Return of Mythical Bird · Reborn of Wetland — Conservation and Restoration Planning & World Heritage Site Application Preparation for Fujian Minjiang River Estuary

Zhaopeng Cheng, Chenxi Wang
Beijing Tsinghua Tongheng Urban Planning and Design Institute
chengzhaopeng@thupdi.com, chenxiwang0727@gmail.com

Abstract
The Fujian Minjiang River Estuary, a vital mudflat wetland along the East Asian-Australasian Flyway, serves as a sanctuary for numerous endangered species. In 2000, the reappearance of the Chinese Crested Tern *(Thalasseus bernsteini)*, long presumed extinct, brought new attention to the site. Today, from April to September each year, this 'bird of legend' returns, infusing the wetland with renewed vigor and vitality.

Despite ongoing restoration efforts, challenges such as marine aquaculture, invasive species, and human disturbance remain.

This paper outlines three strategies: defining protection zones, restoring waterbird habitats and hydrological system, and engaging local communities to support conservation and cultural recognition. These efforts contributed to the estuary's inclusion on the World Natural Heritage Tentative List in August 2022, marking a crucial step towards its recognition and protection on a global scale.

Key Words: world heritage; outstanding universal value; coastal wetland; habitat restoration; community development

1 Introduction

The Fujian Minjiang River Estuary, situated along the eastern coast of Fuzhou City, is a mudflat wetland formed through centuries of sedimentation from the Min River Basin(Figure 1). The area serves as a critical node on the East Asian-Australasian Flyway (EAAF) for migratory birds and provides refuge for numerous endangered species (RAMSAR, 2022).Twenty-four years ago, the reappearance of a mythical species added an element of mystery to this wetland. The Chinese Crested Tern (*Thalasseus bernsteini*, classified as Critically Endangered by the IUCN) was once believed extinct due to habitat degradation, typhoons, human interference, and low reproduction rates until its rediscovery in this area in 2000("Chinese crested tern", 2022).

Today, from April to September each year, this 'Bird of Legend' returns as expected, infusing the wetland with renewed vigor and vitality. While numerous restoration efforts have been implemented in recent years, challenges such as marine aquaculture, invasive species, and human disturbance persist(Lu, Y., D.D. Roby, Z. Fan, S. Chan, D.E. Lyons, C.-H. Hong, S. Wang, J. Yang, X. Zhou, D. Chen, H.-W. Yuan, S. Chen, 2020)especially colonies of terns (Subfamily: Sterninae. Consequently, there is an urgent need to establish graded protection zones, restore habitats for endangered waterfowl, and safeguard the ecosystem's integrity and authenticity(RAMSAR, 2022).

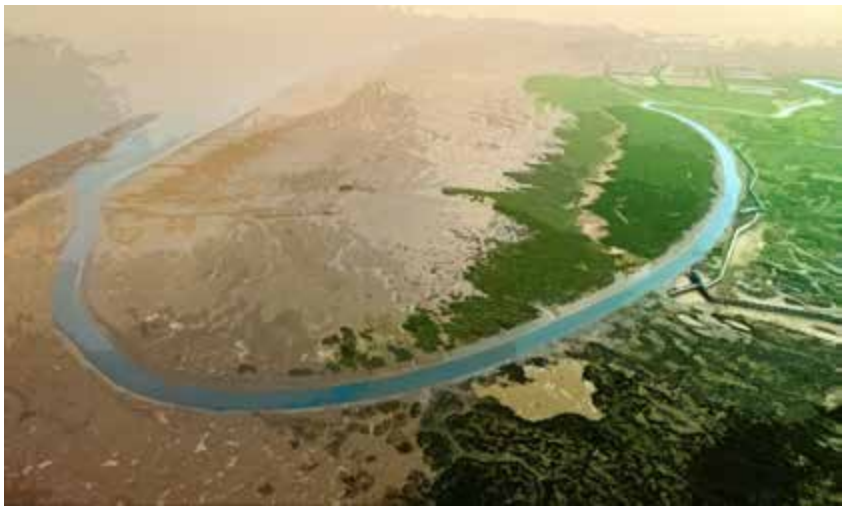

Figure 1 Minjiang River Estuary

This paper aims to introduce the restoration process, detailing how the project team managed to create a welcoming environment for returning wild birds and explore the potential for promoting harmonious coexistence between nature and humans.

The planning effort encompasses three key scopes (Figure 2): **'Research Scope'** covers the eastern coastal region of Fujian Province, extending north to Luoyuan Bay and south to Pingtan Island and Fuqing Bay, with an approximate area of 1,200 square kilometers. **'Conceptual Master Planning Scope'** is also the proposed World Heritage nomination area, covering approximately 267 square kilometers. **'Key Ecological Landscape Designing Scope'** focused primarily on the current Minjiang River Estuary Wetland Park and its surrounding areas, covering about 4.5 square kilometers.

According to each scope, the project contains three primary aspects:

1. Delineating the reservation area's boundaries, identifying Outstanding Universal Value and establishing graded control measures.
2. Optimizing the hydrological network, mitigating the impact of invasive species, and creating suitable habitats.
3. Fostering close cooperation with local communities to showcase the uniqueness and allure of a potential World Heritage Site.

As a significant milestone, the Fujian Minjiang River Estuary was successfully included in the World Natural Heritage Tentative List in August 2022(UNESCO, 2022), marking a crucial step towards its recognition and protection on a global scale.

