

Research on the Path of Ecological Economy Promoting Urban Development Taking Kunming as an Example

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Abstract

At the 15th Summit of the Conference of the Parties to the Convention on Biological Diversity, President Xi Jinping solemnly announced that China will continue to promote the construction of ecological civilization. Based on the guiding ideology of biodiversity conservation and urban ecological economic construction, this paper takes Kunming City as an example to analyze the practical significance of biodiversity to urban ecological economic construction. At the same time, combined with field research and reference to Chinese and foreign research literature, this paper analyzes the current situation and current development problems of Kunming's ecological city construction from the perspective of water ecology and urban ecological construction, with a view to putting forward new ideas and methods for urban ecological economic construction in the new era and helping the sustainable development of green cities.

Keywords

Ecological Economy; Urban Development; Optimize the Environment.

1. Introduction

China is experiencing rapid urbanization. A large number of urban construction has caused serious damage to the original living environment of organisms, and the protection of biodiversity has become a hot topic in urban construction today. Even though countries have different levels of economic, social and cultural development, exploring a development model that does not give up the convenience and comfort of urban life, but also takes into account biodiversity has become the only way for countries to continue to move forward.

On April 30, 2021, when presiding over the 29th collective study of the Political Bureau of the 19th CPC Central Committee, General Secretary Xi Jinping emphasized that, "Ecological environment protection and economic development are dialectical, unified and complementary. Building an ecological civilization and promoting green and low-carbon circular development can not only meet the growing needs of the people for a beautiful ecological environment, but also promote higher quality, more efficient, more equitable, more sustainable and more secure development, and create a civilized development path of production development, affluent life and good ecology." On October 11-15 of the same year, the first phase of the fifteenth meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD COP15) was held in Kunming, China. With the theme of "Ecological Civilization: Jointly Building a Community of Earth Life", the conference formulated the "Post-2020 Global Biodiversity Framework" and set new goals for global biodiversity conservation.

The protection of biodiversity and the construction of ecological civilized cities are the basis for the sustainable development of human society. In the COP15 concept of Kunming, the protection of biodiversity and the continuous development stage of the city form a community of shared future, and put forward the beautiful vision of building a harmonious coexistence between man and nature, coordinated development of economy and environment, and

common development of all countries in the world. In this research, the research team will conduct in-depth analysis on how to reasonably build a biological survival platform in the city and build a green modern city.

2. Literature Review

There are mainly two kinds of documents closely related to this study: One is the theoretical research on urban ecological economy. The other is the research on the effect of biodiversity measures on urban ecological and economic development.

The concept of urban ecological economy can be traced back to Kenneth E. Boulding's paper "A Science - Ecological Economics" published in the 1960s. The paper points out that ecological economy is an "economy that respects ecological principles". The concept of ecological economy quoted in this paper is: "The mode of production and management covering all economic activities is the process and result of the harmonious development of economic activities and the ecological environment." [1] While the industrial revolution has brought rapid economic growth to cities, environmental problems are becoming increasingly prominent [2]. Research on high-quality development of ecological economy has been emerging at home and abroad. Ebenezer Howard put forward the theory of "Garden City" in 1898. Domestic scholars have also conducted fruitful research from different research perspectives, including: the connotation of ecological economy and green development [3], the mode of ecological economy [4], ecological economy and tourism resources [5], analysis of hot spots of ecological economy. The study of urban ecological economy is a powerful means to analyze the complex nature. From the perspective of the construction of the ecological economic system model, many scholars have demonstrated that the concept of ecological economy is one of the theoretical bases for solving the major problems faced by modern human existence by using different mathematical models. Yuan Wen et al. used the multiple regression method to construct the multi factor regression equation of urban eco economic system [6]. Yang Zhifeng et al. used partial least squares algorithm to build UEES model (Urban Eco-economic System), taking Ningbo City as an example [7]. Both of them tested their specific mechanisms through empirical models. Although they used different samples and models, they all concluded that the concept of ecological economy has a positive role in promoting urban development.

