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Revitalizing Island Villages: A Comprehensive Analysis of Sustainable Landscape Renewal Strategies Through the Three-Pillar Conception

Hanqi Tang[1], Yan Li[1], Yun Zhou[2]*

[1]School of Forestry and Landscape Architecture, South China Agricultural University, Guangzhou 510642, China
[2]Guangdong Telecom Planning and Design Institute Co., Ltd., Guangzhou 510630, China

***Corresponding author:** Yun Zhou, 13826266337@139.com

Abstract: In recent years, the study of production-living-ecological space has progressively expanded from urban to rural areas. With the onset of a new era in rural development, diverse requirements for rural landscapes have emerged. Consequently, rural landscape planning in this new era is incorporating the three-pillar conception of sustainability. Island villages, with their distinct natural ecology and marine resources compared to inland villages, offer unique conditions, resulting in the production of diversified landscape types with significant development potential. Despite the limited attention given to the domestic development of island villages, this paper delves into the analysis of the three-pillar conception of sustainability and explores landscape protection strategies and renewal modes specific to island villages. To illustrate these concepts, East Xiaoqing Island Village in Rushan City, Weihai City serves as a case study.

Keywords: Island villages; Rural landscape; Production-living-ecological space; Rural revitalization.

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1. Introduction

China boasts a coastline stretching over 32,000 kilometers and is home to more than 7,000 islands covering an area of 500 square meters or more. Island villages, serving as vital repositories of coastal residential culture, are scattered along the coastline within a few kilometers of each other [1-4]. Island villages exhibit substantial differences in ecological resources, production, life, and cultural heritage when compared to inland villages. Their distinctive landscape types not only reflect unique multicultural values but also hold considerable development potential.

While recent years have witnessed a focus on the development of tourism resources and economic benefits in island villages, research on the construction of their landscape layout has been comparatively limited. Consequently, some island villages have experienced a significant loss of authenticity, uniqueness, and even ecological damage. Weihai City, situated in Shandong Province as the easternmost city of the Shandong Peninsula, exemplifies a typical coastal city. The advantages of its coastal zone have given rise to numerous

fishing and aquaculture-led coastal villages with unique natural scenery, fostering a distinct village culture [5].

Building upon this backdrop, this paper explores the three-pillar conception of sustainability within the context of an island village, using East Xiaoqing Island Village in Rushan City, Weihai City, as an illustrative example. The study delves into the three-pillar conception of sustainability, emphasizing the need for a comprehensive approach to sustainable development. Taking East Xiaoqing Island Village as a case study, the paper investigates the landscape renewal model based on the three-pillar conception of sustainability. The findings aim to provide valuable insights and a decision-making foundation for the sustainable and high-quality development of other island villages.

2. Relevant concepts and explanations

2.1. Island village landscape

Island villages distinguish themselves from their inland counterparts by being enveloped by seawater, offering splendid coastal scenery and abundant marine resources. For generations, island residents have relied on fishing as a way of life [6], resulting in a landscape dominated by aquaculture and fisheries. The absence of bridges and transportation channels around these islands necessitates daily travel by boats, which also serve as essential tools for the residents' fishing activities.

Island villages exhibit distinct regional environmental characteristics shaped by latitude and climate, predominantly featuring an oceanic climate. Although their ecosystems often display noticeable differences between the northern and southern regions, they generally experience four distinct seasons, uniform precipitation, and a regional variation in vegetation. However, despite the superior ecological landscape of these villages, their ecosystems are frequently less diverse, making them more susceptible to disruption and damage.

Island villages, situated away from the hustle and bustle, boast honest and enthusiastic villagers. The captivating natural scenery has fueled the recent rise of the countryside tourism industry. This surge in rural tourism has, in turn, spurred the enhancement and renewal of village infrastructure and public services. Consequently, the living landscape of these villages is gradually undergoing adaptive adjustments from traditional to modern, marking a transformative process driven by the evolving demands of the tourism industry and the changing needs of the villagers.

