

# Landscape Evaluation of Rural and Small Towns in Siming Mountain of Zhejiang Based on Landscape Performance

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**Abstract.** With the advancement of China's urbanization process, China's villages and small towns also begin to face a series of challenges such as ecological environment destruction, population outflow and aging. In order to better deal with these challenges, Zhejiang province issued the "Interim Measures for the Assessment and Acceptance of Environmental Comprehensive Improvement Actions in Small Towns in Zhejiang Province". The document provides detailed environmental assessments of villages and small towns, but lacks economic and social assessments. This study introduced the performance evaluation system of landscape, it focuses on the sustainable development of the thought and the advantage of quantitative evaluation system, combined with "Interim Measures for the Assessment and Acceptance of Environmental Comprehensive Improvement Actions in Small Towns in Zhejiang Province", to build a strong comprehensive evaluation index system. Then, the analytic hierarchy process (AHP) and fuzzy comprehensive evaluation method (FCE) are used to draw the conclusion. In this way, the direction of key construction in the next step of rural and small town development can be clarified to achieve better development of this region.

## 1 Background

In recent years, China's rapid urbanization has caused serious social and environmental problems in rural and small towns in China. At the same time, due to weak environmental protection awareness of rural and small town residents, insufficient government investment in environmental governance and insufficient supervision, the ecological environment of rural and small towns in China is deteriorating. In order to solve these problems, Zhejiang Province promulgated the "Interim Measures for the Assessment and Acceptance of Environmental Comprehensive Improvement Actions in Small Towns in Zhejiang Province" in 2018. Some of the content also applies to villages. It mainly evaluates the landscape and environment of villages and small towns, and the assessment is rich in content, which fits the actual construction situation of villages and small towns and has strong pertinence. [1] However, the evaluation indicators of this set of assessment methods are difficult to quantify, and there is a lack of evaluation on the economic and social levels.

The theory of Landscape Performance is based on three aspects: environment, economy and society. By quantifying the environmental, economic and social benefits of the completed landscape project (mainly referring to the urban park green space), the performance of the project can be clarified, so as to determine whether the design methods and strategies meet the

design objectives and contribute to the sustainable development of the project. [2] This evaluation system not only meets the requirements of sustainable development, but also has a quantifiable calculation toolbox. However, some of the evaluation indicators are too micro, which do not fit well with the actual construction of rural and small towns in China.

## 2 Construction of index system

### 2.1 Selection of Indicators for "Interim Measures for the Assessment and Acceptance of Environmental Comprehensive Improvement Actions in Small Towns in Zhejiang Province"

The "Interim Measures for the Assessment and Acceptance of Environmental Comprehensive Improvement Actions in Small Towns in Zhejiang Province" is dedicated to improving the landscape and environment of rural and small towns and improving the functions of towns. Its assessment and evaluation methods are mainly field research. This evaluation index has a strong pertinence to Siming mountain villages and small towns in eastern Zhejiang province..

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**Table 1.** Evaluation Indicators of “Interim Measures for the Assessment and Acceptance of Environmental Comprehensive Improvement Actions in Small Towns in Zhejiang Province”

First Level	Second Level
Environmental improvement	Strengthen ground cleaning
	Keep water clean
Improvement of town style	Road occupied
	Unordered parking
	Freely placed by vendors
	Demolition of illegal houses
	Wire arrangement at random
	Street elevation improvement
Landscape enhancement	Promote the integration of renewable energy buildings
	Improve supporting facilities
Extra points	Enhance landscape greening
	Resident satisfaction
	Protection of historical and cultural blocks and historic buildings
	Local characteristic residential renovation

## 2.2 Selection of Landscape Performance Evaluation Index

Landscape Performance is an assessment of the operational status of completed projects, which in the United States are parklands. The current research results have covered 7 categories of assessment indicators: land, water, habitat, carbon, energy and air quality, materials and waste, economics and society. [2]The scope of this study is the rural areas and small towns of Siming Mountain in eastern Zhejiang. It has certain differences in scale and nature from the green space of American city parks. Therefore, some indicators of Landscape Performance need to be deleted.

