OPEN ACCESS PRESS (OAP) OpenAccessPress.com/Journal/CHS

ISJN: CHS

Coastal Human Settlements

Volume 1 Issue 2 - 2024

ISSN: 3078-8773 (P) / 3078-8765 (E)

Editorial Open Access DOI: Registering

Marine Architecture: Localized Exploration and Futuristic Construction of Coastal Human Settlements

Chibiao Hao[1,*]

[1] Chair of the International Academic Union of Oceanic Architecture (IAUOA)

*** Correspondence:** president@iauoa.org

ABSTRACT: Against the backdrop of the marine century, the technological revolution, ecological transition, and humanistic awakening have driven architecture to break land-based boundaries, and Marine Architecture has emerged as a natural outcome. Inheriting the concepts of the Beijing Charter, it takes interdisciplinary integration as its path and localized exploration as its core, addressing multiple challenges such as global marine strategic competition, ecological coexistence, and upgraded demands. Based on Gener-alized Design, it constructs an integrated sea-city spatial model through approaches including horizontal and vertical interdisci-plinary expansion, localized integration of technology and humanity, and future scenario preview, enhancing spatial value from the dimensions of survival, ecology, production, and life. Its core ideology is to break the land-centric mindset and promote the marine localized innovation of the architectural discipline; its core objective is to eliminate the antagonism between humans and the ocean, create a safe, livable, and human-ocean symbiotic coastal human settlement environment, and provide disciplinary support and guidance for the sustainable development of human civilization in the marine century

KEYWORDS: marine architecture; coastal human settlements; localization; generalized design science

RECEIVED: 02 June 2024

ACCEPTED: 02 June 2024

PUBLISHED: 06 July 2024

ACADEMIC EDITOR(S): Chibiao Hao

OPERATING EDITOR(S): Shawn Zhang

REVIEWER(S): Y.F. Zhao

CITATION: Registering.

DOI: Registering.

At the critical juncture of human civilization marching toward the marine century, the architectural discipline is facing unprecedented cross-boundary expansion and localized innovation. As climate change reshapes the global ecological pattern, technological revolution restructures production and lifestyle, and humanistic awakening redefines the perception of spatial value, the ocean—an underexplored blue territory for humanity—has become a core field for architecture to break existing boundaries and address the propositions of the times.

"Marine Architecture" is based on the essential needs of coastal human settlements, inherits the holistic thinking and sustainable development concept of the Beijing Charter, takes interdisciplinary integration as its path and localized exploration as its core, and provides disciplinary support and action guidelines for the future of harmonious coexistence between humans and the ocean.

1. Background: The Architectural Turn in the Marine Century

The surging advancement of technological waves has injected core momentum into marine exploration. Breakthroughs in artificial intelligence, digital tools, and intelligent manufacturing have shattered the technical constraints on marine space development, shifting humanity's approach to ocean transformation and adaptation from passive response to proactive construction. Digital tools enable the dynamic coupling of marine ecology, geological hydrology, and architectural design, while intelligent manufacturing addresses engineering and construction challenges in the ocean's high-salinity, high-humidity, and highly corrosive environment—laying the foundation for large-scale marine space development.

The global consensus on ecological transition highlights the ocean's strategic value. Climate change-induced sea-level rise and frequent extreme weather events have forced humanity to re-examine its relationship with natural systems. As the Earth's ecological "regulator," the ocean is not only a key carrier for climate governance but also a crucial direction for human survival space expansion. The concept of sustainable development has extended from land to sea, demanding that the architectural discipline break free from the limitations of "anthropocentrism," construct a spatial model symbiotic with marine ecosystems, and achieve the goals of resource recycling and minimal environmental impact.

The in-depth demands of humanistic awakening have reshaped the perception of spatial value. People are no longer satisfied with a single supply of living space but pursue coastal life integrated with cultural identity, emotional belonging, and artistic experience. As an important part of human civilization, marine culture—with its unique regional cultural resources—provides an inexhaustible source of inspiration for architectural creation. It drives architecture to evolve from "spatial construction" to a "spiritual vessel", realizing the localized expression of humanistic value while meeting functional needs.

