

# Application of "Ecological Design" Concept in Rural Leisure Landscape Design\*

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**Abstract**—Developing rural tourism is an important way and means to realize the strategy of rural revitalization and the development and construction of beautiful countryside. Good ecological environment is an important rural tourism resource, the basis and guarantee for the development of rural tourism. The natural resource pattern of "green hills and green waters" is also the charm for the development of rural tourism, which is the key factor to retain "nostalgia" in memory. Therefore, as an important carrier of rural tourism, rural leisure landscape shall follow and apply the concept of ecological design in its planning and design. It is particularly critical. How to understand the connotation and essence of "ecological design"? It is the premise and guarantee for the construction of a healthy and sustainable development of rural leisure landscape to adjust measures to local conditions, consciously maintain the environmental carrying capacity, choose the appropriate local landscape model, and practically use the concept of "ecological design" in its planning and design.

**Keywords**—rural revitalization; rural leisure landscape; landscape design; ecological design

## I. INTRODUCTION

The strategy of Rural Revitalization is an important strategy for rural development in the new period put forward by the Nineteenth National Congress of the CPC. It is the general goal for agricultural and rural development in the new period and the guiding principle to lead other rural development plans. It needs to put planning and design first and plan carefully. Rural tourism development planning and leisure landscape construction shall be considered and reasonably designed within the strategic framework of rural revitalization. It is necessary to place emphasize on the influence of rural leisure landscape construction on rural natural ecological environment and interaction mechanism,

and explore a way of rural leisure landscape construction guided by the development of leisure tourism and based on the principle of ecological design concept, so as to give better play to the positive role of rural tourism in promoting rural economic development and ecological protection, cultural prosperity, people benefit and income increase.

At present, in the practice of rural leisure landscape design it generally lacks ecological awareness and grasp of ecological concepts throughout the design scheme. Although most designers and government management cadres often mention "ecological" issues and views, there are still misunderstandings in landscape practice. They thought it is ecological concept to expand the green area and reduce hard land, plant more plants including grass, flowers and trees in the design. Village cadres and designers who hold these views are easy to enter the misunderstanding of "ecological design" in the implementation of landscape projects. Therefore, it is necessary to systematically sort out the concept of "ecological design" and discuss it in detail.

## II. SCIENTIFIC PRINCIPLE RESEARCH: CONCEPTUAL INTERPRETATION AND DIFFERENTIATION

The interpretation of scientific principle concept based on their origin is an important basis for any academic research. The purpose of scientific principle research is to scientifically analyze phenomena, explain problems and establish a disciplinary system (Li Yunfu, 2010). "Scientific principle" refers to scientific principles or laws (Qin Zaidong, 2012), and also refers to the understanding of the normative meaning of the concepts involved in an academic problem (Wang Ruijun, 2009). The relevant scientific principle research in this paper is based on the definition, connotation and characteristics analysis of key concepts.

### A. Ecological Design

In recent years, "ecological design" has been a hot topic of concern, but also a doubtful point of discussion. Eco-design is still in its infancy in the field of landscape design,

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and the interpretations of its concept are also different. The understanding of the connotation of the concept of “ecology” generally refers to the living state of organisms in a certain natural environment. It also refers to the physiological characteristics and living habits of organisms. It is also the abbreviation of the efficient and harmonious relationship between human beings and the environment. Generally speaking, ecological design includes two aspects: first, applying the principles of ecology to guide design; second, making the results of design friendly to the environment while meeting human needs. Referring to the definitions of Stuart Cown and Sim Vander Ryn, any design form that coordinates with the ecological process and minimizes its damage to the environment is called ecological design, which means that design respects species diversity, reduces deprivation of resources, protects water circulation and nutrients, and maintains the quality of plant and animal habitats, conducive to the improvement of human settlements and ecosystem health.

It is believed that “ecological design is to inherit and develop the experience of traditional landscape design, follow the principles of ecology, build scientific multi-level, multi-structure and multi-function plant communities, establish a new order of harmonious coexistence of human beings, animals and plants, so as to achieve the unity of the beauty of science, ecology, art and culture on the premise of minimal damage to the environment and create a clean, beautiful and civilized landscape environment for mankind.

At present, “ecological design” of rural agricultural leisure landscape is not yet mature and is in the transitional period of exploration. It needs clearer concepts, solid theoretical basis, specific principles and standards, and further research, discussion and continuous design practice.