**Table 2.** Landscape Performance Evaluation Index.

First Level	Second Level	Third Level
Economic performance	Real estate value	Housing sales price
		House rental fee
	Construction cost savings	Save money by reusing materials
	Job	Number of jobs created
	Tourist consumption	Site rental fee
		Ticket income
Economic Growth	Parking revenue	
Social performance	Recreation and Social Value	Visitors
		Tourist satisfaction
	Cultural protection	Number of ancient trees
	Healthy and quality life	type of activity
Landscape quality	Satisfaction	Satisfaction
		Infrastructure quality

	Traffic	Traffic flow quality
		Walking system quality
		Quality of public transportation
Ecological performance	Water	Water quality monitoring data
	Habitat air	Green coverage
		PM2.5 reduction
	Material reuse	Recycled material as a percentage of total material

## 2.3 Establishment of post-construction evaluation index based on Landscape Performance of Siming mountain village and small town in eastern Zhejiang province

According to the research and analysis of the two evaluation systems mentioned above. This evaluation system takes the first-level indicators in the Landscape Performance evaluation system: social performance, economic performance, and ecological performance as the overall framework, and combines some indicators of Evaluation Indicators of “Interim Measures for the Assessment and Acceptance of Environmental Comprehensive Improvement Actions in Small Towns in Zhejiang Province”. [3] The author establishes a post-evaluation system for rural and small town construction in Siming Mountain, eastern Zhejiang based on Landscape Performance.

**Table 3.** Post-construction Evaluation Index of Siming mountain village and small town in eastern Zhejiang based on Landscape Performance

First Level	Second Level	Third Level
Economic performance	Real estate value	Housing sales price
		House rental fee
	Job	Number of jobs created
	Tourist consumption	Site rental fee
		Visitors
Economic Growth	Ticket income	
Social performance	Relevant policy	Parking revenue
	Cultural	Resident satisfaction
		Number of ancient trees
		Protection of historical and cultural blocks and historic buildings
		Local characteristic residential renovation
	Traffic	Type of activity
		Traffic flow quality
Walking system quality		
Ecological	Ecosystem	Quality of public transportation
		Water quality

performance		monitoring data
		PM2.5 reduction
		Recycled material as a percentage of total material
		Renewable energy efficiency
	Landscape environment	Green coverage
		Landscape satisfaction
		Street environment
		Community environment

Through field investigation and data comparison, it can be found that in the evaluation of Fengcun Construction, the economic performance score was 10.615, the social performance score was 8.067, and the ecological performance score was 23.62. Ecological performance is better than economic performance, and economic performance is better than social performance. Therefore, in the future development of Fengcun, more attention should be paid to the construction of public transportation, public infrastructure, historical and cultural protection and utilization.

### 3 Research methods

At present, the commonly used systematic evaluation methods include fuzzy comprehensive evaluation method and analytic hierarchy process. Since the comments used in the post-construction evaluation are often vague, it is advisable to adopt a fuzzy comprehensive evaluation method. Using this evaluation method, the weight of each index has a decisive position, and the weight of fuzzy evaluation is usually given by experts based on experience, which is inevitably subjective. Analytic Hierarchy Process (AHP) is a method that combines quantitative and qualitative methods to express and process human subjective judgments in quantitative form. It can minimize the impact of personal subjective judgments and make the evaluation results more credible. [4]

In this study, two systematic evaluation methods were used to evaluate typical cases. The author attempts to further clarify the key direction of relevant cases in the future development through the evaluation results.

### 4 Case study: Fengcun

Fengcun is located in Siming Mountain, Yuyao, Zhejiang. It is 5 kilometers from Lanjiang Street and 10 kilometers from the urban area, covering an area of 7.5 square kilometers. The area of the hills in the village area is large, the water resources in the village are rich, and the vegetation is in good condition.