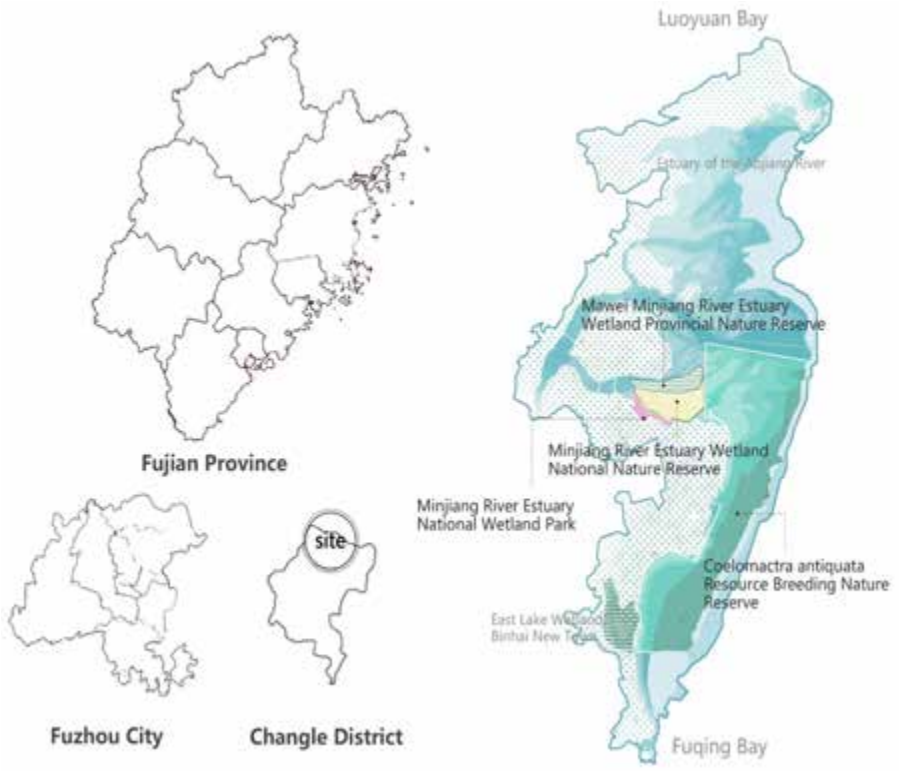

Figure 2 Project location and scope

2 Ecological Significance of the Estuary

The Fujian Minjiang River Estuary is a vital ecological zone where the Minjiang River meets the East China Sea. The estuary encompasses approximately 2,100 hectares of wetlands, including intertidal mudflats, mangrove forests, and shallow marine waters (F. Chen, H.P. Wang, Z.F. Zheng, P.H. Zhang, Y.Y. Ye,1998). As the most well-developed, natural and typical estuary delta in the East Asian subtropical region,

it was designated as a National Nature Reserve in 2013 and added to the Ramsar List of Wetlands of International Importance in 2022(RAMSAR,2022), making it reach a higher level of attention globally.

The ecological importance of the estuary can be summarized into three major aspects.

2.1 Biodiversity Hotspot

Known as the "mother river" of Fujian Province, the Minjiang River originates in the Wuyi Mountains, flows across the expansive plains of Fuzhou City, and ultimately merges into the East China Sea—where the Minjiang River Estuary is situated. (Wang, J.-Q., J. Li, Y.-J. Shih, L.-M. Huang, X.-R. Wang, T.-J. Chu, 2023)eight documents and surveyed data were collected and compared from 1990–2021. To obtain suitable analysis data, the content of the data was compared and evaluated. Explore the suitability of data based on several criteria. Among them, the bottom trawling survey carried out in 2006–2007, and non-parametric estimation methods such as Chao 2, Jackknife 1, Jackknife 2 and Bootstrap were used to estimate the fish species richness. The results of this case show that a total of 153 species of fish were caught in the trawling survey in the fourth quarter, belonging to 14 orders, 57 families and 101 genera. The 2006–2007 cruise is more complete for studying species richness. The Estimable expectations of fish species richness are: 250 (Chao 2

Located at the ecotone of two terrestrial biogeographic provinces and two marine ecological regions(D.Liu, 1995), the Minjiang River Estuary exhibits a high diversity of ecosystems and species with distinct regional characteristics, providing critical habitats for a numerous endangered species, including migratory birds, fish, large marine animals that migrating through the northwestern Pacific, and virous kinds of benthic animals (F. Chen et al.,1998).

2.2 Crucial Steppingstone of Migratory Birds

Situated along the East Asian-Australasian Flyway, the Minjiang Estuary serves as a key stopover and wintering site for numerous migratory birds. A recent survey conducted by Fujian Normal University in 2024 recorded 337 bird species in the Minjiang River Estuary Wetland, spanning 20 orders and 65 families (Fujian Normal University, 2024). Among these, 5 species are listed as Critically Endangered (CR), 10 as Endangered (EN), and 12 as Vulnerable (VU) on the IUCN Red List. Notably, the estuary is home to globally Critically Endangered (CR) species such as the Chinese Crested Tern (*Thalasseus bernsteini)* and Spoon-billed Sandpiper *(Calidris pygmaea)*, underscoring its significance as a critical node for global bird migration, biodiversity conservation, and ecological protection (Figure 5).

Figure 3 Representative Bird Species of Fujian Minjiang River Estuary

The Chinese Crested Tern *(Thalasseus bernsteini)* stands out as the most iconic species of the Minjiang Estuary. Once thought to be extinct for over six decades, it was rediscovered near Mazu Island—close to the Minjiang River Estuary—in 2000 (Lu, Y.et.al., 2020)especially colonies of terns (Subfamily: Sterninae and was given the name "Bird of Legend." Bearing the word "Chinese" in its name, the species is also imbued with cultural significance, often seen as a symbol of good fortune. Despite its symbolic status, the tern faces ongoing threats, including illegal egg collection, summer typhoons, and habitat degradation caused by sewage discharge, agricultural runoff, and industrial pollution(Lin, H., H. Lin, W. Chen, 2011). Enhancing habitat quality and expanding high-tide habitat areas are recognized as key strategies for safeguarding the future of this highly endangered species.

2.3 Coexistence of Ecosystem and Local Community.
Minjiang River Estuary has long been the central of the livelihoods, cultural identity, and heritage of surrounding communities. Exemplifies a gradient evolution of "mountains—human settlements—plain farmlands—saltwater fishponds—sea embankments—intertidal mudflats—river channels—open ocean"(Figure 4), the estuary reflects the natural landscape transition and the dynamic process of human settlement formation and development.

