Relationship between Eco-service Function and Land Development Projects

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Abstract: Development of land use projects are closely related to biodiversity and ecological environment. It is extremely urgent to study the relationship between development projects and ecological environment. In order to build the relationship between the actual economic cost of land development projects and ecosystem services, we established two models named ecosystem-oriented evaluation model and land development project-oriented evaluation model. The two models are established to promote the development of ecosystem services and to improve land development projects.

1. Introduction

Cities are human settlements and the main body of social development and economic growth. On one hand, urbanization has bred modern civilization, promoted the development of human society in many aspects, on the other hand, it brought a series of problems. These problems were not noticeable when they first emerged. Over time, it will lead to serious consequences. They can be summed up in two aspects. One is natural: such as water and air pollution, soil degradation, ecological environment imbalance, resource destruction, global warming; the other is social: such as uncontrolled population growth, housing and transportation problems, rising crime rate, people's inner emptiness and so on. This seriously restricts the further development of the city, and even directly threatens the survival and development of human society.

Therefore, it is imperative to solve the urban problems and contradictions scientifically and build a sustainable ecological city. Nowadays, the world has set off an upsurge of eco-city construction. In the design of land development projects, how to reasonably consider the factor of ecosystem has become the focus of research.

In order to model the relationship between the real economic cost of ecosystem services and land use projects, this chapter will establish two evaluation models of ecosystem services, which are ecosystem-oriented evaluation model and land use project-oriented evaluation model to solve problems in the future.

2. Evaluation Model of Ecosystem Service Function

Ecosystem is the basis of human survival and development. It not only provides space for human survival, but also provides all kinds of resources needed for human development, and absorbs waste

generated by human production and life. Since SCEP (Study of Critical Environmental Problems) first proposed Ecosystem service function in Human Impact Report on the Global Environment in the early 1970s[1], more and more attention has been paid to the study of ecosystem service function.

Classification of ecosystem service function is the basis of ecosystem service function value evaluation, which directly affects the results of value evaluation. Because scholars have different definitions of ecosystem services, there are also great differences in classification.

Based on the above analysis, we use the following ecosystem services function system in this paper.

Table 1. The Ecosystem Service Function System

Ecosystem service function	Water Conservation Function
	Purification Function of Atmosphere
	Noise Reduction Function
	Carbon Fixation and Oxygen Release Function
	Leisure and Recreational Function

3. Main Indicators of Eco-service Function—Oriented to Land Development Projects

In order to analyze the actual economic cost of land development projects and to correspond the land development projects with ecological services, we established an ecosystem service evaluation model for land development projects. Firstly, a comprehensive evaluation index system of ecosystem services was constructed.

In this part, we put forward 12 main indicators of ecological services, and give the important role they play and the secondary indicators they contain[6][7].

(1) Planning system.

The planning system includes three secondary indicators: planning location, traffic organization and functional layout. Focus on the overall layout and functionality of the region. Excellent planning system can provide the best geographical conditions and functional support for the region.

(2) Energy system

Energy system includes three secondary indicators: energy saving of building main body, conventional energy optimization and green energy application. Focus on the overall regional energy use and green energy situation. Excellent energy system can provide the best power support for the region.

(3) Production system

The production system includes four secondary indicators: the utilization of local materials, building materials, food and medicine. Focus on the balance of the source of goods and material consumption for the overall production of the region and the development of the industry. Excellent production system can provide the best basic living conditions for the region.

(4) Water environmental system

The water environment system includes five secondary indicators: water supply and drainage system, sewage treatment and reuse, rainwater collection system, water saving and water resources regulation. Focus on the overall utilization, regulation and protection of regional water resources. Excellent water environment system can provide the best living water security for the region.

(5) Air environmental system

The air environment system includes three secondary indicators: indoor air environment, outdoor

air environment and overall air circulation. Focus on the maintenance of the overall regional air environment. Excellent atmospheric environment system can provide the best atmospheric circulation and air quality for the region.

(6) Acoustic environment system

The acoustic environment system includes two secondary indicators: indoor acoustic environment and outdoor acoustic environment. Focus on the maintenance of the overall sound environment in the region. Excellent acoustic environment system can provide the best quiet living and working environment for the region, and keep the different zones of the region from interfering with each other.

