BREATHING LAKE

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

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0 Foreword

Abstract

Key words: Poyang Lake, System, Resilience, Water dynamics, Circulation

Poyang Lake is a seasonal lake located in the lower reaches of the Yangtze River. During the wet season in summer, it reaches its largest water surface and highest water level, appearing as a lake. Conversely, during the dry season in winter, it shrinks to its smallest surface area and lowest water level, resembling a river.

Local people utilized the unique seasonal hydrological processes, topography, and natural resources of Poyang Lake to develop the traditional water system, a cyclic production system adapted to water dynamics. Agriculture is developed in the polder during the wet season, fishery in the sub-lake during the dry season, and animal husbandry in the wetland, while taking into account the harmonious coexistence with migratory birds and the recycling of resources. This system embodies the original systematic and dynamic thinking of local residents about the landscape and realizes the harmonious relationship between humans and nature in the context of that time.

However, due to the emergence of new influences in the new era, Poyang Lake has faced numerous challenges, including floods, droughts, ecological degradation, and loss of livelihood. As one of the world's most important habitats for migratory birds, Poyang Lake holds significant ecological value. Its unique and varied landscape typologies also contribute to its spatial value. Therefore, this thesis aims to address these issues through landscape architectural tools to enhance ecological value, improve human livelihoods, and ensure the spatial interest of Poyang Lake.

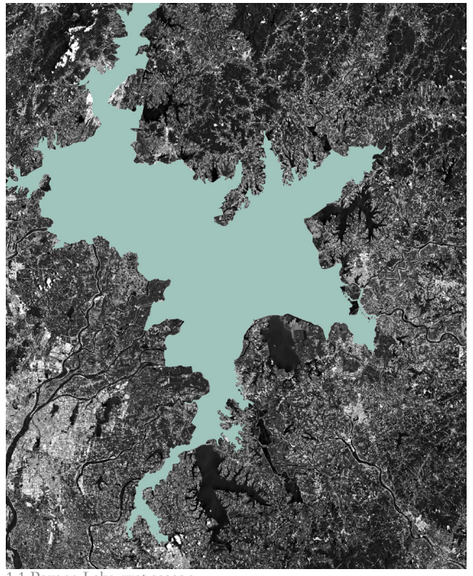
The design project is grounded in systemic thinking, focusing on water, ecology, and livelihood as its main dimensions. It introduces the concept of a rural self-circulation and mediation system, aiming to harmonize the relationship between people and water, as well as between humans and nature, and to operate and circulate autonomously, revitalizing rural areas while protecting the city. The system utilizes the three major landscape typologies of Poyang Lake—polder, sub-lake, and wetland—as spatial carriers, and is designed with continuous scales. Based on specific strategies and design frameworks, diverse spatial principles are logically integrated to ultimately establish a sustainable circular landscape system.

Foreword

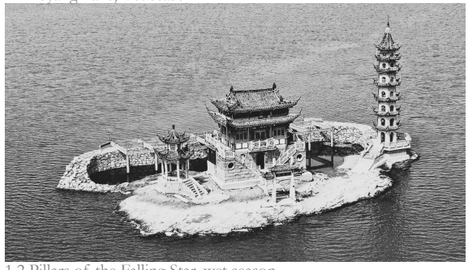
Poyang Lake has a long-term problem of unstable hydrological rhythm, for which the local government has proposed the Poyang Lake Water Conservancy Hub Project. The project aims to build a dam at the northern inlet of Poyang Lake to regulate the water level of the lake during the dry season. However, after the proposal was made public, it was opposed by many scholars, experts, and public welfare organizations for the reason that although the proposal can mitigate the impacts of the upstream, its impacts on the downstream have not yet been clarified, especially in terms of ecological functions. Among them, WWF advocates the construction of a dam-free project to maintain a healthy lake ecosystem. The discussion and justification of this issue have been debated for a decade. Therefore, this design aims to propose a new solution from the landscape perspective that can both regulate water storage and ensure ecological function and spatial fascination.

1 Fascinations

Wet Season

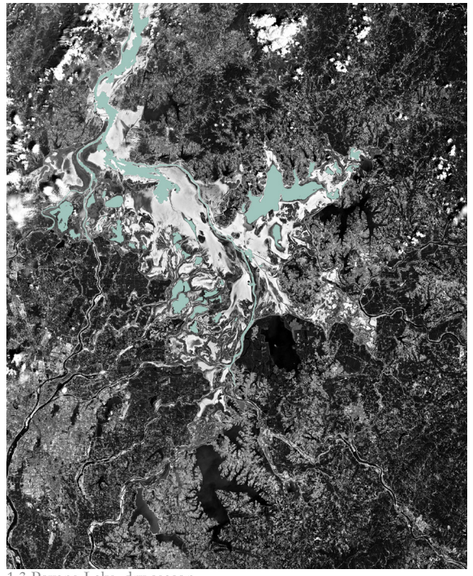


1.1 Poyang Lake, wet season



1.2 Pillars of the Falling Star, wet season

Dry Season



1.3 Poyang Lake, dry season

1.4 Pillars of the Falling Star, dry season

1.1 Satellite photo retrieved from Landsat 8
1.2 Photo by Our China Story. Retrieved from https://www.ourchinastory.com/zh/3451. Edited by author.

1.3 Satellite photo retrieved from Landsat 8
1.4 Photo by Dongsheng Wei. Retrieved from http://pic.people.com.cn/n1/2021/0117/c1016-32002051-6.html. Edited by author.

Living by the Water

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1.5 Photo by Guochun Li. Edited by author.
1.6 Photo by Weiguo Zhang
1.7 Photo by Guochun Li. Edited by author.
1.8 Photo by Bowen Fang. Edited by author.
1.9 Photo by Xiaozhong Li. Edited by author.

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1.10 Photo by Xingjun Yu
1.11 Photo by Zhiwei Xu. Edited by author.
1.12 Photo by Xingjun Yu
1.13 Photo by Zhonghua Wang. Edited by author.
1.14 Photo by Juanying Weng. Edited by author.

1.15

1.5-1.14
The former way of life of the people around Poyang Lake developed until the beginning of the 21st century.
1.15
Tang Dynasty(619-907) Poem describing the scenery of Poyang Lake, representing its cultural background

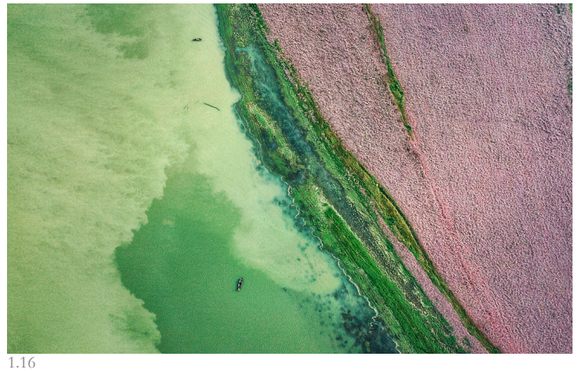
(From Jiangxi Photographers Association)

1.15 Wen Zhengming's calligraphy of Tengwang Ge Xu. Retrieved from https://en.wikipedia.org/wiki/Tengwang_Ge_Xu

Poyang Lake is a seasonal lake. "High water is a lake, low water is a river" is how the Chinese describe its great seasonal variation. The water taking in and out is the breath of the lake and the life of the lake. Between this unchanging breath, it has spanned two thousand years of life, witnessed the change of Chinese ancient dynasties, and the change of human life.

The lake's shores, fertile soil, abundant water, and rich resources made it the best place for people to settle down in the agricultural era. People lived by the water, grateful for the lake's gifts, adapting to the lake's dangers, ingeniously coexisting with this regular dynamic change, and developing a unique lifestyle. Civilization was born here.

Nature's Vastness



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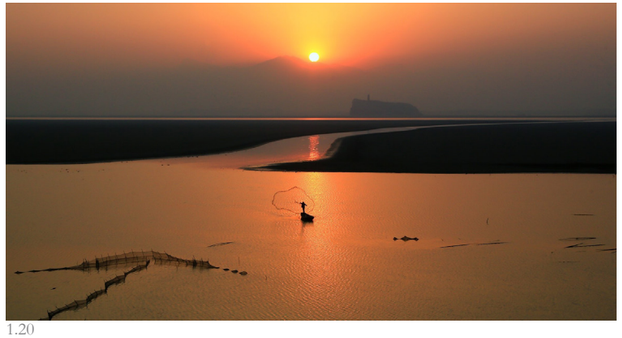


1.20

1.21

The beauty of nature's vastness unfolds here.

"The evening glow parallels with a lonely duck to fly, the autumn river shares a scenic hue with the vast sky. The fishermen can be heard singing the evening songs, their voices drifting as far as the banks of the Poyang Lake. Even the wild geese feel the chill of dusk settling upon them, and they cry all the way while flying southward, disappearing around the south bend of the Heng Mountain." This is the famous line of Chinese poetry that has been sung for thousands of years, sketching a picture of returning to the vast nature and representing the pristine and poignant poetry and aesthetics of the Chinese nation.

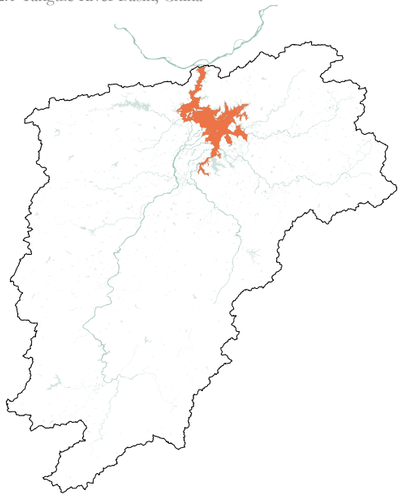
To this day, the water still changes, the lake still breathes, the lake still lives. However, challenges arising from the new age have emerged. What I want to write is the new story of our generation and the lake.

1.16 Photo from VCG. Retrieved from https://news.cgtn.com/news/2020-04-07/Why-Poyang-Lake-enters-into-the-longest-dry-season--PuFa2rAdLq/index.html
1.17-1.18 Photo by Deqing Pan. Retrieved from https://news.cgtn.com/news/2020-08-08/Poyang-Lake-source-of-diverse-natural-beauty-SMyepDMtPy/index.html
1.19 Photo by Yu Shi. Retrieved from http://jx.people.com.cn/n2/2022/0823/c190260-40092103.html
1.20 Photo by Qing Ye. Retrieved from https://www.birdnet.cn/thread-3987301-1-1.html
1.21 Photo from VCG. Retrieved from https://news.cgtn.com/news/2022-08-07/China-s-largest-freshwater-lake-enters-dry-season-1ciCQrY14U8/index.html

2 Context

2.1 Location

2.1 Yangtze River Basin, China



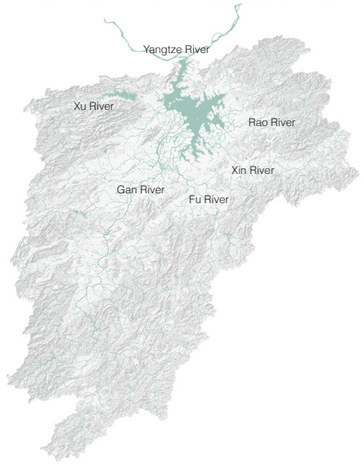
2.2 Poyang Lake Basin

Poyang Lake is located in Jiangxi Province, China. It is the largest freshwater lake and the second-largest lake in China. The Poyang Lake basin is one of the major tributaries of the middle and lower reaches of the Yangtze River Basin.

The area of Poyang Lake is 3150 square kilometers when the lake is at a general-water level (14m-15m), more than 4125 square kilometers at a high-water level (19m), and only 500 square kilometers at a low-water level (12m). The lake is 173 kilometers long from north to south and 16.9 kilometers wide from east to west on average, with a maximum width of 74 kilometers and a minimum width of 3 kilometers.

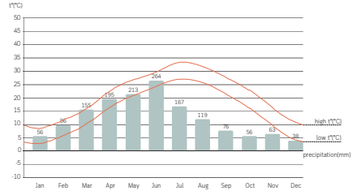
2.2 Hydrological Process

Catchment Area



2.3 Poyang Lake Basin catchment area and five main tributaries

Climate

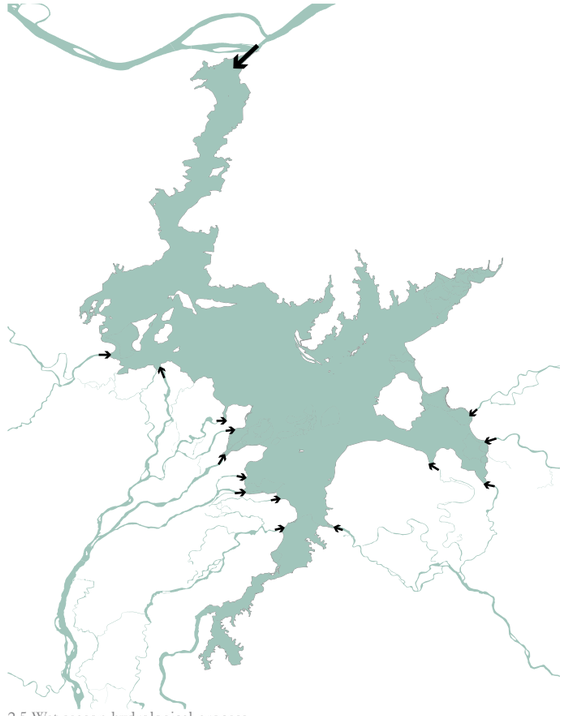


2.4 Annual precipitation and monthly average temperature

The terrain of Poyang Lake Basin is high in the south and low in the north, surrounded by mountains, forming a basin topography. The hydrological system of Poyang Lake is driven by five major tributaries, the Gan River, the Fu River, the Xin River, the Rao River, and the Xiu River, as well as the Yangtze River, the largest river in China. The water of Poyang Lake mainly comes from five major tributaries, originating from the surrounding mountains and replenished by precipitation. Among them, the Gan River which goes through Nanchang, the biggest city in the Poyang Lake basin, provides more than 40% of the water volume of Poyang Lake, accounting for the largest proportion. In addition, Most of the large and small rivers in Jiangxi Province are fed into the Yangtze River through Poyang Lake. As the catchment center, Poyang Lake controls the water balance between the basin and the Yangtze River.

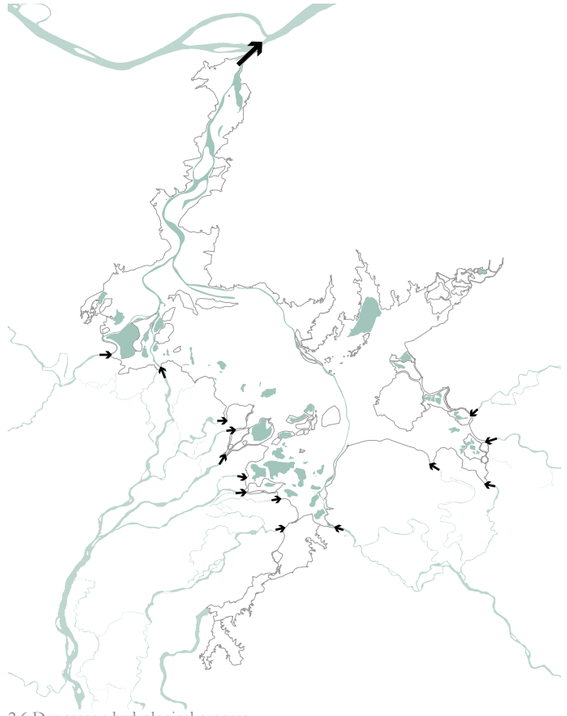
Precipitation in the Poyang Lake basin is unevenly distributed throughout the year, manifesting itself in dry and wet seasons with a short transition period in between, and subsequently leading to changes in runoff. From January to June, precipitation increases. The water volume of the five major tributaries rises, together with the jacking influence of the Yangtze River, resulting in the water convergence and a rapid expansion of the water surface in a short period, and reaches its maximum in July. From September to December, precipitation decreases. The amount of water from the five major tributaries decreases, and the water flows directly into the Yangtze River through the deepest fluvial area of the lake bed, with the rest of the lake bed exposed.

Wet Season



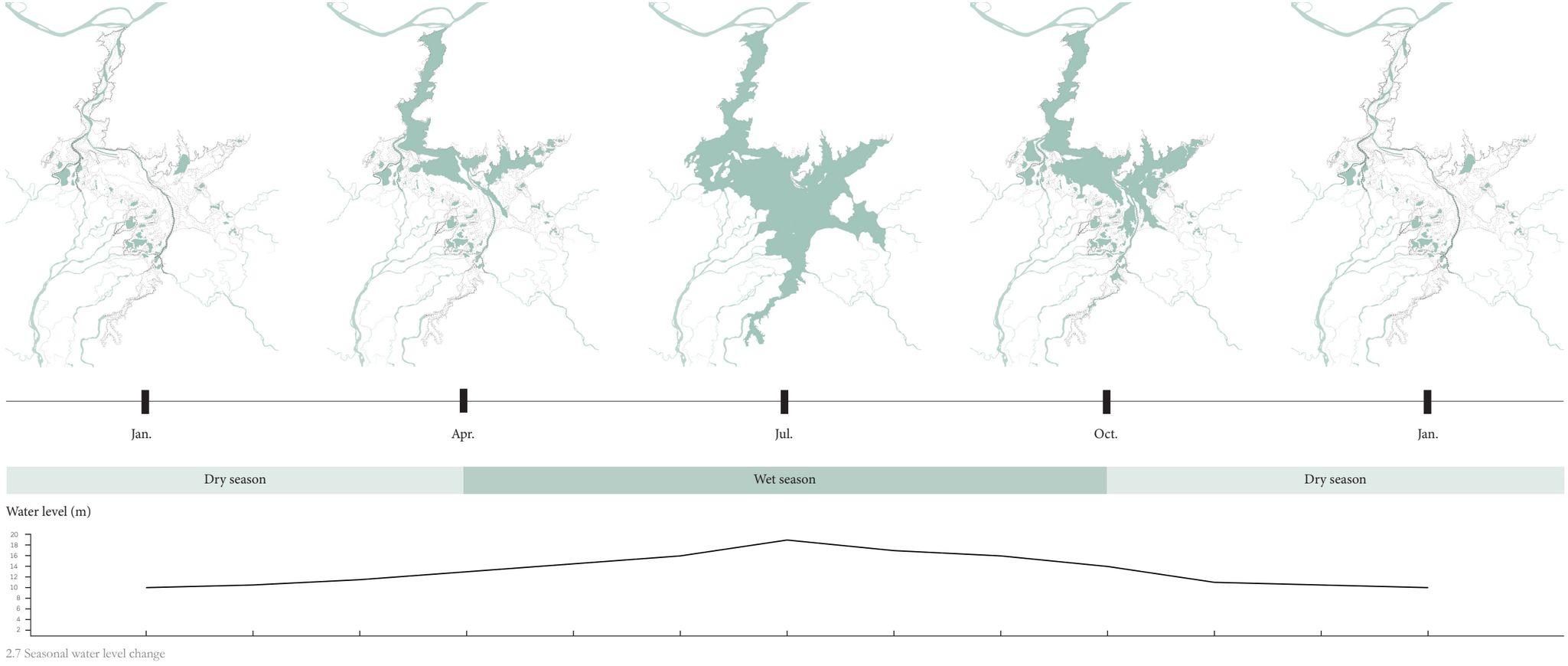
2.5 Wet season hydrological process

Dry Season



2.6 Dry season hydrological process

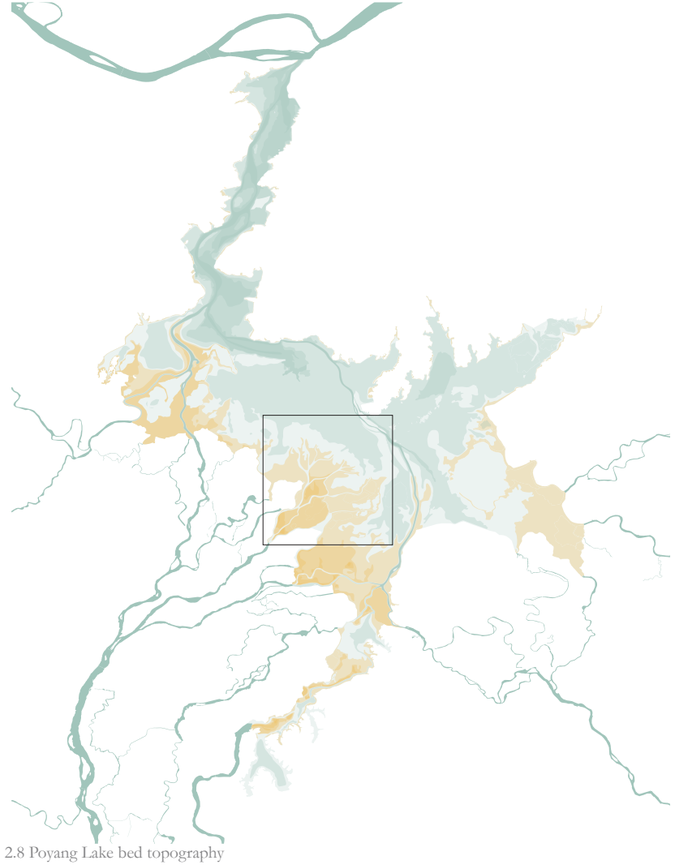
2.3 Seasonal Water Level Change



2.7 Seasonal water level change

Based on hydrological conditions, Poyang Lake shows seasonal water level changes, as well as water surface area changes. Based on the statistics and analyses of the monthly water surface and water level in Poyang Lake, this paper designates April to October, when the water area is larger and the water level is higher, as the wet season, and November to March, when the water area is smaller and the water level is lower, as the dry season.

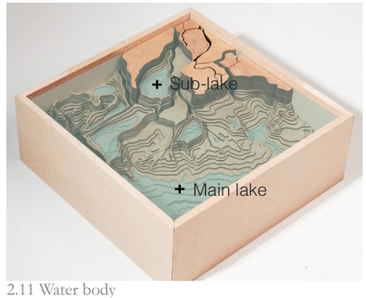
2.4 Lake Bed Topograghy & Water Body



2.8 Poyang Lake bed topography

2.9 Model

2.10 Detail of the model



2.11 Water body

Poyang Lake is a lake formed by the flood plain of rivers. About 1800 years ago, Poyang Lake was a humid plain. With the water overflowing from the waterway to the sides, the whole lake basin was gradually filled up. With the inflow of the five tributaries of the water, bringing a large amount of sediment which deposited in the lake area, the lake-entry delta continued to develop. In the process of delta formation, the flow rate reduced as it entered the main lake. Sediment was unevenly deposited by hydrodynamic forces, forming natural sand ridges on both sides of the mainstream and shallow depressions in waters away from the main stream. On this basis, This paper divides the lake bed topography into the deepest river area, the flat floodplain area, and the higher sub-lake area, which differ in their ecological, anthropogenic, and hydrological processes.

In a combination of topography and seasonal water level changes, the unique hydrological phenomenon of Poyang Lake is generated. The topographic features of the sub-lake caused its hydrological process characteristics different from the main lake which is connected with the river. Its relationship with the main lake is shown as the connection of the high water level, the correlation of the middle water level, and the separation of the low water level. In winter, part of the water is left in these shallow depressions, forming sub-lakes, which are separated from the main lake. In summer, the water level rises, and Poyang Lake becomes a complete water body again.

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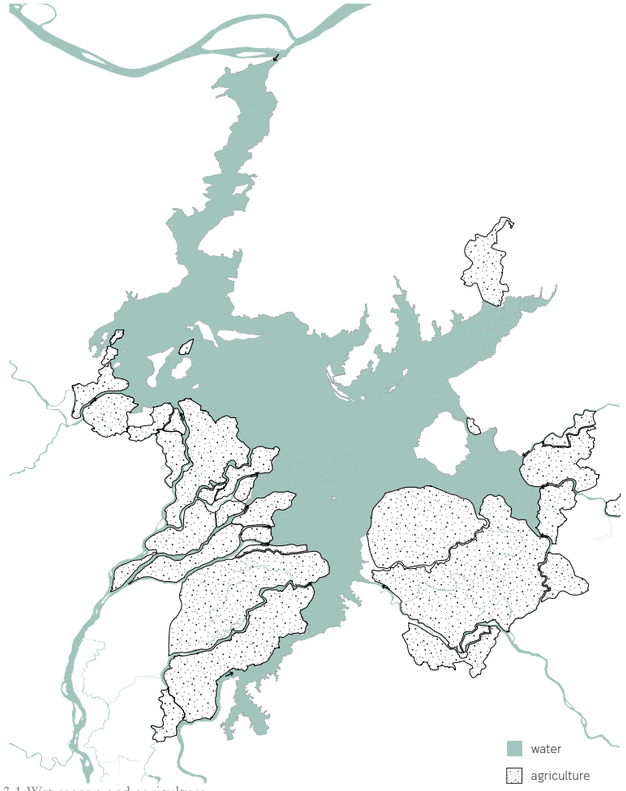
3 Balanced System of the Past

3.1 Traditional Water System

3.1.1 Production Acitivities: Wet Season



3.1 Wet season and agriculture

3.2 Landscape: Polder

3.3 Production activity: Agriculture

Based on the seasonal changes including water, available land, climate, and vegetation, people have developed a unique traditional water system in the Poyang Lake basin, which integrates water, ecology, production, and living, and realizes the cycle of resources, land, and production patterns.

In the wet season, the entire lake bed is covered by water, thus the mainland used was polder and the main productive activity was agriculture.

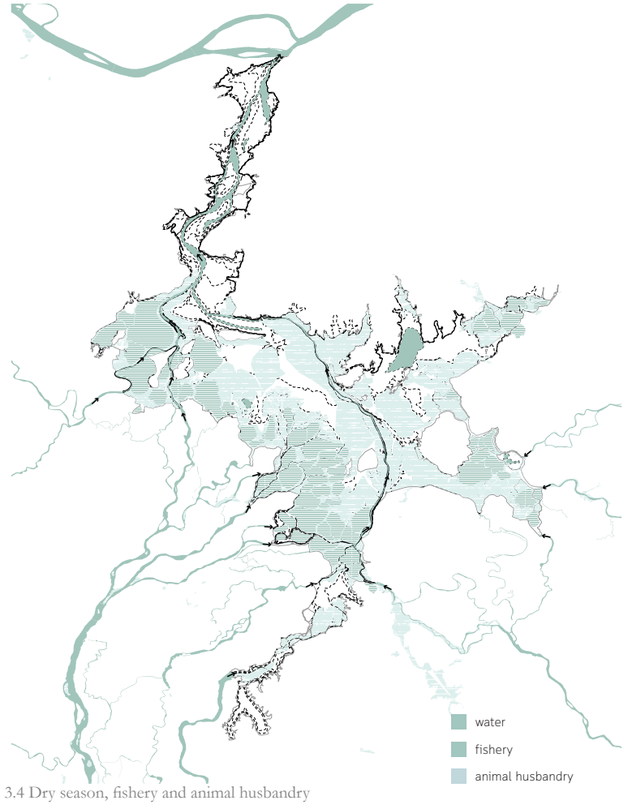
During the Ming and Qing Dynasties (1368-1840), the Poyang Lake area has seen the peak of land reclamation. At that time, due to the need for water conservancy construction and land use, the government and the public cooperated and participated in the polder construction, resulting in the polders being managed in different ways and sizes. Small polders were subsequently re-diked and linked together to form large polders. As a large amount of mudflat along the lakefront was transformed into polders, with the abundance and stability of water resources, a large number of people began to live on the polders and engage in agricultural production. Poyang Lake gradually became one of the most important rice production areas in China.