Figure 4 Mountain-to-sea Gradient of Minjiang River

Within the basin, the accumulated cultural activities, exchanges, and ethnic customs of settlements are linked through the Minjiang River. Over the course of history, these elements have fostered a diverse and hierarchically complete urban-rural settlement system, laying a robust foundation for the preservation and inheritance of historical and cultural heritage. By safeguarding the estuary, both cultural fabric and economic well-being of the region can be preserved, promoting a harmonious relationship between nature and local communities for generations to come.

3 Current Threats and Challenges
Over the past century, global warming, accelerated urbanization, and food insecurity have led to growing human encroachment on natural ecosystems(Chen, G., B. Fu, Y. Jiang, X. Suo, Y. Lai, Z. Chen, J. Li, L. Li, M. Lu, Y. Tang, H. Guo, R. Yang, B. Li, 2024). Recent studies indicate that natural World Heritage sites are increasingly at risk due to rapid climate change, particularly in the face of more frequent and severe climate extremes(Ke-Yi, J., W.U. Ming, S. Xue-Xin, 2011). The Minjiang River Estuary has not been immune to these pressures. Activities such as marine aquaculture, the spread of invasive species, and persistent human disturbances continue to pose significant threats to the health and stability of the wetland ecosystem, raising concerns about potential degradation.

Based on a thorough on-site investigation and a detailed evaluation against the criteria for World Natural Heritage, three key challenges have been identified in the study area. First, the ecological integrity and diversity within the existing reservation area is insufficient, and an effective control mechanism has yet to be established.

Second, the hydrological network is insufficiently connected, with ongoing threats such as invasive alien species. Additionally, critical high-tide habitats are missing, and existing waterfowl habitats are both small in scale and lacking in ecological diversity.

Third, Interaction between the wetland and surrounding communities has not been established, and there is a lack of display landmarks with heritage features.

Thus, how to protect the unique ecosystem of the Fujian Minjiang River Estuary, restore the 'home of the mythical bird', and assist in the application process for World Heritage has become a great challenge for both designers and all the other stakeholders.

4 Restoration Strategies and Implementation.
Landscape architects and engineers from various backgrounds gathered on this significant project. Starting from in-depth scientific ecological research, the project adopted nature-based solutions (NbS) to create suitable habitats for endangered water birds such as the Chinese Crested Tern, and strive to promote the regeneration of this wetland.

4.1 Solution 1: Delineate the scope of the reservation area & Establish control rules by grade
4.1.1 Analysis of Regional Uniqueness and Distinguish OUV
As part of this strategy, we began by analyzing the existing zoning framework and species survey data of the study area to distinguish its uniqueness based on its location and species. From the perspective of global terrestrial and marine biome classification systems, the project site lies within a transitional ecotone between two global terrestrial biogeographic regions—the China Subtropical Forest and the South China Rainforest—and two marine ecoregions—the Warm Temperate Northwest Pacific and the South China Sea(M.Holland,1991). Additionally, it falls within a national zoogeographic transition zone(D.Liu, 1995), highlighting its ecological and biodiversity significance.

Within this complex ecological context, multiple forms of ecosystem degradation have been observed (Figure 5). At the same time, the ecological gradient extending from the Wuyi Mountains to the East China Sea—traced by the course of the Minjiang River—has provide foundations for various ecosystems and habitat types(Wang, C., F. Cai, H. Qi, S. Zhao, G. Liu, Y. He, H. Lu, Y. Sun, T. Zhang, 2024). These include intertidal mudflats, salt marshes, shallow coastal waters and subtidal zones, scattered mangrove forests, freshwater wetlands and marshes, and chains of sandbanks and high-tide roosting islands(F. Chen, H.Wang, Feng.Z, P.Zhang, Y.Yan, 1998), providing shelters for numerous endangered species around the globe.

The regional uniqueness of the Minjiang River Estuary was defined through three key characteristics: its position at the convergence of major biogeographical provinces and marine ecoregions; its role as a critical habitat and migratory corridor for marine biodiversity; and its function as a vital staging site along the East Asian–Australasian Flyway. This conceptual framework—grounded in scientific evidence and ecological relevance—has been professionally endorsed by a group of experts, forming a solid foundation for articulating the Minjiang Estuary Wetland's Outstanding Universal Value (OUV).

Figure 5 Ecosystem types of Minjiang River Estuary

Through comparative analysis of analogous World Natural Heritage sites—such as the Wadden Sea, Suncheon Bay, and Phase I of the Yellow Sea–Bohai Gulf Migratory Bird Reserve—as well as key coastal wetlands across China, the Minjiang Estuary Wetland's exceptional value was defined (Figure 6). The site clearly meets UNESCO World Heritage Criterion (x) for its importance to in-situ biodiversity conservation and satisfies more than four Ramsar criteria for internationally significant wetlands. Based on this empirical evidence, its Outstanding Universal Value (OUV) was proposed as:

"One of the most critical natural habitats for in-situ biodiversity conservation globally"—a definition ultimately adopted in the official nomination dossier.

Comparative Analysis of Yellow Sea and Bohai Sea Heritage Sites

	Name	Criterion	Number of bird species	IUCN threatened species (birds)	Number of critically endangered species (birds)
Migratory Bird Sanctuaries along the Coast of Yellow Sea-Bohai Gulf of China (Phase I)	Yancheng Wetland Rare Birds National Nature Reserve, Jiangsu (YS-1)	x	415	17	1
	Yancheng Wetland Rare Birds National Nature Reserve, Jiangsu (YS-2)	x			
Migratory Bird Sanctuaries along the Coast of Yellow Sea-Bohai Gulf of China (Phase II)	Yellow River Delta National Nature Reserve, Shandong	x	381	30	3
	Liaohekou National Nature Reserve, Liaoning	x	292	22	3
	Dandong Yalu River Estuary National Nature Reserve, Liaoning	x	254	23	4
	Getbol, Korea Tidal Flats	x	118	22	1
	Fujian Minjiang River Estuary	x	312	25	5

Figure 6 Comparative Analysis of Minjiang River Estuary and other sites

4.1.2 Optimization of Protected Area and Control Rules by Region

Building upon thematic studies, the zoning of the heritage sites was reconfigured, by adding two extension area – Aojiang Estuary Wetland in Lianjiang County & Donghu Wetland in Binhan New City – the ecological integrity and biodiversity conservation of the wetland ecosystem was enhanced. At the same time, the area of the wetland park, where public interaction and education take place, was reclassified as the buffer zones of heritage site. These adjustments reinforce its function as both a long-term platform for regional ecological governance and a visible interface for World Heritage interpretation.