These era-defining changes collectively point to a new juncture in architecture development: the evolution of the discipline has transcended traditional land boundaries, moving toward diversified localized exploration of the ocean. As predicted in the Beijing Charter, the connotation of architecture expands horizontally and deepens vertically with the times. Marine Architecture is an inevitable product of this expansion and deepening—it responds to humanity's desire to explore the blue territory and embodies the discipline's trend of interdisciplinary integration.

2. Issues and Challenges: Disciplinary Reflections in the Marine Context

2.1. The Expansion of Human Living Space Is Caught in a Global Game of Marine Strategies

With the increasing scarcity of land resources, countries worldwide have incorporated the ocean into their core national development agendas, turning it into a "new continent" for seizing future opportunities. How to strike a balance between marine space development and harmonious coexistence amid global competition is an era-defining proposition that architecture must address.

2.2. Global Climate Change Tests the Bottom Line of Marine Ecological Coexistence

The vulnerability of marine ecosystems is deeply intertwined with climate variability, with prominent issues such as sea-level rise and worsening pollution. How to safeguard marine ecology during development, construct coastal spaces adaptable to climate change, and achieve the dynamic balance between artificial and natural systems constitutes a core issue.

2.3. Upgraded Spatial Demands Drive the Reconstruction of Marine Scenario Models

Human needs for marine space have shifted from traditional production functions to diversified and integrated demands, including coastal tourism, scientific research, and health and wellness. How to align spatial supply with diverse needs and build a new model of multi-scenario integration is a key direction for exploration.

2.4. Marine Localization Requires In-depth Coupling of Culture and Space

The unique geographical, climatic, and cultural characteristics of the ocean have shaped distinct local genes, which are not merely superficial regional labels. How to integrate these genes into design, avoid homogenization, and make coastal spaces carriers for inheriting marine culture tests the discipline's localized capabilities.

2.5. The Separation of Technology and Humanity Urgently Calls for a Breakthrough in the Marine Context

Current marine development faces the dilemma of excessive technological rationality or superficial humanistic expression—some projects neglect humanistic needs, while others merely pile up marine symbols. How to realize the localized integration of technology and humanity, and make technology serve humanistic values, is a critical research topic.

2.6. Traditional Disciplinary Boundaries Restrict In-depth Research Expansion

The complexity of marine space demands breaking the limitations of architecture as a single discipline. How to dismantle professional barriers, promote the cross-disciplinary expansion of knowledge systems, and enable the discipline to address diverse issues such as living models and ecological civilization is a core challenge in disciplinary construction.

The core direction of these issues and challenges lies in Marine Architecture's interdisciplinary, multi-dimensional, multi-perspective, and multi-level localized exploration of the marine attributes of coastal human settlements. It requires us to transcend superficial regional labels, delve into the inherent attributes of the ocean and the core needs of humanity, and construct a disciplinary system and practical path truly aligned with the marine context.

3. Path and Core: From Generalized Design Science to Marine Architecture

As Academician Wu Liangyong proposed in the Beijing Charter, with human settlements as the core, traditional architecture has been expanded into an integrated Generalized Architecture, laying the foundation for the discipline's interdisciplinary integration. The exploration of Generalized Design Science, as an extension of Generalized Architecture, further breaks the professional barriers of existing architecture—evolving from a technology-focused "creation-oriented" level to a future-predicting "preview-oriented" level. Based on the inherent value of space and guided by scenario needs, it constructs a "future-shaping" disciplinary system covering multiple elements such as survival, ecology, production, and life through the integration of humanistic art and technological means, providing an important prerequisite for the localized construction of Marine Architecture. As a core localized branch of Generalized Design Science, Marine Architecture profoundly embodies the discipline's interdisciplinary nature, localization, and futurism:

3.1. Horizontal and Vertical Two-Way Expansion of Interdisciplinary Integration

Horizontally, it spans architecture, marine science, ecology, information technology, humanities and social sciences, realizing the cross-boundary integration of knowledge systems. Vertically, it connects basic research, application practice, and policy formulation, forming a complete chain from theory to practice. This two-way expansion breaks the closedness of traditional disciplines and builds a comprehensive disciplinary system based on marine attributes.