People managed the water through dikes, ponds, canals, ditches, and sluices. During the wet season when the water level of Poyang Lake was high, they opened the sluice gates and the water flows naturally through the canals and ditches into the farmland for irrigation and domestic use. Smaller ponds were then used for temporary water storage. At the same time, they used Poyang Lake buffalo (a domesticated breed of buffalo unique to Poyang Lake) to plough the fields. The three stages of ploughing and sowing, growing and fertilizing and harvesting are carried out from April to October according to the rice planting cycle. Today, after several rounds of infrastructural improvements and reinforcement of the polder structure, these polder fields are still in use, and the Poyang Lake area still provides food for the whole country.

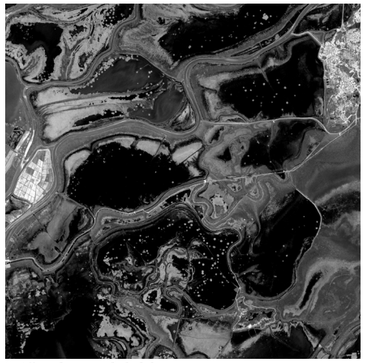
3.2 Satellite photo retrieved from Google earth
3.3 Photo by Shilei Ouyang. Retrieved from https://www.infzm.com/contents/237607?source=131. Edited by author.

3.1 Traditional Water System

3.1.2 Production Activities: Dry Season



3.4 Dry season, fishery and animal husbandry



3.5 Landscape: Sub-lake

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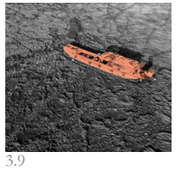


3.9

3.6 Build the dike and water gate
3.7 Open fishing for bigger fishes
3.8 Drain the lake to catch the remaing fish
3.9 Sun-dry the lake bed

3.5 Satellite photo retrieved from Google earth
3.6 Photo by Manqing Zhou. Retrieved from https://cj.sina.com.cn/articles/view/1684012053/645ffc1500101biia?finpagefr=p_104. Edited by author.
3.7 Photo by INSTITUTE FOR PLANETS. Retrieved from https://www.zhihu.com/question/532491375/answer/2482562858. Edited by author.
3.8 Photo by Shandonglingong. Retrieved from https://www.sdlg.cn/topdriver/rewiew/wnhisnews-detail-2628.htm. Edited by author.
3.9 Photo by INSTITUTE FOR PLANETS. Retrieved from https://www.zhihu.com/question/532491375/answer/2482562858. Edited by author.

3.10 Landscape: Wetland

3.11 Production activity: Animal husbandry

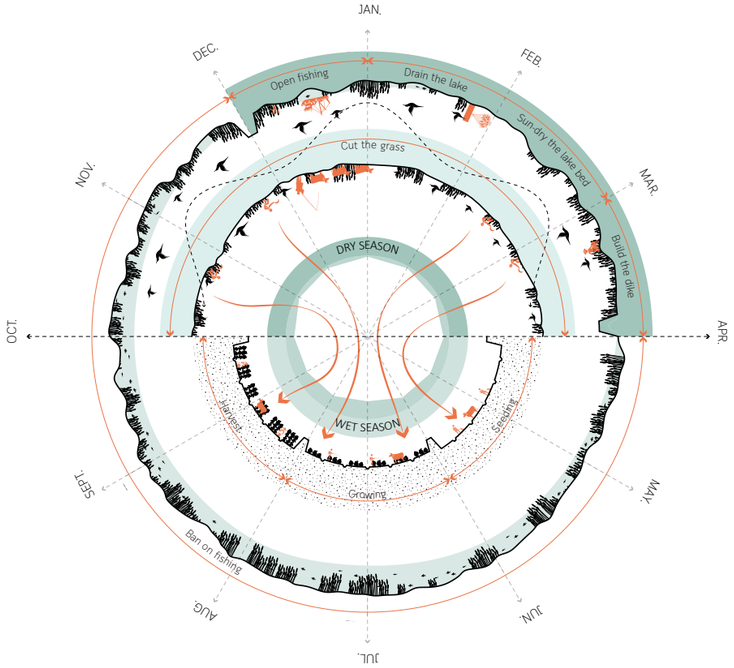
During the dry season, the floodplain area and the sub-lake area are exposed and become the mainland used by people, and the main productive activities were fisheries and animal husbandry.

As the water level drops, part of the water is left in the higher sub-lake which attracts fishes to stay with the good overwintering and feeding conditions. Therefore, the fishermen of Poyang Lake took advantage of this unique condition to engage in fishery. The fishery of Poyang Lake could be divided into four sequential stages: 1Building the dike and water gate, 2Opening fishing for bigger fishes, 3Draining the lake to catch the remaining fish, and 4Sun-drying the lake bed. Influenced by the water flow from tributaries, sand ridges were formed naturally and gradually enclosed into the sub-lake. Local fishermen leveraged this natural terrain, reinforcing and elevating it, and controlled the water level through sluice gates to achieve artificiality. Annually, they reinforced the dikes and sluice gates, implementing a designated fishing ban period. When the dry season came, they opened the fishery to catch the bigger fish first. Subsequently, through a combination of sluice gates and nets, the water in the sub-lake was discharged into the river or the main lake, and all the remaining fish were left in the nets. As the lake dried up, it was exposed to the sun to facilitate the breakdown of harmful substances and prevent swamping.

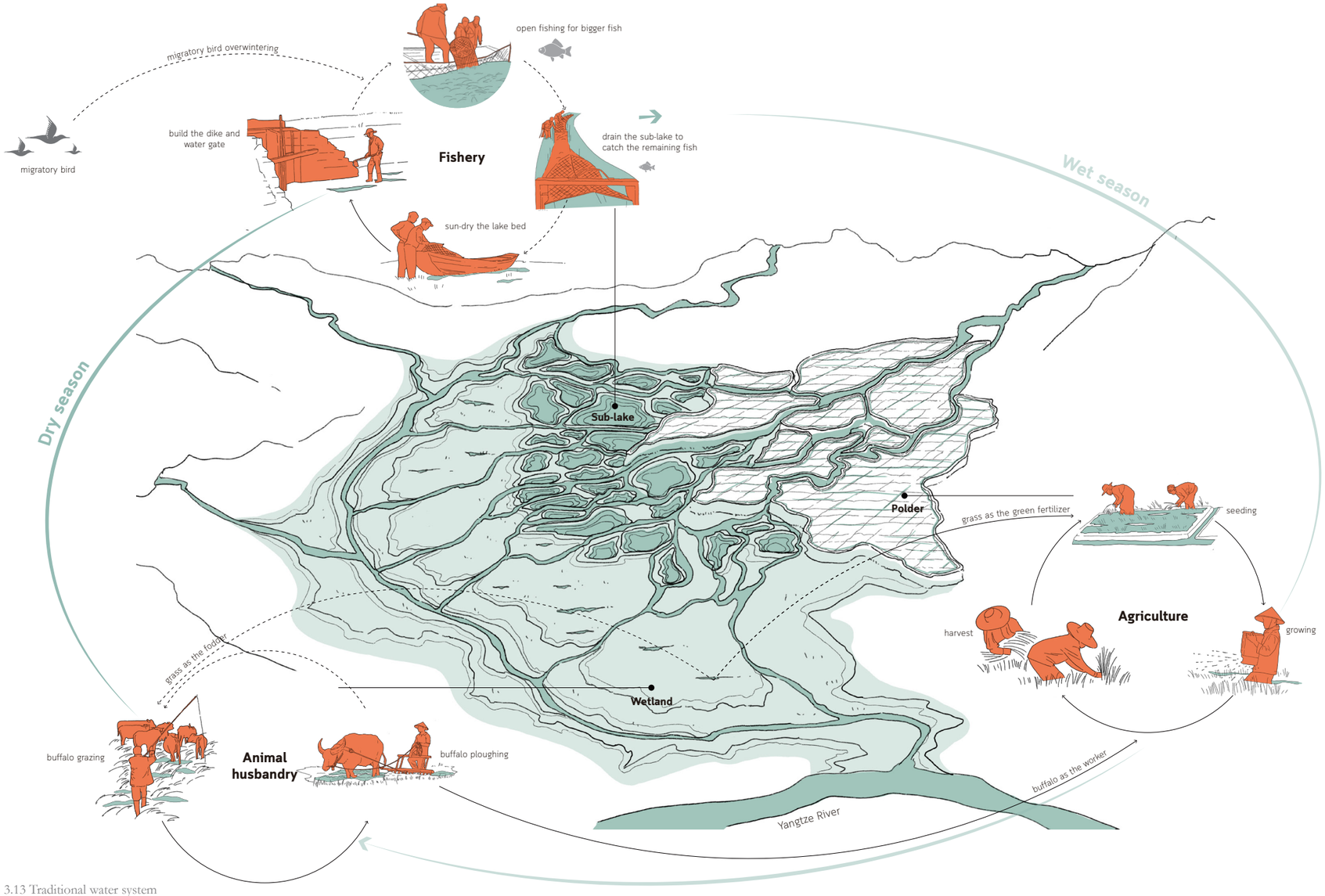
The floodplain area consists of sandy areas and wetlands. The wetland grows lush water grass, which is exposed as the water level drops. Farmers made use of the grass resources here to develop animal husbandry. Animal husbandry was carried out with the production and resting period of buffaloes. Poyang Lake buffalo is an endemic species introduced and improved in the 1970s and 1980s, and it is the largest land species in the Poyang Lake area. Poyang Lake buffaloes had been widely existing in the area around Poyang Lake and played a crucial role as an important draft animal and service tool. During

3.10 Satellite photo retrieved from Google earth
3.11 Photo by INSTITUTE FOR PLANETS. Retrieved from https://www.zhihu.com/question/532491375/answer/2482562858. Edited by author.

the wet season, buffaloes worked in the farmland, while during the dry season, they rested in the wetland. The water grass in the wetland is the natural feed for buffaloes, and the wet and watery environment is also suitable for buffaloes. At the same time, people cut these water grasses and composted them as green manure for the farmland.

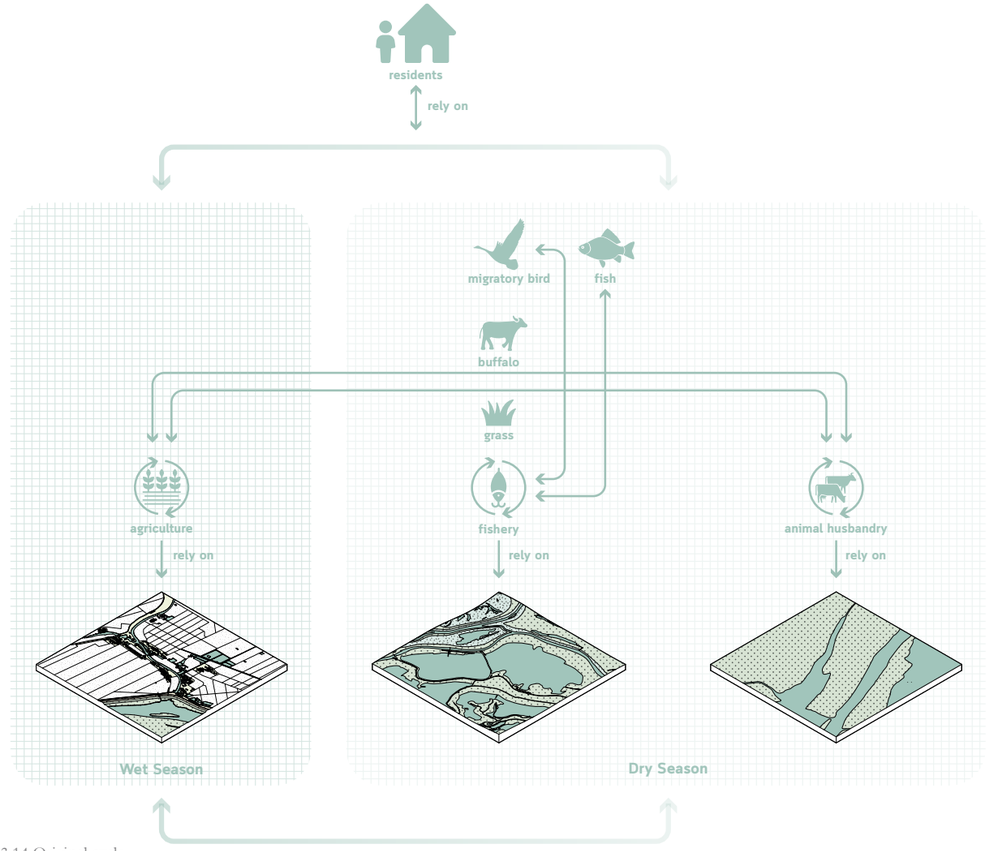


3.12 Annual Cycle



3.13 Traditional water system

Original System



3.14 Original cycle

To sum up, before the 21st century, Poyang Lake basically maintained the balance of the ecological and social system under the background of time and productivity level. What people have constructed is a social production system that relies on the seasonal changes and natural resources of Poyang Lake. The relationship between the social systems and ecosystems is dependency, in which human activities are largely subject to great natural changes, and the disturbance is relatively slight, thus the balance between the two is maintained.

Meanwhile, in this traditional water system, the people have shown primitive systematic thinking and dynamic thinking between the longtime of mutual compromise with nature. They combine the dimension of time with the existing physical environment (including geography and resources, etc.), which endows the system with a dynamic property. For example, seasonal changes in water levels give different land types a cyclical variation in the amount of time available for human use. The plants and animals in the system also have their own life cycles. All the components of the system have their own "processes". Human beings have combined these "processes" and intervened appropriately according to the functional needs to form the traditional water system of Poyang Lake. This systematic thinking and dynamic thinking is the most important characteristic and charm of the Poyang Lake traditional water system, and this paper expects to apply it in the subsequent research and design.

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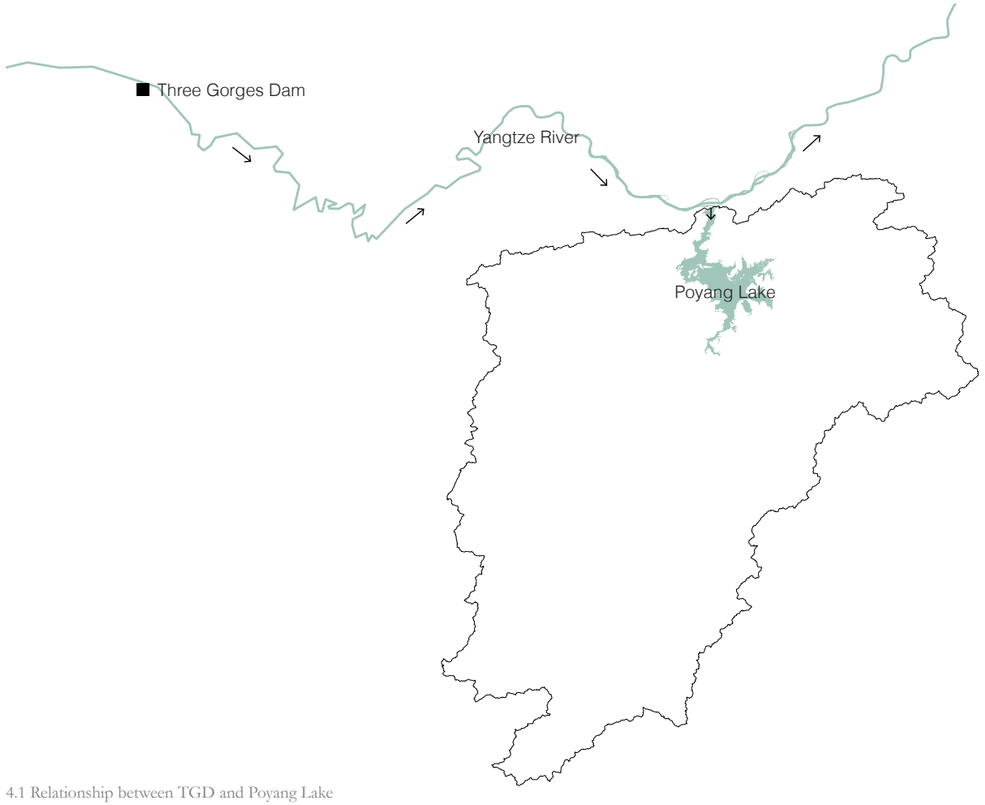
4 The Emergence of Disharmony

4.1 Emergence of New Influence

4.1.1 Changes in river (lake) connectivity: Construction of the Three Gorges Dam



4.1 Relationship between TGD and Poyang Lake

4.2 Three Gorges Dam

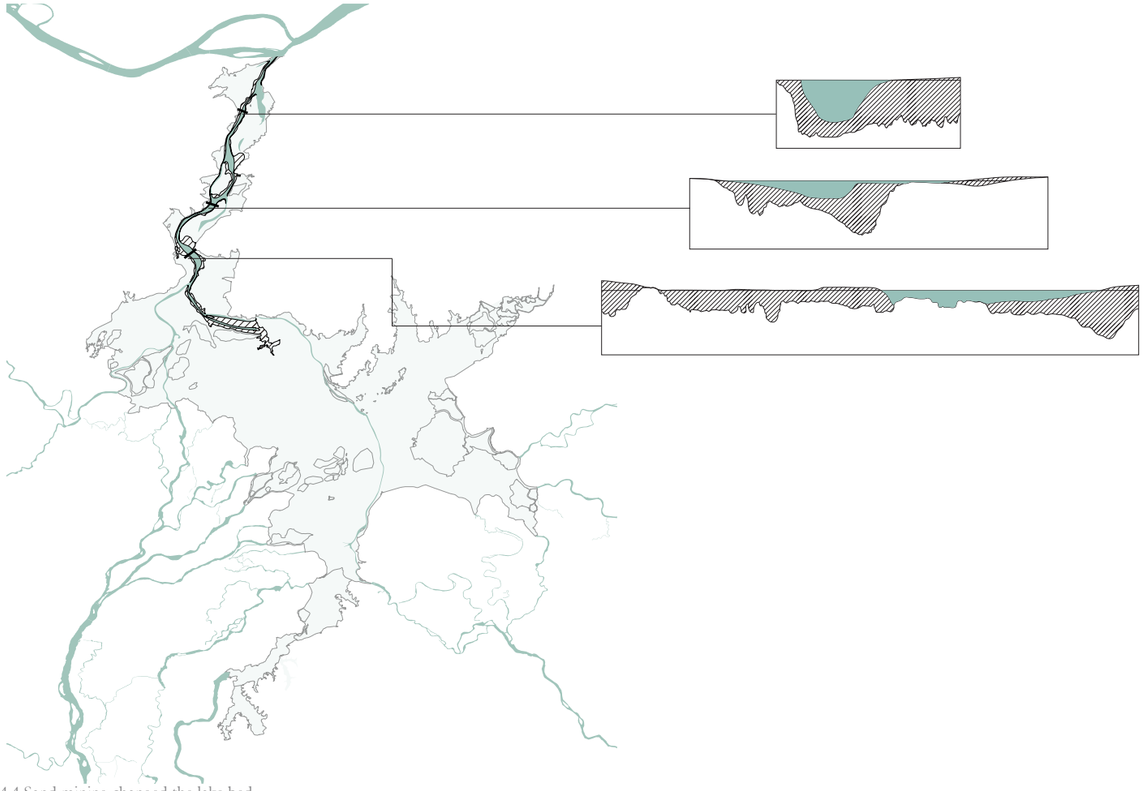
4.3 Three Gorges Dam

The Three Gorges Dam, which was built in 1994 and began operation in 2003, integrates flood control, power generation, shipping, and water resource use, and is one of the largest water conservancy hub structures in the world today.

The operation of the Three Gorges Dam has had a wide range of complex impacts, either positive or negative, on both the upstream and downstream basins of the Yangtze River. This paper will focus on the impact of the Three Gorges Dam on the Poyang Lake basin. The construction and operation of the Three Gorges Dam is an important turning point in the development of Poyang Lake. In terms of water, the operation of the Three Gorges Dam has had a drastic impact on the hydrological processes of Poyang Lake. The end-of-flood storage(September to November) of the Three Gorges Dam led to a lowering of the water level in the main stream of the Yangtze River, which triggered the accelerated decline in water level in the dry season as well as a prolongation of the dry season at Poyang Lake, and consequently altered the inundation dynamics of the sub-lake and wetland. In terms of sediment, the Three Gorges Dam intercepted the sediment, subsequently reducing the amount of sediment in Poyang Lake and exacerbating the scouring and erosion of the riverbed. In terms of ecology, the dam blocked the connectivity between the waters and therefore the migratory path of fish. Meanwhile, it also changed the original water flow rate, which in turn changed the habitat conditions for flow-sensitive fishes.

4.2 Photo by Associated Press. Retrieved from https://www.indiatvnews.com/explainers/china-three-gorges-dam-world-s-largest-hydropower-project-earth-s-rotation-environmental-hazards-pollution-landslides-floods-power-updates-2023-08-01-884249
4.3 Photo by Le Grand Portage. Retrieved from https://commons.wikimedia.org/wiki/File:ThreeGorgesDam-China2009.jpg

4.1.2 Increase in Outflows: Sand Mining



4.4 Sand mining changed the lake bed

4.5 Destruction of the shape of the lakeshore

4.6 Sand quarry

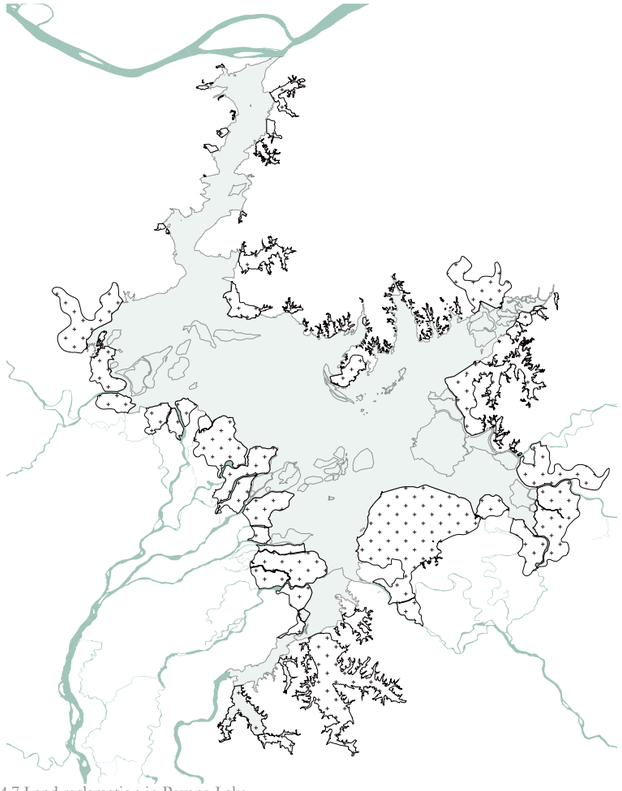
China's massive urbanization in recent decades has driven the demand for sand as a building material, which in turn has fueled a booming sand mining industry since around 2001. Poyang Lake is a natural sand quarry due to the long years of siltation and the formation of a deep sediment base at the bottom of the lake. However, with the long-term uncontrolled mining, the river area of the lake bed has been subject to extensive erosion, and the larger and deeper river way has led to an accelerated rate of water outflow, further exacerbating the rapid decline of the water level in the dry season. Besides, sand mining activities have exacerbated the turbidity of the lake, changing the sediment from a precipitated state to a suspended state, and from siltation to scouring, making it more susceptible to being lost in exchange for water. In addition, due to the interception of sediment by the Three Gorges Dam as mentioned above, the sand resources of Poyang Lake are under threat. Meanwhile, the impact of sand mining activities on the water level and the destruction of the lake bed and lake bed vegetation have also caused negative impacts on the habitat and biodiversity of Poyang Lake.

The Chinese government currently lacks a complete assessment of the impact of sand mining. Intervention in the sand mining has had little effect, with the trade-off between a complete ban on mining and an inability to control mining, and no mature regulatory mechanism has yet been developed.

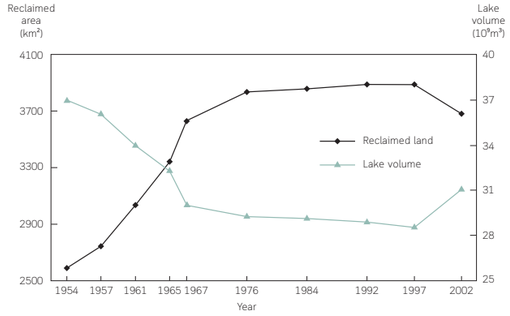
4.4-4.5 Imformation from https://www.reuters.com/graphics/GLOBAL-ENVIRONMENT/SAND-POYANG/qzjpqxxabvx/. Redrawn by the author.

