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Reflections on the Application of Low-Tech in Landscape Architecture Design amid Environmental Crisis

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Abstract
The post-modern focus on landscape and vernacular architecture emerged from ecological concerns due to resource crises, critiquing high-tech resource consumption and uniform aesthetics. Low-tech landscape architecture integrates traditional and modern architecture, utilizing passive ecological technologies. This approach seeks to modernize energy use in landscape architecture, fostering innovation within low-tech frameworks. Policies and regulations ensure that construction meets aesthetic and technical standards, emphasizing local materials and sustainability. These methods promote sustainable development and harmonious coexistence with nature, offering new avenues for architectural design and landscape art amid environmental challenges.

Keywords: Environmental crisis; landscape architecture design; aesthetics; low-tech application; development

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1.0 Introduction

Low-tech architecture represents an aesthetic philosophy that emerged after modernist architecture. It has been a significant architectural and aesthetic reflection based on regional primitive typological construction techniques from the 1960s to the present. This primitive typology originates from Marc-Antoine Laugier's theory of the "primitive hut" described in his work "Essay on Architecture," which posits that all architectural elements stem from necessity. These necessities encompass the fundamental components of architecture and are the essential elements of construction technology. The primitive, rustic hut embodies all the essential components later seen in architecture, such as the base, eaves, columns, pediments, and roof. The hut serves as a prototype upon which all architectural aesthetics can be conceptualized.

The advent of industrialization gave rise to the "paradigm typology," a type of architecture that can be mass-produced through standardization. This typology focuses on the generation of new kinds, with industrialization enhancing efficiency for users but diminishing the aesthetic diversity celebrated by the first typology. The standardization of technical norms homogenized architectural aesthetics, leading to a proliferation of uniform, high-tech industrial buildings and the standardization of architectural elements. As paradigm typology dismissed architecture's original aesthetic and emotional factors, the 1960s saw the emergence of the New

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Rationalist Typology. Pioneered by Aldo Rossi, this third typology extended the concept to include style, form, and other aesthetic dimensions, as well as urban organization, structure, history, and cultural elements, emphasizing architectural aesthetics centered on humanistic connotations and lifestyles.

Hence, it is evident that humans are fundamental to creating architectural aesthetics, and low-tech architectural art is an effective means to reshape emotional aesthetics. Awareness of the environmental resource crisis in construction represents self-awareness; the ability to curb high-end consumption reflects self-control, and advocating for harmonious, sustainable development between humans and nature is a moral virtue of beauty.

In the aftermath of architectural modernization, vast rural and traditional architectures lost their original aesthetic appeal, with severe resource wastage characterizing industrialized construction. This has led to a paradoxical culture. Additionally, the ecological concerns stemming from the resource crisis have garnered attention in architectural art, ultimately reflecting a critique of high-energy, high-pollution development and a rejection of industrial products devoid of aesthetic culture.

This study responds to these ecological and cultural critiques by investigating the application of low-tech principles in landscape architecture. The aim is to explore how these principles can bridge the gap between traditional craftsmanship and modern architectural needs, offering solutions that emphasize sustainability, resource efficiency, and cultural preservation. By integrating traditional techniques with passive ecological technologies, the study seeks to reimagine architectural practices that balance functional, aesthetic, and environmental objectives. Ultimately, the research aspires to contribute to the growing discourse on sustainable design, addressing the urgent need for innovative yet contextually grounded approaches to contemporary environmental challenges.

2.0 Literature Review

This critique is based on the paradoxical proposition: "Firstly, the total amount of non-renewable global resources is fixed; secondly, the progress and development of human civilization are inseparable from continuous resource consumption." (Wang, 2003). Although humanity continuously updates resource utilization methods and invents innovative modes of resource use, these efforts merely slow down the reduction of total resource quantity relative to the ultimate resource limits. With the global population around 7.4 billion, quadrupling from 1.8 billion in the 1960s, most non-renewable energy sources are nearing their limits. This has led to reflections on resource utilization technology within paradoxical culture (Zhang, 2016).

Under this proposition, a sub-proposition arises: if the rate of resource consumption slows or achieves negative growth until the Earth's life limit, then such a mode of resource utilization is commendable. This involves sustainable development through resource substitution and low-tech applications to reduce energy consumption rates. Research on low-tech architecture is crucial in addressing this proposition within this paradoxical culture and technology. Low-tech architecture can be summarized on three levels: a) Primitive Architecture Level: Advocates for natural ecology, vernacularization, and passive environmental protection and energy saving. b) Modern Level: Critically negates the consequences of industrialization and the energy consumption of high technology, advocating for the use of proactive low-tech architecture. c) Comprehensive Low-Tech Constructive Thinking Level: Utilizes ecological, energy-saving, and environmental protection technologies—integrating active and passive energy-saving techniques in architecture and innovating technology utilization modes. These three aspects construct the framework of low-tech architecture within humanity's paradoxical cultural and temporal system, ensuring continuous reflective power throughout modernization.

