Cascading Floodspace

Rebalancing flood prevention through spatial design interventions in Jianghan Plain, China

Houxuan Zhang
Landscape Architecture MSc

DECLARATION OF AI USE

This project involved the use of AI-assisted tools for specific aspects of visual production and language support. ChatGPT-4o was used to assist with the translation and refinement of English texts throughout the document. On pages 208 – 209, Fig. 3.44. and Fig. 3.45. was generated using an AI image synthesis model based on Stable Diffusion. A line drawing created by the author was provided as input, and the AI-generated base image was subsequently edited and post-processed by the author to produce the final visualization.

All creative decisions, interpretations, and final outputs remain the responsibility of the author.

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Faculty of Architecture and the Built Environment

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Delft University of Technology

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And like a quiet note at the beginning of a long melody, I begin this work with thanks.

To my mother — the one I love being with the most. Thank you for treating all my mistakes with such endless gentleness, and for responding so softly to every premature hope I held for the world. You planted in my heart the capacity to dream — not only of places, but of meanings, of spirit, and of stories.

To my father — the person I respect above all. You never taught me in loud words, but in the calm firmness of your own way of being. I cannot help but follow the path you walk.

To those dearest to me — my grandmothers, my grandfathers. You've always wanted to understand the strange little world I inhabit. And to Professor Qian Yanmin, a senior whose wisdom and kindness I have long admired — thank you for your generous support across time and distance.

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To Gu Xinming — thank you for always being there. I've longed for you to see the wonders I've witnessed over these two years, and to feel with me the quiet awe and unexpected joy.

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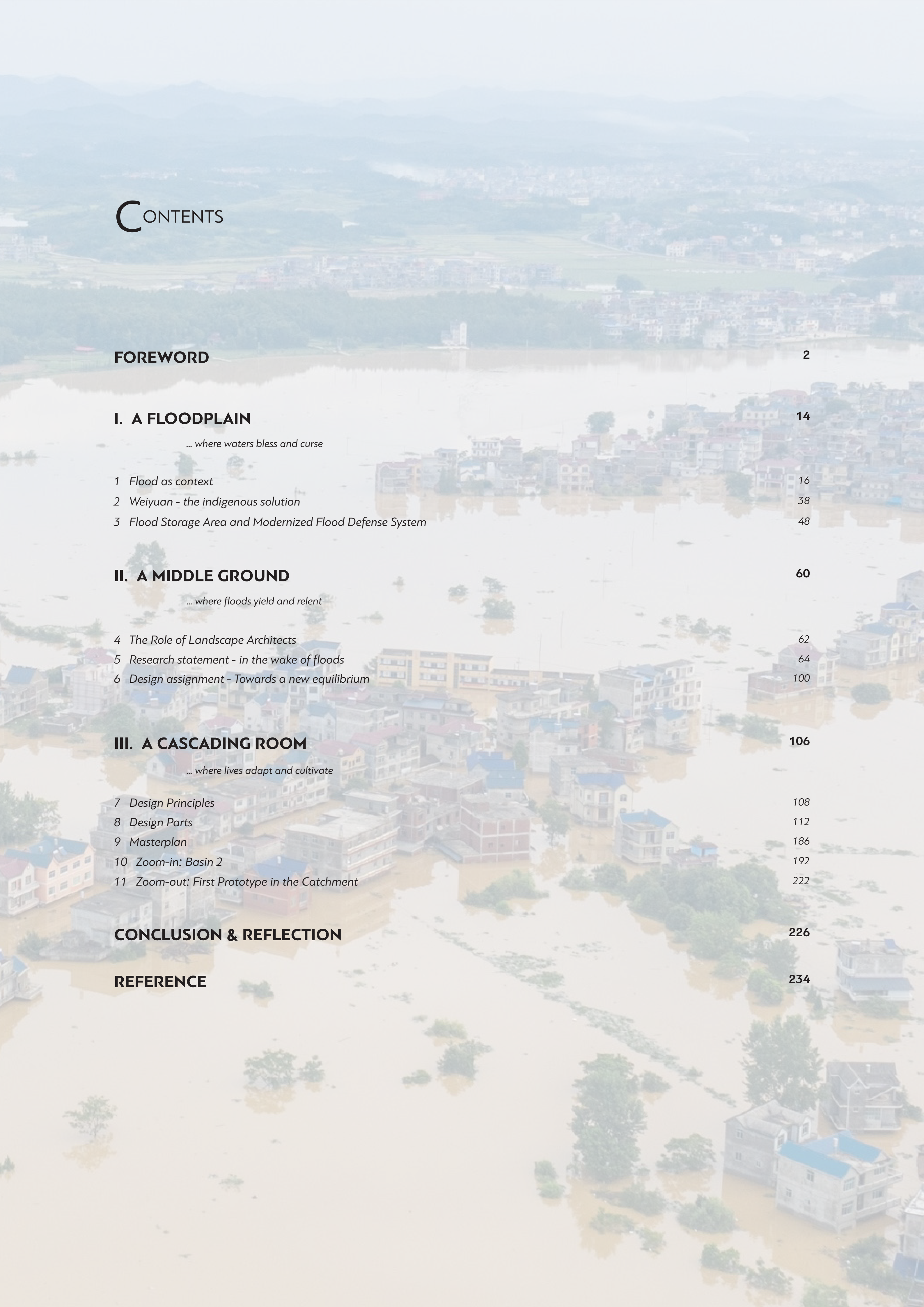
To DianDian — my old cat, whose purrs in the sunshine always remind me that the world can slow down, that serenity can be found in the small and the familiar.

To my homeland — thank you for giving me roots. Thank you to the mighty Yangtze River, whose pulse still flows in my blood. And to the Netherlands — this soft land of wind and green — thank you for your warmth. You've given me a place to grow, and memories to hold.

And lastly, I dedicate all this work to my grandmother, Cai Xiangyuan. I loved her more than anyone. May she have found a quiet land of peace. May warmth and light now surround her soul.



Contents

"Embankments speak of mastery over nature. the river, however, remains unconvinced."

Taken from a viral meme on a local web forum

FOREWORD

Along the waters of the Jiang and Han, I drift with thoughts of home—
A single weary scholar beneath the boundless sky.

Du Fu, Tang Dynasty, *Jianghan*

FASCINATION

Is water its own controller?

When a drop of water is melted for the first time in a thousand years from the glaciers of the Sanjiangyuan (Source of three rivers) region into the immature headstreams of the Yangtze River, the shape of the water is determined by the interrelationship between the physical properties of the water itself and the surrounding geography. The topography and soil change the shape of the water, and the water constantly shapes the space to which it belongs. Over the millennia of natural succession, these two processes have reached a harmonious cycle.

In this moment, water controls its destiny.

However, nowadays, water is always being managed, especially in highly populated areas. We can find traces of water management in the human environment between dams and in ditches. The most obvious traces are in the water infrastructure that we have built. When water is finally stored in well - constructed industrial tanks, it loses control over its role.

When James C. Scott (1998) argues about "high modernism", he argues that modernity involves the translation of Nature into "natural resource". Among modernity, water becomes the kind that fits with a modern vision of society, losing its identity as a natural element. Ironically, more attempts are being made to make water more accessible to the public. Ironically, the more attempts we make to tame the water, usually the stronger water strikes back, in the longer term. As modern technology develops enough to fundamentally change the structure of the natural water cycle, the necessity to respect the natural rhythm of water is long forgotten. The necessity to respect the natural rhythm of water is long forgotten.

This article was inspired by the author's birth region, Hubei, "the province of a thousand lakes", where people and water have long co-existed and struggled with each other, and where several dramatic moments of conflict have erupted. More stories will be told about the expansion of agriculture over a period of 1000 years, the tragic floods, including the events of 1998, and the attitudes of the local people towards water. The story of this province serves as a slice of the macro-story of human and water - human's constant attempts to tame the floods, only to allow them to intensify.

In the tragic floods of 1998, well-known propaganda was, vowing to defend against the dike with lives. however, all heroic characters could be treated in a dialectical way. In this paper, I would like to explore whether the behavior of the people in resisting the natural forces of water plays a more controversial role in this story.

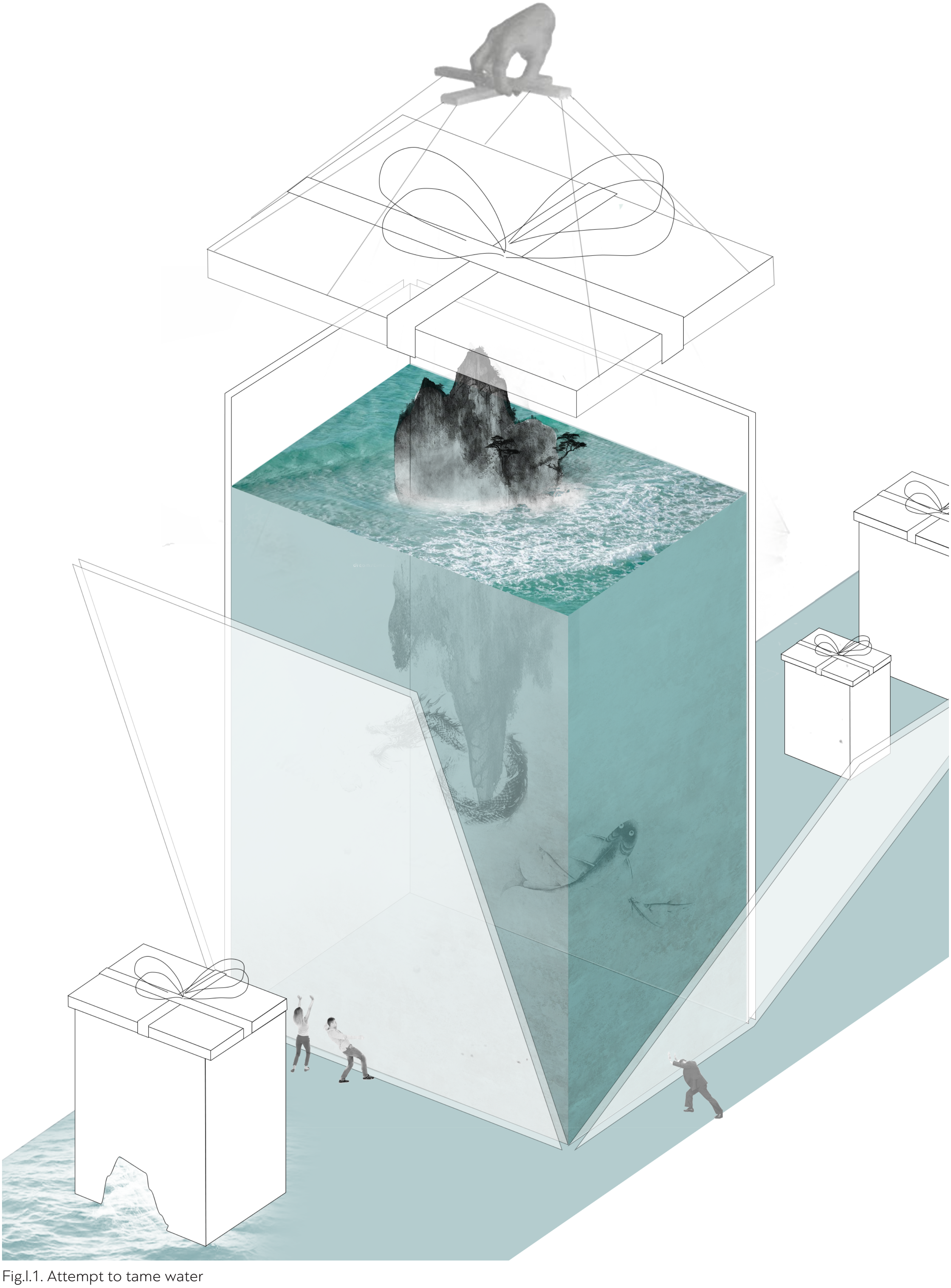


Fig.I.1. Attempt to tame water

FOREWORD

General Infomation

The project is located in the middle stream of Yangtze River, one of the largest rivers in the world. Nearly one-fifth of China's territory is contained within the catchment of this mother river. (National Bureau of Statistics of China, 2007), which includes nearly 40% of entire Chinese population. Originating from the crystal glaciers of the Tibetan Plateau and flowing through the rugged and mountainous Sichuan Basin and Wushan Mountains, the Yangtze River flows almost instantly into the vast and flat Jianghan Plain.

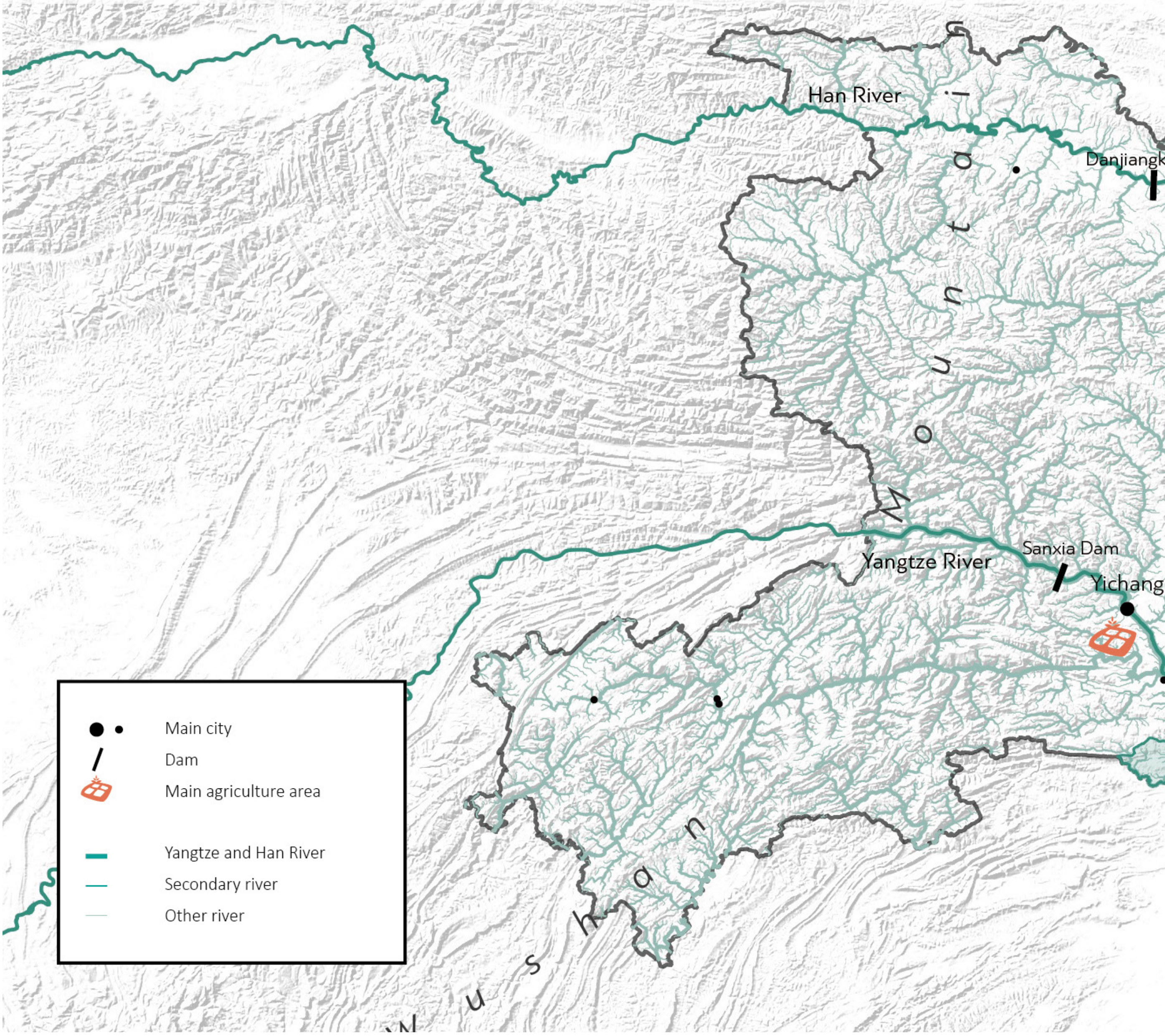


Fig.I.2. Location of Jianghan Plain

The vast Jianghan plain, with an average elevation of merely 27 meters, is veined with a dense network of rivers, while lakes and wetlands, are scattered like stars across the land. Since 2000 years ago, The population began to gradually migrate from the population centers at that time, further north in the Yellow River Catchment, to the Jianghan Plain. War is often the main reason for such population movements. However, the land is also favored for the rich floodplain soils that have developed over the centuries.

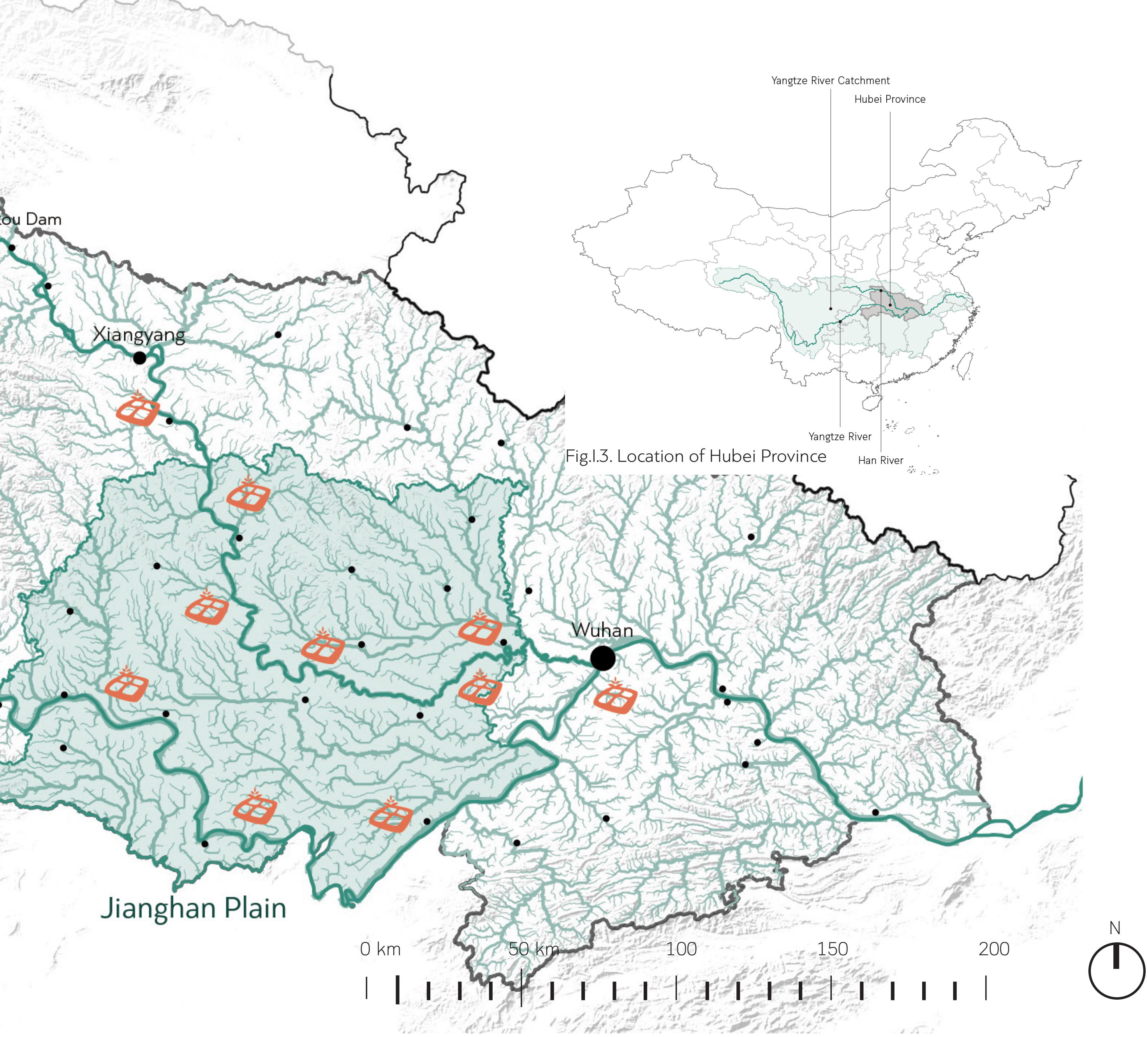


Fig.I.3. Location of Hubei Province

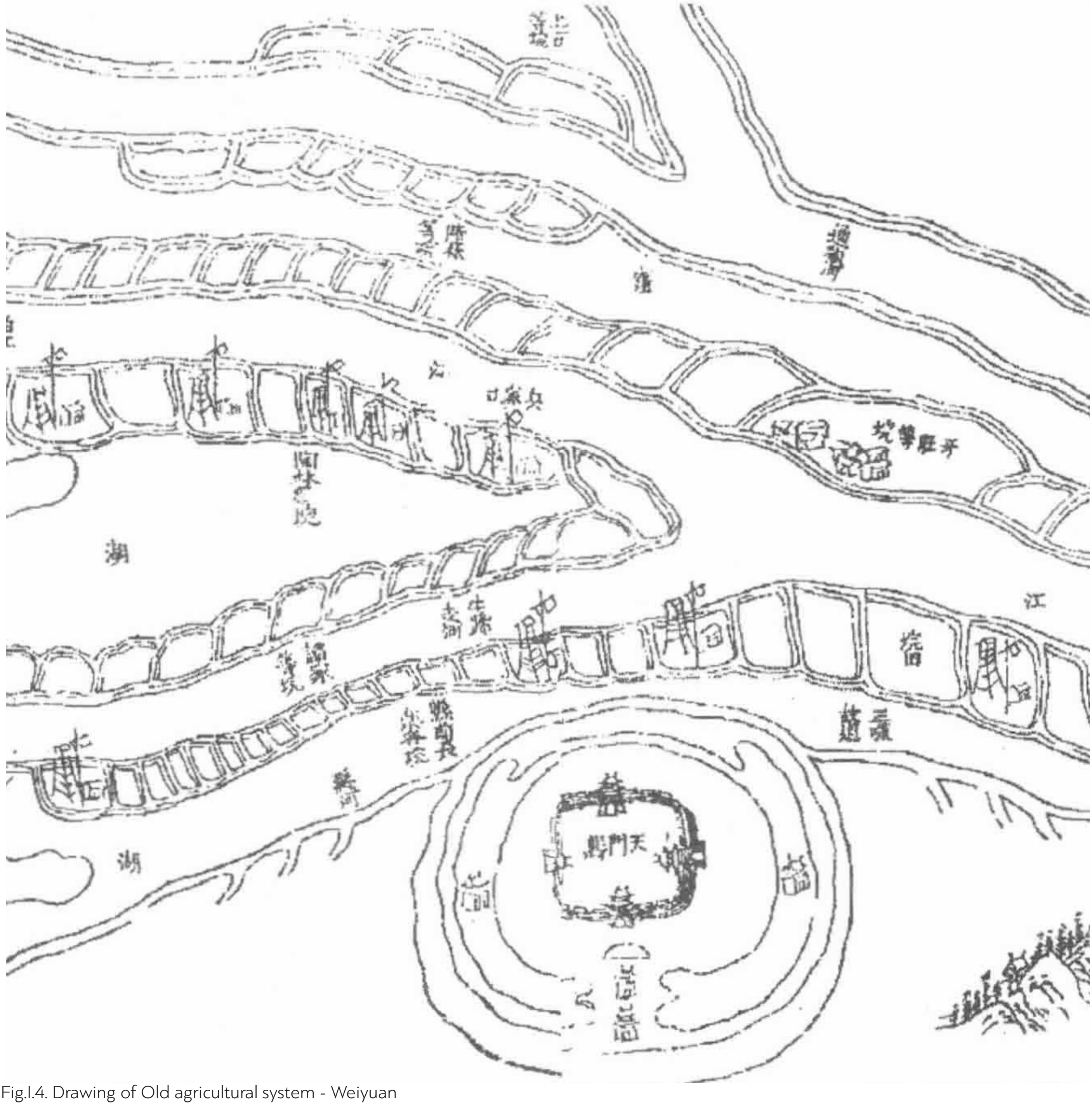


Fig.I.4. Drawing of Old agricultural system - Weiyuan

Adapting to Context

Due to the region's hydrological conditions, they were compelled to adapt to the ever-changing landscape. Every spring and summer, the warm and humid monsoon winds from the Pacific Ocean bring not only life-giving greenery, but also varied and persistent precipitation. Immigrants from the lower reaches of the Yangtze River brought with them the techniques of constructing Weiyuan agricultural system, a flood-prevented agricultural system protected by earthen embankments containing internal ditches like a chessboard. This system reached its heyday during the ROC (1912-1949). During that time, the lakes, riverbanks, flood plains, and residual river channels in the Jianghan Plain were transformed into hundreds of Weiyuan system and intensively cultivated.

Their reclamation efforts were originally driven by the pursuit of subsistence rather than the chase for market profits. While some small farmers did engage in cultivating cash crops, their endeavors remained deeply constrained by the limitations of the local environment. However, since the Ming and Qing dynasties (1368-1912), the rapid development of the Weiyuan system has made Hubei one of the largest crop exporters in China. (Chen et al., 1992)

The Flood

A fact that was neglected at the time was that the expansion of agriculture exacerbated the flood problem by taking up flood flowing and storage space during the rainy season. Until 1,000 years ago, devastating floods occurred only once every fifty or a hundred years. In the last 100 years, however, there have been nearly 20 fearful flooding events. (Yang et al., 2024)

It is striking that the contemporary rising flood risk in the Jianghan Plain is accompanied by a gradual disappearance of awareness of flooding. Flood awareness of a Weiyuan land reclaimer 500 years ago is much stronger than that of a contemporary rural dweller. The huge concrete dikes, several meters high, constructed by modern flood protection systems, create a strong sense of security, keeping people away from the floods. The problem was not solved, however, and part of it stayed in place in the form of higher and higher flood levels, while the other part moved downstream. After all, the Jianghan Plain was originally a huge natural flood storage area. And with this function gone, the floodwaters will find other ways downstream.

Today, the vast majority of residents on the Jianghan Plain remain unaware of the intricate flood defense system that surrounds them-those towering, dark-grey floodgates, the winding embankments, and the silent expanse of flood storage farmlands stretching across the plains.

What have we sacrificed? What have we gained? And what have we left behind?

A landscape is more than just space - it is a story. As this project takes the landscape as its lens to examine the deep imprints left by floods and humanity's response to them, the wisdom and absurdity embedded in these spaces emerge, revealing themselves almost in unison.

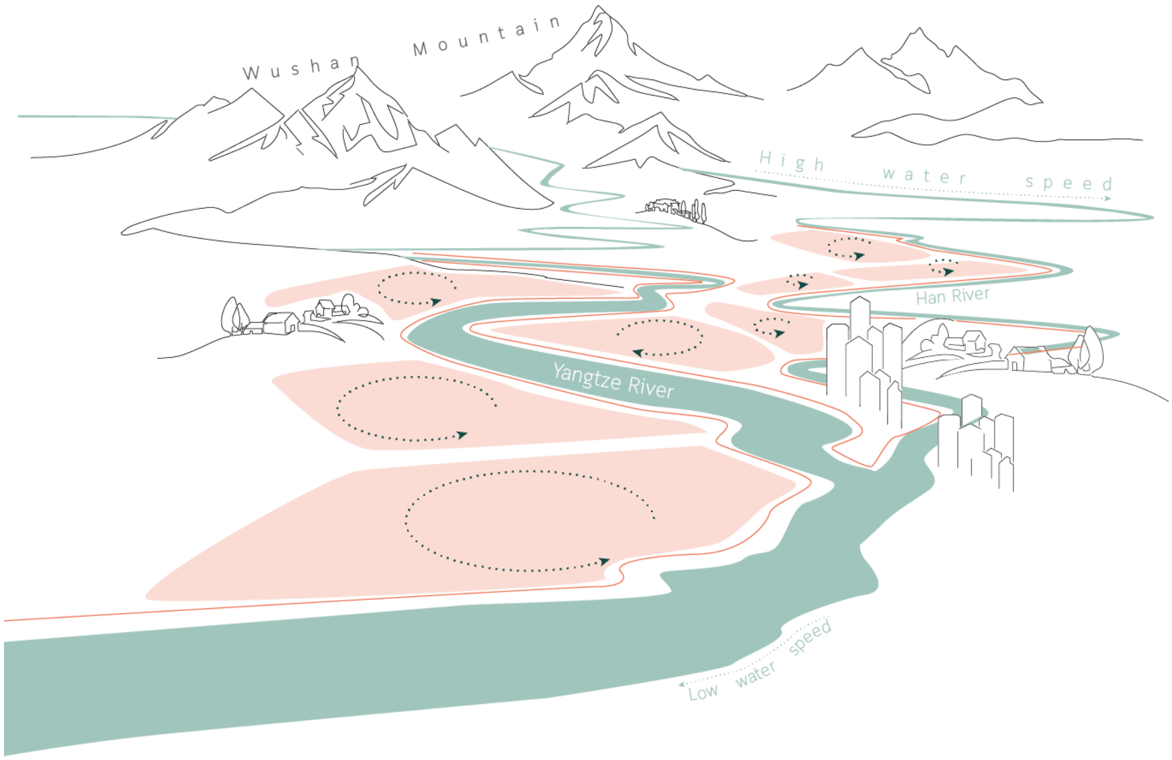


Fig.I.5. Spatial structure of Jianghan Plain

STRUCTURE OF THE REPORT

Contextual Background, Catchment scale, Jianghan Plain
Introduces the hydrological, social, and historical context of the site at the catchment and Jianghan Plain scale.

Issue Analysis, Catchment scale, Jianghan Plain
Identifies existing spatial, ecological, and social issues and traces their systemic origins.

Theoretical Framework, Catchment scale, Jianghan Plain
Establishes the conceptual foundation and introduces the Cascading Floodspace model at the regional scale.

Design Principles, Management scale, Jing River Flood Storage Area
Focuses on the Jing River Flood Storage Area, outlining spatial logic and design intentions at the management scale.

Masterplan Development, Management scale, Jing River Flood Storage Area
Proposes a layered spatial system within the flood storage area, balancing flood control and productive land use.

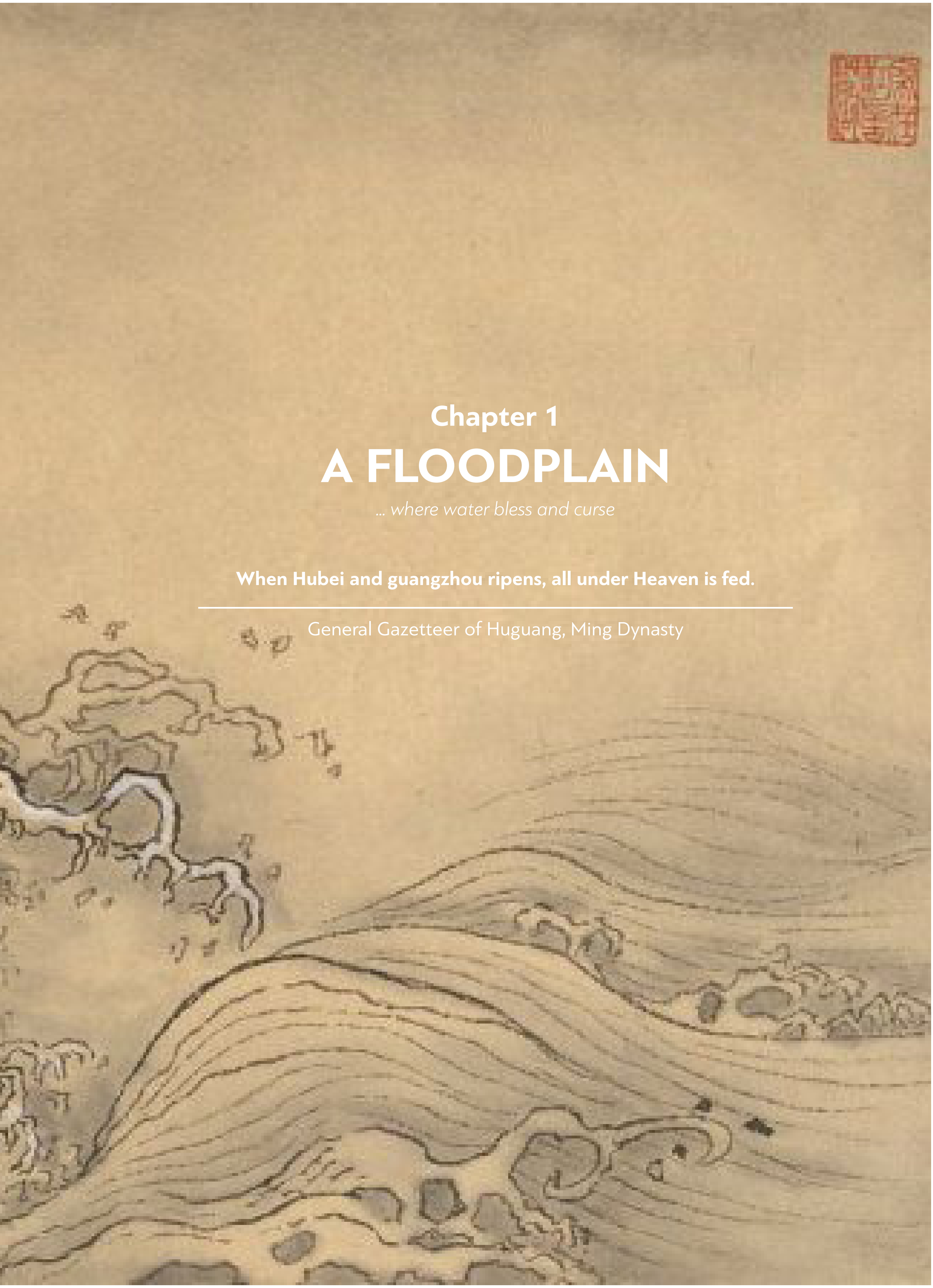
Zoom-in Design, Design scale, Basin 2
Concentrates on Basin 2 to articulate landscape strategies and experiential qualities.

Detail Design, Human scale
Examines key interventions at the human scale, emphasizing materiality, sequence, and use.

Zoom-out Vision, Catchment scale, Jianghan Plain
Reconnects the local intervention to broader regional networks, exploring potential future transformations.


Fig.I.6. Yangtze River - A Giant Dragon


雲舒浪卷



Chapter 1

A FLOODPLAIN

... where water bless and curse

When Hubei and guangzhou ripens, all under Heaven is fed.

General Gazetteer of Huguang, Ming Dynasty

FLOOD AS CONTEXT

Research Area Description

Jianghan Plain, the primary research area of this project, is a relatively ambiguous geographical concept. Its name originates from the two rivers that flow through this region-the Yangtze River and the Han River (historically referred to as Jiangshui and Hanshui, directly translated as Jiang water and Han water). The term "Jianghan Plain" generally refers to an alluvial plain enclosed by the Wushan Mountains to the west, the Dabie Mountains to the southeast, and the Dongting Lake Plain to the south. It spans nearly half of Hubei Province and includes small portions of northern Hunan and Jiangxi provinces, covering approximately 43,000 square kilometers, with a total population of around 30 to 40 million. At the confluence of the Yangtze and Han Rivers, nearly 14 million people reside in Wuhan, a megacity in central China. Beyond Wuhan, the Jianghan Plain is home to four other cities with populations exceeding one million(Jingzhou, 5.1 million, Xiantao, 1.2 million, Tianmen, 1.2 million, and Jianli, 1.1 million. Thanks to its extensive river networks, numerous lakes, and vast plains, the Jianghan Plain is one of the few regions in China capable of producing large quantities of rice, wheat, corn, cotton, flax, rapeseed, sugar, and fish. As a result, it serves as a crucial hub for China's grain and aquatic product supply.

Fig.1.1 A glimpse of Jianghan Plain as an agriculture area

One Land, Two Rivers, A Thousand Lakes: History of Water

Yangtze River, the longest river in Asia, is one of the two "mother rivers" of Chinese civilization, with an annual runoff of approximately 960 billion cubic meters. Han River, one of its major tributaries, contributes around 50 to 60 billion cubic meters of runoff each year to the mainstream of the Yangtze. During the Pre-Qin era (1000BC - 221BC), with the end of the Ice Age, the temperature in the Jianghan Plain gradually warmed, and the deep-cut river valleys formed by the two rivers expanded under the rising water levels, eventually forming a vast lake named as Cloud-dream Lake (Zhou, 1994). In the Western Han Dynasty, the famous writer and rhapsodist Sima Xiangru described in his Rhapsody of Zixu that on the eastern gently sloping hills of Cloud-dream Lake, various herbs grew, the southern part was a vast plain and marsh, bordered by the great Yangtze River and limited by the Wushan mountains. The western part was dotted with bubbling springs and lowlands, while the northern part had giant forests and fruit trees. The King of Chu (?-223BC) at the time enjoyed touring this area, occupying it as the royal hunting ground. Modern research suggests that at its largest extent, Cloud-dream Lake covered up to 40,000 square kilometers, once being one of the largest inland bodies of water in Chinese history.

During the Cloud-dream Lake period, the Jianghan Plain remained on the periphery of civilization. It may be difficult for people living there today to imagine that thousands of years ago, this land was a sweltering, overgrown tropical wetland, dense with forests and vast lakes. At that time, tigers and wolves roamed freely, Yangtze alligators lurked in every lake, and peacocks, apes, wild elephants, and rhinos occasionally appeared (Zhu, 1991). The inhabitants of this land were often derogatorily referred to as Man* or Quan Rong. The "civilized" people of the Central Plains regarded them as uncultured and unrefined. Furthermore, The Tribute of Yu, a Warring States-era (476BC-221BC) text that recorded China's natural resources following legendary flood control efforts, ranked the soil of the Jianghan Plain as the lowest grade, emphasizing the difficulties of utilizing its humid and marshy terrain.

*This does not refer to "man" in English (meaning a male person), but rather to the pronunciation of a Chinese character (meaning uncivilized people).

Fig.1.2. Imagination of Cloud-dream Lake

Of course, the "Man" people of that time could hardly have imagined that the harsh land they struggled to cultivate would one day become the granary that sustained the rise and fall of multiple dynasties. As sediments carried by the Yangtze River and Han River continued to accumulate, vast bodies of water gradually fragmented into hundreds of smaller lakes. During the dry seasons of winter and spring, most of the land could be reclaimed as fertile farmland. Almost overnight, the once muddy tidal flats were transformed into rich soil, nourished by centuries of sediment deposits from the Yangtze. From the late Western Han (202BC-8AD) to the Tang Dynasty (618-907), Central China experienced endless wars and conflicts, particularly repeated invasions by northern nomadic tribes, prompting large-scale migration southward. By the Western Jin period (265-316), the number of households in Jingzhou had reached 389,000, accounting for 15.62% of the national population at the time. By the late Tang Dynasty (618-907), the total population of the Jianghan Plain had grown to between two and three million (Liang, 1980).

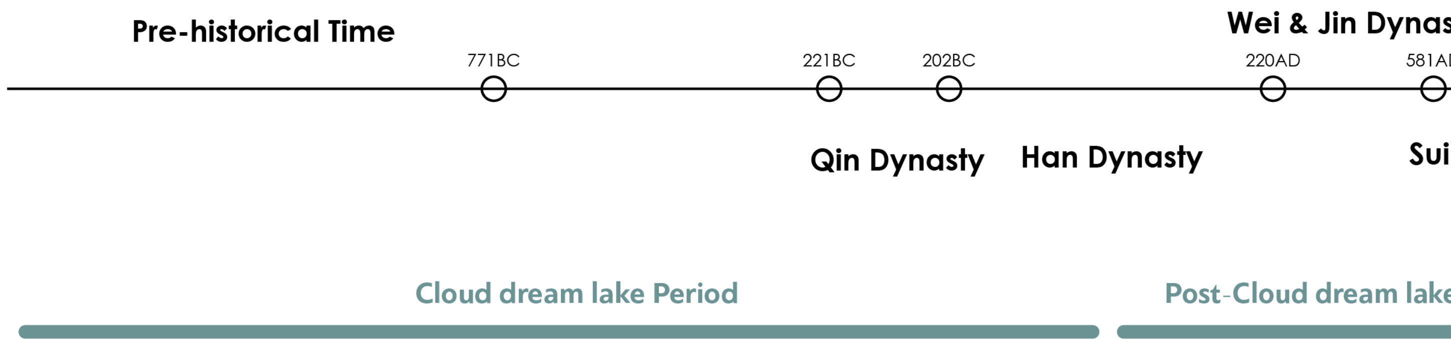
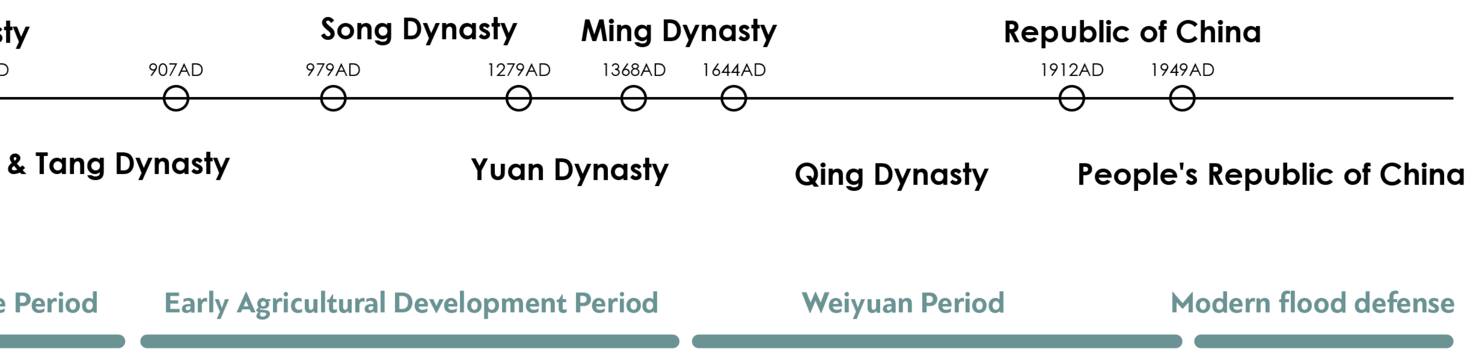


Fig.1.3. Simplified timeline of dynastic system in China

Within a few centuries, the once fragmented highlands were transformed into vast fields, while the great Cloud-Dream Lake completely disintegrated, leaving behind hundreds of pearl-like lakes, winding rivers, and wetlands deeply influenced by groundwater infiltration. From this period onward, the Jianghan Plain became known as the "Land of a Thousand Lakes." What was once a single vast water chamber gradually evolved into a labyrinth composed of countless interconnected rooms, corridors, loops, and dead ends. As the confluence point of the Yangtze River and the Han River, the Jianghan Plain serves as the destination of an immense catchment system. Each year, it receives over 700 billion cubic meters of transient water from the upper reaches of the Yangtze and Han Rivers, as well as various tributaries from Dongting Lake (Li, 2022). These vast inflows become trapped within this intricate maze, making drainage a persistent challenge for the region.



Each summer, warm ocean monsoons bring months of continuous rainfall to the entire Yangtze River Basin, with the early summer period (June-July) experiencing the most intense precipitation. The ceaseless drizzle defines this gray season, as dewdrops form on smooth stones and the air remains heavy with moisture. Because this period coincides with the ripening of plums, it is traditionally known as the Plum Rains. During the Plum Rains season, increased precipitation poses a persistent flood risk to the middle and lower reaches of the Yangtze River.

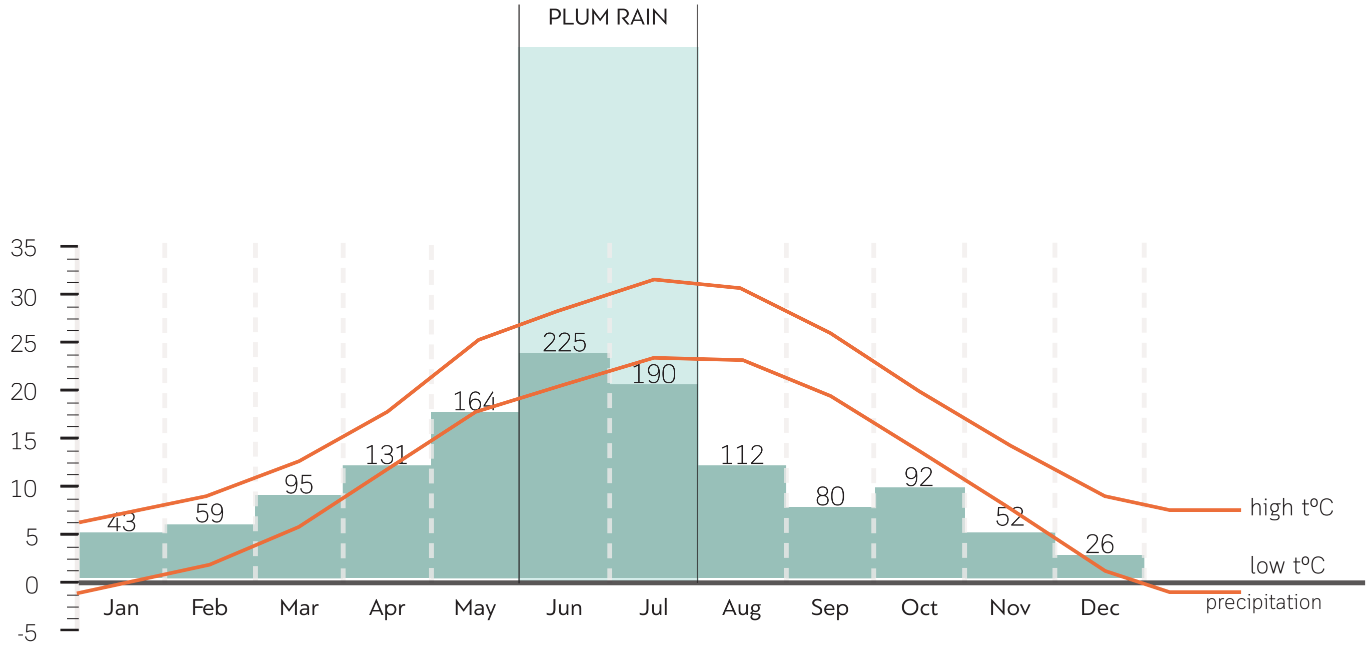


Fig.1.4. Temperature and precipitation in Hubei Province

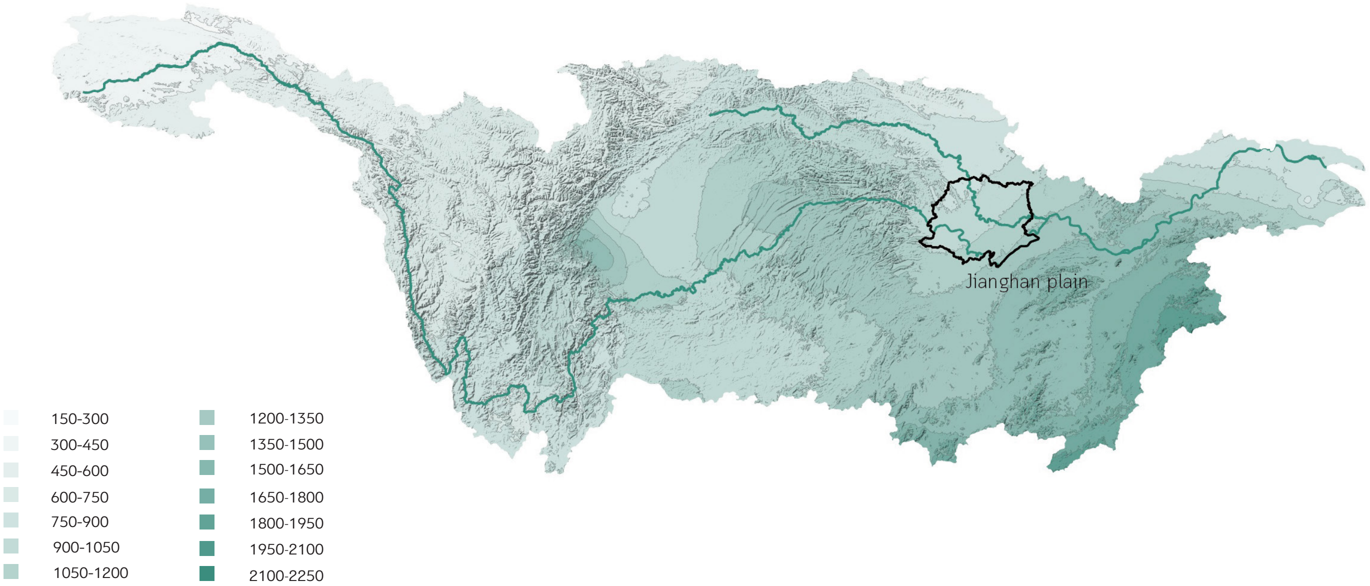


Fig.1.5. Precipitation Map in Yangtze river catchment

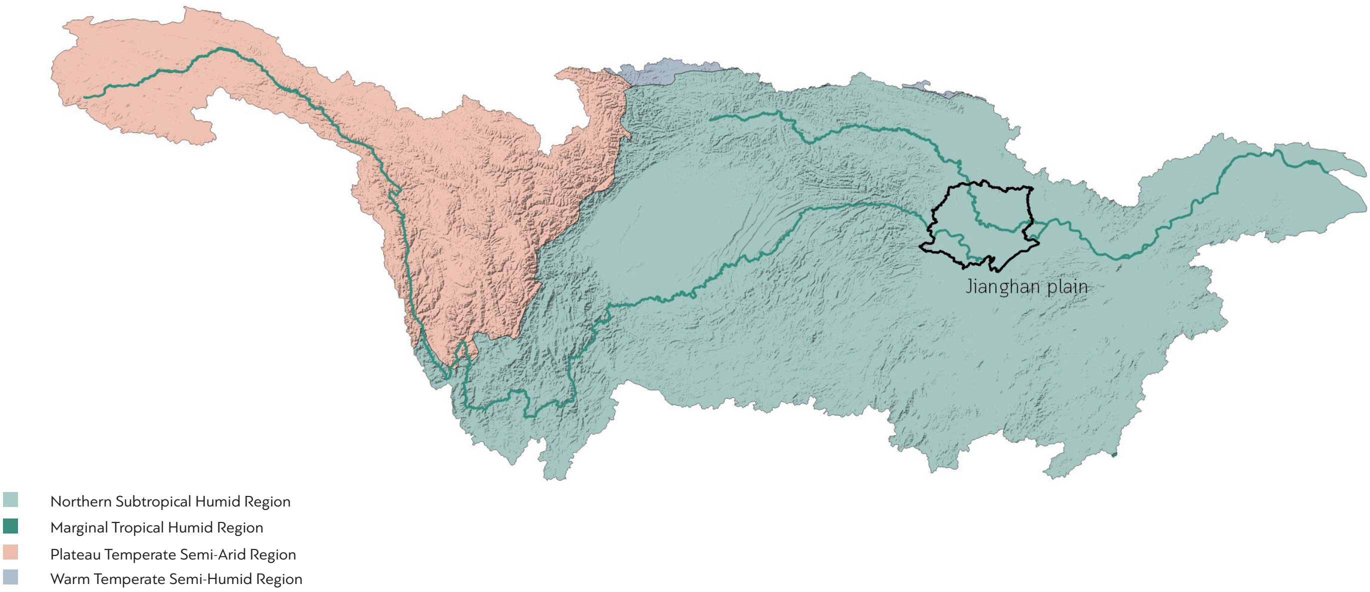


Fig.1.6. Climate zone in Yangtze river catchment

Plum Rain

The Meiyu season-literally "plum rain"-refers to a period of sustained, heavy rainfall that typically occurs in early summer across the middle and lower reaches of the Yangtze River Basin, including the Jianghan Plain. This monsoonal phenomenon is driven by the convergence of moist air masses from the South China Sea and the western Pacific, forming a quasi-stationary frontal system over the region. The Meiyu season usually spans from mid-June to mid-July, and is characterized by prolonged precipitation, high humidity, and limited solar radiation.

This concentrated rainfall plays a crucial role in regional water availability but also significantly increases flood risk, particularly in low-lying areas with limited drainage capacity. Historically, the timing and intensity of Meiyu have had direct implications for agricultural productivity, flood control infrastructure, and settlement patterns in the Yangtze River Basin.

Fig.1.7. Plum rain

The Summer Flood

The Qing Dynasty official Wei Yunchang once described the devastating summer floods of 1658 in the Jianghan Plain (Yu, 2017)

The regions of Jingshan, Tianmen, Hanchuan, Yingcheng, Yunmeng, Xiaogan, and Hanyang suffered varying degrees of damage, ranging from one-third to two-thirds of their total area. The floodwater spread for seven to eight hundred miles, transforming the land into a vast lake. Boats floated like trees, fish swam in the cauldrons, fields and houses were carried away, and bones of the dead were seen drifting like serpents or dragons. Countless lives were lost, and many were forced to flee. Furthermore, laborers who were tasked with building dikes died from exhaustion and starvation, all of which were caused by the Han River.

Fig 1.8. Summer flood

Weiyuan System

Initially, agricultural expansion in the Jianghan Plain was restricted by frequent flooding, forcing early settlers to cultivate only the naturally elevated lands. However, during the Southern Song Dynasty (1127-1279), residents from the lower Yangtze River introduced a more advanced Weiyuan agricultural system, which had been practiced in the Taihu Basin for over 300 years. This marked the beginning of a large-scale "reconquest" of the Jianghan Plain's vast flood-prone landscape (Chen et al., 1992).

The term Weiyuan is a combination of two concepts- Wei refers to artificially constructed embankments enclosing farmland, while Yuan denotes the small plots of cultivated land or rice paddies formed within these enclosures, typically separated by irrigation ditches. Within this system, additional water management structures such as canals, ponds, sluice gates, and transport channels were developed to enhance agricultural productivity.

Wei	**Yuan**
圩	垸
artificially constructed embankments enclosing farmland	small plots of cultivated land or rice paddies formed within these enclosures

As a reclamation tool, Weiyuan transformed the Jianghan Plain from a natural floodplain-wetland ecosystem into a patchwork of enclosed, artificially controlled agricultural zones. Over time, this system reshaped the landscape, turning vast seasonal wetlands into managed farmland protected by embankments, fundamentally altering the region's flood control and irrigation patterns.

Fig.1.9. Old drawing of paddy field agriculture production

Increasing Flood Frequency

The expansion of the Weiyuan system's occupation of flood-prone areas in the Jianghan Plain reached its peak during the late Qing Dynasty and the Republican era. By this time, the plain had been almost entirely filled with Weiyuan units of various sizes, leaving little space for water to flow freely. As a result, the spatial domain of water was further compressed. Each summer, when floodwaters surged past the rugged Wushan Mountains into the flatlands of the Jianghan Plain, they found their former refuge blocked by towering levees, marked-figuratively and literally-with signs that read “No Entry.” The encroachment upon natural flood channels significantly reduced the floodplain’s capacity to absorb excess water, leading to a dramatic increase in the frequency of flood disasters. While in the 14th and 15th centuries, major floods occurred perhaps once or twice per century, by the 19th and 20th centuries, that number had risen to nearly 20 severe events per 100 years (Yang et al., 2024). Aside from climate change, the loss of natural flood pathways due to human settlement and agricultural expansion was a primary driver of this alarming increase.

The Weiyuan system represents the historical ambition of farmers on the Jianghan Plain to tame and cultivate a landscape once dominated by lakes and marshes. Yet, the increasingly aggressive return of floods against this system reveals the internal contradiction of the human-centered pursuit to overcome nature. The gradual disappearance of the floodplain does not only signal the loss of flood storage capacity-it also marks the erosion of many ecological benefits once brought by the floods themselves.

The fertility of the Jianghan agricultural system has long depended on sediments deposited by seasonal flooding over centuries. Beneath the thriving crops visible on the surface lies a layer of invisible nutrients, carried downstream from distant origins-the Sichuan Basin, the Hengduan Mountains, and even the Qinghai-Tibet Plateau. This natural transfer of fertility, once sustained by the rhythms of the Yangtze River, has diminished over time, as the Weiyuan system expanded and increasingly claimed the land for continuous cultivation.

Modern Flood defense

After the Republican era, agriculture on the Jianghan Plain moved increasingly toward modernization and systematization. Large, symbolically charged levees along the Yangtze River gradually replaced the smaller Weiyuan embankments as the sole protectors of arable land. Under centralized planning, many of these smaller structures were flattened. Individual Weiyuan units were merged into larger ones, now managed and enclosed by singular, more extensive embankments.

This process of consolidation-driven purely by managerial logic-culminated in a moment that marked neither celebration nor success- the Jianghan Plain became a single, unified Weiyuan entity. But in doing so, it lost its local adaptability and was rendered an abstract, oversized system, disconnected from human scale and daily life. What had once been a decentralized, locally embedded system of flood management became a forgotten mechanism, along with the vernacular knowledge it had once embodied.

In its place emerged a simplified and overtly modern flood control framework, organized around a few monumental levees. These structures, now stripped of their social and ecological context, came to be perceived as self-contained artifacts-admired from a distance, yet largely detached from the landscapes and people they were meant to protect. The Jianghan Plain itself was gradually reduced to a number in technical reports. On the official website of the Ministry of Water Resources of the People‘s Republic of China, the Jing River levee is described as follows：

The main levee directly safeguards the northern Jianghan Plain, protecting a population of five million and approximately 5.3 million hectares of farmland, along with numerous towns and critical resources. In the event of a major flood, a breach of the Jing River levee would not only compromise this area but also pose a significant threat to an additional 4.6 million people and 5.7 million hectares of farmland in the Hannan and Hanbei districts, as well as to the city of Wuhan and several key transportation corridors, including railway and highway lines. As a result, the Jing River levee has been designated a primary levee of strategic importance in the Yangtze River’ s flood control system.

