Study on Eco-optimization Model of Rural Water Landscape Based on Regional Sustainable Development

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Abstract: In order to meet the needs of ecological security and sustainable development of rural landscape, this paper makes an in-depth study on the selection and optimization strategy of rural development mode based on the dynamic change of rural landscape pattern. Based on the current pattern of land use, the principles of landscape ecology and sustainable development criteria are discussed in depth. According to the characteristics of extensive landform development, fragile rural ecological environment and backward economic and social development, the significance of rural landscape optimization is pointed out. Studies have shown that the optimal allocation of regional water resources must be based on the “bearable” of water resources for each subsystem.

1. Introduction

According to China's current water control policy and the new situation in the development and utilization of water resources, the theoretical research on water resources development and utilization is gradually developing towards the theory of water resources allocation based on sustainable development [1]. Unreasonable land use in the process of rural development directly affects the spatial pattern of rural landscapes, resulting in the failure of normal circulation of rural natural systems and damage to the ecological balance system, which has seriously affected the sustainable development of the countryside and hindered the construction of beautiful countryside [2]. The urban environmental problems that people often overlook are actually important factors for whether cities can maintain sustainable development, whether people and nature, economic and environmental factors are coordinated [3]. The Czech Republic, Germany, Netherlands and other countries in Europe were the first countries to study landscape ecology and to plan agricultural or rural landscape [4]. With the continuous development of social economy, the demand for water resources is increasing. Blind and predatory exploitation and utilization of water resources will endanger the ecological environment on which human beings depend [5]. The suburban villages of big cities are influenced by the special location conditions, transportation advantages and political status of the central city. In the process of rapid urbanization, they gradually evolve into the urban-rural ecotone, and their landscape pattern is changing rapidly [6].

China has the largest population base in the world. In recent years, due to the rapid economic and social development and unreasonable human activities, China's ecological function coefficient has declined as a whole, and energy has been continuously consumed [7]. Landscape ecology started late in China. Chinese scholars actively introduced landscape ecology in China only in the early 1980s [8]. Therefore, only by realizing rational development and efficient utilization of water resources and actively restoring and restoring the damaged ecological environment, can human beings guarantee their own living environment [9]. Due to the relative scarcity of water resources and the threat of increasing environmental pollution in China, it is urgent to strengthen measures to maintain waterfront areas. In 1984, Huang Xichou and others published Landscape Ecology Analysis of Alpine Grassland in Changbai Mountains in the Journal of Geography, which became the first research report on landscape ecology in China [10]. The waterfront area is the survival signal sought by human nature since ancient times. Nowadays, the waterfront area has a status that cannot be ignored in the landscape planning and design. The conversion of land use in urban-rural interlaced areas is relatively fast, and its conversion trend has obvious unidirectional characteristics. There are other types of land use (farmland, forests, etc.) that are rapidly converted to urban

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construction land. Therefore, only when regional water resources meet the “bearable“ conditions of these goals can the systems be mutually promoted and coordinated to meet the basic conditions of sustainable development.

2. Methodology

The water resource system is a complex system. Socio-economic-water--the ecological and environmental systems have complex coupling relationships that promote and restrict each other. At the same time, changes in the spatial pattern of the landscape will have a profound impact on the socio-economic processes of the region. Under the premise that the state puts forward the theory of sustainable development, although the understanding of the ecological environment of the Chinese people is somewhat improved, the implementation of the theory is still unsatisfactory in view of the current situation of China's ecological situation. Ancient and modern Chinese and foreign mathematicians have proposed that the treatment of waterfront areas in the process of establishing a good urban ecological landscape can be said to be a crucial link in the development of human settlements. They believe that the origin of cities is started by water sources, while urban Development is also closely related to the waterfront area, and the water system is about the city. It also experienced a transition from ecological landscape theory to practical application (with tourism planning). The development of rural landscape pattern is affected by the intersection of rural and urban aspects, which has the uniqueness and representativeness of the suburban development of the central city. However, with the rapid development of urban economy and the rise of industry in China, the direction of utilization of already scarce waterfront areas is quite different from the original ecological value of water resources. The great speed of economic and industrial development conceals the respect that the ecology of the waterfront area should be respected, which directly leads to the sharp decline of the ecological coefficient of the waterfront area in China, and the scope of the deterioration of the water body has been expanding.

The function of eco-tourism is mainly determined by the characteristic resources of the countryside, forest land and water resources. Therefore, the area of forest land patches and water resources patches is selected as the main index to evaluate the function of eco-tourism. The author investigates the function of rural landscape.