This paper constructs a new dimension of low-tech architectural art from the perspective of "paradox culture" by combining time and space, thereby promoting harmony between nature and humans and ensuring sufficient resource space for the survival and development of humanity in the future. Reflected in architecture's temporal and spatial dimensions, this mainly manifests as the technical thinking between tradition and modernity, globalization and regionalism, humanism, ecologism, and low-tech and high-tech. It aims to correct the ecological relationship between humanity's excessive resource consumption and the sustainable development and utilization of the Earth's limited resources.

The Industrial Revolution accelerated urbanization, hastened the standardization of construction, and led to the design of massive building complexes to accommodate urban economic expansion and capital growth. These developments necessitated extensive urban artificial systems, resulting in a pattern of resource-intensive, energy-intensive, environmentally polluting, and resource-wasting urban energy consumption. Western modern industrialized architectural design principles and highly efficient energy utilization techniques have exacerbated these issues globally. In response to this situation, low-tech architecture emphasizes ecological considerations, focusing on sustainable resource utilization, perpetuity, and harmonious human habitation. This paper examines low-tech architectural art's application prospects and aesthetic values from the perspective of these key themes.

In the context of contemporary economic, cultural, and technological globalization, the application of low-tech architecture demonstrates the following characteristics: diversification of architectural aesthetics, the integration of traditional materials and techniques with regional characteristics, transformation of architectural design methods, and the existence of architecture in the context of counter-urbanization and rural informatization, the influence of consumer culture on architectural aesthetic concepts and the popularization of low-tech architecture, and the shift of architectural design from industrialization towards natural ecological values, gradually constructing the theoretical implications of architectural ethics.

3.0 Methodology

This study aims to investigate the application of low-tech architecture in addressing environmental challenges while preserving cultural heritage and promoting sustainable development. The goal is to develop a theoretical framework and practical strategies that integrate

traditional architectural techniques with modern energy conservation practices. By doing so, the study seeks to bridge the gap between vernacular architectural traditions and the demands of contemporary ecological design.

To achieve these aims, the research employs a structured, multi-phase methodology:

1. Theoretical Exploration: The study expands on the foundational concepts of low-tech architecture, examining its historical, cultural, and philosophical underpinnings. This includes a detailed analysis of the occurrence, development, transformation, and refinement of traditional technical architecture. Separate examinations of Eastern and Western architectural traditions are conducted to identify shared principles and distinct innovations.
2. Reflection and Conceptualization: Building on the theoretical base, the research reflects on the current state of low-tech construction. It explores opportunities for its development and popularization, particularly in the contexts of globalization and post-urbanization. This phase involves sketching a conceptual framework for low-tech architectural design thinking, guided by ecological philosophical principles, to address the increasing urgency of sustainable development.
3. Application Analysis: From the perspective of the global resource crisis, the study critically evaluates the need for low-tech solutions. This involves contrasting the shortcomings of high-tech, resource-intensive methods with the advantages of low-tech approaches, particularly in urban architecture. Case studies are utilized to illustrate the real-world applicability of low-tech design, highlighting its potential to reduce energy consumption and environmental impact.
4. Adaptability and Implementation: The research introduces the concept of adaptability in low-tech architecture, addressing various dimensions such as social, cultural, climatic, and ecological adaptability. This includes designing prototypes for living spaces in rural areas that align with energy conservation and environmental protection goals. Specific methods are tested to evaluate their feasibility, such as employing locally sourced materials, optimizing passive design strategies, and promoting community participation in design processes.
5. Critical Analysis of Trends: The study investigates post-architectural trends and their implications for urban design. Through case studies and examples, it bridges theory and practice, demonstrating the evolution of low-tech architectural concepts in contemporary settings. Key insights are derived to refine the application of low-tech principles in modern contexts.

By combining these phases, the research constructs a comprehensive framework for low-tech architecture that emphasizes adaptability, sustainability, and cultural relevance. The findings aim to provide actionable recommendations for integrating low-tech solutions into urban and rural contexts, ensuring a balance between environmental conservation and architectural innovation.