Following the clear demarcation of the heritage site boundaries, a zoned management system aligned with international conservation standards was implemented(Ringbeck, B. 2008):

1). Core Restricted Zone (Nominated Property): Enforces strict limitations on human activity and infrastructure, consistent with IUCN Category Ia (Strict Nature Reserve) guidelines.

2). Buffer Zone: Focuses on landscape protection and ecological coherence, allowing scientific research and education under regulatory oversight.

3). Co-Development Zone: Sets clear project thresholds and prohibited activity lists, promoting sustainable use through eco-industrial frameworks, green infrastructure, and carrying capacity monitoring (Figure 7).

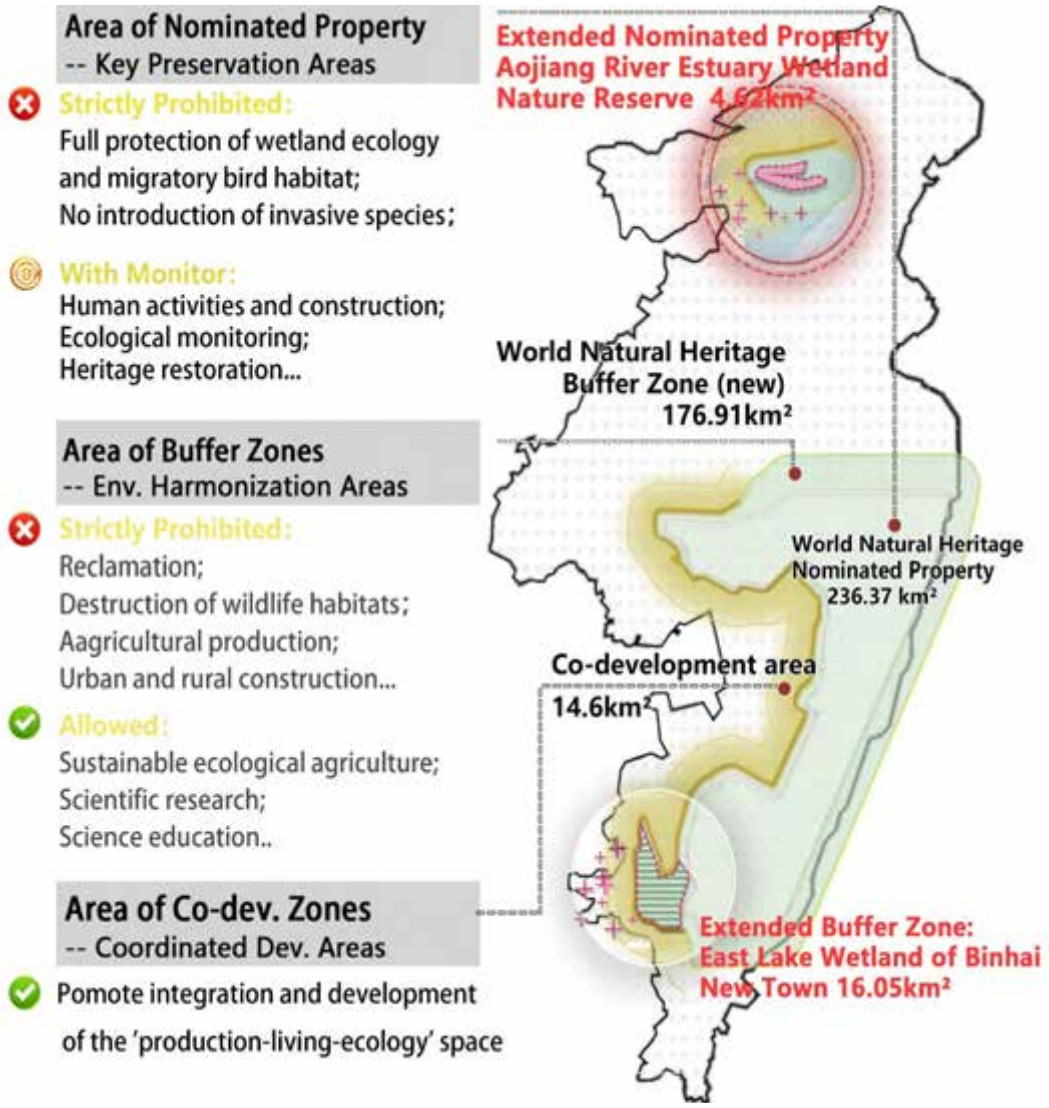

Figure 7 Reservation Area Optimization Plan

4.2 Solution 2: Systematically restore ecosystem & Create bird habitats

4.2.1 Optimization of Hydrological System

Wetlands are areas fundamentally defined by the presence of water, and water level is considered a key factor determining the species richness of waterbirds within these ecosystems(H.Liu, 2006). Fluctuating water levels can create diverse habitats that support various bird species -- for instance, shallow areas may provide feeding grounds, while deeper areas can serve as refuge during dry periods(Sánchez-Zapata, J.A., J.D. Anadón, M. Carrete, A. Giménez, J. Navarro, C. Villacorta, F. Botella, 2005)(A F Boshoff,1991). Given that the study area comprises not only natural habitats such as intertidal mudflats and mangrove forests, but also a substantial expanse of artificial environments like fishponds, designing and managing the hydrological system to provide more suitable habitats is essential to the success of our conservation efforts.

Currently, the hydrological conditions of research area are facing three major issues (Figure 8). First, there is no clearly defined mechanism for water replenishment between the internal fishponds and the adjacent open water, which puts limitation to the exchange of water that are critical for water quality, salinity balance, and the growth of benthic organisms. Second, the hydrological interconnection between each individual ponds are insufficient, leading to stagnation water conditions and signs of eutrophication. Third, the lack of a systematic hydrological regulation results in unpredictable water level fluctuations, undermining the stability and effectiveness of ongoing conservation efforts.

