

ANALYSIS of the creation of rural ecological architecture from the perspective of landscape aesthetics--the case of Diaojiao Building in Xijiang Qianhu Miaozhai

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Abstract. In the context of rural revitalization, the establishment of eco-architecture plays a crucial role in promoting the sustainable development of rural landscapes. Eco-architecture that encompasses aesthetic features serves as an ideal option for rural development. The Xijiang Qianhu Miaozhai stands as the largest Miao settlement in China. Its Diaojiao Building, situated on the mountain, seamlessly integrates ecological, aesthetic, and ethnic cultural elements. It exemplifies the successful merging of ecological architecture and landscape aesthetics. This paper thoroughly examines the Diaojiao Building from the standpoint of landscape aesthetics and ecological architecture. Extensive exploration is conducted to uncover the aesthetic characteristics and landscape value with this unique architectural style. Through comparisons with other prevalent architectural types, this research identifies the ecological architectural attributes specific to the timber-frame building. Ultimately, the study concludes by offering insights into the methodology of rural ecological architecture, grounded in the perspective of landscape aesthetics.

1 Introduction

Eco-building is a comprehensive concept that encompasses green buildings, natural buildings, and energy-saving buildings. Its main purpose is to protect resources and the environment in order to realize the maximum harmonious coexistence of man and nature. Rural eco-building reflects both the regional cultural characteristics and humanistic features of villages, while also promoting the sustainable development of natural ecology. This represents a prevalent trend in rural architecture. In recent years, the process of "urban-rural integration" has led to the loss of local characteristics in many village buildings during renovations and constructions, making it difficult for the buildings to blend in with the surrounding environment. This, combined with outdated technical conditions, construction methods, and the use of substandard building materials, has resulted in weakened architectural features, inadequate energy conservation, and environmental pollution caused by the waste of cement and concrete. Therefore, further improvement and refinement are necessary in the research and promotion of eco-architecture.

In the rapid development of urbanization, rural areas are facing many opportunities and challenges, among which the ecological construction of rural buildings is an important direction. Ma lan, Wang Wei and others discussed the relationship between ecological architecture, harmonious environment and design aesthetics, which opens the way for architects to address environmental impacts from the source^[1-2]. Xue Songlu

discussed the relationship between *Feng Shui* theory and contemporary architectural design theory in line with the sustainable development of eco-architecture with Chinese characteristics to provide some references^[3]. By studying and analyzing the background of eco-architecture design, Liu Yong discussed the development prospect of eco-strategies and green eco-architecture in architectural design^[4]. Yu Zhichun emphasized the application of ecology in architecture from village planning to house construction, inherited and innovated local history and culture, inherited the vernacular ecological experience, and solved the deficiencies of the traditional dwellings by using modern technology^[5]. Peng Wenfei and Mao Lin further studied the methods of creating ecological architecture in the countryside^[6-7]. These research results provide a certain theoretical foundation for the development of ecological architecture in rural China.

Eco-buildings have been researched abroad for a long time, and the related design theories and concepts are more mature. Dian Pramita Eka Laksmiyanti discusses the application of green building and eco-concepts in small-scale industrial settlements, and describes the integrated water management and environmental management strategies in the local area^[8]. There are also many studies on the development of rural eco-buildings. Esin Hasgül proposes new principles of sustainable application of rural heritage through the example of passive energy renovation of vernacular buildings^[9]. Mafazah Novian analyzes and researches the concept of sustainable development of vernacular

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buildings with the example of the Dayak Kenyah tribe^[10]. Kemal Reha Kavaz et al. argue that sustainable development is achieved by integrating rural architecture with geography, mentioning the relationship between rural ecological design and rural cultural landscape, and researching and developing a methodology for analyzing, interpreting, and evaluating traditional rural settlements that is suitable for them^[11]. These studies provide a theoretical basis and reference value for the development of eco-architecture in cities and villages.

