The Preliminary Study on the Strategy of Ecological Coast Restoration—Illustrated by the case of the Ecological Restoration of Lingni Old Seawall in Wenzhou City, Zhejiang Province

Xie Chaoyu¹, Peng Wenfei²* and Yangchang³

¹Wenzhou Vocational & Technical College, Wenzhou, Zhejiang, 325000, China
²Wenzhou Vocational & Technical College, Wenzhou, Zhejiang, 325000, China
³Wenzhou Ecology and Environment Department, Wenzhou, Zhejiang, 325000, China

*Corresponding author’s e-mail: ppwwff@gmail.com

Abstract: The eco-coastal restoration has been a hot issue in recent years, however a complete theoretical and methodological system has not been formed yet. Taking the ecological restoration project of Lingni old Seawall in Wenzhou City, Zhejiang Province as an instance, this paper illustrates the status quo of the project, and elaborates on the three steps of site arrangement, environmental restoration and cultural renewal, which embodies the idea of ecological restoration for this type of coastal space. On this basis, three principles of reality-based, nature-rooted and culture-oriented are put forward. It is hoped that in future related projects and coastal space restoration, the nature will be respected in combination with culture, and municipal infrastructure construction, landscape infrastructure construction and ecological infrastructure construction will be closely coordinated, so as to establish a coastal landscape system with multi-sense ecology in line with the principle of utilizing the sea ecologically.

1. Introduction: Background and significance of ecological coast construction

The 21st century will be a century of oceans. In the 13th Five-Year Plan Outline, the renovation of the Blue Bay is going to be listed as one of the four major marine projects, in which the renovation of the Blue Bay, the South Red and North Willow Project and the Ecological Island Reef Project, etc. will become the key work in the field of marine ecological environment protection and sustainable utilization of resources in the future, and the implementation of a large number of coastal renovation projects is urgently in need of technical support of the research work of coastal remediation [1].

Zhejiang abounds in marine resources and its strategic location is of critical significance. Wenzhou, as one of the important coastal cities, has abundant natural and geographical marine resources, and has a considerable degree of development of coastal, port and other urban functional elements. Under the background of today's society, how to conduct sustainable development and utilization of marine resources and how to make ecological planning and design for coastline space are one of the concerns nowadays.
2. Description of problems - ecological restoration of Lingni old Seawall in Wenzhou City, Zhejiang Province

Lingni Seawall is a large-scale municipal engineering in Wenzhou City, which connects Niyu Island in Dongtou County of Zhejiang Province at one end and the land across Lingkun Island at the other end. The total length of Lingni Seawall is about 14.5 km. It is one of the longest sea-crossing seawall in China at present. The area under discussion is one of the old seawall. Due to the changes of sea level and the elevation of municipal engineering technology in recent years, the project segment has been discontinued and a new seawall has been built on the side for use. How to redesign the old seawalls, which are unusable, difficult to dismantle and in a relatively awkward situation, to a coastal space to be ecological and entertaining, and accessible for families, is one of the urgent problems to be solved at present. The exploration of this strategy will also provide some inspiration and ideas for the planning of other "grey" coastal space belts and old and outmoded coastal space.

3. Strategic research

Before solving the problem formally, the following SWOT analysis of the site has been conducted.

![Chart 1 SWOT analysis of the site]

It can be concluded that the geographic location of the site is preferable, but the current situation is comparatively dirty and messy, and the coastal ecological environment is worse than the urban space in other cities. The site will be endowed with two new functional labels - "Coastal Eco-cycling Avenue" and "Coastal Reception Room". Starting from these two functions, the site will be restored in three steps as follows so as to inject new vitality into the site.