With regard to the impact of biodiversity measures on urban ecological and economic development, BCG (2021) believes that, as the basis for sustainable economic and social development, biodiversity, in the form of food supply, carbon sequestration, water and air filtration, creates an economic value of more than 150 trillion dollars annually, accounting for about twice the global GDP. WEF (2020) estimates that at present, more than half of global GDP is highly dependent on biodiversity and its ecosystem services, with a total amount of more than 44 trillion US dollars. The decline of biodiversity will affect the safety and stability of the supply chain of urban ecological economy industry chain through production, sales, investment and financing and other links [8]. Taking the urban construction of Tai'an City in Shandong Province as an example, Liu Zhongde and others analyzed the characteristics of biodiversity in Tai'an City, and put forward the basic ideas and innovative measures for building an ecological city in Tai'an [9]. Chen Hongbo, based on the rich biological resources in the Yangtze River Economic Belt, explored the potential economic value of biodiversity from three perspectives of resource attribute, environmental protection function and ecological security attribute, so as to promote the improvement of ecological environment and the development of emerging industries in the Yangtze River Economic Belt, and realize the coordinated progress of ecological priority and green development [10].

To sum up, although the existing research literature on ecological economy and biodiversity has been very rich, most of them are carried out from different research dimensions on the

connotation, value position, measurement methods, mechanism, etc. of urban ecological economy and biodiversity, and few of them discuss the specific path of their integration and development. The possible innovation of this paper lies in: taking Kunming City as an example, this paper analyzes the practical significance of biodiversity in the construction of an ecological city. Combined with field research and reference to domestic and foreign research literature, this paper analyzes the current situation and current development problems of Kunming eco city construction from the perspective of water ecosystem and urban ecosystem construction, and gives relevant solutions. The goal is to provide reference for the construction of ecological cities in the new era and help the sustainable development of green cities.

3. The Impact of Kunming's Ecological Economy on Urban Development

3.1. It is Conducive to Purifying the Riverbed and Optimizing the Environment

The reed bed technology proposed by China in 2014 is sludge drying reed bed technology, which is a combination of constructed wetland and traditional sludge drying bed. The operation method is as follows: plant the wetland plant *Phragmites australis* in the filler layer of the constructed wetland, periodically distribute the sludge to the surface of the reed bed, and the water in the sludge permeates through the filler layer and the sludge layer formed after it, then discharge it through the water collecting pipe, and the solid substances in the sludge are trapped in the bed. This technology focuses on purifying the lake bed and removing the underwater pollution. The reed bed technology first adopted in the Thames River ecological control measures in the UK in 1985 focuses on wastewater treatment and water purification. Through the establishment of a wetland sewage treatment system with artificial reeds, the developed root system of reeds and the superior ecological effect of water soil air exchange can be used to make sewage flow naturally purified through the soil bed or sand gravel bed with reeds.

Climate analysis shows that Kunming, Yunnan, has a subtropical plateau monsoon climate, while London, England, has a temperate marine climate. The average temperature of the coldest month of both is greater than 0 °C and the annual precipitation is rich. It meets the growth demand of wetland crops such as reeds and cattails. From the perspective of water ecological pollution, the Lake Dian in Kunming has the problems of serious pollution of lake bed sediment and deterioration of water quality at the same time. Both Chinese and western reed bed technologies have room to play a role. To sum up, the feasibility of applying reed bed technology to Lake Dian is strong.

3.2. It is Conducive to the Mutual Promotion of Economy and Environment

Kunming is surrounded by mountains on three sides and borders Lake Dian on the south. It is a mountainous landform, which has created a unique geographical style of Kunming with large terrain drop and obvious vertical climate differentiation. Since Kunming is of great economic significance in the whole southwest region, and there is less flat land available for urban construction, in order to save land, most commercial and residential areas are high-rise buildings, so it is feasible to build a forest city. Different from the traditional concept of forest city, the project team, drawing on the experience of the forest city built by Country Garden in Malaysia's New Special Economic Zone, plans to add or modify green exterior walls on the exterior walls of high-rise office buildings and residential buildings in Kunming, so that they can carry shrubs and flowers to form "forest in the air" and "garden in the sky", which can improve biodiversity and promote the beautification of the city image. The research team believes that the advantage of Kunming compared with Malaysia's forest city lies in the terrain characteristics of Kunming - obvious vertical differentiation, different floor heights will also be