4.5 Photo by Alamy. Retrieved from https://dialogue.earth/zh/10/71572/
4.6 Photo by Aly Song / Alamy. Retrieved from https://e-info.org.tw/node/229391

4.1.3 Reduction of Water Retention Areas: Land Reclamation



4.7 Land reclamation in Poyang Lake



4.8 Land change statistics

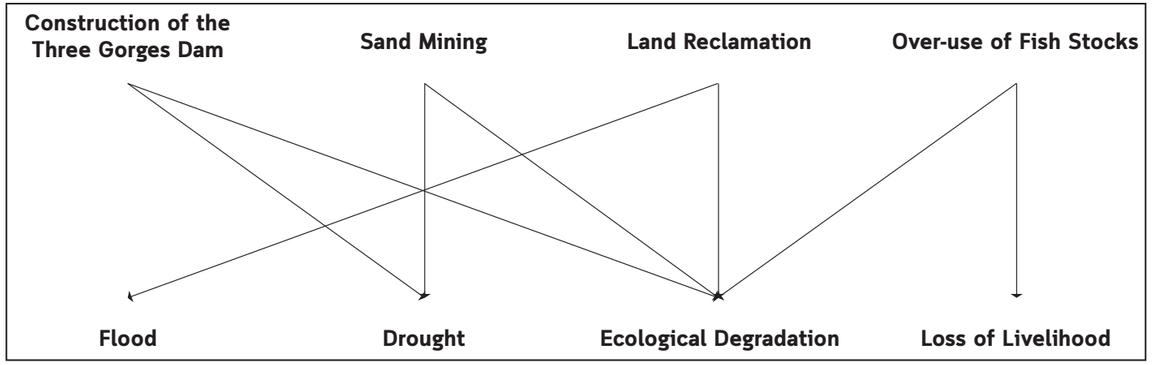
The land reclamation of Poyang Lake has been developing continuously since the Ming and Qing Dynasties nearly hundreds of years ago, and the land and water pattern of Poyang Lake has been changing. There is a lack of pictorial information to support land changes during the Ming and Qing dynasties. The study of Li Bing et al. on the evolution of Poyang Lake from the 1930s to 2010s still elucidated the form and development process of land reclamation in the lake to some extent. This study showed that the wetland area of Poyang Lake decreased from 5024.3 km² in the 1930s to 3232.7 km² in the 2010s, with a loss of up to 35.7%, most of which was converted into arable land and reservoirs. With the 2000s deepening understanding of lake hydrology and increased awareness of ecological protection, the land reclamation in Poyang Lake has significantly reduced and come to an end, but the changes caused before have inevitably affected the lake. This land change of water bodies being converted into land directly led to a large decrease in the water storage of Poyang Lake. In addition, the isolation of part of the water body by sluice gates and dikes has led to a reduction in hydrological connectivity. The isolated water body has a completely independent hydrological rhythm with the main lake, and cannot continue to serve the water body storage. These changes have weakened the capacity of Poyang Lake to cope with seasonal flooding. The loss of the original wetland also hinders the maintenance of the lake's ecological service system.

4.1.4 Resource Over-utilization: Over-use of Fish Stocks

4.9 Dead fish littering the shore

The previously mentioned fishing activity on the autumn sub-lake undoubtedly takes an approach that is contrary to the goal of sustainability in today's perspective. Due to its low productivity, fisheries resources and ecology have not been seriously affected. However, as times have changed and productivity has increased, a variety of new and efficient fishing methods have emerged. The Yangtze River has begun to suffer from the effects of destructive and intense fishing activities, together with other multiple impacts such as sand mining, the fishery resources have been dealt a huge blow that the species and quality of fish in the basin shrinking. In addition, biodiversity has also been affected, and some rare species, such as river dolphins, have become extinct as a result.

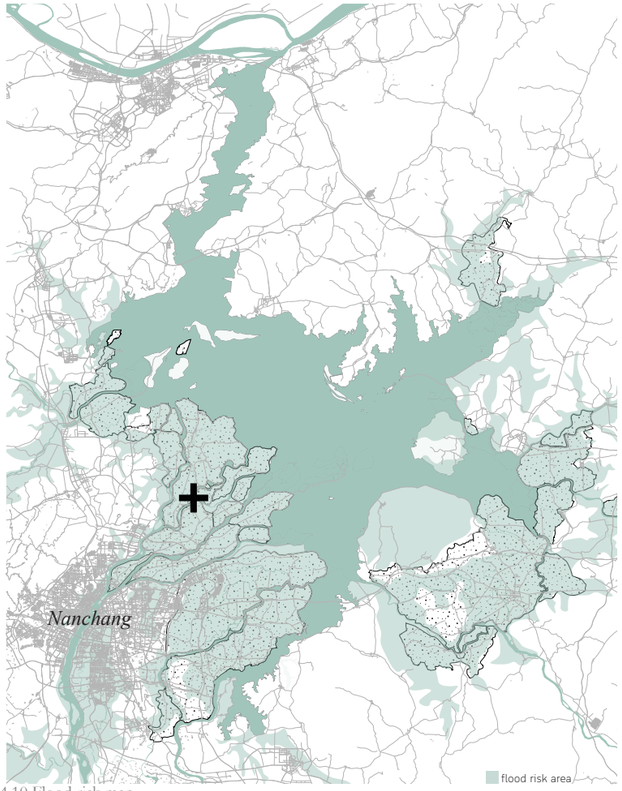
Influenced by the four major drivers, various problems have begun to emerge at Poyang Lake.



4.9 Photo by Thomas Peter / REUTERS. Retrieved from https://www.zawya.com/en/multimedia/galleries/chinas-poyang-lake-shrinking-amid-heatwave-drought-seo61tzw

4.2 Problem

4.2.1 Flood



4.10 Flood risk map

4.11

4.12
Houses on polder flooded.

The area around Poyang Lake is low-lying and flat and has historically suffered from severe flooding.

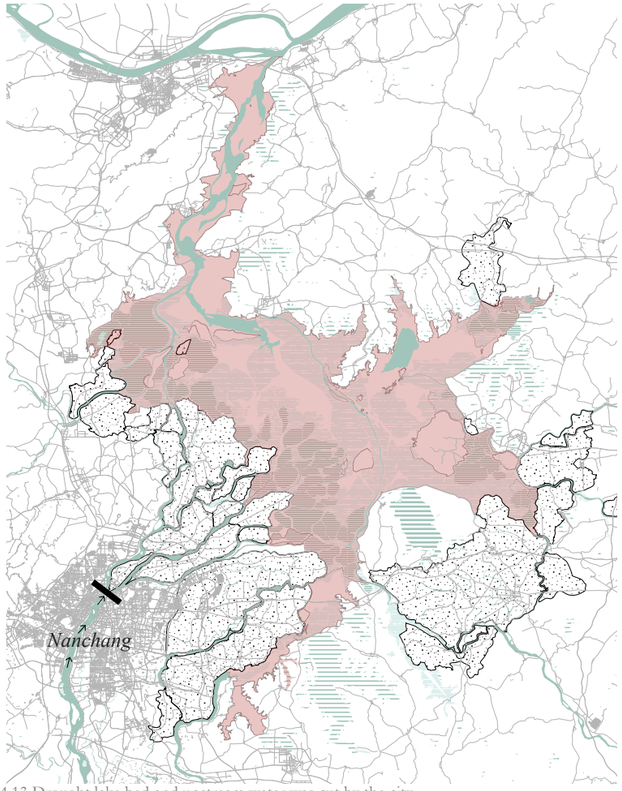
Flood events occur during the wet season, especially during the heavy precipitation from April to June. The water levels of the tributaries and the Yangtze River rise at the same time, causing the water level of Poyang Lake to rise rapidly. Extremely flood events occur at Poyang Lake and the lower reaches of major rivers when subjected to extreme precipitation events in certain years. Numerous studies have shown that such extreme precipitation events are closely related to the El Niño phenomenon which occurs every 2-7 years and is unfortunately unpredictable.

The area around Poyang Lake is protected from flooding by a large-scale polder and dike system. This system can withstand the expected annual floods but is not sufficient during extreme events. These dikes are typically 19-20 m. When the water level in Poyang Lake exceeds 19.5 m, it is defined as a major flood event. When it exceeds 20.5 m, it is defined as a severe flood event, which has occurred 7 times in recorded history. The water level reached 22.52m in 1998, which is still the historical extreme since the beginning of the hydrological record.

The polder and dike system protects the land while weakening the water storage capacity of Poyang Lake, stimulating the occurrence of more intense floods. Over the past 500 years, the average water level of Poyang Lake has risen by 0.48m every 100 years, with a total rise of about 2.4m (Min and Wang 1992). In recent decades, the height of the flood level at Poyang Lake has been increasing and extreme flood events have become more frequent (Min, 2000). Poyang Lake is in a difficult situation. The levee system with non-resilient boundaries is an overly aggressive and reckless strategy. What can be predicted is that in the future, unstoppable floods will eventually come. The surrounding farmland and people living near Poyang Lake will be seriously threatened in terms of life and property. At the same time, most of the cities in Jiangxi Province are built around Poyang Lake, especially Nanchang, the largest city in Jiangxi Province with a population of more than six million people, is in the downstream area of the tributary and is in danger of flooding.

4.10 Photo by Imaginechina/AP. Retrieved from https://asia.nikkei.com/Opinion/China-must-act-now-to-prevent-Yangtze-floods-getting-worse
4.12 Photo by STR/AFP/AFP via Getty Images. Retrieved from https://edition.cnn.com/style/article/china-three-gorges-dam-intl-hnk-dst/index.html

4.2.2 Drought



4.13 Drought lake bed and upstream water was cut by the city

4.14 Lack of water supply in the polder

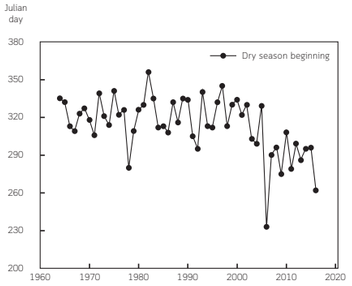
4.15 Sub-lake dries up

4.15 Migratory birds lack food and enter farmland to feed

Due to the uneven distribution of seasonal precipitation, Poyang Lake is one of the areas with a high incidence of drought and water scarcity in China, with 105 dry months occurring in the last 50 years (Ye et al., 2015) and six extreme drought events in the last 60 years (Zhang et al., 2015).

Droughts at Poyang Lake tend to occur between the end of the wet season and the dry season. According to Liu Yuanbo et al., three typical extreme drought events at Poyang Lake in 2003, 2006, and 2009 corresponded to the lowest winter water level on record. These drought events are associated with meteorological combinations of evapotranspiration and precipitation (Liu et al., 2011). In addition, the frequency of droughts at Poyang Lake in recent years has shown an increasing trend, and the dry season has shown an early and prolonged trend. This is due to the emergence of new influences, such as the operation of the Three Gorges Dam, which has changed the seasonal flow pattern of Poyang Lake. The interaction between Poyang Lake and the Yangtze River strongly influences the chance of drought events. During the dam impoundment period (September to November), the water level in the lower reaches of the Yangtze River, where Poyang Lake is located, is significantly lower, and the return flow from the Yangtze River is weakened. At the same time, the widening and deepening of the river area as a result of sand mining further contributed to a faster flow of water out of the lake and a faster drop in the lake water level. The Chinese government's water research department has reached a general consensus that the drying up of Poyang Lake is likely to be trending and normalized.

The lake water is an important source of agricultural and industrial water for the region around Poyang Lake, sustaining the operation of industries. When there is no drought event, the inhabitants allow the natural flow of water from the higher lake level into the lower polder canals and ditches by opening the sluice gates on the dikes on the lakeside. When a drought event occurs, the lake drops rapidly and the water surface shrinks towards the center of the lake. This system of dikes and sluices, which rely on the natural difference in water level elevation, cannot function properly. Meanwhile, the more populous cities located upstream, such as Nanchang, intercept incoming water from upstream. Rural areas along the lakeshore have to wait for water passively, or even be abandoned. With earlier and earlier dry seasons and lower and lower minimum water levels, many Chinese worry about whether the Great Lake, which has survived for thousands of years, will disappear.



4.16 Statistics on the start of the dry season

4.14 Photo by Thomas Peter / REUTERS. Retrieved from https://www.aljazeera.com/news/2022/9/23/red-alert-in-china-as-drought-dries-up-countrys-biggest-lake
4.15 Photo by REUTERS. Retrieved from https://www.japantimes.co.jp/news/2022/06/18/asia-pacific/science-health-asia-pacific/china-poyang-lake-environment/
4.16 Photo by Alamy. Retrieved from https://dialogue.earth/zh/10/71572/

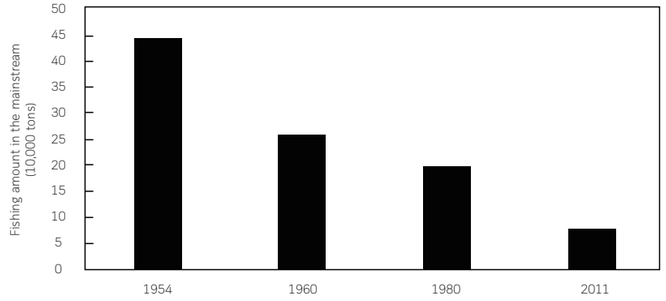
4.16 Data from *Hydrological drought in two largest river-connecting lakes in the middle reaches of the Yangtze River, China*. Redrawn by the author.

4.2.3 Ecological Degradation

WWF has clarified that Poyang Lake has an irreplaceable ecological role in the global ecological pattern (WWF, 2014). The ecological environment and biodiversity of Poyang Lake have been significantly affected by frequent droughts, long-term inappropriate fishing practices, and direct discharge of wastewater. In terms of water quality, Bing Li, Zhaoshi Wu et al. have experimentally demonstrated that the water quality of Poyang Lake is deteriorating and eutrophic. The lake may be transformed into a eutrophic lake, with occasional algal blooms requiring strict control of nutrient loading (Li et al., 2020). In terms of vegetation, the early drop in water level coupled with the low drying level exposes the sub-lake and the wetland area 1-2 months earlier. As the exposed area increases and the subsequent soil water content decreases, the water requirements of the wetland plants can hardly be met, resulting in significant plant mortality. In terms of animals, a large number of benthic animals, such as mussels and snails, died due to dehydration. Meanwhile, due to low water levels and poor water quality, fish foraging is affected. The construction of the Three Gorges Dam has also led to the blockage of fish migration routes. At present, the catch resources of Poyang Lake have been significantly reduced, and show the trend of lower age and miniaturization (Yao et al., 2021). Migratory birds, which feed on plant tubers and fish, are not only threatened by food sources but also by habitat damage due to vegetation degradation.

4.17 Exposed lake bed kills aquatic plants

4.18 Exposed lake bed kills aquatic plants



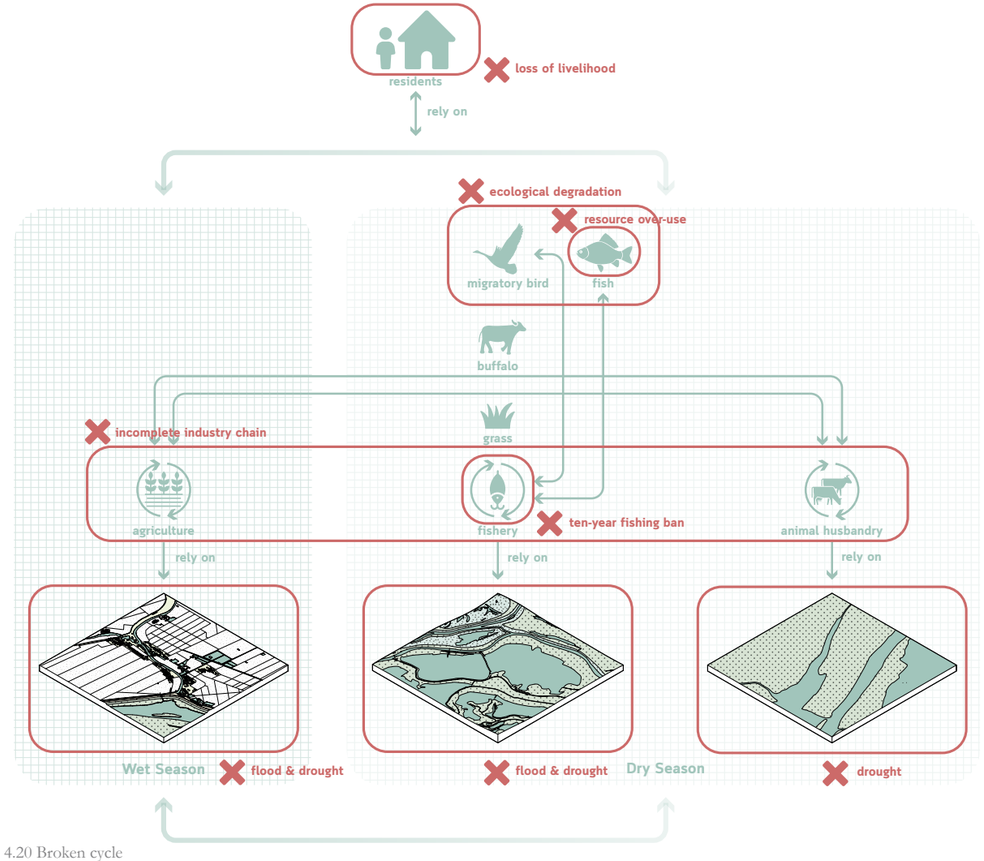
4.19 Decline in fishery resources

4.2.4 Loss of Livelihood

A series of changes at Poyang Lake have doubtlessly threatened the livelihoods of the people living along the lake, most of whom are rural population which has a high level of vulnerability. They rely on traditional industries, such as agriculture, fisheries, and animal husbandry. Their entire lake industrial system is highly dependent on natural rather than artificial means. Seasonal water level variations and the cycling of natural resources are the core of this system. Therefore, when natural conditions change, human livelihoods are greatly affected. As a result, agriculture suffers frequent crop failures due to unstable water supplies. Fisheries are also hit hard by the decline in fishing resources. In addition, due to concerns about the fish market supply, the Chinese government issued an announcement on a plan to ban fishing for natural fishery resources in the Yangtze River Basin in 2020, which came into effect on 1 January 2021. This has directly led to a large number of fishermen abandoning their original livelihoods in favor of new industries such as sand mining which makes it even more difficult to constrain this industry. More and more young people are leaving the rural areas in search of new opportunities in the cities. The productive dynamism of this region is declining.

4.17 Photo by visual.people.cn. Retrieved from https://photos.caixin.com/2022-08-09/101923972.html
4.18 Photo by CFP.CN. Retrieved from https://science.caixin.com/2022-08-08/101923483.html
4.19 Data from *WWF LIVING YANGTZE REPORT 2020*. Redrawn by the author

4.3 Broken Cycle



4.20 Broken cycle

To sum up, with the emergence of one new variable after another, the Poyang Lake traditional water system can no longer be adapted to the increasing complexity of the current situation and is gradually collapsing. The root cause is the change in water rhythms. For example, dams control the timing of the wet and dry seasons, deeper riverbeds lead to longer dry seasons, etc. Changes in water rhythms have brought about a series of chain reactions. Therefore, Poyang Lake urgently needs to establish a system adapted to the new water rhythms. The establishment of this system should still be systematic and dynamic, with the existing physical environment as the carrier and tool, through a scientific way to achieve adjustment and enhancement.

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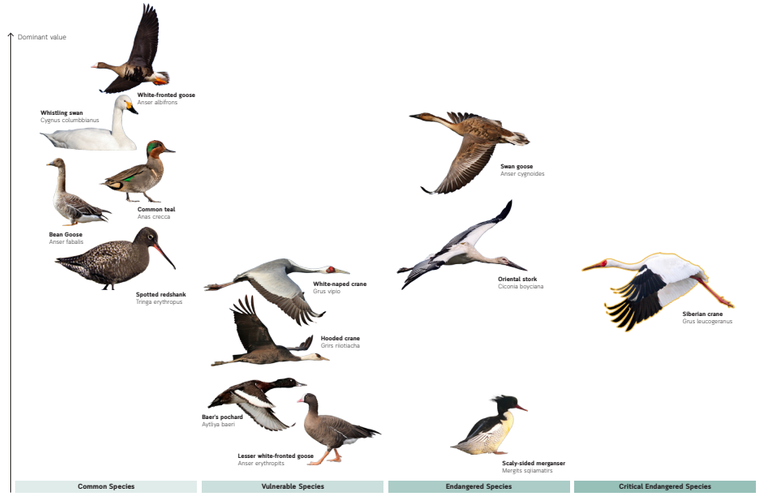
5 Values

5.1 Ecological Value

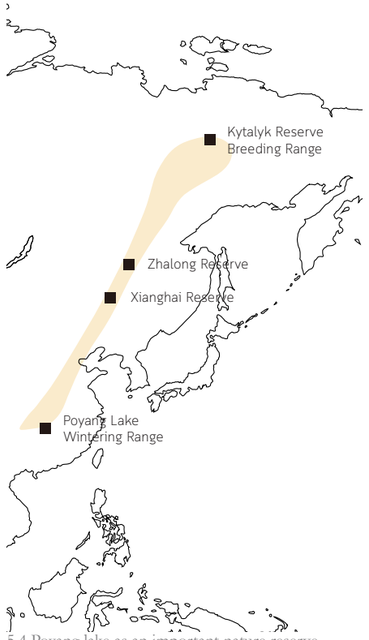


5.1 Poyang Lake migratory bird species

5.2

5.3

Humans and migratory birds coexist harmoniously



5.4 Poyang lake as an important nature reserve

5.2 Photo by Guiying Wang.
5.3 Photo by Shexueqing Wang. Edited by author.
(From Jiangxi Photographers Association)
5.4 Information from Ed Harrison / China Dialogue. Redrawn by the author.

Poyang Lake has very essential ecological value. The climatic conditions of the Poyang Lake area, the natural conditions of the sub-lake area, and the fishing activities have made Poyang Lake an important habitat for rare waterbirds, such as the Siberian White Crane (*Grus leucogeranus*). Every winter, thousands of migratory birds from other habitats, such as Siberia in Russia and Northeast China, fly to Poyang Lake for wintering.

In the Poyang Lake ecosystem, sub-lake plays a vital role. Each sub-lake is a highly open, relatively independent, and distinctive subsystem. With the change in water level, the sub-lake continuously exchanges material and energy with the outside environment. Changes in water level allow fish to stay here. The shallower water levels also allow aquatic plants to grow here. Therefore, the sub-lake's rich aquatic plants and fish resources, flat lake bed, and shallow water level all make it a very suitable habitat for migratory birds to overwinter Hu et al., 2015).

Meanwhile, the past fishery activities in Poyang Lake, due to its low productivity, not only did not disturb the ecosystem but also positively affected the wintering of migratory birds. Firstly, fishermans built low dikes to enclose the shallow water, which slowed down the drying-up process and created the habitat. Secondly, the enclosure of sub-lakes before the water level dropped extended the growth period of fish and other aquatic animals, improved fish production, and subsequently provided food for migratory birds. Thirdly, artificially regulating and lowering the water level of the sub-lake provided shallow water conditions, which were favorable for migratory birds to feed. As for the people in the Poyang Lake area, the small population and low productivity made their relationship with migratory birds not a relationship of struggle but a relationship of harmonious coexistence.

Nowadays, Poyang Lake is still the largest bird-protected area in the world. There are more than 300 kinds of birds and nearly one million birds in the Poyang Lake Area, among which there are more than 50 kinds of rare birds. There are about 4000 white cranes (*Grus leucogeranus*) in the world. 90% of them overwinter at Poyang Lake.

5.2 Spatial Value

5.5 Continuous landscape collage from polder to lake

The landscape of Poyang Lake takes on a different character as it travels from the city to the lake, representing the lake's unique beauty and the value of the landscape.

As vehicles drive away from the steel forest of the city, houses begin to decrease, the space opens up, and green areas and fields gradually come into view. In the polder area, vehicles drive along canals planted with trees, next to large picturesque fields, where crops that cannot be seen in the city shine with a unique vitality at the moment.

After passing through the polder and crossing the dike, the view of the sub-lake gradually unfolds. The space is vast and empty as the sky and the land line up. The whole wilderness can be seen by climbing up high. There are both winding rivers and large areas of water, and various aquatic plants grow along the water's edge, showing a wild charm. Thousands of migratory birds fly in the sky and land on the water.

The wetland area turns into a sea of green grass in spring and early fall. Whenever the wind blows, the green grass flutters like the waves of the sea.

The best bird-watching season is from November to March every year when tourists and bird-watchers from all over the world come here to see the beauty of nature.

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6 Research Statement

6.1 Research Question

Main Question:

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

Sub Questions:

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

UNDERSTANDING THE LANDSCAPE

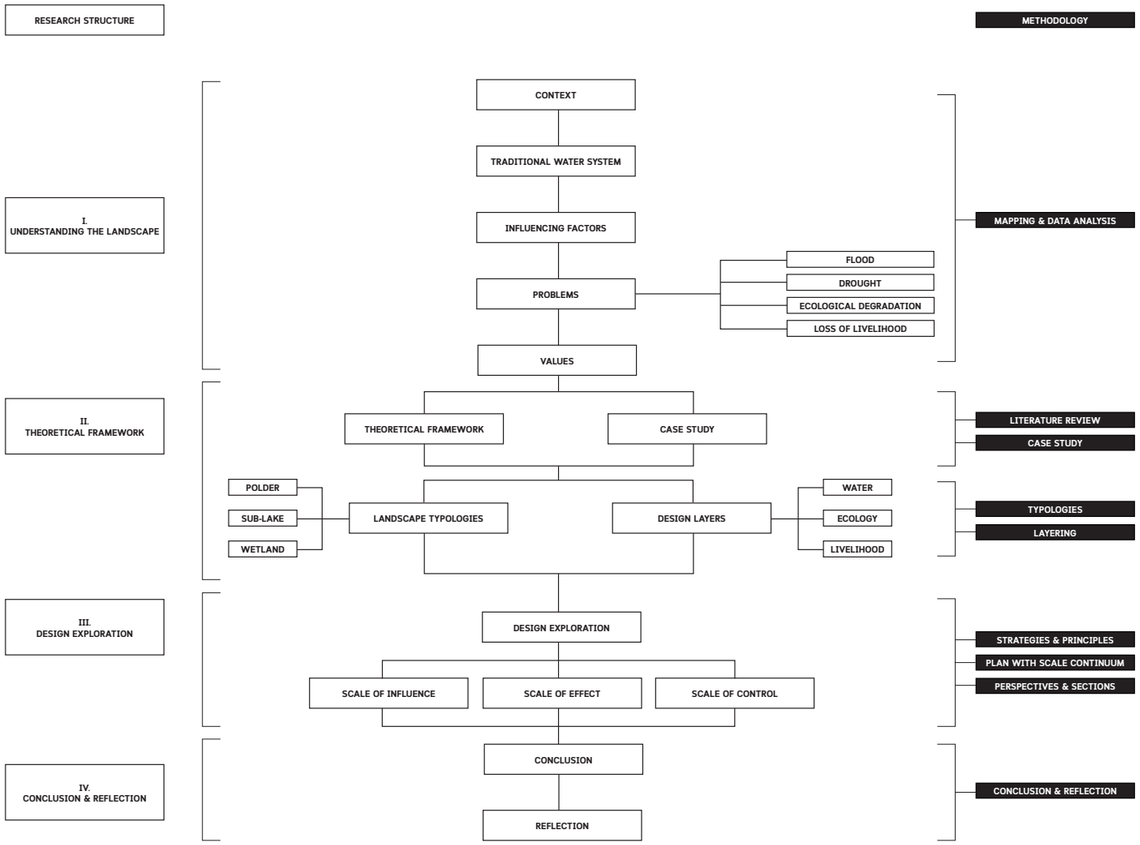
What specific spatial and principles can be used to address the issues of flooding, drought, ecological degradation, and loss of livelihood at Poyang Lake, and how to integrate them to build the holistic landscape system with scale continuum?

DESIGN EXPLORATION

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

CONCLUSION & REFLECTION

6.2 Methodology



I.Understanding the Landscape

This research project began by exploring the traditional water system's original logic and operations, and identifying how they have deteriorated and caused various issues. This section aims to understand the landscape and design context.

