., Boivin, N., Díaz, S., Fuller, D. Q., Gill, J. L., Kaplan, J. O., Kingston, N., Locke, H., McMichael, C. N. H., Ranco, D., Rick, T. C., Shaw, M. R., Stephens, L., Svenning, J.-C., & Watson, J. E. M. (2021). People have shaped most of terrestrial nature for at least 12,000 years. *Proceedings of the National Academy of Sciences*, 118(17). <https://doi.org/10.1073/pnas.2023483118>

Diane Pearson, & Julian Gorman. (2023).

Acknowledging Landscape Connection: Using Sense of Place and Cultural and Customary Landscape Management to Enhance Landscape Ecological Theoretical Frameworks. *Land*, 12(729), 729. <https://doi.org/10.3390/land12040729>

Barrière, O. (2019). Coviability of social and ecological systems. Vol. 2, Coviability questioned by a diversity of situations. Springer. <https://public.ebookcentral.proquest.com/choice/publicfullrecord.aspx?p=5730811>

Nijhuis, S., Sun, Y., & Lange, E. (2023). *Adaptive urban transformation: urban landscape dynamics, regional design and territorial governance in the Pearl River Delta, China*. Springer. <https://doi.org/10.1007/978-3-030-89828-1>

Winterwerp, J. C., Albers, T., Anthony, E. J., Friess, D. A., Mancheño, A. G., Moseley, K.,

Muhari, A., Naipal, S., Noordermeer, J., Espinosa, F. (2023). Coastal habitat conservation : new perspectives and sustainable development of biodiversity in the anthropocene. Elsevier, Academic Press, an Imprint of Elsevier. <https://www.sciencedirect.com/science/book/9780323856133>

Oost, A., Saengsupavanich, C., Tas, S. A. J., Tonneijck, F. H., Wilms, T., Van Bijsterveldt, C., Van Eijk, P., Van Lavieren, E., & Van Wesenbeeck, B. K. (n.d.). Managing erosion of mangrove-mud coasts with permeable dams - lessons learned. *Ecological Engineering*, 158. <https://doi.org/10.1016/j.ecoleng.2020.106078>

Iqbal, S., Pasha, G. A., Ghani, U., Ullah, M. K., & Ahmed, A. (2021). Flow Dynamics Around Permeable Spur Dike in a Rectangular Channel. *Arabian Journal for Science and Engineering*, 46(5), 4999–

5011. <https://doi.org/10.1007/s13369-020-05205-y>

Wahab N.A., Gasim M.B., Umar R., Ata F.M., Sulaiman N.H., & Kamarudin M.K.A. (2016). Assessment of total suspended sediment and bed sediment grains in upstream areas of Lata Berangin, Terengganu. *International Journal on Advanced Science, Engineering and Information Technology*, 6(5), 757–763. <https://doi.org/10.18517/ijaseit.6.5.994>

Eadg. (n.d.). Reinventing the River Life System, Shenzhen Maosu River Bidao-Guangming Section Ecological Restoration Pilot Project. Weixin Official Accounts Platform. <https://mp.weixin.qq.com/s/pxRbJ-N7iFPpMKvo-7I70Q>

Wei, Xing & Cai, Shuqun & Zhan, Weikang. (2021). Impact of anthropogenic activities on morphological and deposition flux changes in the Pearl River Estuary, China.

APPENDIX

References

Scientific Reports. 11. 10.1038/s41598-021-96183-0.

Pearl River Water Resources Research Institution. (2016) Global Water Partnership (China) WACDEP Work Package Five outcome report: Pearl River Delta Demonstration Project. Global Water Partnership (China). work-package-five-outcome-report.pdf (gwp.org)

Huang, G., Wang, J., Chen, C., Wu, Z., Zhuo, M. (2001). Man-made soil and water loss and its hazards in Zhujiang Delta area——A case study in Guangzhou city. Soil and Environmental Sciences. 10(2): 104-107, Article 1008-181X(2001)02-0104-04.

Wang, Y., Zhai, J., Gao, G., Liu, Q., & Song, L. (2022). Risk assessment of rainstorm disasters in the Guangdong-Hong Kong-Macao greater Bay area of China during 1990-2018. Geomatics, Natural Hazards

and Risk, 13(1), 267-288. <https://doi.org/10.1080/19475705.2021.2023224>

Huang, P., Ma, C., & Zhou, A. (2021). Assessment of groundwater sustainable development considering geo-environment stability and ecological environment: a case study in the Pearl River Delta, China. Environmental Science and Pollution Research, 29(12), 18010-18035. <https://doi.org/10.1007/s11356-021-16924-6>

BBC News Chinese. (2022, June 22). Hundreds of thousands evacuated as floods rage in southern China. BBC News Chinese. <https://www.bbc.com/zhongwen/simp/61892593>

The official website of Marine Development and Management Magazine. [n.d.]. <http://www.haiyangkaifayuguanli.com/html/2005/6/050621.html>

Pollution invades the eight scenic spots of Guangdong City, Shanwei Jinxiang Yintan is full of garbage_Huizhou Channel_Sina Guangdong_Sina.com. (2016, May 26). [Hattpus://gd.cena.com.cn/hajg/2016-05-26/citi-haj-ifxsu4465530.shtmll](http://gd.cena.com.cn/hajg/2016-05-26/citi-haj-ifxsu4465530.shtmll)

Sina_Mobile. (2009, July 29). The Death of the Pearl River Estuary. Sina Mobile_Mobile Sina.com. <https://news.china.cn/c/2009-07-29/detail-ikthian1868490.dhtml>

The fisherman's family adrift in the "cracks" of the world of wealth dreams of "owning a house on the shore"_The Paper_The Paper. [n.d.]. https://www.thepaper.cn/newsDetail_forward_2776414

Ancient Family, Last Life on the Water. (2017, January 24). NYTimes.com. <https://cn.nytimes.com/china/20170124/china-tankariver-people-datang/>

Li Q., Luo B., Zhang Z., Zhang L., Guan J.,

Peng J., He P., Wei B., & Sciences, G. a. O. F. (2017, December 19). CN108112518B - Efficient staged cultivation of oysters in Hong Kong Google Patents. <https://patents.google.com/patent/CN108112518B/zh>

Oyster-tecture - SCAPE. (2024, January 31). SCAPE. <https://www.scapestudio.com/projects/oyster-tecture/>

JUN, 2024
DELFT, NETHERLANDS