This paper discusses the landscape aesthetics and ecological attributes of Diaojiao Buildings and summarizes the methods of creating rural eco-architecture based on these aesthetic and ecological characteristics. Xijiang Qianhu Miaozhai is located in Nangu Village, Xijiang Town, Leishan County, Guizhou Province, surrounded by mountains on all sides, with the Baishui River flowing through the middle of the village. The main body of the building is situated on the slope of the river valley on the northeast side of the river, with a subtropical humid mountain monsoon climate. When the Miao nationality moved into this area, they took into account the rainy and changeable climate, the undulating terrain and the demand for land planting and other factors, and constructed the Diaojiao Buildings on the slopes of 30-70 degrees, and based on the inheritance of the traditional dry-rail type architecture, they created the wooden structure of Diaojiao Buildings with pierced-double hermitian roofs, which formed the unique characteristics of the residential houses. The frames of traditional Diaojiao Buildings are all mortise-and-tenon structures, with thousands of mortise-and-tenon interspersed columns, roof beams and square beams all intersecting each other vertically, forming stable and dignified triangular and rectangular geometric shapes. The carpenters who built the buildings did not need to use nails and rivets and drawings, so they could make a wooden building stand tall on the slope straight up, and the level of skill was evident. Diaojiao Buildings was divided into three floors: the elevated ground floor is used for piling up sundries, raising livestock, or building toilets; the second floor houses people, with a wide hall in the center, and rooms and bedrooms on both sides; the top floor is mainly used for storing grains, fodder, and other production and living materials. Diaojiao Buildings are the living fossils of the ancient Chinese residential buildings, which have high aesthetic value in architecture and other aspects, and also have the attribute characteristics of ecological architecture.

The following is an analysis of the landscape aesthetic characteristics of the Diaojiao Buildings from five aspects: shape, material, colour, overall and local culture.

·**Modeling Beauty.** Diaojiao Buildings basic components consist of uses columns and braces, following the architectural style that originated in the Tang Dynasty and the Song Dynasty. Throughout the subsequent dynasties, this style underwent continuous improvements, resulting in a distinctive spatial pattern created by the bucket arch frame. Not only to ensure the stability of the structure, artistic modeling also gives a person both elegant beauty. The roof ridge of the

Diaojiao Building is decorated with a pair of symmetrical flying birds or several flying pigeons. Additionally, the gray-white tiles and boards at the bottom of the eaves have clear outlines. Wood carving serves as the most prominent decorative technique in the Diaojiao Buildings. The windows feature various carving techniques, such as relief carving and openwork carving, arranged in both sparse and dense patterns. Many columns of the pillars in these buildings are adorned with gear-shaped carvings, enhancing the decorative beauty of the wooden structures and establishing a distinctive style. The shape of the Diaojiao Buildings, whether in terms of building decoration or overall structure, reflects a particular architectural aesthetic effect. These beautiful and grand buildings have garnered love and admiration from the people, becoming an integral part of the local landscape and adding a brilliant touch of uniqueness.

·**Material Beauty.** The prototype of Diaojiao Buildings can be traced back to the Hemudu period, and is an ancient architectural craft inherited from the ancestors. When the Miao nationality migrated to the area, they faced limited productivity and had limited abilities to transform nature. As a result, they utilized local materials in accordance with the local conditions. The walls of Diaojiao Buildings are primarily constructed using locally available wood that possesses a sufficient level of strength. Generally, upright trees such as cedar, maple, catalpa, pine, and cypress are chosen, with maple being the preferred material for the buildings and catalpa specifically used for one of the columns. The roofs of Diaojiao Buildings are covered with tiles, while the lower portions of the structures are surrounded by stones, providing both theft-proof security and an aesthetically pleasing appearance. This approach not only reduces transportation costs associated with purchasing materials from distant locations but also avoids the pollution and waste generated by materials like concrete and steel bars over time, thereby reflecting certain ecological characteristics.

·**Color Beauty.** In the decorative color of the Diaojiao Buildings, the primary focus lies on utilizing the natural color and texture of the wood itself. To protect against insects and corrosion, local residents apply a layer of tung oil to the outer surface of the wood. As a result, the buildings typically exhibit a log color or an earthy yellow appearance. Complementing these hues, accent colors such as sky blue, earth red, or earth yellow are used in small areas of the Diaojiao Buildings. This combination of colors creates a simple yet elegant architectural atmosphere that harmonizes with the surrounding natural environment, providing viewers with a warm and cozy visual experience. The unique layout of the Diaojiao Buildings contributes to a staggered and rhythmic spatial effect, further enhancing their overall appeal.