While this study provides a comprehensive exploration of low-tech architectural principles, it acknowledges several limitations. First, the focus on specific case studies may limit the generalizability of findings across diverse geographical and cultural contexts. Additionally, the reliance on historical data and theoretical models may overlook the practical challenges of implementing low-tech solutions in rapidly urbanizing environments. The study also acknowledges the difficulty of fully integrating low-tech practices in regions with limited access to traditional materials or skilled labor. These limitations highlight the need for further research to address these gaps and refine the proposed strategies for broader applicability.

4.0 Findings

As a product of human labor necessary for survival, architectural art is a carrier of human cultural art and a manifestation of thought, reflecting various stages and regions of human development. This has resulted in the formation of primitive types, typological types, and neo-rationalist architectural cultural studies (Tianjin University Press, 2005). Therefore, the existence of architectural culture is fundamentally based on human activities.

Fig. 1. The examples of architectural culture.
(Source: Pramod, G., 2021)

Since the beginning of human society's development, humanity has always been confined to the cultural models it created or imagined, living in a predetermined cultural world, accepting specific cultural influences, and being shaped by them. In this sense, there is a familiar essence between human subjectivity and cultural subjectivity. The realization of human essence and subjectivity aligns with the creation and development within the cultural world (Sima Yunjie, 993-3). While architectural culture constructs human residential cognition, environmental behavior patterns, and the inheritance and development of buildings and human thought, it also embodies contradictions and irrationalities in its value, significance, and functionality, contributing to the paradox of human values, ideologies, and activities—the "architectural culture paradox." (Wang, 2008). With its economic, social, expansive, technical, and greedy characteristics, this paradox impacts human social development and architectural progress, becoming a central theme in paradox studies. In recent years, ecological architecture (Fig. 2), environmentally friendly buildings, anti-planning (Yu Kongjian, 2009), and environmental protection have reconsidered the architectural culture paradox in planning and design.

However, these titles, embellishments, and gimmicks, which exceed their practical significance, still need to fundamentally curb humanity's path to self-destruction under its cultural model. The key to resolving cultural paradox lies in mobilizing cultural subjectivity and fostering continuous creativity and self-renewal. Creativity, eternally conflicting with traditional forces, through internal cultural reflection, forms responses more suited to the subject's needs, thereby gradually eliminating the negative aspects brought by the cultural paradox (Ernst et al., 2004). Therefore, from the perspective of low-tech in architectural culture under the cultural paradox, it is essential to explore the cultural turning points underlying the phenomena of architectural development amidst rising technology. These turning points reveal the inherent irrationalities in the structure and functionality within the architectural and cultural world, characterized by self-related contradictions and value and significance's chaos and uncertainty, thereby demonstrating diversity and hybridity. It necessitates timely reflection, critique, absorption, restraint, development, and innovation.

Fig. 2. The examples of ecological architecture.
(left) Marco Polo tower – Hamburg, Germany & (right) CopenHill – Copenhagen, Denmark.
(Source: Ansari, K., 2022)

Unlike derivative cultural paradoxes, primal architectural, cultural paradoxes carry the significance of primitive studies and genesis, originating in the natural conditions and social existence when a new culture is created. They are transcendental and inherent paradoxical forms (Guo, 2001). Derivative paradoxical culture continuously integrates with social conditions during its movement and transformation, constructing cultural value and function transformations that lead to counter-movements, aiming to resolve social culture's and technological development's contradictions. The architectural, cultural, and technological paradox synthesizes these two cultural forms. The primal paradox aligns with the ecological essence of human-nature harmony in architecture, being primary and based on natural philosophy, exhibiting passive adaptability; derivative architectural cultural and technological paradoxes align with human development goals and survival demands, showing active development, requiring correction and management when deviating, and deceleration and restraint when excessive.

As in the early development of architecture, humans constructed defensive buildings to withstand various threats from nature. It was at this juncture that the simplest forms of housing emerged. Precise geometry defined human habitation; not a single piece of wood was unstressed or unchanged in shape, and all joints had functional purposes. This approach aimed to maximize efficiency and developed a standardized model for primitive housing. Who can say such humble huts might not be offered to the deity's temple one day? (Le Corbusier, 2011). With the improvement of the ability to conquer and transform nature, architectural aesthetic culture also evolved, incorporating higher levels of technology and resulting in humanistic architectural forms linked with political contexts, emphasizing aesthetics. Beyond practical considerations, humans intended to contemplate events beyond their current dim and chaotic awareness. Various buildings were arranged according to specific concepts, leading to various architectural forms under this cultural paradigm (Le Corbusier, 2011).