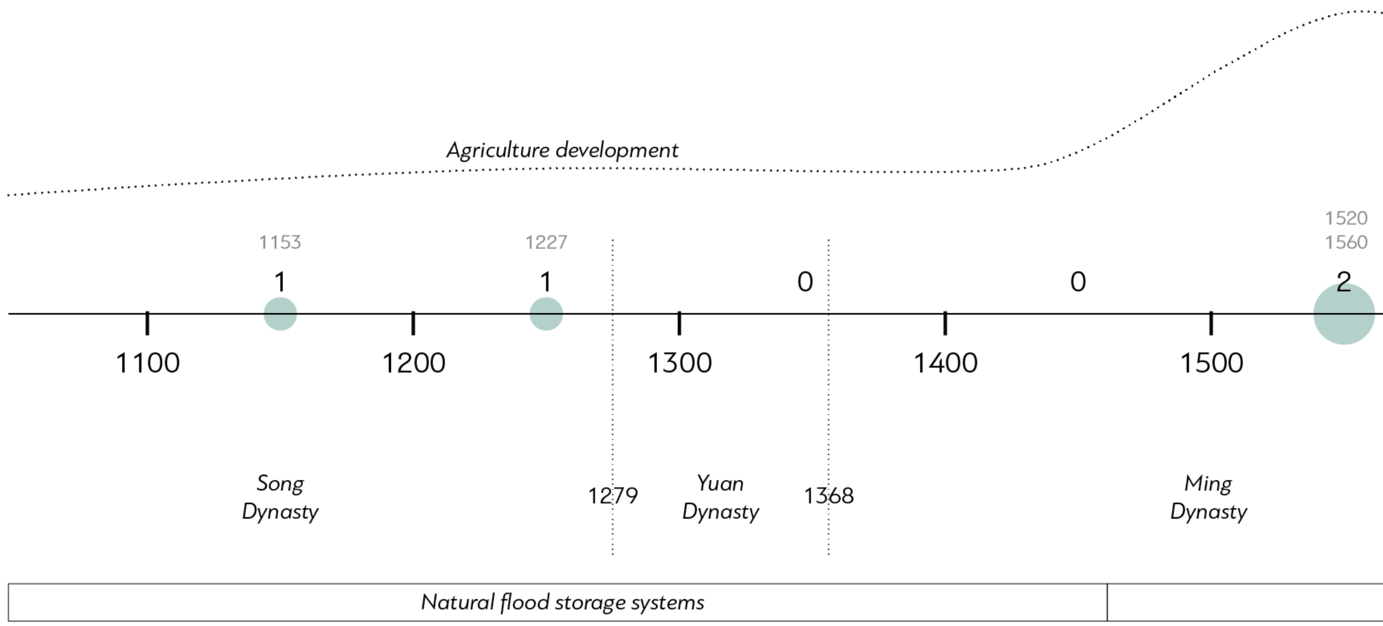
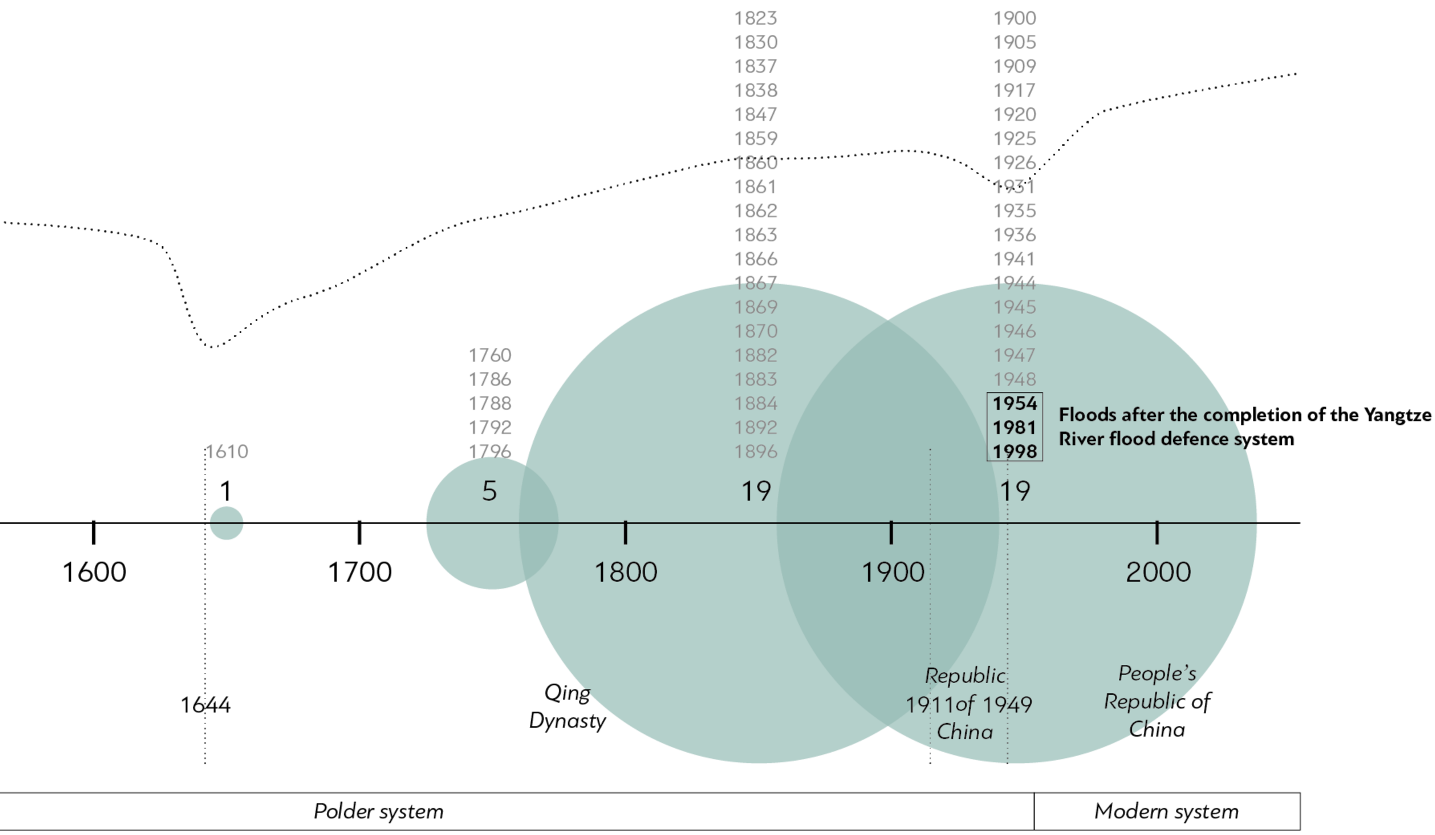


Fig.1.10. Timeline of Flood frequency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Floods after the completion of the Yangtze River flood defence system
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Qing Dynasty
Republic of China
1911
1949
People's Republic of China
Polder system
Modern system

Fig.1.11. Wuhan Yangtze River Crossing Festival

The Wuhan Yangtze River Crossing Festival—held annually since 1956 in memory of Mao Zedong's
swimmers and spectators alike.It symbolizes more than a sporting challenge; it is a communal celebratio

However, in recent years, the event has been repeatedly postponed or canceled due to high flood leve
reflecting serious safety concerns. In 2024, heavy rains and lingering high river stages delayed the event
flood risk continues to shape both cultural rituals and public safety measures.

famous swim—has become a defining event of local identity and resilience, attracting thousands of on of Wuhan's connection to the Yangtze and a reaffirmation of collective courage.

els. In 2020, the 46th edition was called off when water levels exceeded the 27.3 m warning threshold, again from July to August.This interruption underscores how, even in a city with deep riverine traditions,

What is the thought of people nowadays?

Today, traces of the Weiyuan system have all but vanished from the Jianghan Plain. Floods, too, seem distant-both temporally and spatially. Most people are content with the knowledge that levees, flood storage areas, and dams will offer protection. What remains visible is an agricultural landscape that increasingly appears uniform and unremarkable- a grid of irrigation channels and golden fields of wheat, scarcely different from one place to another.

Floods once caused great suffering, but they also made this landscape distinct. That tension-between devastation and identity-has faded. **It now feels far removed from our present, doesn't it**?

Fig.1.12. A view of agricultural field near Gong'an, a city in Jianghan Plain

WEIYUAN - THE INDIGENOUS SOLUTION

A Cascading Space

The Weiyuan system once represented the most prominent achievement in the agricultural history of the Jianghan Plain. Similar polder-based agricultural structures originated in the lower Yangtze River Delta, particularly in the Taihu Plain, and were later transmitted southward—using the Jianghan region as a steppingstone—eventually reaching the distant Pearl River Delta (Chen et al., 1992).

Yet, the Weiyuan system in the Jianghan Plain was unique. It responded to the specific conditions of a large river floodplain and was closely adapted to the flood rhythms unique to this region. Since the Tang Dynasty, the system has played a dominant role in shaping local agricultural production. It was also a key factor in enabling the Jianghan Plain to emerge as one of the major grain-producing regions of the central imperial dynasties.

Although the Jianghan Plain is generally flat in topography, subtle micro-elevation differences exist across the region. These variations, though minor in absolute terms, carry significant implications in a flood-prone environment. The Weiyuan agricultural system was developed in direct response to such microtopographic conditions.

Within traditional Weiyuan systems, areas of relatively higher elevation—often referred to as inner highlands or drylands (yuan zhong gaodi)—were less exposed to floodwater and benefited from better drainage. These zones were typically used for cultivating dry crops such as wheat and cotton. Intermediate zones, known as transitional floodlands (guoshuidi), were prone to occasional inundation and thus suited for crop rotation involving rice and other moisture-tolerant species. The lowest-lying areas were subject to regular flooding and water accumulation, forming wetlands, ponds, or grassland. These were commonly used for paddy rice cultivation, aquaculture, or seasonal grazing (Sun & Geng, 1980).

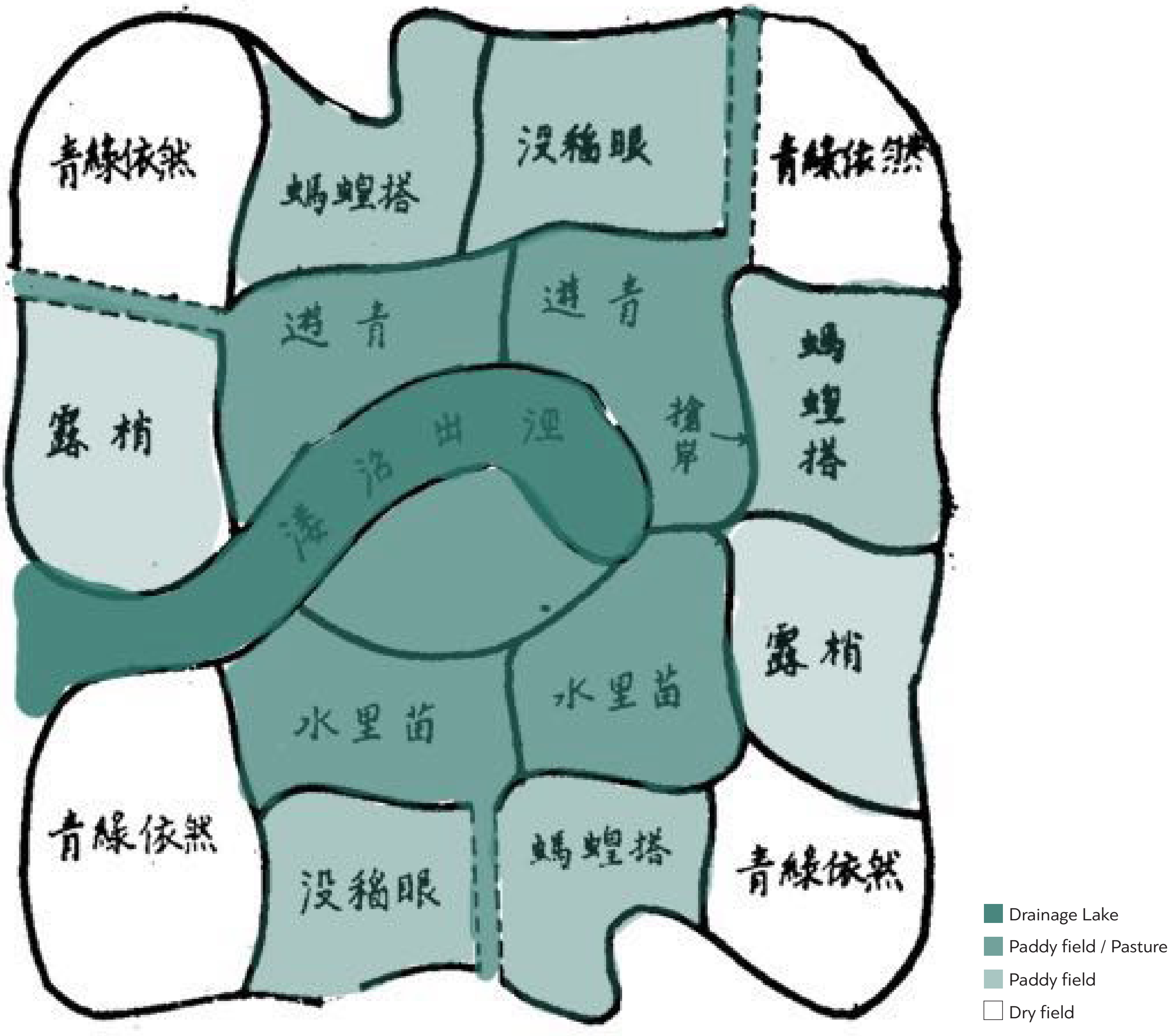


Fig.1.13. Diagram of a typical Weiyuan system

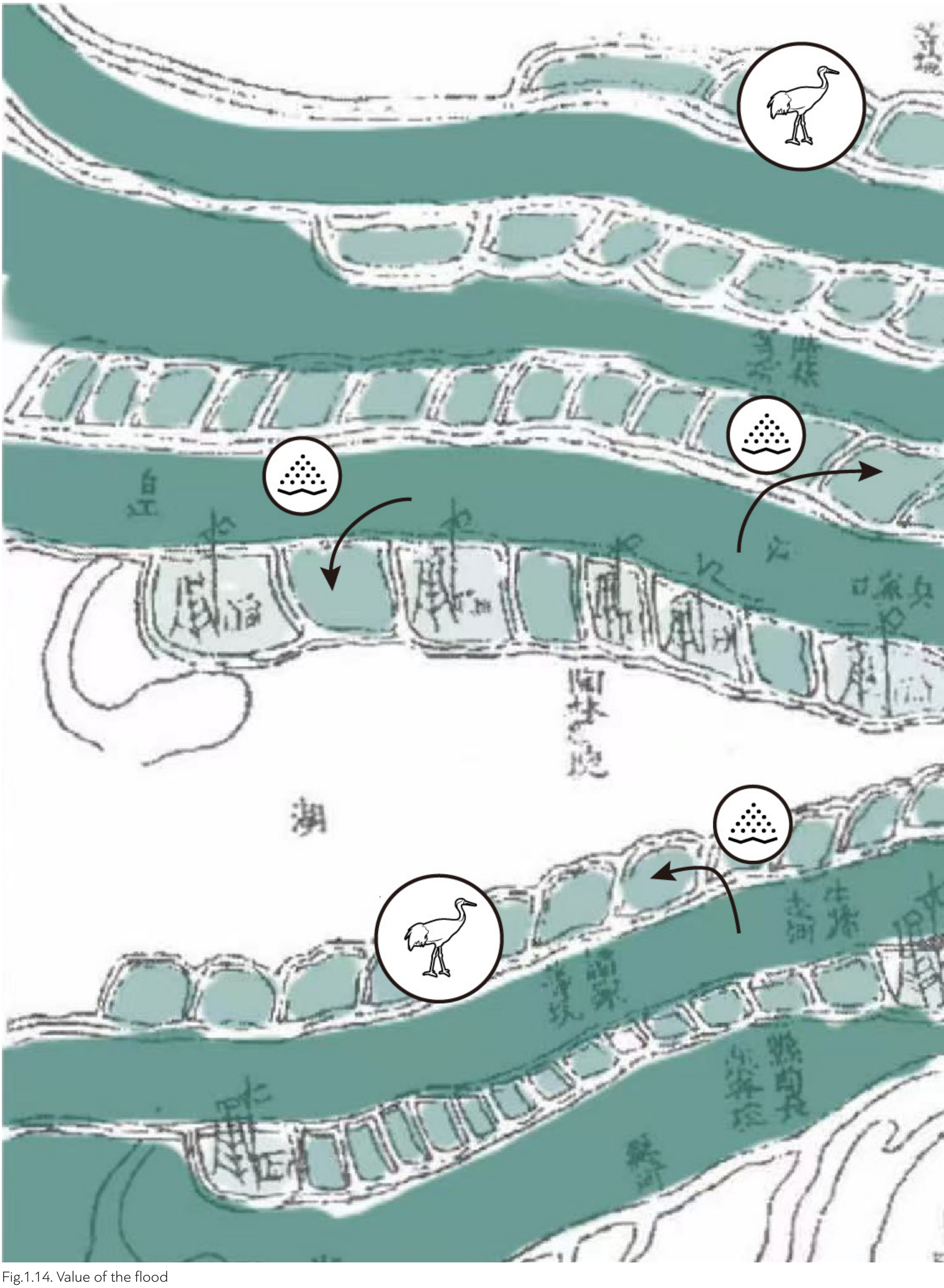
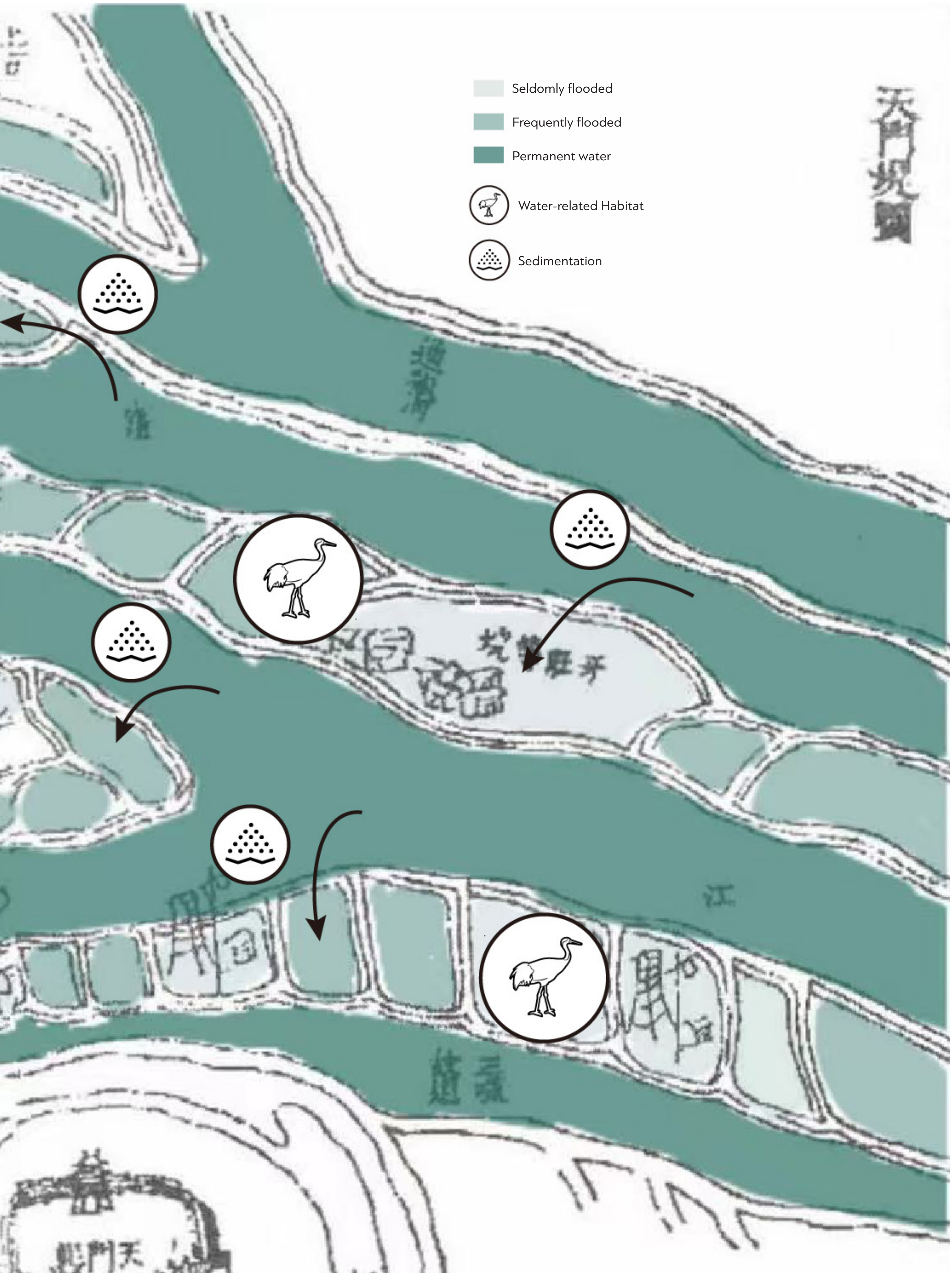


Fig.1.14. Value of the flood


Seldomly flooded
Frequently flooded
Permanent water
Water-related Habitat
Sedimentation
江

Local farmers historically arranged agricultural use based on each plot's hydrological profile—its proximity to and interaction with water. This differentiated spatial logic allowed for the efficient use of varying flood conditions and contributed to the overall resilience of the agricultural system. It also reflects a long-standing empirical understanding of flood behavior and seasonal rhythms.

The traditional agricultural structure of the Jianghan Plain's Weiyuan system can be further differentiated into three functional zones: **Diyuan, Juru, and Feicao**. These zones serve distinct but interconnected roles—flood control, cultivation, and ecological grazing—forming an integrated agricultural-ecological system.

Diyuan refers to enclosed agricultural areas protected by artificial embankments. These are the core of the system, where flat terrain and engineered drainage allow for relatively stable and intensive farming. The land within is organized into a composite agricultural structure, with rice paddies as the dominant form, supplemented by dryland crops and commercial plantings. This area receives higher levels of social and technical investment, and in return, functions as a key grain production zone with relatively predictable yields.

Juru denotes the low-lying wetlands located outside or between embanked areas. These zones are seasonally or permanently saturated and are frequently inundated during flood events. In many cases, Juru areas retain their natural marsh conditions, but they may also be temporarily cultivated after water recedes—commonly for rice or used as fish ponds. Additionally, they support the grazing of flood-tolerant livestock such as water buffalo. Functionally, Juru acts as a buffer zone in the flood control system, absorbing overflow and reducing pressure on the embanked Diyuan zones.

Feicao typically refers to naturally occurring or semi-managed grasslands located between embankments or overlapping with Juru areas. Due to frequent inundation, these areas are not suitable for conventional crop cultivation but support dense growths of wild grasses such as Cyperus and Carex species. Local farmers harvest this biomass as livestock fodder or convert it into green manure.

As such, Feicao serves as a vital organic input to the agricultural cycle, particularly in rice-based systems where soil fertility enhancement through green manure is essential.

The three functional zones are interdependent and dynamically transform. For instance, during the dry season, the Juru zone can temporarily shift into a Feicao zone, while areas within the embanked lands may also become part of the Juru zone due to drainage issues. The entire system adjusts continuously across years and seasons, with its core logic being the allocation of functions based on varying levels of hydrological contact, enabling both flood adaptation and optimal resource utilization.

In contrast to modern agricultural systems that rely on large-scale infrastructure to achieve flood control, the Weiyuan system's wisdom lies in its ability to adapt to the seasonal and annual variations in flood dynamics. Ancient farmers, in response to the land's elevation differences, constructed a resilient, cascaded flood storage and drainage space. Floodwaters were not entirely excluded from the system; rather, the system was designed to allow floodwaters to enter agricultural areas, capitalizing on the opportunities created by seasonal flooding to develop a more diverse, symbiotic agricultural system in harmony with nature.

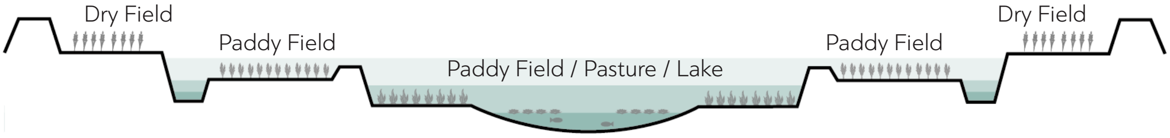


Fig.1.15. Conceptual section of Weiyuan system

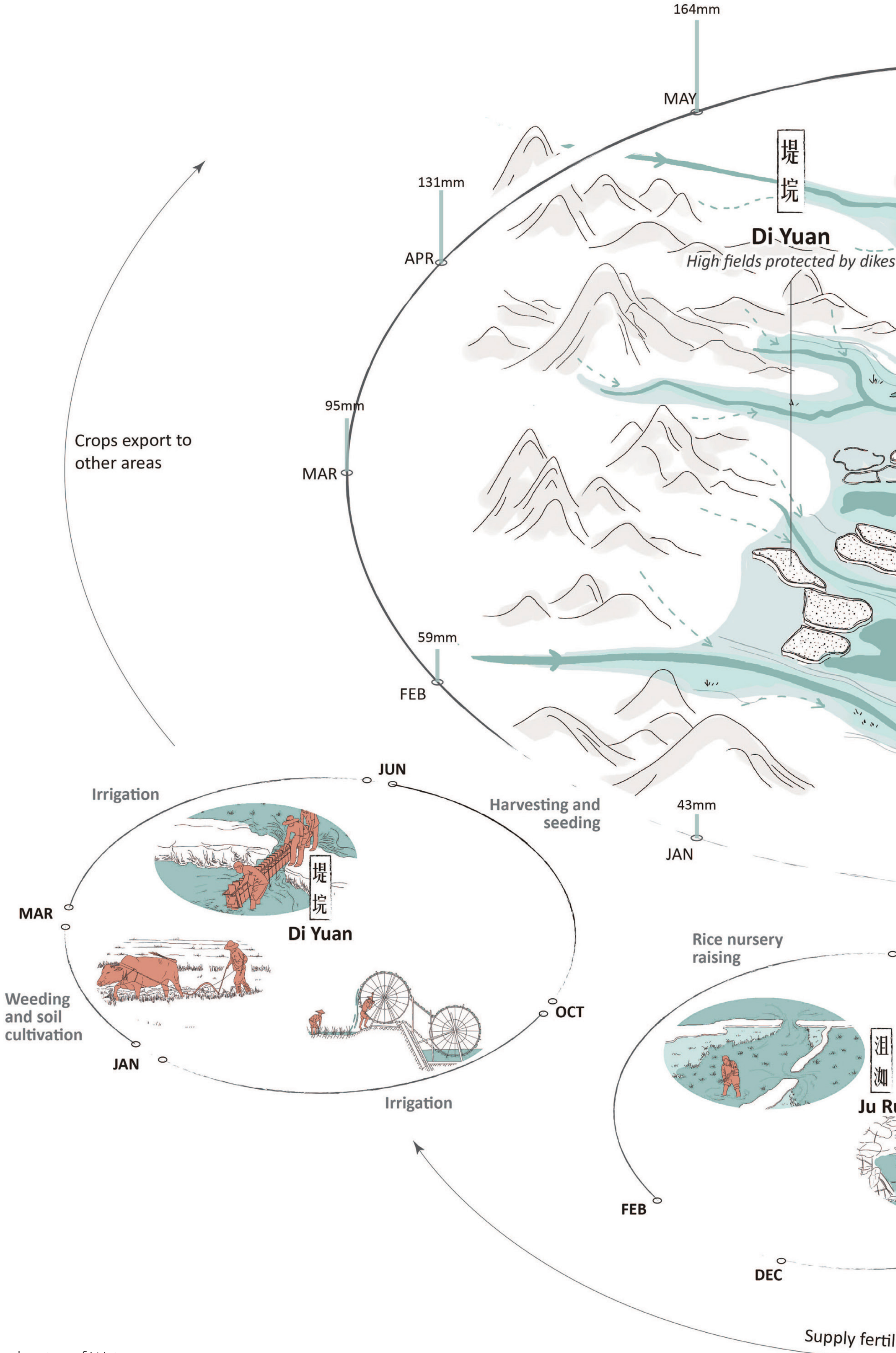
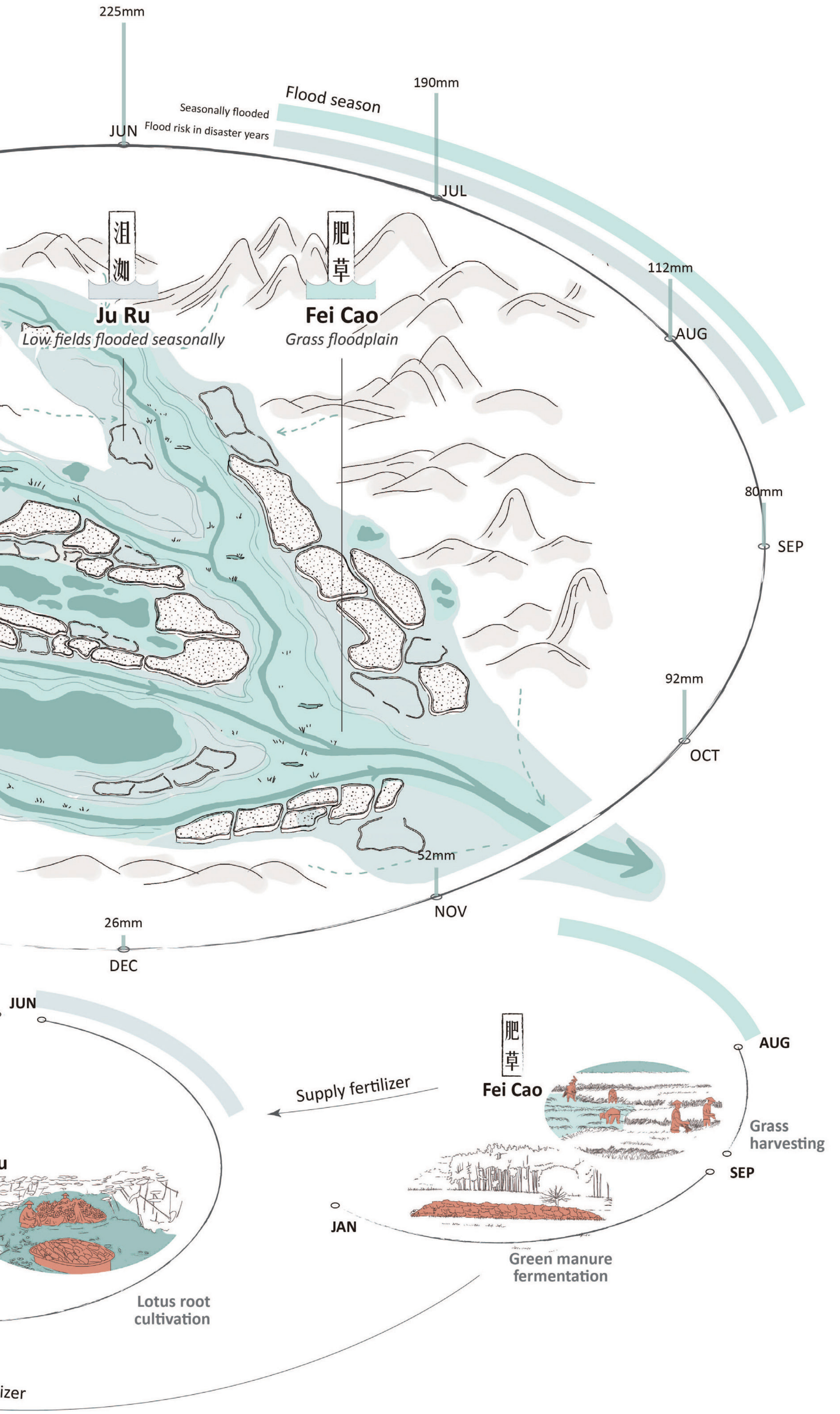


Fig.1.16. Water circularity drawing of Weiyuan system



225mm
JUN
Seasonally flooded
Flood risk in disaster years
Flood season
190mm
JUL
112mm
AUG
80mm
SEP
92mm
OCT
52mm
NOV
26mm
DEC
沮洳
Ju Ru
Low fields flooded seasonally
肥草
Fei Cao
Grass floodplain
JUN
AUG
肥草
Fei Cao
Supply fertilizer
Grass harvesting
SEP
JAN
Green manure fermentation
Lotus root cultivation

All the ups and downs - a history of balancing

Ironically, as with many other Indigenous or low-tech production systems, the wisdom of living in harmony with nature did not arise from a profound reverence for natural systems by the local people, but rather from their powerlessness and fear in the face of these systems. The effective functioning of the Weiyuan system was built upon the limitations of local construction techniques, and as these techniques advanced, people, with surprising determination, disregarded the original balance of the Weiyuan system. With population growth and increasing agricultural production pressures, the Weiyuan agricultural system in the Jianghan Plain entered a phase of large-scale expansion from the Ming and Qing Dynasties onward. What was initially an agricultural layout centered around "water adaptation" gradually transformed into one focused on "water exclusion."

In order to expand cultivated land, farmers and local governments continuously built dikes around lakes to reclaim land, incorporating Juru zones and even parts of the lakes into the embanked areas for rice paddies. The areas originally serving flood storage and drainage functions, such as "Feicao" and "Juru," were gradually compressed or even disappeared. The original Jianghan water network system was fragmented, and natural water flow pathways were blocked, reducing the movement of water and causing the lakes to become stagnant and eutrophic. Sedimentation intensified, and the lakes gradually degraded into shallow wetlands or even farmland. The lakes and depressions, once used for water storage, were reclaimed as embanked fields, significantly reducing the flood discharge pathways. When extreme floods occur, the embankments face greater pressure, and the risk of flooding increases exponentially. The ecological functions originally supported by the Juru and Feicao zones, such as water regulation, habitat provision, and biodiversity protection, have steadily diminished, leading to a decline in the region’s water management capacity and ecological stability.

This trend originated with advancements in dike construction techniques during the Ming and Qing Dynasties, reaching its peak in the 20th century. Particularly with the development of large-scale water conservancy projects and the acceleration of agricultural modernization, the ecological regulation capacity of the traditional Weiyuan system was deliberately overlooked. On one hand, agricultural output saw short-term increases; on the other hand, the contradictions of rising flood risks, environmental degradation, and imbalanced rural production systems became increasingly prominent. As recorded in Records of the Jing River Dike, the local water-related disasters grew more severe (Jingzhou Yangtze River Channel Administration Bureau, 2012):

On both banks of the Jing River, local people competed for lakes and marshlands, building large dikes to protect their land. The expansion of embanked fields became unstoppable, yet they failed to realize that when humans compete with water for land, water will ultimately compete with humans for land, bringing harm instead of benefit. By the reigns of Emperor Kangxi and Qianlong of the Qing Dynasty, there were over 100 to 150 embanked fields in Jiangling and Jianli, with Mianyang having as many as 1,397 embanked fields. During the Xianfeng period, Jianli had 502 embanked fields. The larger embanked areas stretched for several tens of miles, while smaller ones spanned just a few miles, leading to a dramatic reduction in the natural flood storage capacity of the lakes and frequent flooding disasters.

FLOOD STORAGE AREA AND MODERN FLOOD DEFENSE SYSTEM

Mega dikes and vast flood storage areas

Starting in the 1950s, the government began large-scale intervention in flood control in the middle and lower reaches of the Yangtze River. The Jianghan Plain, as a high-risk flood zone, was incorporated into the comprehensive basin-wide management system. Unlike the traditional Weiyuan agricultural system, modern governance emphasizes centralized control and unified scheduling. This approach addressed the structural weaknesses of the traditional decentralized system—individual Weiyuan could fail, but unified management ensured overall safety.

Along the Yangtze and Han Rivers, a series of high-standard dikes were constructed, with a significant portion resulting from the renovation of old dikes. The Jingjiang Dike, which protects the northern bank of the Jingjiang section of the Yangtze River, was formed by merging several large dikes, including the Jin Dike, Cun Jin Dike, and Wan Cheng Dike, reaching its largest scale in 1954. The main dike along the Yangtze River, protecting Jianli and Honghu sections, was formed by the integration of numerous smaller embankments, which were repaired multiple times after the establishment of the People's Republic of China and reached their maximum size in 1985 (Jingzhou Yangtze River Channel Administration Bureau, 2012).

In addition, to address more urgent flood crises, a series of "retreat routes" were added to the comprehensive flood control system. These are referred to as the Plain Flood Storage Projects, which utilize the existing depressions, Weiyuan, or flood storage reclamation areas in the plains. These areas are artificially controlled to systematically store excess floodwaters during major floods. This strategy sacrifices certain areas to protect more critical downstream regions. Most of these flood storage areas are newly reclaimed lake islands or sandbars, which, when approved for reclamation, also agreed to bear the responsibility of floodwater storage in years of severe floods. However, several large flood storage areas were originally reclaimed from already established Weiyuan. The population density within these floodplains is extremely high. According to 2005 statistics, among the 14 Flood Storage Areas in the middle and lower reaches of the Yangtze River, three areas had populations exceeding half a million, and two had populations exceeding one million (Li, 2005).

Fig.1.17. Jing River Dike - Mega Dike in Jianghan Plain

Main Flood Storage Area (Larger than 500 km²)

Name	**Flood storage capacity** (10^8 cubic meters)	**Size** (Square kilometers)
Jing River flood storage area	54	921
Dongting Lake	162	2785.4
Hong Lake flood storage area	160	2783
Xiliang Lake flood storage area	42.3	1032
Dujiatai flood storage area	22.9	614
Huayang River flood storage area	62	1460

During this period, the geomorphological landscape of the Jianghan Plain underwent significant transformation. The towering dikes completely separated cities from the rivers and lakes, and the once dynamic tidal flats were compressed into static flood storage areas. These flood storage zones, redefined as "risk spaces," also became a special form of "spatial fault": they no longer fully belong to the city, nor have they been truly incorporated into modern rural development strategies. In the policy context, their landscape identity was simplified to "functional space." Most of these flood storage areas are agricultural regions; however, it is important to note that within Hubei's traditional intensive agricultural spaces, there are many scattered small settlements. At the same time, large flood storage areas still contain medium-sized cities with significant populations, such as Gong'an County (900,000) within the Jingjiang Flood Storage Area and Honghu City (800,000) within the Honghu Flood Storage Area.

Population (10^4)	**Year of construction**	**Time of use**
50.4	1952	3
137.1	1986 start to be used	
111.4	1958	
14.51	1956	19
	1956	

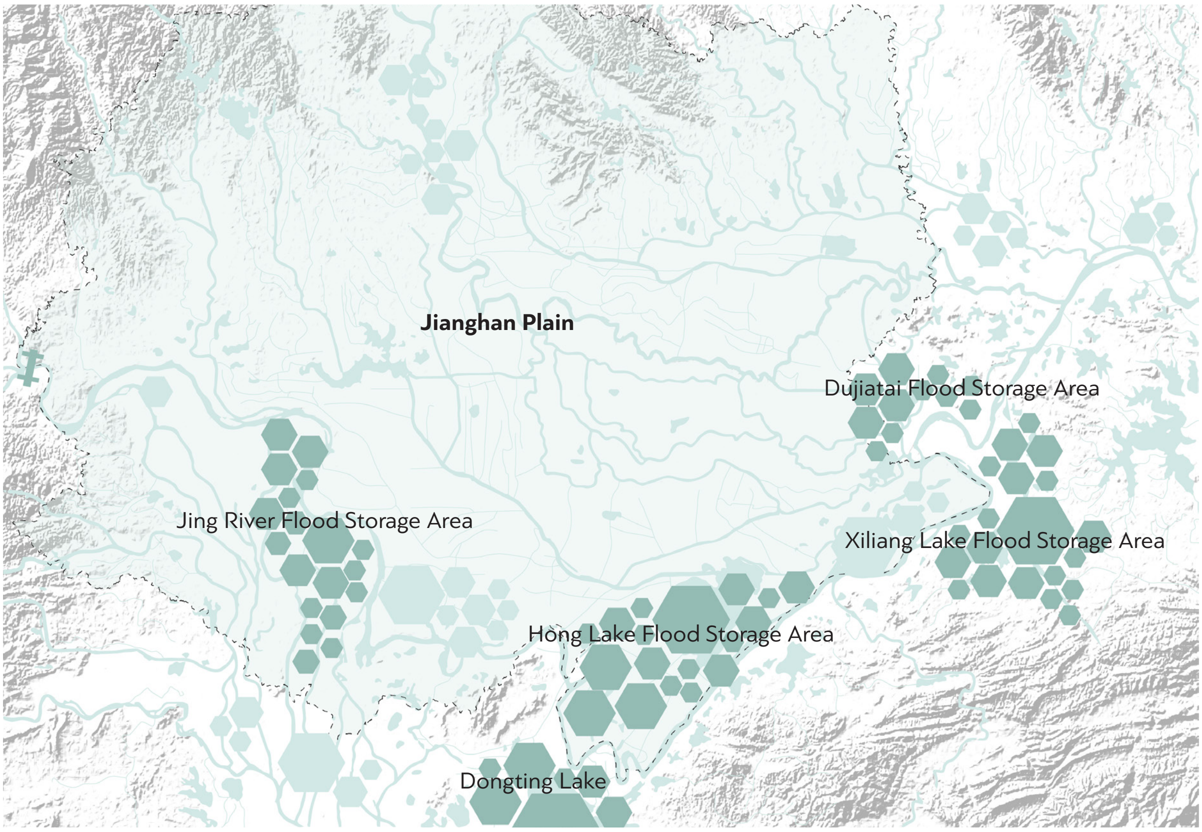


Fig.1.18. Location of main flood storage area

Flood Diversion

Degree of flood Influence

Fig.1.19. Concept of Flood diversion and flood storage

Flood Storage

Disfunctional Flood Storage Area

The existence of flood storage areas carries a tragic undertone. These areas serve as both agricultural production spaces and reserve areas that can be submerged during floods. From a management perspective, local economic development and population growth should be controlled to prevent excessive economic loss during flood periods. Ideally, this is a "controlled letting of water" mechanism—when floods arrive, flood storage areas sacrifice part of their land to protect the greater system; when the waters recede, residents return, and the state provides compensation. However, the reality is undoubtedly more complex.

Taking the implementation of compensation mechanisms as an example, in some years, residents did receive timely assistance and post-disaster recovery funds. For instance, after the 1954 floods, the compensation mechanism intervened promptly and played a significant role in shortening the period of disaster impact and in restoring economic production. However, in other years, the system's implementation was affected by unforeseen circumstances, resulting in farmers being unable to restore production for years after the disaster.

For example, during the 1998 floods, the Jingjiang Flood Storage Area's flood warning procedure was activated for nearly a month, during which 330,000 people were relocated, resulting in approximately 2 billion RMB in economic losses. However, the government ultimately decided not to use this flood storage area that year. Furthermore, the Ministry of Water Resources of the People's Republic of China issued the "Interim Measures for Compensation in Flood Storage Areas" which ambiguously states, "For flood storage transfers that were ordered but not implemented due to changing circumstances, appropriate compensation will be provided for the losses caused" (Central Commission for Discipline Inspection of the Communist Party of China, 2000). We might speculate that much of the economic loss was not reasonably compensated.

The modern flood control system adopts a model that treats floodwaters as an "other"—they must be tamed, mitigated, diverted, and excluded, rather than seen

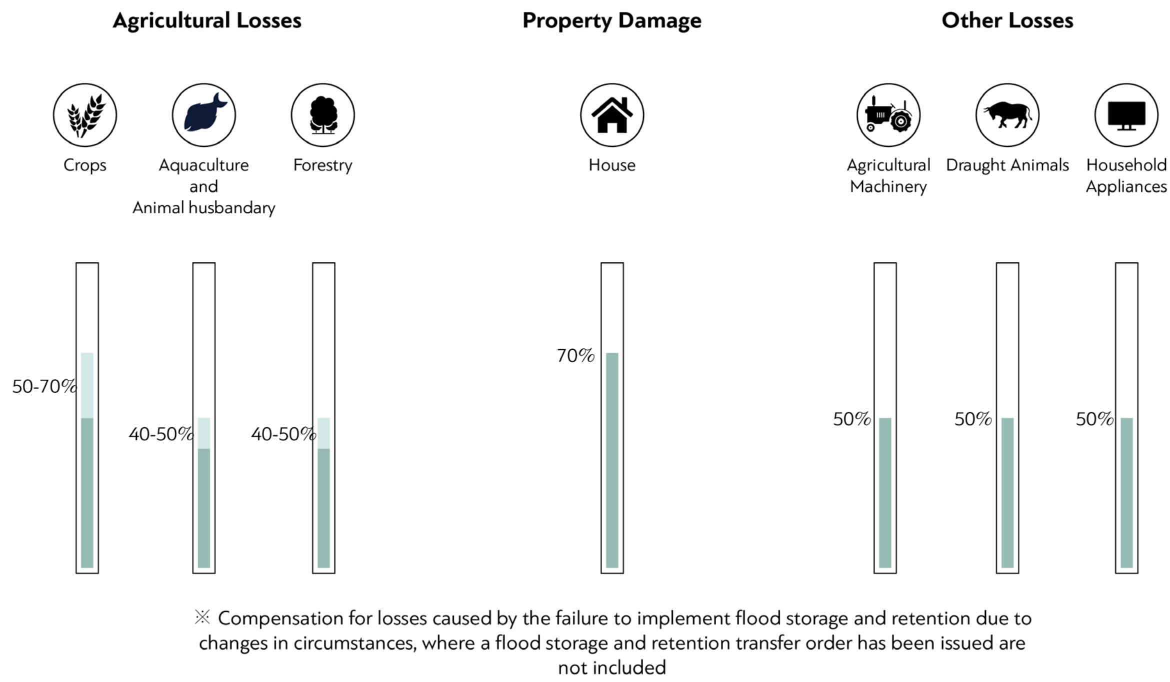


Fig.1.20. Compensation mechanism for flood storage loss

as a natural presence with which coexistence is possible. In a certain sense, this logic is still rooted in the desire to control water, but on a larger scale, with more refined methods and centralized management. Under this top-down structure, the subtle hydrological relationships of the past, characteristic of the Weiyuan era, have been simplified in modern engineering planning into models and scheduling parameters. The agricultural system, once built on marshes and seasonal rhythms, has lost its space for existence within the high embankments of today. The role of farmers, once active participants, has now been reduced to that of engineering subjects, displaced households, and compensation recipients.

Under this development context, flood storage areas gradually transform into marginal spaces. They constantly exist between the potential of normal and exceptional development, perpetually constrained as a "landscape that should never be completed." Settlements within these areas face limitations on land development, shortages in urban infrastructure, and the uncertainty of life brought about by periodic floods. At the same time, these regions often lack a clear developmental direction—they cannot be incorporated into stable agricultural plans, nor can they attract investments in public facilities.

The absence of long-term planning is replaced by a sense of urgency driven by short-term interests. If, inevitably, everything will be submerged, how can people maintain interest in the space itself? What we observe is the local population's intense desire for economic development. Many rural residents have migrated to urban areas in search of employment, while local land is increasingly contracted by outsiders. As sedimentation from floodwaters becomes unstable, chemical fertilizers are used excessively. Unplanned agricultural development has encroached upon the original wetland space, and the local ecological value has been largely depleted.

1998 Flood

This contradictory development reached its peak during the 1998 flood. The 1998 flood was the most severe since the 1954 flood, marking the second major flood event of the entire Yangtze River basin since the founding of the People's Republic of China. On the morning of August 6, the water level of the Yangtze River had reached the flood warning level of the first flood storage area in the middle and lower Yangtze River—Jingjiang Flood Storage Area. According to regulations, 330,000 people were temporarily relocated to safety zones within the flood storage area and surrounding cities. However, since the first activation of the Jingjiang Flood Storage Area in 1954, the economic development in the area had broken the balance of sacrificing a "small part" to protect the "larger part." Over the course of more than fifty years, the population in this region increased from 164,000 to 504,000 (Li, 2005). Consequently, the government decided, with the population having fully evacuated, to forgo activating the Jingjiang Flood Storage Area for flood retention. This decision undoubtedly brought more uncertain risks to the downstream cities.

Debate on the necessity of flood storage area

The academic debate regarding whether flood storage areas should continue to exist has persisted over time. However, with the completion of the Three Gorges Dam, the continuous reinforcement of the dike systems along the Han River and Yangtze River, and the improvement of forecasting and scheduling systems, the necessity of activating flood storage areas in extreme events is gradually diminishing. The official stance is that for a once-in-a-hundred-years flood in the Jingjiang area, the Jingjiang Flood Storage Area may not need to be activated; however, for floods exceeding the hundred-year level—such as the catastrophic floods of 1870 or 1860—flood storage areas still need to be used to ensure the safety of the flood discharge in the Jingjiang section and to prevent the breach of the dikes on both banks, avoiding catastrophic damage. However, the impact of climate change is becoming increasingly complex: while extreme rainfall events have increased, their distribution is more localized, and the mechanisms of basin-wide flooding now present more uncertainties compared to the past, challenging the traditional logic of flood storage area planning and scheduling.

More importantly, flood storage areas have gradually evolved into regions with permanent populations, complete industrial systems, and even urban-rural integration. The activation of these areas in the event of a flood could mean the temporary relocation of thousands of residents, the destruction of large amounts of farmland and infrastructure, and the sudden loss of years of accumulated economic progress. Compensation mechanisms often fail to cover the true extent of the losses, leaving residents caught in the dilemma between "sacrifice and survival."

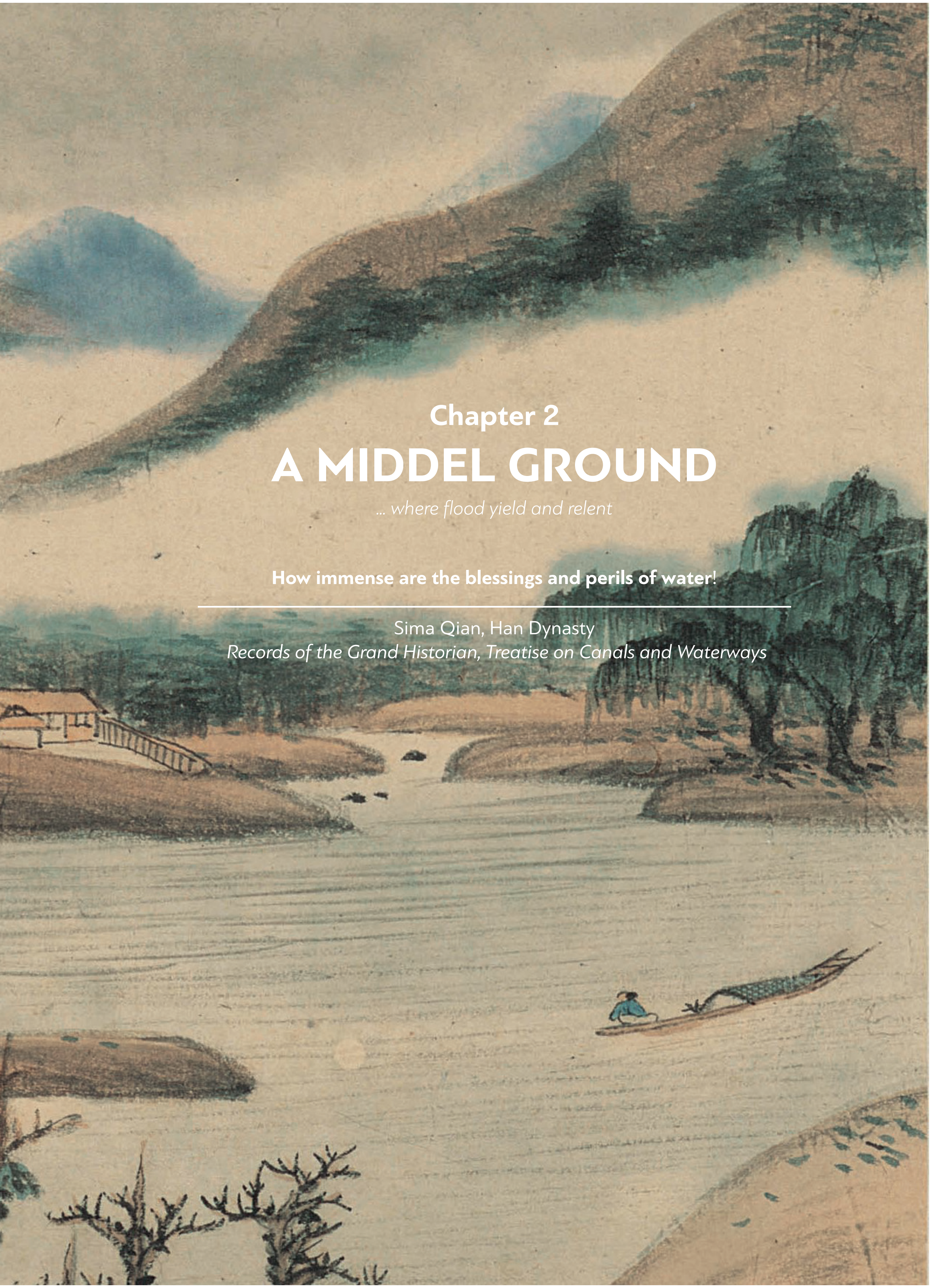
But we must reconsider: **what is the ultimate goal of flood management? Is it to resist every possible flood disaster, or is it to create a society that can flexibly respond to hydrological changes? Can flood storage areas be understood as a kind of "contemporary Weiyuan system"? Can they bear new production, ecological, and cultural functions? Can their periodic flooding characteristics inspire new landscape design paradigms?** For instance, developing seasonal ecological agriculture, creating flood memory parks, or restoring traditional waterway systems to re-establish the daily relationship between people and water.

FLOOD IN 1998

21.2 million hectares of land being influenced
223 million people involved
3004 death
23 billion of US dollar loss

0 Flood Storage Area being used

Fig.1.21. Compensation mechanism for flood storage loss



Chapter 2

A MIDDEL GROUND

... where flood yield and relent

How immense are the blessings and perils of water!

Sima Qian, Han Dynasty
Records of the Grand Historian, Treatise on Canals and Waterways

Wait, what is the role of landscape architects?

After an extended exploration of water management systems and historical hydraulic structures, readers may start to wonder what any of these has to do with landscape architecture. This section could be seen, half-jokingly, as an attempt to give some orientation—to reconnect those bewildered by the preceding analysis with the lens of landscape. Still, this is more than a rhetorical gesture. The premise of this report is that water-related spatial challenges—flood risk, drainage, land use conflicts—can and must be addressed through landscape-based strategies. To do so effectively, however, requires revisiting what landscape architecture is, and what it is not.

It is a common misconception that landscape architecture is an isolated discipline, primarily concerned with artistic or aesthetic spatial design. But as the history of landscapes reveals, the logic behind their formation has never derived from landscape alone. Landscapes have always been the physical performance of overlapping political, economic, ecological, and sociotechnical forces. From this perspective, landscape cannot be understood apart from the multiple disciplines that inform it. The fragmentation of space into discipline is itself part of the problem; besides, the integration of space is part of the solution—and this is where landscape design becomes instrumental.

What emerges is a discipline shaped by interdisciplinarity and oriented toward spatial mediation. As Gülgün et al. (2014) suggest, contemporary landscape architects must rethink their roles within collaborative frameworks. This entails moving between disciplines—hydrology, governance, ecology, engineering—and, in doing so, helping to blur the boundaries between divergent values and policy objectives such as water safety, spatial quality, and economic development (Van Den Brink et al., 2019).

In the waterscape contexts discussed in this report, landscape architects often find opportunities in spaces traditionally occupied by technical experts—engineers, water managers, or hydrologists. While these roles focus on measurement, modelling, and risk mitigation, the landscape perspective introduces interpretive and narrative capacities. Barnes (2014), for example, calls for water systems to be understood not merely as physical cycles but as flows shaped by political, cultural, and economic relations—and, crucially, as flows that in turn shape those very relations. This represents a call for disciplinary crossover, which landscape architecture is particularly well-equipped to engage.

In fact, at the 2023 IFLA World Council in Nairobi, landscape architecture was described as “the articulator par excellence,” a discipline capable of mediating between natural and social dimensions while advocating for quality of life, identity, and ecological restoration (IFLA, 2023). Similarly, in Van Den Brink et al.’s (2019) study of the Dutch "Room for the River" project, landscape architects were found to perform both content-driven and process-oriented tasks. These ranged from evaluating spatial values and coordinating stakeholders to constructing narrative frameworks that reveal invisible ecological processes and imagine alternative futures.

Thus, the contribution of the landscape architect is not limited to designing water spaces per se. It involves understanding long-term hydro-social dynamics, communicating across disciplines, and reconstructing space as a legible and livable medium. In this sense, the landscape architect assumes the role of narrator, translating historical and technical knowledge into forms of spatial intervention that make sense to both experts and the public. Through this role, landscape becomes not an endpoint of design, but a means of inquiry and engagement—a method for integrating water, land, and life.