·**Overall Beauty.** The Xijiang Miao Diaojiao Buildings are originated from the southern fence style building of the ancient inhabitants, using the combination of multiple structures such as rectangle, triangle and diamond to form a three-dimensional spatial network system. In terms of construction, the simple and

natural architectural components and decorative symbols are integrated with the landscape and idyllic landscape. The relatively closed rural environment and historical culture have created a unique architectural landscape of the Diaojiao Buildings. Visually, the slender wooden structure of the cross-section through the bucket type frame, highlighting the visual feeling of "light", constitutes a contrasting relationship between reality and falsehood, revealing a harmonious and unified artistic effect. In terms of space, it can save arable land and adapt to mountain slopes, integrating with the surrounding green mountains, green water and idyllic scenery, with good ventilation and moisture-proof effect. It fully embodies the overall beauty of harmony with the environment.

·National Culture. The residential architecture of a nation serves as a concentrated expression of its historical accumulation of economic, cultural, artistic, family, social, and religious concepts, conveying its cultural connotation through inherited material forms. Within the architectural landscape of the Diaojiao Buildings, a material cultural form is embodied, which represents the humanistic material landscape shaped by the Miao nationality over thousands of years through their utilization and transformation of nature. Guided by the concept of multi-god worship, the construction and inhabitation of the Diaojiao Buildings reflect the phenomenon of coexistence between humans and deified beings. When constructing newly-built Diaojiao Buildings, meticulous attention is given to the selection of wood, the arrangement of the house, beams, and other processes. The optimal orientation for the house is determined by the principles of "Left Green Dragon, Right White Tiger, Before Red Finch, After Basaltic." Additionally, a significant emphasis is placed on the direction of the house, either facing west to east or east to west. Within this context, the Miao nationality, their buildings, and the gods have formed an inseparable relationship, infusing profound humanistic connotations into the rural buildings and landscapes.

2 Materials and methods

According to the differences in the construction age, materials used and load-bearing members of China's rural buildings, the types of rural structures chosen in the comparison are earth and wood structure (C), wood frame structure (W), brick and wood structure (BW), brick and concrete structure (BC) and steel structure (S). The Diaojiao Buildings belongs to one of the manifestations of wood frame construction. The comparison factors are aesthetics, seismic and ecological properties, and the main building materials.

Table 1. Comparative analysis of building types

structure type	Comparison factor			
	Durable life (years)	Seismic resistance	Residual value rate (%)	Main materials
C	35	range	1	soil, hay

W	50	preferably	0	wood
BW	40	medium	4	brick, wood
BC	50	range	2	brick, reinforced
S	80	preferably	0	Steels

According to the above data (Table 1), it can be seen that steel, brick-concrete and wood-frame buildings have a longer service life than brick-wood and adobe structures; steel and wood-frame structures have better seismic resistance, brick-wood structures are moderate, and brick-concrete and adobe buildings have poorer seismic resistance; brick-wood and brick-concrete structures have higher residual value rates; and steel and wood-frame structures have a lower residual value rate, but a relatively high recycling rate.

3 Results

In summary, the ecological advantages of steel and wood structures are more obvious. Therefore, Diaojiao Buildings have a certain landscape aesthetic value. Summarized as the following four points:

·Ecological. Ecological architecture, in its overall planning, aims to reconnect with nature and create a living environment that embodies a natural space belonging to the earth. It strives to save resources, protect the environment, and achieve harmony with the ecological surroundings. The design of the Diaojiao Buildings capitalizes on the favorable aspects of local conditions and materials to effectively utilize environmentally friendly resources. In comparison to modern building materials, these materials, including wood, bamboo, stone, and tile, offer ecological advantages. These materials are readily available, provide insulation for warmth in winter and coolness in summer, possess earthquake-resistant properties, are easily repairable and relocatable, and do not emit harmful gases into indoor spaces. The grand and distinctive structure of the Diaojiao Buildings seamlessly integrates with the beautiful natural landscape, while also evoking a sense of original beauty.