3.2. Localized Integration and Expression of Technical Rationality and Humanistic Art

Based on the technical adaptation to the marine environment, it deeply integrates technological means such as artificial intelligence, digital modeling, and green building materials with marine culture, local folk customs, and artistic aesthetics. It not only ensures the safety, durability, and sustainability of architectural projects in the marine environment but also conveys marine humanistic values through spatial form, material selection, and scenario creation, achieving mutual prosperity and symbiosis between technology and humanity.

3.3. Upgrade from Sustainable Development to Future Scenario Preview

Breaking away from the passive response thinking of traditional sustainable development, it takes the "preview methodology" of Generalized Design Science as the core. Based on the laws of marine ecological evolution and the development trend of human needs, it predicts potential changes in future scenarios in advance and incorporates mechanisms of flexible adaptation and dynamic adjustment into design, realizing the transformation from "meeting the present" to "leading the future".

3.4. Multi-Level Extension of Integrated Sea-City Spatial Models and Scopes

Breaking the dualistic separation thinking of "land-ocean," it constructs a multi-level integrated sea-city model ranging from coastal areas to offshore regions, and from urban spaces to marine ecological spaces. It expands the connotation and boundaries of space—extending from the coastline to both urban and marine sides, and from the sea level to the deep sea and sky. It covers not only physical spaces such as architectural, port, and ecological spaces but also virtual spaces such as digital, cultural, and experiential spaces, achieving comprehensive improvement of spatial value.

3.5. Construction and Enhancement from Multi-Dimensional Perspectives

Taking the ocean as the core carrier, it addresses the diverse needs of humanity related to the ocean from four dimensions: survival, ecology, production, and life. At the survival level, it ensures the safety and resilience of coastal spaces; at the ecological level, it realizes symbiosis with marine natural systems; at the production level, it optimizes the spatial support for the marine economy; at the life level, it improves the quality and experience of coastal life—constructing a comprehensive marine spatial value system.

3.6. Diverse Element Expression of Spatial Value

Balancing human living needs and natural ecological needs, it integrates diverse elements such as ecological protection, cultural inheritance, technological innovation, and emotional experience into spatial design. It not only guarantees the practical functions of space but also emphasizes the maximization of ecological benefits; it not only conveys regional cultural characteristics but also meets human emotional yearnings for a better life, achieving a diverse balance of spatial value.

4. Core Ideology and Objectives

The core ideology of Marine Architecture lies in the exploration and breakthrough of the inherent nature of architectural space and the marine localization of disciplinary professionalism. It requires us to break free from the land-centric mindset of traditional architecture, delve deeply into the unique attributes and local genes of the ocean, re-examine the value connotation and construction logic of space, and conduct discussion, extension, and reconstruction of the existing disciplinary system within the marine context. This exploration is not a simple regional extension but a localized innovation of the discipline’s essence, representing the architectural discipline’s proactive commitment to addressing the propositions of the times.

The core objectives of Marine Architecture are to promote the symbiotic development between artificial systems and marine natural systems, guided by futuristic and life-oriented ideas. It aims to break the antagonistic relationship between humans and the ocean, constructing a symbiotic model of interdependence and co-evolution. It seeks to meet the diverse needs of humanity in survival, ecology, production, and life both now and in the future, creating a safe, healthy, livable, and vibrant coastal human settlement environment. Through disciplinary construction and practical innovation, it aspires to provide spatial support for the development of human civilization in the marine century, realizing the harmonious coexistence between humans and nature, technology and humanity, and the present and the future.

At the historical juncture of human civilization expanding toward the ocean, Marine Architecture is not only the inheritance and development of the sustainable development concept proposed in the Beijing Charter but also an inevitable choice for the architectural discipline to respond to the needs of the times. It calls on the global architectural community, researchers, and practitioners from related disciplines to join hands, with an open perspective, integrated thinking, and localized sentiment, to explore the theoretical core and practical paths of Marine Architecture in depth. Let us take the ocean as a bridge, break disciplinary boundaries, reconstruct spatial value, and jointly write a bright future of harmonious coexistence between humans and the ocean, contributing wisdom and strength to the construction of coastal human settlements and the sustainable development of human civilization.