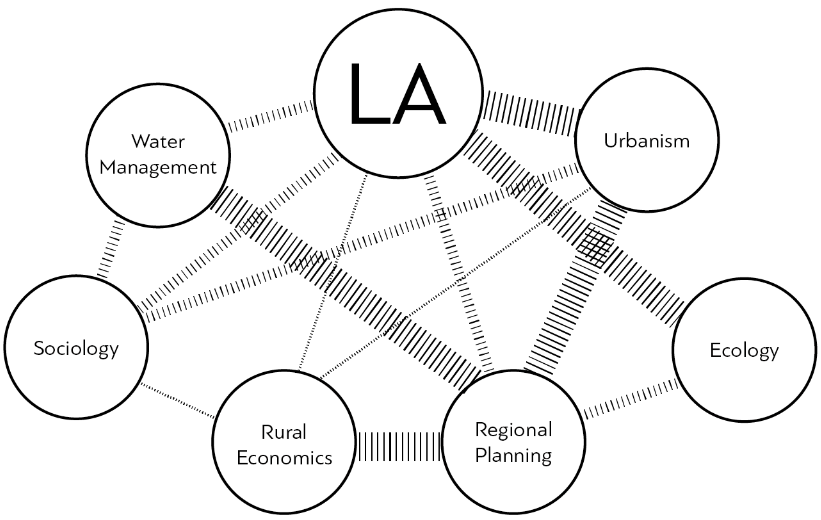


Fig.2.1. Relations between disciplines

RESEARCH STATEMENT - IN THE WAKE OF FLOODS

General Information of Jing River Flood Storage Area

As mentioned in the Structure of the Report at the beginning of this study, this research will first introduce the history of flood storage in the Jianghan Plain and the general background of flood storage areas in Chapter 1. Following that, the Jing River Flood Storage Area (JRFSA) will be selected as the site for design exploration in this study. JRFSA, located as the first large-scale flood storage area encountered by the Yangtze River as it enters the Jianghan Plain from the Wushan Mountains, is only 140 kilometers away from the Three Gorges Dam upstream. Functioning as one of the key components of the Jing River flood regulation scheme, the area was designed as a flood storage area in the 1950s to protect densely populated downstream regions, including Wuhan and other cities along the middle and lower Yangtze.

The JRFSA spans approximately 1,000 square kilometers and includes a population of over 300,000 residents spread across several towns and rural settlements. Despite its designation as a flood-prone area, the region maintains a complex and adaptive economic structure centered around agriculture. Dominant land uses include wheat, rice, cotton cultivation and aquaculture. It is rich in rice, cotton, fish, lotus root, poultry eggs, and other products. (Hubei Jing River Flood Diversion and Storage Area Engineering Management Bureau, 2025)

Historically, the area's dual identity has led to a delicate socio-spatial balance. Following the catastrophic 1931 and 1954 floods, large-scale state intervention reorganized land and population structures, establishing resettlement policies and engineering works such as sluice gates and embankments. These interventions embedded a logic of sacrifice and resilience into the local landscape: the land must be cultivable in normal years and submersible during extreme events. Over the decades, this duality has given rise to a distinct landscape structure composed of linear embankments, elevated settlements (known as "platform villages"), and checkboard-like farmland patterns bounded by drainage and irrigation channels.

In recent decades, the ecological value of the Jingjiang Flood Diversion Area has come under increasing pressure due to the development of agricultural practices and the collapse of traditional land-water relationships. While the region's hydrological function needs ecological resilience, landscape transformations—driven by production demands and rural modernization policies—have gradually decrease the size of native habitats such as wetlands, riparian woodlands, and seasonal grasslands. Many of these ecosystems once played a critical role in water regulation, sediment retention, and biodiversity support, forming a living infrastructure that complemented the region's engineered flood management system. Their disappearance gave us a lesson that ecological buffers historically increased landscape variability and resilience.

The transition from traditional diverse agriculture to monoculture has further exacerbated these trends. Relying on chemical fertilizers and pesticides has led to soil degradation and nutrient runoff. The low-lying geography of the JRSFA, combined with its artificially constrained drainage networks, makes it particularly vulnerable to the accumulation of agricultural pollutants. These changes not only undermine long-term agricultural sustainability but also damage the ecological services required for nature diversity.

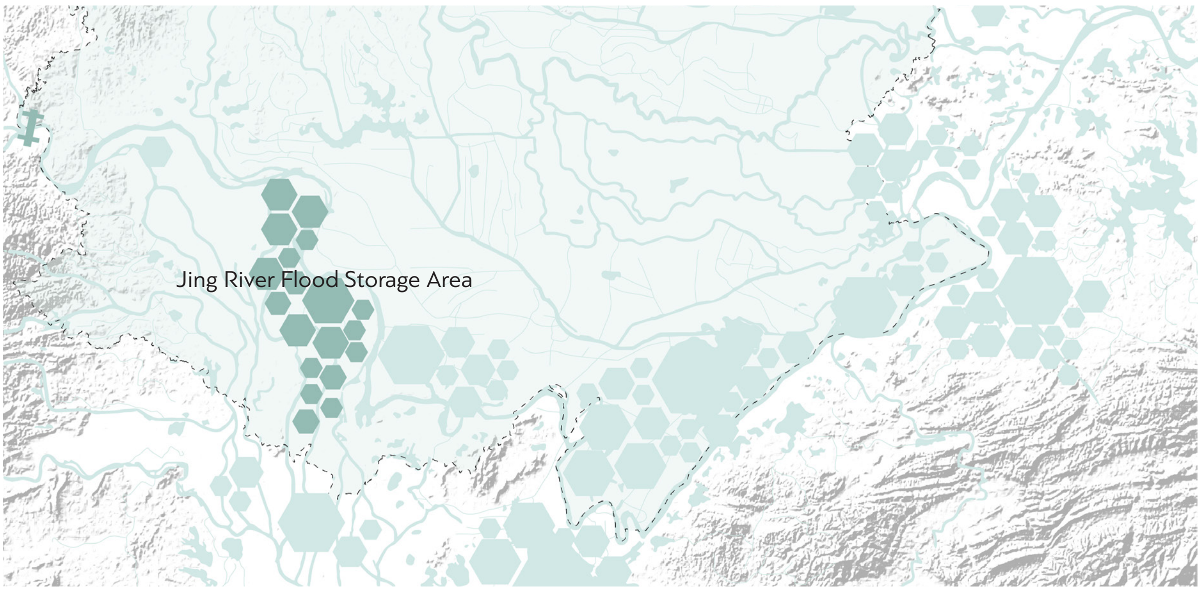


Fig.2.2. Location of main flood storage area

Jing River Flood Storage Area

Size
921 km^2

Flood Storage Capacity
5,400,000,000 m^3

Farming Land Size
361.7 km^2

Population
504,000

Year of Construction
1952

Fig.2.3. Northgate of Jing River Flood Storage Area


Entrance Area of Flood Storage

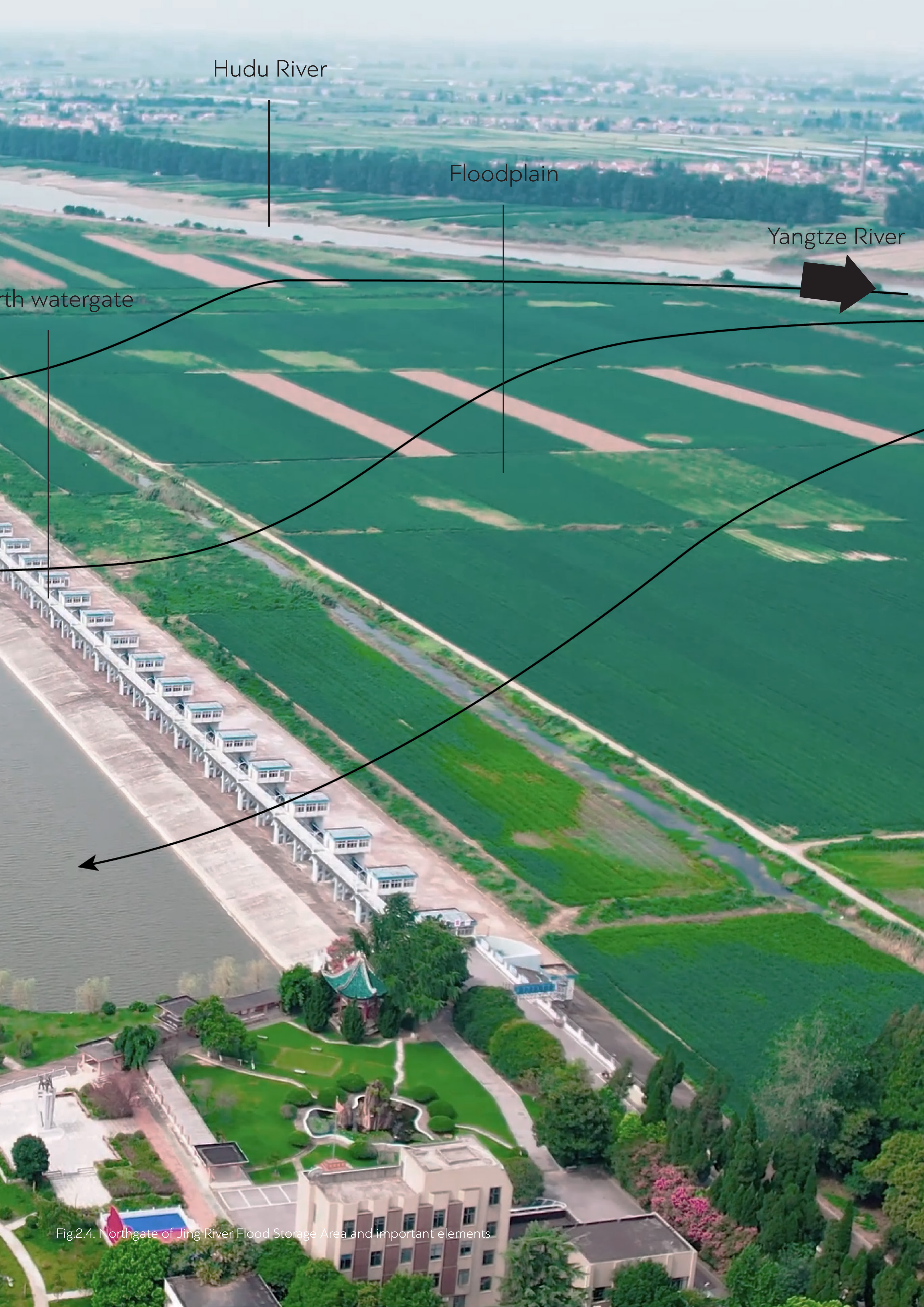


Fig.2.4. Northgate of Jing River Flood Storage Area and important elements

Research Question

What does the flood storage area mean for the people living in the polder? Only two of the 40 flood storage areas in the Yangtze River's middle reaches have been used so far. The risk of flooding has a more profound impact on the local landscape and human-land relations than the floods themselves. Both agricultural planning and development are restricted under the requirements of flood storage planning, with agricultural production dependent on unmanaged, informal landscape spaces. On the other hand, the low frequency of flood storage further promotes the unregulated, uncontrolled development of local agriculture. Estimates of flood storage losses in 1998 were tens of times higher than in 1954, directly contributing to the decision not to open flood storage areas during the great flood of 1998, even though the water level exceeded the threshold for initiating flood storage. (Li, 2005) The current state of the flood storage area is not conducive to either flood storage or sustainable regional economic development. (Su et al., 2006)

Non-tiered flood risk management model has also led to downgrading the ecological and spatial value of the local landscape. The ecological attributes of the area as a wetland have almost disappeared due to the lower-than-expected use of the flood storage area. (Cai, 2017) The number of fish species in the Jianghan Plain region has been reduced from more than a hundred species before the construction of the flood storage area to 74, and the original wintering sites for birds, such as wild geese and ducks, have been lost. (Yin, 2008) Due to the flood risk, the planning of the flood storage area requires that the town's recreation, service, and socializing places be designed in a centrally protected safety platform. (Wang, 2021) The land outside the safety platforms is focused on one use: agricultural development. The unregulated agricultural development focusing on economic benefits has resulted in severe agricultural pollution and the complete loss of the local agricultural landscape identity of 'Weiyuan', which historically represents the living symbiosis with water and cultivation. Other than production, the connection between people and the landscape space has been suppressed on this land.

As a result, the local water management framework needs to be rebalanced into a system that enhances economic, ecological and spatial values. However, what spatial design tools will facilitate this balance, and will the existing local landscape structure allow this change to take place? These questions need to be urgently addressed and researched.

How can a design framework for a flood-adaptable landscape contribute to rebalancing flood prevention, mitigation, and recovery of agricultural, biodiversity, recreation and living spaces?

Sub-questions

How has the existing flood control infrastructure shaped the spatial rigidity and functional imbalance within the flood storage area?

What socio-spatial and ecological consequences have emerged in the JRFSA due to the long-term avoidance of floodwater entry?

In what ways has the disconnection between local inhabitants and the landscape weakened long-term resilience and awareness of flood risk?

To what extent does the current single-scenario flood management approach contribute to the decline in multifunctionality of the landscape?

Issues

This study will begin by addressing the nine existing issues within the site, illustrating how the Jing River Flood Storage Area (JRFSA) has gradually transformed from a vibrant and opportunity-rich space into a "long-term temporary landscape," serving as a "concession and sacrifice" within the comprehensive flood disaster management system of the Yangtze River Basin. As a result, any potential landscape changes in this area, whether positive or negative, face significant resistance. The first step in solving these issues is to understand them. Once we grasp the interconnected and mutually influencing network behind these seemingly independent problems, we may begin to untangle the root causes.

1. Ecological Value Loss

During the Ming and Qing dynasties, the Jing River region was originally characterized by widespread lakes and marshes, forming an important node in the inland water network of the Jianghan Plain. These areas nourished a rich biodiversity, including fish, wetland plants, and waterfowl. However, with the implementation of the lake reclamation policies, vast areas of lakes and wetlands were gradually drained and converted into agricultural land. As a result, the flood storage areas not only became agricultural spaces but also lost their function as ecological habitats. In modern times, the number of fish species has sharply decreased from nearly one hundred to less than half, the number of aquatic plant species has reduced from 82 to 68, and the bird species count has fallen from 167 to 130 (Yin, 2008). Some endemic species have even become nearly impossible to find. This decline has brought about not only a reduction in ecosystem stability but also a rupture in the landscape's identity and cultural imagination.

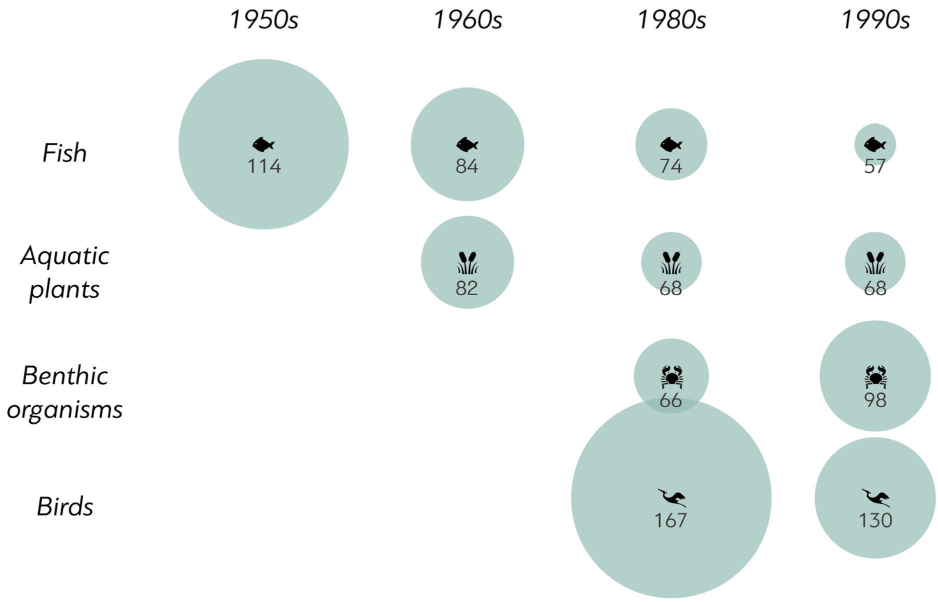


Fig.2.5. Change of the number of species

2. Chemical Pollution

The periodic inundation of floods used to be a crucial force for the ecological self-repair and nutrient cycling of this land. The sediments brought by floods provided natural fertility to the farmland, enabling stable high yields with almost no need for additional fertilizers. However, today, floods are rare, with some areas going decades without being utilized, and the sediment flow system has been artificially interrupted. The soil structure has become compacted and infertile. At the same time, to compensate for the lack of soil fertility, farmers have been forced to rely heavily on chemical fertilizers and pesticides, particularly in areas with agriculture facilities and high-yield crop cultivation. Pesticide residues and fertilizer runoff enter ditches and ponds, leading to eutrophication and the accumulation of pollutants, which in turn causes a sharp reduction in aquatic plant species and plankton. Small wetland systems around farmland have been destroyed. This artificial production logic gradually replaced the agricultural landscape that once coexisted with nature.

3. Unbalanced Spatial Distribution

Within the dikes, the agricultural population continues to decline, with large areas of farmland left abandoned, leading to severe rural hollowing-out. Meanwhile, outside the dikes, urbanization is rapidly advancing, with newly built residential areas and industrial parks often extending beyond the original dike control lines. This extreme spatial imbalance results in an imbalanced emergency response system: on one hand, there is a rural governance dilemma marked by a lack of population and usable land, while on the other hand, urban expansion constantly erodes the safety boundaries of flood storage areas.

Fig.2.6. Unbalanced spatial distribution in Jing River Flood Storage Area in Jianghan Plain

4. Agricultural Landscape Degradation

The Jing River Flood Storage Area once featured a richly diverse agricultural landscape: fish ponds and lotus ponds were interspersed among undulating farmlands, while shelterbelts, irrigation canals, and field ridges wove together a pastoral mosaic blending natural and artificial elements. However, with the advancement of agricultural intensification and land consolidation projects, this traditional "mosaic" and "multi-functional" landscape has gradually been replaced by large-scale monoculture fields. Farmland boundaries have become rigid, biological corridors have disappeared, and water bodies have been channelized or even hardened. As a result, not only has the area's ecological functionality deteriorated, but the landscape has also lost its perceptible details and local identity, turning into a repetitive, flat, and uninspiring production space.

5. Loss of Connection between People and Landscape

Due to the uncertainty of flood storage policies and frequent land use restrictions, local residents find it difficult to regard this land as their true "home." Most people understand that it could be requisitioned, evacuated, or cleared at any moment, leading to a lack of emotional investment in long-term settlement. At the landscape level, this sense of temporariness manifests in the reluctance to repair houses, invest in construction, or engage in cultural landscape creation or maintenance of vernacular features. As a result, the landscape becomes rough, provisional, and purely functional. Emotional bonds between people and the land are suspended by policy, and the landscape loses its capacity to carry memory and identity.

6. Lack of Risk Awareness

In recent years, following the completion of the Three Gorges Dam and repeated reinforcement of the main embankments, public vigilance toward flooding in the Jing River Flood Storage Area has sharply declined. Local residents have generally developed the belief that "the dam can hold back the floods" and that "since the flood storage area hasn’t been used in decades, it probably never will be again.” In this atmosphere, both government and grassroots administrators have gradually relaxed their efforts in risk communication and emergency drills. Some officials have even failed to update contingency plans and evacuation procedures as required, resulting in a state of “no response” when faced with sudden rainfall or early warnings. This collective forgetting of institutional risks is quietly eroding the very foundation of the flood storage system.

7. Uncontrolled Population Growth

Since the late 20th century, the Jing River Flood Storage Area (JRFSA) has experienced a steady return and growth of population, driven by relaxed rural land-use policies and the relocation of industries. This trend has been especially prominent in elevated areas within the polders and near the base of embankments, where sizable township-style settlements have gradually emerged. Today, such small-scale urban settlements are widespread throughout the flood storage area. However, this form of "default development" has occurred without proper planning approval or zoning regulation, leading to a sharp rise in both construction and population density. If the area is ever activated for flood diversion, not only would evacuation be extremely challenging and losses difficult to quantify, but the government would also face immense financial pressure in terms of compensation and reconstruction.

8. Lack of Individual Mitigation

Residents generally lack proactive flood prevention or disaster preparedness measures. Due to insufficient risk education and lack of policy incentives, very few people elevate their house foundations, stock emergency supplies, or plan evacuation routes. As a result, once a flood diversion is initiated, they are highly likely to find themselves in a passive and vulnerable position.

9. Informal Agriculture Development

In the institutional and regulatory vacuum, a phenomenon of household-based "marginal land" cultivation has emerged within the flood storage area—particularly along roadsides, dike crests, and the edges of field ridges. In pursuit of higher yields, some farmers have even converted original drainage ditches and roadside shelterbelts into planting areas, resulting in a patchwork of farmland and fragmented landscapes. This uncoordinated, informal agricultural expansion has gradually degraded the flood storage area from a potentially multifunctional landscape—balancing agriculture and ecology—into a low-quality, high-intensity monocultural production space, significantly diminishing both its visual and ecological value.

10. Increasing Flood Storage Loss

Unlike the early 20th-century flood storage landscapes dominated by low-yield paddy fields and grasslands, today's Jing River Flood Storage Area (JRFSA) has evolved into a hub for various high-value industries: aquaculture, facility-based agriculture, commercial grain production, and even segments of industrial and logistics parks. If the area were to be reactivated for flood storage, it could result in direct economic losses amounting to hundreds of millions of yuan or more, severely tipping the cost-benefit scale between “use” and “non-use.” The economic transformation of the flood storage area has rendered a once "sacrificable" space increasingly "unbearable."

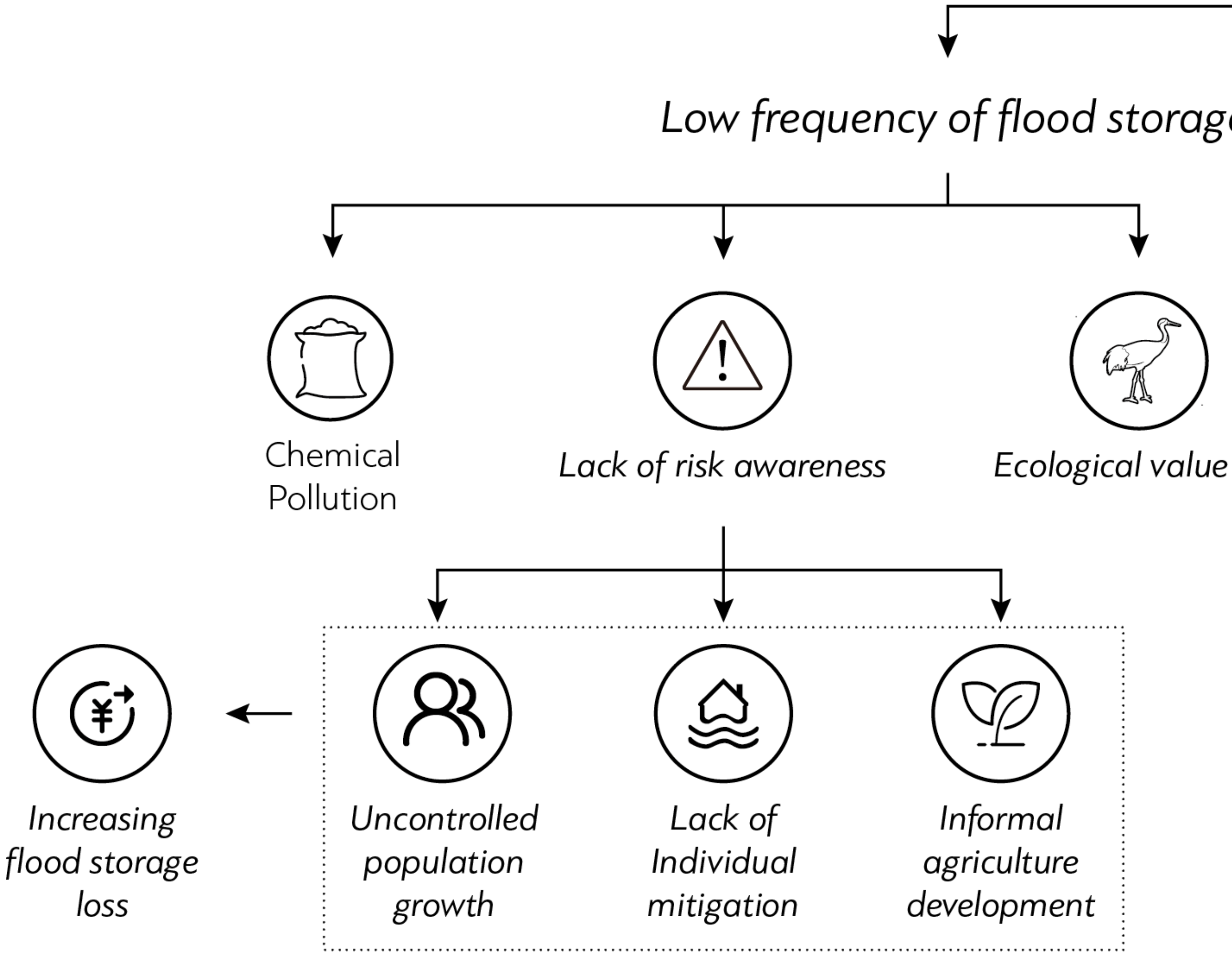
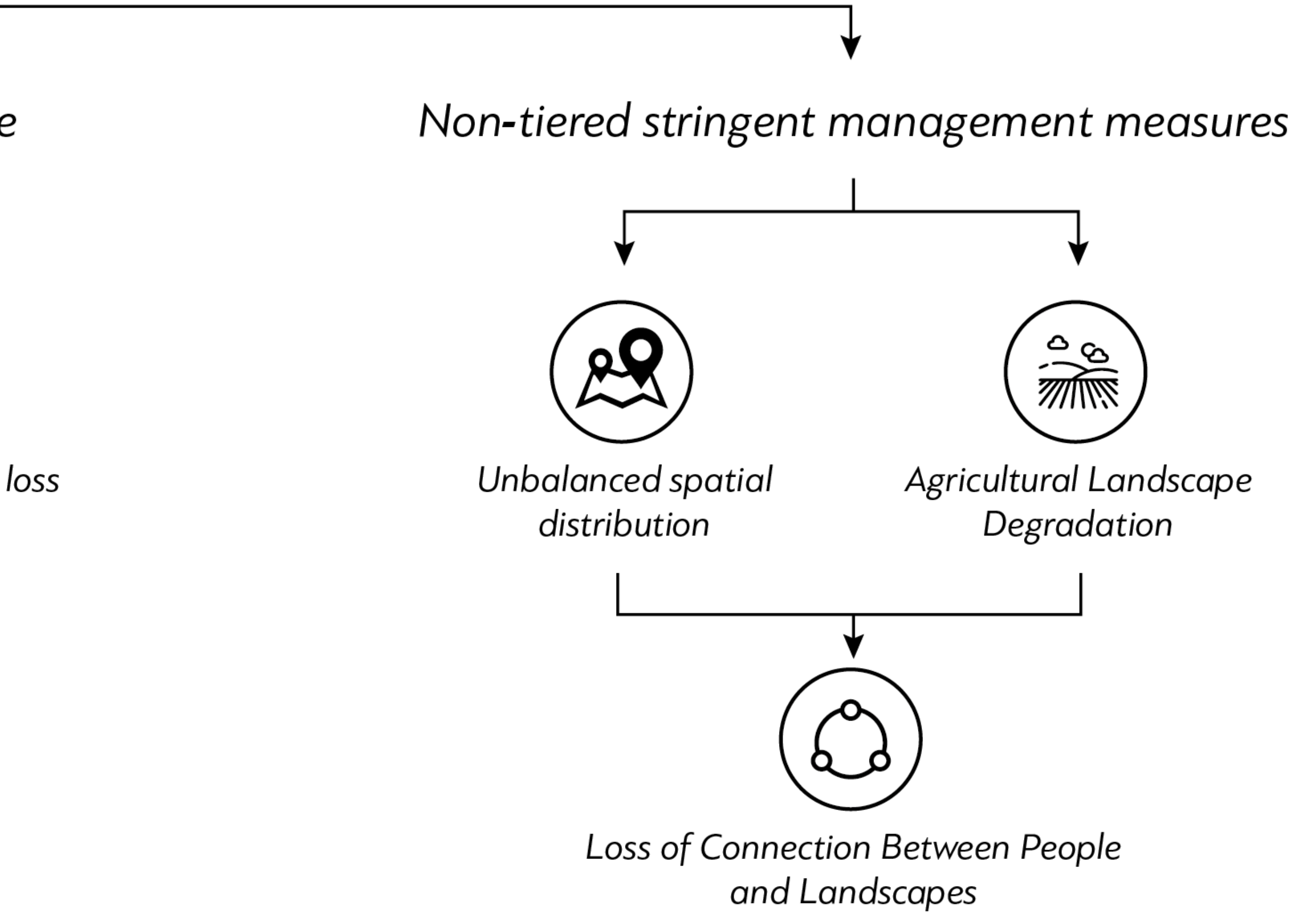


Fig.2.7. Relations between problems


e
Non-tiered stringent management measures
loss
Unbalanced spatial distribution
Agricultural Landscape Degradation
Loss of Connection Between People and Landscapes

Theoretical Background

In the flood-prone Jianghan Plain, especially in the Jing River Flood Storage Area (JRFSA), flood management has always been a key driver of landscape evolution. Traditional flood control logic is often based on the technical rationality of "controlling" and "isolating" floodwaters, while recent developments in restorative approaches emphasize the possibility of "coexisting with water." The "Flood Management Triangle" model proposed by Suykens et al. (2016) attempts to strike a balance between three strategies—prevention, mitigation, and recovery—in order to build a more resilient flood management system.

The historical management practices of the Jing River Flood Storage Area (JRFSA) can be viewed as a dynamic interplay between the strategies of "prevention"

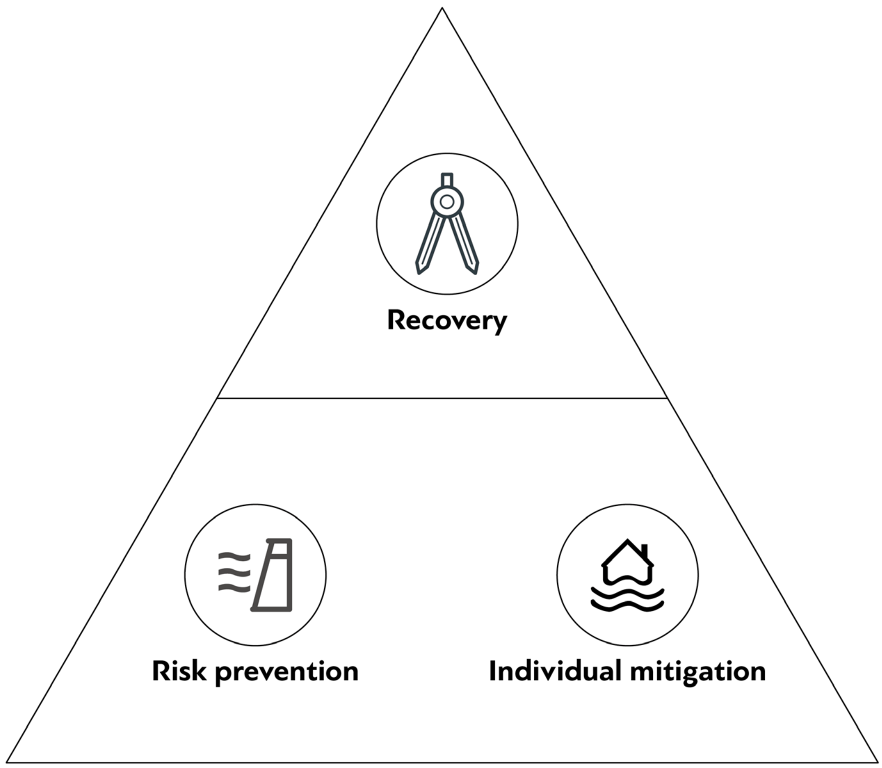


Fig.2.8. Flood management triangle

and "recovery." Choosing not to open the flood storage area (prevention) helps maintain agricultural production and population growth, while opening the flood storage area (recovery) benefits wetland ecology, enhances soil nutrients, preserves water culture, and strengthens residents' awareness of risk. Historically, these two strategies have been harmonized, sustaining the ecological-production balance of the site.

However, since 1954, the region has not experienced a major flood event, and policies and land use have increasingly shifted toward a "long-term non-opening" approach. This has eroded the spatial foundation for recovery strategies, leading to a gradual loss of the associated ecological and social benefits. At the same time, the agricultural development and population growth fostered by the prevention strategy have shown signs of being highly temporary and lacking proper management support, gradually evolving into new problems: loss of risk awareness, uncontrolled population expansion, informal agriculture, and a decline in flood storage capacity. This imbalance in strategies manifests spatially as a monoculture of land use, degradation of agricultural landscapes, and weakening of the human-environment relationship, ultimately forming a structurally fragile landscape pattern.

The more far-reaching impact is that the completion of the Three Gorges Dam, combined with the effects of climate change, is making the flood characteristics in the Jing River region increasingly complex and unpredictable. In this context, the traditional binary management strategies—open or not open—lack sufficient flexibility and are ill-equipped to cope with an uncertain future. This is exactly the core issue emphasized by the "no-regret strategy": the best approach to dealing with an uncertain future is to provide spatial responses that are viable across multiple scenarios.

Landscape design, as an intervention that spans across scales and disciplines, can offer managers a multi-layered, intermediate state between "complete openness" and "complete non-openness." It is precisely in this intermediate zone that the multifunctionality and resilience of landscapes have the potential to come into play.

To respond to future uncertainties and spatial imbalances, this paper proposes the theoretical concept of Cascading Floodspace. This concept draws inspiration from the tiered structural logic of the traditional "Weiyuan" agricultural system in the Jianghan Plain. The ancient Weiyuan did not exist as a single, unified flood storage space; instead, they consisted of multiple spatial units with different elevations, functions, and hydrodynamic response mechanisms. These units provided a certain degree of hydrological resilience and adaptability.

Building on this, Cascading Floodspace advocates for the division of the existing flood storage area into multiple spatial blocks, each characterized by different flood frequencies, landscape adaptation strategies, and production models. The areas closest to the main river channel can be designated as high-frequency flood zones, focusing on ecological restoration and wetland landscapes. The middle zone could develop adaptive production models such as crop rotation and temporary aquaculture. The peripheral areas would maintain stable residential and agricultural layouts, supplemented with early warning systems and infrastructure

A Cascading Floodspace

A spatial design framework that organizes flood storage areas into multiple adaptive layers based on topography, flood frequency, and land use compatibility. Instead of treating the flood zone as a single-use, binary space, it introduces a gradated system that balances flood prevention, ecological recovery, and productive land use through layered inundation and management strategies.

improvements. This tiered spatial construction not only enhances the site's adaptability under extreme conditions but also provides a platform for coordination and dialogue among different populations and management mechanisms.

This spatial framework directly addresses several issues, such as the loss of ecological value and the degradation of agricultural landscapes. However, more importantly, it rebalances flood management strategies, tackling the root causes of many issues—the prolonged periods without floods and the continuously high standards of flood storage management policies. By doing so, it resolves many non-landscape problems inherent to the site. This approach also aligns with the role that landscape designers should play in large-scale projects, as mentioned earlier. Landscape design is not just confined to solving landscape issues but also serves as an effective tool to address problems in various other domains.

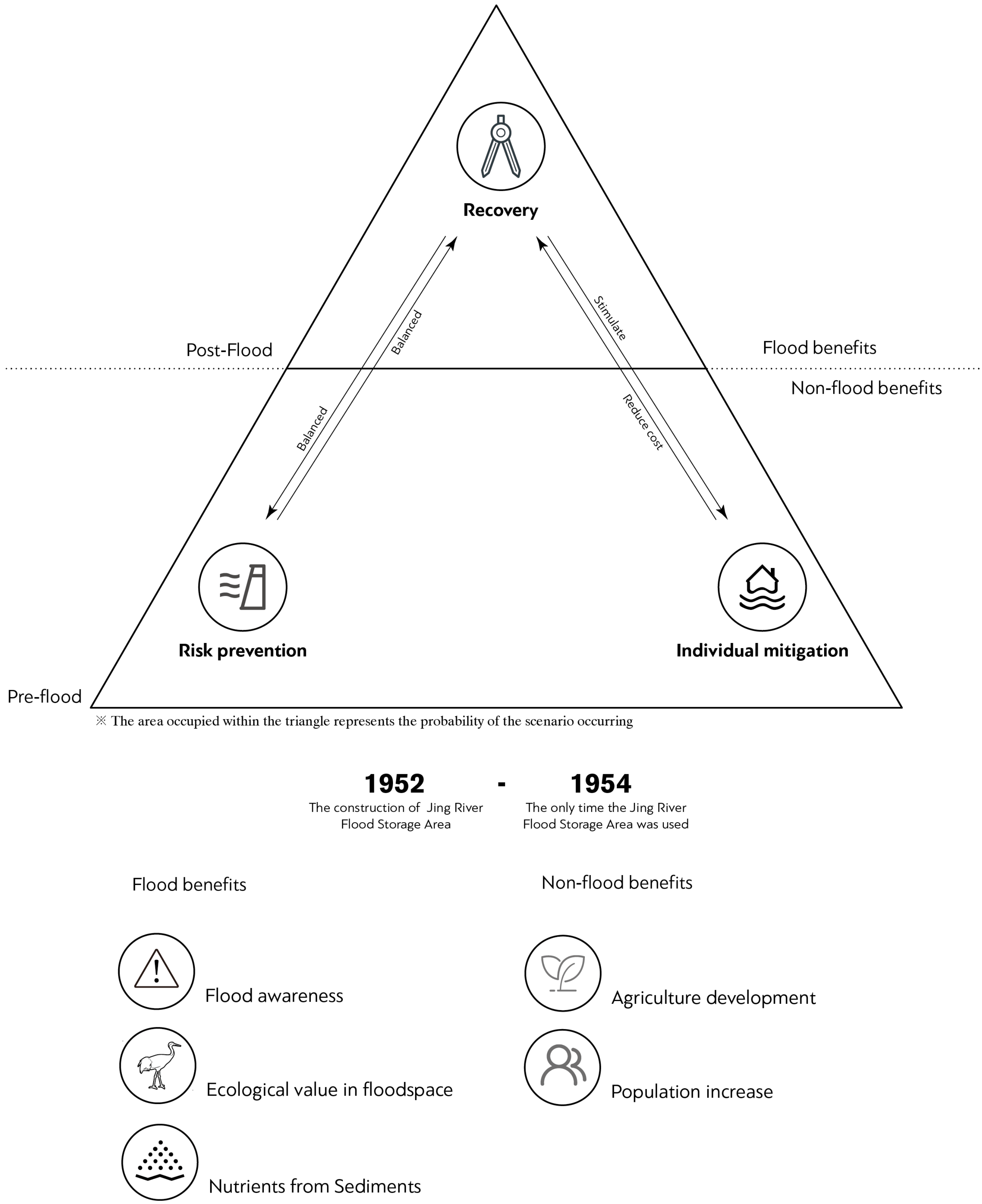
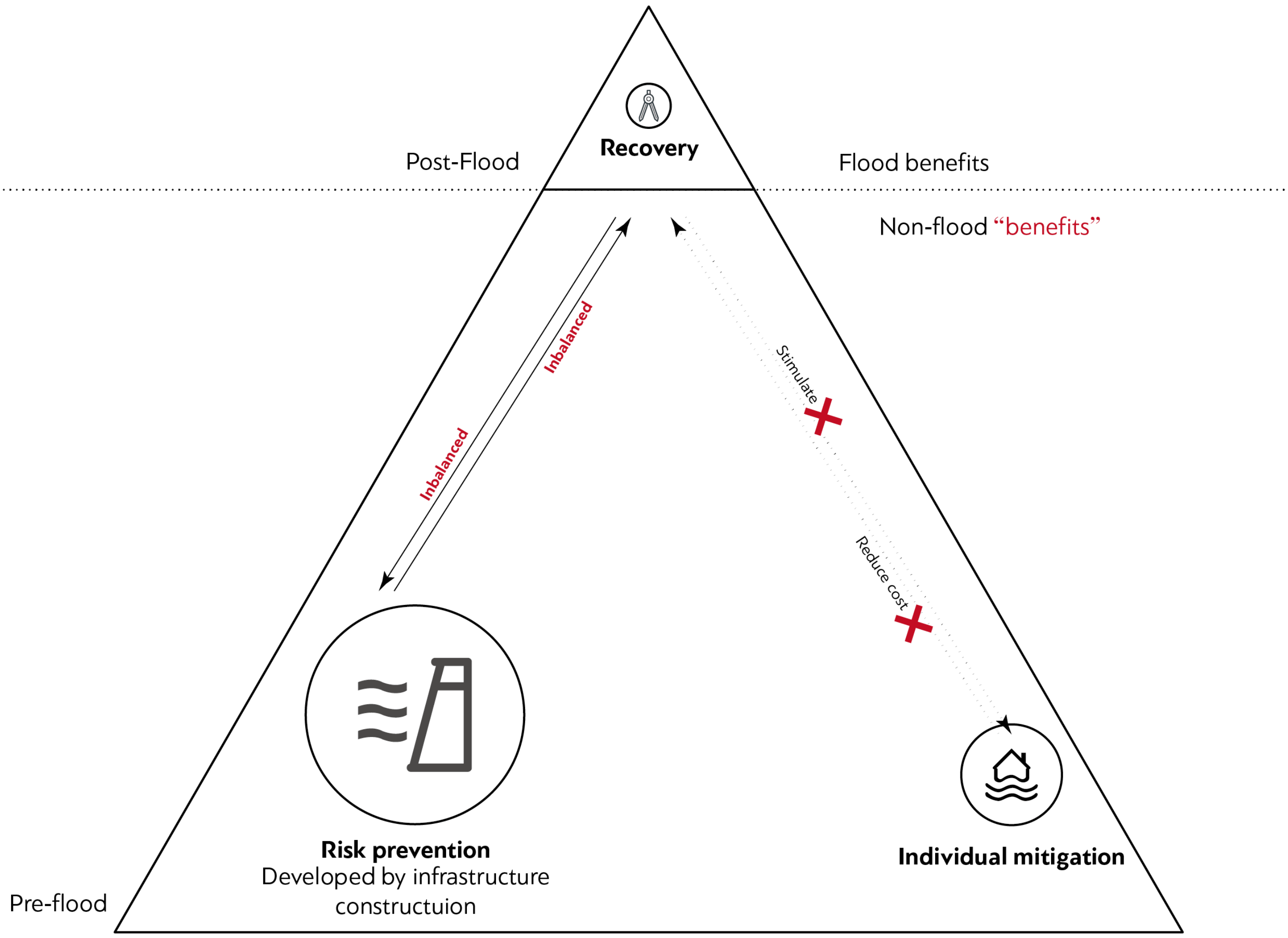


Fig.2.9. Flood management triangle between 1952 and 1954



※ The area occupied within the triangle represents the probability of the scenario occurring

1954 - **2025**

The only time the Jing River Flood Storage Area was used

The floodplain was not used even during the great flood of 1998

Flood benefits

~~Flood awareness~~
→ Lack of individual-level flood mitigation

~~Ecological value in floodspace~~
→ Ecological diversity loss

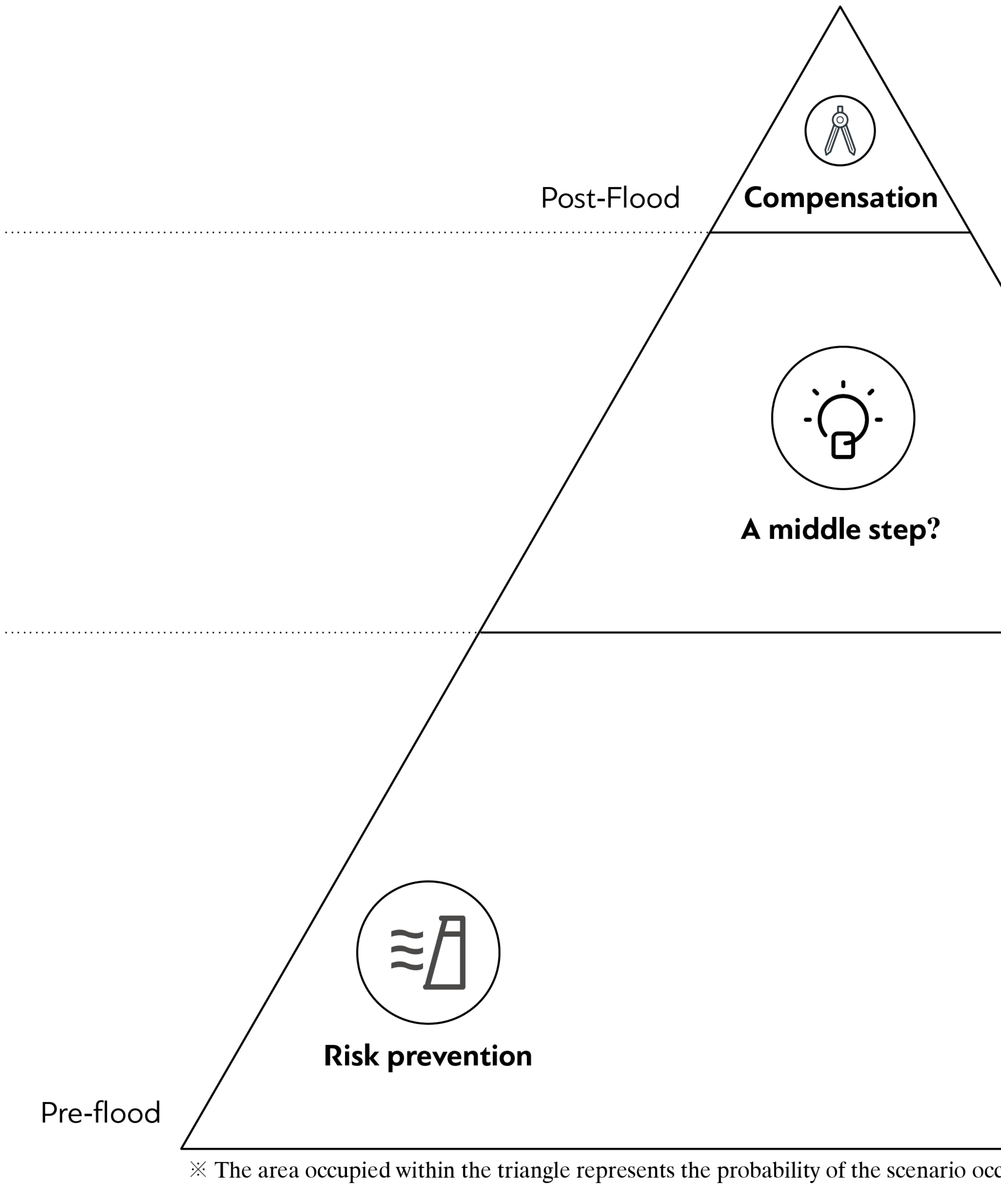
~~Nutrients from Sediments~~
→ Excessive use of fertilisers

Non-flood “benefits”

Uncontrolled agriculture development

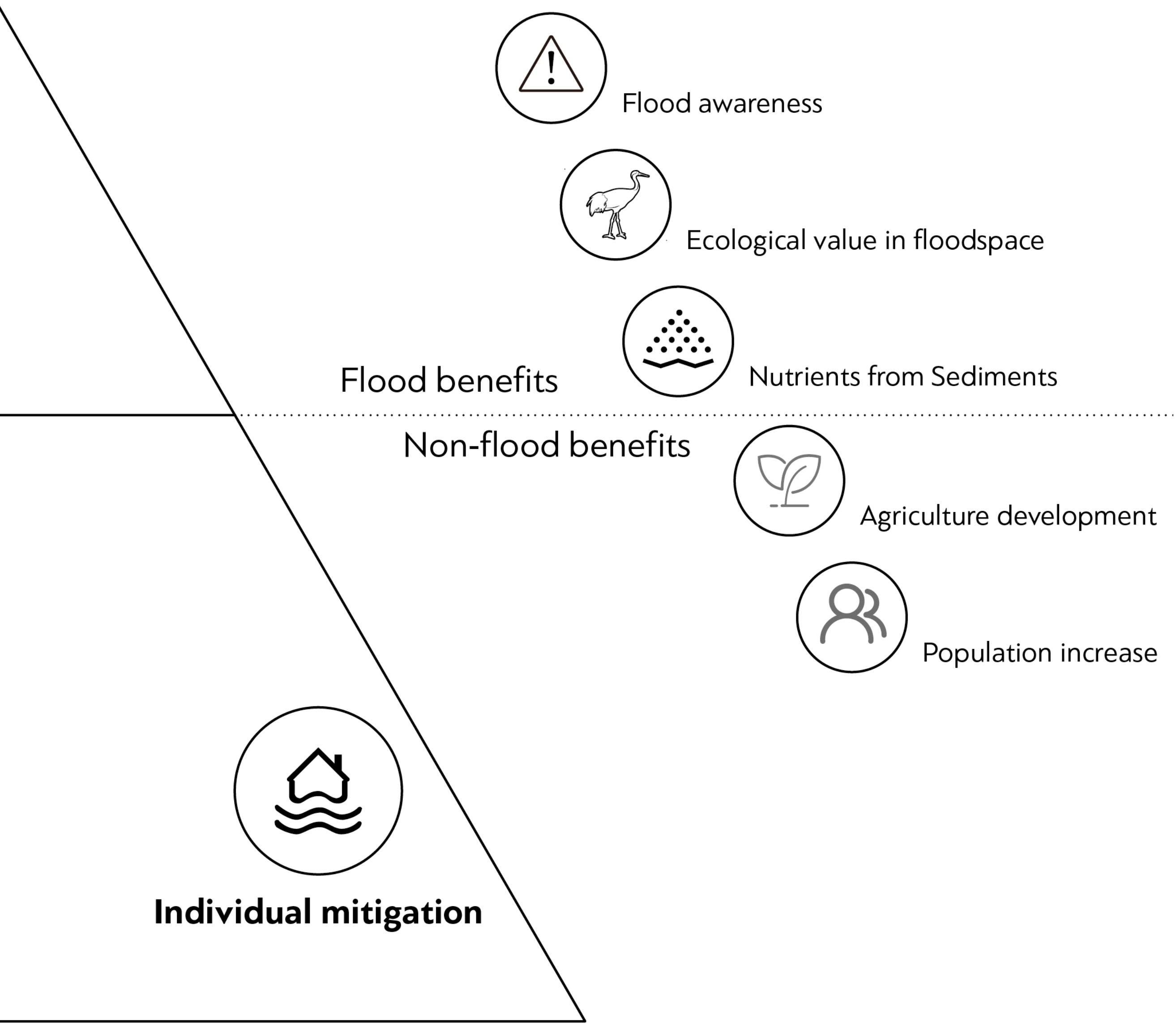
Uncontrolled Population increase

Fig.2.10. Flood management triangle between 1954 and 2025



Proposal for the Fu

Fig.2.11. A proposal to rebalance flood management triangle



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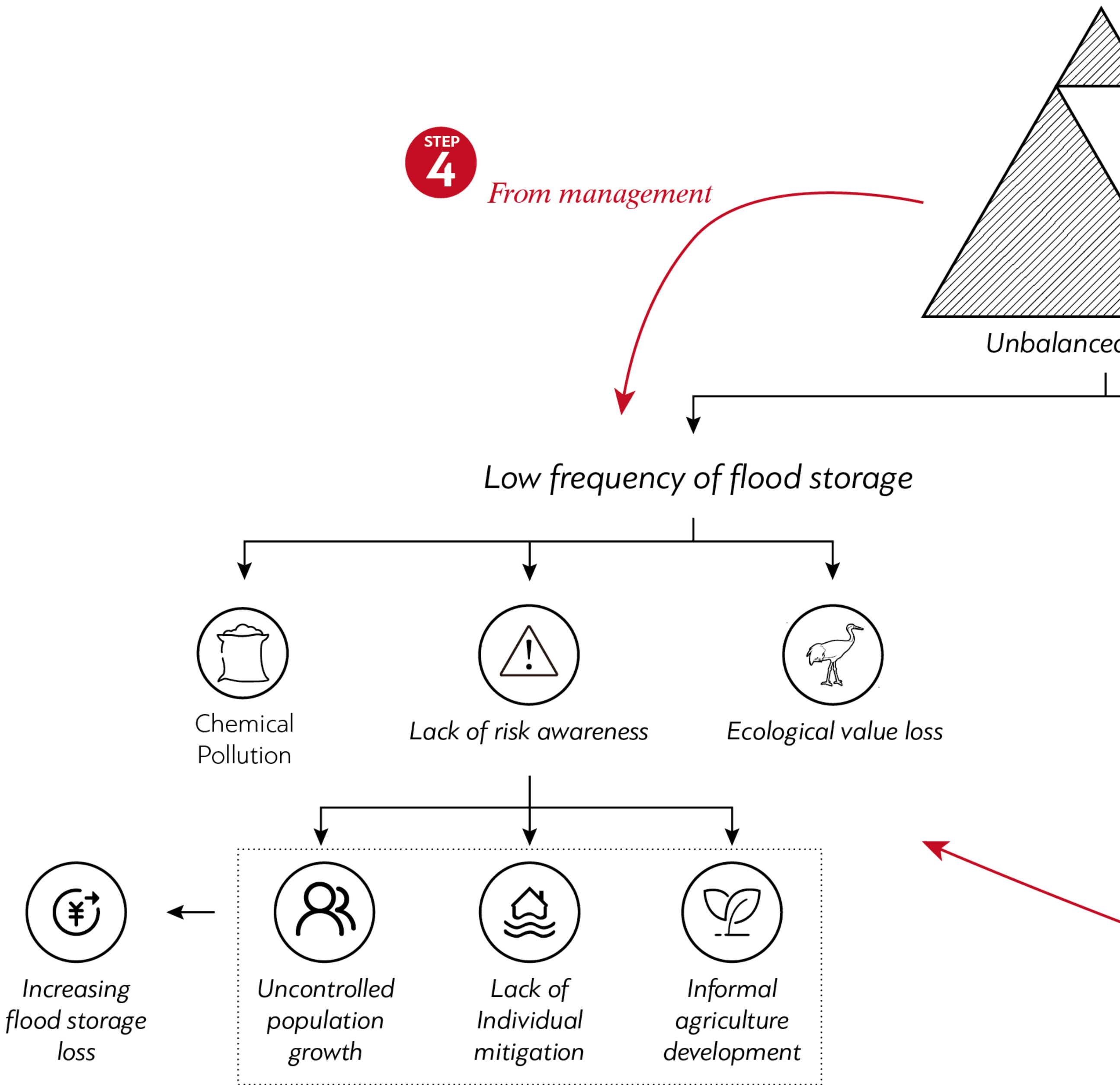


Fig.2.12. Problem-solving strategy

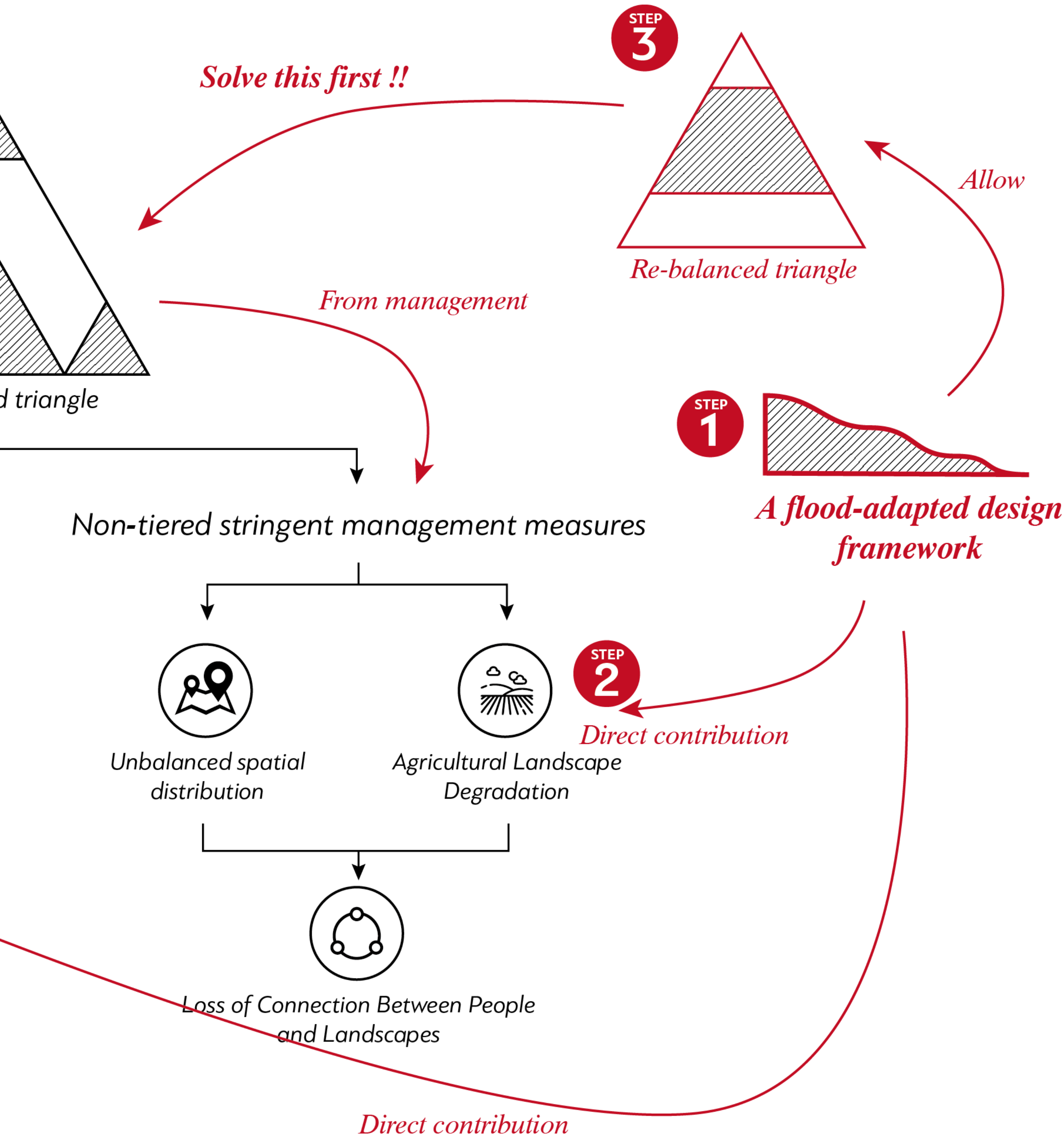
Problem-solving Approach

Step 1

A spatial framework for flood' adaptable landscapes is developed to respond to varying hydrological conditions.