Figure 8 current fishponds of research area

To improve issues above, the project redefined hydrological units, managed the inlet and outlet water channels, added two smart water gates so natural exchange of water body can be realized with tides. By reshaping the pond topography, the internal water flow pathways within each individual pond can be optimized (Figure 9). For example, the northern section of Fishpond#1 has a relatively higher elevation what prevents natural drainage. The design excavates the overly elevated area thereby facilitating the water movement. Excess soil will be repurposed to consolidate the scattered habitat islands, expand the area of shallow zones and create a more coherent and efficient water flow network. In addition, water level regulation mechanism that meets the need of waterfowl habitats was developed, using monitoring data collected from 3 tide gauge stations nearby.

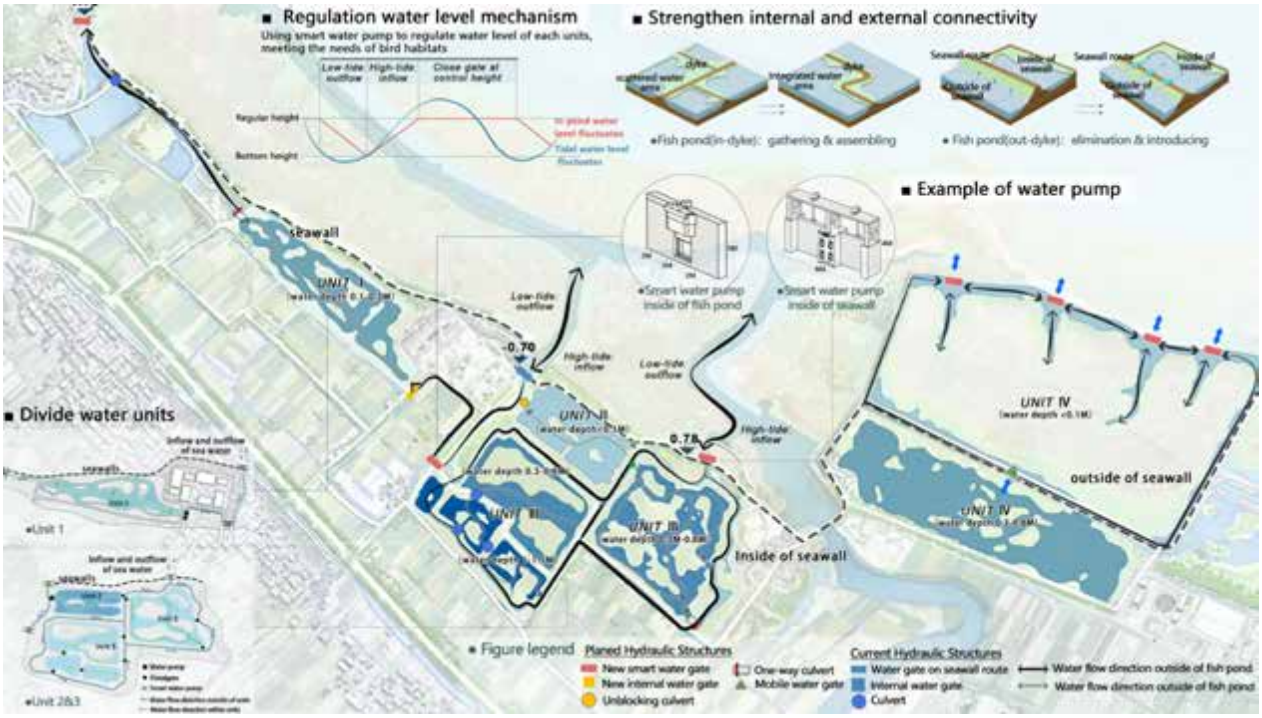

Figure 9 Optimization Efforts for Hydrological System

4.2.2 Replacement of the Occupied Ecological Niches

The Minjiang River Estuary, like other major coastal wetland along eastern China(An, S.Q., B.H. Gu, C.F. Zhou, Z.S. Wang, Z.F. Deng, Y.B. Zhi, H.L. Li, L. Chen, D.H. Yu, Y.H. Liu, 2007), has been significantly affected by invasive plant species, particularly smooth cordgrass (Spartina alterniflora) and common reed (Phragmites australis). S. alterniflora began to invade the Minjiang Estuary in 2002 and since then has gradually expanded its range(Feng, J., Q. Huang, H. Chen, J. Guo, G. Lin, 2018). Although efforts have been made to remove them and restore native vegetation – such as replanting with mangrove species like Kandelia obovata—the habitats of waterbirds remain at risk due to the invasive species occupying critical ecological niches(X.Xie, X.Sun, T.Wu, G.Jiang, L.Pu, Q.Xiang, 2020).

In the planning, a key area was designed for focused ecological management, covering approximately 1,250 hectares (Figure 10). By employing physical methods such as 'mowing, tilling, site preparation and plantation restoration'(Y.Zhu, 2025)(Figure 11), efforts would be made to manage invasive species like Spartina alterniflora (*Spartina alterniflora Loisel*) in this area. Local salt marsh plants such as mangroves, reeds *Phragmites australis*, Cyperus malaccensis *Cyperus malaccensis subsp. monophyllus*, and scirpus mariqueter *Bolboschoenoplectus mariqueter*are planted in suitable areas.