2.2. Production-living-ecological space and the three-pillar conception of sustainability

Currently, research on production-living-ecological space (PLES) in the domestic context has expanded across various fields since its inception. However, the majority of this research focuses on larger-scale entities such as cities or counties, with relatively limited exploration into smaller scales like the countryside [7].

PLES encompasses ecological, production, and living spaces. Rural ecological space amalgamates natural attributes, providing environments that yield ecological products and services for the countryside. Rural production space serves as a spatial carrier with economic benefits, contributing to the production of agricultural goods. Meanwhile, rural living space functions as a public facility, serving as a place for villagers to reside and utilize in their daily lives.

The three-pillar conception of sustainability entails viewing the social, economic, and environmental factors of the countryside holistically, facilitating unified and coordinated planning. This involves refining resource elements and integrating the natural and humanistic environment of the countryside in a multifunctional manner. The aim is to rectify the structural imbalance stemming from the original single-function approach and realize the sustainability of rural areas [8].

3. Exploration of a landscape revitalization strategy for island villages based on the perspective of the three-pillar conception of sustainability

3.1. The application value of the three-pillar conception of sustainability in island village landscape revitalization and renewal design

The development of traditional Chinese villages adheres to a logical structure where three interconnected spaces – ecology, life, and production – form an organic system with wholeness. In the context of the proposed rural revitalization strategy, villages are undergoing design and transformation trends aligned with the principles of the three-pillar conception of sustainability. This approach emphasizes the ecological environment as the foundation, industrial development as the driving force, and living services as the content to achieve the goals of village revitalization and de-hollowing.

The three-pillar conception of sustainability signifies a profound integration of social, economic, and environmental factors, creating a place where humans and nature coexist harmoniously. In the case of island villages, it involves leveraging the natural resources of the island to craft a comfortable ecological environment for residents to enjoy life and work. The cultural aspect is vital for sustaining a space over generations and encapsulates the daily life of villagers, contributing to the preservation of the wholeness of the village space. When transforming unused or dilapidated spaces, careful consideration should be given to maintain their original style and overall landscape pattern. The transformed village becomes a hub for new forces of development.

The core of the three-pillar conception of sustainability should encompass three key elements: nature, economy, and society, all of which aim to foster a balanced integration of social, economic, and environmental considerations in the design and development of island villages.

3.2. Basic principles of island village landscape revitalization and renewal

Considering the current state of island development, the successful revitalization of an island village landscape hinges on several key factors. Firstly, there is a need to prioritize ecological environmental protection by respecting and safeguarding the natural resources of the island. This involves maximizing the utilization of the island's ocean, land, and climate resources to foster sustainable development. Secondly, a comprehensive approach involves delving into the cultural heritage of the island village, shaping the characteristics that define the memories unique to the island. Thirdly, diversifying economic sources for island villagers is essential. Beyond traditional fisheries, attention should be directed towards innovating and ensuring the sustainability of the tourism industry. This is crucial for maintaining the originality, integrity, and sustainability of the island village landscape.

Moreover, in the planning and design of island village landscapes, beyond the focus on nature, culture, and economy, the distinctive sense of place the island villages offer deserves careful consideration. The sense of place experienced by individuals can vary, and analyzing the uniqueness of this island's sense of place can further enhance the synergy of the production-living-ecological space within the village (**Figure 1**).

3.3. Exploration of the revitalization and renewal strategy for the island village landscape under the perspective of the three-pillar conception of sustainability

For the landscape design of island villages to undergo true revitalization and renewal, it must fully leverage the natural and human resources of the island, prioritize the sustainability of economic development, and achieve a delicate balance among nature, culture, and economy. In pursuit of this goal, three key aspects of revitalization and renewal strategies – exploring the source, tracing the flow, and continuation – are proposed to delve into the conditions of the three-pillar conception of sustainability for island villages.