Table 1 Evaluation System of Rural Landscape Function

Rural Landscape Function	Agricultural production	Ecotourism	Socioeconomic
Evaluation Index System	Agricultural floor area ratio	Forest patch area ratio	Policy support
	Plate Area Ratio in Waters	Plate Area Ratio in Waters	Traffic location
	Environmental suitability	Characteristic resources	Population size

Landscape pattern index is a simple quantitative index that can highly condense the information of landscape pattern and reflect its structural composition and some characteristics of spatial allocation. The design of rural landscape ecological optimization model is actually an aspect of landscape ecological planning and design in rural areas, based on the economic and natural conditions of rural areas. The multiple attributes of landscape, such as landform, vegetation and so on, are studied, and the landscape utilization mode is put forward, so as to realize good material and energy cycle in the interior and realize sustainable development of landscape in rural areas. There are many kinds of landscape spatial analysis methods, which refer to the analysis methods used to study the composition characteristics of landscape structure and spatial allocation relationship. Generally, it can be divided into two categories: spatial statistical methods and landscape pattern index methods. Nowadays, the major design industries vigorously advocate green design, and urban landscape ecological design, planning has become an important push to maintain the natural

environment. The brilliance brought about by the rapid development of industry and economy is undeniable. From the fundamental concept of the human text, the waterfront as a city green lung plays a major role in how to make the development of the city and the natural ecosystem harmoniously coexist. Therefore, in the context of urbanization and beautiful rural construction, combined with the research results of relevant interdisciplinary subjects, the evolution characteristics of landscape pattern are analyzed from the perspective of landscape architecture and urban planning. Construct an evaluation of the impact factor evaluation system, explore optimization paths and optimization strategies, and guide the rural spatial planning in the central region with practical goals.

This study is based on the background of natural geographical elements and, more importantly, the ecological functions that we play. We divide the area into three-level hierarchical systems to conduct research, as shown in Figure 1.

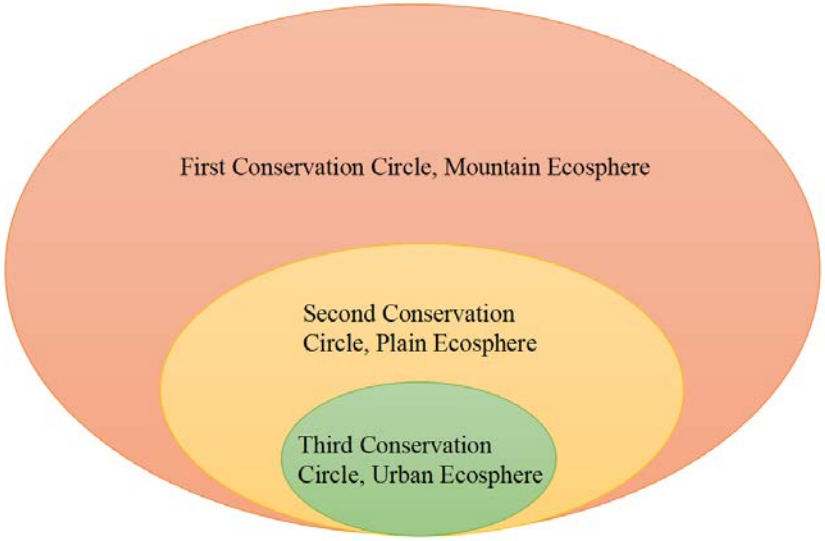

Fig.1. Schematic diagram of the small "three circles" pattern of ecological construction and conservation

3. Result Analysis and Discussion

The purpose of optimal allocation of water resources is to achieve sustainable use of water resources, ensure the coordinated development of social economy, resources and ecological environment, and enable the limited and sufficient use of limited water resources. Provide reliable water sources for industry, agriculture, living ecology, etc., to obtain the best comprehensive benefits (including economic, social and ecological benefits). On the other hand, scholars have already had relevant academic achievements in environmental science, urban geography and computer science, but due to the limitations of discipline development, it is difficult to achieve practical guidance for rural planning and construction. From the existing ancient capitals in China, it has always been seen that the site selection is almost always in the water. The object of geomantic omen research in China is actually the role of air, water and soil on human beings. The water method of geomantic omen refers to Yin and Yang geomantic omen. There must be mountains and waters. "Watching the mountains before seeing the waters, there are mountains and no waters for burial," and "managing people's water and water resources finances". There are also: "Shajiao Shui Hui, Yin and Yang intersection", "Water is the blood of the dragon", "Water is the essence of Shanjia blood, benefiting people and harming people as quickly as God" and so on. After the founding of New China, the government advocated vigorously developing industry, which greatly damaged the ecosystem of waterfront environment and destroyed the function of waterfront area. At this stage, people paid attention to the direction of economic production, which led to the neglect of the ecological development of urban waterfront parks.