Step 2

This framework directly addresses site' specific issues such as ecological degradation and landscape loss.



Step 3

It serves as a strategy to rebalance the disrupted flood management triangle' prevention, mitigation, and recovery.

Step 4

By restoring this balance, the approach targets the root causes of broader site challenges, including pollution, identity disconnection, and unregulated development.

Values

The Jing River Flood Storage Area (JRFSA) is a vast and complex environment, consisting of many different stakeholders. The design proposal will interact with various stakeholders, such as those responsible for implementation, those affected by the implementation, and statutory and regulatory bodies. Due to their differing backgrounds, there is a strong divergence in the degree of importance placed on different values. The first task is to identify which values are prioritized in the context of the flood storage area. The values that may be of concern to any stakeholder are categorized into four types: **Economic Profiting**, **Flood Prevention**, **Ecological Value**, and **Landscape Value**:

Flood prevention

Ecological value

Landscape value

Economic Profiting

Economic Profiting (E) focuses on direct land revenue and industrial development, including agricultural production, aquaculture, real estate, and infrastructure investment. Stakeholders are primarily concerned with sustainable land use, maximizing output value, and policy-based compensation as real economic returns.

Flood Prevention (F) emphasizes the strategic position of the flood storage area within the broader flood control system of the middle Yangtze River. It focuses on levee safety, emergency efficiency when activating flood storage, and population relocation mechanisms. Groups prioritizing this value typically place risk control and social stability at the forefront.

Ecological Value (C) focuses on wetland restoration, biodiversity, natural water cycles, and system resilience in the region. This perspective emphasizes the functional role of the flood storage area as part of the ecosystem, particularly in the context of climate change and environmental degradation.

Landscape Value (L) focuses on spatial aesthetics, cultural memory, and the relationship between people and land, emphasizing that land is not just a resource but also a landscape that carries identity and public perception. Stakeholders with this perspective are concerned with landscape quality, spatial organization, the preservation and renewal of traditional agricultural landforms, local tourism development, and the rebuilding of community belonging.

It is important to note that there are often contradictions between these four values. We must recognize that a solution that perfectly satisfies all four values is usually not feasible. More importantly, it is crucial to find a balance among these values based on the needs of the local community.

Stakeholders

We will first identify and elaborate on the list of stakeholders within and around the JRFSA. At the same time, based on the four values mentioned above, the study will categorize these stakeholders into the following seven groups:

Coordinator (E, F, C, L)

This category of stakeholders has a high capacity for policy-making and resource allocation, and they strive to balance economic development, flood prevention, ecological protection, and landscape quality. Their role is more of a coordinator, playing a key part in conflict resolution, institutional design, and resource distribution. Representatives include **the Hubei Provincial Government and Gong'an County Government**, which act as bridges in guiding higher-level policies and local implementation. Additionally, **urban residents in JRFSA** are also included in this category, as they have comprehensive demands for their living environment and safety, indirectly influencing government decisions.

Downstream Beneficiary (F, C, L)

This group is not located within the flood storage area itself but is a direct beneficiary of the flood storage function of JRFSA. They place great emphasis on the stable performance of Flood Prevention (F) and have some degree of concern for ecological and landscape demands (C, L) to ensure urban livability and long-term resilience. Typical representatives include **Wuhan City and other major downstream cities**, which are asset-dense and densely populated, making them highly sensitive to changes in upstream water flows.

Realist (E, F)

This group is more focused on practical interests, seeking a stable balance between economic benefits and risks. **Commercial banks** are concerned with insurance compensation measures after flooding and the repayment ability of agricultural loans, while **agricultural cooperatives** emphasize output efficiency and the actual threats posed by floods. These stakeholders support the improvement of infrastructure and risk control, while also remaining sensitive to maximizing profits. They are important influencers of local agricultural development policies.

Developer (E)

This group focuses solely on Economic Profiting (E), viewing land as purely a resource for capital. They often promote intensive, large-scale land use and tend to prioritize short-term benefits. This includes **agricultural individual contractors**, **agricultural company contractors, agricultural product processing enterprises, residents of safety platforms in JRFSA**, and **local non-agricultural enterprises**. These stakeholders have very low concern for "soft values" such as ecology and landscape, and in spatial planning, they may drive unplanned expansion, increasing land conflicts and environmental burdens.

Expector (E, F, C, L)

This group take a comprehensive interest in various values but lack actual influence and awareness of the contradictions between different value orientations. A typical example is **local farmers**. They seek stable income while being concerned about flood risks, and they have a deep reliance on the natural state of the land and landscape culture. However, due to limited channels for expressing their concerns and their weaker economic status, they are often in a passive position in the negotiation process.

Protector (F)

The "Protector" focuses almost entirely on Flood Prevention (F), with their mission being to ensure the lowest possible risk and implement institutionalized response plans. This group includes **the Flood Control and Drought Relief Headquarters**, **the Gong'an City Fire and Rescue Brigade, the Jing River Flood Retention Area Project Management Bureau**, and **vulnerable groups within the area** (such as the elderly and low-income households). They have limited concern for ecology, landscape, or economic profits, and are more focused on emergency response and institutional stability.

Landscape Enthusiast (C, L)

This group emphasizes the unique values of the flood retention area in terms of Ecological Value (C) and Landscape Value (L), advocating for the restoration and reactivation of its public and natural characteristics. Representatives include the **Jingzhou Municipal Government** and the **Jingzhou Ecological and Environmental Bureau**, which promote ecological projects and landscape protection at the city level. Additionally, **local flora and fauna** are regarded as "silent stakeholders," with non-human environments also being included within the scope of landscape justice. They are committed to establishing a more organic and sustainable ecological-landscape synergy system.

The stakeholder analysis not only provides a clearer understanding of how different groups in various regions prioritize different values but also offers guidance for subsequent spatial design. Another insight from this analysis is that the current trend of disordered and utilitarian regional development is rooted in China's unique agricultural production decision-making system, where the dominance of "Developers" and "Realists" plays a key role. This structure increasingly views agricultural space as a mere accumulation of economic numbers, where production efficiency and land utilization become the sole standards of measurement. Meanwhile, dimensions like "harmonious coexistence" and "landscape culture," which are difficult to quantify, are continually marginalized. The landscape within the flood retention area is perceived as expendable buffer space, making it difficult to effectively maintain its system and continuity.

At the same time, management-oriented stakeholders in the flood retention area, such as the "Protector" groups, are extremely sensitive to flood safety and have clear responsibilities. However, they often lack long-term attention to ecological and landscape values. Due to institutional performance evaluation pressures, these

Fig.2.13. Stakeholder group and their value focus

stakeholders tend to focus more on executing functional, responsive tasks rather than systematically planning and improving the overall spatial quality of the flood retention area.

It is worth noting that those who truly care about ecological and landscape values, the "Landscape Enthusiasts," are either "silent stakeholders," such as plants, animals, and endangered habitats, or they exist outside the JRFSA system, such as ecological and environmental departments at the municipal or provincial levels. The landscape-ecological values they represent have not yet been effectively translated into locally perceivable economic benefits, nor can they form sufficient bargaining power within the existing power structure.

Therefore, to break this structural imbalance, a higher-level coordination mechanism is needed to connect the governance channels of the JRFSA with those at the municipal and provincial levels. This would facilitate the conversion of landscape and ecological resources into new economic drivers by linking them with emerging industries such as tourism, cultural creation, and education. Such a transformation would not only enhance the local residents' sense of belonging to their home environment but also encourage non-local residents and the broader river basin society to re-evaluate the real flood risks, thereby restoring respect for and understanding of natural laws. This may be the key path for the future sustainable development of the flood storage area.

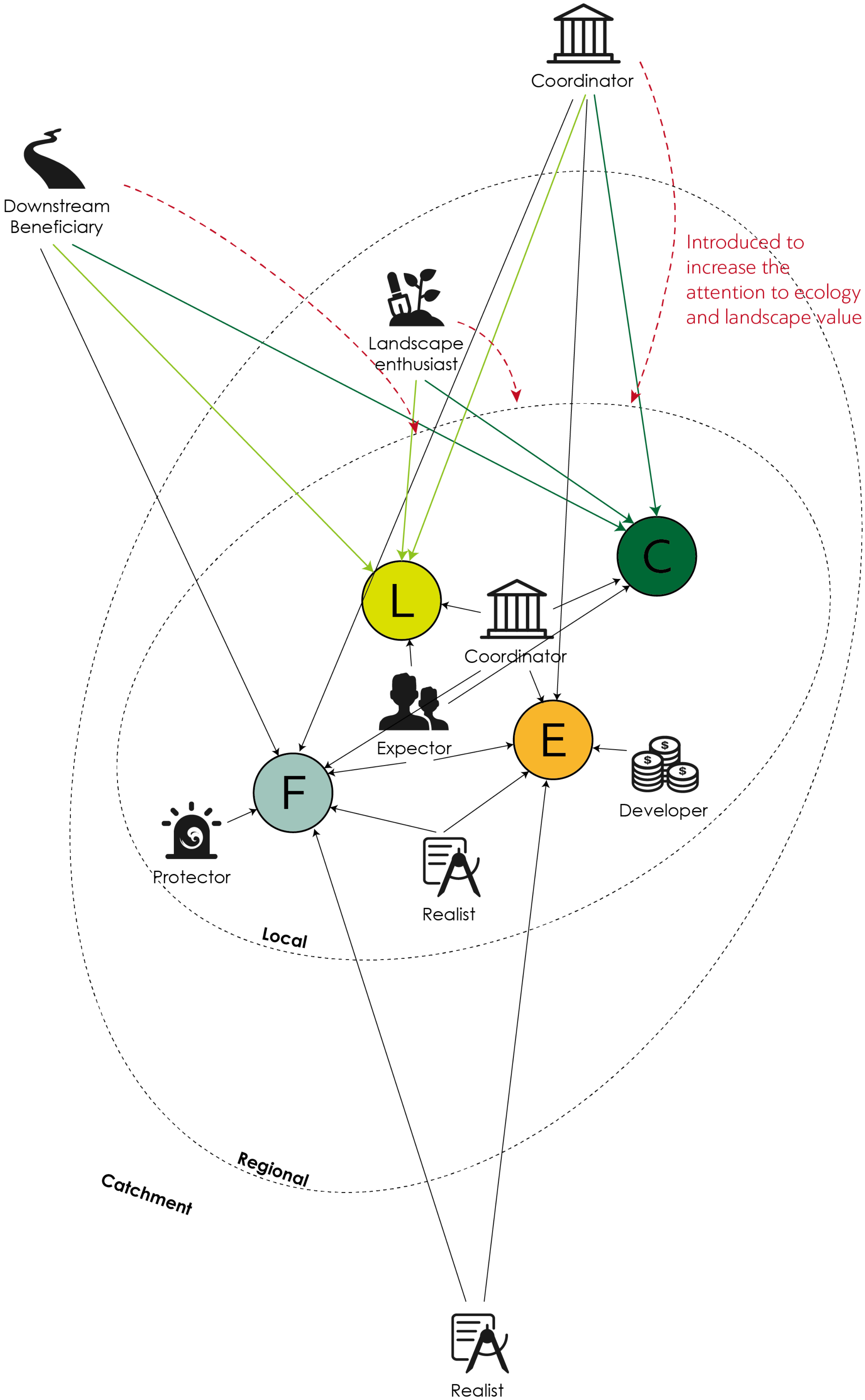


Fig.2.14. Stakeholder group and their value focus

STAKEHOLDERS	LOCATION	POWER	INTEREST	ATTITU Econom
Hubei Provincial Government	Catchment	+++	+	++
Wuhan City and other major downstream cities	Catchment	+++	--	---
Commercial banks	Catchment	++	++	+++
Gong'an County Government	Local	++	+++	++
Urban residents in JRFSA	Local	--	-	+
Agricultural individual contractors	Local	---	++	+++
Agricultural company contractors	Local	--	++	+++
Agricultural product processing enterprises	Local	-	++	+++
Residents of safety platforms in JRFSA	Local	---	+	++
Local non-agricultural enterprises	Local	+	-	+++
Local farmers	Local	---	+++	++
Flood Control and Drought Relief Headquarters	Local	++	+++	---
Gong'an City Fire and Rescue Brigade	Local	-	+	---
Vulnerable groups	Local	---	+++	--
Jingjiang Flood Retention Area Project Management Bureau	Local	++	+++	--
Agricultural cooperatives	Local	+	+++	+++
Jingzhou Municipal Government	Neighbor	++	--	+
Flora and Fauna	Local	---	+++	---
Jingzhou Ecological and Environmental Bureau	Neighbor	++	++	---

Table.2.1. List of stakeholders

DE Towards ...ic Profiting	ATTITUDE Towards Flood Prevention	ATTITUDE Towards Ecological Value	ATTITUDE Towards Landscape Value	ROLE
	+	++	++	Coordinator
	+++	++	++	Downstream Beneficiary
	+++	---	-	Realist
	++	+	++	Coordinator
	+++	+	++	Coordinator
	-	---	---	Developer
	--	---	---	Developer
	+	--	--	Developer
	-	-	+	Developer
	+	---	---	Developer
	++	+	+	Expecter
	+++	-	-	Protector
	+++	--	--	Protector
	+++	+	+	Protector
	+++	+	-	Protector
	++	--	---	Realist
	-	+++	+++	Landscape Enthusiast
	---	+++	+++	Landscape Enthusiast
	-	+++	++	Landscape Enthusiast

Landscape ethusiast: Neglected and located off site

DESIGN ASSIGNMENT - TOWARDS A NEW EQUILIBRIUM

Proposal

The primary objective of this design is to reestablish a balanced, adaptive relationship between flood dynamics and human occupation within the JRFSA. For decades, policy and development have favored a fixed, non-flooding paradigm, disrupting the historical flood–agriculture–landscape rhythm and accelerating ecological degradation, social fragmentation, and a loss of risk awareness.

Drawing on my academic exploration at TU Delft, I have become increasingly interested in how landscape structures can be designed not only as spatial solutions but as mediators in complex hydro-social systems. Informed by the concept of "Cascading Floodspace," this project proposes a re-layered flood landscape composed of multiple adaptive zones, each capable of responding differently to varied flood intensities.

Inspired by the historical Weiyuan systems and low-tech infrastructures of the Jianghan Plain, the design envisions a gradual transition from rigid dichotomies—open or closed—towards a nuanced system of spatial gradients. These gradients support diverse agricultural models, ecological retention, flood mitigation, and cultural re-engagement. Water, in this vision, is not a threat to be excluded, but a seasonal actor shaping landscape productivity, awareness, and meaning.

Through this proposal, I aim to offer a resilient landscape framework that enables multiple futures—where ecological value, risk distribution, and rural identity can co-evolve with the unpredictability of water.

Goals

At the beginning of the design process, it is crucial to establish a consistent value system that is reflected across different levels. The values that the design aims to achieve at various layers are of utmost importance. The design is structured around four core dimensions: **Agriculture, Flood Prevention, Ecology & Pollution, and Landscape/Tourism/Awareness**. Each dimension is paired with specific design goals that guide and assess whether the future proposal meets the intended design expectations. These four core dimensions correspond to the values of Flood Prevention, Economic Profiting, Ecological Value, and Landscape Value, respectively.

Flood Prevention (FL)

Has the multi-level zoning and functional gradient design within the flood retention area been achieved?
Does the design provide a third or multiple operational strategies beyond "open/close"?
Has space been reserved at a larger scale for the system's response and expansion in future extreme events?

Agriculture (AG)

Has the design introduced agricultural types adapted to different flooding frequencies?
Does the design reflect the coupling of farmland, water systems, and topographical structures?
Has reliance on high input been reduced?
Has the design enhanced the local community's autonomy in land use and diversified strategies?

Ecology & Pollution (EP)

Has the design introduced a diversified ecosystem based on hydrological rhythms?
Has a mechanism been established to mitigate agricultural pollution?

Landscape / Tourism / Awareness (LTA)

Has the design incorporated accessible landscape paths, display nodes, and educational spaces related to the flooding process?

Has the design provided landscape experiences across multiple seasons and states?
Has the design introduced elements of flood history or cultural features to enhance the local landscape identity?
Has the design strengthened the perception and understanding of flooding mechanisms among visitors/residents?

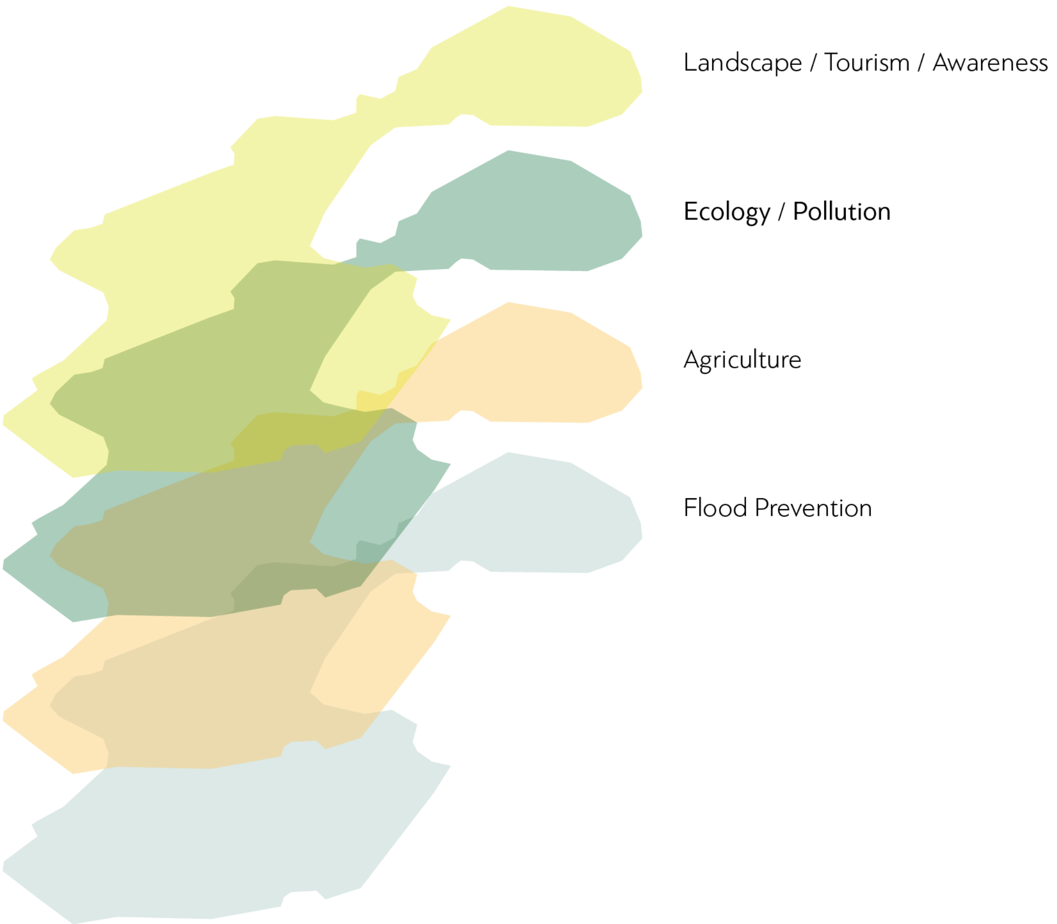


Fig.2.15. Four design parts

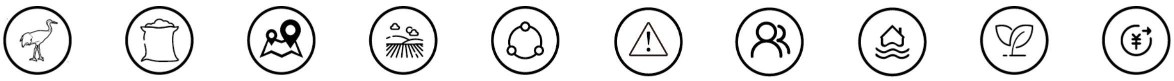
Framework of the Components

A framework of a flood-adapted diverse landscape in an experimental design area to [1] enhance the awareness of flood risks on the nexus between spatial planning, adaptive building management, and water management, thus stimulating the potential of local individual-level mitigation [2] create tiered flood storage space to establish better links with the flood prevention strategy and ex post compensation mechanisms, allowing a "middle step" to happen, [3] explore the possibility of agricultural production during the flood period and the spatial system of agriculture that corresponds to it.

WHAT HAPPENED?

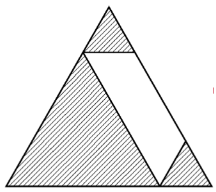
Disfunctional Flood Storage Area

WHY?



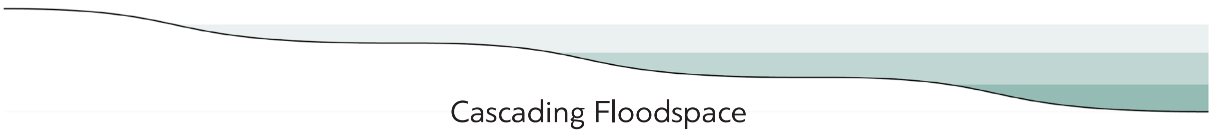
Ten issues

which caused by ...



Unbalanced Triangle

HOW TO SOLVE?



Cascading Floodspace

which consisted of ...

Flood Prevention (FL)
Agriculture (AG)
Landscape / Tourism / Awareness (LTA)
Ecology & Pollution (EP)

New York Central Park, US

Beemster, Netherlands

Design scale
Basin 2, China

Management scale
Jing River Flood Storage Area, China

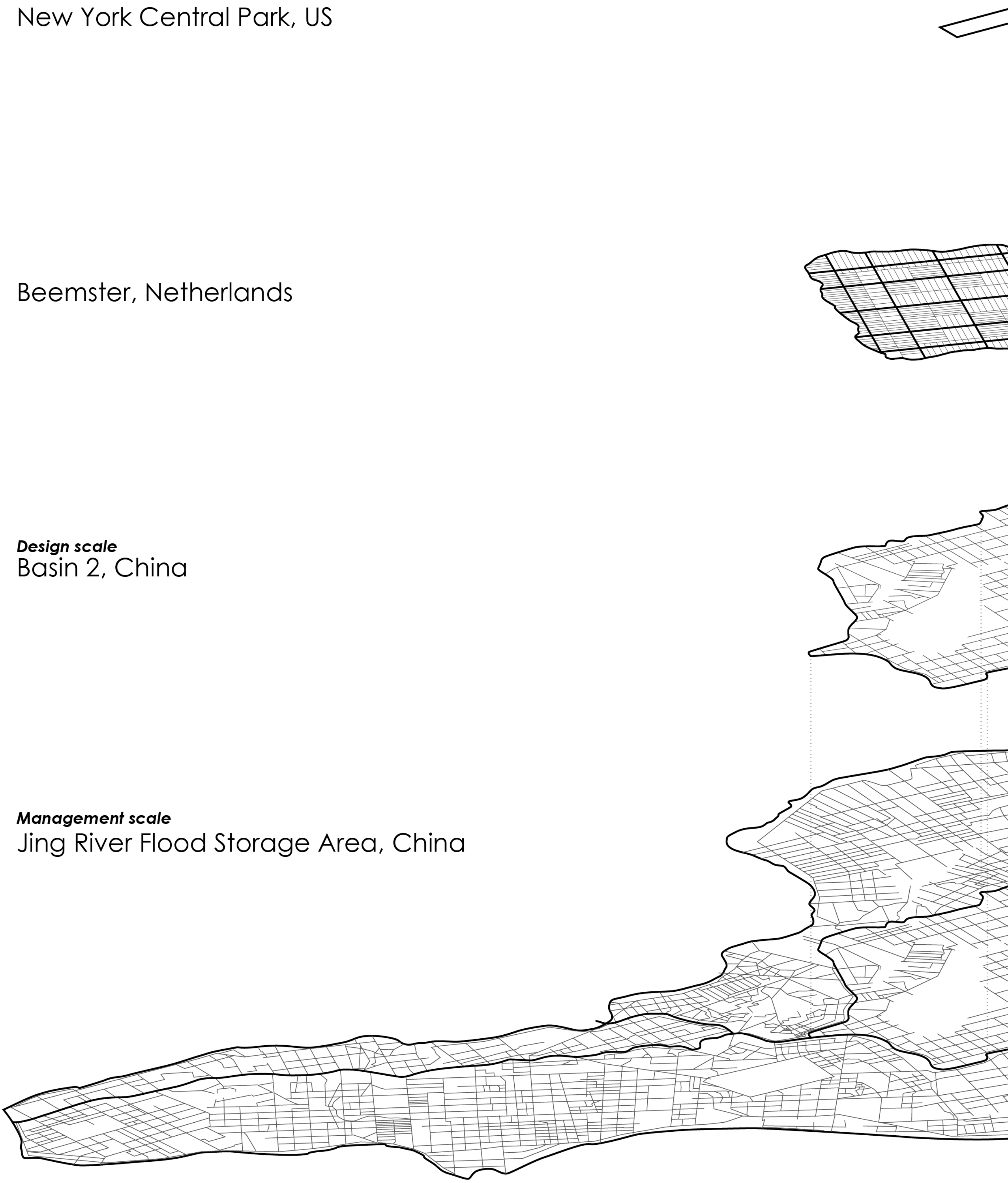
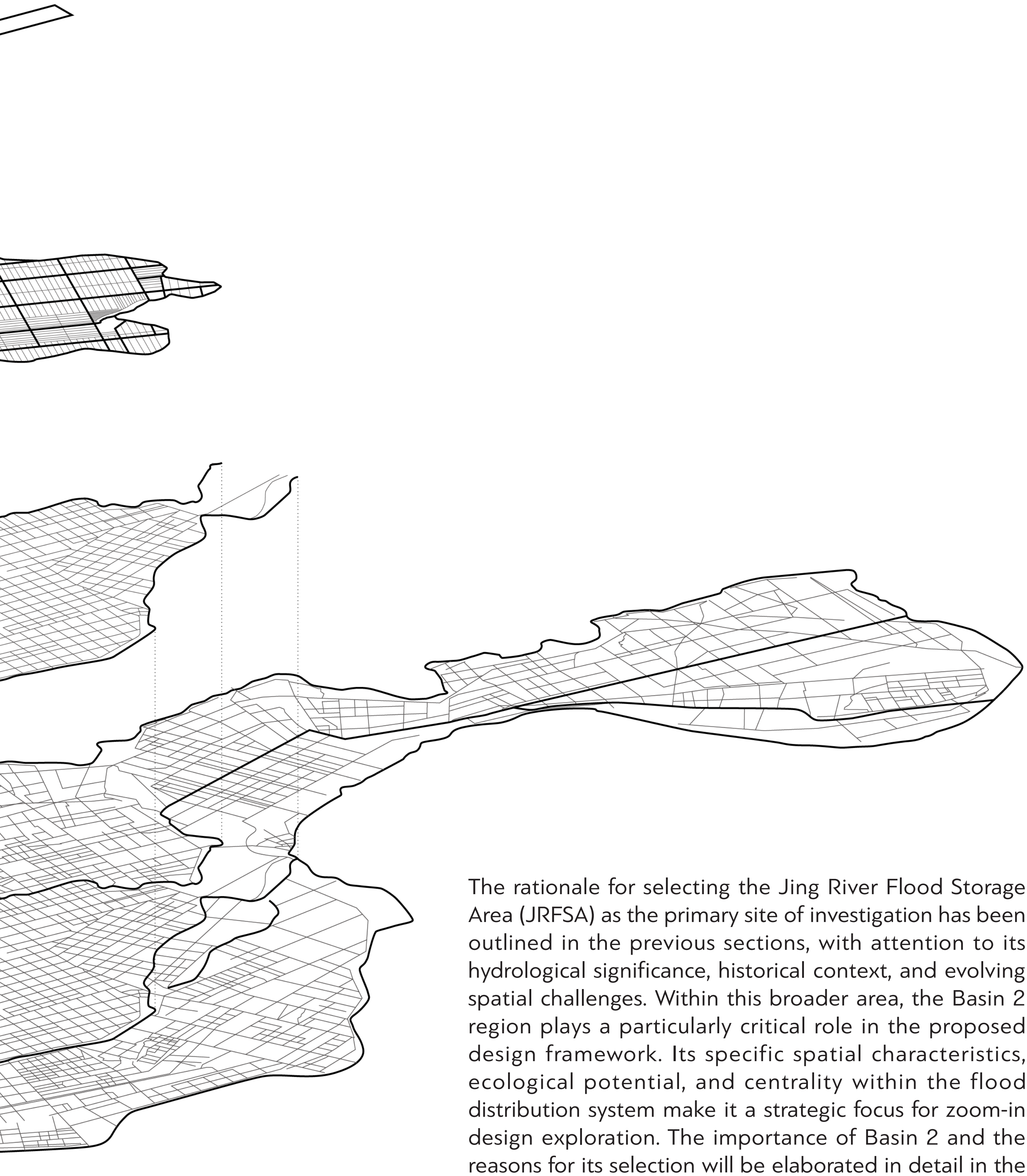
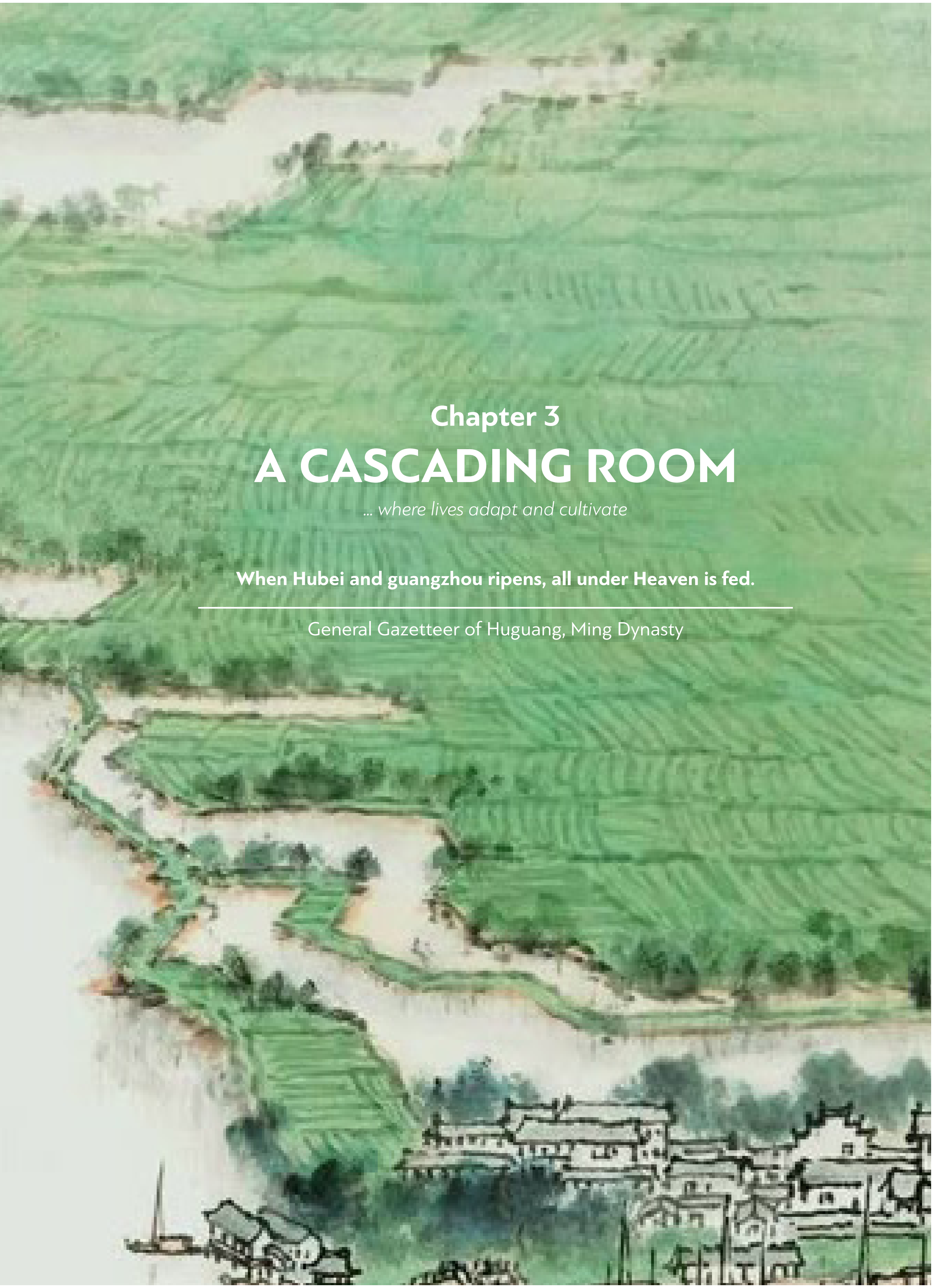


Fig.2.16. Scale of the project



The rationale for selecting the Jing River Flood Storage Area (JRFSA) as the primary site of investigation has been outlined in the previous sections, with attention to its hydrological significance, historical context, and evolving spatial challenges. Within this broader area, the Basin 2 region plays a particularly critical role in the proposed design framework. Its specific spatial characteristics, ecological potential, and centrality within the flood distribution system make it a strategic focus for zoom-in design exploration. The importance of Basin 2 and the reasons for its selection will be elaborated in detail in the following chapters.



Chapter 3

A CASCADING ROOM

... where lives adapt and cultivate

When Hubei and guangzhou ripens, all under Heaven is fed.

General Gazetteer of Huguang, Ming Dynasty

DESIGN PRINCIPLES

Design Parts

This design, based on the core concept of Cascading Floodspace, transforms the JRFSA from a single, integrated flood control area into a multi-layered, highly adaptive composite floodplain landscape system. The design constructs the overall spatial logic based on four Design Parts: **Flood Prevention (FL)**, **Agriculture (AG)**, **Ecology & Pollution (EP)**, and **Landscape/Tourism/Awareness (LTA)**. These four parts do not exist independently; rather, they are superimposed within the entire site structure and hydrological context, influencing and interacting with each other. They serve as the foundational modules that form the symbiotic relationship of the entire system.

Flood Prevention (FL) is responsible for graded responses to different intensities of flooding, from annual natural inundation to once-in-a-century catastrophic flood peaks. Each level has its specific flood storage logic and regulation mechanisms.

Agriculture (AG) builds adaptive agricultural models ranging from natural and composite types to high-yield types, based on the frequency of flood interference. It also carries the dual demands of rural economy and landscape culture.

Ecology & Pollution (EP) focuses on ecological processes and pollution regulation, using sediment collection, nutrient cycling within agriculture, and wetland systems to restore ecological functions and buffer pollution.

Landscape/Tourism/Awareness (LTA) emphasize landscape accessibility, cultural awareness, and public participation, reconnecting people with floods and the site through landscape narratives, transforming landscape and ecological values into some economic value, thereby meeting the needs of local stakeholders.

Cascading Layers

Based on this logic, the design draws inspiration from the Indigenous water system—Weiyuan System's water management wisdom—and divides the entire

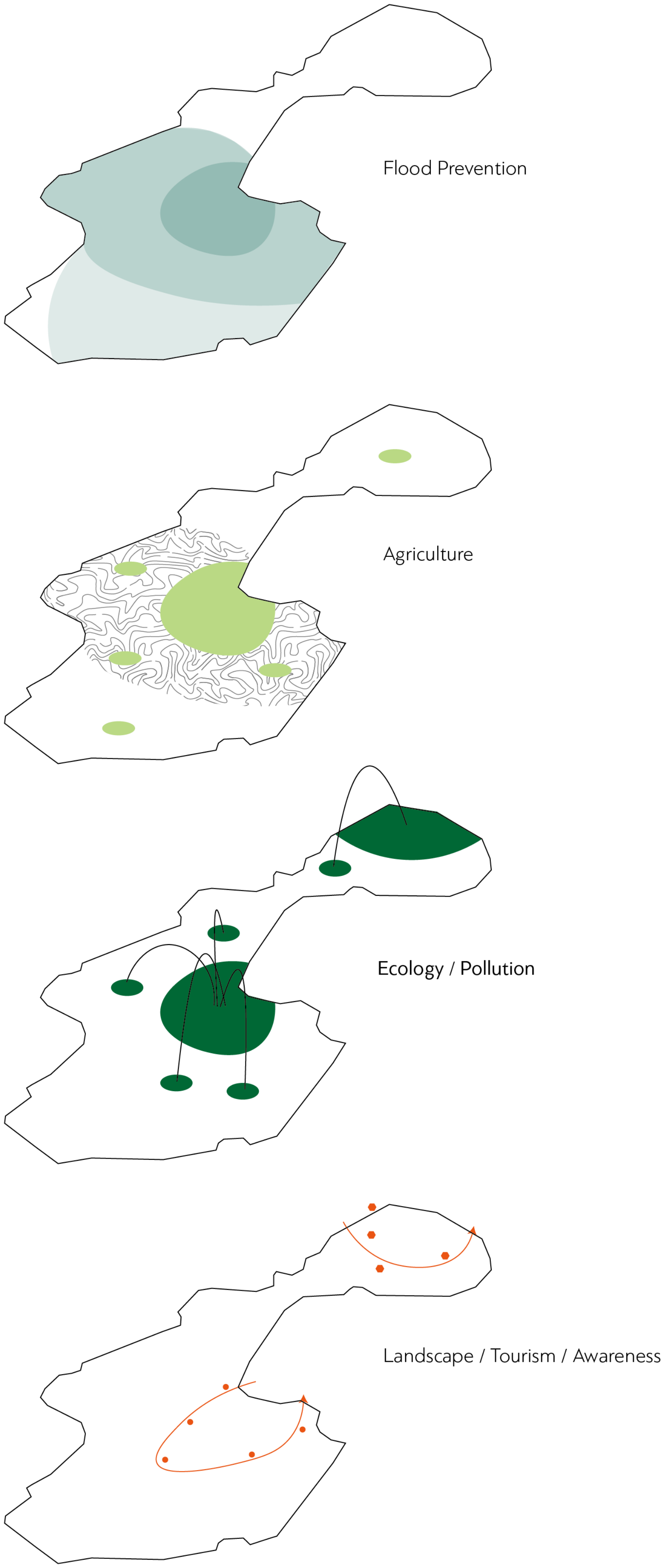


Fig.3.1. Design Principles of four design parts

flood storage area into three interconnected spatial levels. Each level corresponds to different flood frequencies, spatial roles, and design responses:

Ecological Base Layer

This is the area most frequently affected by flooding within the flood storage zone, designed to adapt to the **annual flood** rhythm.

FL: As the hydraulic entry point of the entire system, this layer prioritizes directing flood peaks into the area to relieve pressure upstream, and serves as a diversion platform for floodwaters to transition to other gradient layers.

AG: This layer utilizes wild, ecological farming forms, such as fish ponds, wetland grass combined with livestock farming, and other low-intervention production modes. It ensures livelihoods while enhancing land resilience.

EP: Acting as a flood sediment collection area, this layer uses herbaceous plants and water systems to transfer nutrient-rich sediment, which is then converted into green fertilizer for use in upper agricultural areas.

LTA: The floodplain wetlands and wild water bodies form a unique landscape, combining ecological education and aesthetic value, helping to enhance the public's understanding of floods as a natural process.

Agricultural Adaptation Layer

This area is designed to carry floods with **a frequency of once every ten to one hundred years,** while also serving as the main agricultural production zone during non-flood years.

FL: In moderate flood scenarios, this layer provides secondary flood retention functions and ensures that communities located on raised embankments above the agricultural areas and along roads can live safely during floods.

AG: The agricultural system here is designed to be adaptive, with flood-resistant rice cultivation, aquaculture rotations, and temporary pumping mechanisms, enabling the agricultural activities to recover quickly after flooding.

EP: Wetland parks are preserved as regional ecological bases, promoting the return of flora and fauna and reconnecting ecosystems. The fertilization system primarily relies on green fertilizers to prevent pollution accumulation.

LTA: While the level of landscape participation is lower than in the first layer, wetland nodes can serve as supplementary spaces for community leisure and education.

Inhabited Buffer Layer:

This layer is designed to adapt to extreme flood scenarios with **a frequency of once every one hundred to one thousand years**. It is the final and most critical buffer zone within the flood system.

FL: This layer is activated in extreme cases when other layers cannot mitigate the flooding. It has the largest flood retention capacity but typically remains in a "reserve" state.

AG: Mature agricultural systems are developed here, focusing on local staple crops such as rice and cotton. Infrastructure is enhanced to strengthen protection and recovery mechanisms.

EP: The focus is on green infrastructure such as embankment slope protection and vegetated green belts along channels. Green fertilizers from the Ecological Base Layer are introduced to reduce pesticide use intensity and strengthen soil and water conservation functions.

LTA: The historical flood management infrastructure is preserved and repurposed as a flood memory and educational base. Cultural landscape nodes are created to strengthen the public's understanding of flood history and the operational mechanisms of the system.

Design Part

FLOOD PREVENTION

Current Situation

The Jing River Flood Storage Area (JRFSA) is located in the transitional zone of the middle and lower reaches of the Yangtze River and is one of the key nodes in the Yangtze River flood control system for flood storage and regulation. This area plays a critical role in alleviating upstream flood peak pressure and reducing flood risks in the middle and lower reaches of downstream cities. Its total flood storage capacity is 5.4 billion cubic meters, accounting for 8.9% of the total capacity of the 14 flood storage areas along the middle and lower Yangtze River. (Yin, 2008) In specific flood scenarios, the activation of the Jing River Flood Storage Area can effectively mitigate the impact of flood peaks from the watershed on downstream regions.

The hydraulic system within the region has seasonal conversion capabilities, with its irrigation and flood storage functions switching between each other over time. During normal periods, the region's irrigation network primarily relies on two main channels: the County Main Canal and the Dongqing River, which run in a north-south direction. These channels, along with their tributaries, form a relatively complete networked irrigation pattern. During flood storage and regulation periods, the Jingjiang North Gate serves as the main inlet, guiding floodwaters from the northern part of the region. The floodwaters then gradually expand from north to south, eventually being discharged through the Jingjiang South Gate at the southern end. According to historical simulation data, the entire flooding process takes approximately 130 hours (Xie, 2011), with different sections of the area entering the flood storage state in stages, presenting a clear spatial progression.

The topographical conditions have a decisive influence on the water storage path and functional division of the Jingjiang Flood Storage Area. The overall terrain of the region is relatively flat, with higher ground in the north and lower ground in the south. The central and southern parts have several relatively low-lying areas suitable for flood retention and sedimentation. The southwestern part is influenced by hills and ridges, where the terrain is slightly undulating, but it does not significantly disrupt the overall water storage pattern. Additionally, the long-term water flow deposition along the two main channels has formed relatively raised natural embankments, further dividing the internal spatial structure on a micro-topographic scale, providing a fundamental topographical basis for differentiated flood storage zoning design.

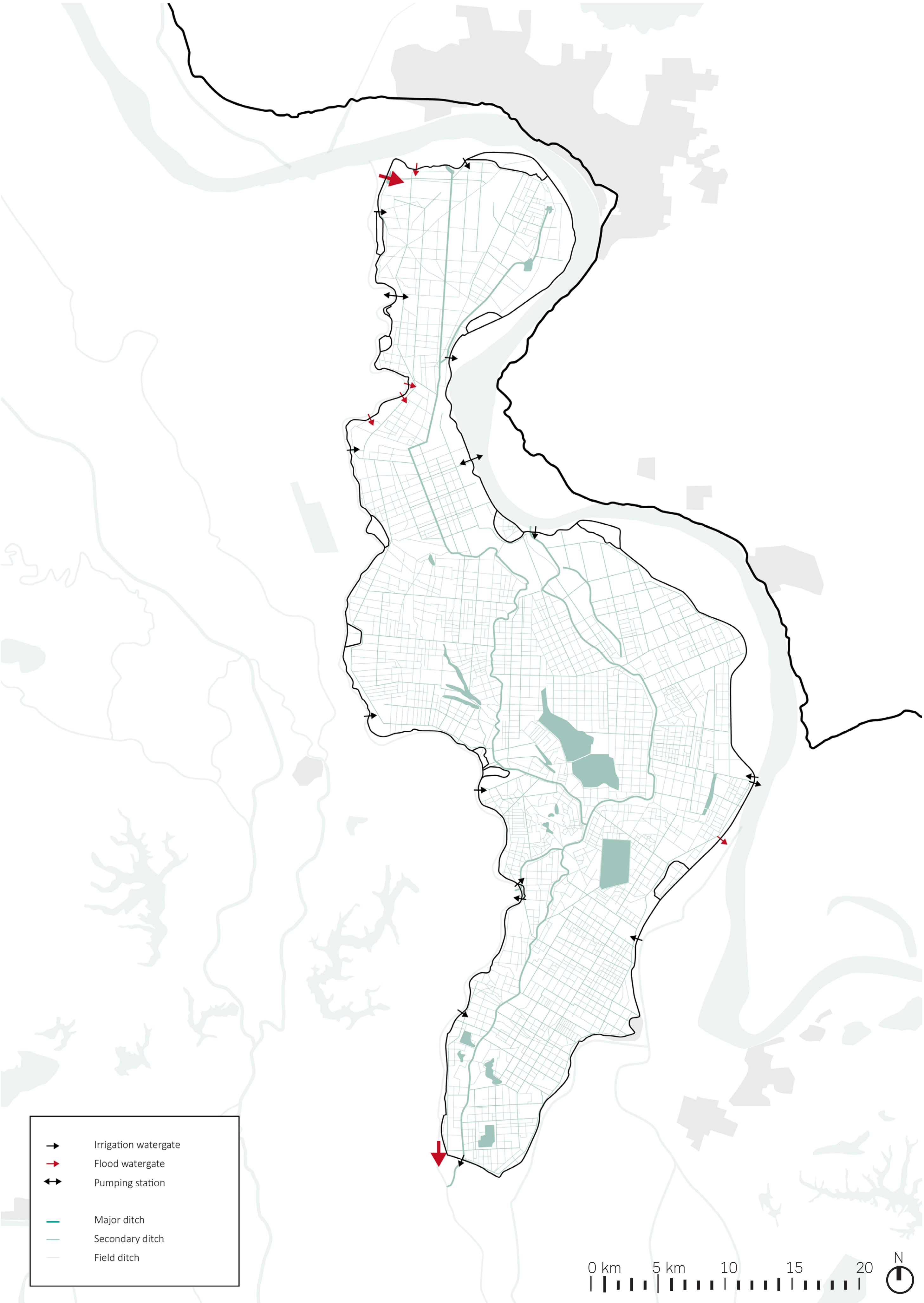


Fig.3.2. Existing Water system

Flood scenario and water level

The flood prevention design of the Jingjiang Flood Storage Area (JRFSA) needs to be based on a thorough understanding of the temporal and spatial distribution characteristics of flooding in the Yangtze River Basin, especially under the context of dramatic changes in flood peak water levels. The flooding process in the middle Yangtze River is mainly influenced by the typical subtropical monsoon climate, which is concentrated during the Meiyu and typhoon seasons from July to August. During this period, extreme flood events can last up to a month. This time frame not only represents the peak period for regional rainfall but also the main period for flooding caused by the combination of upstream runoff and regional rainfall.

Over the past two decades, the annual maximum flood peak water level in the Jingjiang section of the Yangtze River has fluctuated significantly, ranging from the lowest level of 31.44 meters (2015) to the highest of 37.77 meters (2020). The 1998 catastrophic flood in history reached a peak water level of 40.30 meters, which, although it did not exceed the design elevation of about 46 meters for the Jingjiang levee, caused levee failure downstream, resulting in major casualties and economic losses.

To respond more effectively to different flood risk scenarios in the design, this article simplifies the flood water levels into five standard levels: the annual average flood peak low water level of 32 meters, the annual average flood peak high water level of 35 meters, the 10-year flood water level of 36 meters, the 100-year flood level of 40 meters. There is a lack of effective historical observation data to support the thousand-year flood, and its occurrence would require the entire Jingjiang Flood Storage Area to be fully activated, beyond the operational range of conventional flood prevention design; thus, it is only considered as a background in the actual design.

The submerged areas corresponding to different water levels vary significantly, posing challenges for the layered flood storage strategy of the region. When flood volume far exceeds local scheduling capacity, it is nearly impossible to

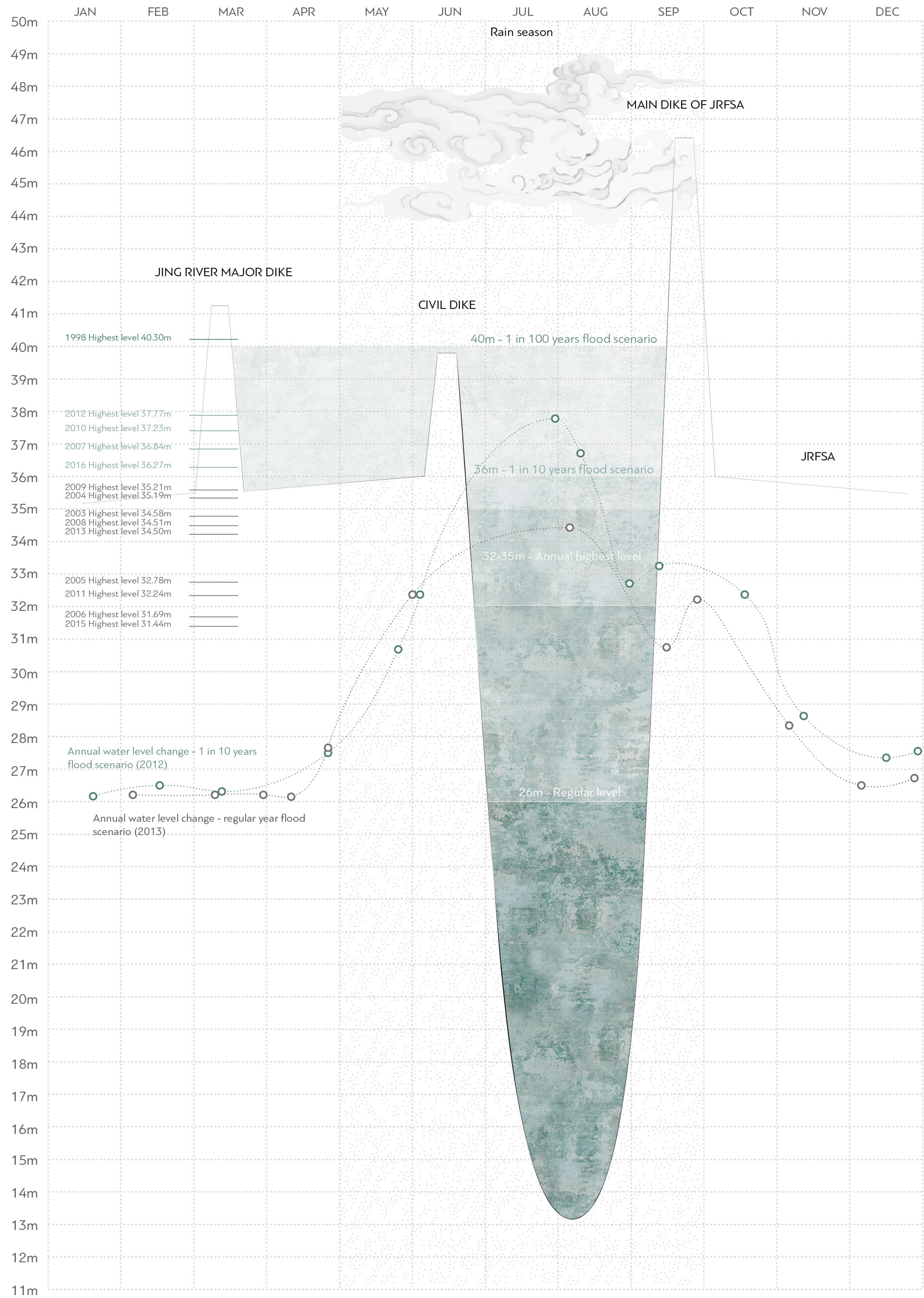


Fig.3.3. Flood scenario and water level

Fig.3.4. Terrain level according to flood scenario

transport water across elevations using dynamic pumping stations within this region. Therefore, the use of flood storage space must depend on the relationship between natural elevation and water levels. For example, the average ground elevation in the northern part of the Jingjiang Flood Storage Area is higher than 36 meters, meaning that under the scenarios of annual average floods or 10-year floods, this area does not have effective flood storage capacity. Considering that this design requires further refinement of spatial responses under different water levels, continuing to use the northern gate as the main flood entry point is no longer practical. Therefore, in future designs, the location and function of the northern entrance should be adjusted in conjunction with the reconstruction of the regional flood storage mechanism to achieve a more precise and hierarchical flood control strategy.

Terrain Model

The realization of the "Cascading Floodspace" concept relies on effective spatial layering and graded management, which is based on a precise understanding and reasonable generalization of the topographical pattern. In the Jingjiang Flood Storage Area, where the terrain generally has little undulation but notable local variations, how to divide the area is the core issue in the spatial control strategy. To preserve the existing landform structure to the greatest extent and minimize ecological and social disturbances caused by human intervention, this study uses the natural sedimentary raised areas (i.e., natural embankments) on both sides of the large artificial channels as the basis for initial zoning. It is important to note that although the main channels have the potential to guide sediment deposition and form raised terrain, not all sections exhibit significant embankment features. This study employs high-precision topographic data, combined with channel distribution and hydrological profiles, to define the boundaries of the embankments that effectively obstruct water flow.

Based on the above analysis, the Jingjiang Flood Storage Area can be divided into nine relatively independent topographical units. These units exhibit significant differences in terms of natural elevation, slope direction, and boundary closure. To simplify the analysis and design process, the design further categorizes these nine regions into the following four typical topographical models:

Basin: This type of region presents a "high all around and low in the center" closed form, with good water collection characteristics. When floods occur, water naturally converges toward the lowest point in the terrain, making it the ideal storage unit for water.

Ramp: This type of region exhibits a single-direction gradient decrease in elevation. When water enters from higher areas, the entire region will be exposed to water flow, quickly resulting in widespread flooding. However, when water enters from lower areas, it allows for gradient-based flood storage, which is beneficial for implementing a "tiered storage" strategy.

Highland: This type of region has a higher elevation compared to its surroundings, often forming local "island-like" water-blocking units. Although the area is limited, it plays an important role in flood control, acting as a barrier and division point, functioning as another form of embankment.

Ridge: Mainly found in the hilly and ridge areas in the southwest of the Jingjiang Flood Storage Area, this type of region is characterized by sharp elevation differences and irregular topographical distribution. Due to its complex terrain and limited ability to carry water, it is difficult to incorporate into effective flood storage units, making its practical value relatively low.

For the four types of terrain models mentioned above, the subsequent design will be based on a "multi-level response" framework, assigning different design levels and inundation sequences according to their natural characteristics, flood entry paths, and storage capacities. This terrain-based layered approach will allow for a more precise and operational spatial control and flood prevention strategy for the complex flood storage area.

Layers and Flood Sequence

In this study, to address the storage needs under diverse flood scenarios and implement the "cascading floodspace" grading design strategy, GIS tools were used to systematically analyze the terrain and spatial relationships within the Jing River Flood Storage Area. First, based on the water levels corresponding to different return period floods (such as average annual peak flood, 10-year flood, 100-year flood), the terrain units below those water levels in each subzone were identified. The potential storage volume was estimated by combining their area and average elevation. This analysis provides quantitative data on the maximum flood storage capacity for each segment under different water level scenarios, serving as an important reference for the subsequent design grading decisions.

Secondly, based on the existing terrain division, a hydraulic connection path network was further developed between the regions. This network, based on the elevation differences and adjacent relationships between the regions, simulates the shortest flood propagation paths across different levels. It ensures that under extreme water conditions, water flows will follow the designed paths, avoiding the crossing of high-value land or non-designated areas that could cause additional damage. Additionally, this step clarified the directionality and dependencies of potential flow paths, providing hydrological logical support for the construction of flood storage levels.