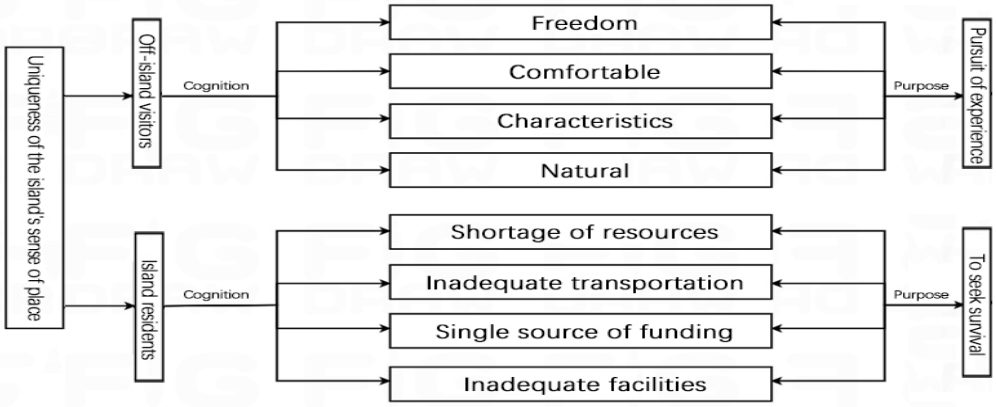

Figure 1. Analysis of the uniqueness of the island's sense of place

3.3.1. Exploring the origin: Respecting the original conditions of the site

The foundation of the three-pillar conception of sustainability rests on respecting the original conditions of the site. This involves a focus on the site's ecology, conducting thorough research, and analyzing the characteristics of the local natural environment, embodying the concept of 'exploring the source.' By maintaining respect and reverence for the site, this nature-centric design not only reduces resource waste but, more importantly, fosters a more coordinated countryside and environment, creating harmony among people, nature, and places.

3.3.2. Traceability: Creating spatial landscape media

At the heart of the three-pillar conception of sustainability lies the creation of spatial landscape media, emphasizing the shaping of suitable landscape spaces that integrate nature and human life. This is achieved through the concept of 'traceability,' which involves focusing on villagers' lives and "backstreaming" nature into the design. The creation of spatial landscape media prioritizes flexibility and innovation. Given the unique natural advantages of island villages, landscape design should explore materials and forms in the natural environment, combining them with the island's unique elements to infuse the landscapes with distinct island characteristics.

3.3.3. Continuation: Optimizing industrial spatial layout

The key to the three-pillar conception of sustainability lies in optimizing the spatial layout of industry, focusing on village production, and providing robust support for local construction and development, encapsulated in the concept of "continuation." The optimization of the island village's spatial layout is a crucial aspect of the island's industrial development, requiring alignment with the specific circumstances of the island village.

4. East Xiaoqing Island Village landscape design and renovation practice and exploration

4.1. Project overview

Situated in the eastern part of Rushan City, Weihai City, East Xiaoqing Island Village is a traditional fishing village intimately connected to the sea. Separated from the mainland by 4.7 nautical miles, the village spans a total area of 0.56 square kilometers on the island. On a macroscopic scale, China's islands exhibit a characteristic distribution of "more in the south and less in the north, more in the near shore and less in the

far shore." East Xiaoqing Island Village, being secluded from the hustle and bustle, provides an excellent opportunity to experience the lifestyle of the northern islands' fishermen. On a meso level, Weihai City has strategically planned the "Thousand Mile Mountain and Sea Self-Driving Tourism Highway Route" (refer to **Figure 2**), showcasing captivating coastal scenery, mountains, seas, islands, and bays. East Xiaoqing Island Village falls along one of the routes, positioning it advantageously as a potential tourist attraction in Weihai City. Microcosmically, East Xiaoqing Island Village boasts a unique natural environment, with hospitable islanders and low overall development, embodying a paradise-like setting floating in the sea. Hence, this village is chosen as the subject for designing and exploring the revitalization and renewal of island village landscapes through the lens of the three-pillar conception of sustainability.