Eventually, the process reached a level that engendered social issues, such as the aesthetic and cultural void in architecture brought about by urbanization and industrialization and the contradictory ways technology utilized resources. After the Industrial Revolution, with

the progress of industrialization, urban development, and the proliferation of buildings, humans enjoyed the benefits of civilization while simultaneously encountering incalculable consequences, such as resource depletion, environmental degradation, and air pollution. However, humanity cannot detach itself from the modernized model supported by these resources. The cultures created on the dual basis of natural conditions and social development inherently possess paradoxes that are difficult to overcome. The exploitation of resources and the frenzied pace of construction aim to satisfy human desires for a more luxurious life, which constitutes the primary demand for the continued development of a more "extravagant" lifestyle. This is also where the paradoxes and the contradictory nature of energy consumption brought by architectural technology come into play. Therefore, the universal value of low-tech construction in the context of paradoxical culture is reflected in constructing low-tech architectural art. This value dimension embodies the universal aspiration for building a better human habitat, which includes rational utilization of natural resources, advocating for sustainable development, creating environmentally friendly beautiful homes, and the concept of harmony between humans and nature and harmonious coexistence (Zhang, 2012). In today's society, this translates to reflecting on the current construction misconceptions, guiding the sustainable development philosophy of architectural art and life, and prompting humanity to enter the "environmental protection era."

5.0 Discussion

This paper explores the paradoxes and contradictions inherent in human development from a historical perspective on paradox culture. It highlights a dual meaning: On the one hand, human development is necessary to solve survival problems; on the other hand, it requires the consumption of finite resources to sustain human needs. However, resource development and utilization are limited. Under this premise, the question arises regarding choosing the optimal path for sustainable development, harmonious coexistence, and resource utilization. This includes developing new energy sources and utilizing ecological energy to achieve sustainable energy use. The aim is to construct a theoretical framework for the artistic application of low-tech architecture and seek ultimate theoretical methods for sustainable development in energy-efficient building practices. This is the core issue addressed by this study.

The research constructs a theoretical system of low-tech architectural art development in response to environmental crises, serving as a guide. It integrates architectural technology, concepts, and practical achievements, drawing on historical and contemporary knowledge and tracing roots from geographical, climatic, human, and natural environmental factors. The study investigates low-tech architectural art's construction principles, techniques, methods, and philosophies, critiquing current pseudo-low-tech, pseudo-ecological, energy-saving, and environmentally friendly architectural practices. It establishes a new technical lineage for the development of low-tech architectural art. Furthermore, the study summarizes a systemic theory and value system of the "three views" and "four dimensions" for developing low-tech landscape architectural art under environmental crisis conditions.

6.0 Conclusion and Recommendations

The focus on landscape architecture or vernacular architecture began after modernism, spurred by the ecological awareness triggered by resource crises and its application in architectural design and aesthetics. This interest stems from a critique of high-tech architectural development's high material and energy consumption and an aesthetic critique of homogeneous architectural forms.

Post-Industrial Revolution resource utilization development shows that the energy consumption of buildings and decoration accounts for nearly three-quarters of total social energy consumption. The widespread adoption of high-speed construction and assembly technologies has severely impacted the artistic quality of architecture and undermined its aesthetic aspirations. Ultimately, to curb and reduce these resource utilization methods, we must return to low-tech construction approaches to achieve sustainable development and gradually reduce the rate of energy consumption. This ensures humanity's continuous survival and development while preserving the cultural memory of beautiful architecture for future generations.

We propose constructing new genealogies of low-tech landscape architectural design under environmental crises, encompassing temporal, spatial, cultural, and technological dimensions. This approach promotes the harmonious coexistence of nature and humans, offering new technological design aesthetics for resource utilization, protection, and development for humanity's future survival and development. It provides new pathways for the landscape artistic forms of architectural design. In the spatiotemporal dimensions of architectural art, this is mainly reflected in the temporal dimension of tradition versus modernity, the spatial dimension of globalization versus regionalism, the cultural and artistic dimension of historical inheritance versus contextual innovation, and the technological dimension of traditional versus modern passive low-tech aesthetics. These dimensions offer new perspectives for landscape architecture design education in the new era.

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Paper Contribution to Related Field of Study

The paper promotes low-tech, sustainable design principles, integrates traditional and modern architectural practices, develops new educational systems, establishes regulatory frameworks, and advocates for harmonious coexistence with nature.

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