#### B. Rural Leisure Landscape

Different scholars define rural landscape from the perspectives of ecology, geography, landscape aesthetics and landscape architecture. Xie Hualin and Zhu Zimin (2006) put forward that rural landscape is a composite mosaic of different land units in rural areas from the perspective of ecology and geography. It has ecological, social, economic and aesthetic values under the influence of natural environmental conditions, human business activities and management strategies. Wang Yuncai (2009) thinks rural leisure landscape is a comprehensive ecological environment composed of natural landscape, economic landscape and cultural landscape with earth landscape as background and rural settlements and agricultural landscape as the core. From the perspective of landscape architecture, Liu Binyi (2007) considered that rural landscape is a landscape space related to human settlement activities in rural areas, which includes three levels of rural life, production and ecology. It has five values of utility, function, aesthetics, entertainment and ecology.

Rural Leisure Landscape Planning is a comprehensive planning method that applies the principles of ecology and aesthetics and combines the needs of current mass tourism to plan and design various landscape elements and utilization modes in the process of rural land use, so as to coordinate

and harmonize the development of rural landscape pattern and various ecological processes in the natural environment. (Zhu Zimin et al., 2006).

### III. GRASPING THE PRINCIPLES OF ECOLOGICAL DESIGN SCIENTIFICALLY

#### A. The Principle of Adjusting Measures to Local Conditions

Firstly, the natural conditions of the base site should be complied with. Any rural landscape ecosystem has specific material structure and ecological characteristics, showing spatial heterogeneity, which should be treated according to the characteristics of rural base site in design; the ecological factors outside the site have a direct impact on the base site, so the design should not be limited to the red line of the base site; it needs to consider the characteristics of ecological elements such as climate, hydrology, topography, vegetation and wildlife, so as to reduce its impact and maintain the healthy operation of the site.

Secondly, it is necessary to respect the traditional rural culture and local knowledge and learn from the local experience. Landscape design should be rooted in its place. Because the local people depend on their living environment to obtain daily life and material information and spiritual sustenance, their knowledge and understanding of the environment is the organic derivation and accumulation of place experience, so the rural landscape design should consider the inspiration given by the local people and their cultural traditions.

Thirdly, the original rural landscape should be rationally utilized according to local conditions. To avoid purely pursuing grand momentum and quick success and instant benefit, it is suggested to make reasonable use of the original rural landscape elements according to local conditions. The use of local plants and building materials is an important aspect of ecological landscape design. Landscape ecology emphasizes the reasonable distribution of ecological patches, and patches of natural distribution have a disordered beauty. As long as it is respected in design and appropriate modifications are made, it is easy to create a rural landscape full of ecological beauty.

#### B. The Principle of Resource Conservation and Protection

It is necessary to conserve non-renewable resources. As natural heritage, it should be only used by absolute necessity. In the process of large-scale landscape design, the protection of special natural landscape elements or ecosystems is particularly important, such as the protection of rural waterfront wetlands and natural woodlands; the use of energy, land, water and biological resources should be reduced as much as possible to improve the efficiency of use. If natural processes such as light, wind and water are reasonably utilized in rural landscape design, energy can be greatly saved. It can greatly improve the utilization rate of resources by utilizing abandoned sites and original materials, including vegetation, soil, brick and stone, to serve new functions.

Energy and material consumption of landscape is reflected in the whole life cycle, including material selection, construction, use management and abandonment process. Therefore, the principle of material selection should be based on recycling, degradation and regeneration, and improvement of service life of landscape.

### C. The Principle of Integrity

Ecological landscape design is a comprehensive design of the rural ecosystem as a whole, rather than an isolated design of a landscape element. Rural landscape is a comprehensive whole, which is realized under certain economic conditions. It shall meet the social functions, also conform to the laws of nature, abide by ecological principles, and belongs to the category of art. Without any one of them, there will be defects. Leisure landscape is a multi-objective design, for human needs, animal and plant needs, for tourism output value needs, as well as aesthetic needs. The ultimate goal of design is the overall optimization of rural environment.