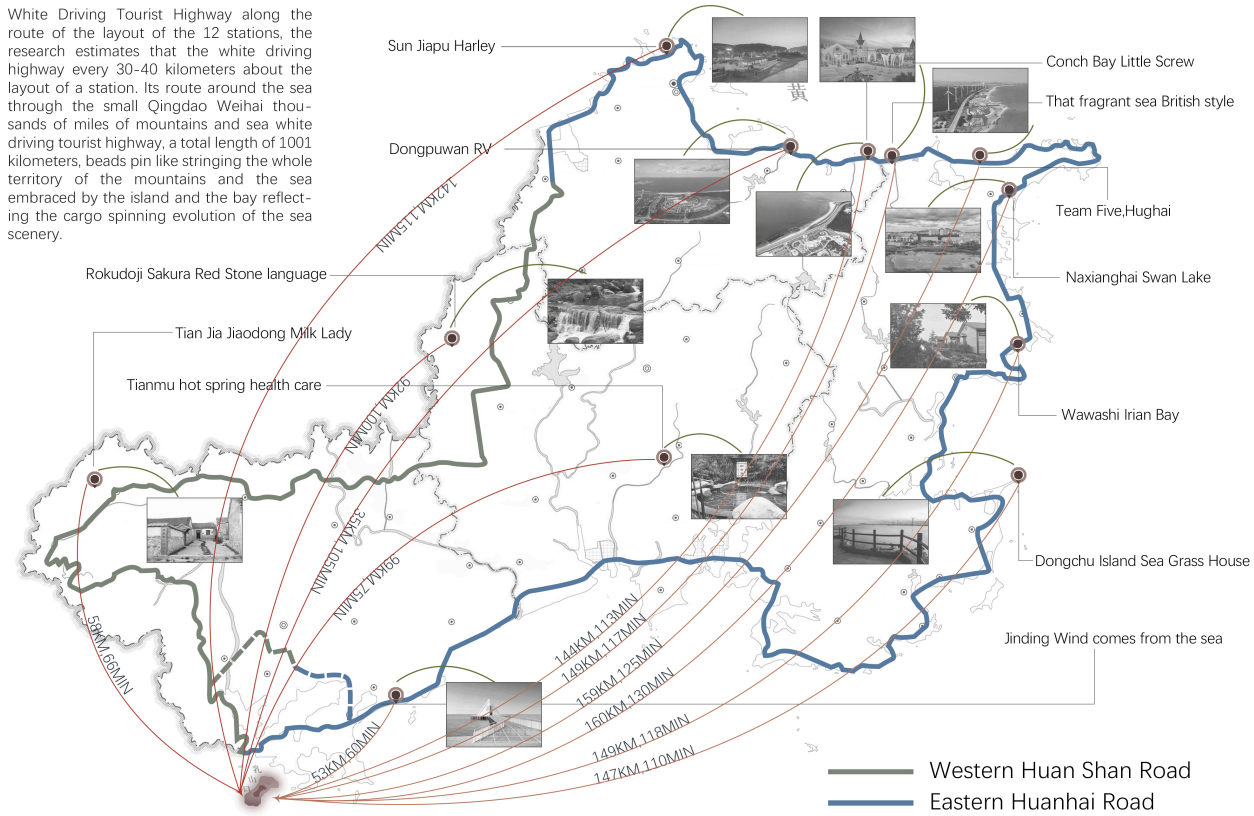

Figure 2. Traveling route of Weihai's "Thousand Mile Mountain and Sea Self-Driving Tourism Highway"