·Cultural. While the modern construction concept is increasingly leaning towards green building development, it often overlooks regional styles and local cultural characteristics as if they are mere replicas lacking individuality. In contrast, the Diaojiao Buildings not only embody ecological architecture but also serve as significant embodiments of the culture and history of the Miao nationality. The design and decoration of the buildings reflect various artistic techniques such as carving, weaving, dyeing, and embroidery, showcasing the rich cultural heritage of the Miao people. Additionally, the architectural landscape layout interacts with the Miao's theological worship practices. As an ecological building, the Diaojiao Buildings not only provide living spaces for the residents but also serve as a testament to the humanistic and material landscape of the Miao nationality.

·Integration. The architectural structure and layout design of the Diaojiao Buildings take full consideration of the geographical environment and climate conditions. To prevent moisture from seeping into the foundation and protect against mosquito and insect infestations, these buildings are typically designed with suspended floors, effectively avoiding ground dampness. Moreover, the construction of Diaojiao Buildings is carried out in harmony with the natural topography and landscape of the mountains, ensuring minimal disruption. This unique architectural style contributes to the distinctive landscape associated with the Miao nationality, where towering wooden structures grace the hillsides, blending seamlessly with the surrounding trees and rivers, creating a magnificent regional characteristic landscape.

·Sustainability. Green buildings not only fulfill basic functions but also integrate with nature and become an integral part of the natural landscape. The majority of building materials used in the construction of Diaojiao Buildings are sourced from nearby forests, making efficient use of local resources, sometimes even harvested directly from the building site.

The roofs of buildings are made of natural materials such as straw and thatch, which possess excellent heat insulation properties, contribute to energy efficiency, and enhance the overall living environment. Additionally, these building materials can be repurposed or recycled, while demonstrating commendable sustainability and landscape value.

4 Conclusions

As a form of wooden structure building, the Diaojiao Buildings is integrated with the Miao culture nurtured by natural ecology and humanistic life, and its natural and harmonious ecological view has become the dominant idea of the village landscape. In the architectural construction of the Diaojiao Building, what best reflects the ecological architectural characteristics is the choice of materials. The mortise-and-tenon structure makes the building's seismic resistance better, and has a low salvage value and a high recycling rate. The shape and color combination of the building creates a simple and natural overall landscape effect, which is good for viewing. However, wood structure also has many limitations, such as low fire resistance, fear of termite erosion, etc., which also puts forward higher standards for future research on ecological architecture.

To sum up, several principles and methods of rural ecological architecture creation under the perspective of landscape aesthetics are summarized:

First, protect and utilize natural resources. In the process of design, priority should be given to the use of renewable resources and materials, and the native materials appearing in the design site should be recycled as much as possible. Reduce the residual value rate while improving the ecology and recycling rate of building materials. Diaojiao Buildings to give full play to the characteristics of the wood itself, the implementation of the principle of the proximity of the material, as far as

possible to reduce the transportation and related processing of some of the energy consumption.

Secondly, design according to local conditions. After detailed understanding of the basic conditions such as geomorphology, wind direction and architectural features of the design site, the selection of building wall materials, the size of door and window openings and the structure of the house are reasonably designed according to the differences in temperature, climate and sunshine angle, so as to minimize energy consumption. The appearance of ecological buildings is upgraded on the basis of meeting the needs of the local applicable population.

In addition, inherit the local culture. Explore the local culture and understand its integration in the local characteristics of building construction, protect the vernacular houses, ancestral halls, temples, cultural and educational buildings, stores and workshops, etc., highlighting the distinctive regional cultural values. Ecological architecture in line with regional culture can be better integrated with the local landscape.

Finally, innovative design concepts, learning from advanced experience. Apply energy-saving and environmentally friendly new technologies and materials to the building, improve the scientific, ecological and environmental protection of ecological buildings, and reduce the negative impact of the building on the rural environment, in order to realize the green and sustainable development of the rural landscape.

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