The design of rural leisure landscape is not only the background scenery of buildings. To be appropriate, it needs to form a unified whole of nature and environment. Squares, street scenery and agricultural greening carry dreams and pursuits of human. They pay attention to people's life experience and feelings. They are harmonious habitats of people in tourism experience. Beautiful landscape environment is the vision of future life, the memory of historical life scenes, and also the space and system of modern life. Rural leisure landscape design is to solve the relationship between people and people, structure and function, pattern and process, so that the natural environment and the surrounding environment can be fully integrated to create a harmonious and rich external space environment.

### D. The Principle of Interdisciplinary Integration

Landscape design involves many aspects such as science, art, society and economy, which are inseparable and complementary. Only through joint multi-disciplinary research, division of labor and cooperation, it is possible to ensure the harmony and stability of the overall landscape ecosystem and create a high-quality rural leisure landscape with reasonable use function, good ecological and economic benefits.

Eco-design is a very important aspect directly related to the success or failure of landscape design and environmental quality. It is an effective way to create a better environment, higher quality and safer landscape. But at present, in the field of rural leisure landscape design, the theory and method of ecological design are not mature enough, especially in the aspects of environmental ecological effect, ecological engineering technology, analysis of human's environmental psychological behavior and so on. There is no ecological principle applicable to it as the theoretical basis of its ecological design, and it is necessary to integrate concepts of protection of ecological environment and realization of sustainable development into every link of landscape design. Therefore, the ecological design of rural landscape in China still needs to make greater efforts, and the operable methods need to be further explored in practice.

## IV. UNDERSTANDING AND MISUNDERSTANDINGS ABOUT "ECOLOGICAL DESIGN" IN PRACTICE

The understanding of theoretical knowledge of the principles of ecological design in rural leisure landscape is a major prerequisite, while the actual operation requires specific analysis of specific issues. Different planning objects and different characteristics need different planning and design methods. Inevitably there are some misunderstandings of ecological design, as follows.

### A. The Prominent Problem of "Paying More Attention to Form Than Function" in Landscape Planning and Design

Landscape function is the beneficial role played by landscape, that is, people's material and spiritual needs for landscape. The sentence "form follows function" comes from Sullivan, a famous American modernist architect. Simonds's concept of landscape planning and design is deeply influenced by it. At the same time, Simmons made further progress and development and said: "Landscape planning has nothing to do with meaningless patterns and cold forms. Landscape planning is a kind of human experience, vivid, dynamic and important. If it is conceived as a diagram of harmonious relations, it will form its own expression form. Under the development of this form, it will be as organic as a Nautilus shell. If planning is organic, it will be beautiful." But in the landscape design practice, formalism landscape planning and design can be seen everywhere. For example, the nationwide popular "rural beautification" movement, many villages and towns do not take advantage of their own natural environment, historical and cultural background and the real needs of villagers, blindly imitate the broad greeting avenue of economically developed villages and towns, luxurious citizen squares, uniform geometric lawns, different forms of "exotic flowers and trees"... Only face-saving projects, they do not consider the vital needs of the general public, but to earn face, ignoring the function of design. Many experts have criticized and questioned this way of obliterating the nature of natural ecology, ignoring the fundamental needs of villagers, ignoring their own cultural background and the needs of tourists' leisure functions, and blindly pursuing novelty. At the same time, it is necessary to pay attention to the opposing extreme "functionalism". According to Simmons, "Any object, space or thing should be designed to satisfy the work to be accomplished most effectively and appropriately, and if the designer realizes the real harmony of form, material, decoration and use, the object will not only work well, but also be pleasing to the eyes." It needs to be thought and studied carefully, and taken as a warning. It is suggested to truly proceed from the behavior characteristics of the users to analyze the actual functional needs of different groups, and carry out reasonable planning and design in combination with the principles of ecological design.

### B. Solidified and Hardened Revetments of River in Villages, Severing the Soil-water Relationship

The natural resource pattern of "green hills and green waters" is the charm for the development of rural tourism and the key factor to retain the memory of "nostalgia". Many