4.2. Problems of the current situation of the site

Through preliminary research and analysis of site factors such as roads, vegetation, facilities, and buildings (refer to **Figure 3**), several issues have been identified within East Xiaoqing Island Village. Firstly, regarding the ecological environment, abandoned aquaculture ponds have adversely affected the pristine coastal ecology, and indiscriminate disposal of domestic waste has further impacted the coastal landscape. Secondly, concerning cultural memory, there is a disconnect in the transmission of the island's sea defense culture, fishery culture, and folklore, particularly evident in the younger generation's limited understanding of fishery culture. Thirdly, in the realm of the production industry, problems include damaged wharves and breeding ponds, along with depleted soil fertility on the island's terraces. Fourthly, in terms of life and recreation, there is surplus unused space in the village with insufficient leisure areas and imperfect recreational facilities. Lastly, regarding transportation, rational path planning is absent, necessitating additional transportation facilities on the existing foundation to enhance the overall transportation experience and achieve an effective synergy between production and excursion routes.

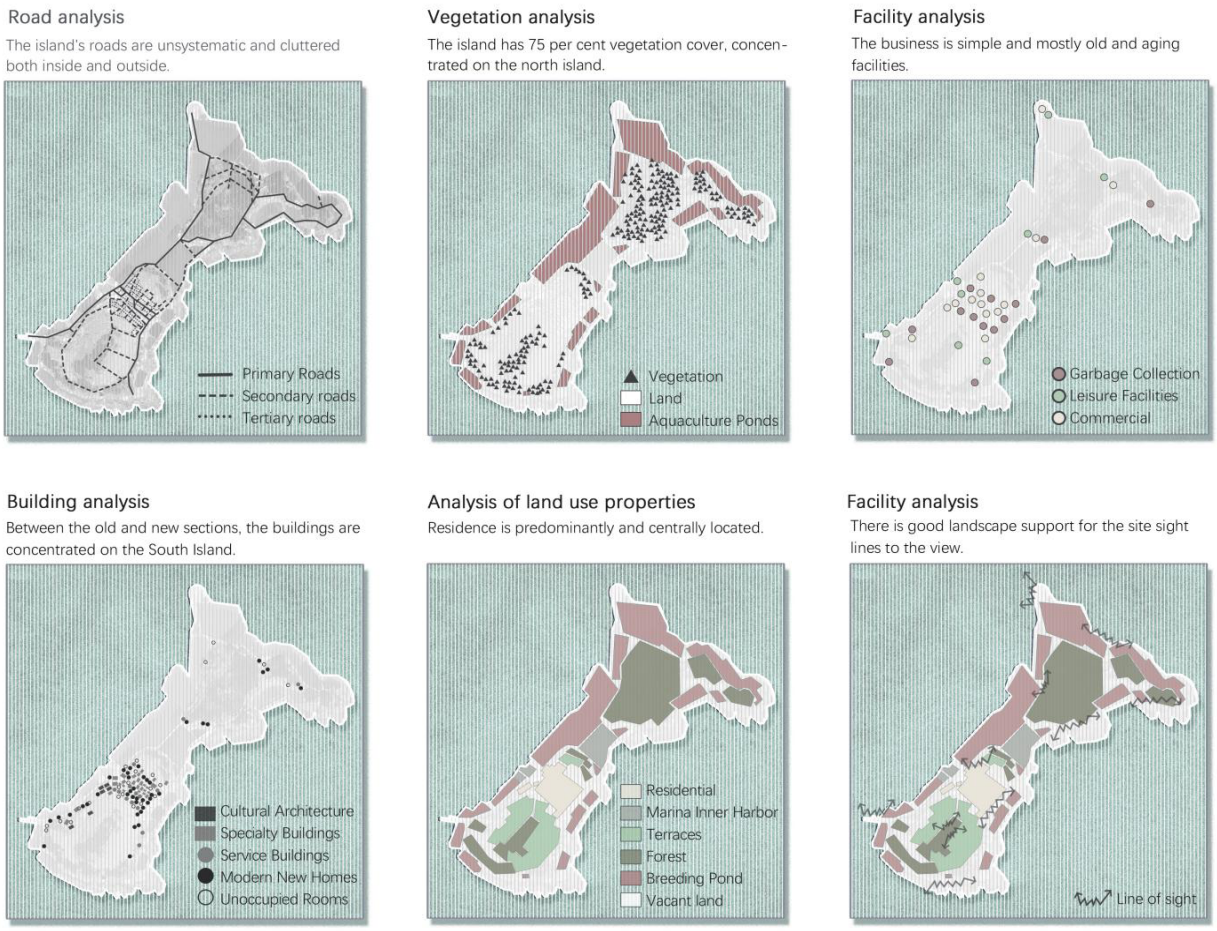

Figure 3. Factor analysis of the site

4.3. Design strategy

In the course of rural revitalization, the primary focus of the design revolves around the production function, ecological function, and life function inherent in the island fishing village. Designing for island empowerment involves three key aspects: environmental empowerment, spatial empowerment, and power empowerment.

Firstly, environmental empowerment emphasizes ecological sustainability, prioritizing respect for the site's native natural resources and maintaining the balance of the site's ecological structure. This involves the preservation of the island's environmental integrity and the responsible use of its natural assets. Secondly, spatial