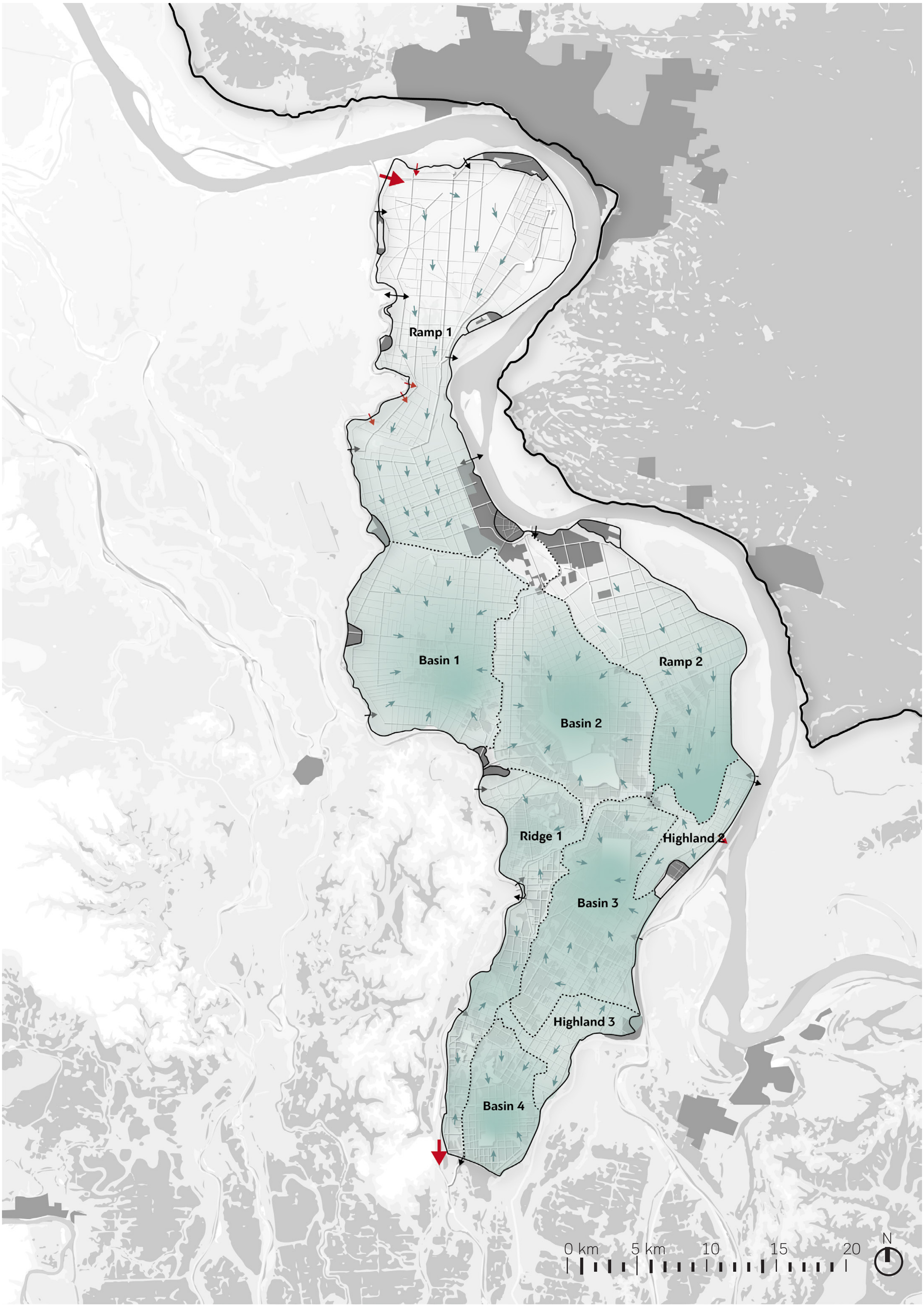
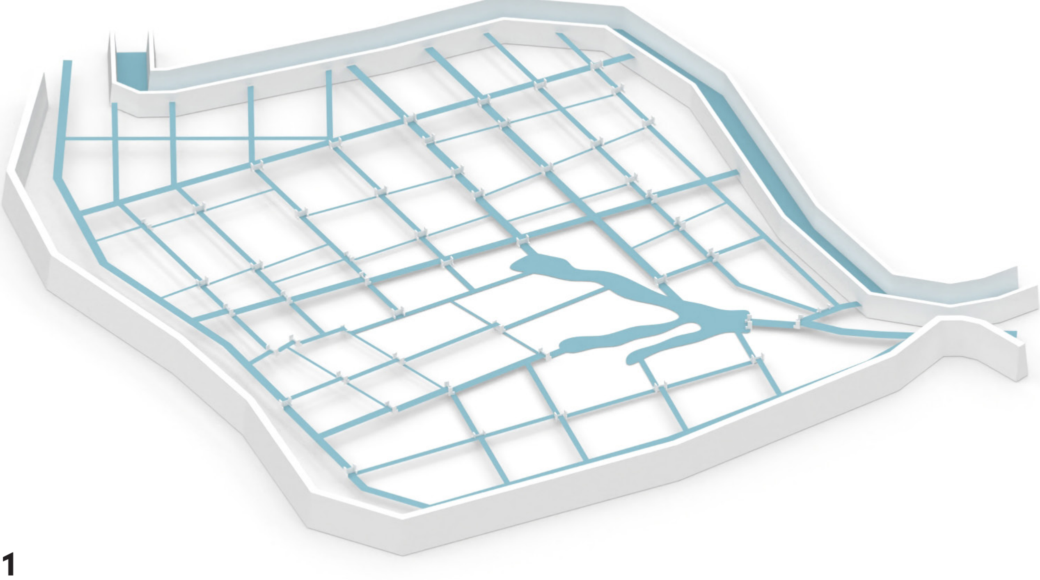
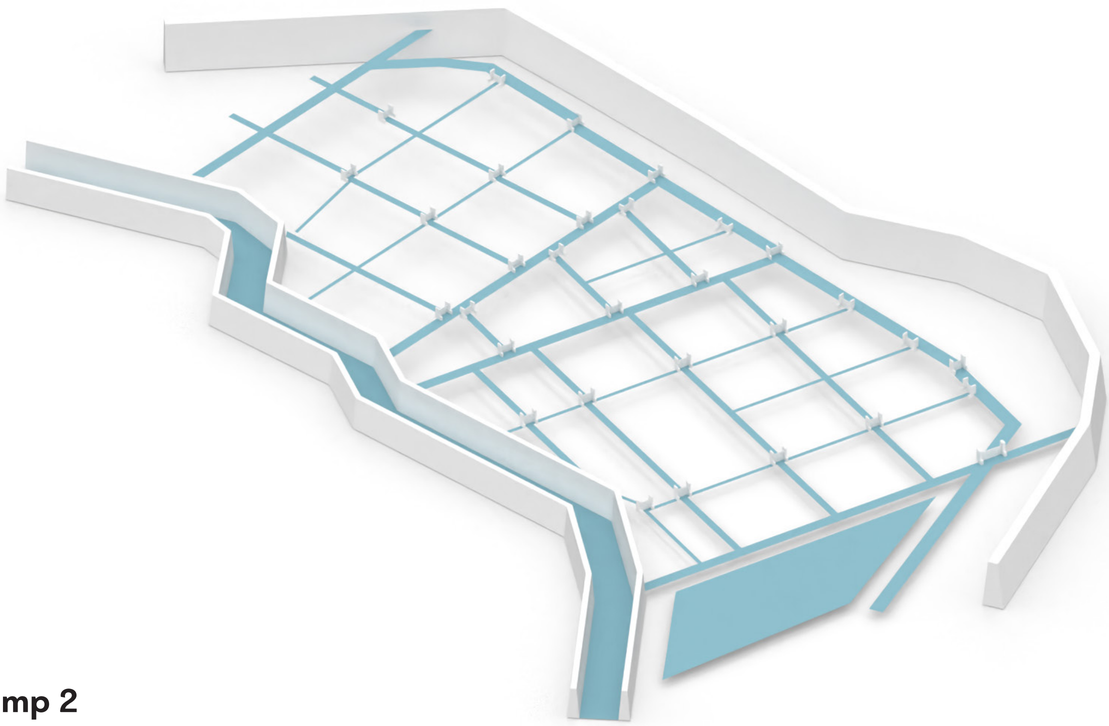


Fig.3.5. Terrain model map



Basin 1

A typical example of basin. This type of region presents a "high all around and low in the center" closed form, with good water collection characteristics. When floods occur, water naturally converges toward the lowest point in the terrain, making it the ideal storage unit for water.



Ramp 2

A typical example of ramp. This type of region exhibits a single-direction gradient decrease in elevation. When water enters from higher areas, the entire region will be exposed to water flow, quickly resulting in widespread flooding. However, when water enters from lower areas, it allows for gradient-based flood storage, which is beneficial for implementing a "tiered storage" strategy.

Fig.3.6. Example of terrain model

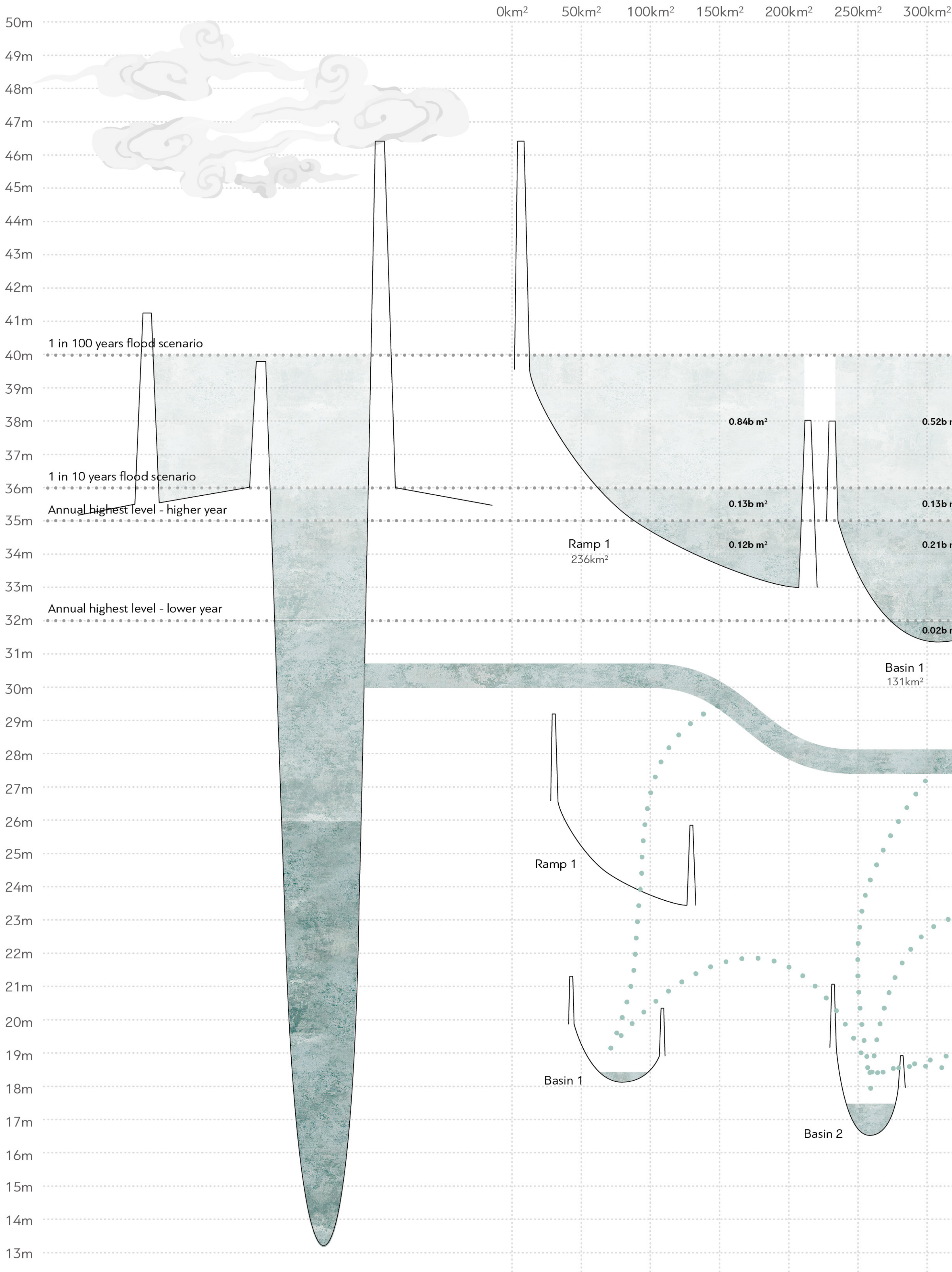
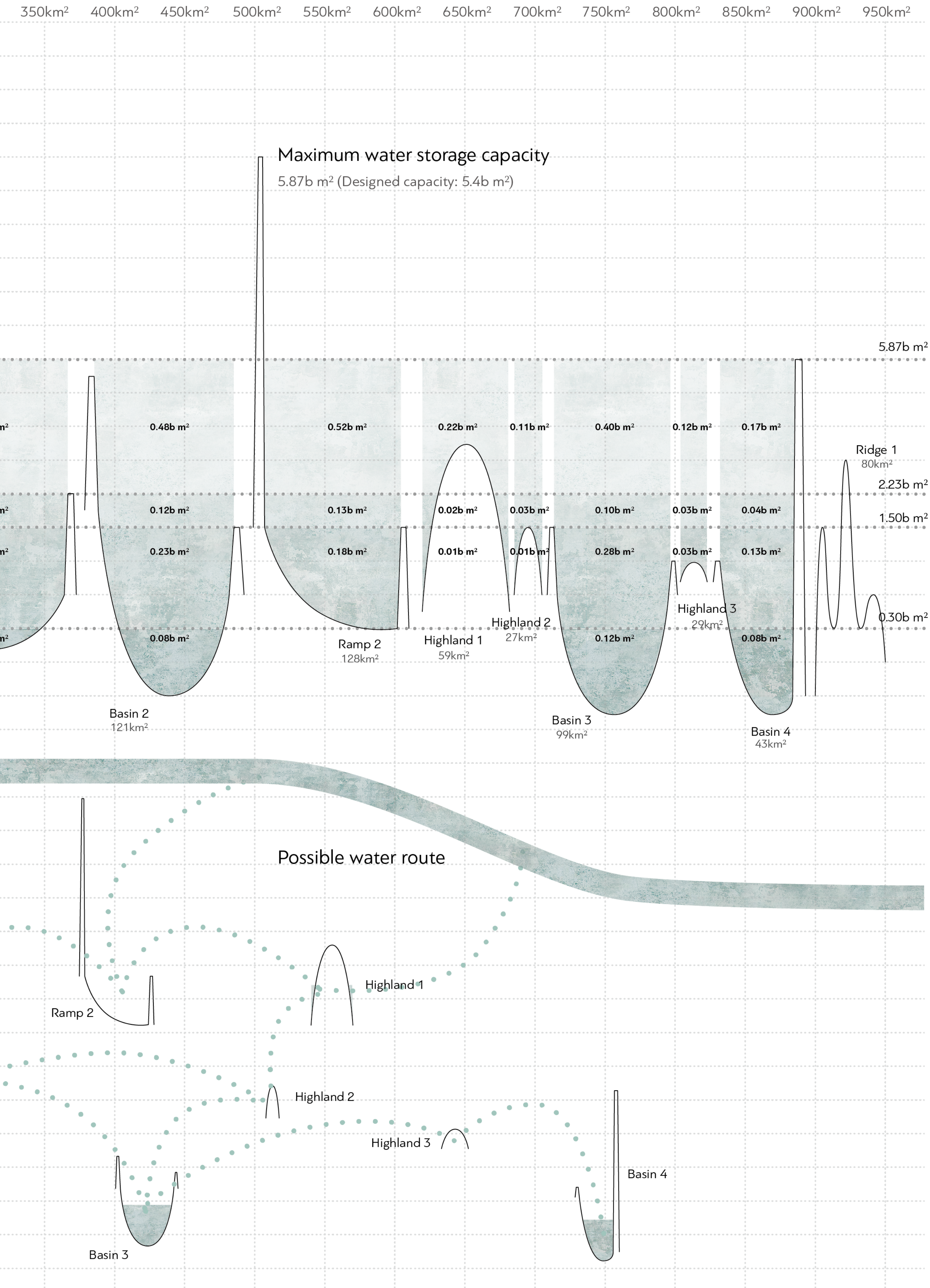


Fig.3.7. Terrain model storage capacity and potential route


350km²
400km²
450km²
500km²
550km²
600km²
650km²
700km²
750km²
800km²
850km²
900km²
950km²
Maximum water storage capacity
5.87b m² (Designed capacity: 5.4b m²)
5.87b m²
2.23b m²
1.50b m²
0.30b m²
0.48b m²
0.12b m²
0.23b m²
0.08b m²
0.52b m²
0.13b m²
0.18b m²
0.22b m²
0.02b m²
0.01b m²
0.11b m²
0.03b m²
0.01b m²
0.40b m²
0.10b m²
0.28b m²
0.12b m²
0.12b m²
0.03b m²
0.03b m²
0.17b m²
0.04b m²
0.13b m²
0.08b m²
Basin 2
121km²
Ramp 2
128km²
Highland 1
59km²
Highland 2
27km²
Basin 3
99km²
Highland 3
29km²
Basin 4
43km²
Ridge 1
80km²
Possible water route
Ramp 2
Highland 1
Highland 2
Highland 3
Basin 3
Basin 4

When allocating flood storage levels, this study adheres to the following three core principles:

1.Regions at lower levels must have the capacity to receive water under typical flood conditions (such as annual average peak floods or 10-year return period floods), ensuring stable ecological flood storage functions and landscape value.

2.When higher-level regions take on more extreme floods (such as 100-year return period floods or higher), their water entry paths must not cross over lower-risk areas that have not yet been inundated, ensuring the minimization of risks during the water spread process.

3.The selection of regions should balance natural topographical conditions with spatial connectivity, avoiding unnecessary engineering interventions.

Based on the above analysis, the 10 delineated terrain units within the Jing River Flood Storage Area have been divided into a four-level flood storage spatial system. The first level, the Ecological Sedimentation Layer, primarily absorbs annual floods and provides ecological wetland and landscape functions. The second level, the Agricultural Adaptation Layer, adapts to flood levels of 10-year return periods or higher, allowing for short-term, controlled inundation to minimize long-term disruptions to the production system. The third and fourth levels, the Settlement Protection Layer, are activated only in extreme flood scenarios (100-year return periods or higher), focusing on safeguarding existing settlements and infrastructure within the region.

Among these, **Basin2** has been identified as the main floodwater inlet for the site, with three significant advantages: (1) Its geographic location is close to the Yangtze River main channel, facilitating rapid floodwater inflow; (2) It is located in the central position of the entire flood storage area, providing favorable conditions for balanced floodwater diversion in multiple directions; (3) The internal terrain exhibits a typical basin shape, with low-lying, stable features, and possesses spontaneous water storage capacity under lower water level conditions, making it a naturally suitable primary floodwater buffer space.

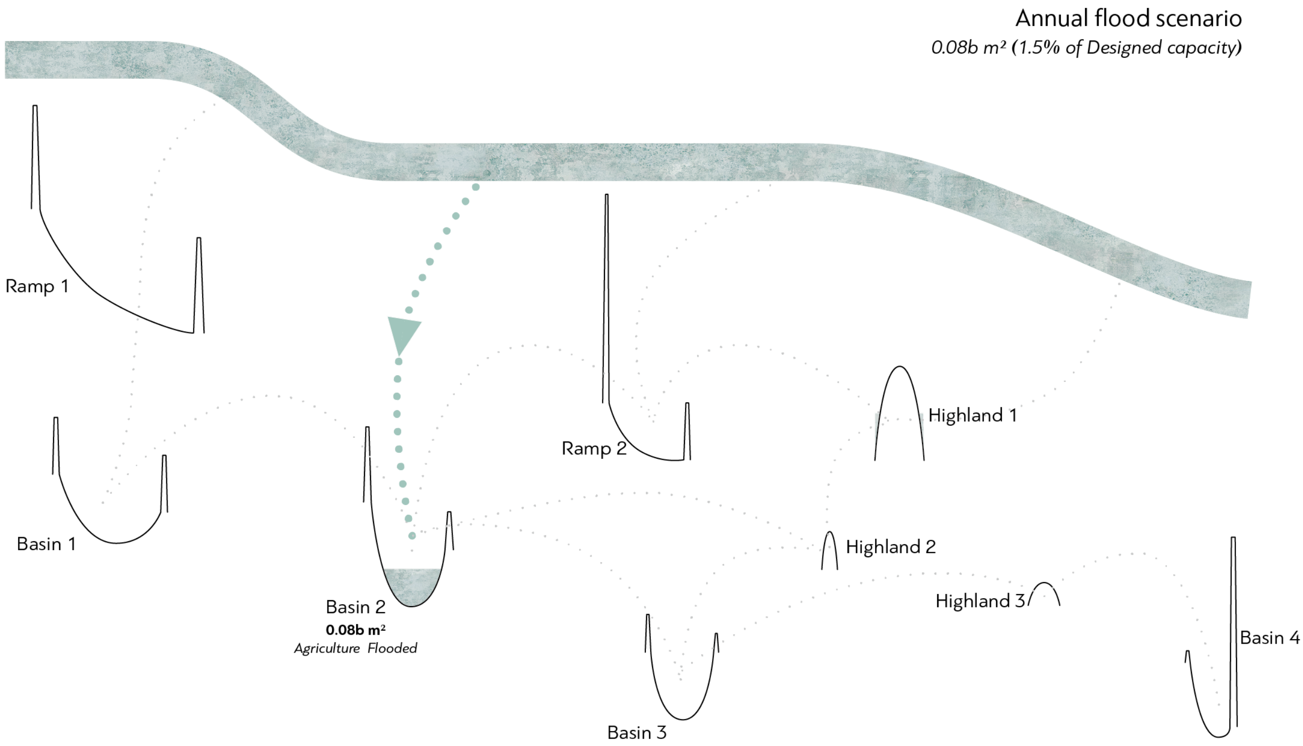
Based on the terrain characteristics and hydrological response relationships, the floodwater storage levels for the 10 areas are divided as follows:

First Level (Ecological Sedimentation Layer): Basin2

Second Level (Agricultural Adaptation Layer): Basin1, Ramp2

Third Level (Settlement Protection Layer): Highland1, Highland2, Basin3, Basin4

Fourth Level (Settlement Protection Layer): Ramp1, Highland3, Ridge1



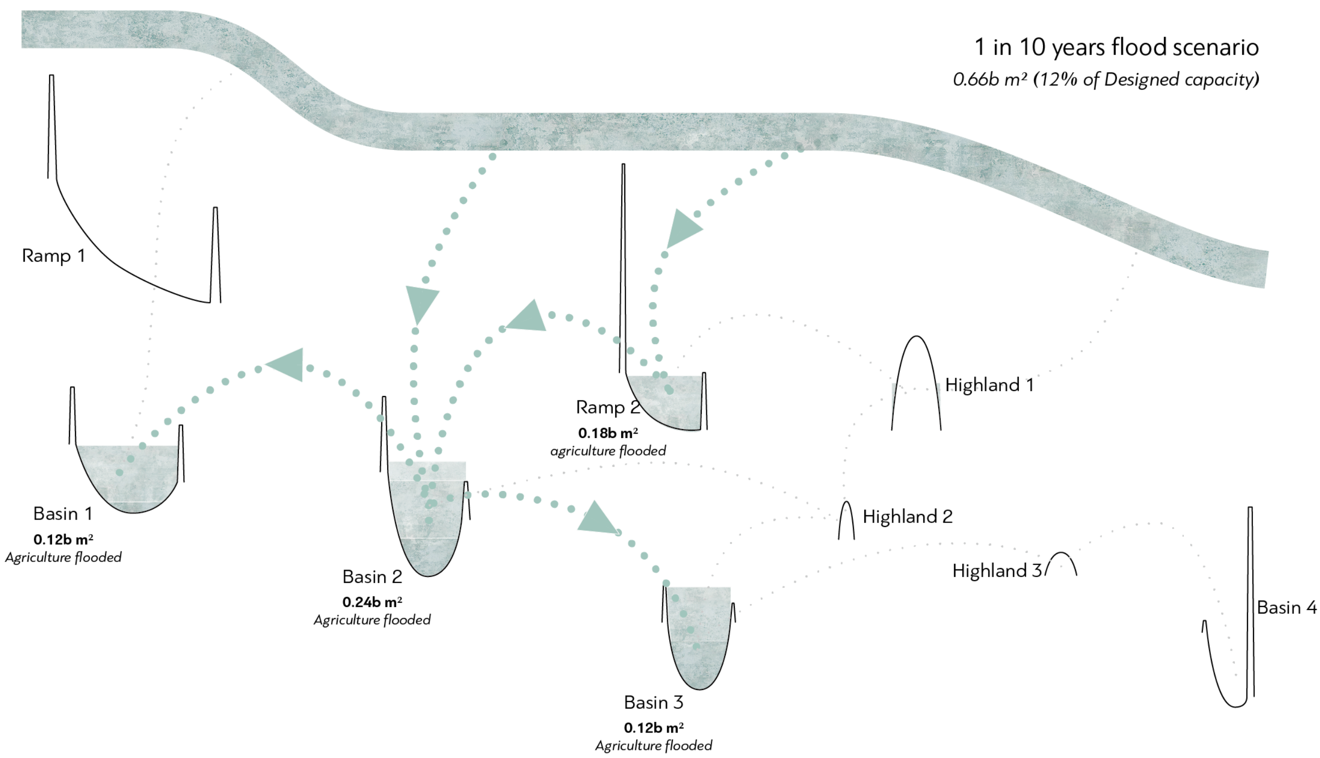
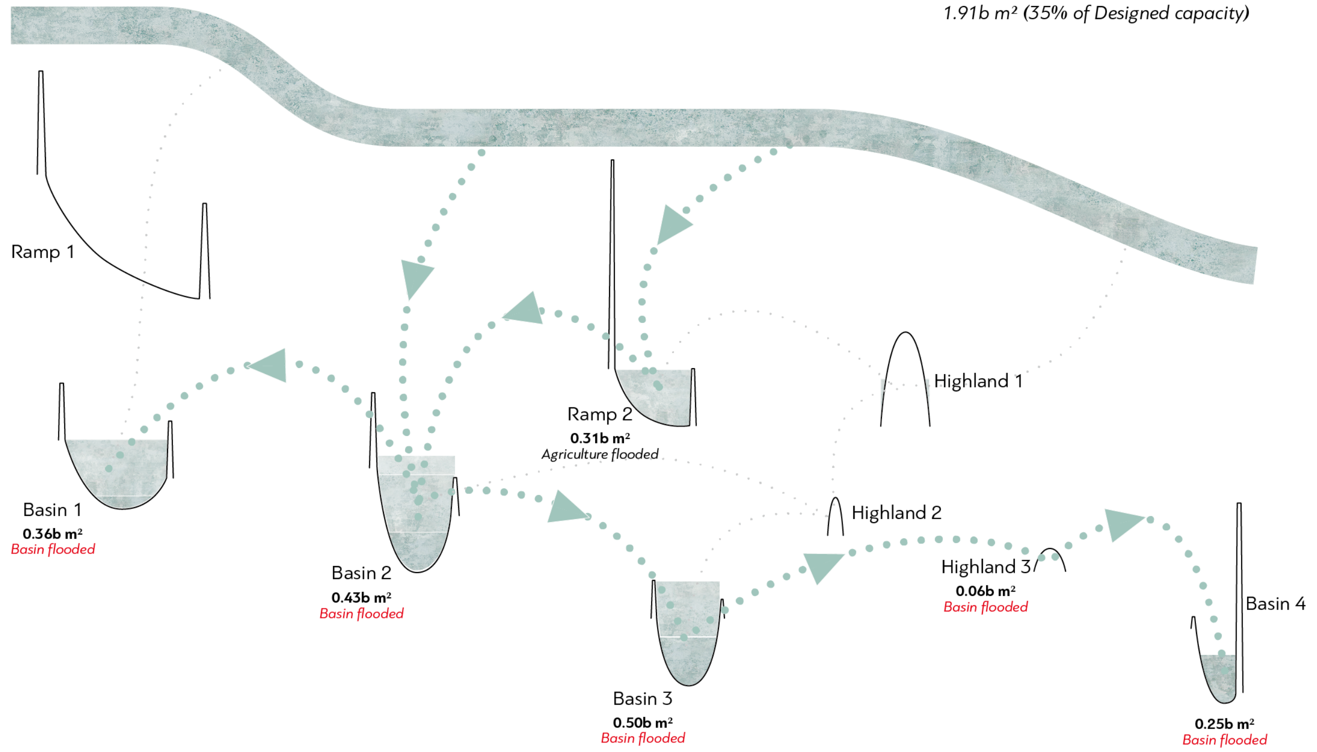


Fig.3.8. Flood water entry route

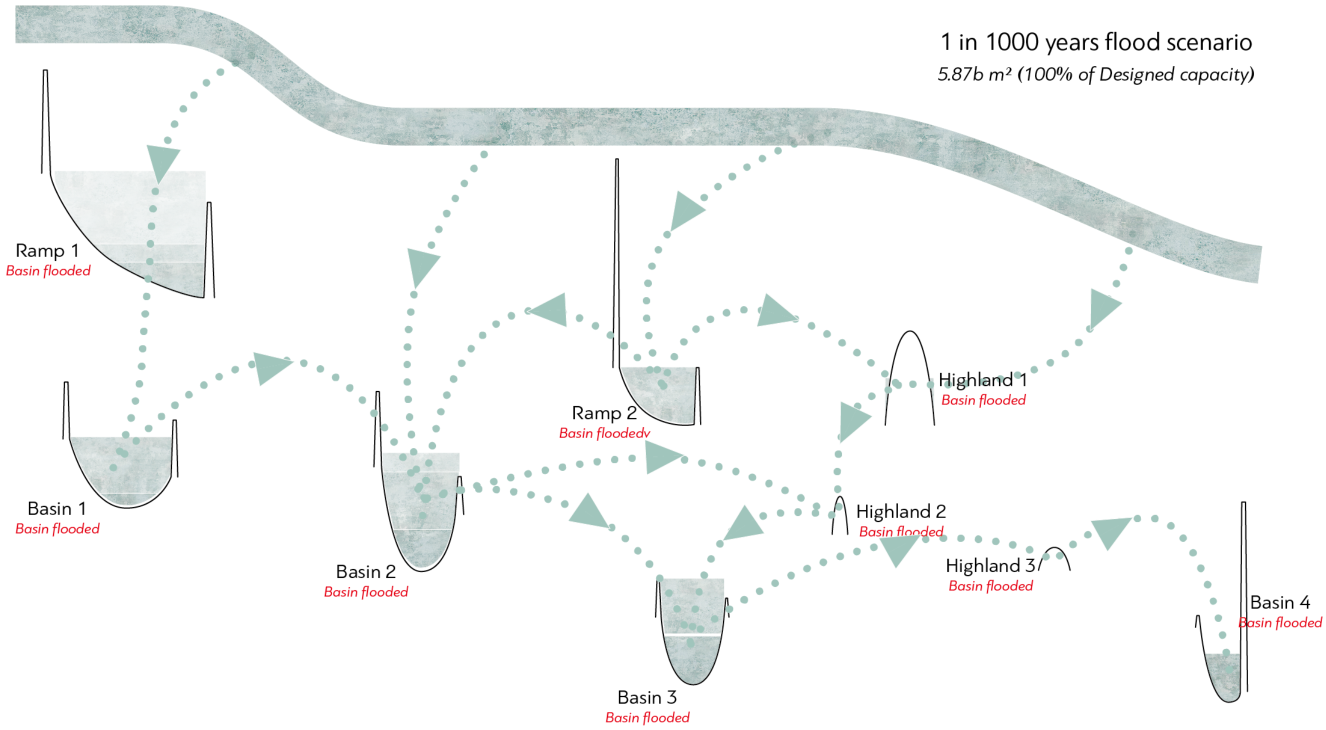
1 in 100 years flood scenario

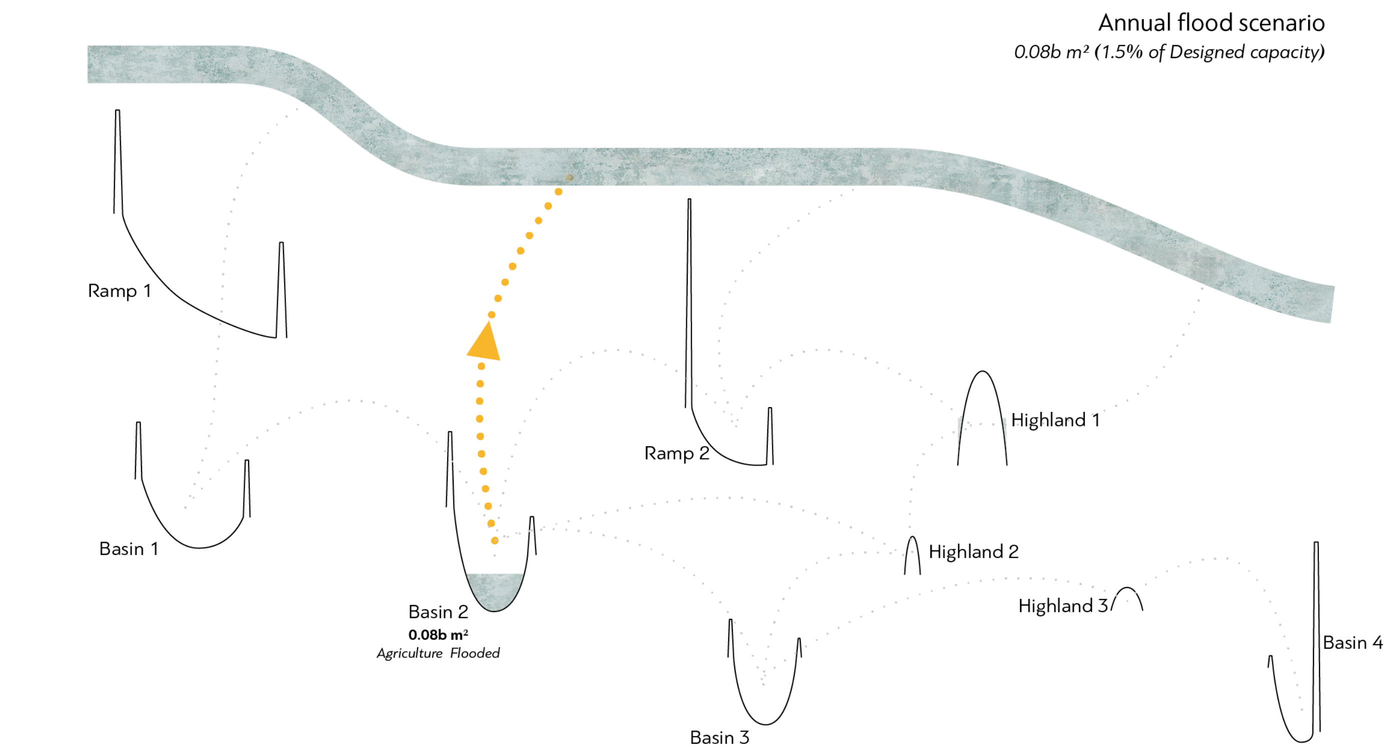
1.91b m² (35% of Designed capacity)



1 in 1000 years flood scenario

5.87b m² (100% of Designed capacity)





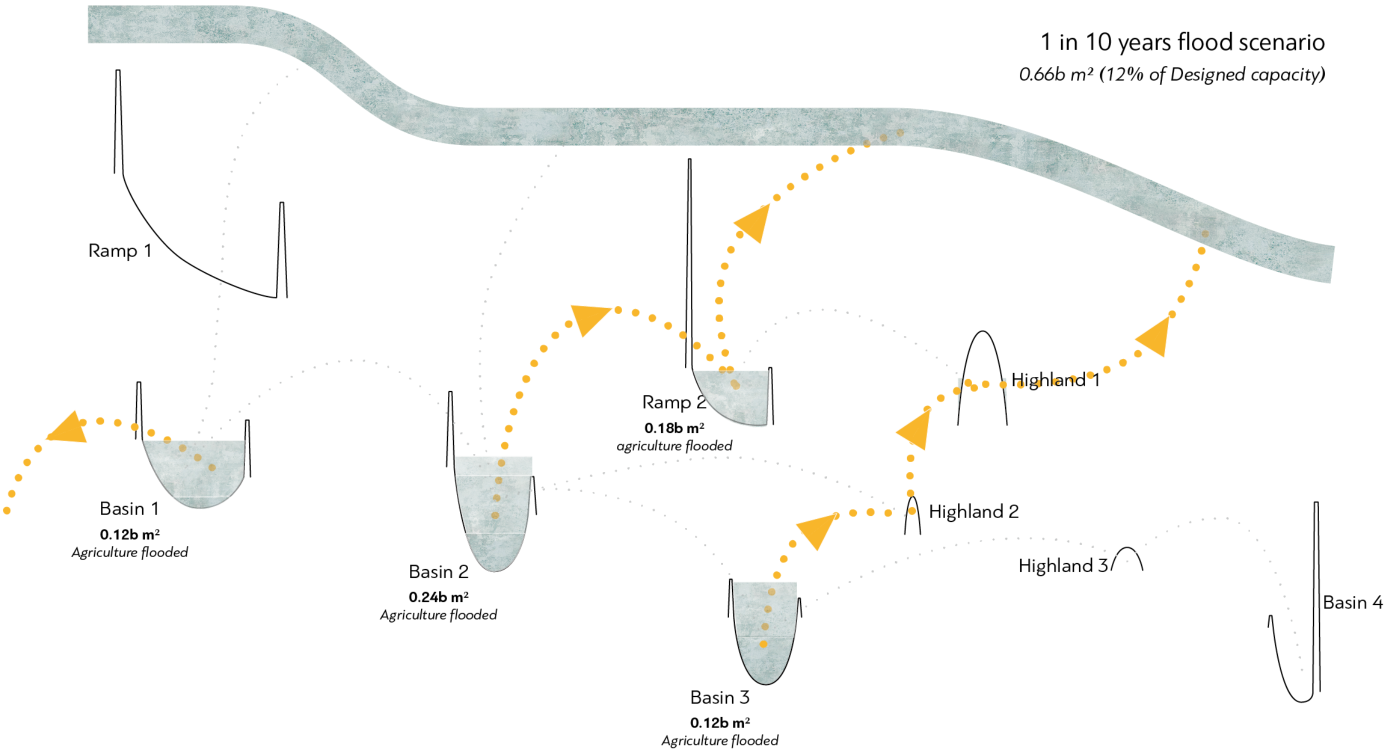
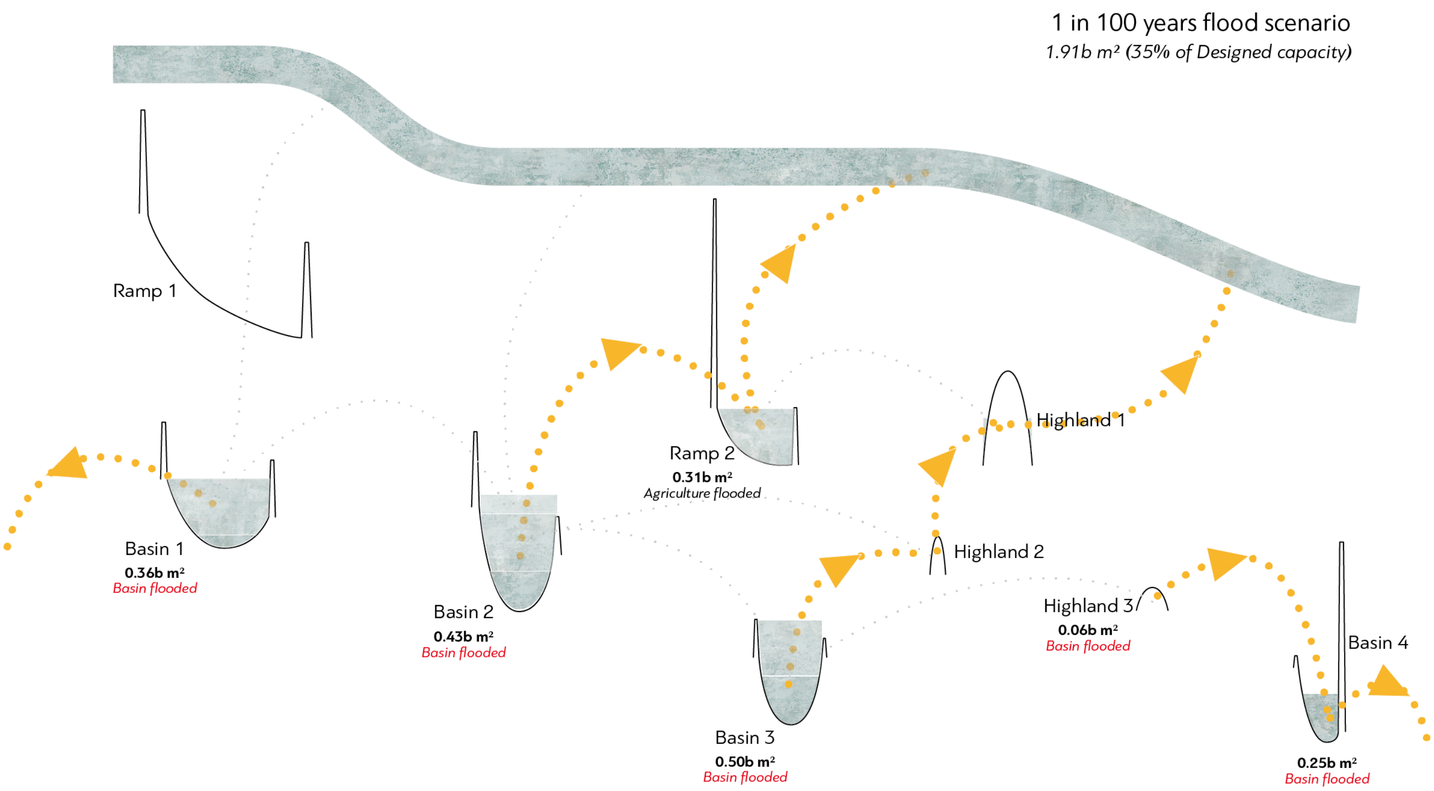


Fig.3.9. Flood water exit route


1 in 100 years flood scenario
1.91b m² (35% of Designed capacity)
Ramp 1
Ramp 2
0.31b m²
Agriculture flooded
Highland 1
Highland 2
Basin 1
0.36b m²
Basin flooded
Basin 2
0.43b m²
Basin flooded
Highland 3
0.06b m²
Basin flooded
Basin 4
Basin 3
0.50b m²
Basin flooded
0.25b m²
Basin flooded

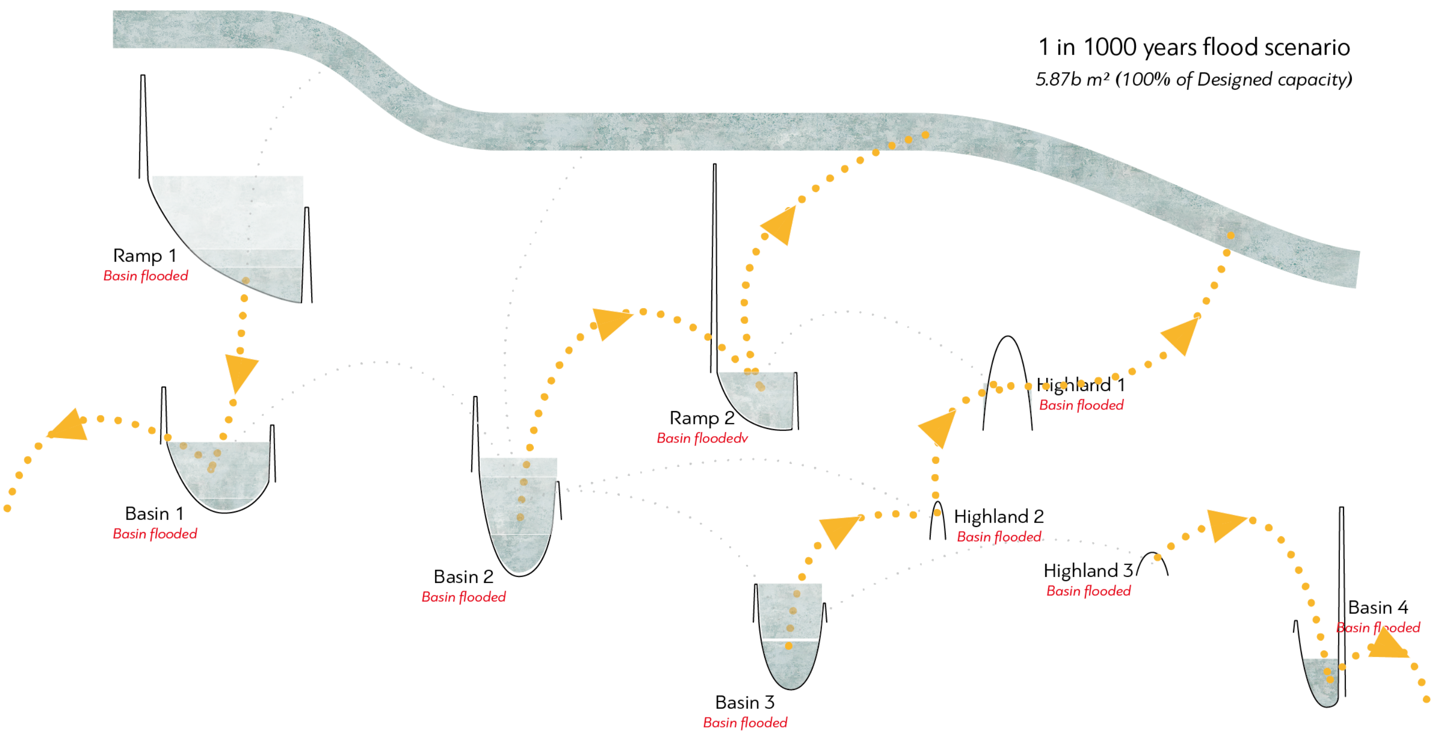

1 in 1000 years flood scenario
5.87b m² (100% of Designed capacity)
Ramp 1
Basin flooded
Highland 1
Basin flooded
Ramp 2
Basin floodedv
Basin 1
Basin flooded
Basin 2
Basin flooded
Highland 2
Basin flooded
Highland 3
Basin flooded
Basin 4
Basin flooded
Basin 3
Basin flooded

Fig.3.10. Flooded area in each scenario

Agriculture Flood Level and Area Flood Level

In addition to the natural or artificial embankments formed by the region's boundaries, there are also significant micro-topographic variations within the region, primarily concentrated around rural roads and settlement areas. These constructions typically rise about 1–2 meters above the surrounding agricultural land, forming small-scale elevated areas.

Based on these topographic features, it is possible to control the floodwater level at different critical heights in practice, thus distinguishing two typical flooding states:

Agriculture Flood Level: Only agricultural areas are flooded, while settlements and main roads remain dry.

Area Flood Level: The entire area, including settlements and transportation facilities, is completely submerged.

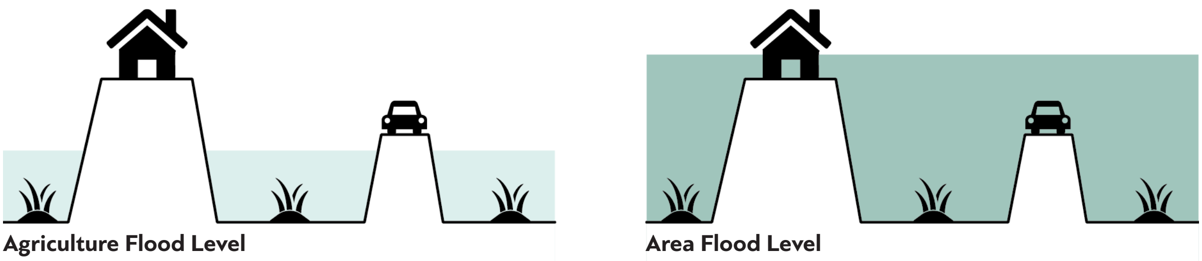


Fig.3.11. Two flooded level scenarios

This classification provides a more refined floodwater storage strategy, enabling selective "agriculture block flooding" under moderate to low-risk water conditions rather than complete inundation of the entire area.

This strategy holds significant application value within the Agricultural Adaptation Layer. By precisely controlling the floodwater level at the Agriculture Flood Level, effective water storage and regulation can be achieved during manageable flood events (such as the 10-year flood), while avoiding substantial disruption to daily life in settlements and traffic networks, thus achieving a relative balance between production safety and residential safety.

Infrastructure

The first aspect involves reinforcing and structurally enhancing the original natural embankments to meet the stability requirements of boundaries under different water level scenarios. The second aspect focuses on the design of key boundaries within the region, particularly the two main canals, to ensure that floodwaters can cross these boundaries without impacting the daily irrigation function of the main canals.

Most of the embankments within the Jingjiang Flood Storage Area have been formed through historical hydraulic engineering or natural accumulation of highlands, and there are significant variations in their continuity and resistance to erosion. For the first and second-level embankments, which are frequently used as boundaries, the design will enhance their durability and ecological buffering ability through a combination of clay compaction and vegetative slope protection, as well as incorporating micro-slope designs to reduce direct impacts. For the embankments used mainly as high-level water barriers, structural reinforcement will be carried out, and where necessary, embedded structures such as reinforced concrete cutoff walls will be introduced to enhance their integrity and impermeability.

Additionally, to ensure that the main canals can still function for irrigation while allowing floodwater to pass through during the flood storage period, the design will incorporate adjustable spillways. These spillways will be set at specific locations where the embankment is lower, and flood paths are pre-designated. The spillways will be triggered by specific water levels and controlled by gate systems to regulate the timing of activation. During the overflow period, sections of the spillway will be isolated from other parts of the canal to prevent floodwater from affecting other regions through the main canal.

Conclusion

In this study, the "cascading floodspace" flood management system achieves multiple objectives, from ecology and landscape to the safety of production and living, through a hierarchical design of flood space and flood path sequencing. The operation logic of the entire system is reflected in a complete and adaptive sequence of flood inundation:

1-year flood (Annual flood): Floodwaters first enter **Basin2,** located at the core of the system. This area has a low, flat terrain with natural water accumulation characteristics, primarily consisting of floodplain grasslands and wetland vegetation. The water level is controlled at the **Agriculture flood level,** allowing for both ecological water storage and landscape creation, without threatening settlements and infrastructure.

10-year flood: As the water level rises, **Basin2** becomes fully inundated, and the system enters the second-level flood storage state. Floodwaters spread through the narrow low-lying outlet to the north of **Basin2** and the main flood inlet on the eastern side of **Ramp2**, expanding into the agricultural blocks of **Basin1** and **Ramp2**, providing a larger agricultural buffer. During this phase, the water level is controlled at the **Agriculture flood level**, ensuring that settlements and main transportation facilities are not affected, and residents do not need to relocate.

100-year flood: The system enters the third-level flood storage phase, where floodwaters surpass earlier regions and, aided by natural elevation and artificial flood control facilities, gradually inundate **Highland1**, **Highland2**, **Basin3**, and **Basin4**. Given the relatively high density of settlements in these regions, some highlands may temporarily provide refuge, but prolonged exposure to high water levels renders these areas unsuitable for long-term habitation, necessitating organized evacuation.

1000-year flood: Under extreme flood pressure, the system activates its final defense line. Except for major town highlands and designated safe zones with elevated refuge areas, the entire Jing River Flood Storage Area is used for flood storage. This phase represents the system's maximum regulatory capacity, aimed at ensuring the safety of a larger area encompassing the central populations and industrial zones of the Yangtze River's middle and lower reaches through organized regional retreat.

Through the staged flood response logic outlined above, the "cascading floodspace" not only determines the evolution path of floods in the time sequence but also achieves a layered control of both ecological and flood protection aspects by precisely managing spatial nodes and boundary conditions. As a result, the Jing River Flood Storage Area is no longer merely a single flood buffer zone but a multifunctional water space system with ecological, agricultural, and residential values.

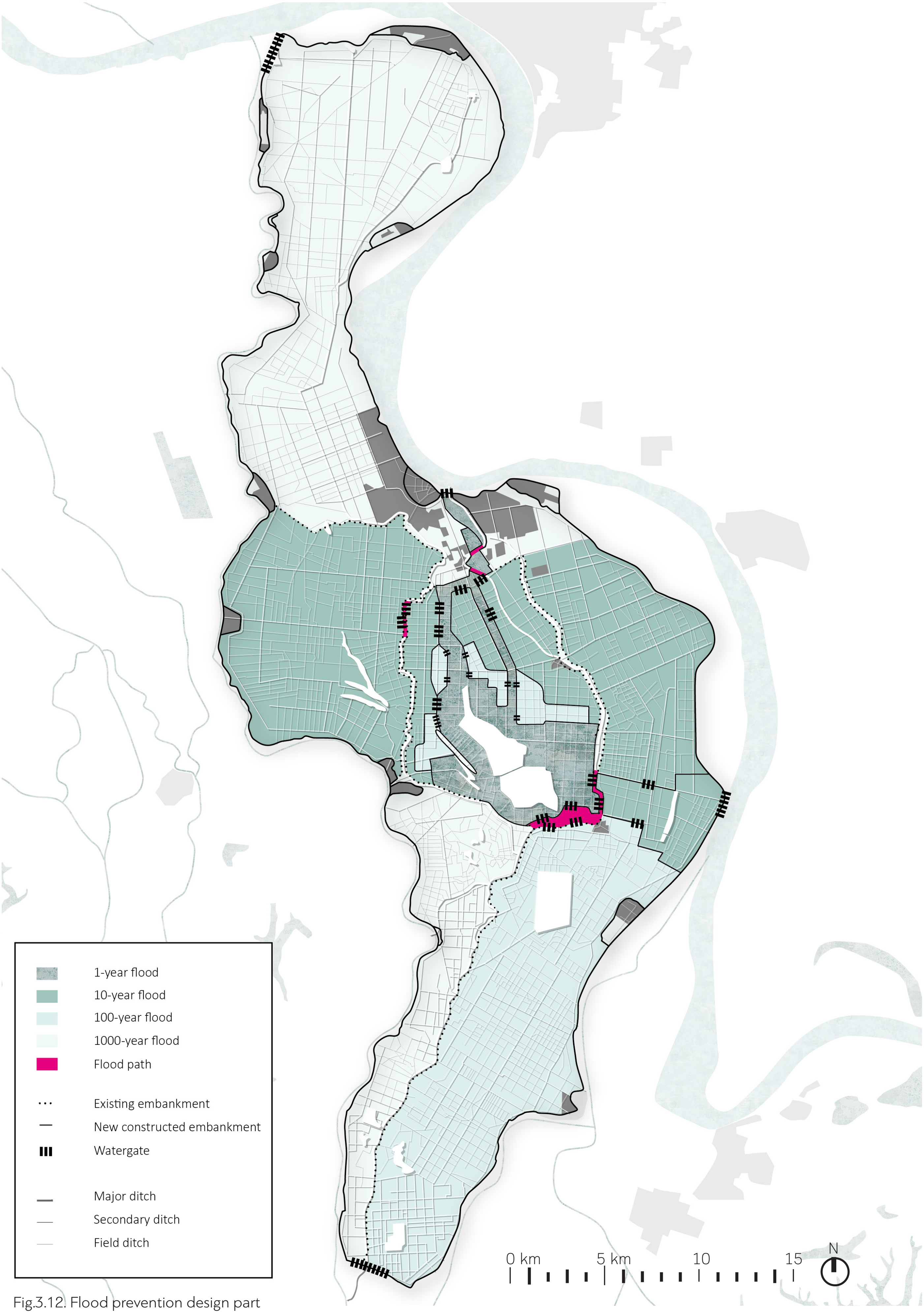


Fig.3.12. Flood prevention design part

Design Part

AGRICULTURE

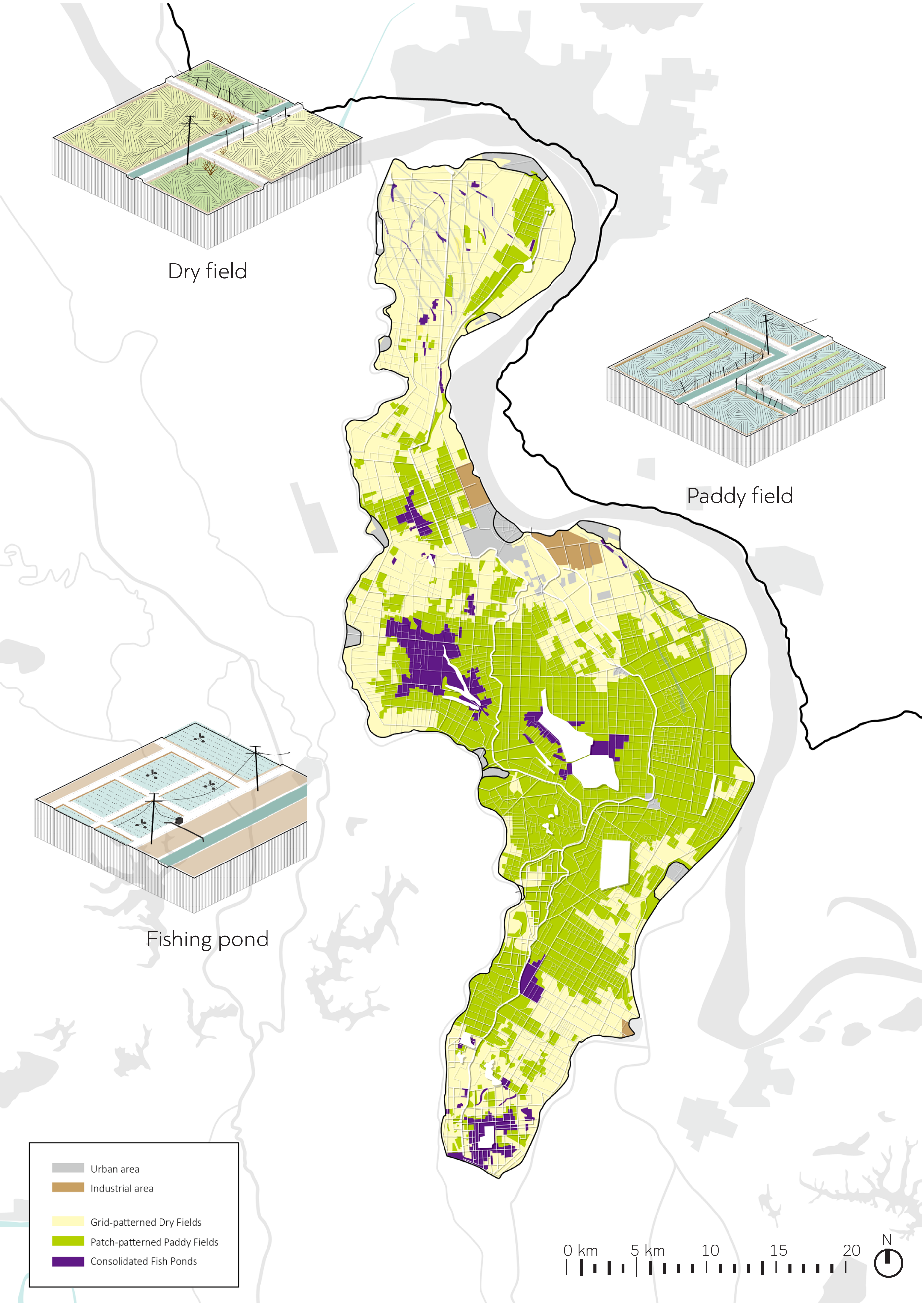


Fig.3.13. Existing agriculture pattern

Current Situation

Agriculture remains the primary economic activity within the Jing River Flood Storage Area (JRFSA), relating to both subsistence and commercial livelihoods for the rural population. Despite its spatial dominance, the current agricultural system reveals clear ecological and structural problems. Cropping patterns are highly uniform, with large portion of land dedicated to single-season rice or cotton cultivation. This simplification has led not only to the biodiversity loss, but also to a degradation of the rural landscape—fields appear functionally efficient but visually monotonous, and ecologically problematic.