1 Mapping & data analysis

Analyze and study the traditional water system of Poyang Lake, with a focus on the region's ingenuity in constructing an integrated system that considers various elements.

Analyze the influencing factors and their consequences, leading to the disruption of the water system's equilibrium, study their operation mechanism and underlying logic, clarify the altered landscape and the affected landscape area, and provide the basis for providing targeted solutions.

II.Theoretical Framework

By researching and studying relevant theories and projects, it established a theoretical and practical foundation for research-by-design.

2 Literature Review

Synthesize and study the academic literature, including systems theory, landscape resilience, etc., to provide a theoretical foundation for scientifically grounded solutions to the project. Align the study with the contemporary landscape academic theoretical framework.

3 Case Study

Study other water systems and analyse their commonalities and differences with Poyang Lake, as well as their strengths and weaknesses.

4 Typologies

Analyze and summarize the spatial composition, polder, sub-lake, and wetland as a foundational point and spatial carrier.

5 Layering

Constructing design layers of different dimensions, water, ecology, and livelihood.

III.Design Exploration

The design project used the landscape typologies as the spatial basis, clarifying the design layers of different dimensions. Strategies and principles were determined and applied to specific spaces with the different design expressions.

6 Strategies & Principles

Propose feasible strategies from the design and research frameworks, develop detailed principles, and test their temporal and spatial coupling to build an integrated system.

7 Plan with Scale Continuum

Construct scale of influence, scale of effect, and scale of control, focus on different priorities, and construct a cohesive narrative.

8 Perspectives & Sections

Consider human experience in the design and illustrate the spatial expression of the design to elaborate on the spatial aspects.

IV. Conclusion & Reflection

the project was summarized through conclusions and reflections.

9 Conclusion & Reflection

Summarize the project with a view to providing a universal model.

6.3 Theoretical Framework

6.3.1 Systems Theory

Systems theory in landscape architecture refers to considering the landscape as a system and applying a systems approach to design.

1 Landscape as a System

According to Murphy, systems, are defined as "wholes", comprising entities and relationships that function through the interrelatedness of their parts (Murphy, 2016). These parts interact with one another, subsequently impacting the entire system.

In light of this definition of the system, landscape should be studied as a system in which the conclusive environmental and cultural elements interconnect and interact to form the landscape as a whole. On this basis, Murphy emphasizes that the landscape is an open system, subject to material and energy exchanges from the external environment, and characterized by interdependence, hierarchy, and tradition:

> **Interdependence** in the relationships among subsystems and the overall system, or the "suprasystem";
> **Hierarchy** among subsystems and the "suprasystem", which exhibit specific patterns of influence within and between system levels;
> **Tradition** in the way that systems are subject to their own unique history and the irreversibility of time during which complex interrelationships became established and entrenched.
> (Murphy, 2016)

Poyang Lake, which is studied in this paper, has an obvious systematic character. It is developed from the traditional water system of a specific period of history and consists of three subsystems: polder, sub-lake, and wetland, which influence each other, constituting the overall system.

2 System Approach in Design

Due to the systemic and holistic characteristics of landscapes, Motloch asserted that landscape designers need to adopt a systems thinking approach, engaging interactively and with an awareness of systemic dynamics (Motloch, 2001). Ackoff further argued that systems thinking supplants analysis, shifting from dissecting components to synthesizing their roles within the broader system they belong to. Analysis is useful for revealing how a system works but synthesis elucidates the underlying reasons for its functionality (Ackoff, 1999). In addition, Murphy emphasized that this systems approach aims to strengthen the entirety, even if it means appropriately diminishing the performance of individual components. The whole is capable of actions greater than the sum of the actions of its parts (Murphy, 2016). Structure, function, and process are key components to be considered of this approach:

> **Structure** of a system defines its components and their relationships
> **Function** defines the purposeful outcomes or products of the system.
> **Process** defines the activities in which the system components are engaged.
> (Murphy, 2016)

Meanwhile, what needs to be clarified is that landscape design is a process in itself, part of a system. Murphy clarified that enhancing landscapes involves continuous systems management, where design represents a particular phase within the change management process. It's crucial for landscape designers to grasp that their work contributes to the ev olution of landscapes rather than dictating a definitive environmental form (Murphy, 2016). Pourdehnad et al. emphasized that difficulties in solving problem results from misconceptions about the changing nature of social systems and their environments. The traditional forms, methodologies, and strategies are inadequate for addressing the new increasingly complex problems (Pourdehnad, Wilson and Wexler, 2011).

This is the situation facing Poyang Lake. As new changes and dynamics emerge, the old landscape system is no longer adapted to the complex new situation. Therefore, this paper considers the application of a systems approach to achieve a systematic enhancement of the landscape by clarifying and optimizing the structure, function, and process of the existing components and adding new elements.

6.3.2 Landscape Resilience

Landscape Resilience can be defined as "the ability of a landscape to sustain desired ecological functions, robust native biodiversity, and critical landscape processes over time, under changing conditions, and despite multiple stressors and uncertainties" (Beller et al., 2015)

Resilience was introduced to the field of ecology by Holling in the 1970s and expanded into urban science. Scholars' growing recognition of landscape's significance in urban literature has spurred them to integrate resilient perspectives with the landscape (Bahrami and Hemmati, 2020).

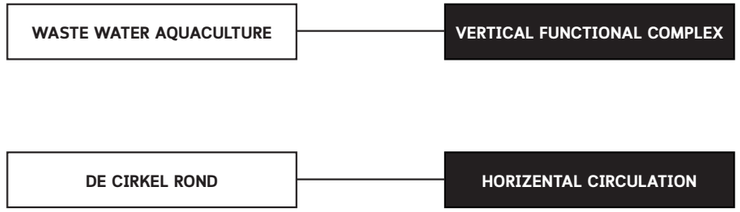
Beller clarifies the principle of landscape resilience:

Setting determines the constraints and opportunities within a landscape
Processes create and sustain landscapes in a dynamic way.
Connectivity enables movement of materials and organisms.
Diversity and Complexity provide a range of options.
Redundancy provides insurance against loss.
Scale provides space and time landscapes need to persist.
People shape landscapes and provide opportunities.
(Beller et al., 2015)

In addition to Beller et al., Cockburn et al. proposed three key concepts underpinning the resilient landscape approach: resilience thinking, creating shared value, and social learning. They emphasized the social aspects in productive multifunctional landscapes. The resilience landscapes they advocated encompass not only the livelihoods but also food chains and markets (Cockburn et al., 2015).

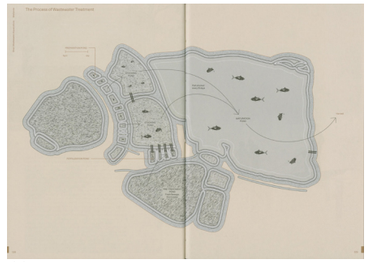
Poyang Lake used to be a resilient system that actively faced risks and dynamic changes. In the new context, however, the old system is beginning to fail. In the research and design, based on landscape resilience theory, the integration and enhancement of the ecosystem level should be considered as well as the resilience and value of the social system, introduced and realized at different scales of the continuum. Specifically, it includes setting (physical environment and historical background), ecological process (seasonality and long-term sustainability), connectivity (landscape typologies connectivity), diversity and complexity (biodiversity and industry diversification), scale (scale continuity) and people (livelihoods and industry chain). The design expects to make the lake resilient again, welcoming dynamics and landscape change.

6.4 Case Study



For this research project, two thematically related projects were selected as case studies: waste water aquaculture and circular agriculture in North Holland. Both cases are characterized by a systemic approach to the landscape, the difference being that waste water aquaculture is a small-scale, bottom-up, vertical functionally superimposed system, whereas circular agriculture in North Holland is a large-scale, top-down, horizontal cyclical system. This research project seeks to combine these two perspectives to construct a multidimensional integrated landscape system.

6.4.1 Lo-TEK: Bheri Waste Water Aquaculture



6.1

6.2

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Waste Water Aquaculture is an experimentation that began in the 1920s. Watson introduced this system in LoTEK: The bheri aquaculture encompasses a series of stages: the preparation of ponds, primary fertilization, fish stocking, then secondary fertilization, and ongoing fish harvesting. Sewage from the city travels from the underground sewer network into an open canal system then through sluice gates into pretreatment ponds and oxidation ponds before reaching sewage-fed bheris for fish cultivation. These fish ponds coexist with diverse plant and animal species, forming an integrated ecosystem (Watson, 2019). Waste water aquaculture is an integrated, resilient, and self-sufficient mode of production. It uses simple structures and technologies, mediated by water, animals, and plants, to achieve a superposition of production and purification functions.

What can be learned:

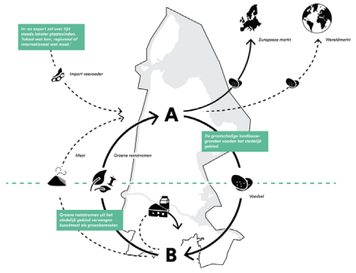
1 Functional Superposition
Waste water aquaculture clarifies the feasibility of multifunctional composites and provides a basic model for building a cooperative system through water, plants, and organisms. This system is full of material and energy exchanges and can be realized with simple technologies.

2 Public Participation
The low-cost, technologically simple, and eco-friendly model is a good way to sustain the livelihoods of low-income people. However, there exists a potential risk of it becoming outdated.

3 Local Spirit
The Lo-TEK system, built from traditional industries and technologies, is more reflective of the region's traditions, culture, and indigenous spirit than new industries.

6.1-6.3 Retrieved from Lo–TEK : Design by Radical Indigenism

6.4.2 De Cirkel Rond: Opportunities for circular agriculture in North Holland



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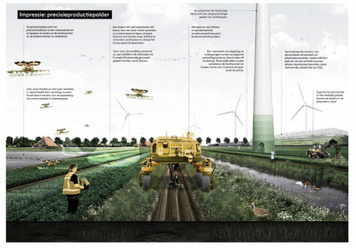


6.5

Circular agriculture in North Holland is a project from SMV(studiomarcovermeulen). By analyzing the diversity of soil types and constructing a circular agriculture module on their basis, the project proposes precision production polder(high-tech innovation) and wide wetlands(cycle between city and countryside) as a future perspective. On this basis, the project connects the landscape in a systematic way with a circular chain that includes raw materials, energy, water, and waste, with the intention of achieving the goal of generating as little waste as possible, emitting as few hazardous substances as possible, and losing as little as possible of the raw materials and end-products used. It builds on the vertical construction of the circular agriculture module to achieve mutual cooperation and interaction between landscapes using the "chain" as a tool.

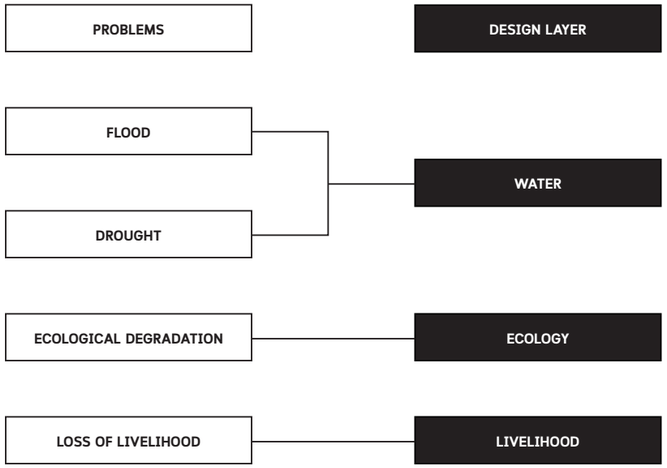
What can be learned:

1 Horizontal Cooperation
The final step in circular agriculture is the Closing Cycles, from which a horizontal perspective of co-operation can be learnt, i.e. the construction of systematic interactions and co-operation through the chained circulation of specific elements from landscape to landscape on the basis of an initial categorization of the landscape and the vertical superimposition of each category.

2 High-tech as a Future Perspective
The use of high technology to promote innovation in traditional industries is a worthwhile future perspective and an effective activation method, but it requires a certain economic foundation and support.

6.4-6.5 Retrieved from https://marcovermeulen.eu/en/projects/completing+the+cycle/

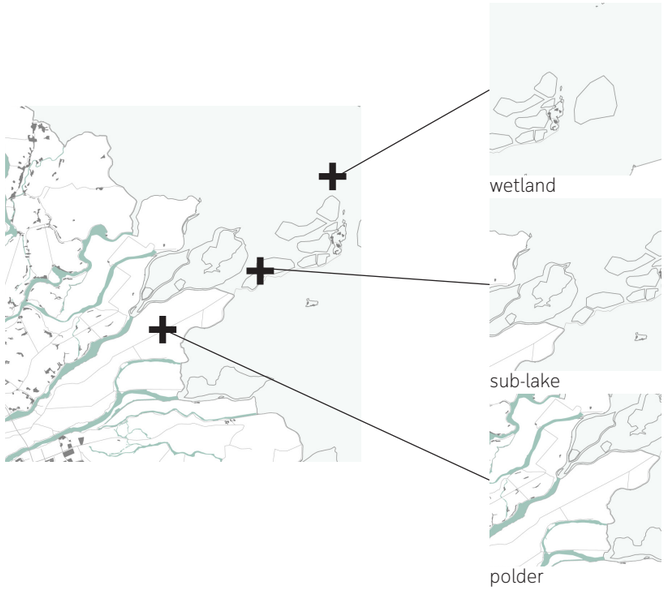
6.5 Design Approach



Depending on the issues to be addressed, the design will establish layers in terms of water, ecology and livelihoods, focusing on solving extreme water problems, enhancing ecological values and securing livelihoods.

6.5.2 Design through Scales

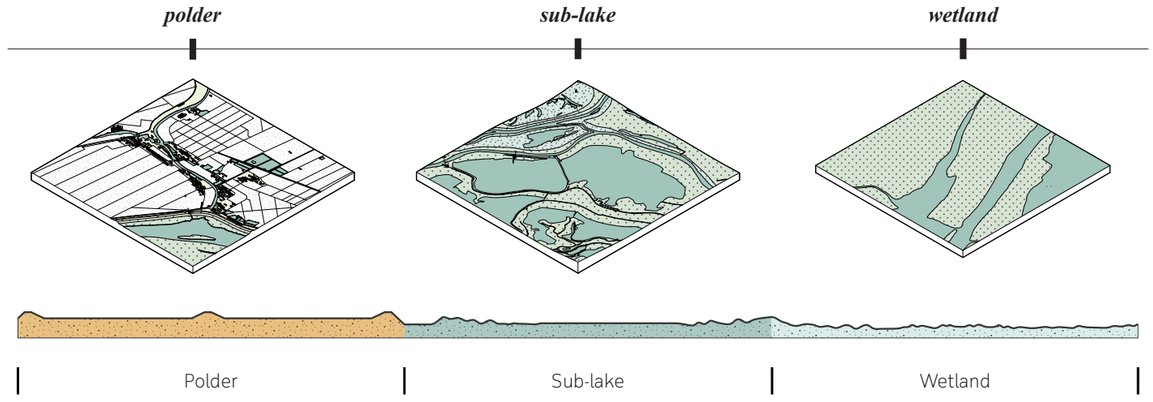
Scale of Influence:
The scale of influence design focuses on the strategic decision, i.e., the classification and decision making for all current polders, sub-lakes, and wetlands.



Scale of Effect:
The scale of effect design focuses on the system operation, i.e., the programs and the space they require, as well as the coupling between programs and how they work together when integrated into a system.

Scale of Control:
The scale of control focuses on the human experience and how they understand the system when in the real landscape.

6.5.3 Landscape Typologies as Spatial Carriers



The landscape typologies can be categorized into polder, sub-lake, and wetland. There are distinct differences between the three in terms of topography, vegetation, human activities, etc. The design will use these three landscape typologies as carriers and tools to clarify their different functions, positioning, and values in the system.

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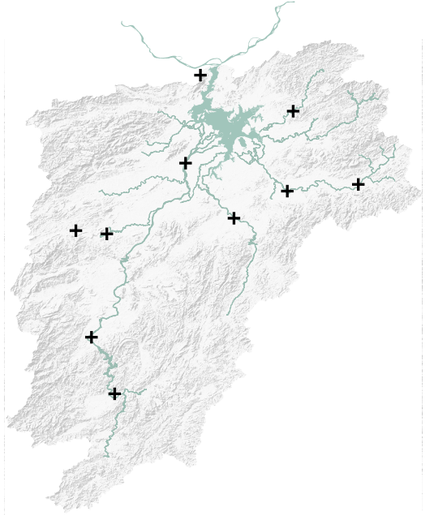
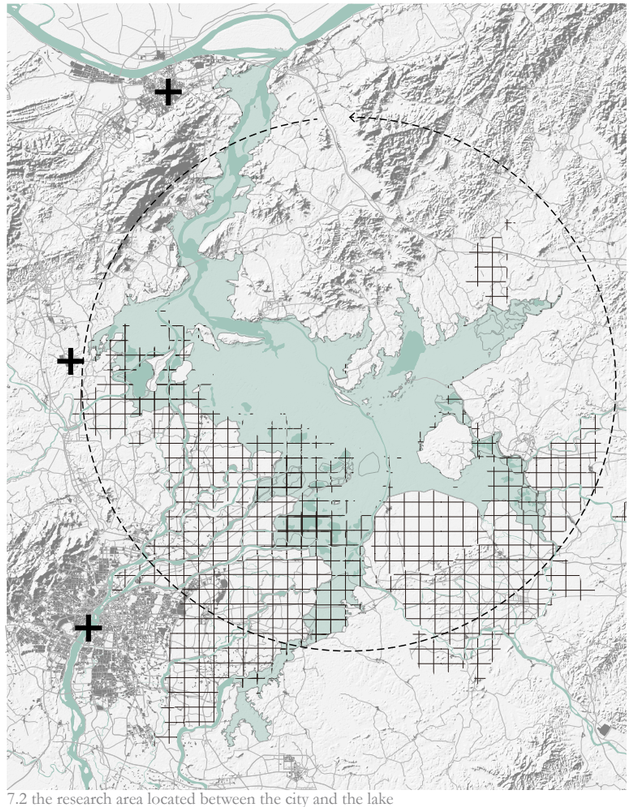
7 Concept

7.1 Potential in Rural Areas



7.1 Cities in the upper reaches of Poyang Lake Basin



7.2 the research area located between the city and the lake

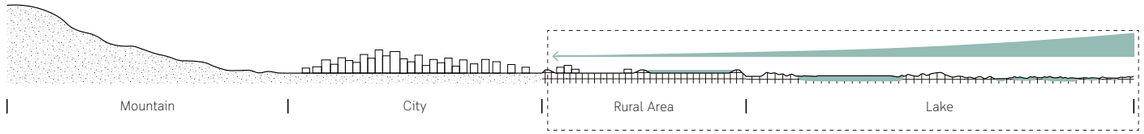
+ city

Based on the former argumentation, it cannot be ignored that the emergence of new threats comes from a series of changes resulting from the development of the times, such as the construction of dams, the increase in productivity, the emergence of new industries, etc. The problems that occurred in the research area are the inevitable consequence of the fact that the composite system of landscapes and humans can no longer be adapted to the new era. Therefore, when discussing how to improve the composite system of the region, this paper, based on systematic thinking, starts by analyzing and clarifying the positioning and potential of the study area.

Water is the core issue of this paper and the base point of all changes. As part of a holistic and continuous water system, the hydrological dynamics of Poyang Lake are closely related to the large-scale changes. The lakeshore rural area is located downstream of the Poyang Lake basin, while numerous cities are located near the rivers upstream. The dikes and water retaining facilities constructed by these cities block the water connectivity and become the key factor to disturb the hydrological balance of Poyang Lake. At the same time, the lack of storage capacity of the lake and non-resilient rural areas directly leads to flooding and drought threats in the closer upstream cities. Water connects the destinies of different regions together.

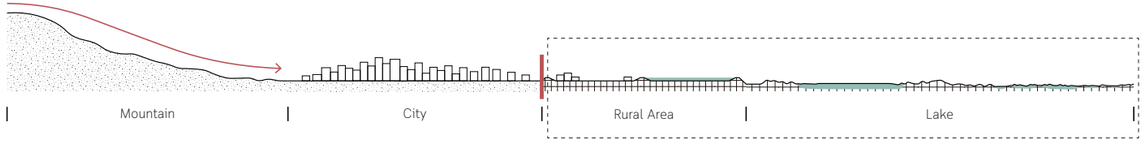
Danger and opportunity always go hand in hand. The lakeshore region has become the most conflict-ridden region that bears all the inevitable consequences of time, while it is also the key fulcrum for solving problems.

Flood: Rural Area as Resilient Water Space



In terms of flood, the rural area is a possible resilient water space between the lake and the city. Rural areas will gain the ability to carry the threat of rising water levels in downstream lakes and upstream rivers by giving them new storage functions through the landscape architectural means, thus protecting the city.

Drought: Rural Area as Water Storage Space



In terms of drought, the rural area used to be highly constrained by the upstream. Based on the resilient water space, a self-contained water storage space can be built to independently support the rural population's living and industrial water use, and even become the backup water support for the city under extreme drought conditions.

Ecology: Rural Area as Ecological Buffer Zone

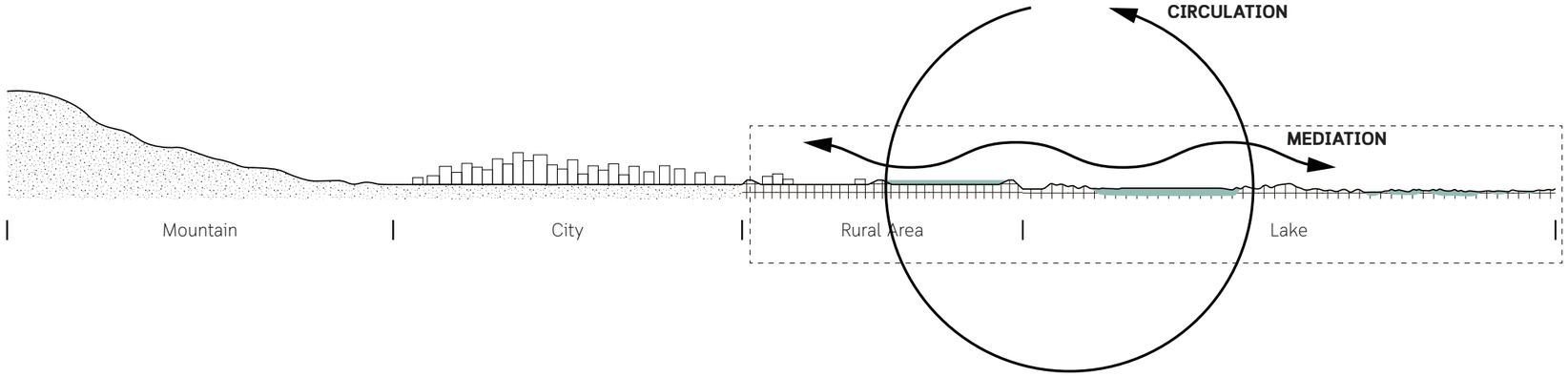
In terms of ecology, with the essential ecological function of Poyang Lake, the rural area has the potential as an ecological buffer to harmonize the relationship between humans and nature.

Livelihood: Rural Area as Innovative Production Area

In terms of livelihoods, the regional industrial chain can be activated with the innovation method. The rural areas will become vibrant production areas, greatly improving the livelihoods of rural populations.

7.3 Layerting diagram illustrating the potential of rural areas

7.2 A Rural Self-Circulation & Mediation System



7.4 Concept illustration: A Rural Self-Circulation & Mediation System

Integrating the potential and positioning of the site corresponding to the major issues, the design will construct a Rural Self-Circulation and Mediation System, based on the three dimensions of water, ecology, and livelihood.

Mediation and circulation are the two main features of this system. Mediation requires that it will serve as a means of coordinating the relationship between people and water, as well as the relationship between humans and nature, and become a buffer zone located between the urban area and the lake as a regional resilient barrier to protect the city. Circulation requires that the system itself will be autonomous, including the function of autonomous operation and autonomous circulation, with a view to enhancing the spontaneous revitalization of rural areas and transforming the relationship between the urban area and the rural area from tough and passive antagonism to flexible cooperation.

Water is the basic and critical layer of this system. Construction of the system will begin by creating a resilient water space by altering the topography and underlying water management methods to adjust the water balance of the region. Based on the balanced water system, the ecological and livelihood dimensions refer to guiding and activating the lifestyle of birds and people in the arena of the landscape, achieved through habitat restoration, design programs, and industrial innovation.

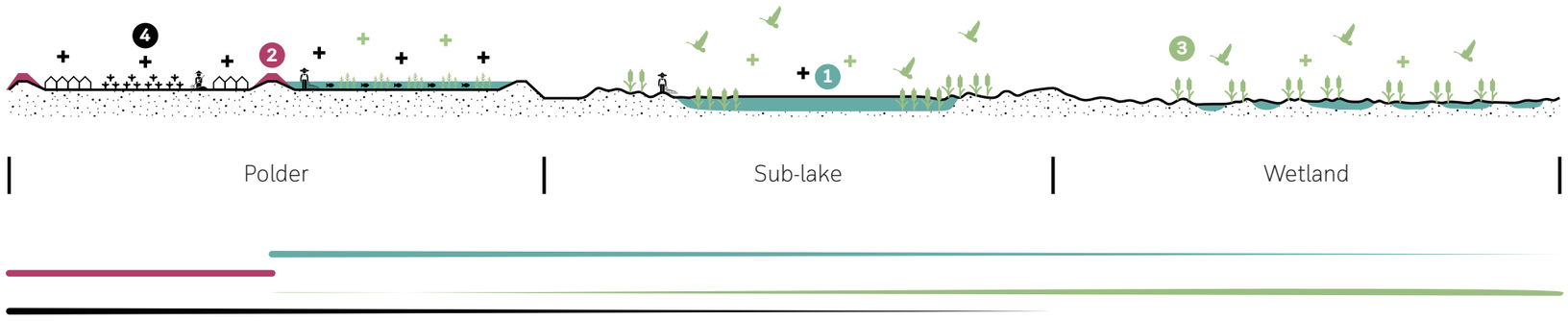
It follows that the system will accomplish following major goals:

- **Realize resilient water balance**
- **Rationalization of water resources**
- **Harmonization of human settlements and nature reserves**
- **Build a recycling innovative living chain**
- **Construct an integrated system of water, nature, and humans**

8 Strategies & Principles

8.1 Srategies

Zooming in to the rural area, the design uses the landscape typologies, polder, sub-lake, and wetland, as the spatial carrier to propose an overall enhancement strategy that realizes the potential of the landscape and meets the needs:



8.1 Strategic section

1 Increase the capacity of the lake
(polder, sub-lake, wetland)
Increase the capacity of the lake is realized by both deepening the original water space and adding new water space. Deepening the existing water space includes deepening the sub-lake with weak ecological value and constructing artificial depressions on the wetland. Adding new water space includes transforming relatively low-value polder into flexible water space with maintenance, and abandoning worthless polder.