planted with different plants. In Kunming, a subtropical city, we will see a high-rise building with plants from tropical and temperate zones at the same time, so it can maximize biodiversity. Affected by the original landform of Kunming Mountain, the terrain of Kunming is relatively fragmented. Large and small plains or basins are scattered among the mountains. The central urban area for developing commerce and providing human settlements is located in a large central flat. Therefore, it is a waste of limited land resources to build a large urban park in the center of land shortage. World class big cities, such as New York, Tokyo and London, adopt multi-point uniform park distribution, so that many small-scale parks are scattered in urban areas. The research team believes that the distribution of multi-point uniform parks best fits the geographical characteristics of Kunming. The construction of small-scale parks in the intermountain basin at the edge of Kunming city and suburb can effectively use the terrain, improve the utilization rate of land resources in the central urban area, maintain the economic development of the business district and protect biodiversity.

4. Problems in the Development of Kunming Eco economic City

4.1. Water Ecological Environment and Aquatic Biodiversity Tend to Deteriorate

The Lake Dian in Kunming is a eutrophic lake, some of which show signs of abnormal nutrition. The water color is dark yellow and green. The organic pollution in the inner lake is serious, and the water in the outer lake has been polluted by organic substances. Toxic and harmful pollution (mainly refers to heavy metal pollution) is not prominent. Ammonia, phosphorus, heavy metals and arsenic are largely deposited on the lake bottom, causing serious sediment pollution. Dianchi Lake has been in the state of "aged" lakes for nearly a hundred years, and its self purification capacity is limited. The survey results in the late 1980s showed that the changes in the ecological environment of Lake Dian led to the destruction of the ecological environment of fish spawning and incubation sites, and the impact of overfishing, fish population interaction and other factors, resulting in great changes in the fish population of Lake Dian. There are only four kinds of indigenous fish species, which are endangered. For example, the tender and delicious goldfish is now extinct. The aquatic ecological environment and aquatic biodiversity in Kunming are deteriorating.

4.2. Unreasonable Urban Planning

Kunming is now a more developed city in the southwest of China, with the total economic volume ranking in the forefront of the national cities. In recent years, the urbanization speed is fast. As most of the surrounding areas are underdeveloped regions, and Chengdu, which is also located in the southwest, has become the largest transportation hub city in the southwest by virtue of its geographical location and infrastructure advantages, Kunming has great pressure to build itself into a financial city. Considering the unique human history, terrain characteristics and climate conditions of Kunming, the research team is more inclined to develop Kunming into an eco-tourism city. The speed of urbanization construction is too fast, and the ecological advantages are gradually lost. Urban park planning is unreasonable, and the ecological significance of park facilities is not fully understood.

4.3. The Contradiction between Ecological Economy and Urban Construction is Prominent, and the Governance System is Not Perfect Enough

Kunming is experiencing a wave of rapid urbanization, and a large number of urban construction has caused serious damage to the original living environment. In the tourism cities represented by Kunming, the urban economy mainly depends on the development of local tourism, and the deterioration of the ecological environment is bound to have a negative impact on the development of many types of economy. To build an ecological city and promote the

development of ecological economy by protecting biodiversity is an important way to realize the common development of cities and ecology. Most residents have enthusiasm to participate in the construction of ecological cities, lacking specific practical approaches; The construction is random. It is common to cut down all the trees planted for one to two years due to certain festivals and replace them with new trees; The policy implementation is insufficient, and the ecological city construction measures with the regional characteristics of Kunming are lacking.