(7) Light environmental system

The light environment system includes three secondary indicators: sufficient sunshine, prevention and control of light pollution, energy saving of lighting and green lighting. Focus on the maintenance of the overall light environment and the prevention and control of light pollution in the region. Excellent light environment system can provide the most healthy light environment for the region.

(8) Thermal environment system

The thermal environment system includes two secondary indexes: indoor thermal environment and outdoor thermal environment. Focus on the overall temperature and humidity of the region is appropriate. Excellent thermal environment system can provide the best temperature and thermal cycle for the region.

(9) Afforest system

Greening system includes two secondary indicators: soil conservation and social and cultural functions. Focusing on the overall greening state of the region, the maintenance of soil function and the cultural promotion of the greening region to the region as a whole. Excellent greening system can provide the best environmental protection for the region, and create a pleasant living and working environment.

(10) Health system

The health system includes two secondary indicators: waste disposal and health management. Focus on the overall health situation in the region. Excellent health systems can provide the best sanitation conditions for the region.

(11) Habitat Security system

Habitat security system includes four secondary indicators: refuge function, public security management, survival and maintenance function and daily maintenance. Focus on the overall regional life security, public security and sustainable development. Excellent habitat security system can provide the best living conditions for the region.

(12) Information system

Information system includes four secondary indicators: entertainment tourism, science education, culture and art, and history education. Focus on the overall development of regional entertainment and spiritual needs. Excellent information systems can provide the best cultural atmosphere for the region.

4. Cost-Benefit Analysis and Model Validity Analysis

Cost-benefit analysis is also called cost-benefit analysis method. Cost-benefit analysis is to measure the cost of land development projects from many aspects, involving developers, residents, and the whole society.

Cost-benefit method can show the project investment in detail, and analyze the corresponding project income according to these investments. In this way, the project value can be directly

reflected, and the net economic benefits of the project can be objectively and clearly reflected in the whole life cycle.

4.1. Cost Composition of Land Development Projects

Each cost includes sub-indicators of the assessment models. The weights of each project in small and large projects are given in the table, and the final results can be obtained by using the weighted average method.

4.2. Income Composition of Land Development Projects

Each income includes sub-indicators of the assessment models. The weights of each project in small and large projects are given in the table, and the final results can be obtained by using the weighted average method.

Table 2. Cost Composition of Land Development Projects

Cost		Weights in Small-scale Projects	Weights in Large-scale Projects	Specific cost
Design cost	Planning cost	0.0769	0.0769	Corresponding to the specific indicators in the evaluation model.
Authentication cost	Production cost	0.0769	0.1538	
Technology cost	Energy cost	0.1538	0.1538	
	Production cost	0.0385	0.0385	
	Water environment cost	0.1538	0.1538	
	Air environment cost	0.1538	0.0769	
	Acoustic environment cost	0.0769	0.0385	
	Light environmental cost	0.0385	0.0385	
	Thermal environment cost	0.0385	0.0385	
	Afforest cost	0.0385	0.0769	
	Health cost	0.0385	0.0769	
	Habitat Security cost	0.0385	0.0385	
	Information cost	0.0769	0.0385	

Table 3. Income Composition of Land Development Projects

Income		Weights in Small-scale Projects	Weights in Large-scale Projects	Specific income
Technology income	Energy income	0.0909	0.1212	Corresponding to the specific indicators in the evaluation model.
	Production income	0.1818	0.1818	
	Water environment income	0.1212	0.909	
	Air environment income	0.0303	0.0303	
	Acoustic environment income	0.0303	0.0303	
	Light environmental income	0.0303	0.0303	
	Thermal environment income	0.0909	0.0606	
	Afforest income	0.0909	0.1212	
	Health income	0.0606	0.0606	
	Habitat Security income	0.0909	0.1818	
	Information income	0.1818	0.0909	

5. Conclusion

In order to describe the relationship between the actual economic cost of land development projects and ecosystem services, we establish two evaluation models, which are ecosystem-oriented evaluation model and land development project-oriented evaluation model for the purpose of

promoting the development of ecosystem services and improving land development projects. What's more, we analyze the composition of cost and benefit of land development project. The validity of the cost-benefit analysis model is obtained by calculating the validity index based on residual analysis with the analysis results and real data.

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