empowerment emphasizes design activation. Recognizing the irrational design and planning of unused space, the approach involves a people-oriented use of design empowerment. Thirdly, power empowerment centers on industrial development. The hollowing out of villages often results in the idleness of village space. Consequently, the development of industry serves to give purpose and vitality to these underutilized spaces. In essence, the development of industry provides power to the previously unused village areas, contributing to the overall empowerment and revitalization of the island community.

4.3.1. Exploring the source: Blue and green concepts interweaving to maintain the native environment

This strategy centers on the symbiotic relationship between the artificial environment and nature in the design process. Leveraging East Xiaoqing Island Village's significant resources – the ocean and the lush black pine forests (**Figure 4**) – the ecological concept of "interweaving blue and green" is proposed.

Figure 4. Scenery of East Xiaoqing Island Village, Rushan City, Weihai City, China.

The blue concept (**Figure 5**) entails marine ecological restoration, encompassing oyster shell beaches, reef beaches, and abandoned breeding ponds along the ecological coast. Oyster shell beaches stabilize the coastline, reduce erosion, and enhance the site's attractiveness as a tourist destination.

Figure 5. The blue concept

The green concept (**Figure 6**) focuses on terraces, ecological agriculture, and forest protection. The naturally occurring black pine forests on the north of the island are preserved with minimal artificial intervention. The south of the island features expansive terraced rice fields, cultivated with ecological agriculture techniques that promote sustainability. The renovation process involves publicizing and popularizing ecological agriculture concepts among the island villagers, encouraging the resourceful use of biochar and organic waste materials such as straw, seed husk, and dung to increase carbon sinks in farmland.