5. Measures for Kunming Ecological Economy to Boost Urban Development

5.1. Purifying Water Environment with "Reed Bed"

Considering that Lake Dian is formed by seismic fault subsidence and the lake area has a large terrain drop, the vertical mode of OBAO (European and American traditional water treatment technology) is preferred, and large reeds are planted in the lake area in a stepped manner. The first step is the middle part of Lake Dian. Half of the reeds in this part are in the water all the year round. They take root in the sludge under the lake and absorb the organic pollutants near the lake, so as to play a preliminary purification role and provide a large habitat for the shallow wetland organisms. The second step is the lakeside part, where the reeds should surround the lake area as much as possible, which is mainly used to block the inflow of urban sewage and the penetration of pesticides and heavy metals in the land of the agricultural reclamation area. The third step is set in the area far away from the lake area, and the lake water may rise to the root of the front reed group only in the rainy season. The purpose of setting up the third ladder is to restore the vegetation coverage around Lake Dian as soon as possible by taking advantage of the humid climate conditions in the lake area, which is the premise of restoring biodiversity - biological habitat. Migratory birds fly to warm and humid areas in the south in autumn and winter. Wetland reeds in the lake area that are not affected by the lake water are excellent places for hiding, breeding and foraging.

It needs to be added that reed or other wetland plants should not be added between the three ladders to prevent problems such as soil fertility decline and mutual blocking of light to slow down growth. Considering the concentration of precipitation in summer, the reeds at the first step may be submerged or even suffocated during the period of heavy precipitation, and the reeds at the third and second steps are also self renewing at any time. In the reed bed system, dead reeds will be manually filled to the bottom of the lake to serve as a filter screen and continue to play the role of water purification. One of the advantages of Kunming Lake Dian lies in its large terrain drop. Dead reeds will slide into the water body along the slope to the bottom, saving labor costs. Long term accumulation and mixing with silt will form a new lake bed - reed bed, which can purify sediment pollution and absorb organic harmful substances in the center of the lake, which is just a lake core problem that is difficult to deal with in general water ecological engineering.

5.2. Build a Forest City Building System with Green Exterior Walls

Green exterior wall, also known as green curtain wall, is a component of green buildings. On the one hand, it takes architectural modeling into consideration. Through the structural design of curtain walls, the buildings can directly use the local natural environment and resources to adjust the indoor environmental quality; On the other hand, plants are used to climb, fix, stick and hang along the facade of the building to form vertical greening. The research team plans to add green exterior walls to the existing office buildings and residential buildings in the urban area one by one. In recent years, the assembly building method has been gradually popularized, and the green exterior wall components can be completed in the industrial prefabrication factory in advance. Green exterior wall is not a highly difficult technology. Its difference from

ordinary material wall is that it needs to have stronger moisture-proof and fire prevention capacity. Therefore, the wall cost is acceptable to most enterprises and residents. With regard to how to use green exterior walls to cultivate plants, the research team proposed two ways: traditional and innovative. The former is a drip irrigation method similar to natural gas pipeline, both parallel drip irrigation and vertical drip irrigation can be used. The latter realizes remote digital management through IOT sensing platform, including intelligent electricity meter, building monitoring and humidity sensing. The outer walls of forest city buildings are fully covered with vertical greening, equipped with an automatic irrigation system. Through automatic online monitoring, the system will provide ideal water for plants, significantly improving the working efficiency, ecological and environmental benefits of the buildings. What is worth noting is the problem of biological invasion. Plants should be selected according to local conditions.

5.3. Construction of Urban Parks in the Form of Multi-point Uniform Distribution

The urban parks shall be constructed in a multi-point uniform distribution mode, and the broken terrain shall be well utilized. The core of sponge city is urban ecological self-regulation. The project team should emphasize one point different from the domestic park planning concept: weaken the entertainment function of the park and enhance the ecological function of the park. Kunming Park, under the influence of subtropical mountain climate, is suitable for many types of vegetation and can be cultivated on a large scale. According to the unique terrain of Kunming, it can be divided into basin park, lakeside park and mountain park, with great ecological value and tourism value. Considering the construction cost and land resources, the research team proposes that Kunming should reduce the capital investment in central urban parks, reduce the scale of central urban parks, and instead invest in the construction of multi-point uniform parks to build a unique sponge city. Together with the forest city project proposed above, it will become the external publicity advantage of Kunming, improve biodiversity, build a tourism ecological city, and promote the development of ecological economy.

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