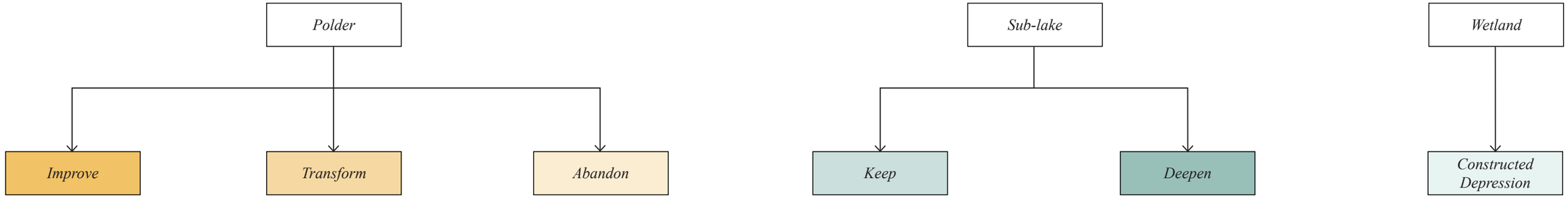
2 Intensive utilization of land
(polder)
Since a part of the polder has been transformed or abandoned, the remaining critical polder in the interacting system should be better protected and provide higher value to achieve high efficiency and utilization of water on limited land. Therefore, intensive utilization of land includes reinforcement of dike, precision management of production activities, and improve water use efficiency.

3 Improve the ecological value
(polder, sub-lake, wetland)
On the basis of realizing a flexible water balance, high-quality habitats for plants and animals will be constructed by means of land conservation, plant purification, and phytoremediation. An ecological gradient from wetland to polder will be built, so as to rationally harmonize the relationship between nature reserves and human settlements.

4 Activate the livelihood
(polder, sub-lake)
Through industrial innovation, precision management, and recycling of resources, a circular industrial chain will be constructed and a production gradient from polder to wetland will be built to improve the livelihoods of rural populations.

8.2 Design Frame

Combining the landscape typologies and strategies, the following design framework is built:



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

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

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

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

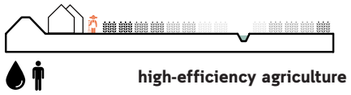
Deepen: Deepen the sub-lakes with low ecological value, adding water management methods to regulate water levels for different functions.

Constructed depression: adding artificial depressions to the wetland.

8.3 Spatial Principles

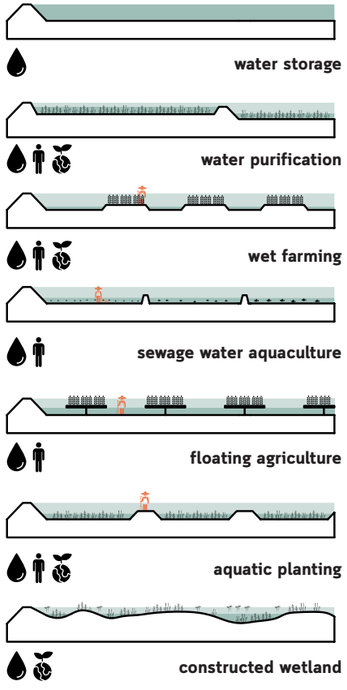
Polder

Improve

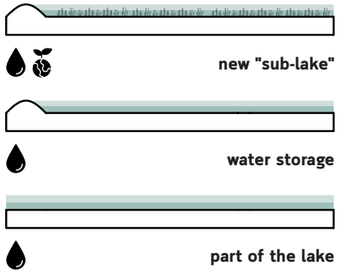


high-efficiency agriculture

Transform

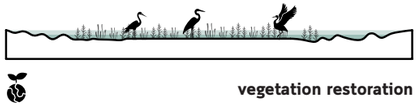


Abandon



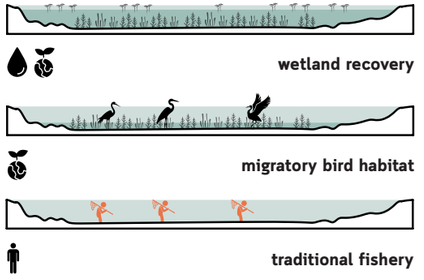
Sub-lake

Keep



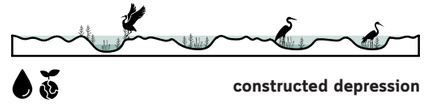
vegetation restoration

Deepen



Wetland

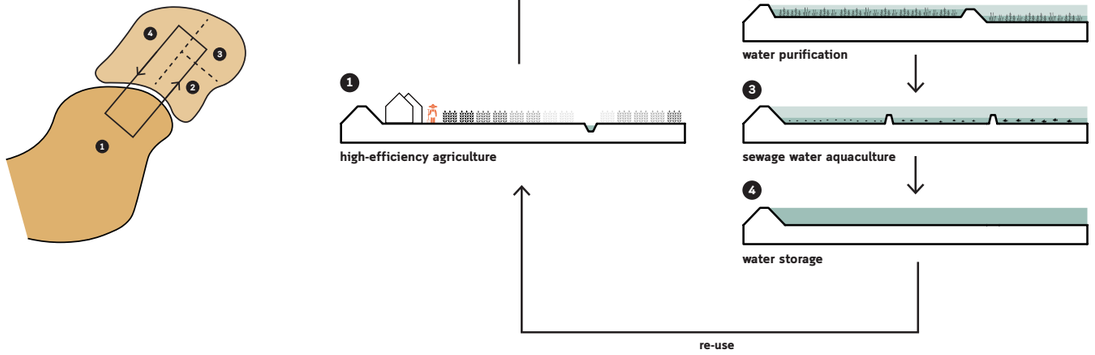
Constructed Depression



constructed depression

8.4 Sub-Cycles

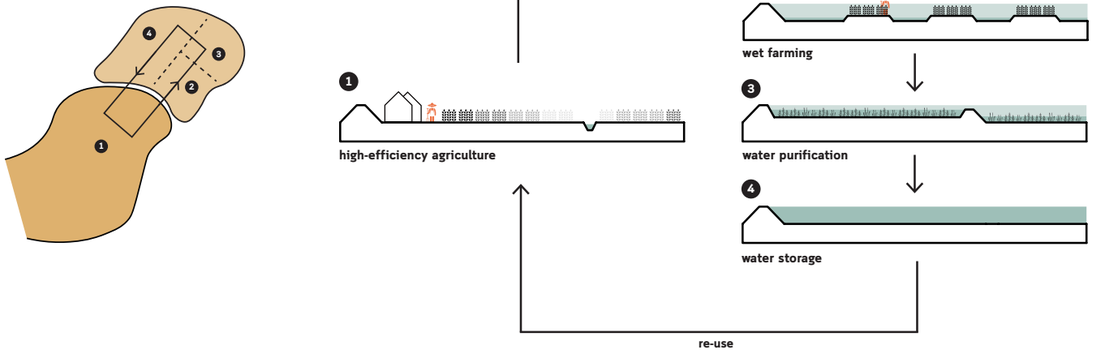
8.4.1 Cooperative Circulation System



The Cooperative Circulation System is a model that circulates between the improved polder and the transformed polder, aiming to utilize the improved polder to provide production functions based on water-saving industries, while the transformed polder provides water purification and storage Functions. This model will be applied to two connected and relatively independent polders with connected water systems separated by dikes.

Cooperative Circulation System A:

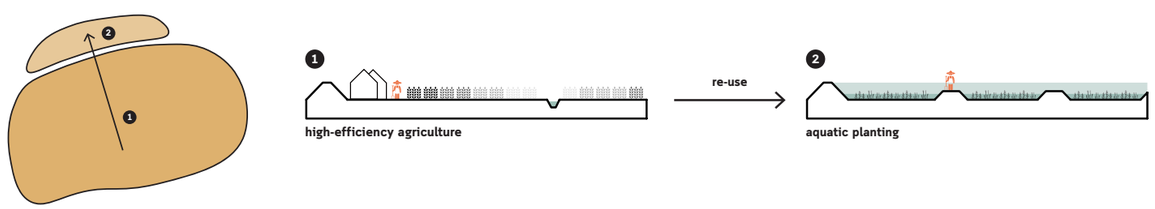
In the improved polder, the design applies irrigation techniques to reduce evapotranspiration, implements crops with less water storage, and employs precision management for efficient agricultural production.
In the transformed polder, the design utilizes purification models that combine aquatic plant purification and sewage water aquaculture. Wastewater is pre-treated with aquatic plants and then fed into cascading fish ponds. The phytoplankton and aquatic plants decompose the organic matter and provide oxygen, shade, and feed for the fish. Then, the purified fresh water is stored and readily reused in the agricultural production of the improved polder.



Cooperative Circulation System B:

The same principle is applied in improved polder.
In the transformed polder, the design applies a combination of wet farming and aquatic plant purification. Wet farming utilizes the limited stripes in the water to grow highly efficient, moisture-tolerant crops. Afterward, the used water goes into the aquatic plant purification pond and then into a water storage space for reuse.

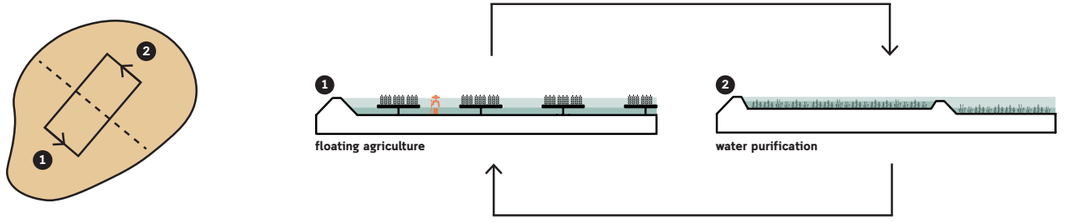
8.4.2 One-way Water Re-Use System



The One-way Water Re-Use System is a unidirectional model from an improved polder to a transformed polder, designed to reuse and purify wastewater from the improved polder before discharging it into the lake. This model will be applied to two polders nearby where the water systems are separated and spatially dike separated.

In the improved polder, the design applies the efficient agricultural production model.
In the transformed polder, the purification method is designed to be applied with aquatic plants, which can also be used as cash crops.

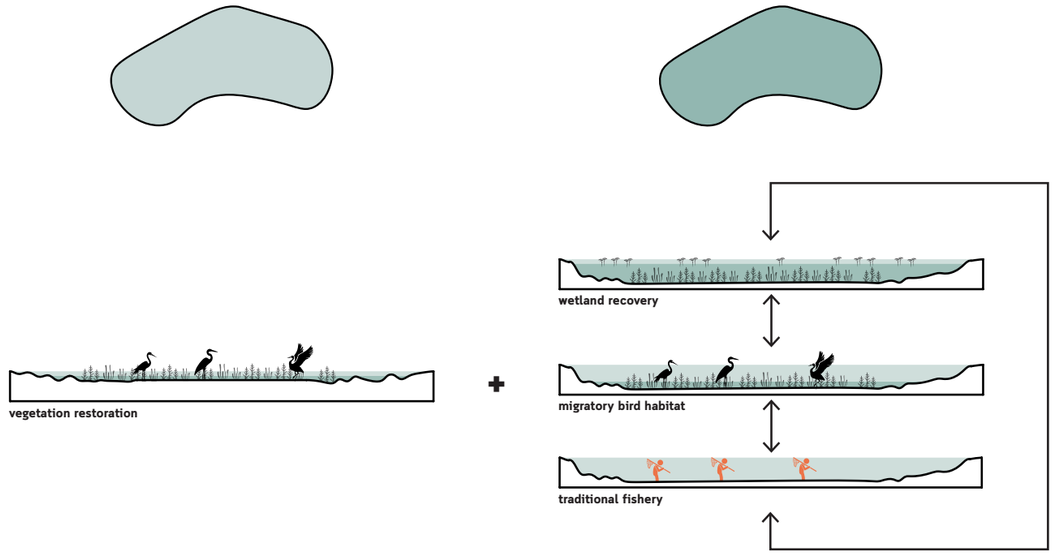
8.4.3 Self-Circulation System



Self-Circulation System is an experimental model applied in a single transformed polder, using floating agriculture and aquatic plant purification.

Water is used in floating agriculture for production, generating green waste flow. Then, it will be purified in aquatic plant ponds and reused in floating agriculture again. The cycle repeats itself.

8.4.4 Natural Circulation System



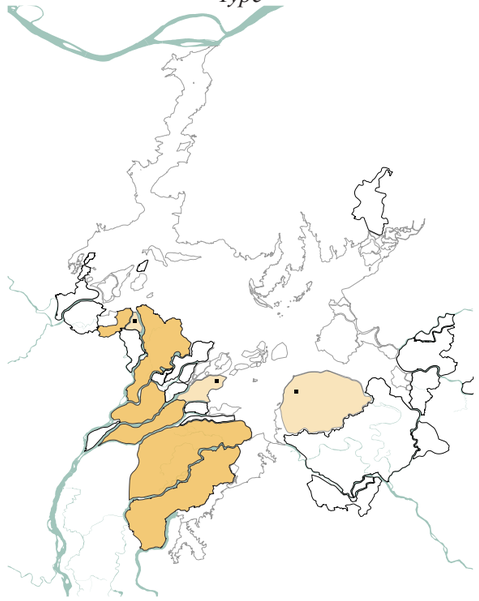
The Natural Circulation System is a combination of the original shallow sub-lake and the artificially deepened and managed sub-lake. The original shallow sub-lake will not be subjected to excessive human intervention other than vegetation restoration, while the deepened sub-lake will be introduced to a five-year cycle. Sub-lakes of similar size and location will be grouped together to cycle between different water levels and functions. This cycle is based on the time required for wetland restoration and is designed to keep the sub-lake active with appropriate human interventions while keeping it from being over-utilized.

9 Strategic Decision

9.1 Decision Making

Polder

Type



crucial polder

flood storage polder

Flood Frequency

very high

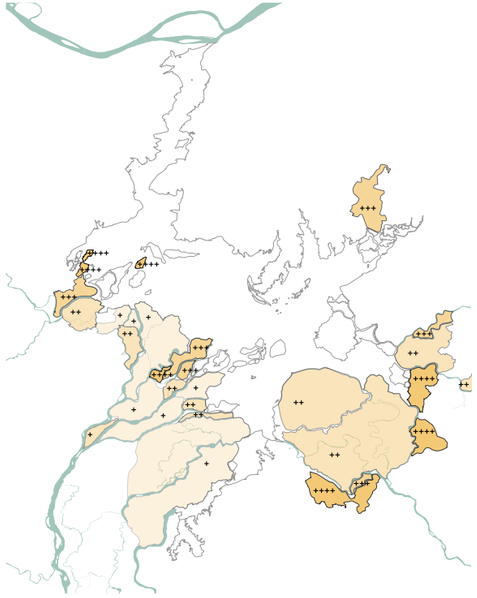
high

medium

low

very low

Elevation



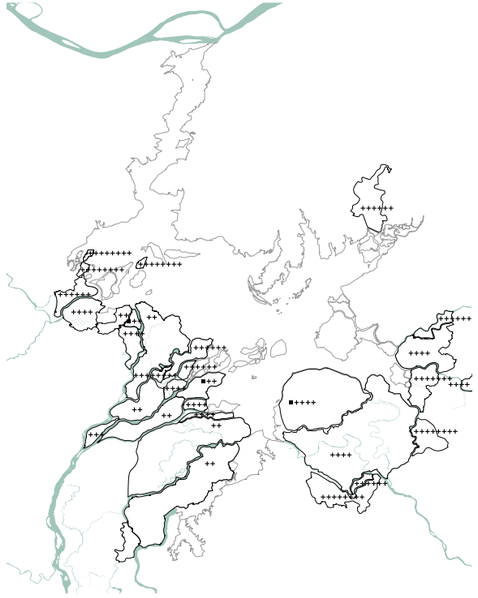
high

medium

low

very low

Evaluation



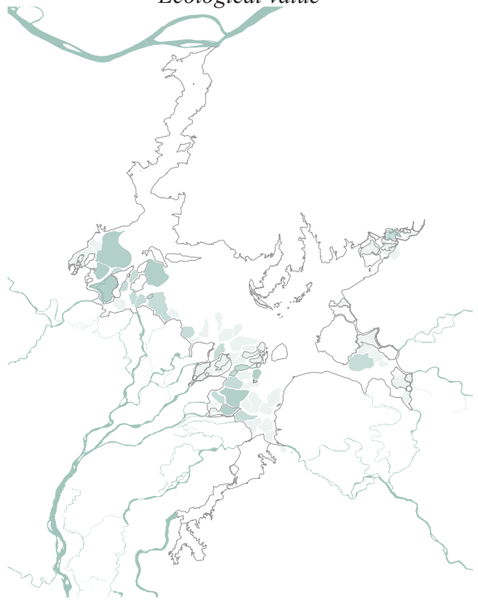
10.1 Analysis of the polder

In terms of the polder, the analysis takes into account the government's assessment and decision-making, as well as the objective characteristics of the polder itself, i.e., the flood frequency and elevation. In China's social environment, the government's decision-making is crucial. The key information for governmental decision-making for Poyang Lake is the flood storage polder and crucial polder, which determine the polder that must have the water storage function and the polder that cannot change the production and residence function in the design. Based on this, overlaying of the flood frequency and elevation information, the high-value and low-risk crucial polder is identified as the improved polder(+<3), low-value, and high-risk polder is identified as the abandoned polder(+>5), and those with some value and risk, as well as those used for flood storage, is identified as the transformed polder(3<+<5).

10.1 Information from *Assessing and mapping human well-being for sustainable development amid flood hazards: Poyang Lake Region of China.* Redrawn by th author.

Sub-lake

Ecological value



seasonal lake with more than 1000 migratory birds

seasonal lake where migratory birds mainly distributed

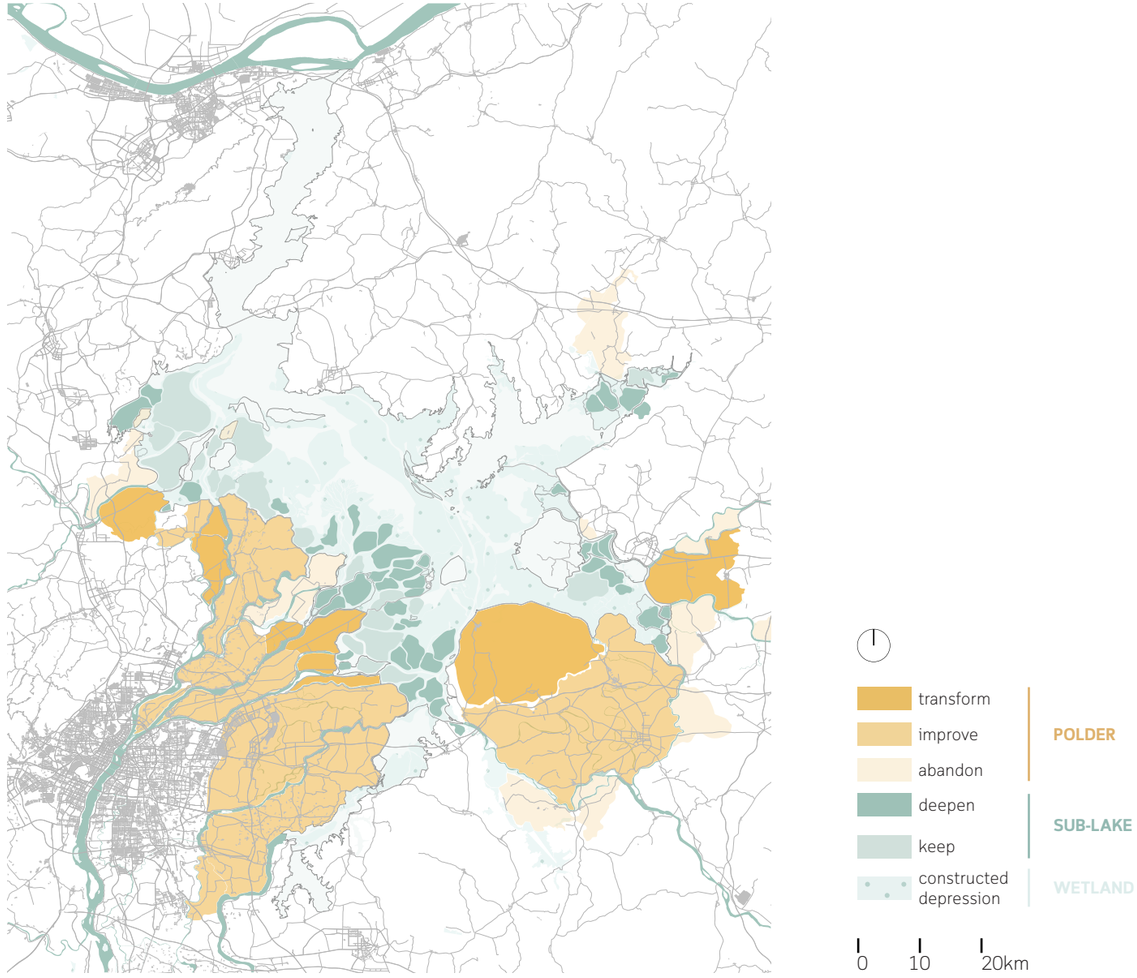
normal seasonal lake

10.2 Analysis of the sub-lake

In terms of sub-lakes, the analysis considers ecological values with migratory bird numbers as quantitative data. Sub-lakes with high ecological value are defined as kept sub-lakes, while the remaining sub-lakes with low ecological value are defined as deepened sub-lakes for which artificial interventions are implemented.

10.2 Information from *Spatiotemporal Dynamics of Water Body Changes and Their Influencing Factors in the Seasonal Lakes of the Poyang Lake Region*. Redrawn by th author.

9.2 Plan / Scale of Influence



Reference

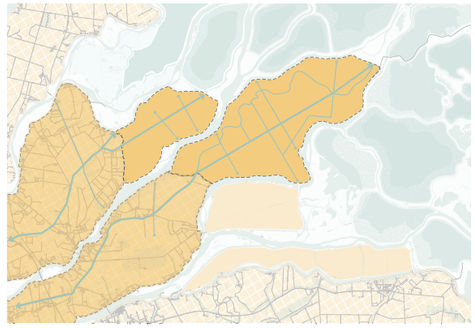
Liu, H., Yuan, H., Wang, S., Zheng, L., & Liao, M. (2021). Spatiotemporal Dynamics of Water Body Changes and Their Influencing Factors in the Seasonal Lakes of the Poyang Lake Region. *Water, 13*(11). https://doi.org/10.3390/w13111539

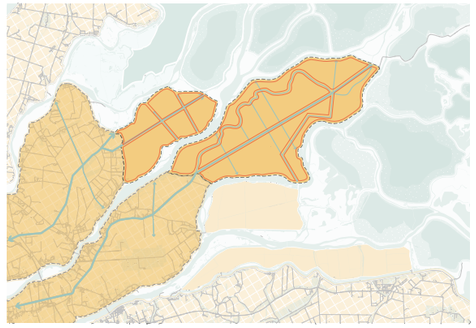
Tian, Q., Brown, D. G., Bao, S., & Qi, S. (2015). Assessing and mapping human wellbeing for sustainable development amid flood hazards: Poyang Lake Region of China. *Applied Geography, 63*, 66–76. https://doi.org/10.1016/j.apgeog.2015.06.007

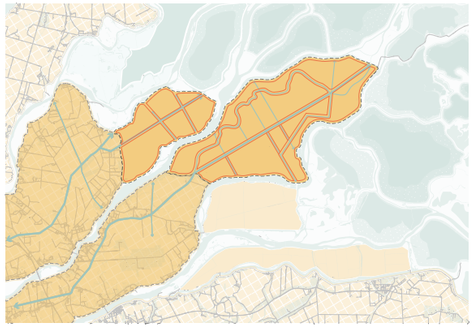
10 System Operation

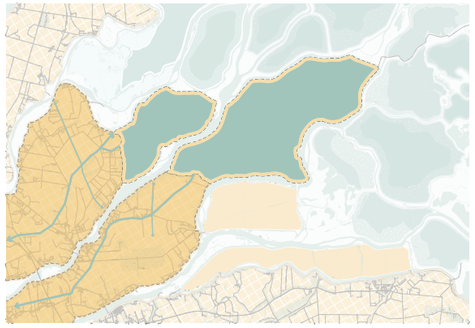
10.1 Design Implement

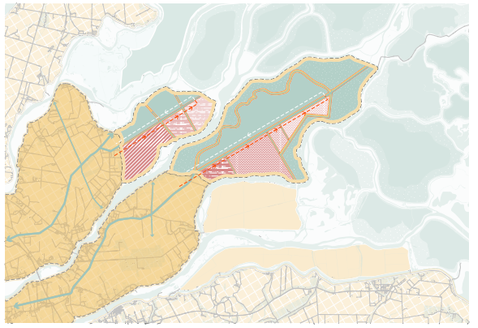
Polder











1 Analyze the original water structure

The designed water circulation system does not alter the original water structure, but relies on the existing canals and ditches to function.

2 Build the dike along the water structure

The design creates dikes to divide the water space with different main functions, such as water purification and water storage.

3 Build subsidiary dikes for specific functions

Subsidiary dikes were built for specific functions within the main water space, such as the fish ponds for fish at different stages of growth.
These dikes will be constructed collaboratively by the government and the local community.

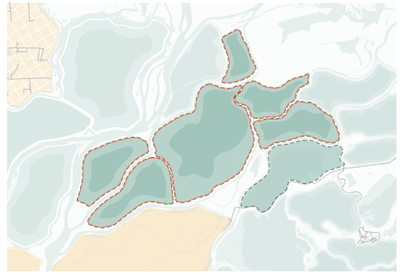
4 Wet season: Let the water in

During the wet season, the entire polder will actively welcome the lake to maximize its storage capacity and prevent flooding. Water management will be realized by the local community.

5 Dry season: Water was left in shallow ponds

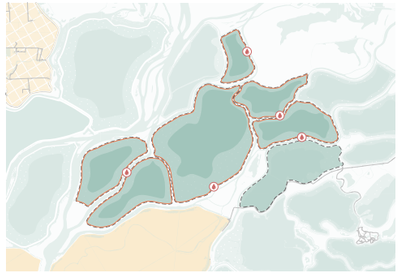
During the dry season, the water space is separated by a lower dike that purifies the water for reuse, prevents drought, and keeps the polder remains active. Local residents will utilize these spaces for production and water use, while visitors will have the opportunity to experience the system firsthand.

Sub-lake



1 Reinforce the dike & Deepen the sub-lake

The design reinforces the unused sand ridges, deepens the center of the sub-lake and retains the shallow areas around the edges for ecological service. It will be constructed collaboratively by the government and the local community.