Fengcun compiled “the Village Planning of Fengcun (Zhu Feng Village) of Lanjiang Street in Yuyao City” and “the Village Design of Fengcun (Zhu Feng Village) of Lanjiang Street in Yuyao City” in 2017. The project covers an area of 7.5 square kilometers. It focuses on sorting out the road traffic in Fengcun and guiding the landscape of Fengcun.

Through field investigation and questionnaire distribution, the author made an evaluation and analysis on Fengcun by combining AHP and fuzzy comprehensive evaluation method, and reached the following conclusions (as shown in Table 4).

Since there is no real estate project development and construction in Fengcun, the index of real estate value is not applicable to the actual situation of construction in Fengcun. Therefore, this index is deleted.

### 5 Analysis and discussion

### 6 Conclusions

The evaluation system constructed in this study has strong regional specificity, and also combines the results of foreign research. The two evaluation systems at home and abroad complement each other and have a broader horizon. It is conducive to rural and small towns to supplement and improve the next stage of strategic research through the summary.

Secondly, although some data were obtained in this study, the evaluation of some indicators lacks dynamic tracking, which has a certain impact on the evaluation of the results.

Finally, the major difficulty of future research lies in the acquisition of large amounts of data and the processing of non-quantitative data.

**Table 4.** Post-construction Evaluation of Fengcun

Post-construction evaluation index of Siming mountain village and small town in eastern Zhejiang based on landscape performance			Implementati on effect	Weights		Classification				Score		
First Level	Second Level	Third Level				Best (+2)	Better (+1)	Gener al (0)	Ba d (-1)			
Economic performance	Job	Number of jobs created	The tertiary industry has developed, and the number of jobs has increased significantly	0.270	1.000	4	10	4	2	16	16.00	10.615
	Tourist consumption	Site rental fee	Slight increase	0.350	0.330	2	8	6	4	8	9.30	
		Visitors	The number of tourists has increased significantly		0.330	3	11	3	3	14		
		Ticket income	Slight increase		0.340	2	7	6	5	6		
Economic Growth	Parking revenue	Slight increase	0.380	1.000	2	8	6	4	8	8.00		
Social performance	Relevant policy	Resident satisfaction	High satisfaction	0.320	1.000	4	12	4	0	16	16.00	8.067
	Cultural	Number of ancient trees	Ancient trees are numerous and effectively protected	0.330	0.250	8	8	4	0	24	8.25	
		Protection of historical and cultural blocks and historic buildings	There is no preservation of historic buildings		0.250	0	2	12	6	-2		
		Local characteristic residential renovation	There is no large-scale transformation and utilization of traditional dwellings		0.250	0	2	12	6	-2		
		Type of activity	Increase significantly		0.250	3	9	6	2	13		
	Traffic	Traffic flow quality	Slight increase	0.350	0.340	0	3	15	2	1	0.64	
		Walking system quality	Slight increase		0.320	0	5	12	3	2		
Quality of public transportation		Nothing much has changed	0.340		0	2	15	3	-1			
Ecological performance	Ecosystem	Water quality monitoring data	Nothing much has changed	0.570	0.250	4	12	4	0	20	19.25	23.62
		PM2.5 reduction	Nothing much has		0.250	6	10	4	0	22		

		changed									
		Recycled material as a percentage of total material	Increase significantly		0.250	4	12	3	1	1	9
		Renewable energy efficiency	Increase significantly		0.250	5	8	5	2	1	6
	Landscape environment	Green coverage	Increase significantly	0.430	0.250	6	8	5	1	1	29.42
		Landscape satisfaction	High satisfaction		0.270	5	9	4	2	1	
		Street environment	The effect of optimization is significant		0.240	4	10	4	2	1	
		Community environment	The effect of optimization is significant		0.240	4	10	4	2	1	

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