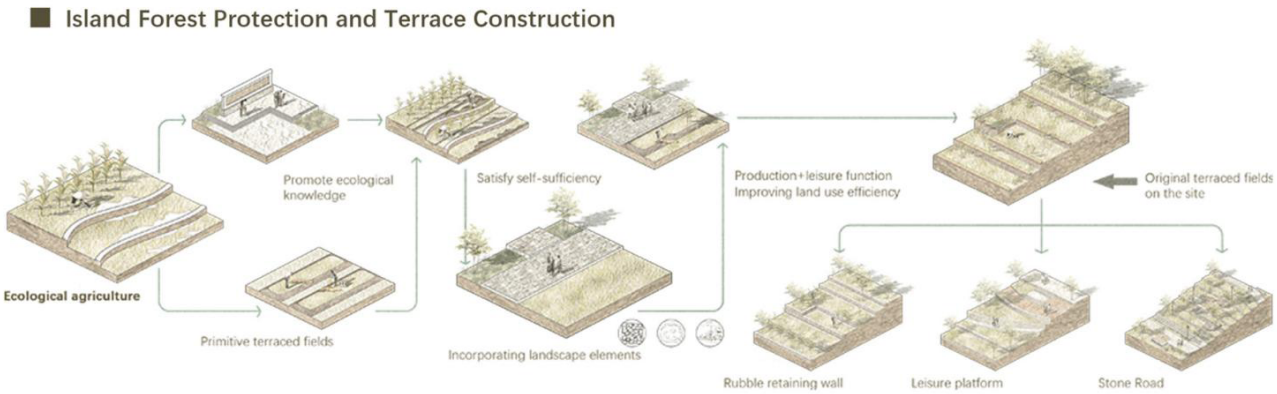

Figure 6. The green concept

In essence, the strategy of blue-green intertwining maximizes the utilization of the natural environment and resources. Through complementary cooperation between marine ecological restoration and terraced eco-agriculture, a sustainable island ecosystem is created, contributing to the overall revitalization and renewal of East Xiaoqing Island Village.

4.3.2. Retrospective: Reshaping and optimizing residents' unused space

The island's historical buildings are primarily concentrated at the village entrance facing the seaside. The sea defense legacy structures have created a unique courtyard space, and the design process will emphasize the protection and utilization of these unused legacy buildings. The reuse of on-site buildings falls into two categories: replacement and juxtaposition.

In the replacement type, unused or dilapidated building space retain their main structural framework or continue their original function, with modifications to align with contemporary lifestyle needs. The juxtaposition type involves the optimization of original functions in unused spaces. New functions are introduced based on

usage demands or development needs, enabling the juxtaposition of different functions.

For instance, the spatial transformation of the village entrance square (**Figure 7**) utilizes a blend of old and new spaces, integrating the original single leisure space with viewing and cultural spaces. This approach achieves a transformation and upgrade of spatial functions.

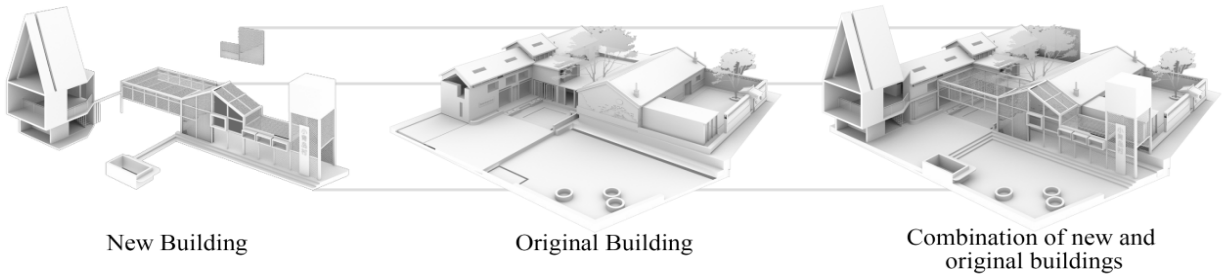

Figure 7. Spatial transformation of the village entrance square

Additionally, emphasis is placed on the recycling of waste materials, such as oyster shells used as construction materials. Due to their natural texture and excellent corrosion resistance, oyster shells serve as construction materials. New or renovated buildings are constructed with a steel frame to ensure structural stability, while decorative materials made from discarded oyster shells replace traditional options. This not only safeguards the buildings but also showcases the texture of local materials, seamlessly blending the structures into the local scenery and promoting sustainable development.

4.3.3. Continuation: Activating elements of island culture and tourism development

Weihai, renowned as the hometown of oysters, boasts a rich tradition of fisheries in East Xiaoqing Island Village. The village's mariculture has established a stable economic model, yet cultural tourism remains underexplored. In planning the island's tourism landscape space, unique cultural factors from the island are extracted, focusing on the fishery culture of East Xiaoqing Island Village and the culture of sea defense. The Fishery Custom Experience Area and the Sea Deferense Culture Study Area are established (**Figure 8**). Simultaneously, utilizing local characteristic culture as the source of elements, various signs and symbols are designed in the landscape of the site and applied throughout the entire space. This approach fully considers the requirements of island culture inheritance and development, aligning with the needs of villagers' residences to craft a distinctive island village landscape and cultural atmosphere. In doing so, the local culture empowers the industry, and the industry, in turn, propels the development of the village.