beautiful villages in China are backed by mountains and facing rivers. They live here because of the water. The rivers flowing through villages have become the basis for villagers to survive for generations. They are also the historical memories in the hearts of villagers. In recent years, with the development of beautiful villages and rural tourism, many local governments have carried out large-scale transformation of landscape environment based on the original village environment. In the process, rivers flowing through villages were first to be affected. Silt removal is carried out at the bottom of rivers, and revetment banks are strengthened as a whole. Reed swamps and aquatic plants on both sides of rivers are eradicated, and uniform rubble revetment banks replaced the original banks. High heights of stone railings are built along the banks in the name of villagers' and tourists' safety. It seemed to improve the landscape environment of waterfronts, but in fact, they cut off the water-soil relationship between riverbed and soil on the bank, and lost the habitat of biodiversity. Year after year, the species of organisms in the water decreased, the eutrophication of water quality became serious, the riverway dried up, the natural environment deteriorated, and the original ecological environment of waterfront suffered damage. As a result, it will endanger the vital interests of the vast number of villagers. Therefore, this kind of landscape design does not follow the concept of ecological design, and is not an advisable design method.

#### *C. Prevalent Transplantation of Big and Old Trees and Exotic Flowers and Trees Replacing Native Plants*

At present, the process of domestic rural landscape construction neglects the positioning and timeliness of landscape planning and design. Many village leaders are eager to achieve success. Every time a landscape planning project is implemented, they want to see the landscape effect quickly. They plant trees and grass, regardless of the biological characteristics of plant growth cycle, and want an effect immediately trees shading streets. Regardless of the fact that the realization of landscape planning and design is a process rather than an ultimate objective fact, "the transplantation of big trees" has become a common practice. Many big trees and old trees are bought at high prices from other villages and mountains and transplanted into new environments. Leaving aside the environmental damage where the trees have been transplanted, the transplanted trees are often totally out of all recognition. Because of the changes of habitats and over-pruning in the process of plant transportation, the survival rate of big and old trees is very low, and the growth effect is very poor. It is a waste of man power and money, and is not worth the candle. In fact, the realization of landscape planning design is not accomplished overnight, nor is it invariable. Trees need time to grow, and natural systems need time to self-adjust and recover because of the disturbance and destruction of human activities. This is very basic common sense, but it is often overlooked.

Many villages in the development and construction of leisure landscape, in order to seek novelty and attract tourists, introduced many precious flowers and trees and high-end lawns. The lawns are trimmed neatly and uniformly, making patterns of different shapes, creating the so-called tourism

landscape characteristics. Because of the changes of climatic conditions and different growth habits of introduced precious flowers and plants, the cost of management and maintenance is very high and unsustainable. For example, the lawn, especially the ornamental lawn, wastes water and can only be seen but not accessed. The artificial lawn in 10 years may have to be replaced. This design is also undesirable, without really considering the principle of ecological design.

#### *D. Prevalent Luxury Squares and the Prominent "Heat Island Effect"*

At present, in the process of planning and designing rural leisure landscape, in order to increase the gathering space of tourists and villagers, many places construct large-scale leisure squares in the public areas of villages. Many wetlands in the original villages disappear and are transformed into hardened marble paving squares. There are fountains falling on the squares and elegant and luxurious sculpture rockeries. It is no wonder that the city square was introduced to the countryside; the original pattern and spatial form were destroyed. A large number of hardened square grounds will be very hot in summer, and "heat island effect" was prominent. In stormy weather, rainwater cannot infiltrate, there will be many puddles on the ground of square and groundwater cannot be recharged, destroying the original natural ecological balance. It is also the consequence of ignoring the ecological design principles. It is the starting point and destination to protect the natural environment, maintain ecological balance, guarantee the virtuous circle of the use function of villages and towns, and the harmonious coexistence of human and nature, and create a sustainable rural ecological environment out of the planning and design of rural leisure landscape.

### V. CONCLUSION

Vigorously developing rural tourism in conditional areas is an important way and means to realize the strategy of the construction and development of beautiful countryside and rural revitalization. More and more people pay attention to it. As an important carrier of rural tourism, it is particularly critical to follow and apply the concept of ecological design in its planning and design of rural leisure landscape. In the practice of rural leisure landscape design, designers and village leaders should be guided to comprehensively and systematically understand the concept of "ecological design", understand the connotation and essence of "ecological design", reasonably grasp the principles of ecological design, adjust measures to local conditions, protect biodiversity, consciously maintain environmental carrying capacity, cultivate and restore the ability of landscape regeneration and self-renewal, enhance the function of ecological services, so as to avoid a series of problems caused by misunderstanding of "ecological design" and create a rural ecological landscape environment that integrates scientific beauty, ecological beauty, artistic beauty and cultural beauty for the society.



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