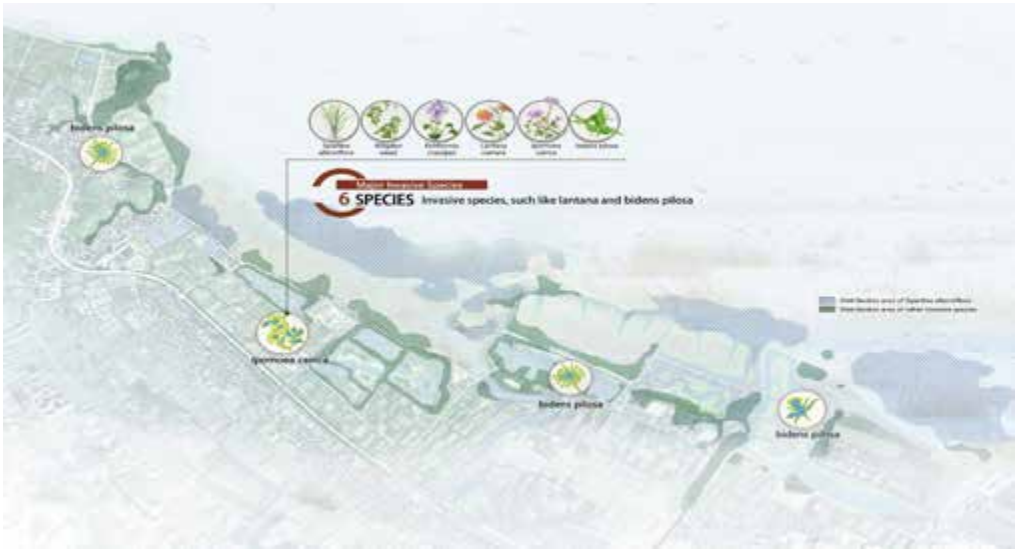

Figure 10 Restoration Area

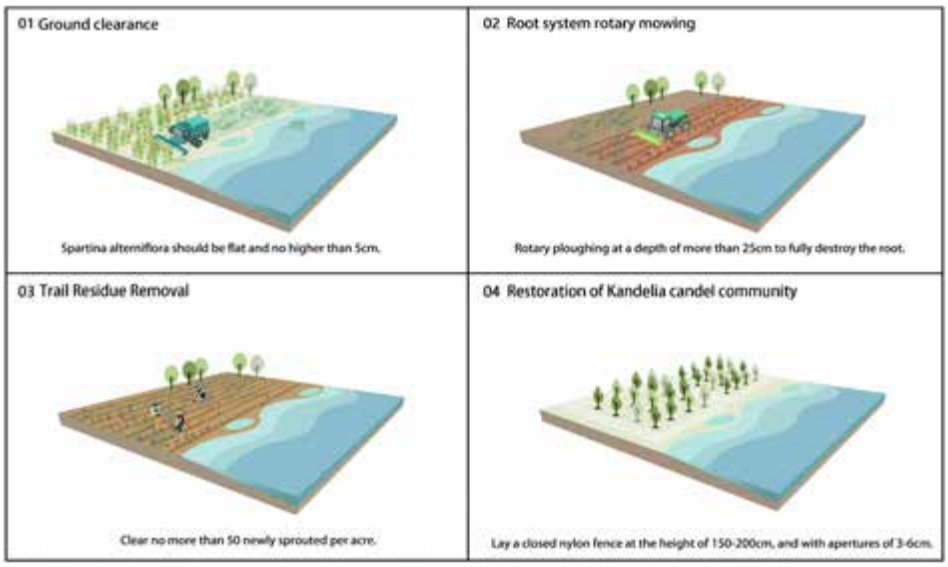

Figure 11 Management Mechanism of Spartina alterniflora

4.2.3 Creation of Diverse Waterbird Habitat

According to the 2020 winter avian monitoring data of Minjiang Estuary wetland, a total of 144 bird species were recorded across the entire area, including various groups such as shorebirds (*Charadriiformes*), geese and ducks (*Anatidae*), and egrets and herons (*Ardeidae*) (Fujian Normal University, 2024). If dividing the wetland into seven zones, labeled A through G, for statistical analysis, one could see that Zone B and E (tidal flats outside the embankment) had the highest volume of birds (Figure 12). Although the total bird counts in Zone C and D (artificial fishponds) was relatively lower, these areas exhibited higher species diversity. Based on our field investigation, the artificial fishponds serve as supplementary habitats for waterbirds during high tide times.

These habitats are moderately suitable for most species; however, due to factors such as poor habitat quality and a lack of suitable benthic organisms, the overall ecological carrying capacity of this area remains low.

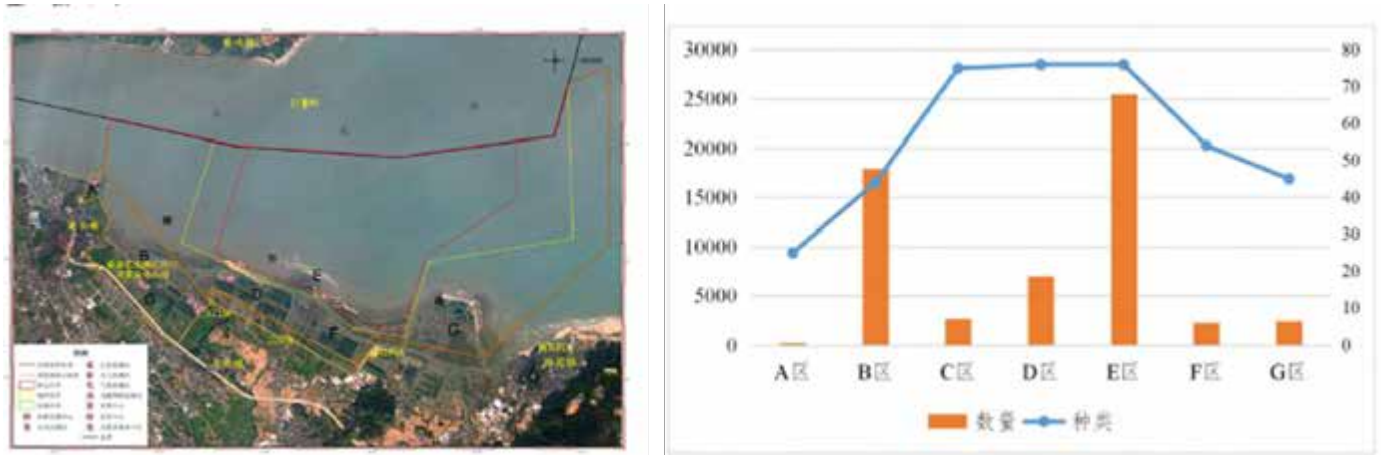

Figure 12 Bird Monitoring Data of Research Area (2020 winter)

To support the diversity of habitat and meet the ecological needs for various bird species, target conservation and management strategies were developed as follows:

For intertidal beach areas, a 100-hectoare core protected zones was designed to be the critical foraging and roosting habitats for migratory waterbirds, including the endangered 'Bird of Legend' Chines Created Tern (*Thalasseus bernsteini*). In addition, the plan suggested to actively manage invasive species to reduce the ecological competition and promote native biodiversity. Efforts such as restoring native wetland vegetation are made to enhance food availability. Tourist activities are prohibited in these core protected zones and only essential scientific research and maintenance work are permitted. In this way we could minimizes human disturbance to the greatest extent possible.