5. Conclusion

In conclusion, the practical significance of the three guiding principles in island village landscape revitalization and renewal design manifests in three main aspects. First, by incorporating the concept of blue-green intertwining through environmental empowerment, the design better captures the natural environment and humanistic history of the island. Second, through spatial empowerment, delving into the cultural heritage of island villages enhances landscape space to contribute to the island economy's prosperity. Third, via industrial empowerment, understanding the unique sense of place on the island, combined with island culture, propels the development of cultural tourism, enhancing the island village landscape to offer an enriched life experience.

Illustrated by the design example of East Xiaoqing Island Village, the changing landscape due to urbanization and evolving production modes in island fishing villages necessitates the integration of ecological,

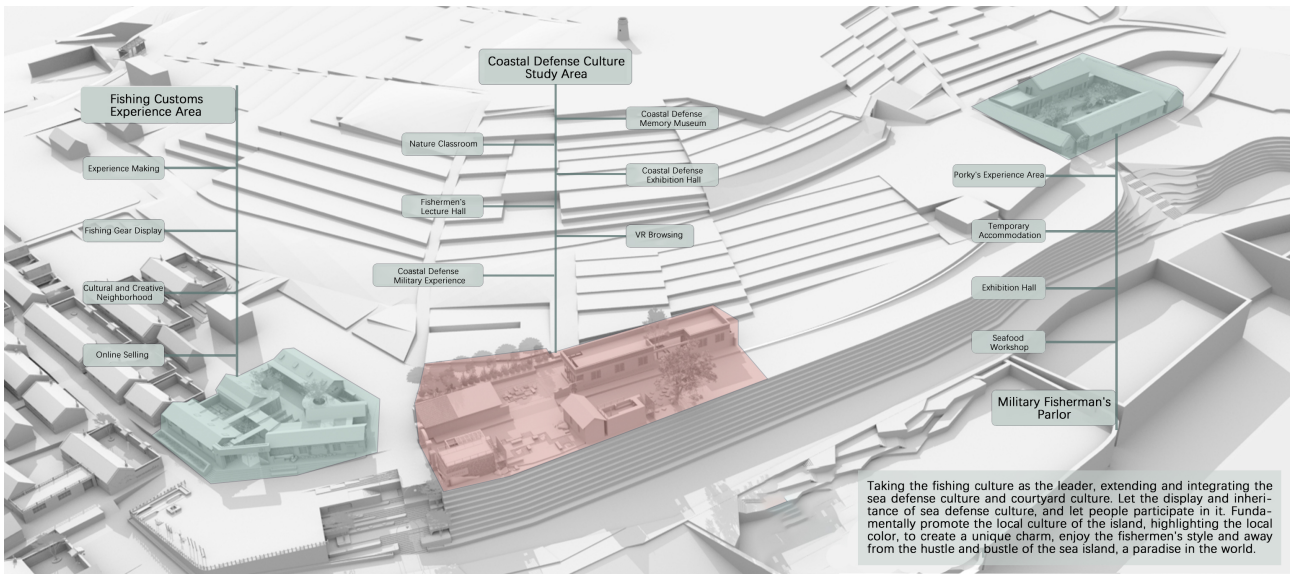

Figure 8. Cultural and tourism functional area plan

life, and production landscape resources for sustainable development. Utilizing the three-pillar conception of sustainability, the essence of the site is extracted, comprehensively considering the site's current state. Through the integration of island landscape elements, a framework for the three-pillar conception of sustainability is constructed. This provides theoretical and practical guidance for rebuilding the island village's sense of wholeness and belonging, facilitating the revitalization and renewal of island space.

Disclosure statement

The authors declare no conflict of interest.

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