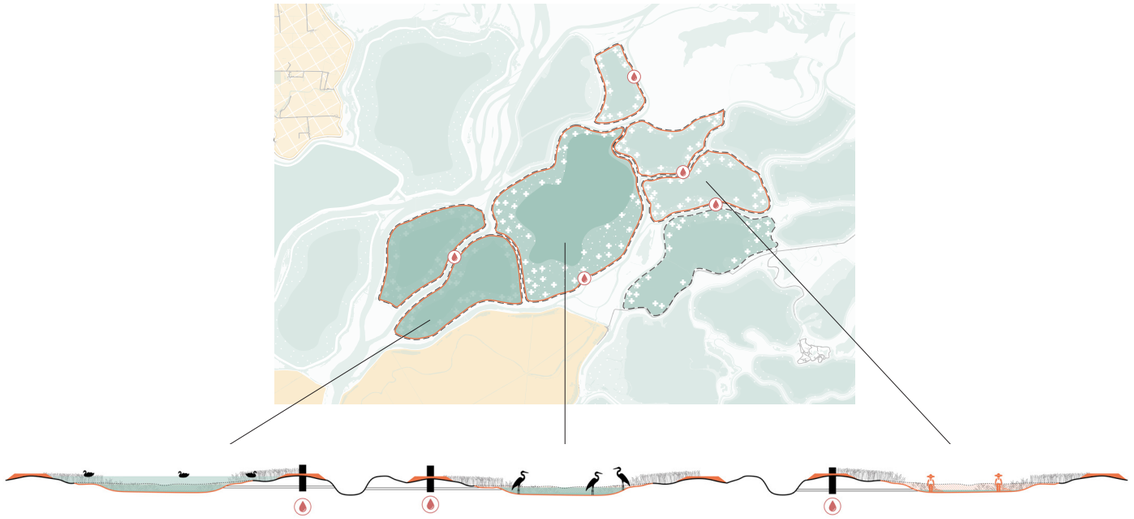


2 Build the pump station

Water levels are managed through pumping stations. The facilities will be constructed collaboratively by the government and the local community.

3 Vegetation restoration

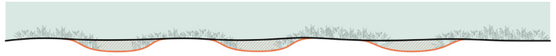
Plant *Carex halleriana*, *Zizania latifolia*, *Vallisneria natans*, *Hydrilla verticillata*, *Ceratophyllum demersum*, etc. for restoration.



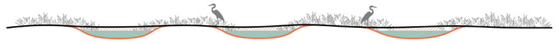
4 Zoning & Cycle

Design builds natural circulation system through water level management. Local residents can be offered work opportunities to manage these devices and cycles, while visitors can experience the system.

Wetland



Wet season: Aquatic Plants Grow



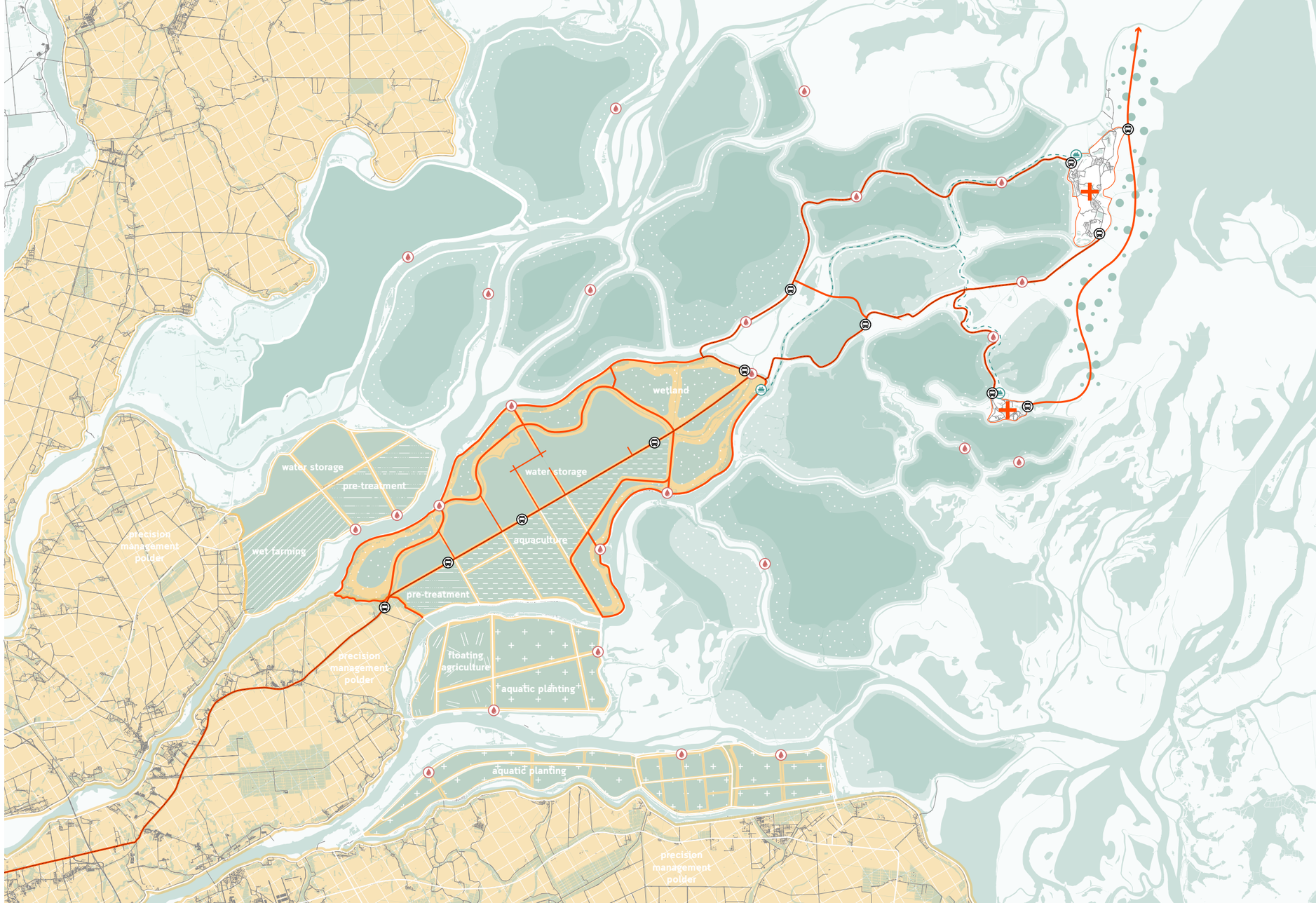
Dry season: Subsidiary Habitat for Migratory Bird

Create constructed depressions

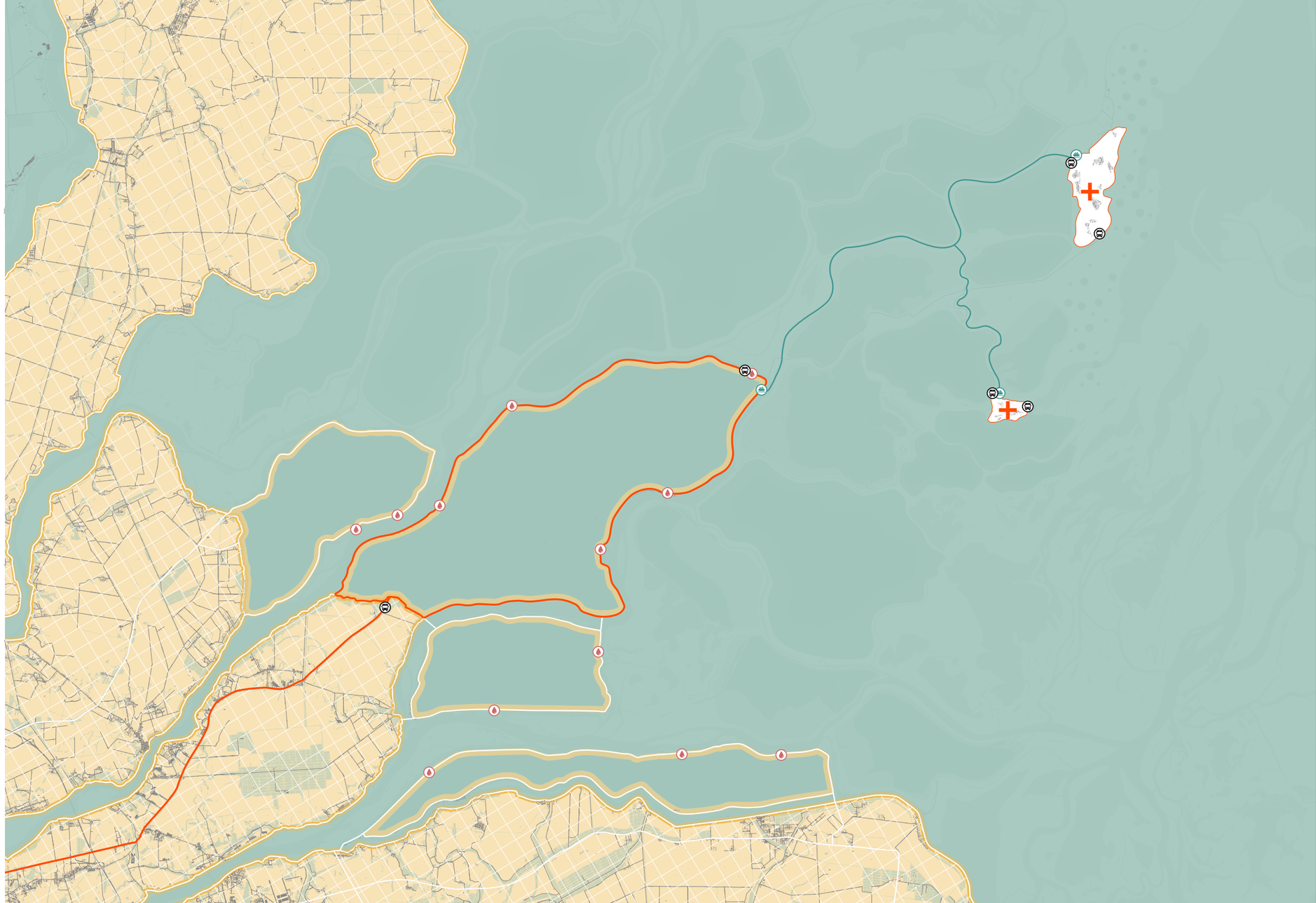
The design removes earth to create more wet depressions for biodiversity enhancement and increase in lake capacity. It will be constructed collaboratively by the government and the local community.

10.2 Plan / Scale of Effect

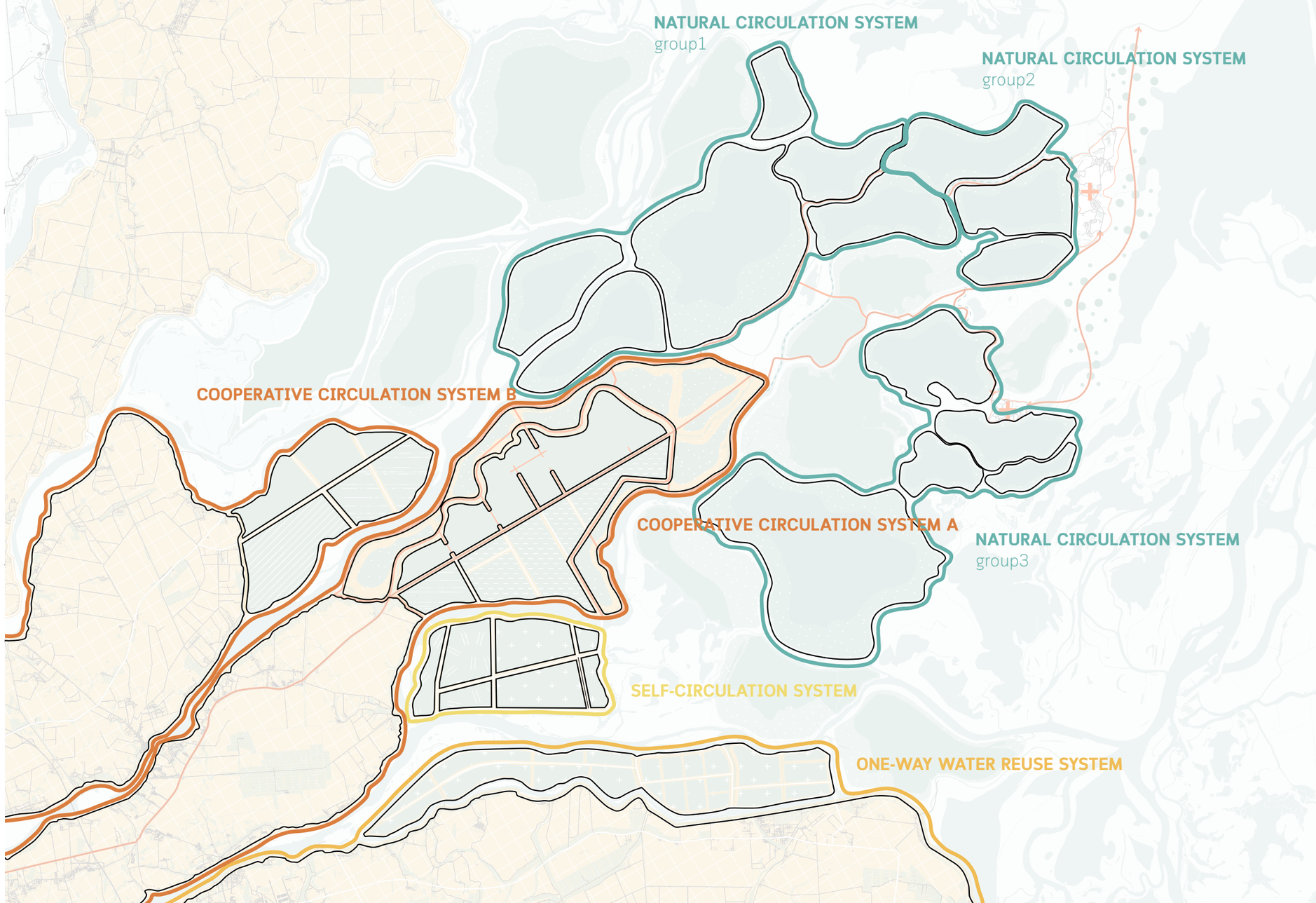
Dry Season



Wet Season


pumping station
bus stop
water bus stop
villages
visitor routing
daily use routing
bus line
water bus line
aquatic planting
floating agriculture
pre-treatment
waste water aquaculture
wet farming
0
1
3
5km

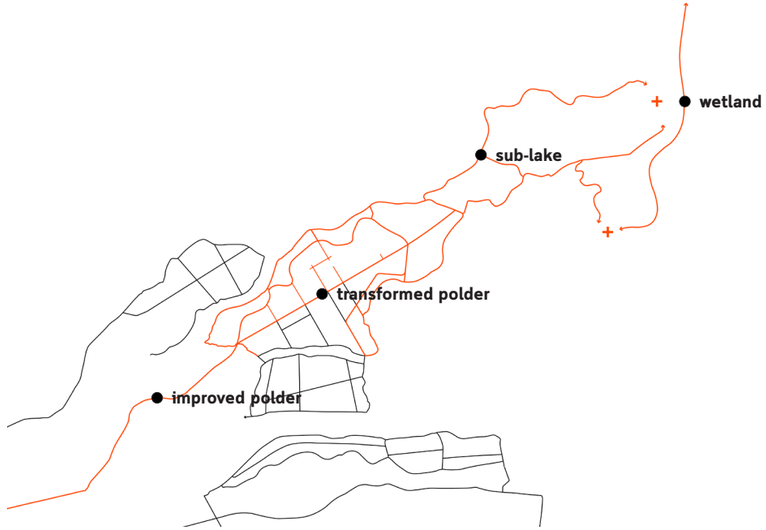
System Operation



0 1 3 5km

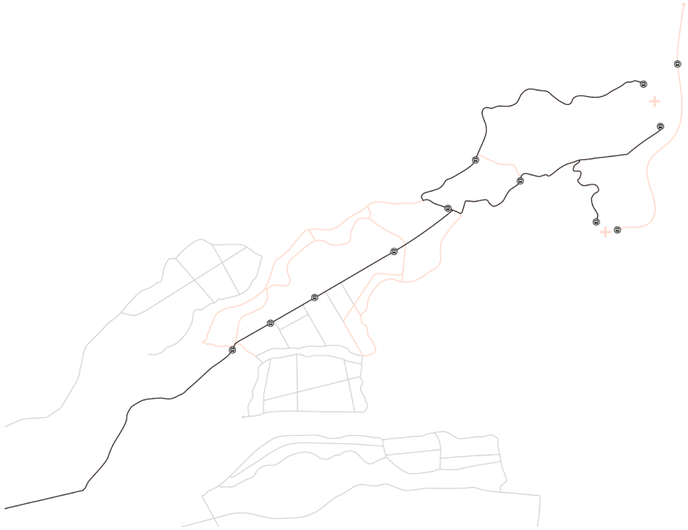
11 Experiencing the Landscape

11.1 Routing Design



Routing for visitors & for daily use

The design distinguishes between routes for local residents' daily use and routes for visitors. The visitor routes will follow the sequence of improved polder, transformed polder, sub-lake, and wetland to experience a continuous landscape.



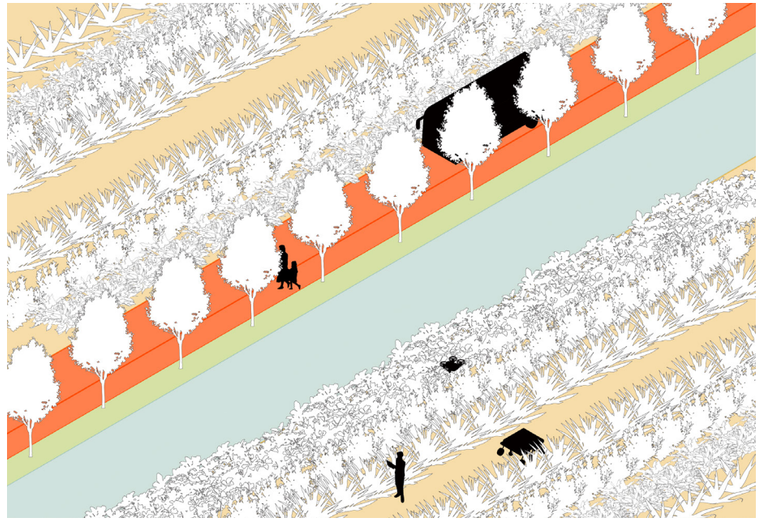
Routing for bus

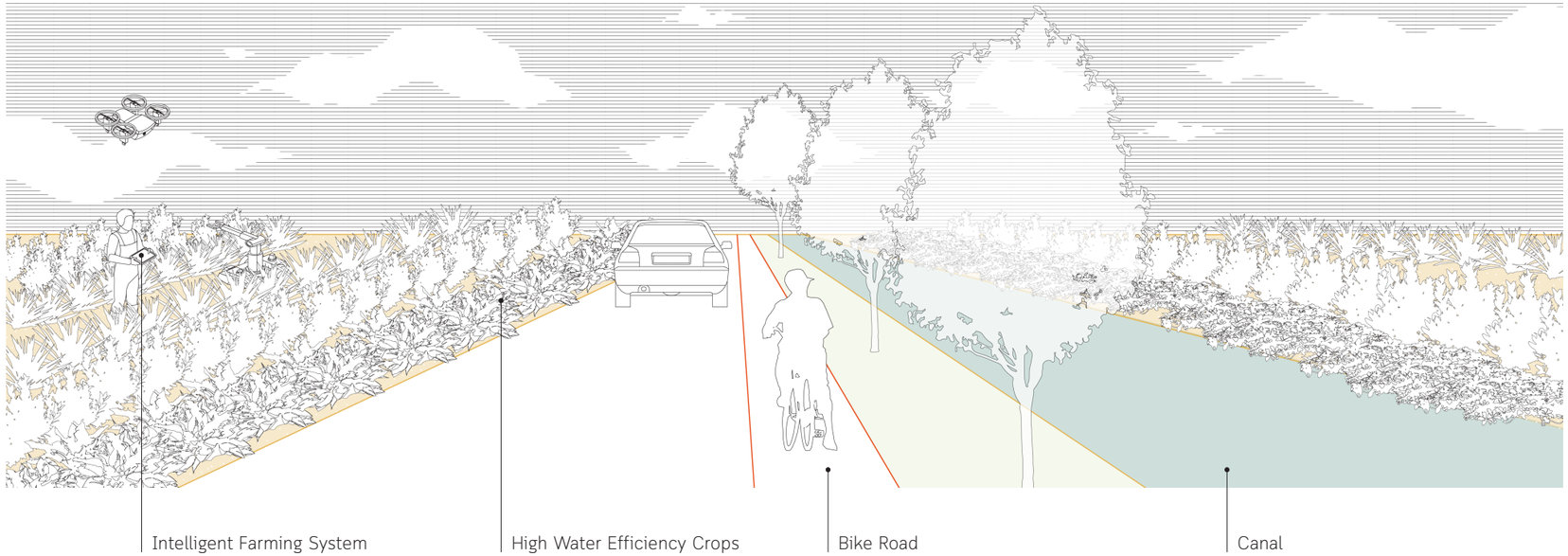
Due to the vastness of the landscape, the design plans bus routes, where bus stops will be located next to the locations of key attractions.

Routing for water bus (only for wet season)

Water routes are planned with a view to creating different experiences in the dry and wet seasons.

11.2 Efficient Productive Polder





Efficient Productive Polder is the design for the improved polder, aiming to achieve efficient water use at the start of this continuous landscape water system through precision management of the polder and crop selection. For instance, cash crops are selected for species with high water efficiency as well as some degree of humidity resistance, and inefficient waste of water is reduced through an intelligent farming system. In terms of spatial value, the design creates a picturesque field landscape as the beginning of the entire landscape system tour.

Material selection:

recycled plastic road

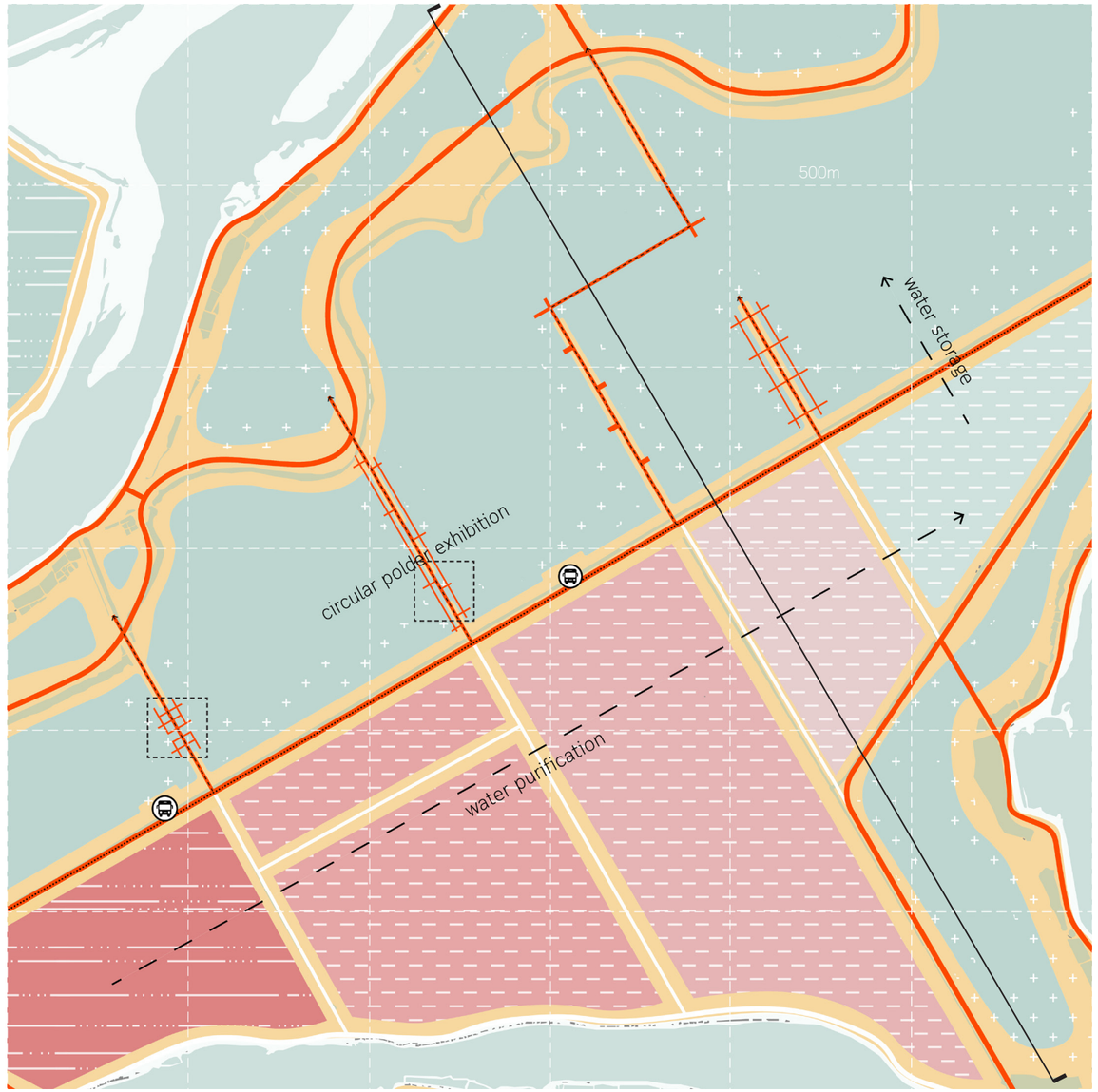
Crop selection:

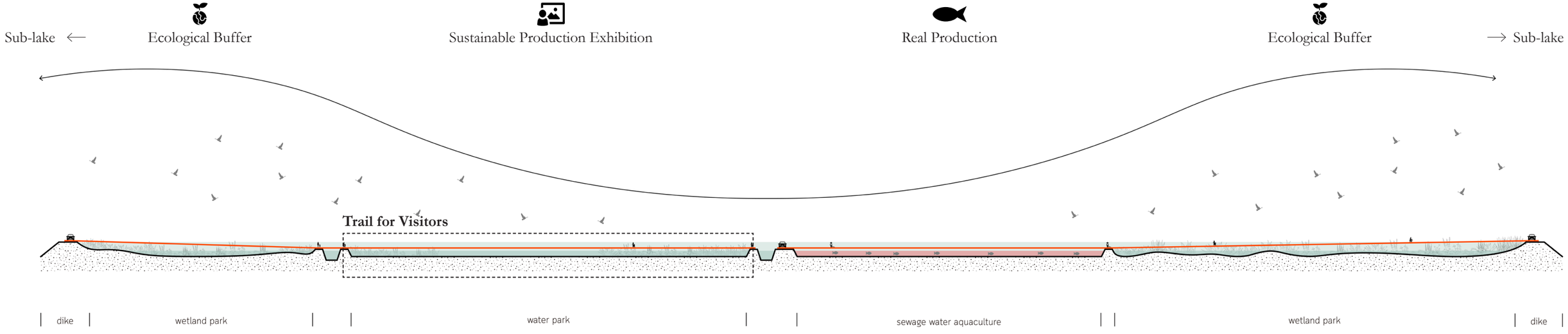
Oryza sativa *Arachis hypogaea* *Medicago sativa* *Camellia sinensis* *Lycium chinense* *Oryza sativa*

(Species with efficient water requirements and higher economic values)

11.3 Sustainable Productive Polder

Sustainable Productive Polder is intended to exhibit the circulation system into a single main route, guiding visitors along a designed path to experience the combination and operation of the programmes in each system. Four main paths organize the four circulation patterns, utilizing the grid pattern of the polder as the design language to organize the space around the paths. Walking along these paths, visitors come into close contact with unique multi-functional landscapes such as wet farming, aquatic planting, floating agriculture, etc. They observe the interaction between water, birds, fish, and humans, and see how local residents use and maintain them, creating an experience akin to visiting an ecological exhibition of sustainable production. And next to these "exhibitions", across the canal, is where the real production takes place.