For high-tide habitats area (fishponds), an approximately 118-hectares of are tidal flats was developed to serve as supplementary habitats for waterbirds during vulnerable periods such as high tide and breading seasons. To enhance the ecological function of these restored zones, the plan removed pond dikes and barriers to restore natural water flow. In addition, benthic organisms have been introduced to enrich the food base, providing foraging resources for shorebirds and waterfowl,

Fishponds are in the wetland park, so in areas where tourists may come into close to bird habitats, protective forest belts are strategically planted, providing buffers serve to visually and acoustically isolated the bird habitat from human activity, thereby disturbance such as movement, noise, and light and be reduced.

A diverse range of habitats has been created through ecological reconstruction of selected fishponds. Water level is carefully regulated to fluctuate between 0.1 to 0.3 meters, which accommodates the foraging and nesting needs of wading birds(H.Liu, 2006). In addition, the bottom of the ponds is regraded to a gentle slope of no more that 3%, promoting sage access for birds and enabling gradual water transitions that support a range of aquatic and semi-aquatic species.

These reconstructed habitats are especially suitable for species such as the Black-winged Stilt (*Himantopus himantopus*) and the Pied Avocet (*Recurvirostra avosetta*), which require shallow water and open muddy or sandy substrates for feeding and breeding(H.Liu, 2006). The design not only increases habitat quality but also enhances ecological resilience, enabling the wetland to support a greater abundance and diversity of birdlife across different seasons and tidal cycles (Figure 13).

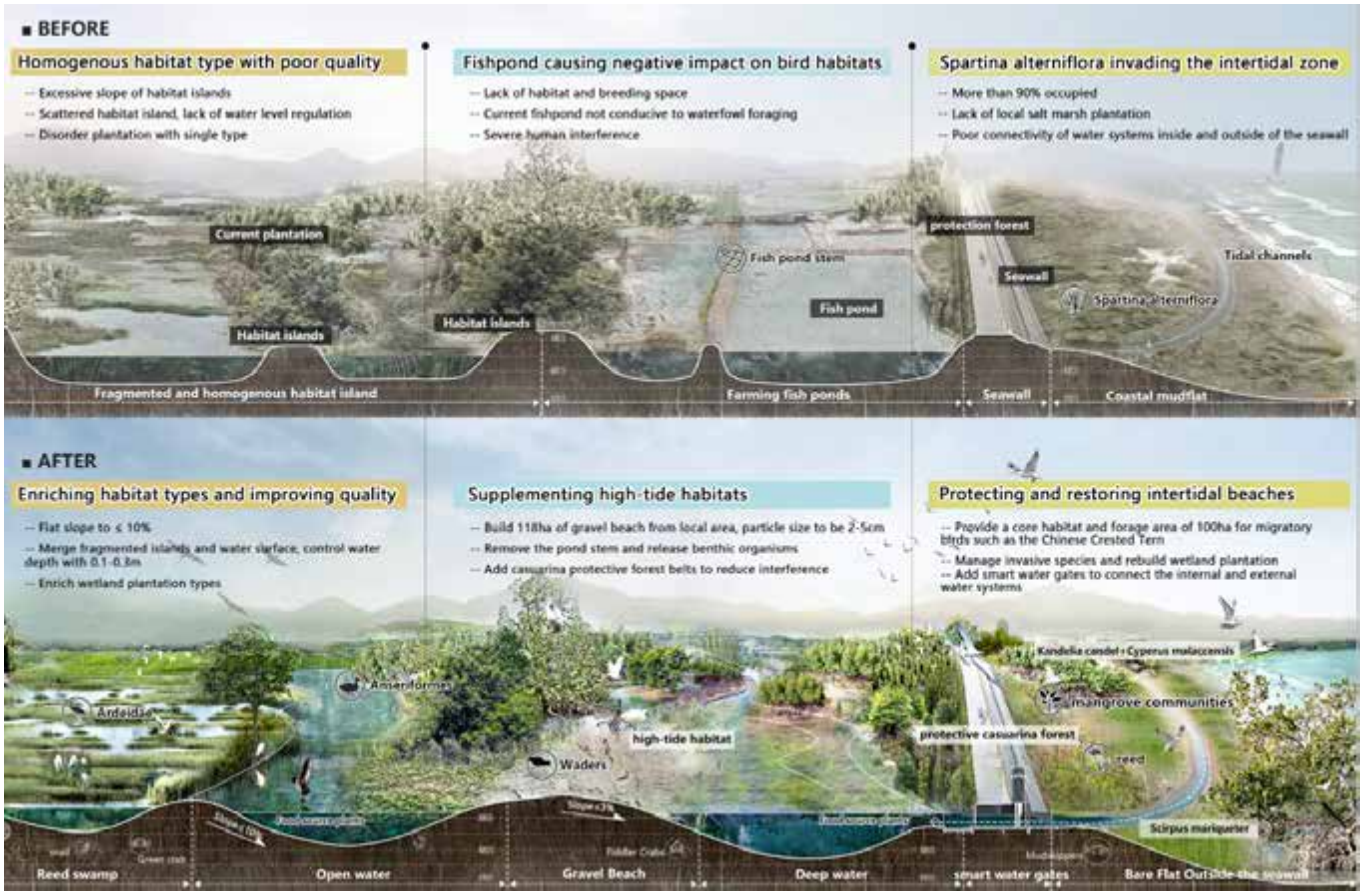

Figure 13 Landform engineering for habitat restoration

4.3 Solution 3: Collaborate with surrounding residents & Demonstrate a World Heritage Showcase

World heritage matters far more the protected area itself. The sustainability of heritage involves the sustainability of the heritage itself and its contributions to the sustainable development of the local population(Xu, L., G. He, L. Chen, 2024). According to UNESCO, World Heritage properties sustain biological and cultural diversity, which may support a variety of ongoing and proposed uses that are ecologically and culturally sustainable and which may enhance the quality of life and well-being of communities concerned(UNESCO,2024) (Lee, Y., R. Jayakumar, 2021).