The selection of water resources carrying capacity evaluation index is influenced by many

factors. The ecological water requirement rate, industrial growth rate and grassland coverage rate were investigated, as shown in Figure 2.

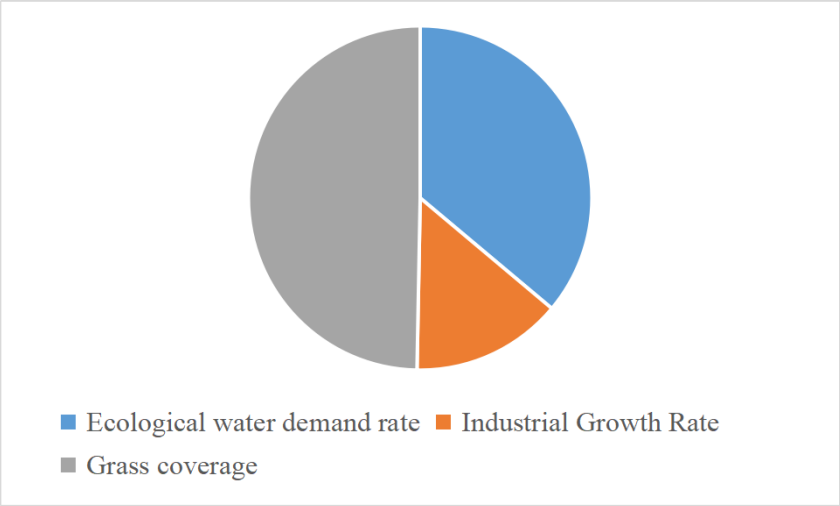

Fig.2. Coverage of water resources

Nowadays, urban construction in China is in a period of rapid development. Domestic planning and development of waterfront areas are very active, while the simple use of waterfront areas gradually transits to deep development and transformation. With the rural population flow, rural economic improvement and rural land transfer, rural landscape pattern has also undergone significant changes. The study of rural landscape in the outskirts of central big cities is conducive to expanding the research field of landscape pattern. At the same time, from the practical level of environmental protection, ecological restoration and natural disaster response, it gradually turns to the practical direction of urban and rural planning and land use planning. Rural areas in Guizhou mountainous areas are facing double pressures of fragile ecological environment and lagging economic and social development, and double challenges of heavy tasks of ecological control (rocky desertification control) and difficult economic development. Therefore, the suburban agriculture in Guizhou Province requires neighboring urban areas to be able to receive the radiation of urban functions in urban areas and to directly serve the urban market. We can get the economic and technological support of the metropolitan area and use all other favorable conditions to develop high-tech, market-oriented modern industries, and have a certain ecological spatial pattern, resulting in ecological functions, life functions, and production functions. We can see the changes in the waterfront ecological area, but this progress is far behind the real needs of urban residents for the waterfront ecological area.

4. Conclusions

Through the processing and analysis of remote sensing images, the landscape types are classified according to ecological theory and land use classification standards. Combining GIS technology to produce landscape pattern thematic map and landscape classification database for spatial analysis and quantitative analysis, the evolution characteristics and laws of rural areas in the suburbs of Lu' an City are obtained. At present, the rapid rise of China's economy, the excessive consumption of resources and the rapid decline of the environment have made the problem of water landscape particularly prominent. Relying on the advantages of ecological resources in mountainous areas, we should cultivate and develop leisure and holiday tourism industry, focusing on the development of agricultural leisure industry and folklore tourism with the main contents of returning to nature, living in farmhouse, eating farm food, sightseeing mountain scenery and enjoying pastoral pleasure. At present, the urbanization level of Guizhou Province is relatively low and the rural area is vast, forming a unique karst ecological environment and rural ecological landscape pattern mosaic of ethnic minority villages. Fortunately, the potential of urban waterfront space has been gradually re-recognized. The practice of water ecological environment, waterfront habitat, open space, green

corridor and waterway rejuvenation, regulation and reuse of waterfront land, integration of water network and so on has been carried out in different aspects. However, how to establish the optimization model of rural landscape in special areas and how to establish a more comprehensive landscape ecological optimization model still need to be further studied in the future work.

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