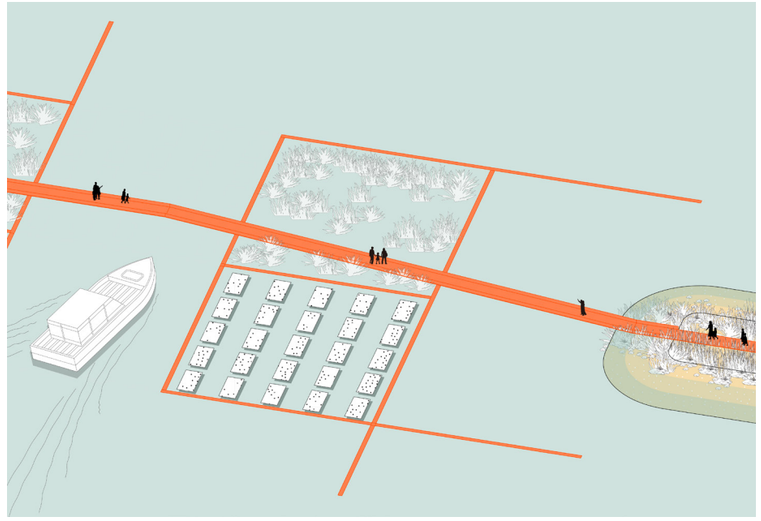


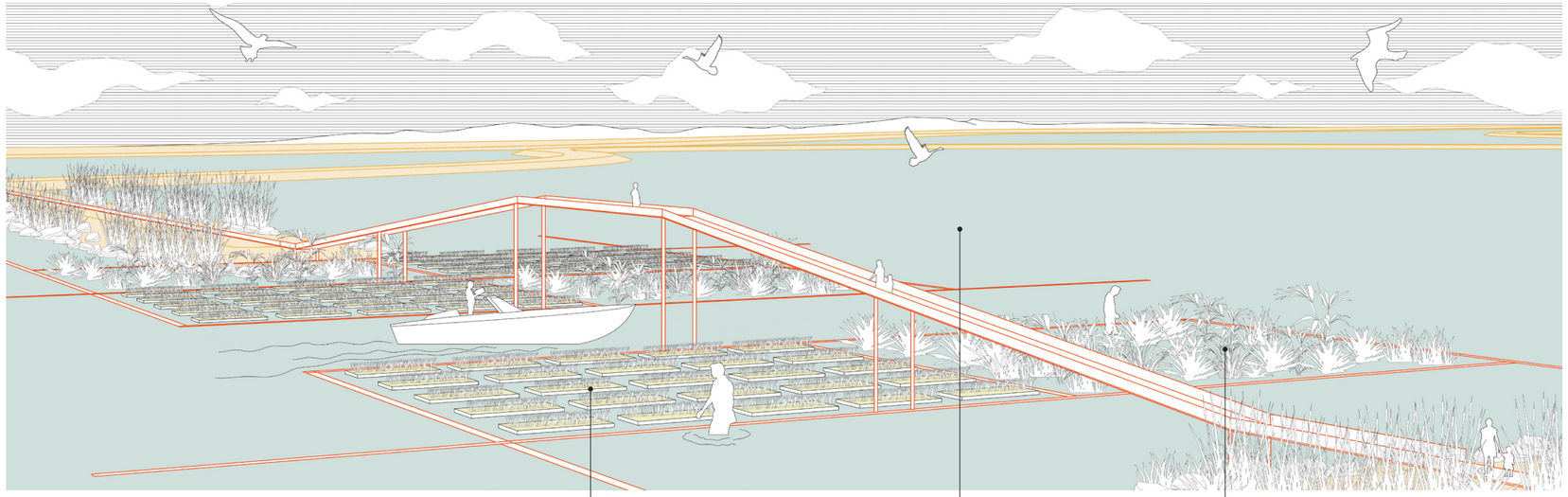
Create wetland park around the transformed polder where it connects to the sub-lake as a buffer zone, providing recreational function.

Combines recreational and water storage functions to provide visitors with a journey to understand the mechanism of the landscape system.

Next to the exhibition is the real production pond, corroborating the landscape system as understood by the visitor.

Trail of Self-Circulation System





Floating Agriculture

Water Storage

Aquatic Planting

Water purification plant selection:

Typha orientalis

Juncus effusus

Iris tectorum

Nymphaea

Antirrhinum majus

Emerged plant | Floating plant | Submergent plant

Floating agriculture crop selection:

Amaranthus tricolor

Brassica Campestris

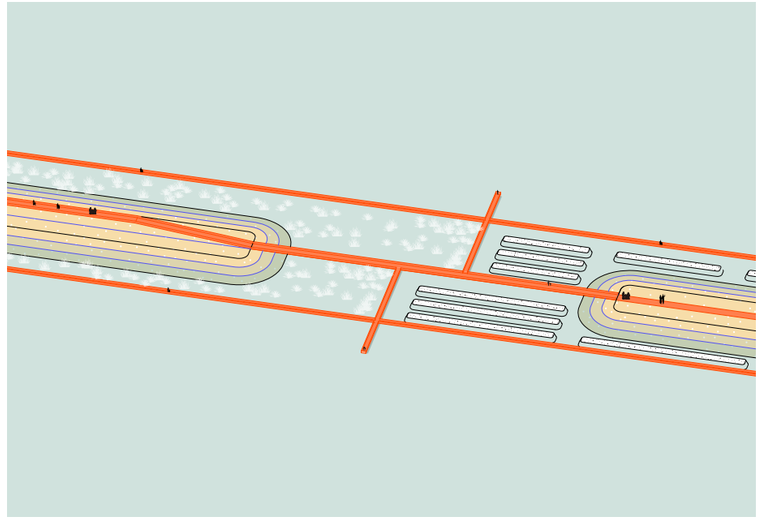
Abelmoschus esculentus

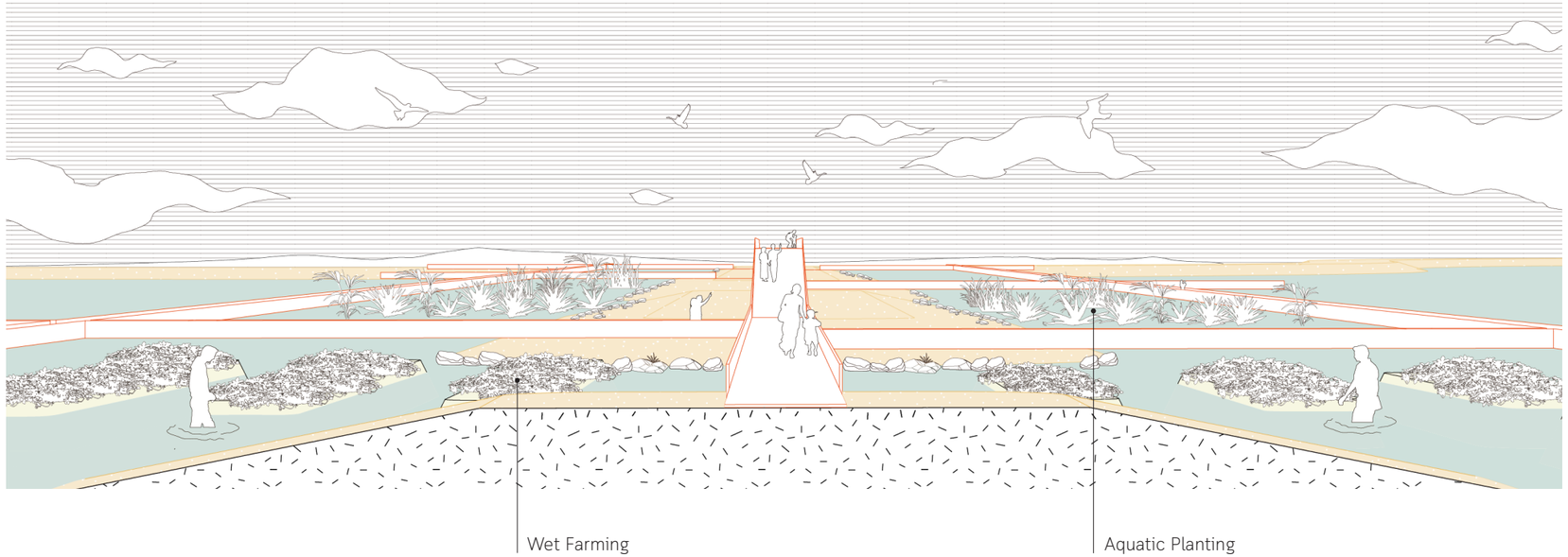
Capsicum annum

Hyacinthus orientalis

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

Trail of Cooperative Circulation System B





Water purification plant selection:

Typha orientalis

Juncus effusus

Iris tectorum

Nymphaea

Antirrhinum majus

Emerged plant | Floating plant | Submergent plant

Wet farming crop selection:

Eupatorium cannabinum

Filipendula ulmaria

Nasturtium officinale

Cardamine pratensis

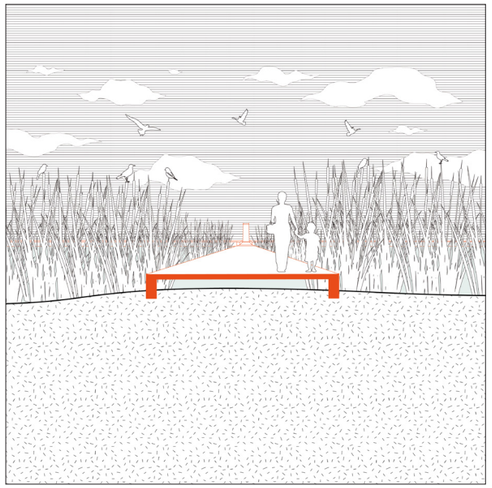
Mentha aquatica

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

11.4 Into the Lake

Into the Lake is designed to immerse visitors in the natural circulation system of the sub-lake. The design follows the sub-lake's topography, organizing transversal paths at varying elevations of areas of reeds, aquatic plants, and deep water. Several longitudinal paths intersect these transversal paths, guiding visitors through diverse landscape scenarios. They move from enclosed reeds to lush aquatic vegetation, look down at the water, and finally reach a high vantage point above the open water, observing various ecological niches inhabited by waterbirds throughout. When traveling by public transport, visitors can view sub-lakes managed in different ways and experience their unique landscapes. This journey truly guides people into nature.

recycled plastic panels



Phragmites australis

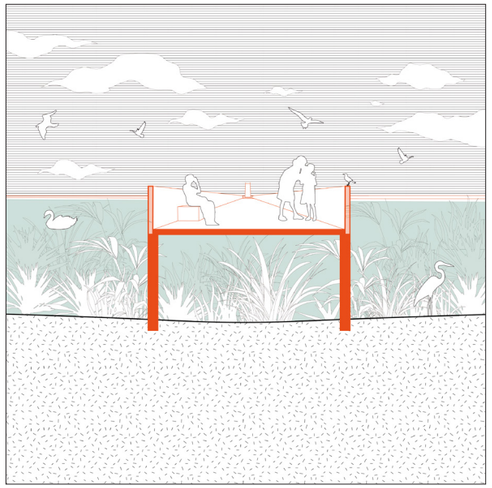
Typha orientalis

Imperata cylindrica

Carex

Zizania latifolia

Reed Area
(planting characteristic: high, enclosed)



Phragmites australis

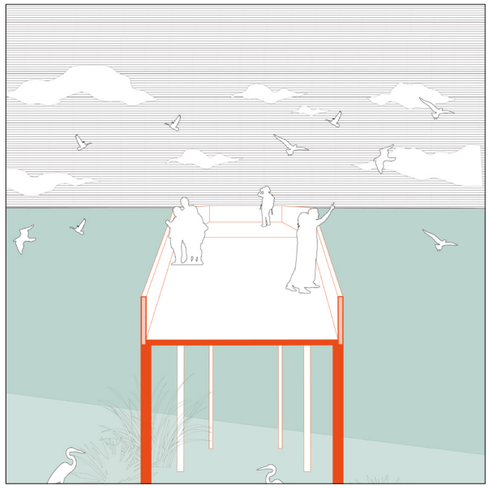
Iris pseudacoruss

Pontederia cordata

Lythrum salicaria

Colocasia esculenta

Aquatic Plants Area
(planting characteristic: ornamental, purifying, semi-open)

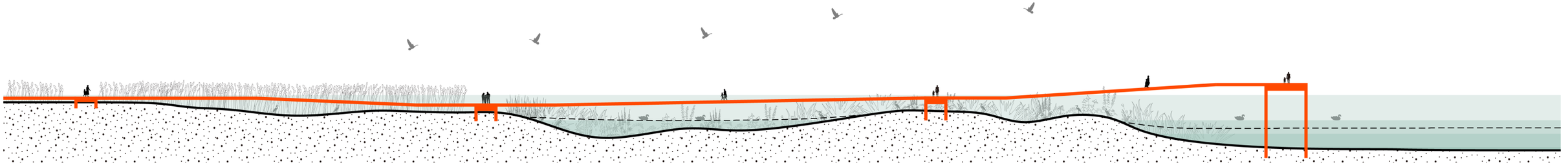


Antirrhinum majus

Hydrilla verticillata

Pontederia cordata

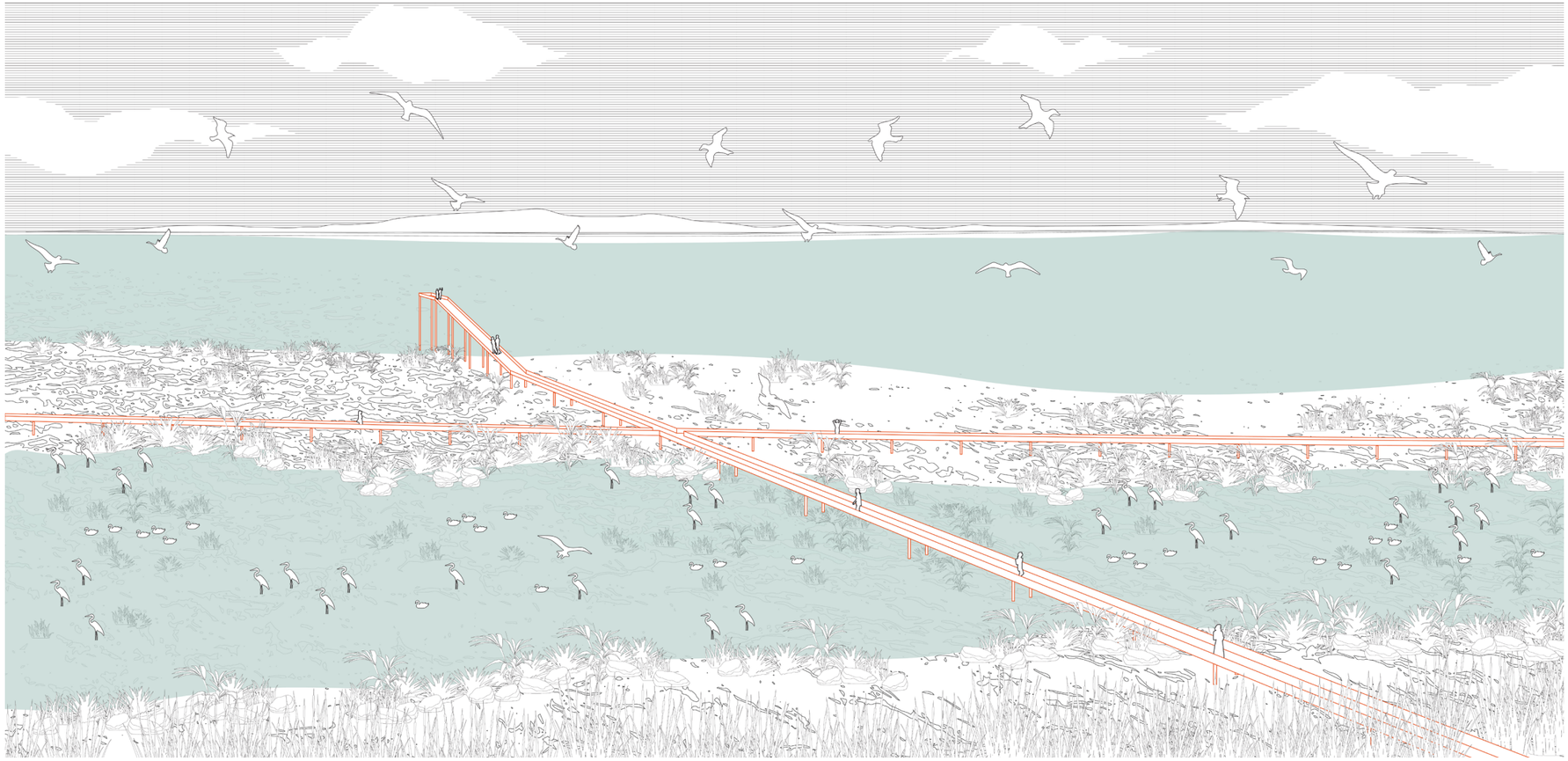
Deep Water
(planting characteristic: submerged, open)



reeds area

aquatic plants area

deep water



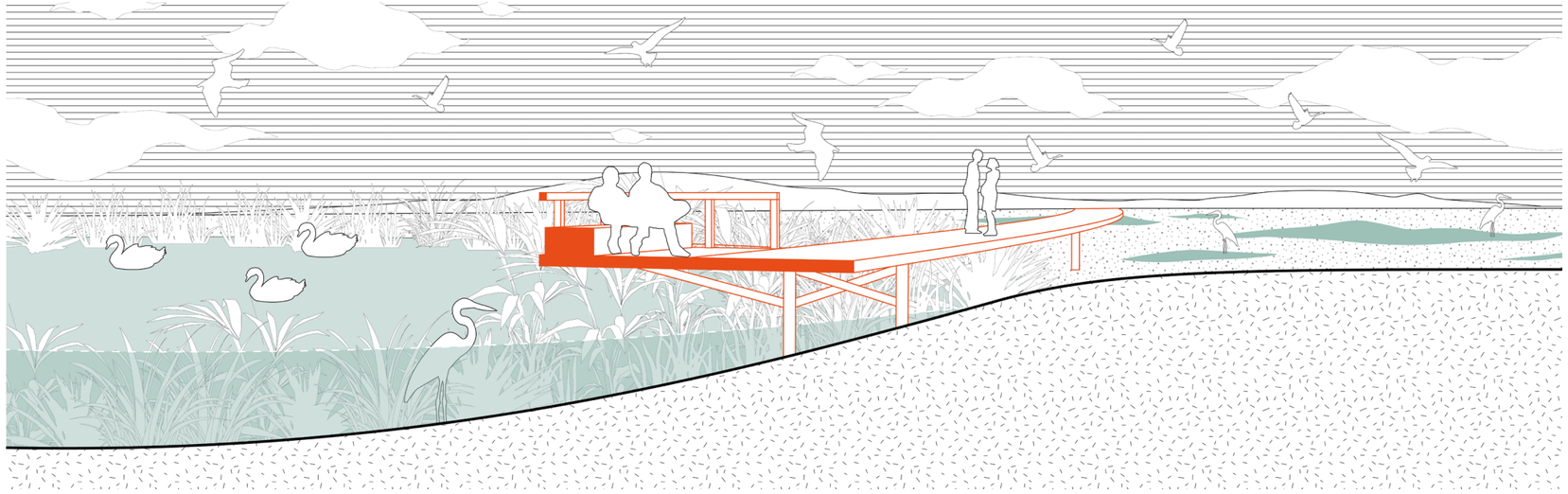
11.5 Sea of Grass

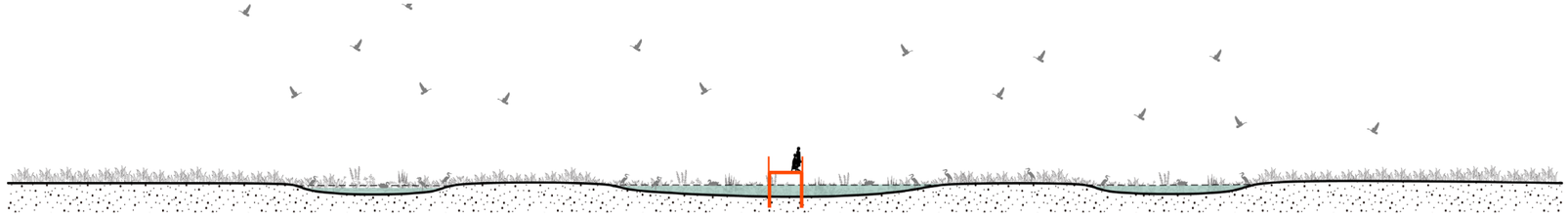
Sea of Grass is centered on the experience of wet grassland. A path leads through a vast expanse of grassland with puddles of water spread across the grassland, where migratory birds fly overhead and stop at the puddles.

recycled plastic panels

Carex

Pontederia cordata

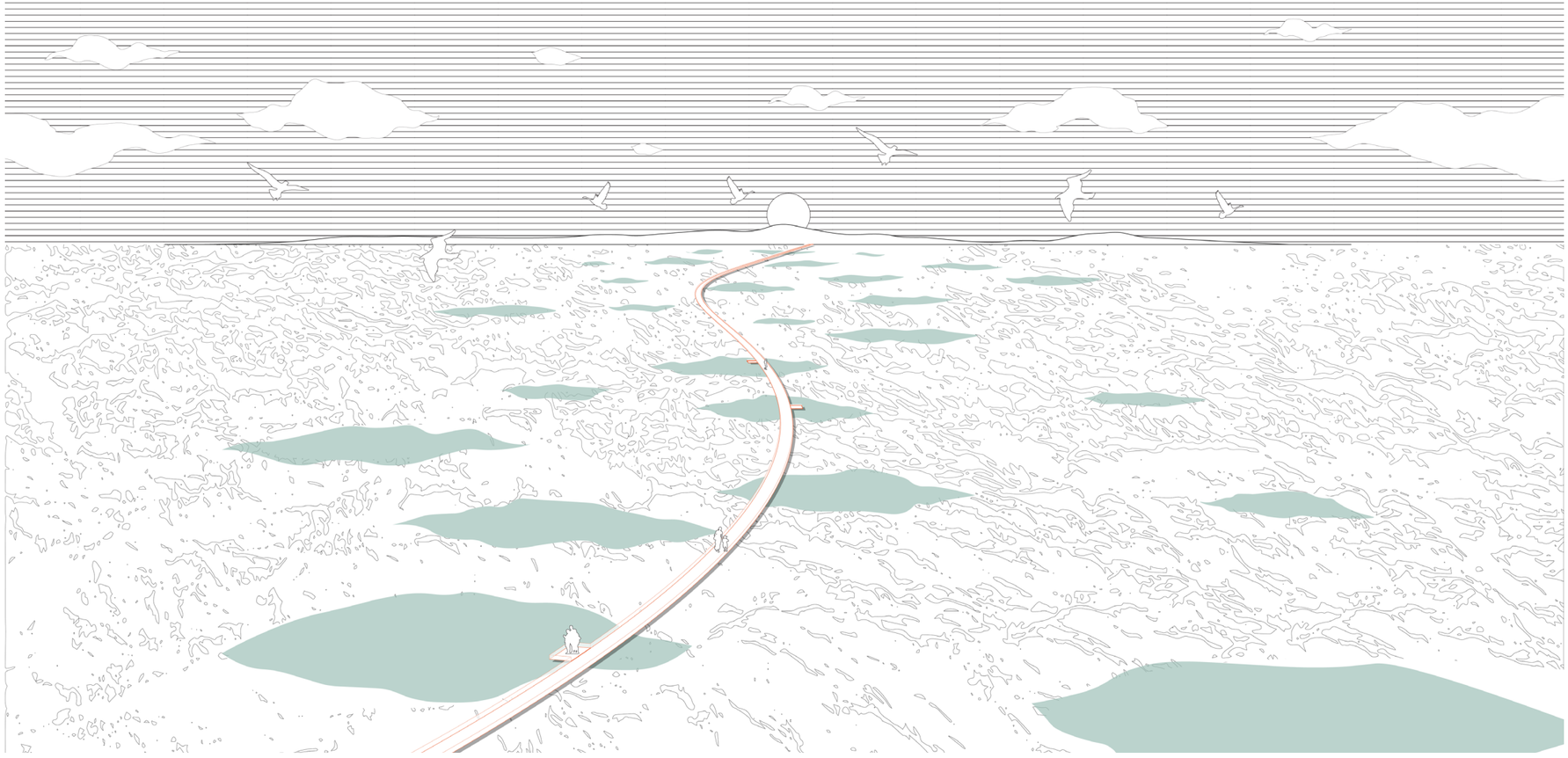




constructed depression

constructed depression

constructed depression



11.6 Landmarks

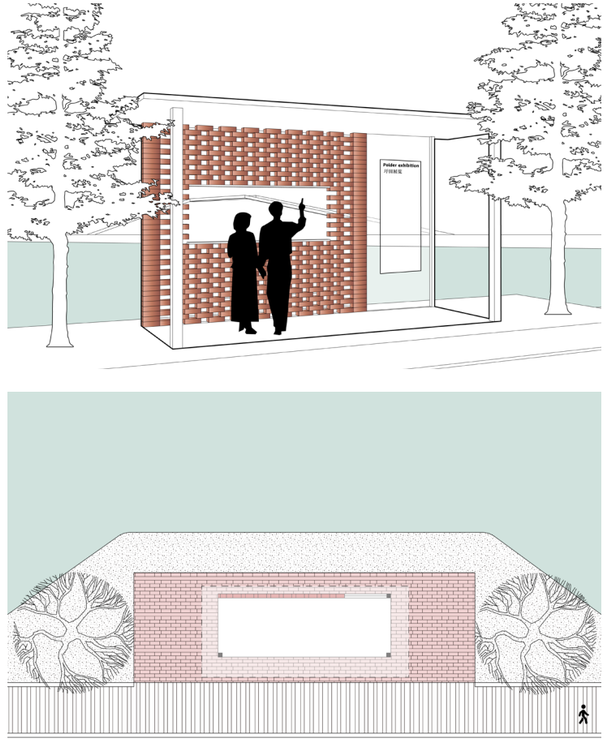
Diverse landmarks are created and distributed throughout the landscape system of Poyang Lake, mainly including bus stops and sluices positioned to signify changes in the scenery and elucidate the operation of the system.