3.1. Site arrangement

The current infrastructure is preferable, but the road conditions and planning methods are outdated. If it is defined as a bicycle lane blocking the motor vehicles, the road utilization needs to be re-planned. Different forms of waterfront venues and facilities can attract people to approach water [2]. For this reason, the original four lanes are re-divided into 1.2m interesting platform, 1.5m sea-watching platform, two 2m temporary parking mobile zone on both sides and the 5m bidirectional riding zone in the middle, which is set as a sightseeing venue in combination with the original part of the widened pavement, so as to achieve a new functional transformation.
3.2. Environmental restoration

After the basic site cleaning, the ecological and natural habitat environment can be rebuilt. Aiming at rebuilding stable and safe ecosystem, the level of biodiversity and ecosystem stability will be improved by enriching wetland habitat types, proliferating specific species, etc. The main design methods are as follows: introducing wetland vegetation environment into the areas with less siltation and muddy beach in high tide location, constructing mangrove area and forming mangrove system in middle and high tide inter-zone; setting up oyster reef area in areas with less siltation, dams in high tide location and muddy beach area in middle and low tide locations, forming oyster reef and beach system in middle and low tide zone, i.e. after laying oyster shells or artificial structures, the oyster seedlings will be proliferated and released, the quantity of resources will be supplemented, and the oyster will grow naturally after stabilizing for 1-2 years.

In this process, several misunderstandings need to be avoided: too much attention should be not paid to vegetation restoration and the increase of wetland greening area, or the final survival rate should be taken as the first consideration [3]; exotic species should be used cautiously which may bring about ecological risks. In this case, the recommended varieties of mangroves are *Casuarina Equisetifolia* and *Kandelia Candel*, which have been proved to have better benefits in Wenzhou. In order to maintain long-term stability, a scientific technical system of the detection and evaluation of ecological restoration benefits should be established for the long-term stability [4].

3.3. Cultural renewal

After the establishment of a more stable ecosystem, the site should have more social functions. It is hoped that this space can become a pro-water space platform for promoting healthy lifestyle concept, and perceiving and experiencing the charm of marine culture. The platform can be combined with periodic bird watching, tide watching, shellfish and crab catching, long-term cycling events, pro-water activities, etc., thus users can love and spontaneously maintain the space of the site, and the concept of eco-integrated site can be subtly rooted in everyone’s using process.

4. Conclusion: 3-principles for restorations

This project ended with quite perfect responds. However, there is no universally applicable design methodology that can be applied to all eco-coastal projects, but still all design foothold can make connections. Based on this case, the author concluded three strategies (“ABC” principles) can be widely used in the middle of all kinds of ecological coasts:
4.1. Appreciate Truth
In the process of ecological coastal restoration, the current situation of the site should be accepted and fully comprehended, so as to retain the available elements and inject new vitality into it. The new renovation project should be down to earth equipped with both operability and practicability. The phenomenon of renovation project turning into a new "rebuilding" activity must be guarded against.

4.2. Belief in Self-healing
In view of the current situation of China's development, what we are often confronted with is a situation of the ecological environment of "damaged first and then restored". Although the means of ecological restoration mainly rely on external forces to restore, rebuild and improve the damaged ecosystem, it is essentially a process of restoring and strengthening the natural self-healing force. In the process of restoration of ecological coast, some elastic space should be reserved for strength, excessive artificialization should be avoided and natural self-healing force should be believed in.

The restoration of ecological coast is a long-term comprehensive project. The contradictions within the site need to be solved and the beautiful landscape reserved is expected. However, in the process, the means within the nature should become the main body with the returning of the coast to the sea.

4.3. Cultivate Lifestyle
Coastal restoration is not only a process of ecological upgrading and landscape beautification, but also a long-term process of changing people's perception and thinking about marine habitats. The regional characteristics and historical culture of the coastline should be fully developed so as to present the characteristics of marine culture, and the local ecological environment should be taken as the starting point so as to reflect the natural landscape resources of the coastline to the greatest extent \[(5]\]. It is a necessity to make users fully perceive the local customs and customs of marine culture, and human history. The popularity of science, education and interaction should be properly increased, people should be encouraged and guided to spontaneously love the ecological environment, healthy behavioural activities and positive attitude towards life should be promoted and cultivated, and the emotional interaction with users should be enhanced \[(6]\]. As for daily life, the way of life and the concept of thinking should be also synchronized with the "ecological restoration".

The relevant types of coastal restoration projects can proceed from the above three basic principles: three-way action to strengthen municipal infrastructure construction, landscape infrastructure construction and ecological infrastructure construction, explore new models of ecological coastal construction, and build a multi-sense ecological coastal landscape system. In the future urban design, what needs to be ecological is not only the ocean, but also our way of thinking about development, construction and urban planning.

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