The absence of regular floodwater inflow, once the region's natural source of fertility, has fundamentally altered the soil cycle. In place of nutrient-rich sediment, farmers now rely heavily on synthetic fertilizers to maintain yields. Overuse is common, driven by declining soil quality and market pressures. As a result, chemical runoff is widespread, affecting both surface water systems and subsurface soil conditions. The deep soil layers, once enriched through centuries of silt accumulation, are now bypassed by fast-acting but shallow chemical inputs, resulting in a growing disconnection between soil structure and agricultural vitality.

More critically, the local farming system has lost its structural and temporal flexibility in relation to flood events. Historically, cultivation was organized around varied micro-topographies and hydrological rhythms—wet-adapted crops in lowlands, drought-resistant grains on natural levees. Today, however, fields are flattened, levees are fixed, and planting schedules follow national procurement policies rather than seasonal water logic. This shift from adaptive to resistant agriculture leaves the landscape increasingly fragile. What once was a resilient system co-evolving with water is now one that must be defended from it.

Existing agriculture patterns

Within the JRFSA, the current agricultural landscape can be broadly divided into three spatial and functional types: **dry fields, paddy fields,**

and fishing ponds. Each reflects a different response to topography, water infrastructure, and production logic—together forming the fragmented foundation of the region's present-day farming system.

Dry fields occupy the higher-elevation areas, typically located near embankments or along raised village platforms. These fields are primarily used for the cultivation of crops such as wheat and rapeseed, and are often operated by local agricultural cooperatives rather than individual farmers. Their landscapes are flat, orderly, and optimized for mechanization. With minimal dependence on surface water or flexible irrigation infrastructure, dry fields are visually and functionally the least expressive of the region's historical water-based agricultural identity.

Paddy fields, by contrast, are found in lower-lying zones near the center of the flood storage area. Here, rice is the dominant crop, and land is more frequently managed by smallholder farmers. The prevalence of fragmented ownership, combined with the technical difficulty of machine access, has produced a more irregular agricultural pattern. The landscape is marked by scattered water channels, many of which are seasonally dry or poorly maintained, and reliant on small-scale electric pumps for irrigation. These fields illustrate the challenges of decentralized management and a declining relationship between hydrology and field structure.

Fishing ponds form the third major type, located around remnant lakes and wet depressions. These areas represent the most intensively engineered form of land use in the JRFSA. Large swaths of land are divided into regular grids of fish ponds, often managed through outsourced agricultural companies. Local settlement is virtually absent; instead, the landscape is defined by industrial-scale aquaculture infrastructure—oxygenation systems, lined pond edges, and service roads. The ecological cost of these operations is significant, and their detachment from the broader social fabric is increasingly visible.

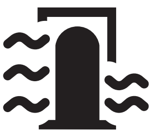
These three patterns—each shaped by different combinations of topography, infrastructure, and land tenure—form the basis for future reconfiguration. Rather than replacing them wholesale, the design strategy builds upon their existing spatial logic to establish a more diverse, flood-adaptive, and ecologically grounded agricultural system.

Strategy of agriculture transformation

To improve the resilience and functionality of the agricultural system within the JRFSA, three primary strategies are proposed—each tailored to different levels of flood exposure and ecological potential: **Annual Flood Symbiosis, Flood Storage Adaptation, and Ecological Modification and Diversification.**

Annual Flood Symbiosis (**AFS**)

Annual Flood Symbiosis applies to areas that experience seasonal inundation on a near-yearly basis, particularly those located within the ecological base layer. In these zones, the core design principle is not to resist water, but to live with it. Drawing inspiration from the traditional weiyuan system, this strategy transitions from intensive monoculture to a mosaic of grass-based cultivation, rotational grazing, green manure production, wetland-compatible crops, and low-input extensive farming. By shifting from purely agricultural productivity to a broader spectrum of ecological, economic, and cultural values, the landscape becomes more dynamic and flood-compatible. As the most hydrologically active zone, this strategy is also intended to be the first implemented, serving as a pilot for adaptive land-use transformation.



Flood Storage Adaptation (**FSA**)

Flood Storage Adaptation targets areas such as parts of Basin 1 and Ramp 2, where moderate but significant flood risks are present. These zones require strategic adaptation. The focus is on minimizing loss during flood events while retaining agricultural viability under normal conditions. Spatially, the system borrows from the logic of submarine compartmentalization—dividing fields into floodable units that can be inundated progressively rather than simultaneously. Since these areas are more likely to experience "agriculture-flooded" scenarios, infrastructure such as adaptive transport networks and modular field access becomes critical to ensuring post-flood recovery and continued operation.

Ecological Modification and Diversification (**EMD**)

Ecological Modification and Diversification is applied to regions subjected only to rare, extreme flood events. These areas, often larger in scale and more topographically diverse, are not prioritized for flood adaptation per se, but rather for their ecological and agricultural development potential. With lower hydrological constraints, the design here emphasizes long-term strategies: increasing biodiversity, experimenting with mixed cropping systems, and creating opportunities for community-based agricultural initiatives. By embedding multifunctionality into these zones, the strategy aims to enhance spatial richness and ecological value while supporting a more participatory and resilient rural economy.

Potential agriculture options

Pasture (AFS)
Extensive grassland cultivation supports seasonal grazing and green manure production, enabling low-input farming that coexists with frequent flooding.

Aquaculture (AFS)
Water-adapted fish farming systems are integrated with flood cycles, using flexible pond infrastructure and native species to minimize ecological disruption.

Floodplain Wild Farming (AFS)
Unregulated and seasonally responsive crop systems—such as wild rice or floating

herbs—are cultivated in open floodplains, relying on natural cycles rather than fixed infrastructure.

Adaptive Dry Field (FSA)
Higher-elevation dry fields are restructured with modular layouts and strategic drainage, allowing phased inundation during flood events without sacrificing annual productivity.

Ecological Paddy Field (FSA, EMD)
Reconfigured rice systems incorporate biodiversity buffers, controlled water access, and soil-friendly practices to balance productivity and ecological function.

Adaptive Fishing Pond (FSA, EMD)
Traditional fish ponds are redesigned with flood bypass channels and variable water levels, making aquaculture infrastructure resilient to partial inundation.

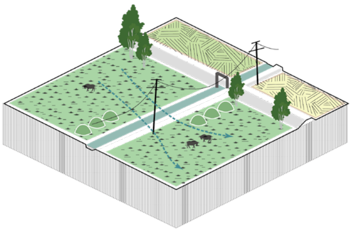
Floating Agriculture (EMD)
Floating beds of lightweight crops and vegetables are established on shallow floodwater surfaces, extending cultivation into temporally wet zones.

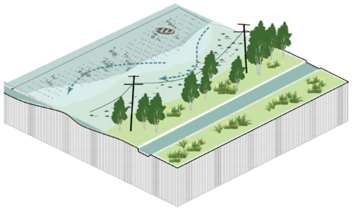
Aquatic Planting (EMD)
Flood-tolerant aquatic crops such as lotus or water chestnut are cultivated in semi-permanent wet zones, linking food production with habitat enhancement.

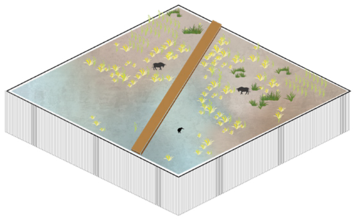
Wet Agriculture (EMD)
A hybrid system combining shallow water crops and lowland agroforestry supports diverse outputs in semi-inundated areas with slow-draining soils.

Wetland Park / Participating Agriculture (EMD)
Publicly accessible wetland zones integrate educational farming plots, seasonal planting, and participatory programs to reconnect local communities with water-adaptive agriculture.

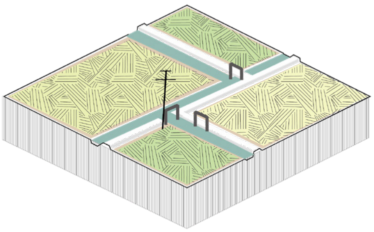
Annual Flood symbiosis

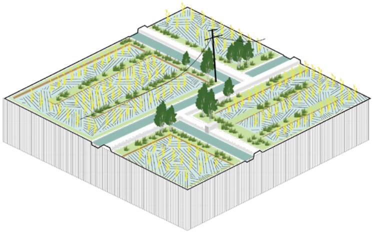

Pasture

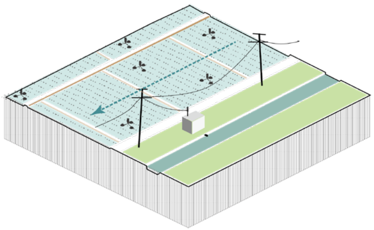

Aquaculture


Floodplain wild farming

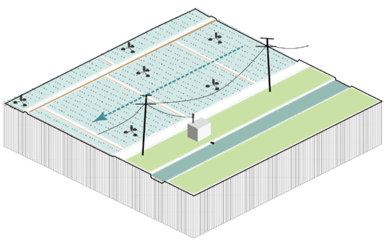
Flood storage adaptation

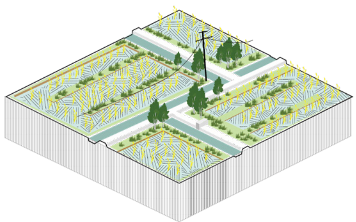

Adaptive dry field

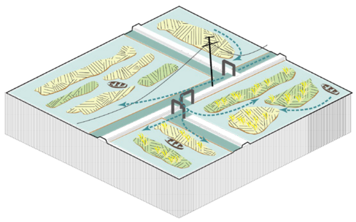

Ecological paddy field

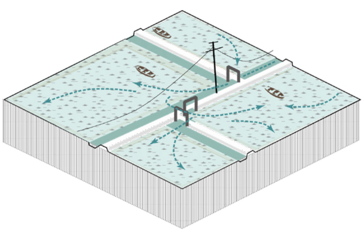

Adaptive fishing pond

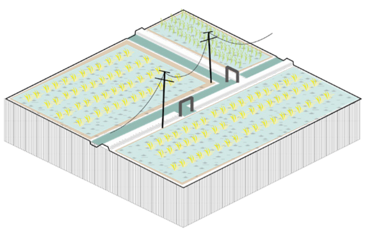
Ecological modification and diversify


Adaptive fishing pond


Ecological paddy field


Floating agriculture


Aquatic planting


Wet agriculture

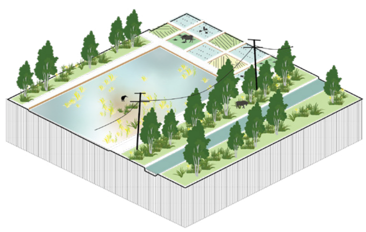

Wetland park / Participating agriculture

Fig.3.14. Potential agriculture options

Phasing

The transformation of agriculture in the JRFSA follows a phased approach aligned with the three adaptive strategies. In the initial phase, areas under Strategy 1: Annual Flood Symbiosis are prioritized, as they face the most frequent inundation and offer immediate potential for spatial and ecological restructuring. Here, new agricultural types such as Pasture, Aquaculture, and Floodplain Wild Farming are introduced first, establishing a foundation for flood-compatible productivity and nutrient cycling.

The second phase targets zones under Strategy 2: Flood Storage Adaptation, where flood risk is moderate and existing agricultural infrastructure remains relatively intact. In these areas, the focus shifts to minimizing disruption while maintaining yield. Interventions include the introduction of Adaptive Dry Fields, Ecological Paddy Fields, and Adaptive Fishing Ponds, each designed to withstand controlled flooding and recover quickly after events.

The final phase addresses areas under Strategy 3: Ecological Modification and Diversification, where flood occurrence is rare but spatial and ecological opportunities are high. Here, the transition centers on long-term diversification and public engagement. New modes such as Floating Agriculture, Aquatic Planting, Wet Agriculture, and Wetland Park / Participating Agriculture are gradually implemented, aiming to expand the ecological and social functions of the landscape beyond production alone.

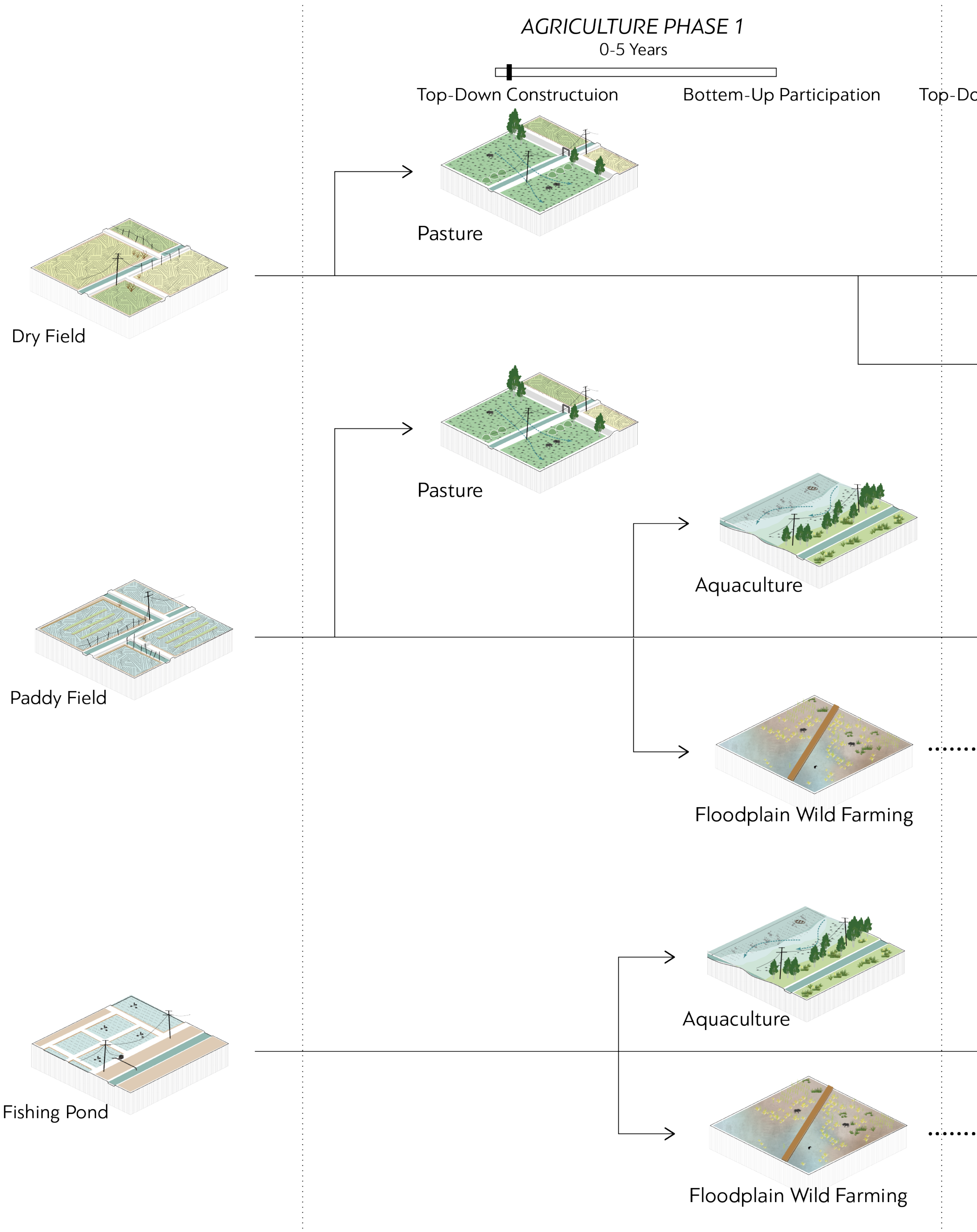
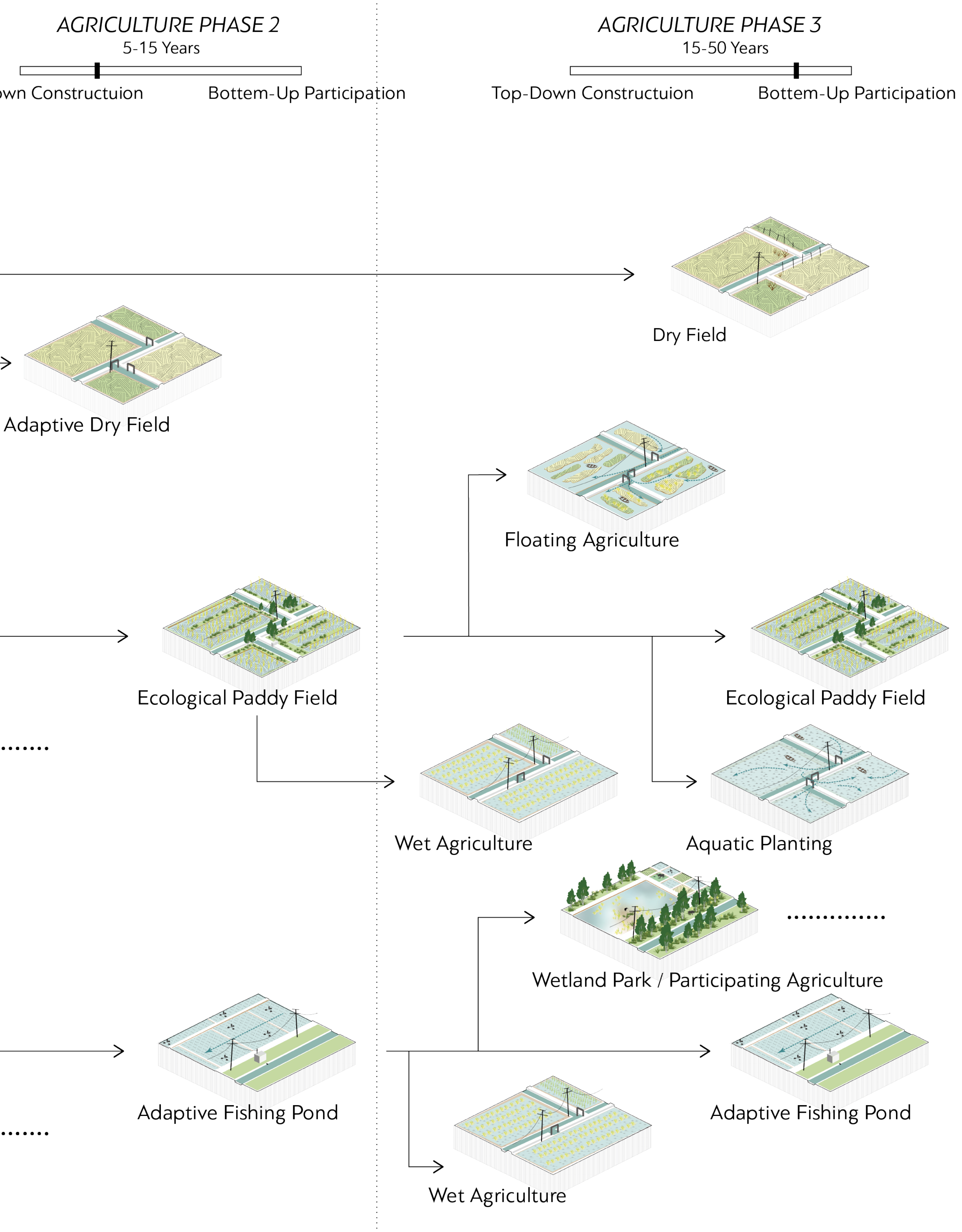


Fig.3.15. Phasing of agriculture transformation


AGRICULTURE PHASE 2
5-15 Years
own Constructuion
Bottem-Up Participation
AGRICULTURE PHASE 3
15-50 Years
Top-Down Constructuion
Bottem-Up Participation
Dry Field
Adaptive Dry Field
Floating Agriculture
Ecological Paddy Field
Ecological Paddy Field
Wet Agriculture
Aquatic Planting
Wetland Park / Participating Agriculture
Adaptive Fishing Pond
Adaptive Fishing Pond
Wet Agriculture

Conclusion

The transformation of agriculture in the Jing River Flood Storage Area is not a one-time change, but a gradual and layered process shaped by different levels of flood risk. Based on three main strategies—Annual Flood Symbiosis, Flood Storage Adaptation, and Ecological Modification and Diversification—the design introduces more flexibility and diversity into a system that has become too uniform and fragile. Each strategy is applied to areas with different conditions, making use of specific farming types such as pastures, ecological paddy fields, floating agriculture, and more. These new models are not just ways to protect farming from floods—they also bring back the connection between agriculture and water, which has been lost over time. In doing so, the project shows how agriculture can become both productive and adaptive, helping the landscape work better for both people and nature.

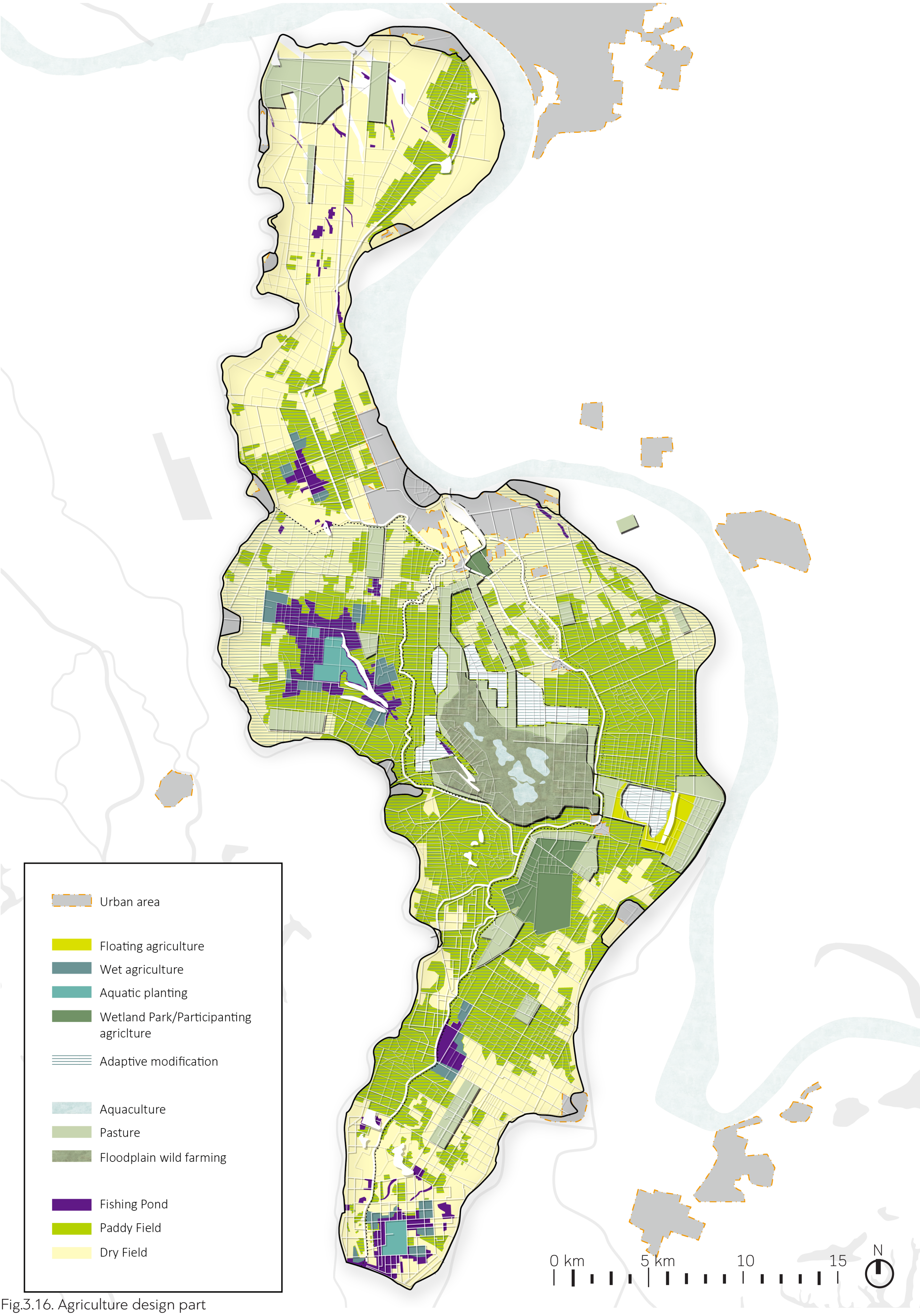


Fig.3.16. Agriculture design part

Fig.3.17. Visualization of Annual Flood Symbiosis


Dike
DRY FIELD
Remained Flood Lake
LAND
LIVESTOCK

Fig.3.18. Visualization of Flood Storage Adaptation


Sluice Gate
Seperation Dike
Flood Prevention Net
ADAPTIVE FISH POND

Fig.3.19. Ecological Modification and Diversification


Floating Patch
TING AGRICUL RE

Design Part

ECOLOGY / POLLUTION

Sediments and Chemical Pollution

Historically, the Jing River Flood Storage Area (JRFSA) was part of a larger alluvial system where annual floods brought nutrient-rich sediment from the upper Yangtze basin. During flood events, silt and organic matter would be deposited across the plain, gradually enriching the soil with nitrogen, phosphorus, potassium, calcium, and other micronutrients. In natural wetland zones, the deep root systems of emergent plants helped stabilize this sediment, allowing nutrients to infiltrate the soil profile over time. These areas functioned as ecological anchors, maintaining long-term soil productivity while supporting diverse plant and microbial communities.

In recent decades, however, this natural system has broken down. The construction of levees and large dams—most notably the Three Gorges Dam—has significantly altered the flood regime. Many parts of the JRFSA no longer receive regular inundation, and sedimentation has nearly ceased. Without the yearly supply of mineral-rich silt, the soil's fertility has declined, especially in lower-elevation areas where traditional farming systems once coexisted with seasonal flooding. In response, farmers have turned increasingly to chemical fertilizers to maintain crop yields.

The consequences of this shift are spatially and ecologically significant. Nutrients from fertilizers tend to remain in the topsoil and are highly water-soluble, making them prone to leaching into water bodies during heavy rains. Nitrate pollution in shallow groundwater is a growing concern, as is phosphorus-driven eutrophication in lakes and wetlands. Additionally, the overuse of chemical inputs has led to soil acidification and a decline in microbial diversity. Groundwater levels have also dropped, partly due to reduced infiltration and increased pumping for irrigation, further degrading the area's ecological resilience.

To restore a functioning nutrient cycle and reduce the dependence on synthetic inputs, the project proposes an ecological intervention closely tied to the spatial strategy laid out in the agricultural section. In the ecological base layer—zones with

FLOOD AS FERTILIZER

Seasonal floodwaters deposit fine sediments above the groundwater table, enriched with essential nutrients such as nitrogen (N), phosphorus (P), potassium (K), and calcium (Ca). Well-developed plant root systems help stabilize these deposits, promoting nutrient retention and enhancing long-term soil fertility.

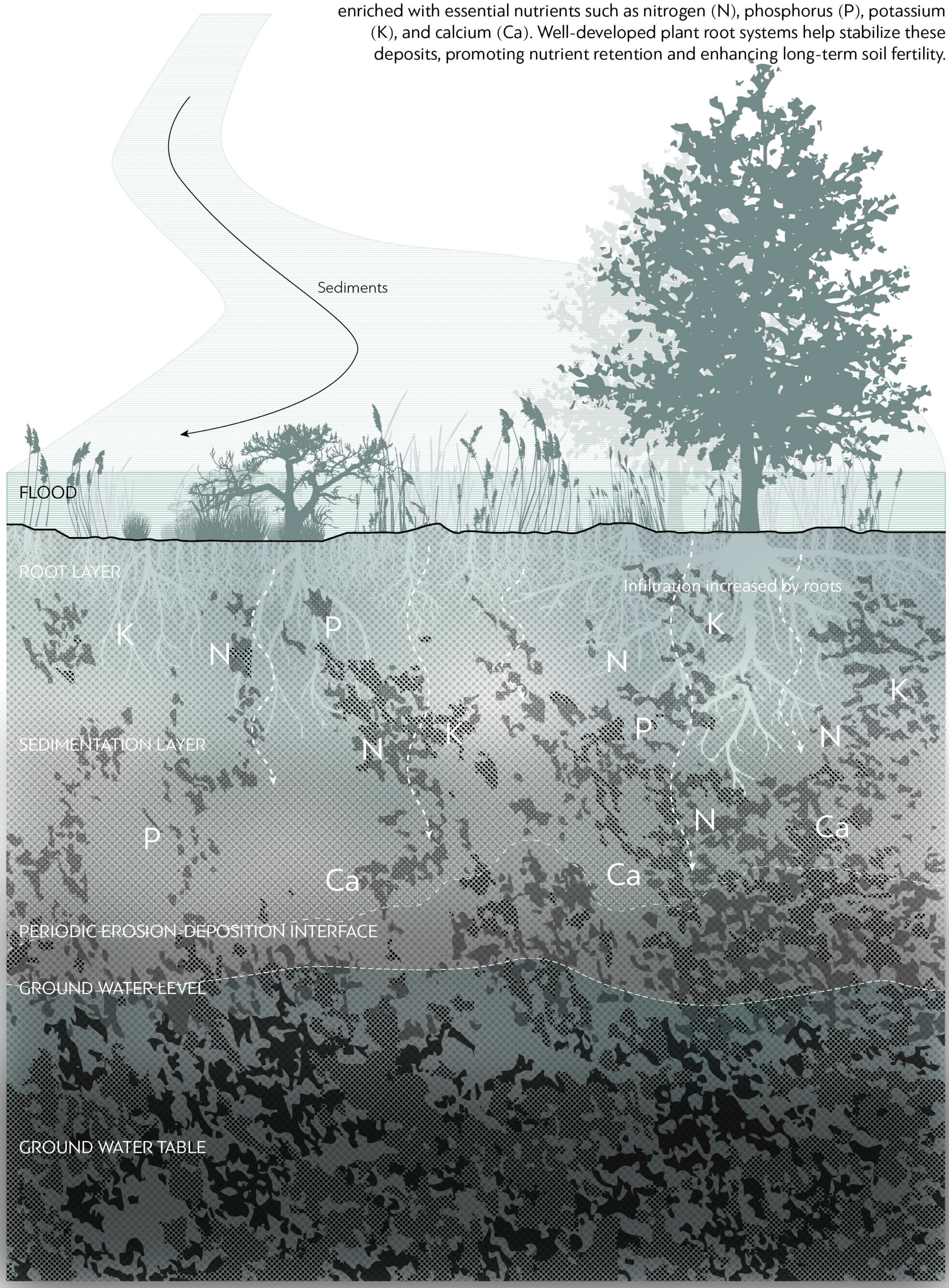


Fig.3.20. Flood as fertilizer

high flood frequency and low development pressure—pasture-based systems are introduced as key ecological-agricultural hybrids. These areas are designed to be seasonally inundated, allowing floodwaters to deposit fresh sediment each year. Grasses with deep and fibrous roots, such as sedges and native pasture species, are planted to retain these sediments in place and absorb nutrients directly into biomass.

After the flood recedes, this biomass is harvested and processed into green manure or compost. The organic fertilizer can then be transported to other agricultural areas at higher elevations, closing the nutrient loop through a low-energy, ecologically grounded process. In this way, floodwaters are reconnected to regional fertility without relying on engineered distribution systems or chemical supplementation. The design does not seek to resist flooding but to reinterpret it as an ecological service—one that restores degraded processes and links formerly disconnected landscape functions.

Diversity of the habitats

While pasturelands serve as the ecological foundation for soil recovery and flood-sediment retention, a broader range of ecological habitats is necessary to support biodiversity and environmental health at the landscape level. The design introduces five primary habitat types—forest, floodplain, waterfront, lake, and pasture—each chosen for its ability to respond to specific topographic, hydrological, and spatial conditions within the JRFSA.

Forest habitats, including woodland belts and forested buffer zones, are introduced at the edges of embankments and settlement zones. These areas stabilize slopes, reduce wind and soil erosion, and serve as corridors for birds and small mammals. Species selection focuses on native or adaptive trees with high carbon sequestration potential and seasonal leaf turnover, which enriches soil organic matter.

Floodplain habitats are located in low-lying zones where controlled inundation

DISRUPTED SEDIMENTATION

Following the construction of dikes, floodwaters no longer reach the field, cutting off the natural supply of nutrient-rich sediments. Chemical fertilizers are applied to maintain crop production, but nutrients are concentrated in the topsoil and prone to leaching. Over time, reduced infiltration and altered water cycles contribute to a declining groundwater table, while soil health becomes increasingly dependent on external inputs.

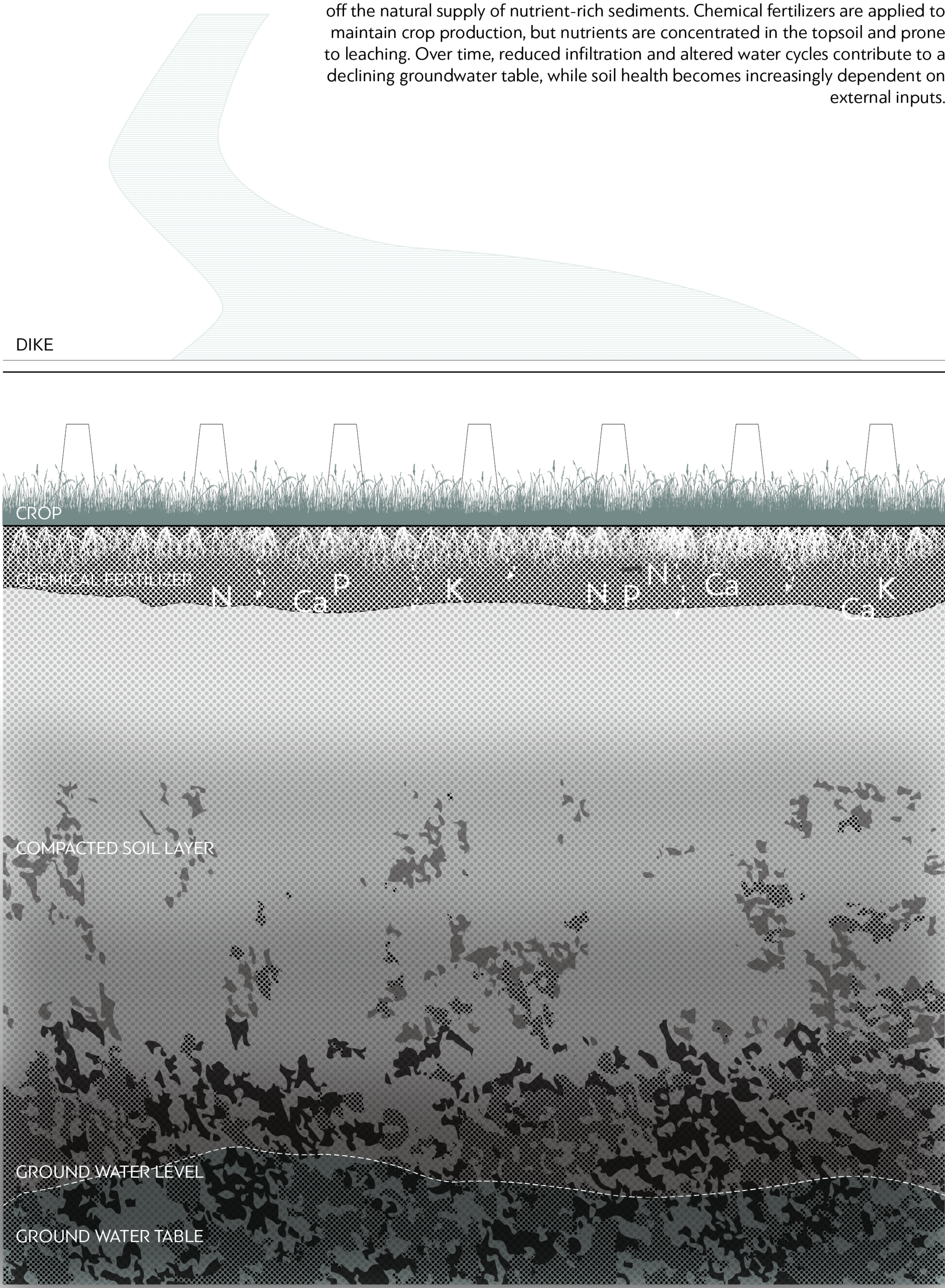


Fig.3.21. Disrupted sedimentation

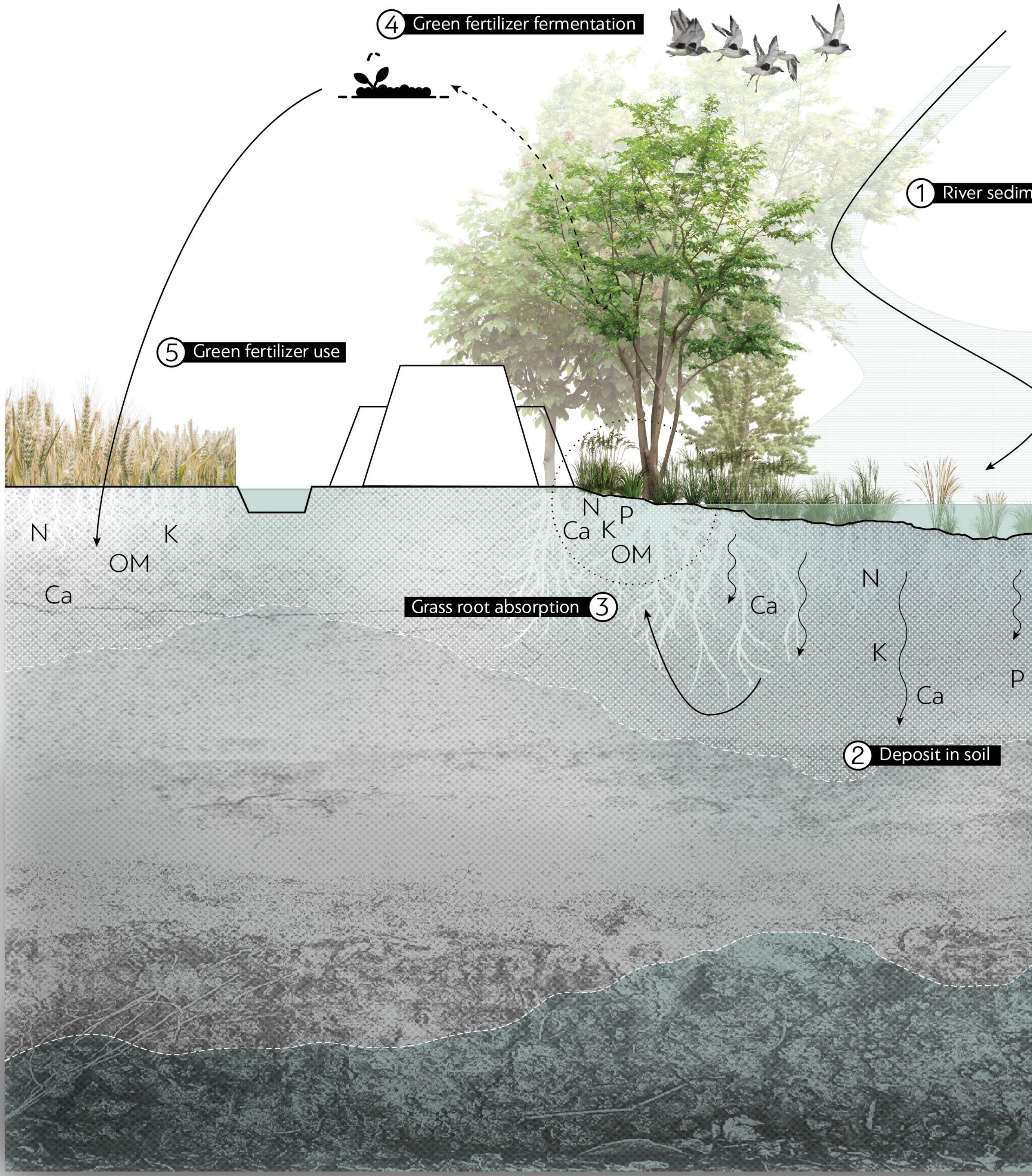
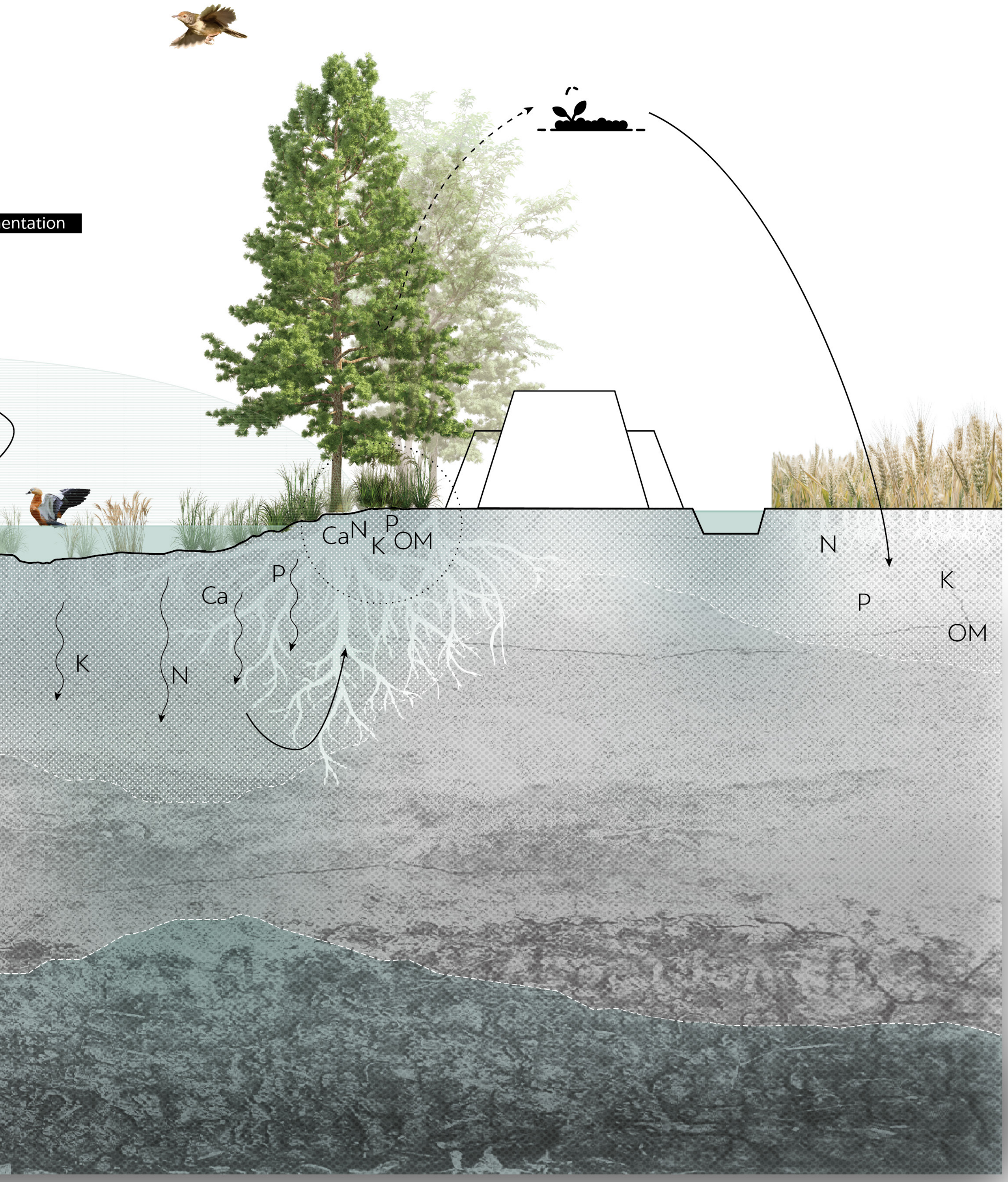


Fig.3.22. Sediment transportation



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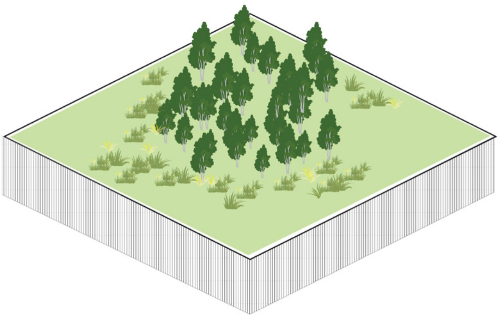
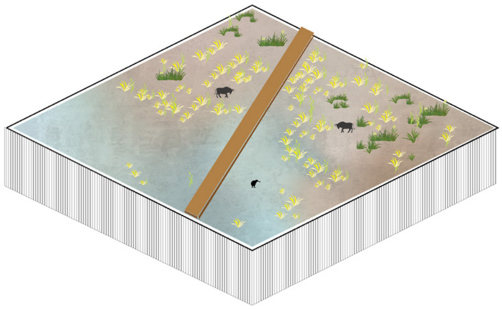
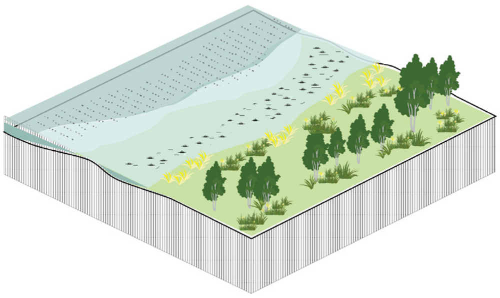


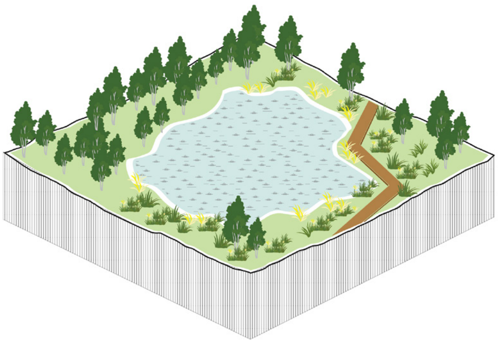
Forest



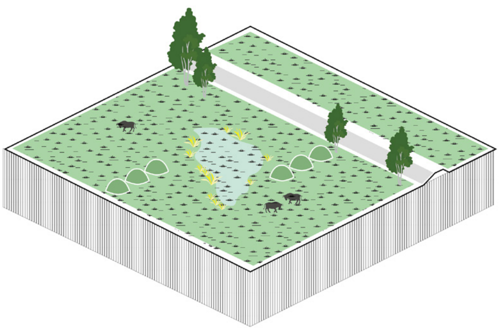
Floodplain



Waterfront



Lake



Pasture

Fig.3.23. Five habitats

is expected on an annual basis. These areas support herbaceous wetlands and scrubland, providing feeding and breeding grounds for amphibians, waterfowl, and pollinators. Their seasonal hydrological variability allows for high species richness, particularly in transitional edge zones.

Waterfront habitats are established along restored canals and water space, including the historic flood channels near the northern gate of the JRFSA and the edge of the floodplain in Basin2. Here, gently sloped embankments are planted with emergent vegetation to stabilize banks and filter runoff. These zones double as recreational corridors and water quality buffers.

Lake habitats focus on existing and overflown lake systems in Basin 2 . These deep-water bodies are redesigned to support aquatic vegetation, submerged macrophytes, and floating species. The lake banks are the same crucial as the lake itself, as it provides a large variety of animal habitats.

Pasture, as introduced earlier, functions not only as an agricultural system but also as a critical ecological habitat. Its extensive coverage and rotational use support small vertebrates, insect life, and wetland-adapted bird species. When interspersed with small hedgerows and micro-wetlands, pastures can serve as stepping stones in a distributed ecological network.

Each of these habitats contributes differently—some offer shelter, others regulate water, and others support trophic chains—but all are part of a shared goal:
to make flood-adaptive land use compatible with ecological resilience. Their integration across scales creates ecological redundancy and spatial heterogeneity, two factors essential to long-term landscape health.

Spatial structure

The ecological strategy culminates in a spatial network of eco bases and secondary habitat zones, embedded directly into the larger design framework. Two primary eco bases form the heart of the system.

The first is the floodplain basin in Basin 2, where the ecological base layer receives annual flooding and sedimentation. This area hosts a composite habitat of pasture, floodplain wetland, and shallow lake zones. As the lowest point in the entire system, it serves both hydrological and ecological purposes—retaining water, absorbing nutrients, and offering seasonal variation in landscape expression.

The second core eco base is located near the northern inflow gate, where historical flood channels are reimagined as restored ecological corridors. These zones integrate floodplain, waterfront, and forest habitats in layered succession. In addition to ecological function, they serve as educational and recreational landscapes, reconnecting communities with the hydrological history of the site.

Secondary ecological zones are dispersed across the mid- and upper levels of the design. These include the southern wetland park adjacent to Basin 2, the restructured inflow corridor of Ramp 2, and the newly designed Floodwater Park located at the city edge in Gong'an County. Each of these contains a tailored mix of two to three habitat types and plays a supporting role in habitat connectivity, water filtration, and ecological education.

Beyond these formally planned areas, small-scale pasture plots are embedded throughout the agricultural mosaic. Though individually modest in size, these patches serve a dual function: providing organic fertilizer for surrounding fields and acting as ecological nodes that increase the permeability of the agricultural landscape to wildlife movement and nutrient flows.

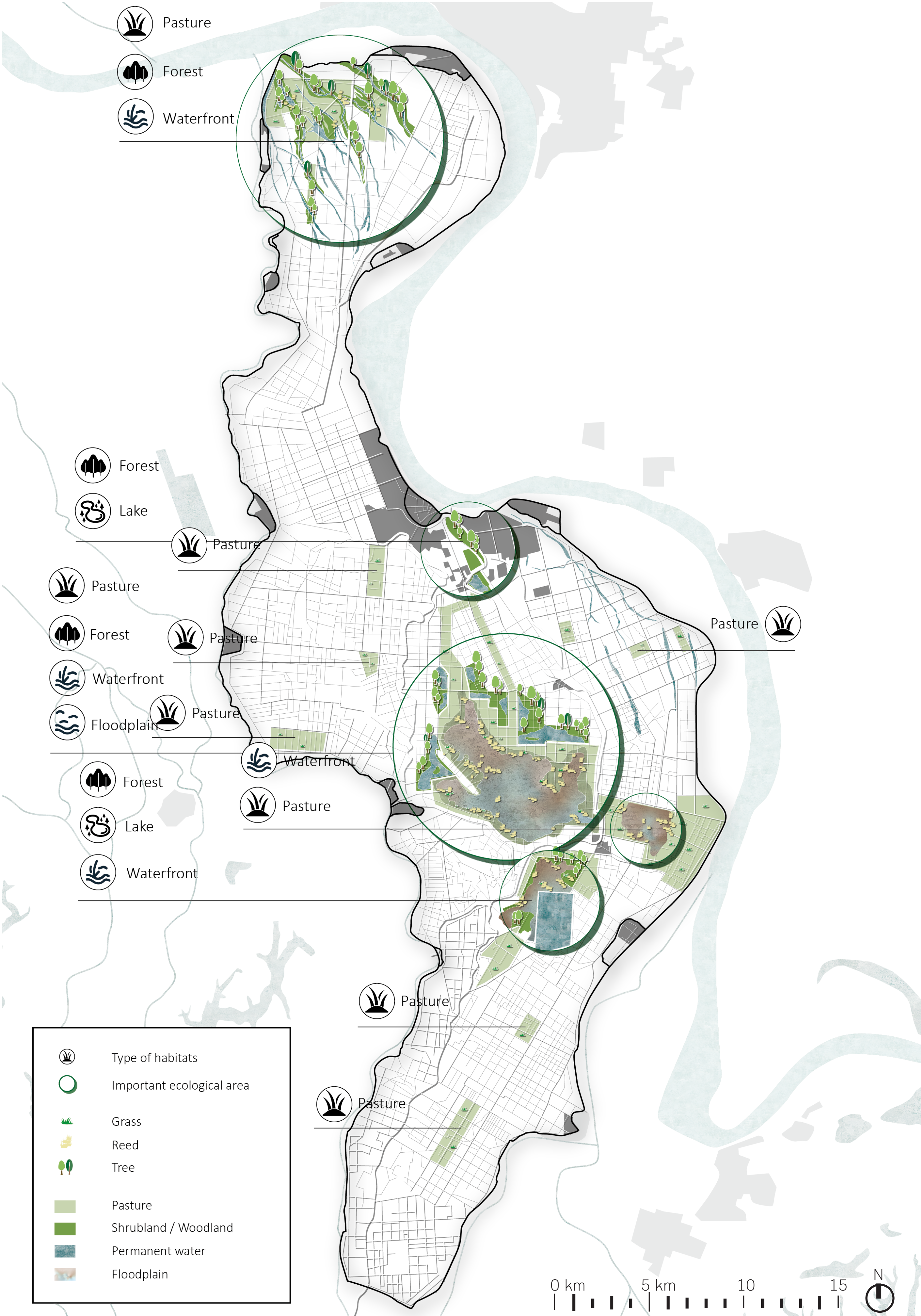


Fig.3.24. Ecology / Pollution design part

Fig.3.25. Visualization of pasture and marshland


Pasture
Floodplain
azhong Yellow Cattle
Spotbilled Duck
Redshank

Fig.3.26. Visualization of overflown lake and forest


Forest
Overflown lake
Water Lily
Grey Heron
Tufted Duck
Grass Carp

Design Part

LANDSCAPE / TOURISM / AWARENESS

Introduction

In the Jing River Flood Storage Area, a land that has long been a key component of the flood control system, it is restored to a functional void once the flood recedes. The once dynamic hydrological regulation and the migration of people were the norm for the area's operation, yet these actions failed to leave lasting marks in the landscape. The relationship between humans and the land has been reduced to a temporary defense space, and landscape construction seems detached due to the lack of deep cultural connections. Consequently, this area, which carries strong spatial memories and institutional symbols, has yet to fully activate its tourism value.

It is important to clarify that the "Landscape" discussed in the **LTA** (Landscape / Tourism / Awareness) section does not refer to all elements in the site that have landscape significance. Rather, it specifically refers to those landscape strategies that are shaped by human intervention and aim to introduce tourism flow or enhance public flood awareness. As mentioned earlier, the agricultural and ecological systems themselves have already imbued the site with unique landscape value. These elements form the basic substrate of the land and, silently, respond to the long-term collaboration between hydrological cycles and human existence. These landscape values are naturally generated and deeply embedded in the land. They do not rely on symbolic spatial narratives nor on external perspectives of appreciation. In some respects, compared to the "Landscape" discussed here, these values have greater potential to fundamentally transform the land.

However, **LTA** focuses not on the logic buried deep within the soil, as discussed above, but on how spatial design can stimulate people's recognition and emotions toward this land. By improving landscape accessibility, establishing cultural cognition structures related to floods, and encouraging the public to re-engage with the site as participants, **LTA** aims to reconstruct a perceptible, experiential relationship network between water, agriculture, disaster, and humans. In this context, the landscape is not just a spatial fixture but a narrative tool. It guides external stakeholders, especially those concerned with ecological, cultural, and social values—to reassess the significance of this area and, in doing so, influences the overall value orientation of the project.

Based on this logic, this section will focus on introducing two recreation routes, using leisure as a medium, as concrete pathways for reconnecting the space with the public.

Two Routes, Two Flood Entrances, Two Different Eras

The two routes originate from two floodgates, one existing and one newly built. These paths, starting from the **North Gate** and the **Gongan Gate**, correspond to landscape narratives guided by the themes of "memory" and "adaptation."

The **Flood Heritage Route** begins at the original **North Gate** and extends northward across the site. Guided by the theme of "memory," this route serves as an open-air museum showcasing the history of human interaction with floodwaters. The path is flanked by several **"Water Escape Building"**high-platform buildings that once served as temporary shelters for villagers during floods. These structures, embodying the collective memory of disaster, have unique architectural details that tell stories of resilience and survival. Further south, the route passes through an early flood path, now transformed into a strip of fishponds. While the area may seem visually unremarkable, the low-lying terrain and the continuous water flow traces serve as evidence of past flood events—floods that once flowed, diverged, and deposited materials in this area. This route carries the flood memories of the site, maintaining the spatial logic of past events through its preserved structures.

The **Flood Adaptation Route** connects the newly established **Gongan Floodgate** with **Basin2**, the primary flood storage area. This route is designed around the concept of "adaptation." The dynamic nature of **Basin2** influences the diverse landscapes experienced along this path. Depending on the flood scenario, Basin2 reveals various landscape expressions. The topographical features, combined with the overflow paths, create diverse hydrological landscape units, such as overflow wetlands, periodically submerged grassland blocks, and the central floodplain.