The bus station on the polder is made of red brick, which is inspired by the main local residential building material, representing the character of the polder that is closely related to human living. The bus stops on the sub-lake and wetland, on the other hand, use reed as the building material, seamlessly blending with the natural surroundings.

The sluice is a tangible reminder to visitors of how this landscape system works. It is inspired by the traditional sluice, using wood and concrete as material, reconstructing by modern style.

These landmarks are linked together as point elements to assist in the cohesive narrative of the polder-sub-lake-wetland landscape sequence.

1. Polder Bus Stop



Vegetation selection:

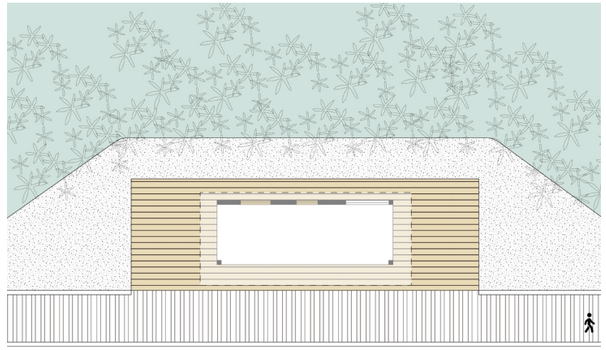
Taxodium ascendens

Material selection:

Photo of local building

Red brick

2. Sub-Lake & Wetland Bus Stop



Vegetation selection:

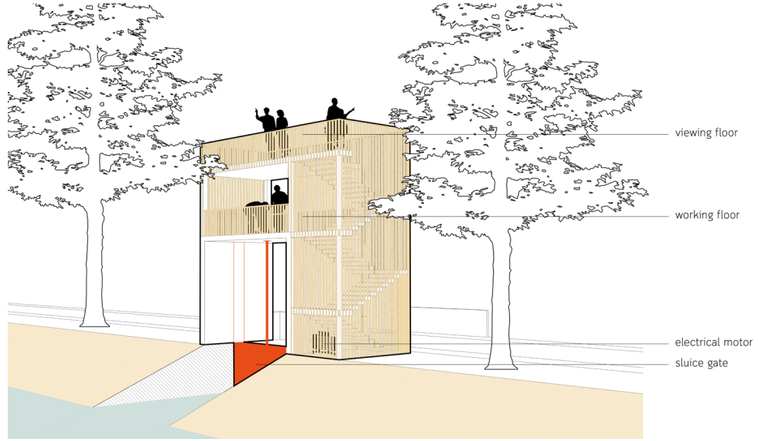
Phragmites australis

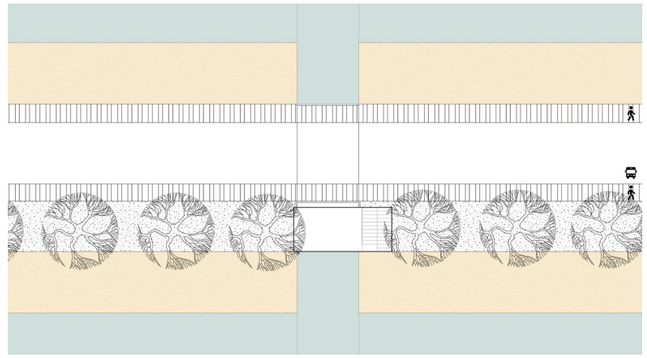
Material selection:

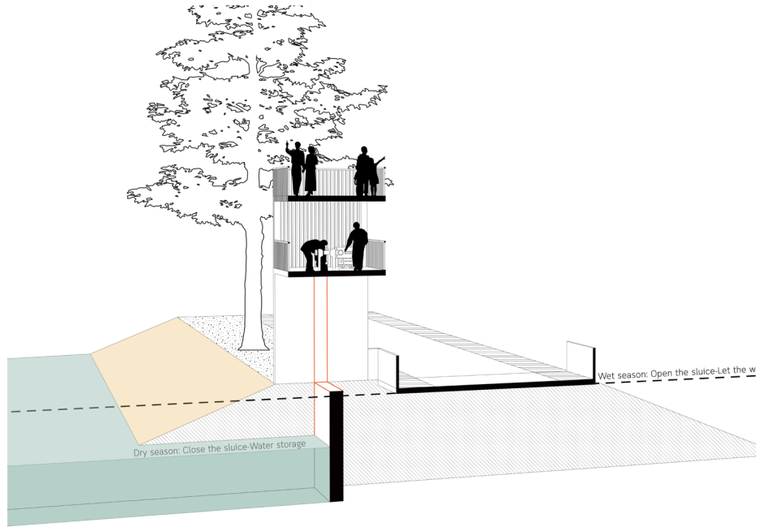
Photo of sub-lake

Reed

3. Sluice







Vegetation selection:

Taxodium ascendens

Material selection:

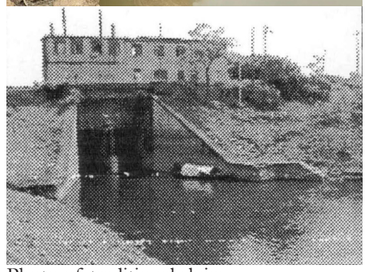
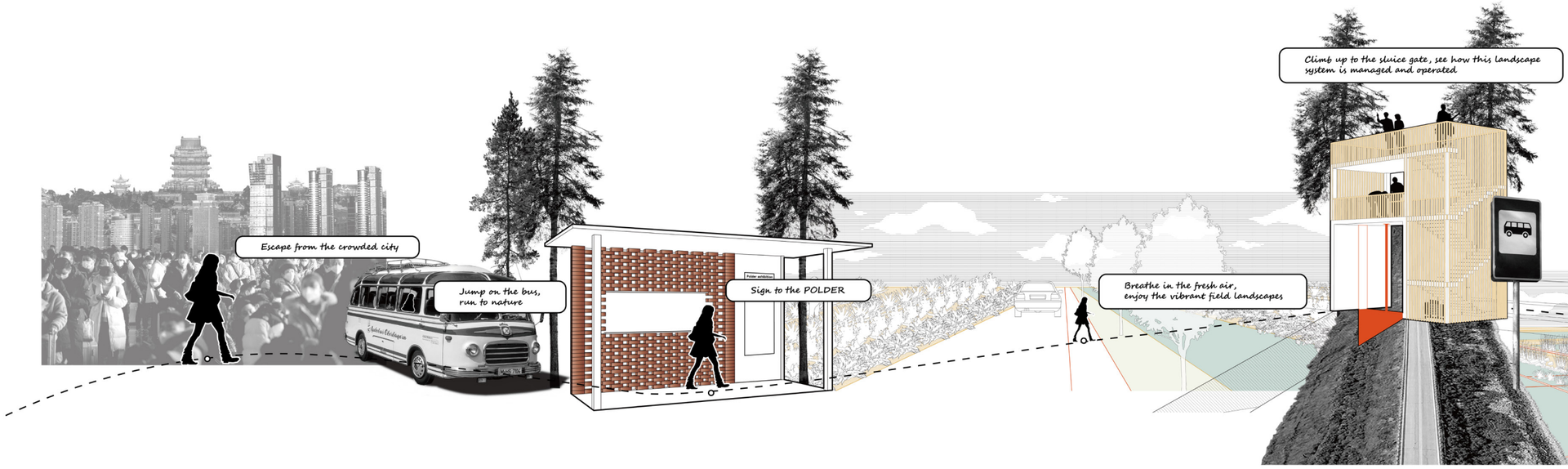


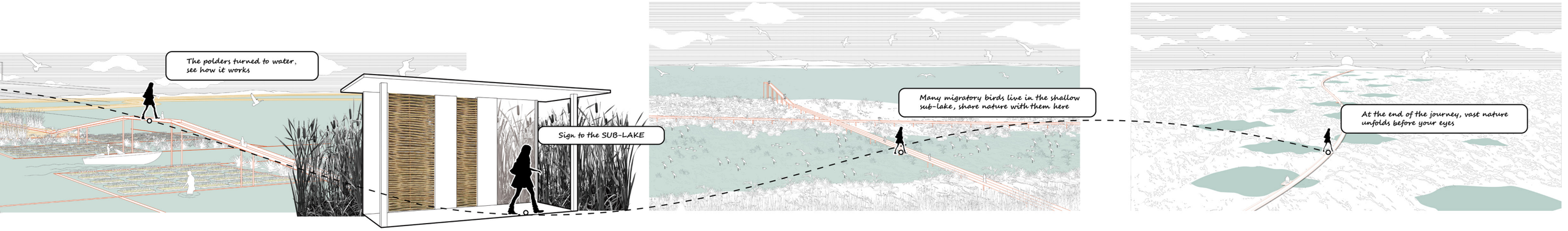
Photo of traditional sluice

Wood & Concrete

11.7 From Crowded City to Vast Nature

Combining the previous designs, this project provides a Polder-Sub-lake-Wetland landscape sequence for visitors to tell the story of Poyang Lake's past, present, and future, showing the beauty and vastness of nature. Visitors take public transport to escape from the hustle and bustle of the city, passing through the field landscape of polder, the sub-lake where numberless birds fly and perch, and the boundless sea of grass in the wetland, which makes up the main body of the story of Poyang Lake. The structures on the journey are like the footnotes of the story, as the nodes of the landscape changes remind the visitors of the composition of the landscape system, how the designers use the new scheme to save the damaged landscape of Poyang Lake, and how the huge landscape system continues to operate and manage. The design expects to restore the vitality of Poyang Lake by means of a clever landscape architecture approach, to revive the beauty of the landscape, and to let Poyang Lake breathe again.



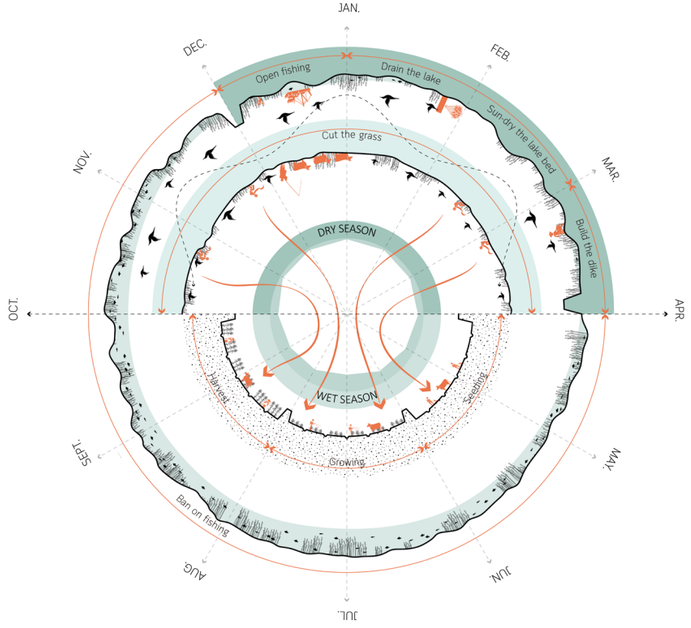

The polders turned to water, see how it works
Sign to the SUB-LAKE
Many migratory birds live in the shallow sub-lake, share nature with them here
At the end of the journey, vast nature unfolds before your eyes

12 Conclusion and Reflection

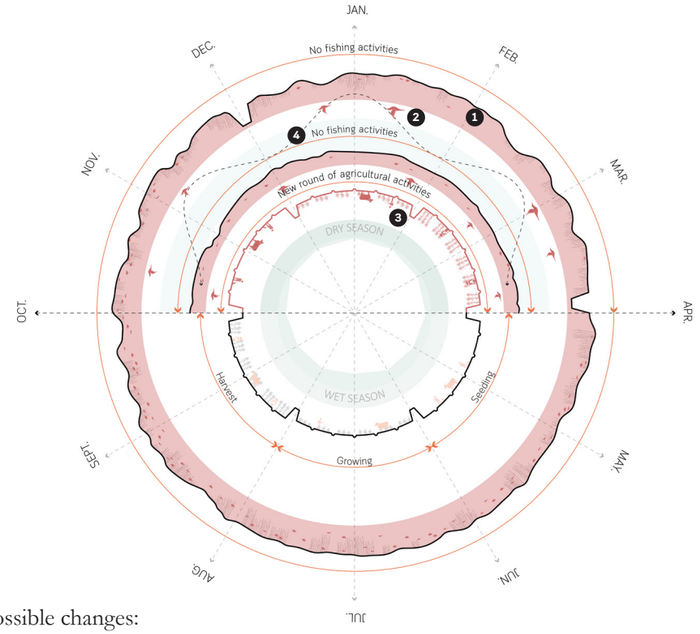
12.1 Conclusion

Water Rhythm

Original Rhythm



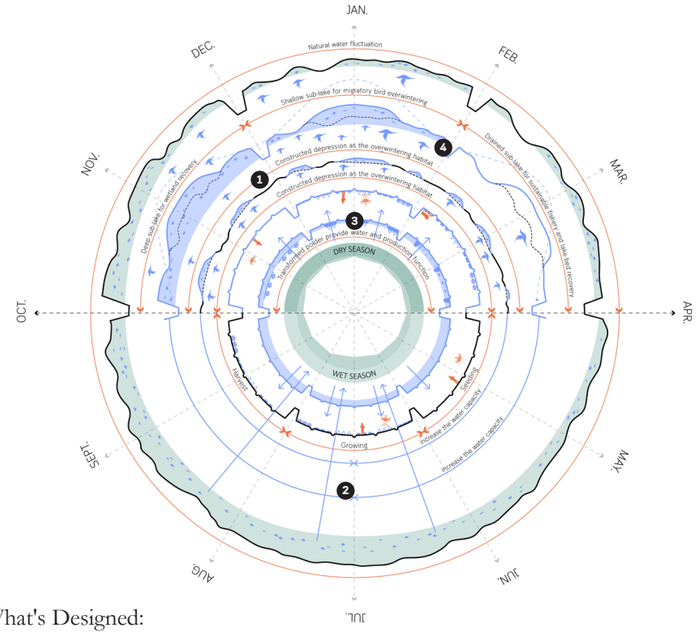
Hypothetical Post-Dam Construction Rhythm



Possible changes:

1. Water will be stored in the dry season, addressing the problem of drought
2. Animal migrations will be blocked, leading to ecologial problem
3. The production of polder will be extended during the dry season
4. Dynamic use of the lake will be lost

Designed Rhythm

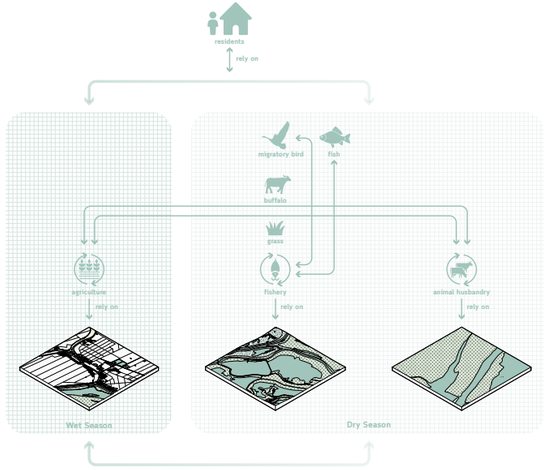


What's Designed:

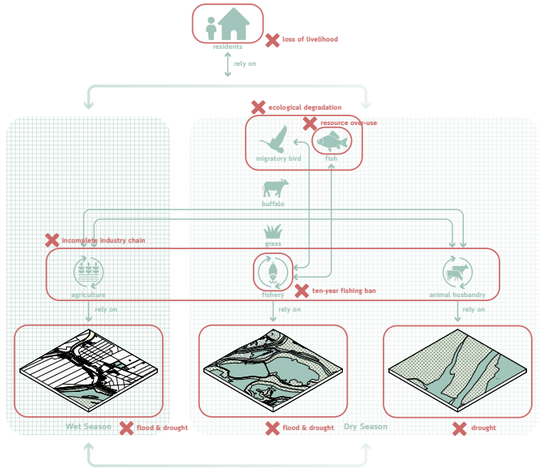
1. Diverse resilient water space are created, bringing the dynamic back to lake
2. Lake water will be released into the water space during wetseason
3. Water space will guarantee water use need during the dry season
4. Biodiversity will be enhanced

System Cycle

Original Cycle

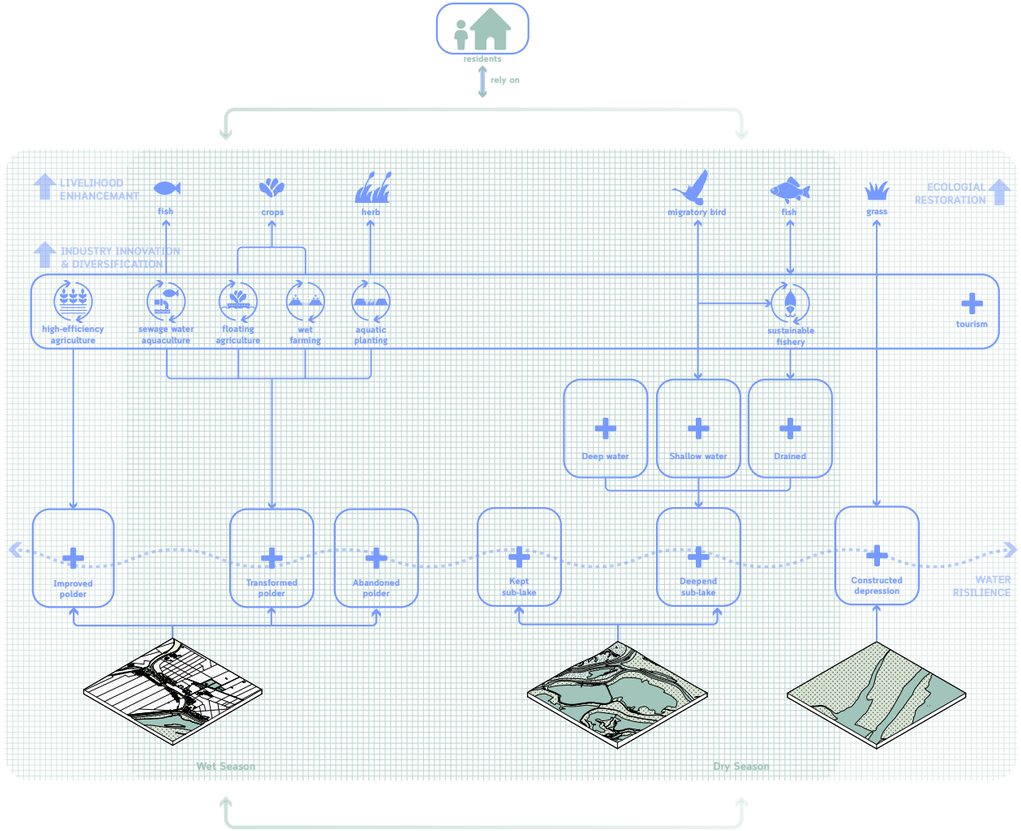


Broken Cycle



In contrast to the Poyang Lake Water Conservancy Hub Project, this research project offers a more resilient, eco-friendly, and integrated solution. Instead of forcefully obliterating the vitality of the landscape, it seeks to adapt to and play with the natural dynamics of water. According to systems theory and landscape ecology theory, the diversity and heterogeneity of subsystems are positively correlated with the stability of landscape systems. This design is based on physical space and time elements represented by hydrological rhythms. By modifying the physical environment, it creates diverse spaces that align with new hydrological patterns. These spaces will support a variety of dynamic functions, such as multifunctional eco-friendly industries, and will consider multiple "roles" within the landscape system, including people, animals, and plants. The interconnected landscape components will form a symbiotic and integrated system. Ultimately, this design aims to develop a healthier landscape system that adapts to new hydrological rhythms, enhances ecological functions, and provides rich human experiences through diverse spaces.

Future Cycle



Estimated Results on Water Issues

According to the estimations carried out for water issues based on this research project, it is possible to significantly reduce the risk of flooding in the wet season and increase the available water resources in the dry season.

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

12.2 Reflection

Reflections on Research Questions

Main Question:

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

By studying and analyzing the value and operational logic of the Poyang Lake Traditional Water System, as well as the mechanisms behind issues arising from modern influencing factors, this research has constructed a comprehensive understanding of the Poyang Lake landscape as a solid foundation. By leveraging the potential of rural areas and combining systems theory and landscape resilience theory, this research project proposes the concept of a rural self-circulation and mediation system. The concept aims to build an integrated system of water, nature, and humans, to coordinate the relationship between humans and nature, people and water, and to activate the rural areas while protecting the cities. The goal is to achieve resilient water balance, rationalize water resources, harmonize human settlements with nature reserves, and innovate a circular living chain. Based on the three major landscape typologies of Poyang Lake (polder, sub-lake, wetland), this system establishes three interconnected layers: water, ecology, and livelihood, and implements specific landscape spatial strategies, principles, and designs at continuous scales, which encompasses macroscopic strategic decision, mesoscopic system operation, and microscopic human experience. By transforming the existing non-resilient landscape into a resilient landscape, the water storage capacity of the lake is increased to cope with floods, and the water storage space is created to cope with droughts. The productive and residential values of the transformed polder are shifted to the safer and crucial polder through intensive use of land. Ecological values are enhanced by constructing a gradient from human settlements, buffer zones, and nature reserves, with phytoremediation and culverted wetlands as the main means. Through industrial renewal and resource recycling, new living chains are activated to ensure the livelihoods of the rural population. A design framework and spatial principles based on this are established, adapted, and combined. On the basis of the dynamic water balance, ecological values, and livelihoods, a continuous landscape scene is constructed and the beauty of the landscape is stimulated through a variety of routes and spatial design tools. A new future landscape system emerges.

Sub Question1:

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

The traditional water system of Poyang Lake reflects the original logic of the landscape as a system. The local people coordinated and integrated all the elements in the landscape, including topography, water, time, natural resources, animals, etc., in a systematic way of thinking, realizing cyclical use of land, adapted production activities, and recycling of resources.

The second is the focus on landscape dynamics. The utilization of the traditional water system by local inhabitants reveals a dynamic attitude towards water, characterized by adaptation to seasonal fluctuations. Humans and water are in a relationship of mutual cooperation and compromise.

Based on the values summarized, this research project learns and reflects systems theory and landscape resilience theory. The design always considers the landscape of Poyang Lake as a system, adjusts the system with systematic thinking, and finally constructs a rural self-circulation and mediation system. The system positively welcomes the water dynamics by implementing resilient spatial strategies and principles.

Sub Question2:

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

Spatial principles for floods and droughts are centered on the creation of additional resilient water space, increasing storage space in the wet season, and providing water support in the dry season. Examples include converting part of the polder into resilient water storage space, deepening part of the sub-lake, and creating constructed depressions in the wetland. Spatial principles for ecological degradation are centered on phytoremediation and wetland nourishment, including the creation of artificial wetlands in the polder and phytoremediation in the sub-lake and wetland. wetland. The spatial principle for livelihood is centered on the creation of innovative production spaces, such as efficient agricultural production on improved polders, wet farming, sewage water aquaculture, floating agriculture, aquatic planting on transformed polders, and sustainable fisheries on sub-lake.

Integrating these problem-oriented spatial strategies involves both vertical and horizontal dimensions. In terms of the vertical dimension, there's a vertical overlay between spatial strategies, guided by water, ecology, and livelihood. For example, new water-based industries can be developed in the resilient water storage space in the polder, and sustainable fisheries, phytoremediation, and wetland conservation can be developed in the deepened sub-lake at the same time, thus constructing an eco-friendly and multi-functionally composite water space. In the horizontal dimension, these composite water spaces can be combined into sub-cycles, e.g. cooperative circulation system combines efficient production, water purification, water-based industries and water storage, one-way water re-use system combines efficient production and water purification, self-circulation system combines water purification and water-based industries, and the natural circulation system combines natural sub-lakes and artificial deepened and managed sub-lakes.

The design clarifies the decision-making for each landscape typology on the scale of influence, implements the spatial principles of the sub-cycle on the scale of effect, and realizes the human experience and understanding of the system on the scale of control, finally forming an holistic landscape system.

Sub Question3:

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

As a result, the Poyang Lake area will reach a new balance. In terms of water, this research project provides a landscape architectural resilient solution. While the initial proposal for the Poyang Lake area included constructing a dam north of the lake to address flooding and drought issues, this hardline solution would have significant negative ecological impacts. In contrast, the design project will achieve a resilient water balance and rational water utilization in a more sustainable and less intrusive way, mitigating the risk of droughts and floods. In terms of ecology, the stable water supply will nourish the sub-lake and wetland, enhancing biodiversity and ecological service value, thereby maintaining Poyang Lake as a crucial habitat for migratory birds. In terms of livelihoods, the introduction of new sustainable industries for landscape transformation and maintenance will create more job opportunities. It is expected to revitalize rural areas, making them regions of independent value.

Reflection on Landscape Architecture

The topic of the Flowscape Studio and the Circular Water Stories Lab provide a key perspective for this research report, which is to focus on water infrastructures, using traditional water systems as an initial starting point, and developing integrated and dynamic spatial systems.

The study of traditional water systems reveals both a deeper understanding of the site and a perspective of the landscape as a process. Traditional water systems represent the high vitality of water within the landscape and the interconnection between humans and nature, showcasing the ingenuity of individuals in utilizing and managing water. Yet the world is in a constant state of change, and every day we are faced with new challenges. Unchanging landscapes can no longer be adapted to new times. The job of the landscape architect is not to envision a set end for the landscape, but to provide a benign enabler for the landscape to evolve.

> *Sometimes a landscape seems to be less a setting for the life of its inhabitants than a curtain behind which their struggles, achievements, and accidents take place. For those who, with the inhabitants, are behind the curtains, landmarks are no longer geographic but also biographical and personal (Barthes, 1968).*

Although landscape architecture has evolved beyond its original meaning, becoming complex, systematic, and sometimes abstract, its essence and core always remain rooted in tangible spaces. Within these spaces exist numerous subsystems and roles, water, animals, plants, organic matter, and humans, representing diverse academic perspectives. Space serves as the stage for the interaction and performance of these roles. Therefore, this project always operates on landscape typologies as its foundation, altering the world from a landscape architectural perspective and manner. By manipulating basic spatial elements like soil and water, it progressively influences organisms, animals, and humans, allowing these roles to dance on the stage once again.

Reference

Berger, J. (1972). *Ways of Seeing*. The Schools.