4.3.1 Promoting a Synergistic Development with Surrounding Villages

The scattered villages and towns surrounding the Minjiang River Estuary Wetland serve as important settlements adjacent to this potential World Heritage site. By targeted environmental remediation and capacity building, actions plan that transform these communities into World Heritage villages were put into action. The transformation involves the strategic selection of dispersed land parcels for the establishment of facilities such as academicians' residences, research apartments, and research centers. Functional zones will be delineated based on the unique characteristics of each settlement – cultural tourism and recreation area, world heritage science and technology exhibition area and coastal leisure area. For example, Meihua Town on the eastern side of the wetland, once been an historic settlement known for its coastal defense heritage, will serve as part of 'cultural tourism and recreation area' and incorporate cultural tourism functions to create integrated pathways connecting local villages with the wetlands. This approach will also enable visitors to engage with both the region's historical and ecological assets, promoting the synergistic development of its natural and cultural heritage (Figure 14).

Figure 14 Creating a Synergistic Development with Surrounding Villages

Simultaneously, the action plan encourages creating sustainable employment opportunities by developing community-based tourism and heritage-related services. These initiatives not only stimulate the local economy but also contribute to the long-term vitality of the region. Invest in capacity building and vocational training to cultivate a new generation of skilled heritage stewards—individuals equipped with the knowledge, sense of responsibility, and practical skills needed to safeguard the site for future generations.

4.3.2 Demonstrate a Unique World Heritage Showcase

In addition to ecological restoration, the renovation of existing wetland infrastructure is a vital component of our broader project. As a symbolic gateway to the Minjiang River Estuary, the wetland museum functions not only as a visitor center but also as a crucial platform for public education and ecological awareness. Although the museum was constructed within the last decade, it suffers from several limitations—including a fragmented layout, an outdated exterior design, and overall underutilization—that falls behind the requirement the World Heritage site requires.

The renovation design draws inspiration from the nesting forms of migratory birds, particularly the iconic Chinese Crested Tern. With an outline resembling outstretched wings in flight, the new structure gently unifies the museum's once-scattered components into the protective embrace of a mythical bird, symbolizing both shelter and renewal(Figure 15).

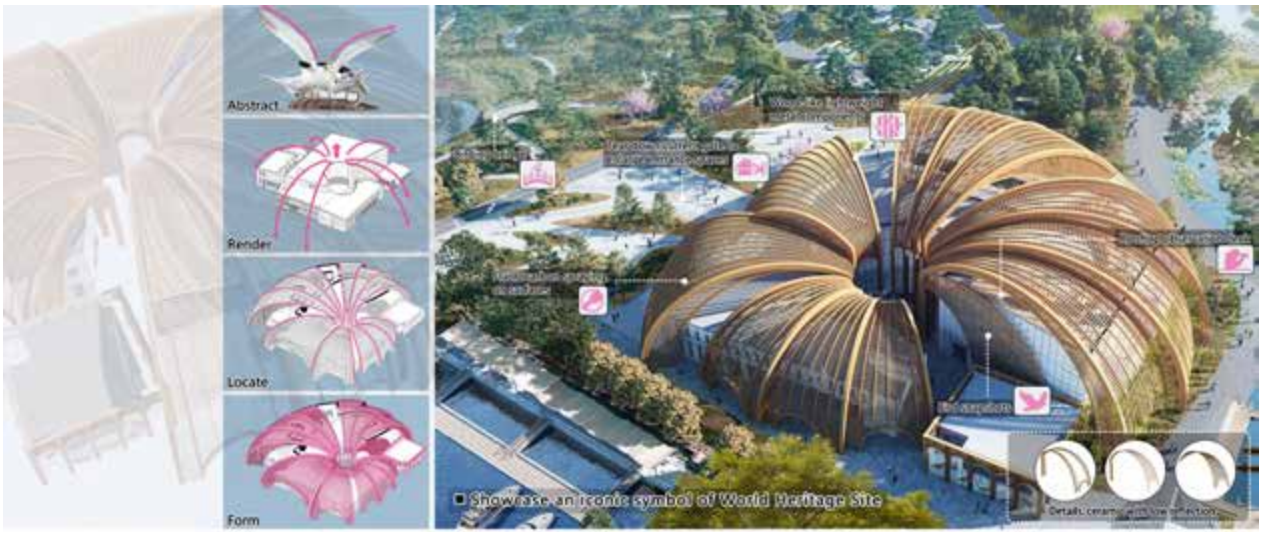

Figure 15 Renovation of Wetland Museum.

The park entrance is another focal point of the design. Inspired by the elegant wings of the Chinese Crested Tern, its fluid lines and graceful form create an inviting gesture—welcoming guests from all directions with a sense of movement, lightness, and warmth (Figure 16).

Figure 16 New design of park entrance

As part of the World Heritage application, this revitalized gateway demonstrates our commitment not only to conservation but to conveying the estuary's outstanding universal value— a shared spaces where human presence and natural life can flourish side by side.

5 Conclusion

The plan, if implemented successfully, would systematically restore 315ha waterfowl habitat, control 182ha of invasive species, supplement 118ha high-tide habitats, and lay out a 14.6km² heritage co-development zone, benefitting 20 surrounding communities and a total of 132000 residents. At the same time, the plan has greatly accelerated the process of the Fujian Minjiang River Estuary's application for Wetland of International Importance and World Natural Heritage sites. In August 2022, the 'Fujian Minjiang River Estuary: The ecotone between marine and terrestrial biogeographical regions' was successfully listed in the World Heritage Tentative List by UNESCO. In February 2023, it was included in the Ramsar Convention List of Wetland of International Importance, providing an important demonstration for the protection and restoration of natural heritage sites from a global perspective.

Conflict of Interest

The authors declare no conflict of interest.

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