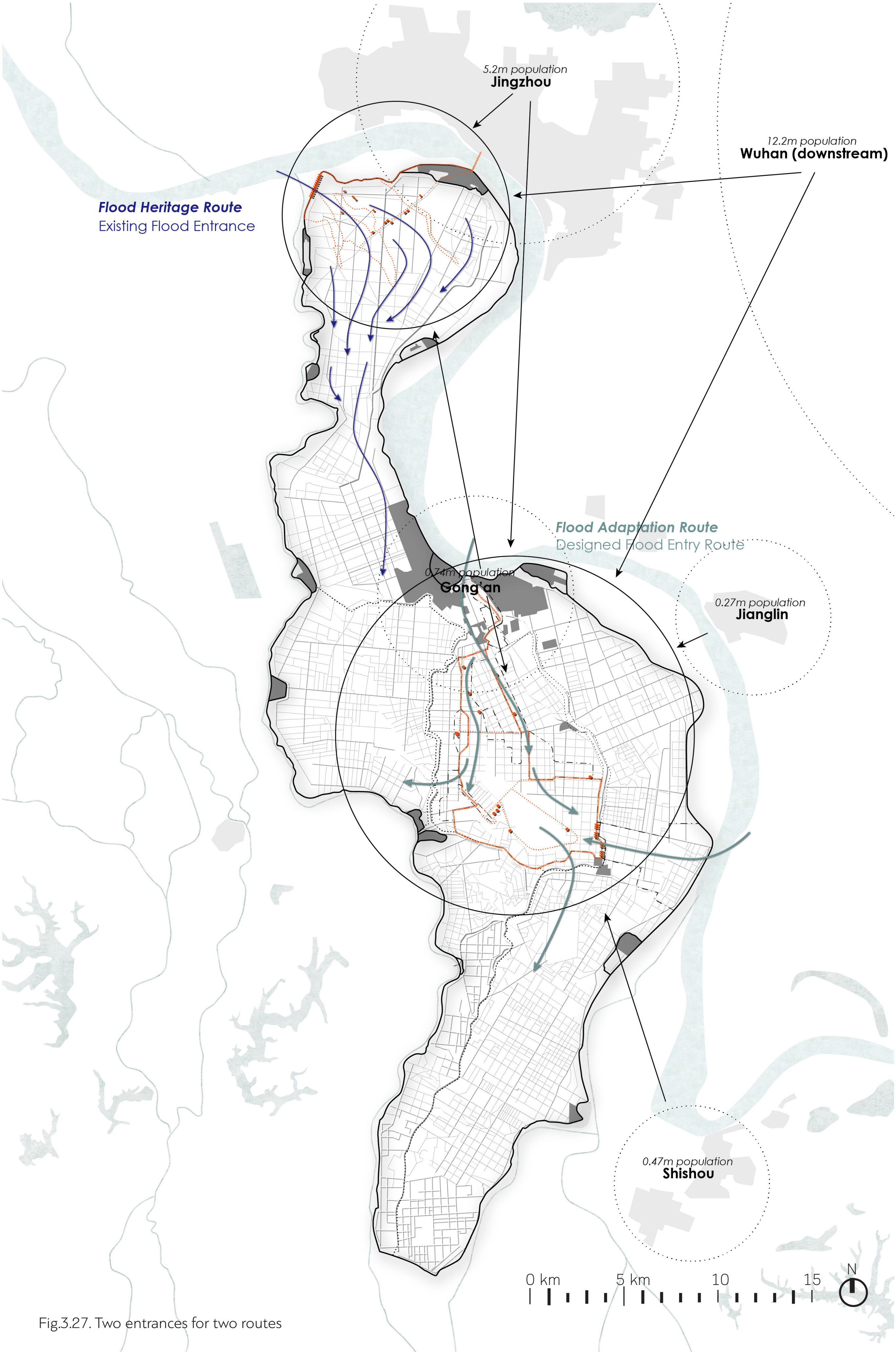


Fig.3.27. Two entrances for two routes

Along the route, there are landscape nodes, including a **Flood Museum** and observation towers, which not only provide scenic resting points but also serve as platforms for narrating modern flood adaptation strategies. The specific structures and layout of the Basin2 area and its nodes will be further explored in the following Zoom-in part.

Visual Typologies

The two routes not only differ in their narrative themes but also present significant contrasts in landscape style and spatial expression. The **Flood Heritage Route** constructs a more introspective and orderly spatial system, with landscape elements primarily consisting of **Riverside Reeds Fields, Flood Courses, and Pastures.** Water in this route is expressed in an organized and guided manner, existing more as traces or remnants, pointing to past flood management practices: elevation control, linear arrangement, and clear functional zoning. Visually, the landscape appears restrained and compact, reinforcing the impression of human governance and regulation of water.

In contrast, the **Flood Adaptation Route** presents a more open and diversified sequence of hydrological landscapes, including **Marshland, Floodplain, Pasture, Grassland and Trees, Urban Park, and Ecological Lake**, among others. These landscape types are interconnected and exhibit strong seasonal variations. The interplay between terrain fluctuations and land use allows this area to generate different spatial states under varying water levels—from still-water wetlands to seasonal floodplain grasslands, from temporarily submerged recreational green spaces to perennial water-retaining ecological lakes. Water establishes a more "adaptive" relationship with the land in this route, creating flexible interactions.

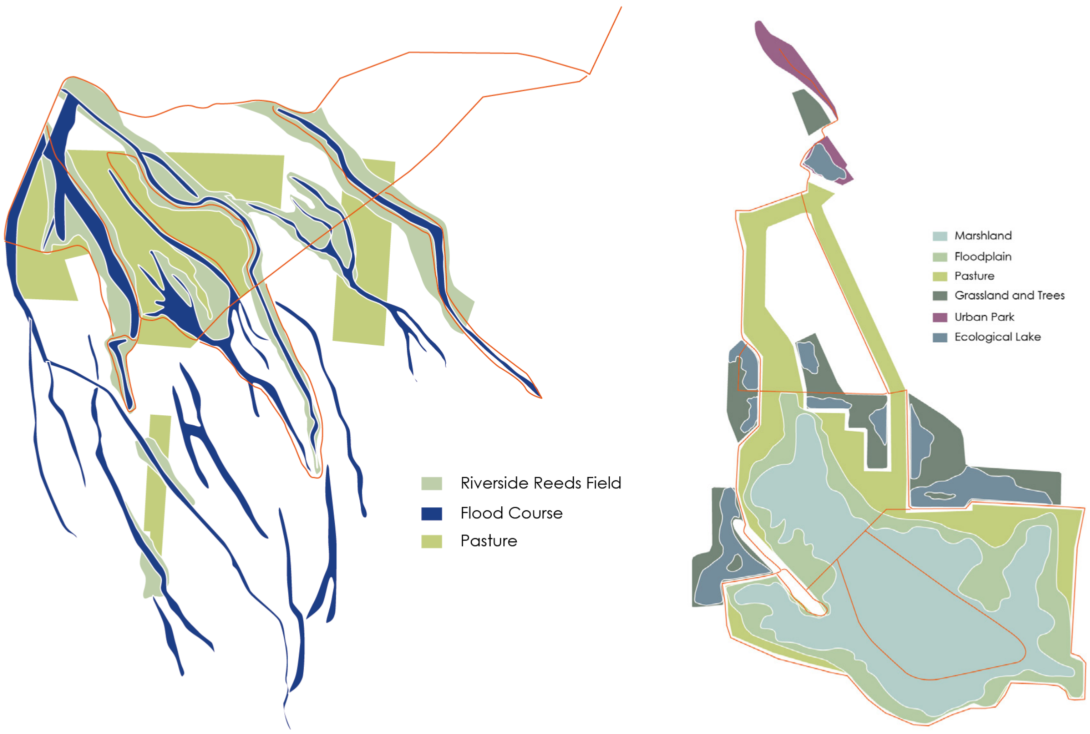


Fig.3.28. Landscape Types in two routes

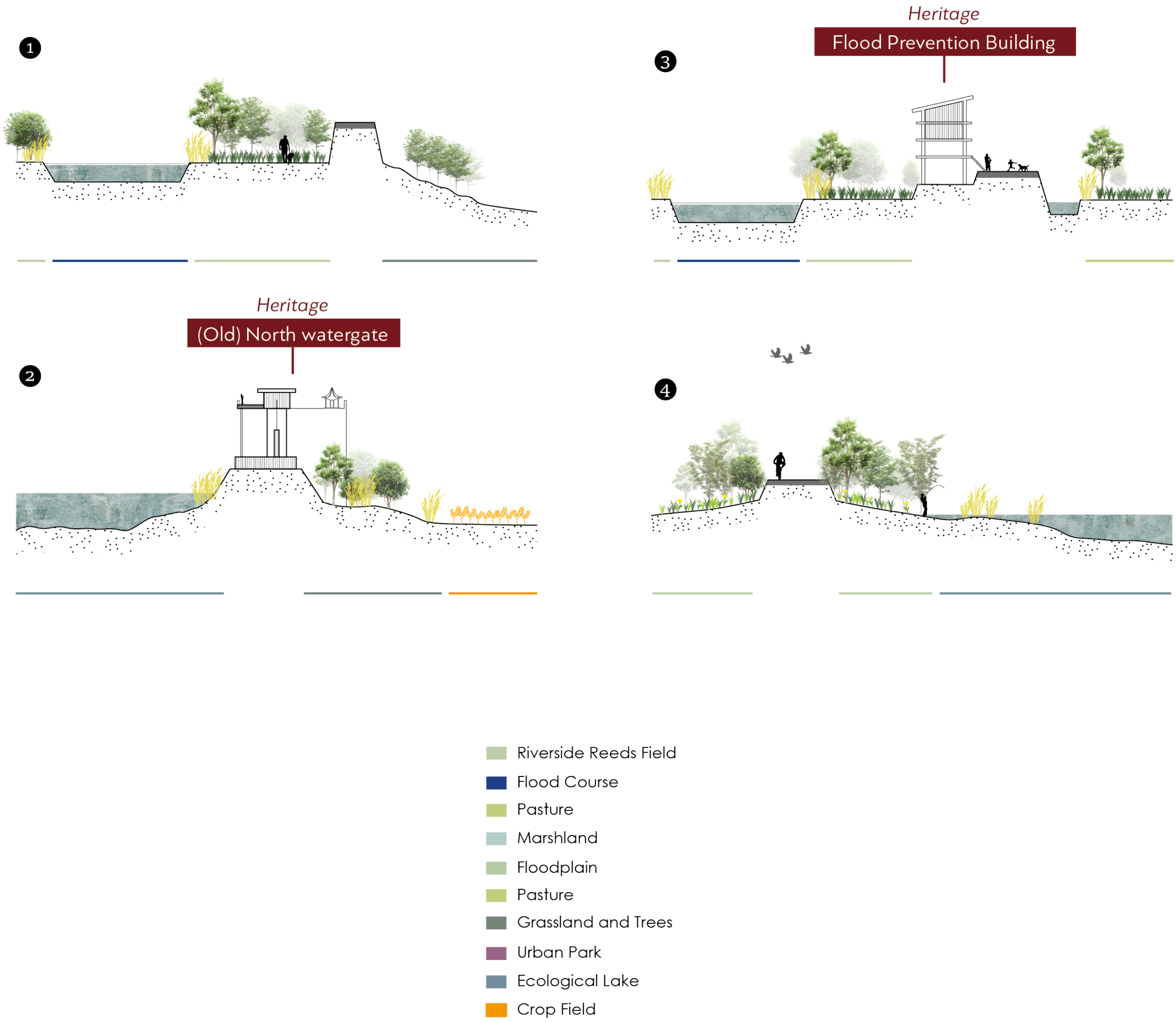


Fig.3.29. Sections of two routes

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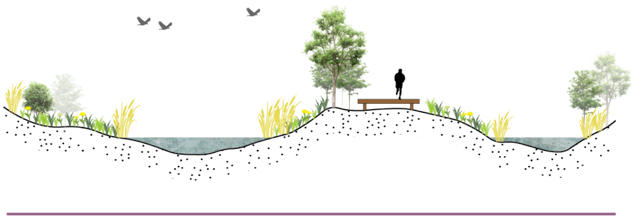

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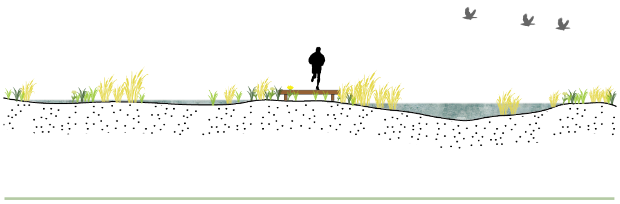
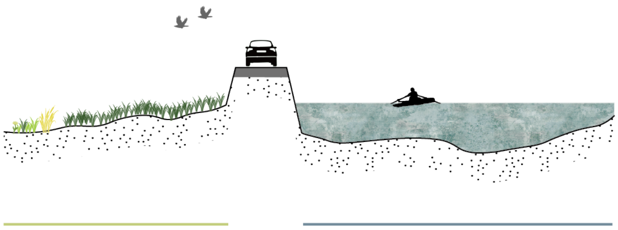


❻


New construction
Observation Tower

❾



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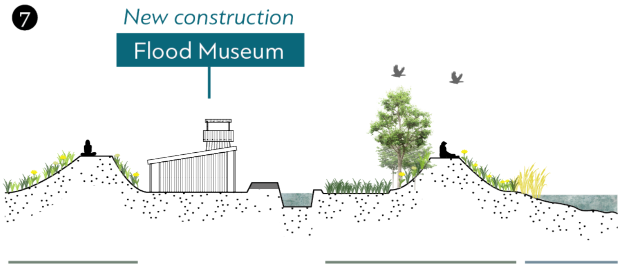
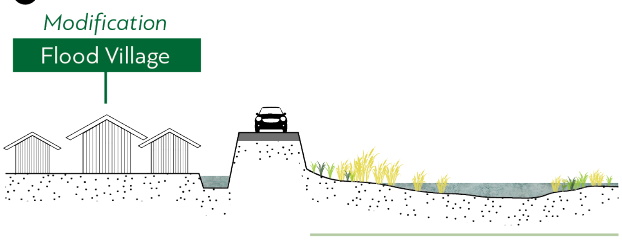

New construction
Flood Museum

❿


Modification
Flood Village

Flood Heritage Routes

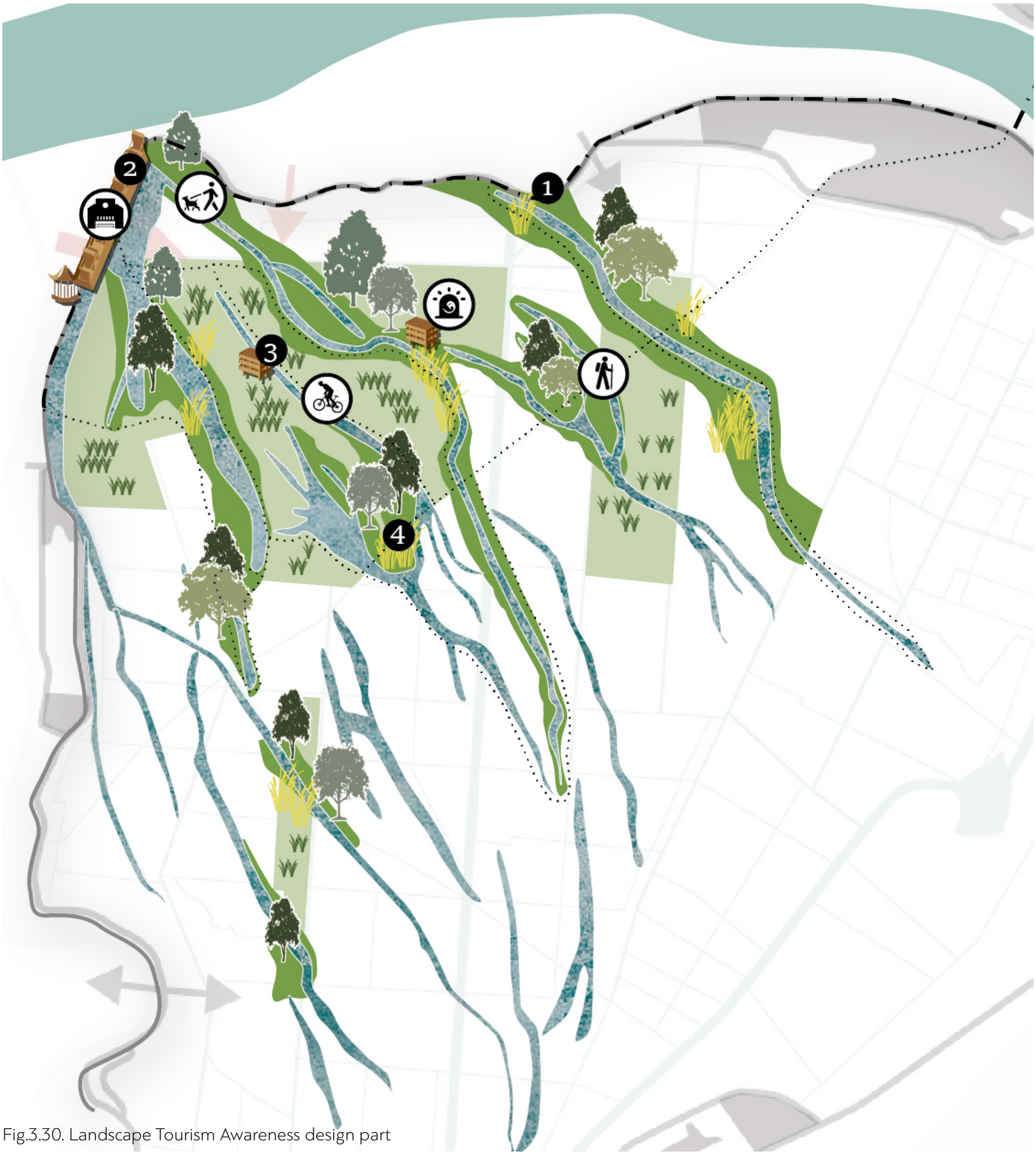


Fig.3.30. Landscape Tourism Awareness design part

Flood Adaptation Routes

Fig.3.31. Landscape Tourism Awareness design part

Relations between Design Parts

Although the design has been structured into four distinct parts—Flood Prevention, Agriculture, Ecology, and Landscape–Tourism–Awareness—these components do not exist in isolation. Each part was developed in response to specific stakeholder value orientations, addressing demands for flood prevention, economic profiting, ecological value and landscape value respectively. However, their spatial and conceptual boundaries are permeable. The flood-adapted agricultural landscape contributes simultaneously to flood retention and ecological regeneration. The ecological zones, while designed to stabilize habitats, also carry implicit educational and aesthetic values. Even the tourism infrastructure, positioned as a communicative layer, reinforces awareness of both hydrological processes and rural livelihoods.

The following diagram illustrates the relationships among these four design parts and the ways in which they collectively support the four stakeholder values. Rather than operating as independent solutions, they form a layered system and showing how flood adaptation is not one technical intervention, but a spatial negotiation among competing yet interdependent priorities.

Together, these related components form more than a collection of functional zones, they constitute a coherent masterplan. It is a spatial framework where flood control, agricultural renewal, ecological resilience, and cultural activation are not parallel goals but interrelated forces.

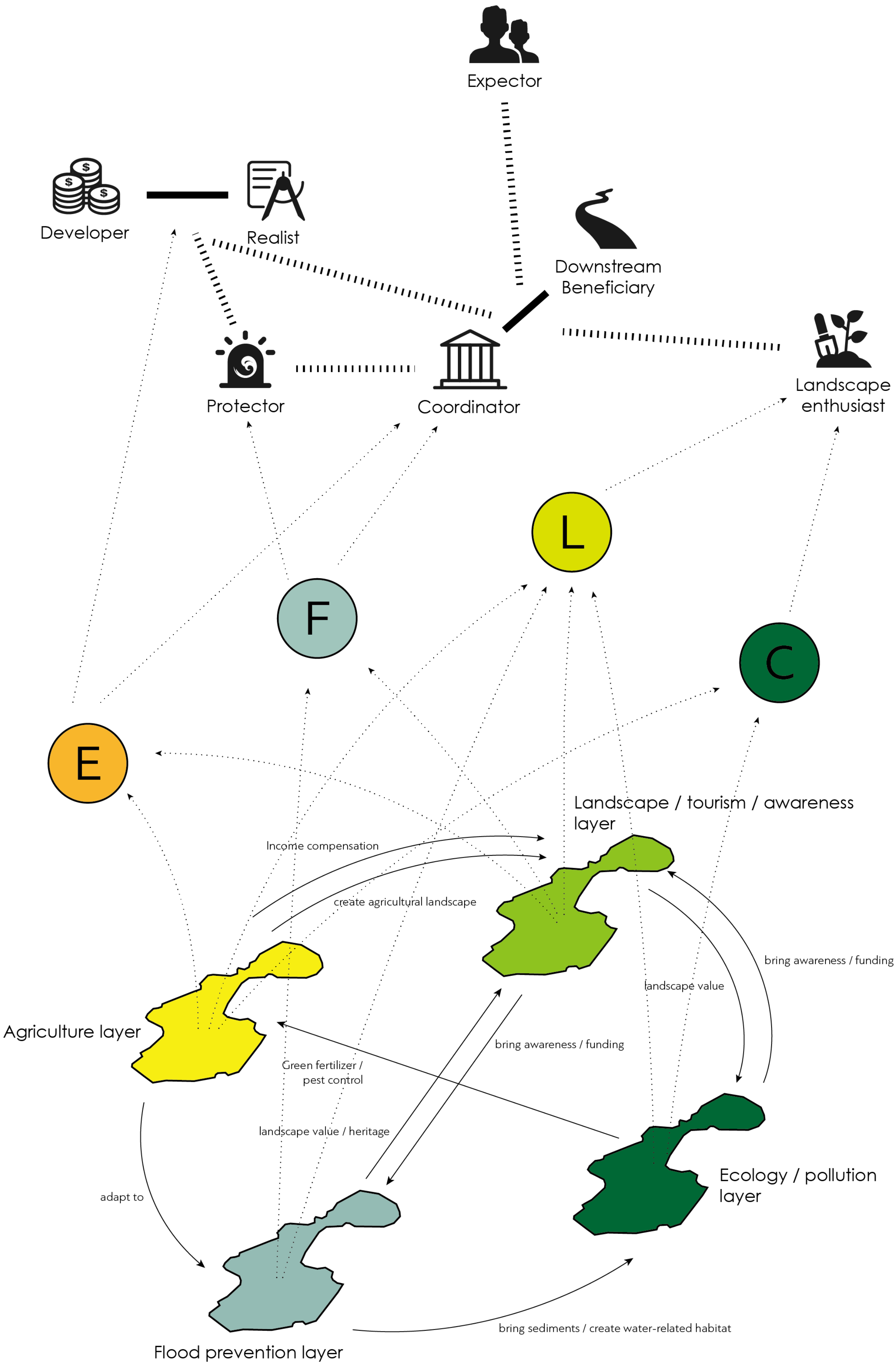


Fig.3.32. Relations between design parts and how they answer to stakeholders

MASTERPLAN

The Jing River Flood Storage Area, a historically engineered landscape, is now reframed through a masterplan grounded in hydrological research, agricultural system, ecological process, and landscape spatial design. This design restores the area's spatial identity—not merely as infrastructure for flood control, but as a multi-functional landscape balancing safety, production, ecology, and cultural value.

The masterplan integrates four design parts: **Flood Prevention (FL)**, **Agriculture (AG)**, **Ecology & Pollution (EP)**, **Landscape/Tourism/Awareness (LTA)**. These components correspond to key stakeholder values—flood prevention, economic profiting, ecological value and landscape value. Flood levels and spatial sequence guide the adaptive layout, allowing each area to respond to different intensities and frequencies of inundation.

At its core, the masterplan is not a fixed solution but a dynamic system. Floodwater becomes both a risk and a resource, shaping agricultural patterns, ecological succession, and landscape experience. Elevated roads, embankments, wetlands, and heritage structures are reinterpreted within this framework—enhancing flood adaptability without erasing historical memory.

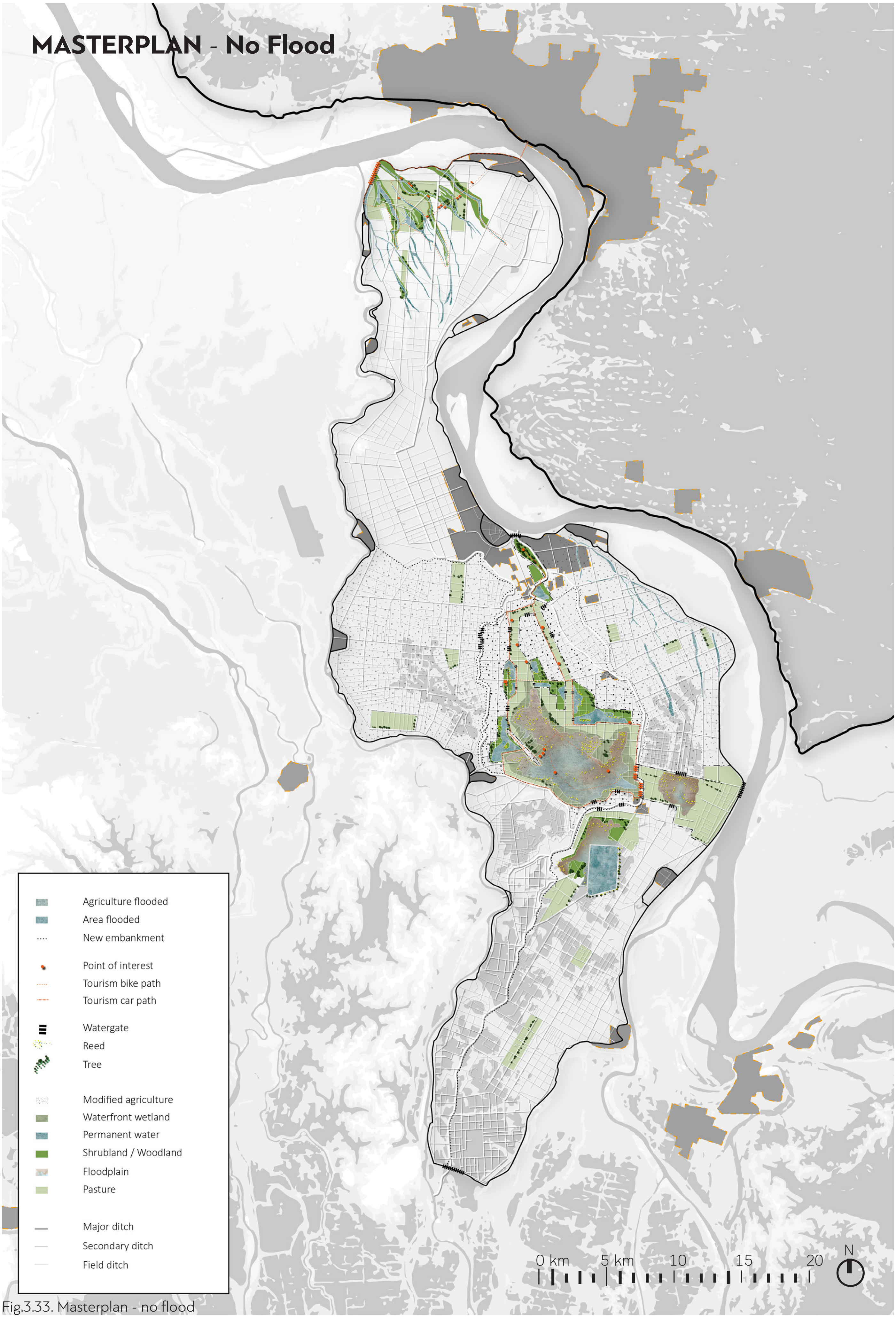


Fig.3.33. Masterplan - no flood

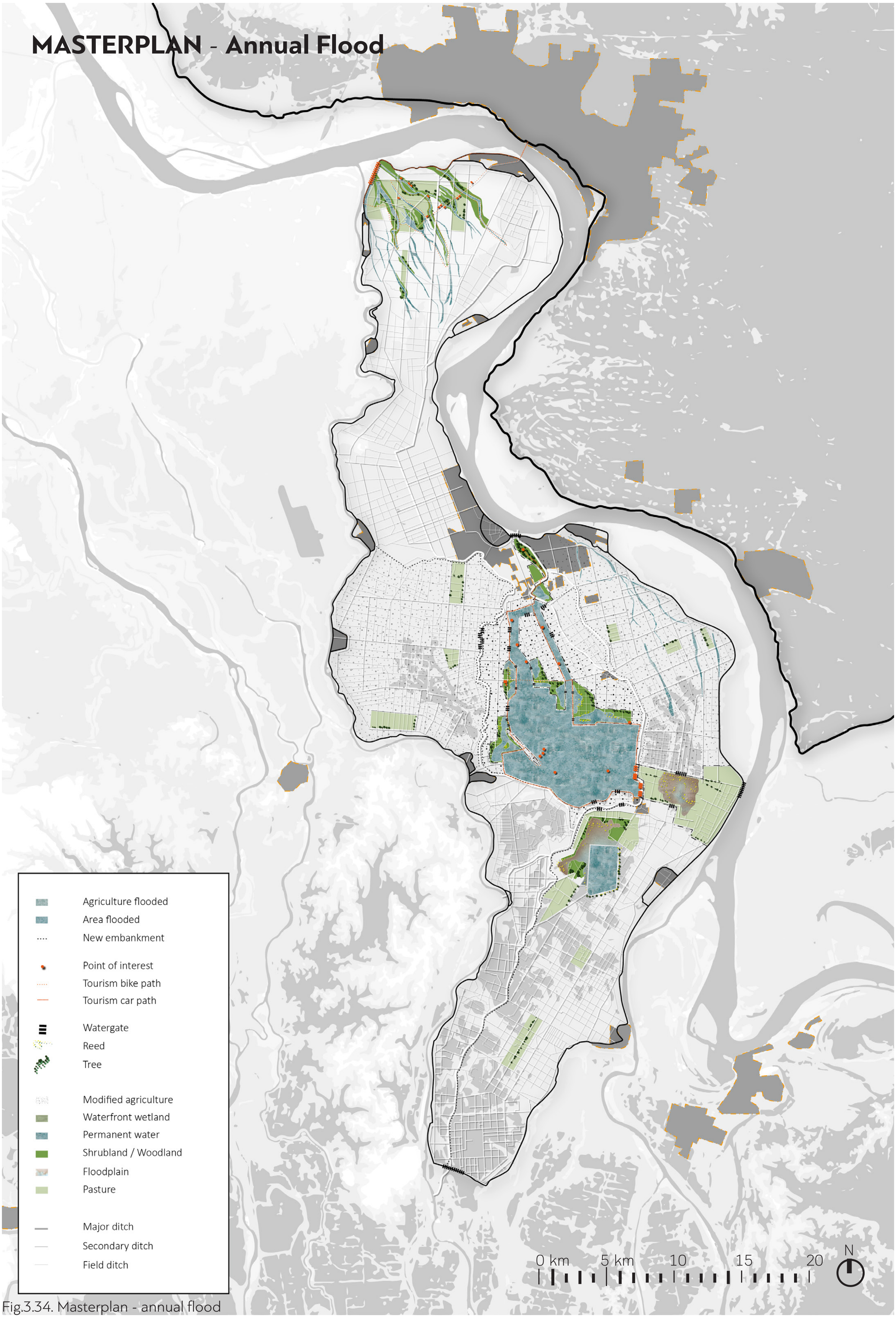


Fig.3.34. Masterplan - annual flood

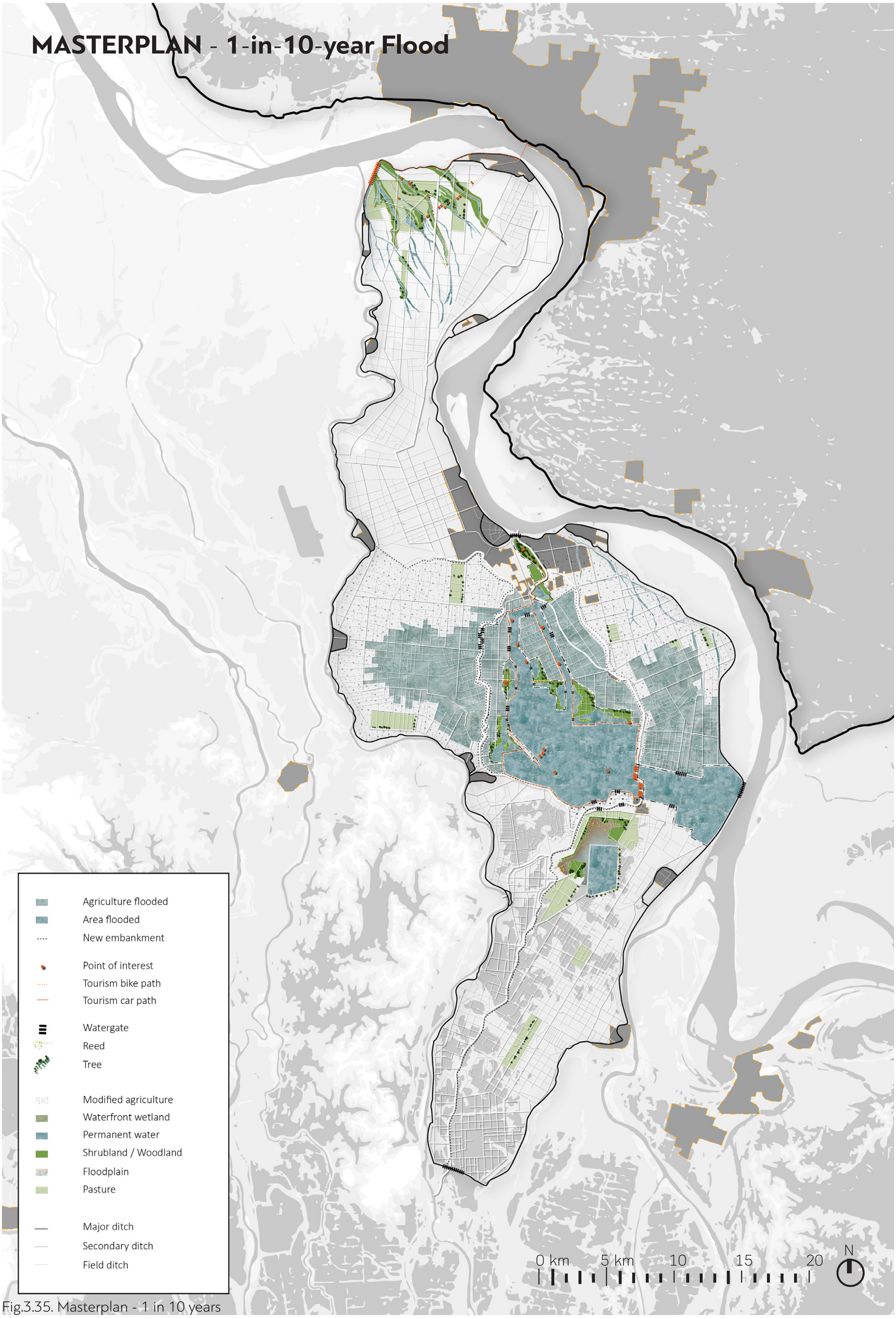


Fig.3.35. Masterplan - 1 in 10 years

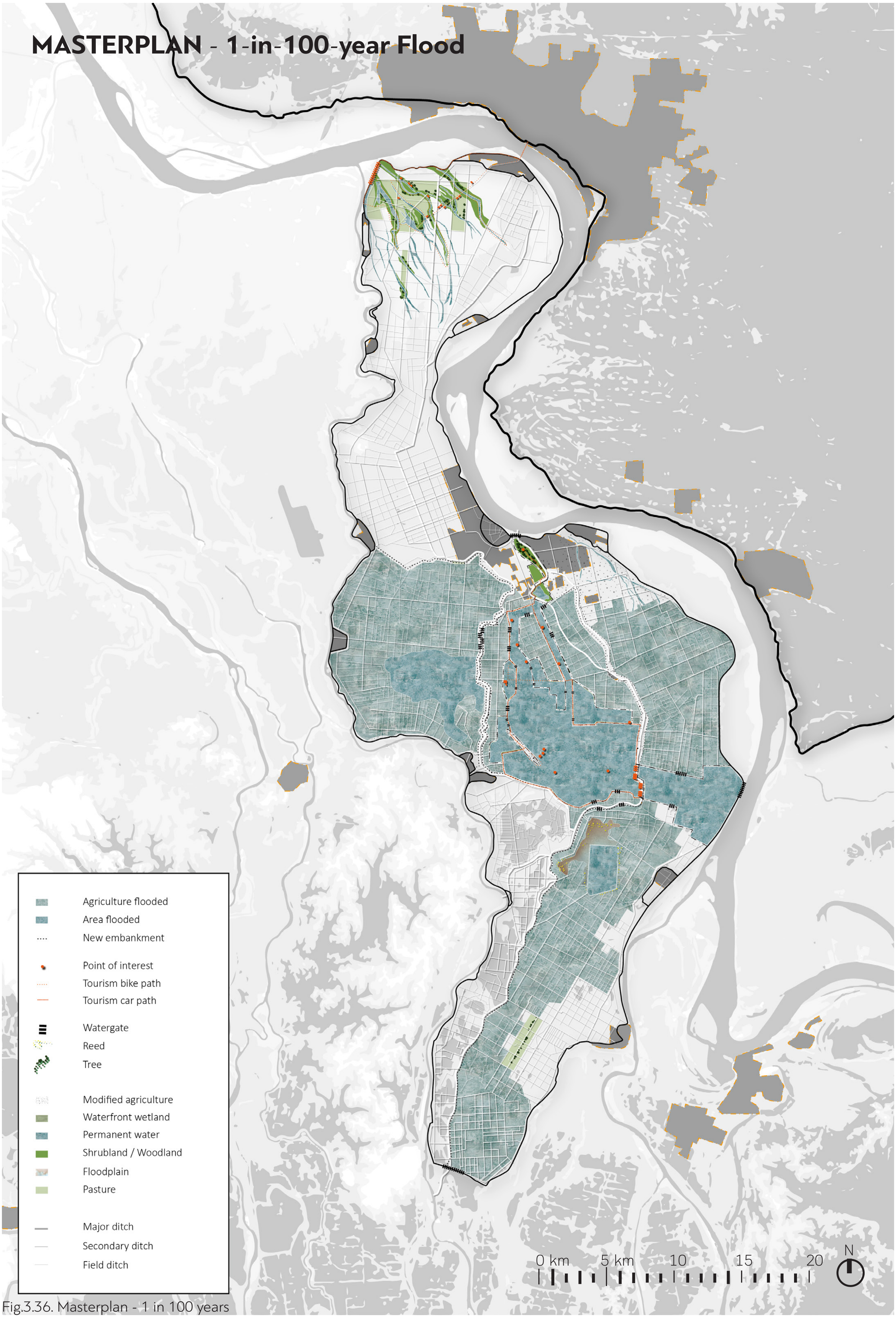


Fig.3.36. Masterplan - 1 in 100 years

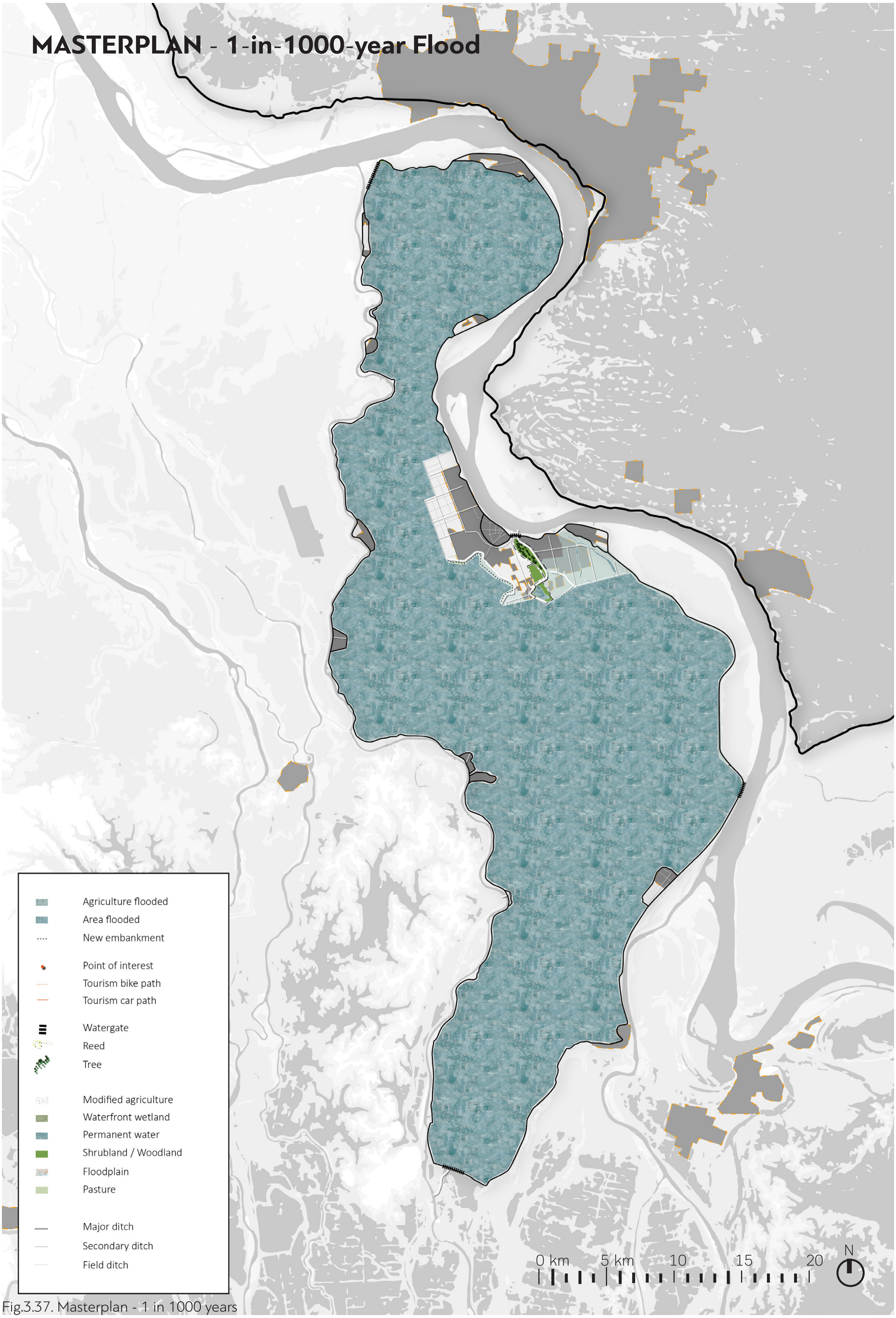


Fig.3.37. Masterplan - 1 in 1000 years

ZOOM IN - BASIN 2

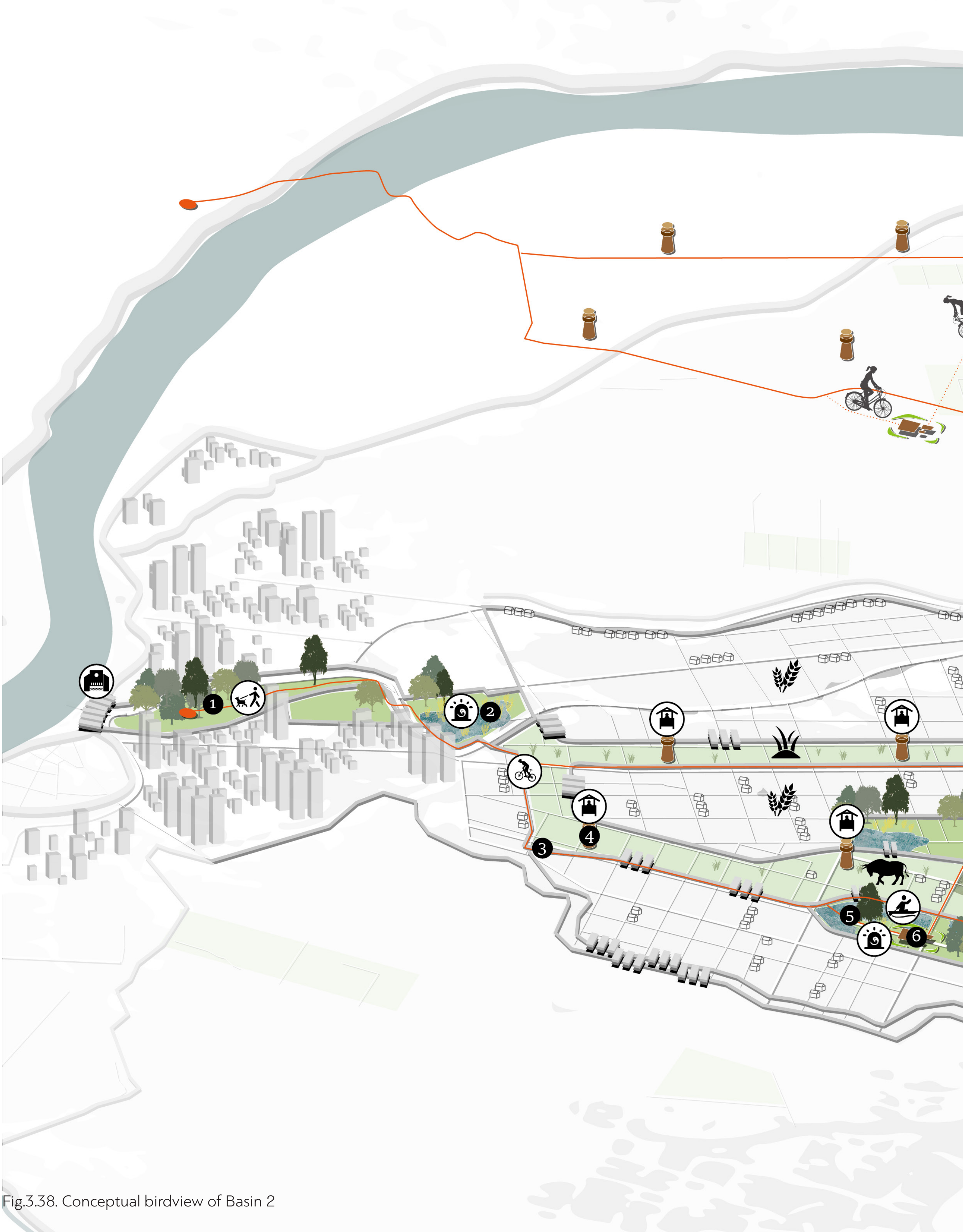


Fig.3.38. Conceptual birdview of Basin 2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Introduction

Basin 2 lies at the heart of the Jing River Flood Storage Area—not only in terms of hydraulic function but as the spatial hinge where ecological, agricultural, and educational values converge. Unlike other basins that operate mainly during extreme flood events, Basin 2 is designed to engage more frequently, flooding partially during seasonal or decadal events. This controlled inundation allows it to become a demonstrative space for flood adaptation, where water's presence is visible, legible, and experientially rich.

Within the broader masterplan, Basin 2 functions as both a buffer and a stage. It mediates hydrological pressure between upper-level diversion flows and downstream infrastructure, while also offering a spatial and visual narrative of living with water. Here, water does not simply pass through—it lingers, reshapes, and defines the land. This interaction gives rise to layered landscape types: overflow wetlands, rotational grasslands, ecological lakes, and floodplain marshes. Each of these zones reflects a specific flood logic and seasonal rhythm.

Moreover, as the entry point of the Flood Adaptation Route, Basin 2 is carefully programmed to maximize accessibility and learning. Landscape nodes such as a flood museum, observation towers, and pedestrian trails are not ornamental but didactic—they offer public access to the processes behind the flood management system, turning an otherwise technical space into a landscape of awareness.

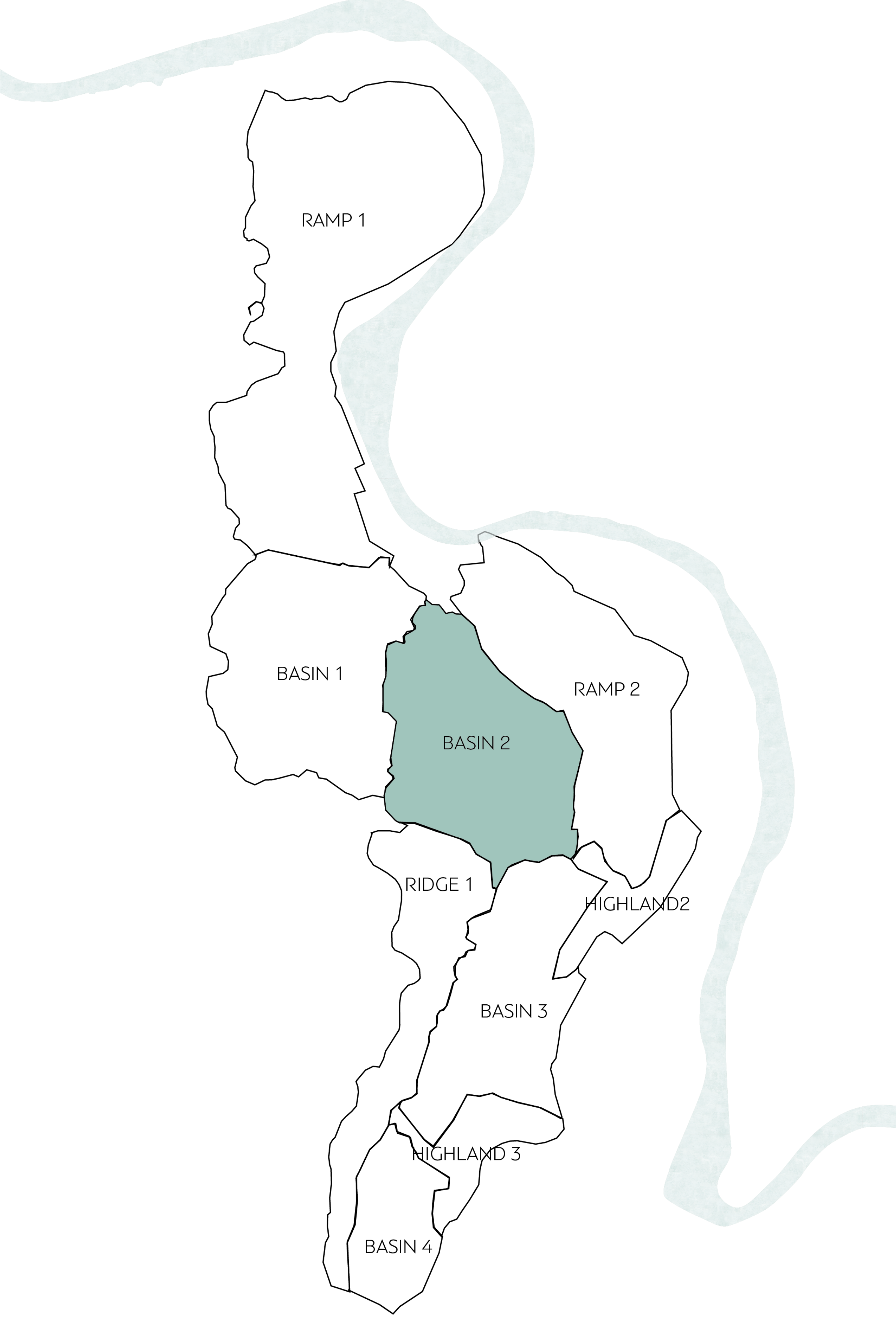


Fig.3.39. Location of Basin 2

Areas

Within the Jing River Flood Storage Area, Basin 2 is organized into a series of spatial subzones that correspond to different stages of the flood process and support a range of ecological, cultural, and recreational functions. These subzones are not only hydrologically sequenced but are also programmatically distinct, each contributing to the broader identity of Basin 2 as a model of flood adaptation.

At the northern edge lies the **Flood Entrance Park**, located between urbanized areas of Gong'an County. Serving as both a primary flood entry point and an urban public park, it operates on a dual scale: infrastructural and civic. Despite its limited size, the park reflects the layered flood logic of Basin 2, containing scaled-down ecological zones that respond differently to annual, decadal, and extreme flood events. It offers a compact yet legible microcosm of the larger flood-adaptive system.

Immediately downstream is **The Bottleneck**, the spatial and symbolic threshold between the city and the open floodplain. This area is designed as a formal landscape marking the transition into the flood domain. It includes an adjustable overflow structure, a retention lake for initial buffering, and a modest commemorative installation to frame the shift in spatial logic—from everyday terrain to flood-operational landscape.

Floodwater then travels through **the Corridor**, a pair of linear grassland zones that guide water toward the central areas of Basin 2. These corridors are designed as multi-functional spaces, combining ecological planting with public access infrastructure. Bike paths on the dikes and scattered viewing towers embedded within the grassland matrix offer both connectivity and varied visual engagement with the site during dry and wet conditions.

Along both sides of the corridors lie a series of **Overflow Wetlands**, fed by controlled breaches along the corridor embankments. Unlike the floodplain zones designed for temporary inundation, these wetlands retain water for longer periods, supporting more stable wetland ecologies. Their persistence provides habitat continuity and allows for long-term environmental interpretation. One of these wetlands hosts the Flood Museum, reinforcing the site's role in fostering public awareness.

At the south and lowest part of Basin 2 is the **Floodplain Wetland**, a broad, concave area that holds the majority of floodwater during large events. Due to its low elevation, residual water and sediments remain here after floodwaters recede, creating conditions highly suitable for species richness and seasonal landscape change. This zone offers both ecological productivity and visual distinctiveness, marking the destination of the site’s flood-adaptive sequence.

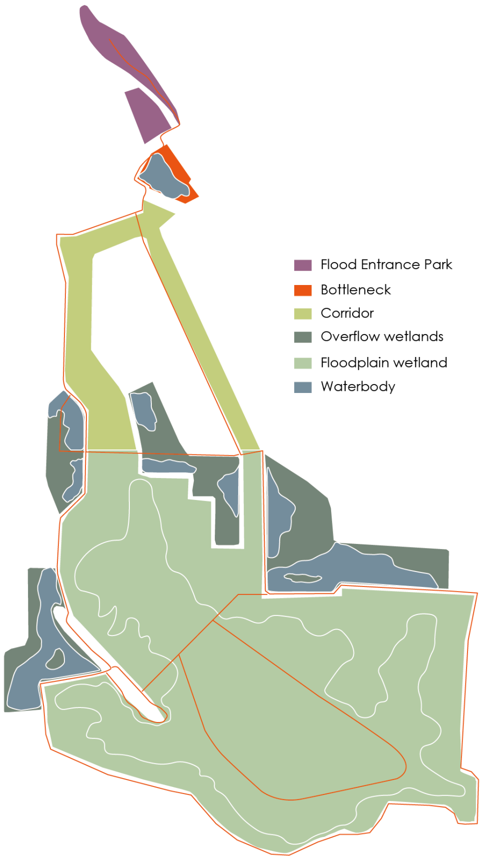


Fig.3.40. Area map of Basin 2

Points of Interest

Within the layered structure of Basin 2, several key points of interest have been added to support public engagement, ecological interpretation, and spatial experience. These elements do not function merely as architectural insertions, but as interpretive place—allowing visitors to perceive the flood landscape not only as infrastructure, but as a lived environment.

Observation Towers are distributed along the Corridor and at the edges of the Floodplain Wetland. Their placement responds to topography and visual axis, offering elevated vantage points over distinct ecological zones—from seasonally inundated grasslands to long-term wetland basins. On certain days, the towers can be reserved online for small group gatherings, offering a place where family ceremony intersect with flood-adaptive infrastructure.

The Flood Museum, located within one of the Overflow Wetlands, serves as a central interpretive node. The museum presents layered narrative chronicling the flood history of the Jianghan Plain, the structure and operation of the traditional Weiyuan system, and the evolving role of flood storage areas in contemporary flood governance. The building itself is surrounded by a permanent wetland lake, yet this condition is deliberately hidden from view at ground level. Visitors inside the museum are enclosed by soft, vegetated berms—suggesting a calm and contained environment. Only upon ascending the grassy slope do they realize the building is entirely encircled by water, echoing the paradoxical reality of floodplain life: to be surrounded by water, often unknowingly.

Chonghu Village, a raised settlement situated between an Overflow Wetland and the Floodplain Wetland, represents a critical spatial typology. The village, now elevated above surrounding farmland, remains dry and accessible during flood events. It is envisioned as a semi-permanent destination, offering accommodation for visitors interested in experiencing the changing flood landscape across seasons. During active flood scenarios, the village becomes a key viewing and interpretation node—allowing for safe observation of water movements, ecological transformation, and the unfolding logic of the adaptive masterplan.

Phasing and Ecological Succession

The spatial transformation of Basin 2 is conceived not as an one-time act of construction, but as a phased process—guided by hydrological engineering and ecological time. The implementation strategy is intentionally gradual, allowing landscape systems to regenerate through a controlled interaction with flood events.

Phase 1 initiates with the restriction of flood waters to two areas: **the Corridor** and **the Floodplain Wetland**. Embankments are constructed to define and protect surrounding areas, using soil excavated from within the Corridor itself. This excavation slightly lowers the base elevation of the Corridor, facilitating the inflow of water during annual and decadal flood events. Over the course of the first five years, repeated inundation and sediment movement will gradually deepen and stabilize the channel, shaping a more defined flood passage through erosive action rather than mechanical intervention.

Once these primary flow paths are hydrologically stable, **Phase 2** introduces a new layer of water management infrastructure. A series of controlled breach points—or overflow notches—are opened along the Corridor's lateral embankments. Each breach is paired with simple sluice or gate mechanisms, enabling the regulated diversion of floodwater into adjacent depressions. These diverted flows form the basis for the **Overflow Wetlands**, which emerge at the interface between engineered structure and seasonal hydrology.

Over the following two decades **(Phase 3)**, the ecological performance of the site gradually intensifies. As flood regimes repeat and stabilize, the interwoven systems of the **Corridor, Floodplain Wetland**, and **Overflow Wetlands** begin to develop into functioning ecosystems. Species colonization, sediment deposition, and vegetation succession give rise to spatially varied wetland ecologies.

This phased approach deliberately avoids rapid formalization. Instead, it leverages hydrological time as an active design agent—allowing ecological succession and public perception to evolve in parallel with the space itself.

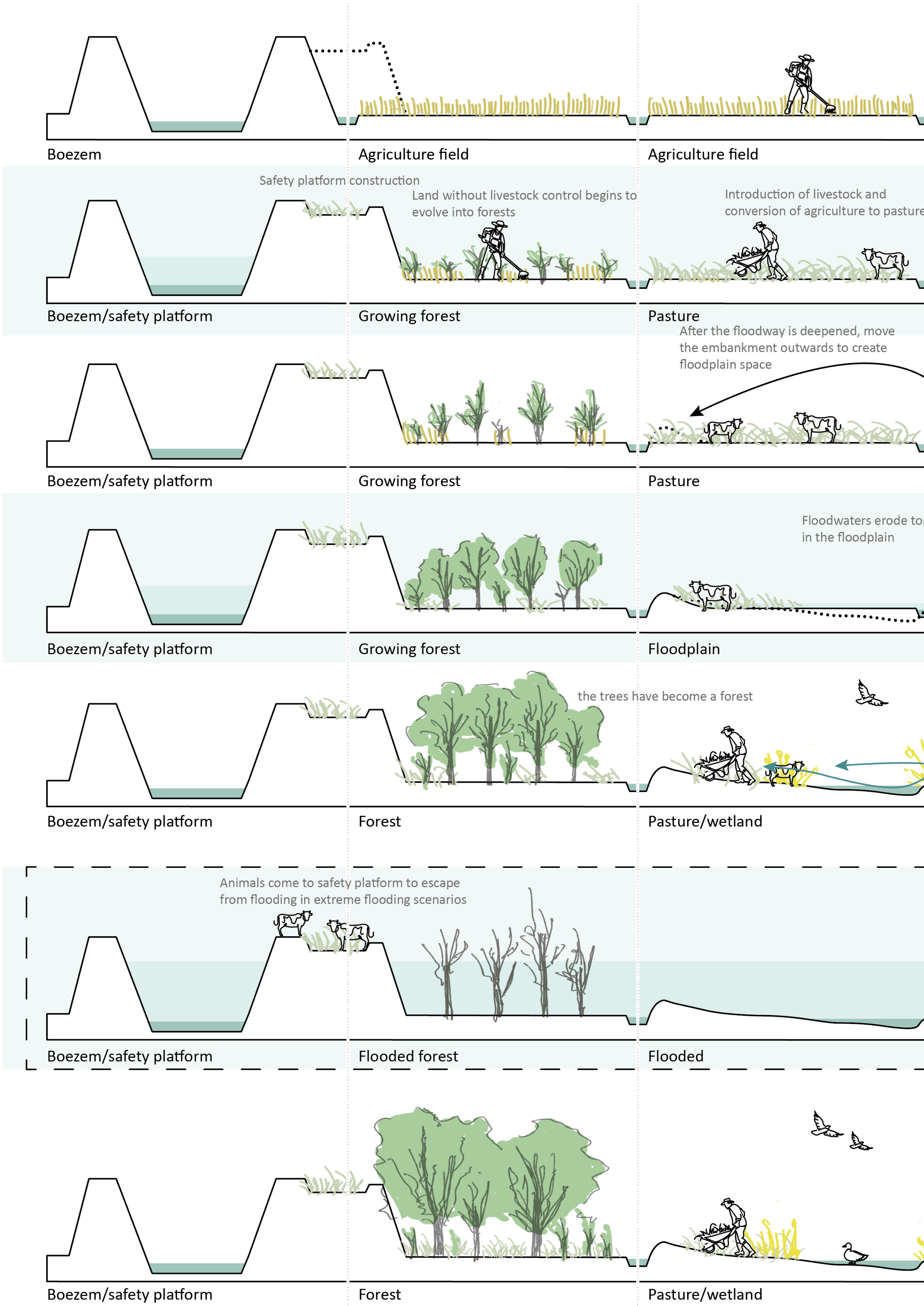
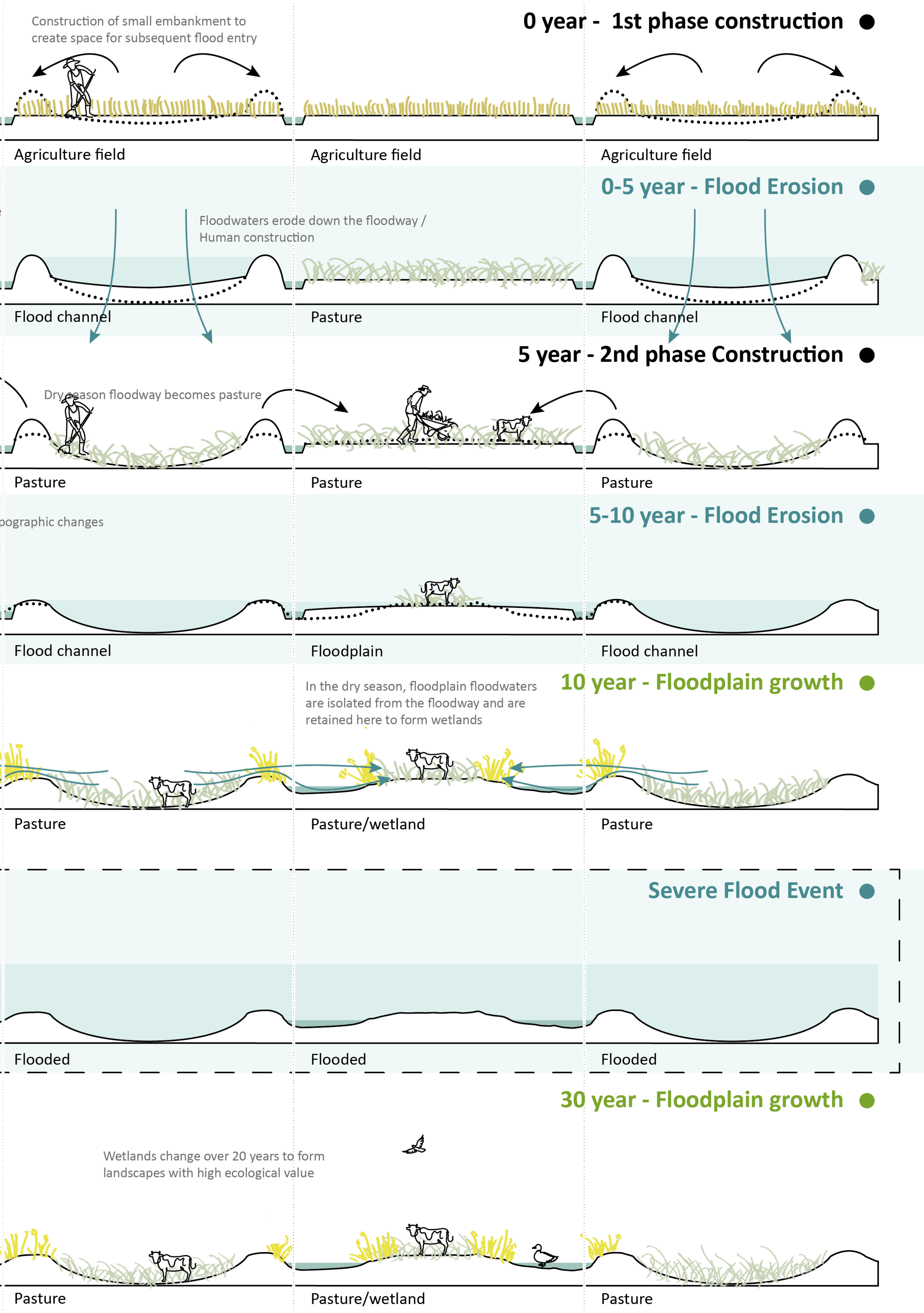


Fig.3.41. Phasing and ecological succession



0 year - 1st phase construction
Construction of small embankment to create space for subsequent flood entry
Agriculture field
Agriculture field
Agriculture field
0-5 year - Flood Erosion
Floodwaters erode down the floodway / Human construction
Flood channel
Pasture
Flood channel
5 year - 2nd phase Construction
Dry season floodway becomes pasture
Pasture
Pasture
Pasture
5-10 year - Flood Erosion
opographic changes
Flood channel
Floodplain
Flood channel
10 year - Floodplain growth
In the dry season, floodplain floodwaters are isolated from the floodway and are retained here to form wetlands
Pasture
Pasture/wetland
Pasture
Severe Flood Event
Flooded
Flooded
Flooded
30 year - Floodplain growth
Wetlands change over 20 years to form landscapes with high ecological value
Pasture
Pasture/wetland
Pasture

Detailed Design - Museum & Corridor

The central public features of Basin 2—including the Flood Museum, the Corridor system, and a series of Viewing Towers—serve as key spatial and interpretive components within the Jing River Flood Storage Area. Together, they form a framework that enhances public awareness of flood adaptation, offers layered ecological experiences, and reveals the underlying hydrological dynamics of the site. Strategically distributed along the flood gradient, these elements support both long-term educational goals and immediate recreational use.

Features:

Flood Museum

Location and Immersion: Situated within a long-retaining overflow wetland, the museum is accessible via a path network. Its location offers year-round proximity to water, anchoring it within the most hydrologically stable zone of the basin.
Design Concept: The building is partially embedded within a designed grass berm, obscuring its relationship to the surrounding lake from the interior. This controlled spatial perception mirrors the floodplain condition—where water often surrounds without direct awareness.
Educational Content: Inside, exhibitions narrate the flood history of the Jianghan Plain, the traditional Weiyuan agricultural system, and the evolving role of flood storage in national water governance.

Corridor

Hydrological Role: The Corridor operates as the primary channel guiding floodwater into the deeper zones of Basin 2. Its formation—through both excavation and long-term erosion—creates a defined flood passage that doubles as a linear ecological park.
Landscape Programming: Composed mainly of rotational grasslands and low planting, the Corridor is accessible throughout the year via bike paths on the dike

and small paths in between.
Spatial Integration: Its dual function as a flood infrastructure and public greenway ensures that hydrological operations remain visible and comprehensible to everyday visitors.

Viewing Towers

Location and Accessibility: Viewing towers are positioned at key points along the Corridor and around the floodplain wetland's edge. They are connected to the cycling and walking network, allowing for easy access during dry seasons.
Visitor Use: On select days, towers can be reserved in advance, offering scenic venues for group activities or quiet observation.
Landscape Views: Their height provides elevated perspectives over dynamic landscape zones—from seasonal marshes to long-term retention basins—reinforcing the basin's identity as a productive and adaptive flood environment.

Conclusion:

The Flood Museum, Corridor, and Viewing Towers collectively transform Basin 2 from a purely functional flood zone into a legible and publicly accessible flood landscape. By balancing infrastructure with interpretation, and control with openness, these elements exemplify how technical landscapes can also be cultural and experiential spaces.

Detailed Design - **Museum & Corridor**
Masterplan - Normal season

1 Green fertilizer generator
2 Flood house
3 Basin2 - corridor
4 Viewing tower
5 Overflown watergate
6 Overflown lake
7 Dock
8 Flood museum
9 Experimental eco-agriculture
10 Personal Garden
11 Settlement

Fig.3.42. Masterplan of Detailed design 1 in nor

rmal season

Detailed Design - **Museum & Corridor**
Masterplan - Flood season

1 Green fertilizer generator
2 Flood house
3 Basin2 - corridor
4 Viewing tower
5 Overflown watergate
6 Overflown lake
7 Dock
8 Flood museum
9 Experimental eco-agriculture
10 Personal Garden
11 Settlement

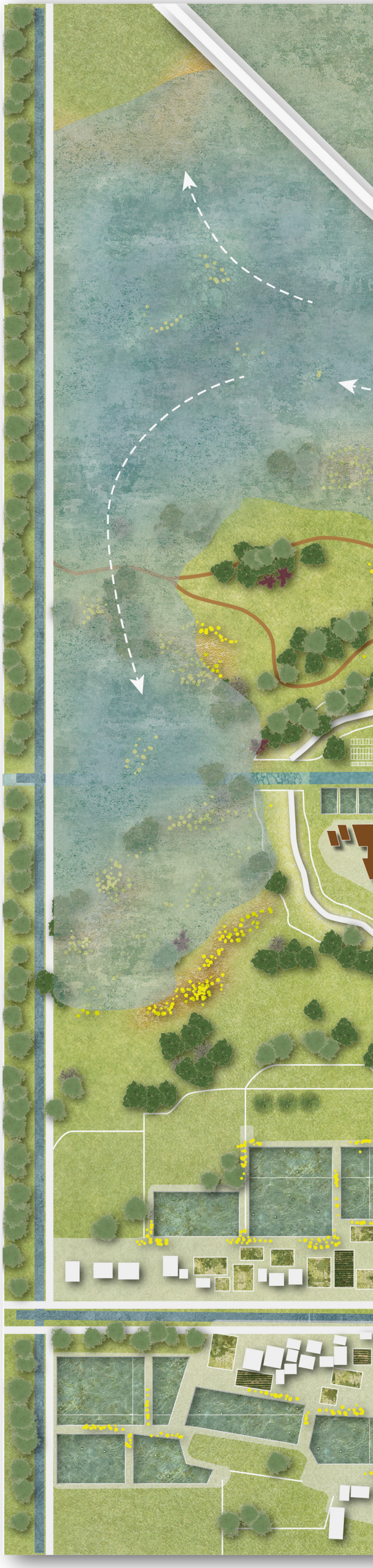


Fig.3.43. Masterplan of Detailed design 1 in floo

d season

Fig.3.44. View of the corridor in normal season

Fig.3.45. View of the corridor in flood season

Detailed Design - **Bottleneck**

The Bottleneck is a transitional zone situated between the upstream urban flood park and the downstream Green Corridor within Basin 2. This narrow spatial threshold marks a moment of passage—from the legible, controlled urban realm into the expansive and ambiguous floodplain. On ordinary days, the central island within the Bottleneck remains dry and accessible. However, during flood discharge events, the same area is reactivated to serve as an additional flow channel, reinforcing its dual identity. The design of this segment centers on one of the most critical yet often invisible forces shaping the flood landscape: elevation. Although water levels eventually equalize across Basin 2, micro-topographical differences dictate the duration and intensity of flooding in each subzone. In this design, elevation becomes not just a technical parameter but an experiential narrative—rendered legible through spatial contrast, path differentiation, and architectural markers.

Features:

Elevated Path and Flood Path

Two parallel routes structure the spatial experience: one elevated to the height of the dike, offering an overview of the broader floodplain; the other aligned with the terrain, leading visitors through reeds and low-lying meadows. Benches embedded along the flood path invite close encounters with water and vegetation. As visitors follow both paths from a shared starting point, the difference in elevation gradually becomes visible—turning abstract topography into embodied knowledge.

Elevation Marks

Along the lower path, a sequence of vertical markers—abstract concrete forms—stand at a constant elevation equal to the surrounding dike. At the northern entrance, these markers appear modest, even human-scale. But as the path descends with the terrain, the markers remain at the same height, eventually rising several meters above ground, turning into quiet monumental presences. Some of these structures double as elevated platforms, offering occasional high views even from the lower trail.

Observation Tower and Sluice Gate

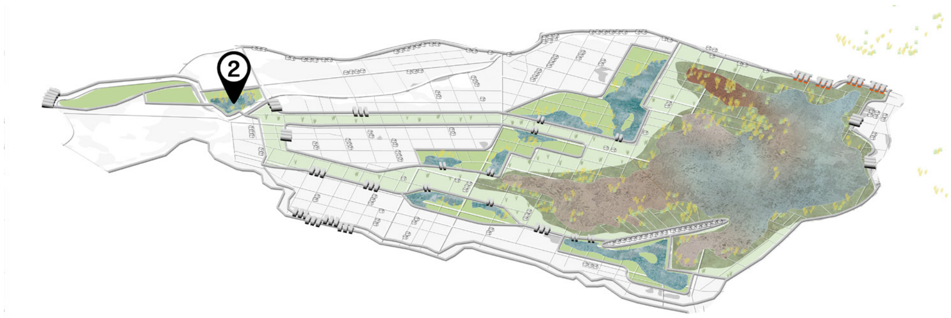
At the southern end of the Bottleneck stands a viewing tower paired with a critical sluice gate. Together they mark the threshold between controlled flooding and protected hinterlands. The tower elevates the viewer once again—allowing a moment of reflection before entering, or exiting, the deeper realm of water.

Conclusion:

The Bottleneck is not merely a physical narrowing but a spatial and perceptual transition—where elevation, flow, and narrative intersect. Through subtle shifts in ground level and carefully staged views, the design reveals how minor topographical differences yield major ecological and experiential variations. It invites visitors to move not just across space, but between systems of understanding: from human-centered stability to the slow, layered logic of water. As a hinge between the urban edge and the open flood basin, the Bottleneck embodies the project's broader aim—to render the invisible workings of the flood landscape both visible and meaningful.

Detailed Design - **Bottleneck**
Masterplan - Normal season

1 Participating agriculture
2 Elevated Mark
3 Elevated Mark (Observation platform)
4 Natural Water Channel
5 Dock & Bench
6 Existing Water Channel (Pasture)
7 Remained Lake
8 Observation Tower
9 Sluice Gate
10 Flood Path
11 Elevated Path
12 Green Corridor



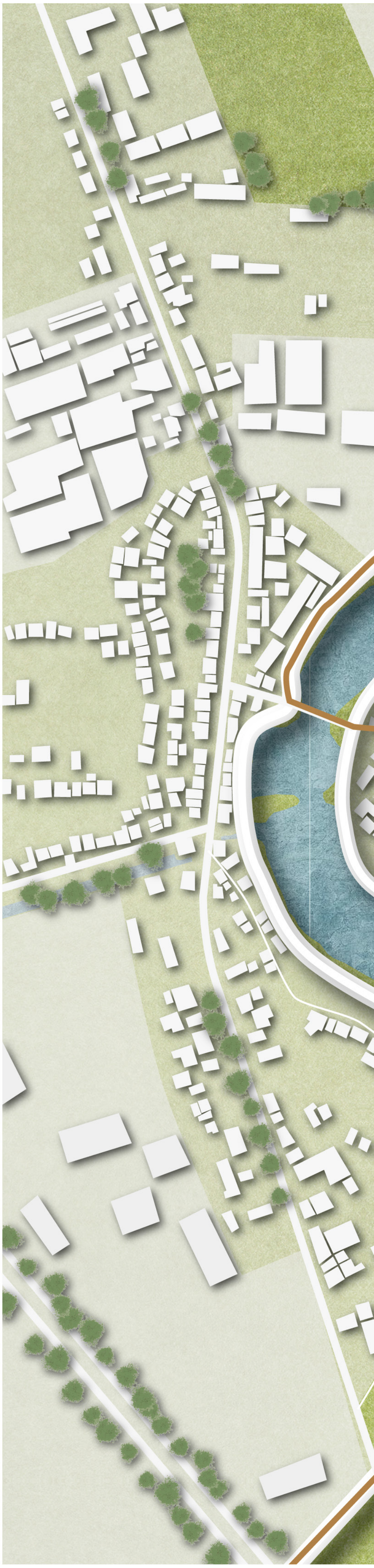
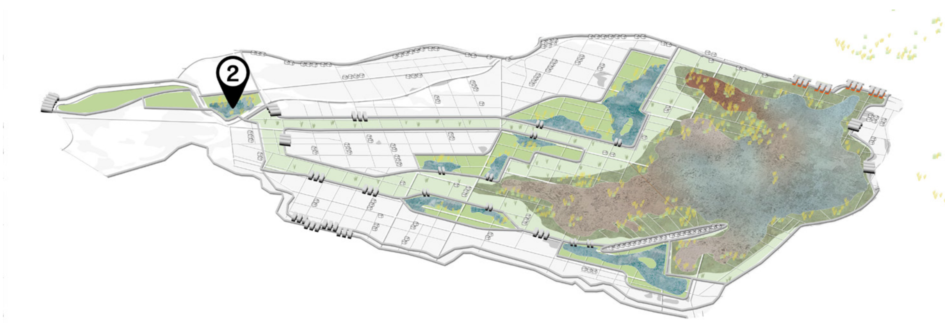


Fig.3.46. Masterplan of Detailed design 2 in nor

rmal season

Detailed Design - **Bottleneck**
Masterplan - Annual Flood

1 Participating agriculture
2 Elevated Mark
3 Elevated Mark (Observation platform)
4 Natural Water Channel
5 Dock & Bench
6 Existing Water Channel (Pasture)
7 Remained Lake
8 Observation Tower
9 Sluice Gate
10 Flood Path
11 Elevated Path
12 Green Corridor



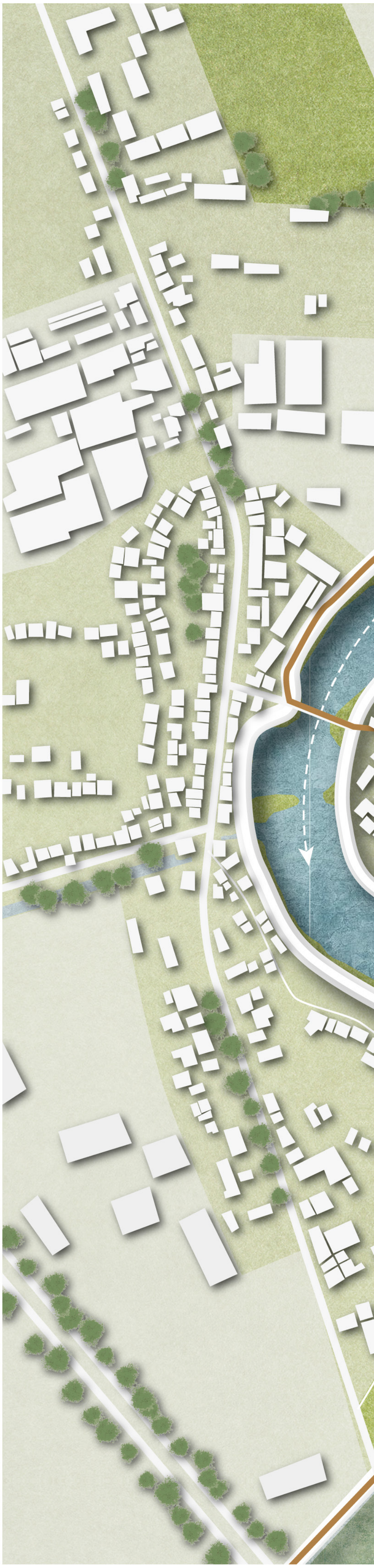
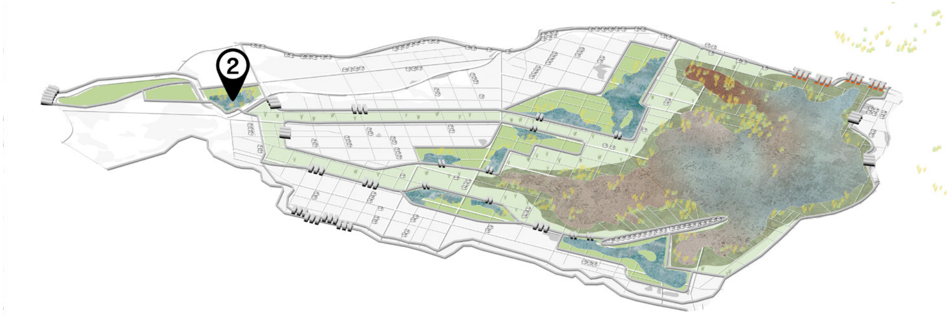


Fig.3.47. Masterplan of Detailed design 2 in Ann

ual Flood Scenario

Detailed Design - **Bottleneck**
Masterplan - Severe Flood

1 Participating agriculture
2 Elevated Mark
3 Elevated Mark (Observation platform)
4 Natural Water Channel
5 Dock & Bench
6 Existing Water Channel (Pasture)
7 Remained Lake
8 Observation Tower
9 Sluice Gate
10 Flood Path
11 Elevated Path
12 Green Corridor



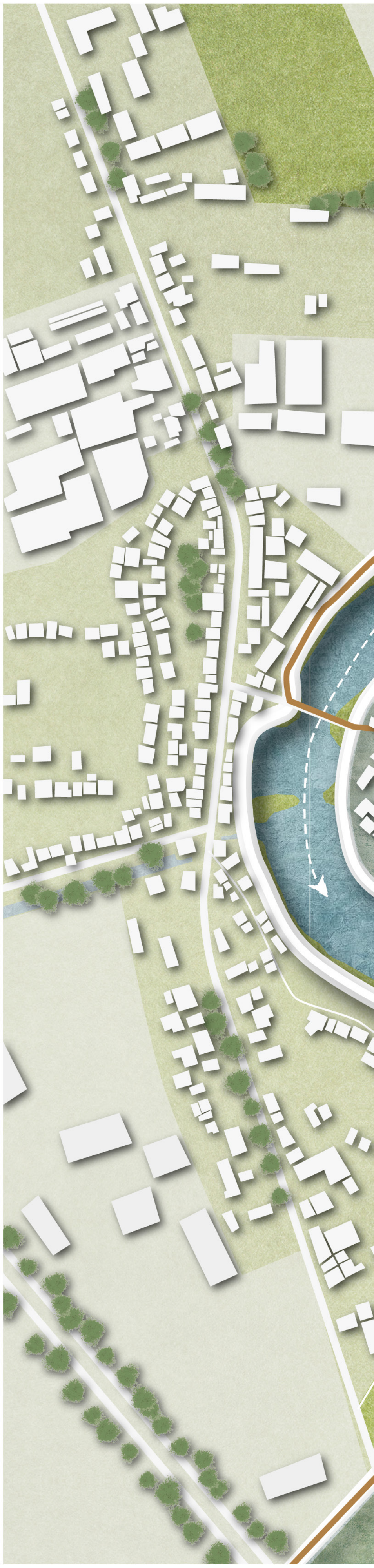


Fig.3.48. Masterplan of Detailed design 2 in Seve

ere Flood Scenario

Fig.3.49. View of the bottleneck in normal season


Fig.3.50. View of the bottleneck in flood season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ZOOM OUT - FIRST PROTOTYPE IN THE CATCHMENT

Following the in-depth design investigation within the Jing River Flood Storage Area (JRFSA), this research concludes by extending its focus to the broader spatial context of the Jianghan Plain—a landscape historically defined by the interplay between flood dynamics and human settlement. Across this flood-prone plain, over a dozen officially designated flood storage areas operate under a sequential activation model: each area is fully inundated before the next is considered. This approach, while straightforward from a control perspective, imposes disproportionate burdens on specific communities, creating uneven exposure to flood risk and amplifying economic and social disruption.

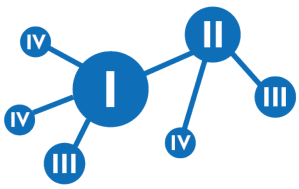
The Cascading Floodspace concept introduces an alternative framework Instead of relying on fully activation, flood storage can be structured across multiple layers both within and between flood storage areas. By doing so, the model enables a more adaptive approach, reducing peak impacts on any single location while maintaining overall flood mitigation capacity.

Crucially, Cascading Floodspace also redefines the role of flood storage areas beyond their hydraulic function. Through layered land-use strategies and differentiated design emphasis, individual basins can develop distinct identities—some prioritizing ecological regeneration, others supporting productive agriculture or seasonal tourism. This opens up opportunities for cross-regional cooperation in land use planning and economic integration. A system once marked by sacrifice can begin to produce value in diverse forms, reflecting the specific conditions and potentials of each site.

Finally, by lowering the threshold of disruption and enhancing site adaptability, this model creates conditions under which more flood storage areas may be voluntarily incorporated into the system. As entry costs decrease—both in terms of local resistance and operational risk—the regional flood management network can be expanded. This expanded network, in turn, reduces the likelihood that extreme events (such as 1000-year floods) will overwhelm a single location, thereby increasing systemic resilience.

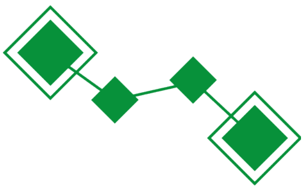
In sum, the design of Basin 2 is not an isolated intervention, but a prototype—a spatial and conceptual model for a new generation of flood landscapes. It proposes that adaptation is not only about resisting water, but about reorganizing territory, recalibrating equity, and reimagining landscape as infrastructure.

Components of zoom-out map



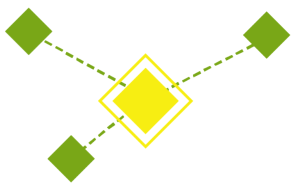
Flood storage network

Flood zones are categorized into four levels based on their capacity and internal layering, enabling synchronized yet differentiated flood absorption across the region.



Eco habitat network

Ecologically significant flood areas are linked to surrounding lakes and mountain habitats, forming two continuous ecological corridors along the Yangtze and Han Rivers.



Green fertilizer network

Floodplains with extensive grass production are connected to external pastures, supporting regional agriculture with a distributed source of organic green manure.

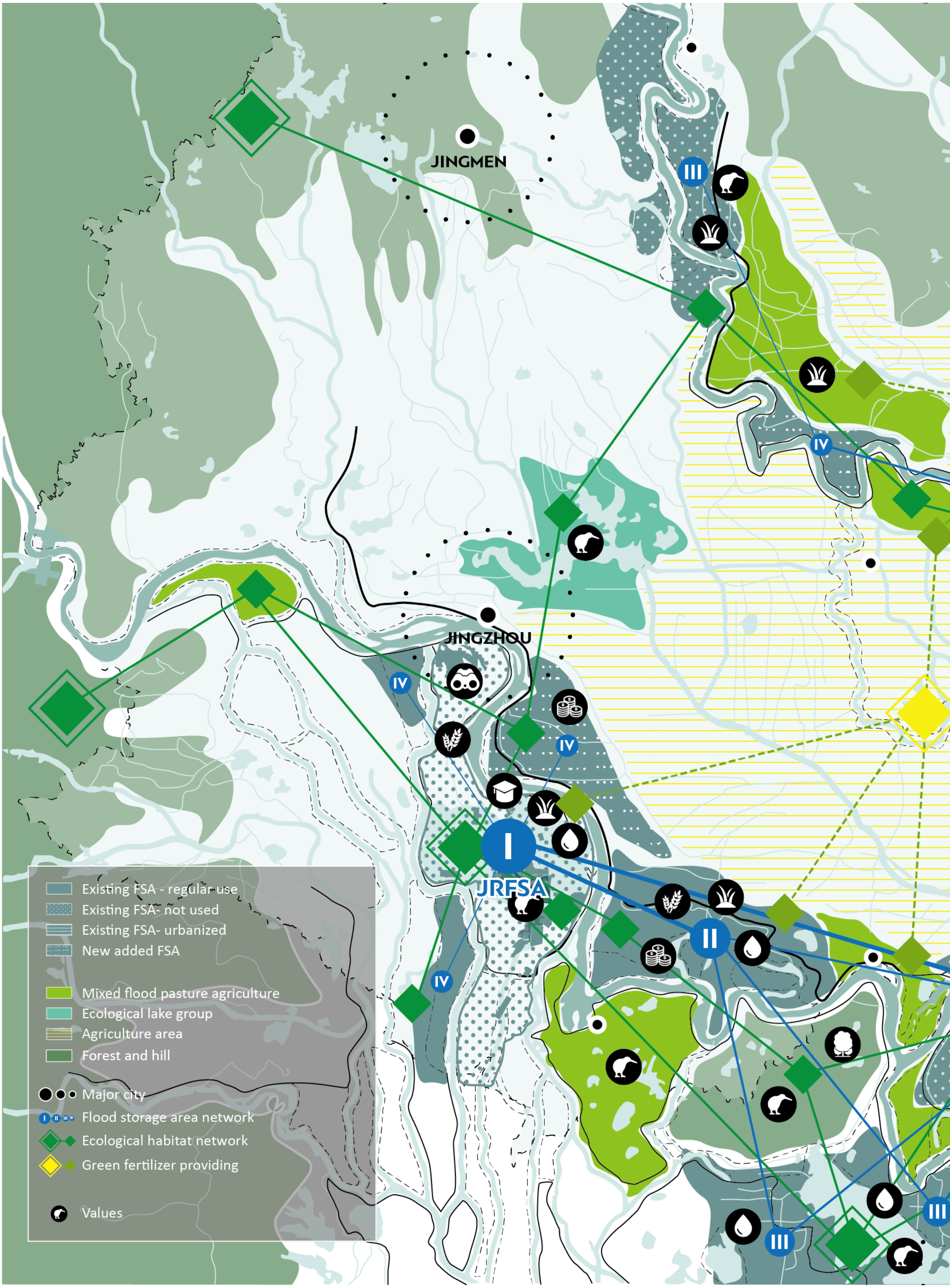
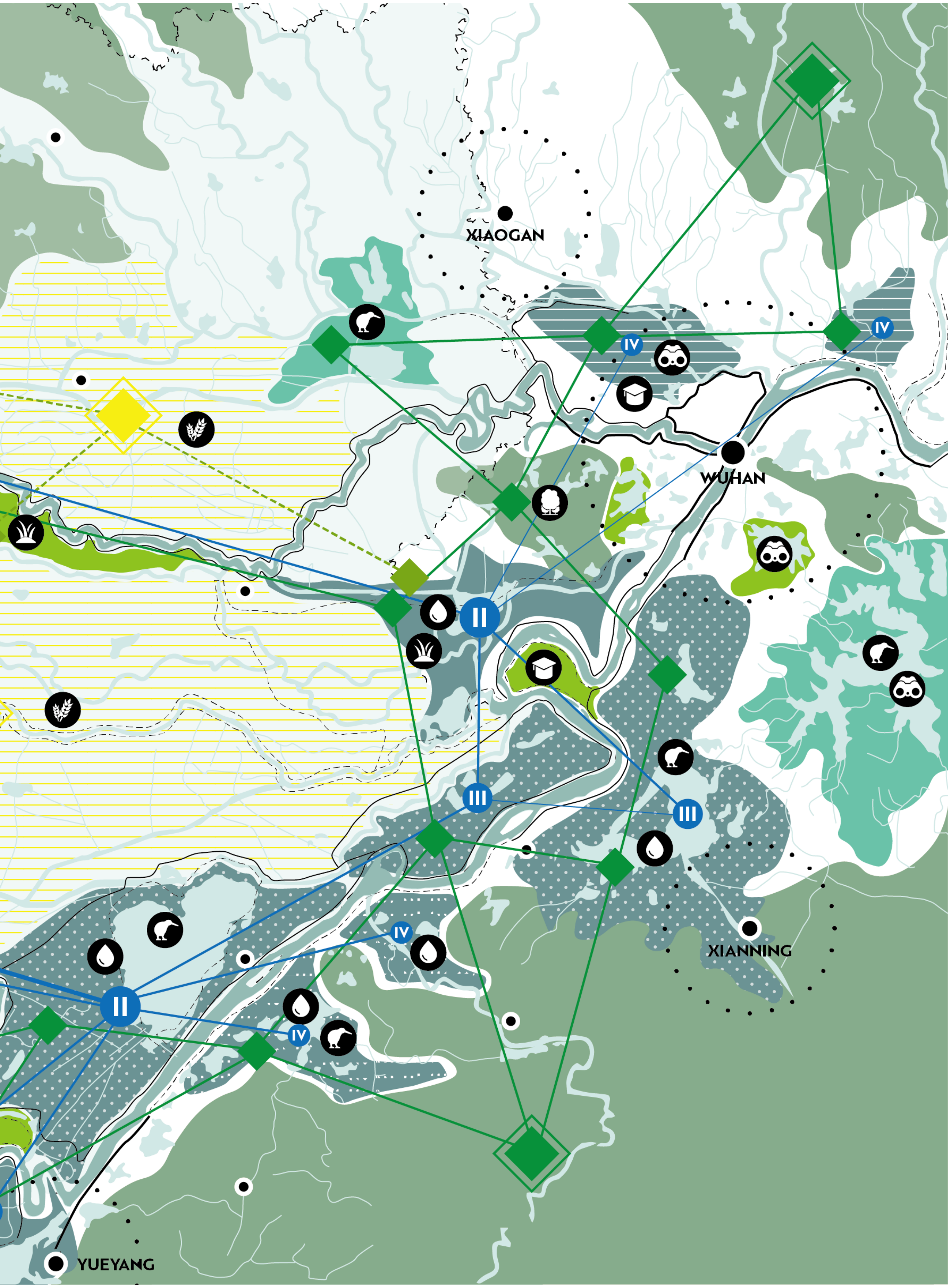
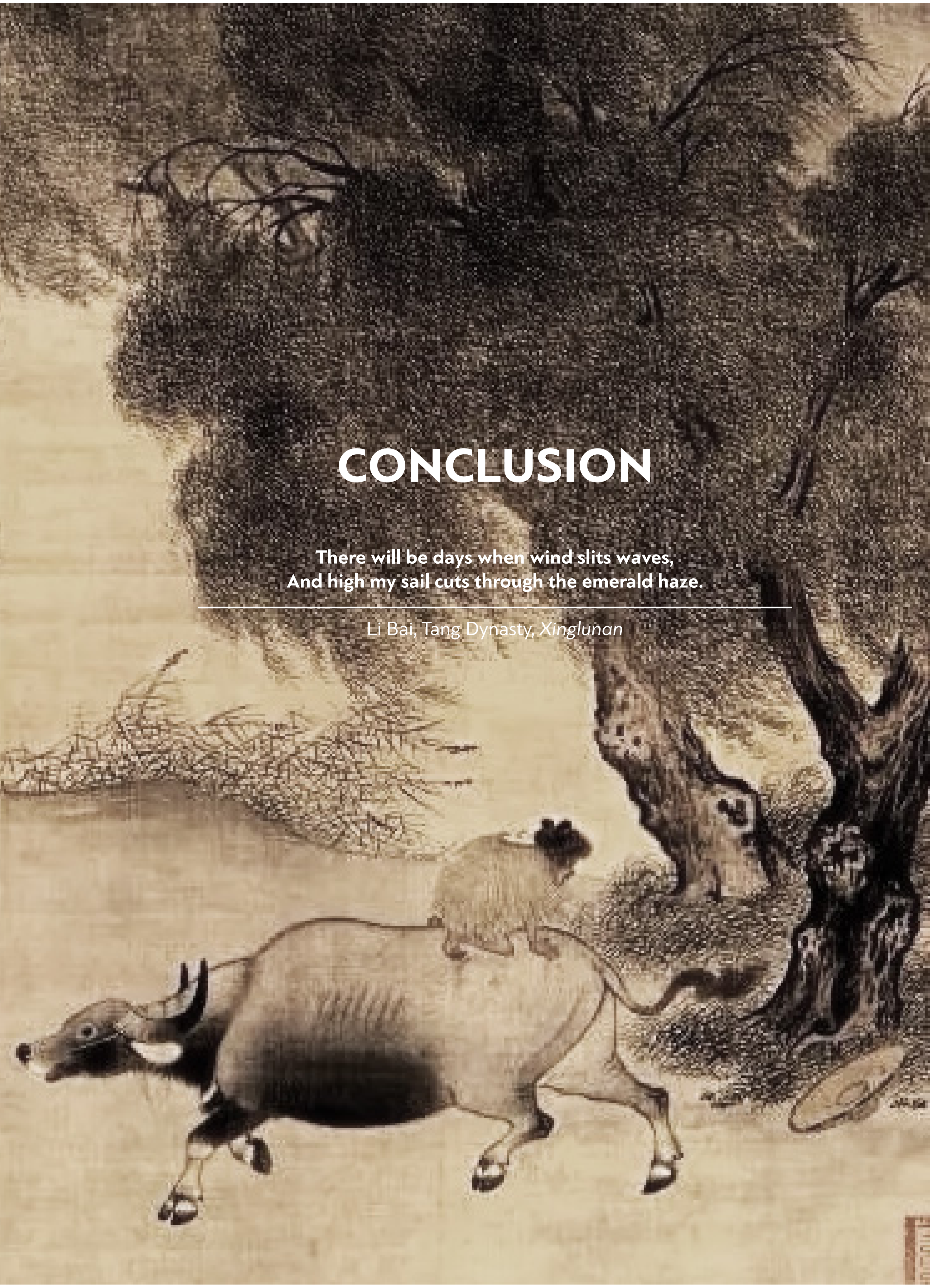


Fig.3.51. Zoom-out - the catchment map


XIAOGAN
WUHAN
XIANNING
YUEYANG
II
III
IV



CONCLUSION

There will be days when wind slits waves,
And high my sail cuts through the emerald haze.

Li Bai, Tang Dynasty, *Xinglunan*

CONCLUSION

The design proposals for the Jing River Flood Storage Area focus on four interrelated goals:

Adaptive Flood Management:
By introducing the concept of Cascading Floodspace, the design restructures flood control into a layered, resilient system. This approach distributes hydrological pressure more equitably, enhances flexibility across multiple flood scenarios, and minimizes disruption for local communities.

Ecological Regeneration:
Through the phased construction of overflow wetlands, floodplain habitats, and erosion-guided corridors, the design enables long-term ecological succession. These environments support biodiversity, sediment retention, and nutrient cycling, offering both environmental and educational value.

Agricultural Compatibility:
The design preserves productive land while enabling adaptive cropping systems suited to varying flood levels. By distinguishing between agriculture flood levels and full inundation zones, the system allows for continuity in rural livelihoods without compromising flood capacity.

Landscape Awareness and Public Engagement:
Public infrastructure—including the Flood Museum, observation towers, and recreational routes—integrates cultural interpretation with hydrological visibility. These elements foster a renewed relationship between people and water, encouraging understanding, stewardship, and place-based tourism.

In summary, this masterplan reimagines the flood storage area not as a site of risk and sacrifice, but as a spatial system capable of absorbing water, generating value, and fostering long-term adaptation. Through ecological intelligence, social inclusion, and territorial coordination, the design sets a foundation for a more resilient and equitable floodplain future.

REFLECTION

This project began with the ambition to address more-than-landscape challenges by positioning landscape architecture at the intersection of hydrology, ecology, and agriculture. One of its core intentions was to demonstrate that landscape thinking can remain central even within large-scale, multidisciplinary contexts. Rather than treating water management and ecological planning as external constraints, the project engaged them as design foundations.

Throughout the process, the project relied on landscape architecture's ability to operate across multiple scales—from small-scale spatial atmospheres to regional flood logics. A consistent conceptual framework was maintained across four distinct levels of intervention-catchment, storage area, flood basin and narrative zone, illustrating how cascading systems can serve as both spatial and narrative drivers.

However, the ambition to integrate multiple disciplines exposed the limits of a single-author effort. Navigating between ecological systems, agronomic logic, and spatial design required expertise that often exceeded the author's disciplinary boundaries. Striking a balance between broad systems understanding and the core task of making space is a critical reflection point. Landscape architecture is a spatial discipline—its agency is strongest when grounded in atmosphere, materiality, and experiential form. Beyond that, the designer risks misalignment.

Another explicit limitation was the lack of engagement with current policy frameworks. In China, spatial decisions are inseparable from institutional logics, yet this project treated policy more as background than an active design component. As a result, its realism is compromised.

There was also insufficient attention paid to the qualities of space itself. In some parts of the project, the landscape was expected to emerge independently through ecological processes and flexible programs. Whether this approach reflects a belief in open-ended design or a deferral of design responsibility remains an open question.

While the design aims to transform large areas of the Jing River Flood Storage Area into more ecologically resilient and flood-adaptive landscapes, it inevitably involves trade-offs—not only in terms of agricultural productivity, but also in the stability and continuity of everyday life. Even though the proposal makes considerable efforts to allow farming activities to continue under floodable conditions, these changes still imply a disruption of familiar routines, spatial certainty, and psychological security. The potential loss is not merely financial; it also touches upon the deeper human need for predictability and a sense of place—qualities that any large-scale spatial transformation must grapple with.

This reveals a deeper tension at the heart of the project. As shown in the stakeholder analysis, the needs and priorities of local communities—especially regarding economic growth, agricultural output and stability of the livehood—remain dominant. Meanwhile, values such as ecological restoration, pollution mitigation, or downstream water safety, while valid from a scientific or long-term perspective, are unlikely to be locally accepted or understood in the same terms. This raises a fundamental question: What should be the relationship between the designer's value system and that of the local community? Should the landscape architect, often trained to prioritize ecology, sustainability, and long-term resilience, impose these values when they come into conflict with immediate local needs?

As an experimental project, this design allows for freedom to speculate: to introduce external stakeholders, to reframe values, and to imagine scenarios where ecological assets can be translated into economic benefits. Yet in practice, such transitions are fraught with uncertainty. They often involve population relocation, economic restructuring, and shifts in governance—decisions that carry ethical, logistical, and political weight far beyond the scope of design alone.

This is not a contradiction that landscape architecture can fully resolve—nor perhaps should it. But what the discipline can offer is a reframing of the conversation. By articulating alternative futures, exposing hidden values, and identifying trade-offs, the designer can influence the value orientation of the project. We may not eliminate loss, but we can help decide what kind of loss is acceptable and necessary in pursuit of broader ecological and social gains.

Ultimately, landscape designers often find themselves representing those who cannot speak—the land, the water, the species, and the generations yet to come. In doing so, we take on a responsibility not only to current stakeholders, but also to a longer, quieter timeline.

Despite these limitations, direction remains promising. Landscape architecture's role in infrastructural and policy-driven projects deserves deeper exploration. Finding a grounded, spatially articulate role within these systems is a challenge I hope to continue pursuing in future practice.

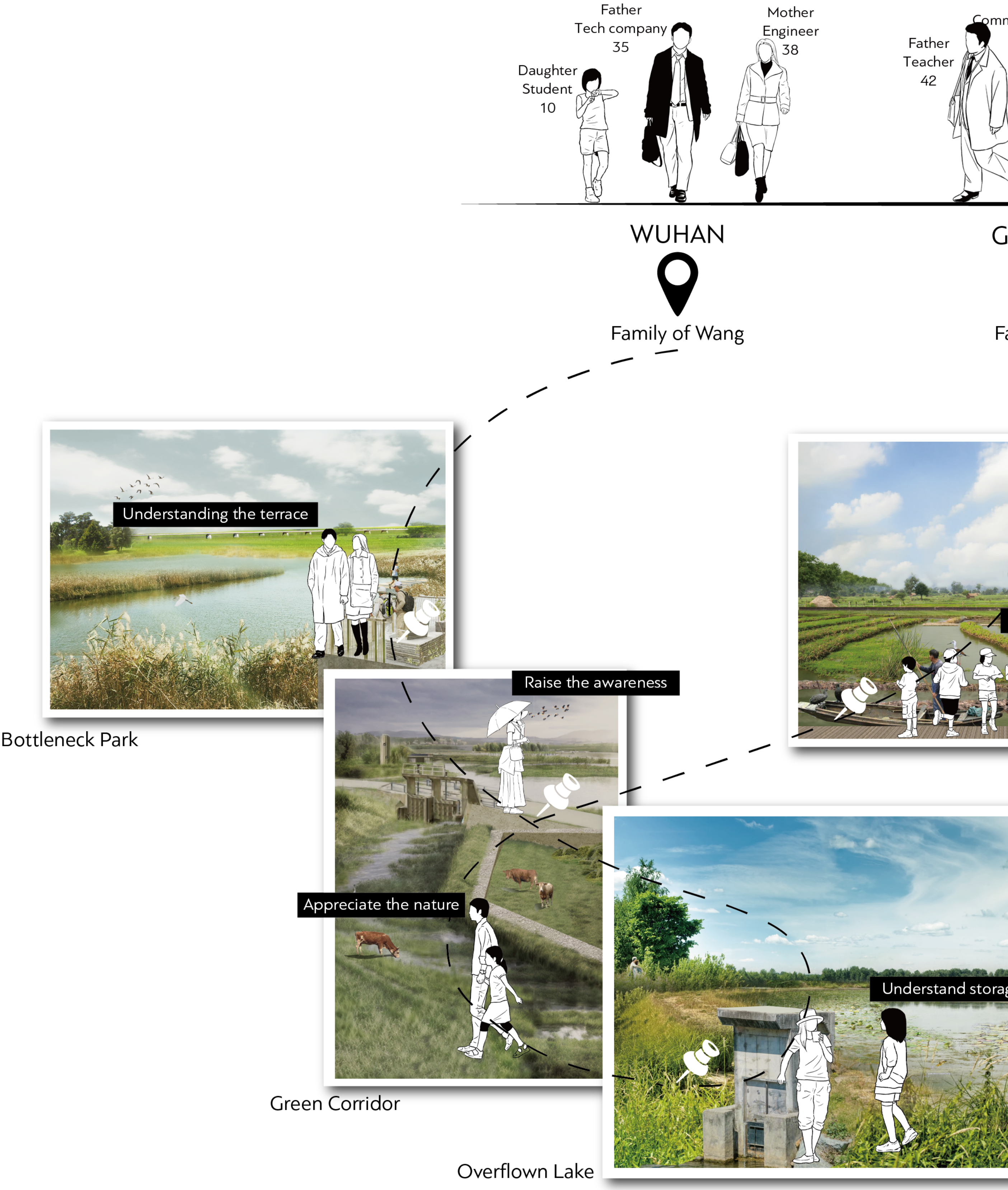
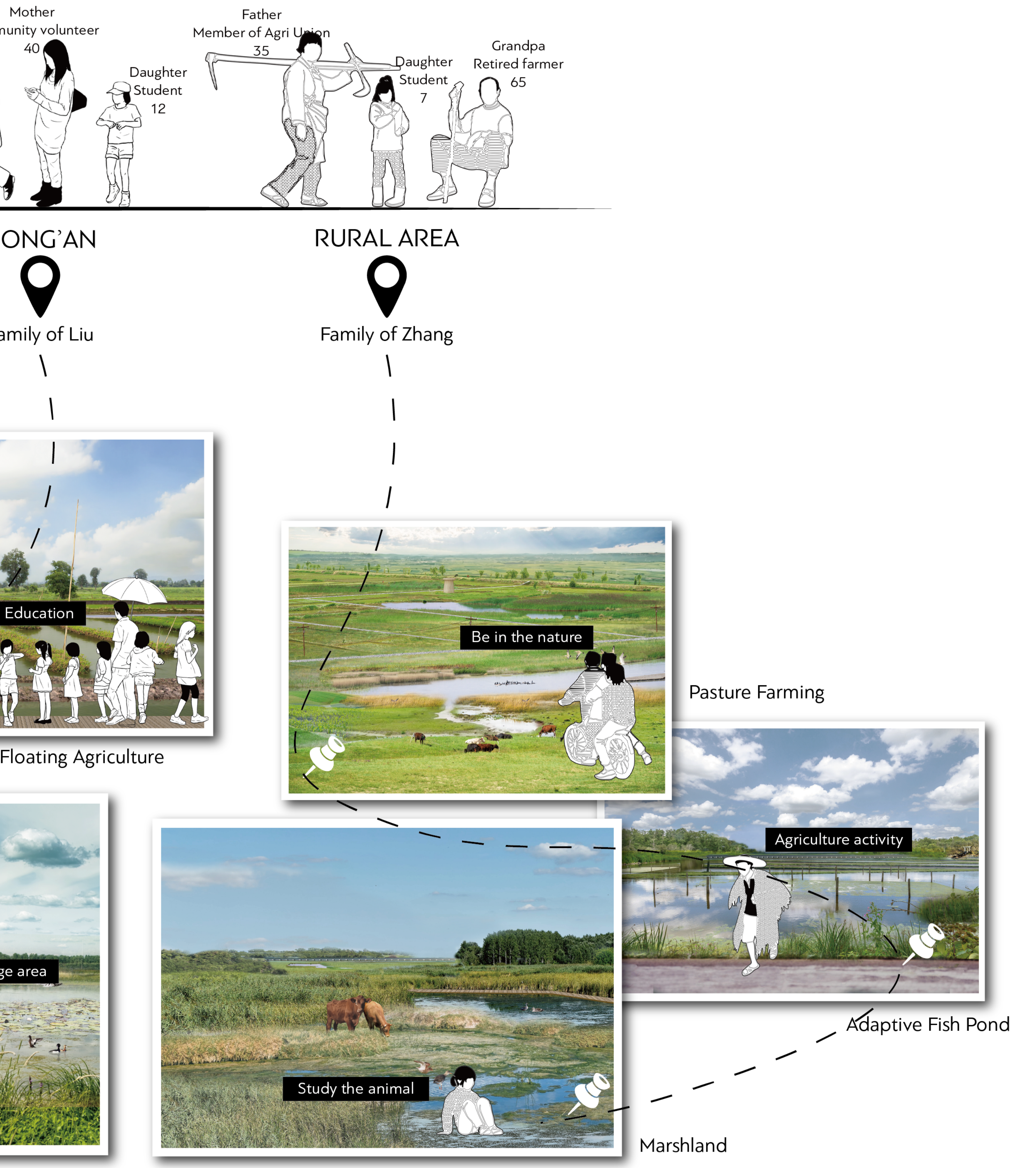


Fig.4.1. The linkage between human and landscape



Mother
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40
Daughter
Student
12
Father
Member of Agri Union
35
Daughter
Student
7
Grandpa
Retired farmer
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ONG'AN
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RURAL AREA
Family of Zhang
Education
Floating Agriculture
Be in the nature
Pasture Farming
Agriculture activity
Adaptive Fish Pond
ge area
Study the animal
Marshland

REFERENCE

Paper:

National Bureau of Statistics of China. (2007). China statistical yearbook 2007 (Chapter 1, pp. 1–7). China Statistics Press.

Yang, J., Qin, J., Li, X., & Chen, C. (2024). Reconstruction and analysis of extreme flood events in the middle and upper Yangtze River Basin over the past millennium. Resources and Environment in the Yangtze Basin, 33(1), 201–213.

Zhou, F. (1994). Historical changes of Yunmengze and the Jing River Delta. Journal of Lake Sciences, 6(1)

Zhu, S. (1991). The formation of agricultural regions and changes in agricultural environments in the Jianghan Plain during historical periods. Agricultural Archaeology.

Li, R. (2022). Flood disasters in the Jianghan Plain in history and their implications. Water and Society, 16, 62–64.

Li, C. (2005). Construction of flood diversion and storage areas in the Yangtze River Basin from the perspective of geological laws and sustainable development. Resources and Environment in the Yangtze Basin, 14(1), 6–11.

Cai, L. (2017). Study on the problems and countermeasures of human-water harmony in Honghu East Block Flood (master's thesis, Hubei University of Technology).

Barnes, J. (2014). Mixing waters: The reuse of agricultural drainage water in Egypt. Geoforum, 57, 181–191. https://doi.org/10.1016/j.geoforum.2012.11.019

Gülgün, B., Guney, M. A., Aktas, E., & Yazici, K. (2014). Role of the landscape architecture in interdisciplinary planning of sustainable cities. Journal of Environmental Protection and Ecology, 15, 1877–1880.

Van Den Brink, M., Edelenbos, J., Van Den Brink, A., Verweij, S., Van Etteger, R., & Busscher, T. (2019). To draw or to cross the line? The landscape architect as boundary spanner in Dutch river management. Landscape and Urban Planning, 186, 13–23. https://doi.org/10.1016/j.landurbplan.2019.02.018

International Federation of Landscape Architects (IFLA). (2023). Future of landscape architecture series: Setting the foundations for resilient landscapes and communities (B. Marques, Ed.). International Federation of Landscape Architects (IFLA) & Te Herenga Waka—Victoria University of Wellington.

Yin, F. N. (2008). Research on landscape ecological planning and watershed ecological management in the Sihu Basin of the Jianghan Plain (Doctoral dissertation, East China Normal University).

Wang, L. Y. (2021). Dual evaluation and zoning optimization of territorial spatial functions in county-level regions of plain water towns (Doctoral dissertation, Central China Normal University)

Schmidt, J. J. (2014). Historicising the hydrosocial cycle. Water Alternatives, 7(1). https://www.water-alternatives.org/index.php/alldoc/articles/vol7/v7issue1/242-a7-1-13/file

Suykens, C., Priest, S. J., van Doorn-Hoekveld, W. J., Thuillier, T., & van Rijswick, M. (2016). Dealing with flood damages: Will prevention, mitigation, and ex post compensation provide for a resilient triangle? Ecology and Society, 21(4). https://www.jstor.org/stable/26269992

Xie, T. (2011). Dynamic assessment and system implementation of flood disaster losses in the Jingjiang flood diversion area based on GIS (Master’s thesis, Huazhong University of Science and Technology).

Book:

Chen, J., Zhang, Y., & Fang, H. (Eds.). (1992). History of agricultural development in Hubei. China Literature and History Press.

Liang, F. (1980). Zhongguo lidai hukou, tian di, tian fu tongji [Statistics on population, land, and land tax in Chinese dynasties]. Shanghai People's Publishing House.

Yu, C. (2017). Chronicle of water conservancy dikes in Northern Chu. In W. Gai, C. Yu, & Z. Hu (Eds.), Collection of water conservancy cases from the Hubei Anxi and Yun Dao regions: Chronicle of water conservancy dikes in Northern Chu: Key points on Jingchu waterworks (Part 2, pp. page range). Yangtze River Publishing House. (Original work published in Qing Dynasty)

Sun, J., & Geng, J. (1980). Illustrated treatise on dike construction and methods (W. Jia-lun, Ed.). Agriculture Press. (Original works published in the Ming and Qing Dynasties)

Jingzhou Yangtze River Channel Administration Bureau. (2012). Records of the Jing River Dike. China Water & Power Press.

Other Literature:

Sima, X. (Western Han Dynasty). Rhapsody of Zixu.
Liu, S. X. (Trans.). (2009). The Tribute of Yu (in The Book of Documents). Zhonghua Book Company.

Central Commission for Discipline Inspection of the Communist Party of China. (2000). Interim measures for compensation in the use of flood detention and storage areas. https://www.ccdi.gov.cn/fgk/law_display/3169

Website:

Ministry of Water Resources of the People's Republic of China. (2025). Homepage. http://www.mwr.gov.cn/

Hubei Jing River Flood Diversion and Storage Area Engineering Management Bureau. (2025). Homepage. http://www.hbjgj.org.cn/