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Analysis of Factors Influencing the Construction of Ecologically Livable Villages in Hangzhou under the Rural Revitalization Strategy

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Abstract: *With the continuous advancement of China's economic and social development, rural revitalization has become an essential strategic direction in the new period. As the largest city in Zhejiang Province, Hangzhou plays a vital role in rural revitalization. At the same time, with the continuous acceleration of urbanization, rural ecological problems have become increasingly prominent, and the construction of ecologically livable villages has become an urgent problem to be solved in the process of the national implementation of rural revitalization strategy to promote the construction of ecologically livable, and to help rural revitalization. This paper takes Hangzhou as an example to discuss the influencing factors of ecological livable construction under the rural revitalization strategy.*

Keywords: *Rural Revitalization, Ecological Livability Construction, Satisfaction, Logistic Regression, Fuzzy Hierarchy Analysis*

1. Introduction

Currently, China is in a period of economic transition and urbanization. With globalization, China is gradually becoming one of the world's largest industries and economies. However, this rapid economic growth has also brought many problems. As an agricultural and populous country, China's urbanization has seriously affected the development of the countryside [1], and the rural environment has been badly affected in the process of social development, especially in production and life as well as the human habitat [2]. In such a social context, rural revitalization and ecological livability have become common concerns for urban and rural areas.

In the process of rural revitalization, the quality of life and environmental conditions of farmers need to be improved. In the past, the construction of rural environments often neglected ecological protection, resulting in soil erosion, water quality deterioration and other problems, and problems such as ecological environment damage are becoming increasingly prominent. Ecological livability is one of the crucial tasks in the implementation of the rural revitalization strategy and one of the important aspects of measuring the results of rural revitalization [3, 4].

In today's world, people are increasingly demanding ecological livability in their lives. However, it's crucial to establish a strong connection between production, life, and ecology in peri-urban areas to improve the quality of life. Perfecting the ecological development system is the key to achieving this goal [5]. From the past situation, the construction of livable countryside only has "building new houses, repairing roads and building garbage ponds" [6]. Separated from the actual economic and social development of rural areas and local people's production and living habits, on the "ecological" talk about ecology, on the "beautiful" talk about beautiful, on the "revitalization" talk about revitalization of the practice, are not desirable [7].

In the current context of China's economic and social development, rural revitalization and ecological protection are of extreme importance. By analyzing the influencing factors of ecological livability construction, we can better understand the ecological environment status and development trend of the countryside within Hangzhou and provide scientific references and bases for the government and all sectors of society.

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2. Purpose of the Study

The analysis can provide a better understanding of the views of rural villagers on ecological livability construction and the differences in factors affecting rural construction in Hangzhou, and provide a scientific basis for promoting rural revitalization work. By exploring the practical effects of the rural revitalization work in Hangzhou, analyzing the problems of rural ecological environment in Hangzhou, and putting forward corresponding countermeasures and suggestions, it will provide a scientific basis and reference for the development of rural revitalization work in Hangzhou and even the whole country. Specifically, the research results of this paper will have the following significance:

We are promoting the development of rural revitalization work in Hangzhou. Rural revitalization is an important strategy for China's economic growth at present. Hangzhou City, as a typical representative of rural revitalization, can understand the practical effects of local rural revitalization work through the analysis of the influencing factors of local rural ecological and livable construction to facilitate the development of more effective rural revitalization strategies and policies by the local Government and relevant departments.

We are proposing countermeasures and suggestions for improving ecological livability construction. By analyzing the current situation and issues of rural eco-livability construction in Hangzhou, the local environmental environment can identify issues and shortcomings and countermeasures and provide suggestions for improving and upgrading eco-livability construction to the local government and relevant departments better to promote the development of local rural revitalization work.

We are providing a scientific basis and reference for rural revitalization work. Rural revitalization is an essential strategy for China's economic development, and studying the influencing factors of rural ecological livability construction in Hangzhou can provide scientific basis and reference for rural revitalization work in other regions to promote the development better.

3. Analysis of Factors Affecting the Construction of Ecologically Livable Villages

3.1. Logistic Regression-based Analysis of Factors Influencing Ecological Livability Construction

3.1.1 Modeling

Firstly, we use the basic form of the multiple linear regression model [8, 9], as shown in equation (1):

$$\text{Logit}(p) = \ln\frac{p_i}{1-p_i} = \beta_0 + \sum_{i=1}^{n}\beta_i x_i \tag{1}$$

We want to explore the factors affecting eco-livability construction. Using Logistic regression to determine which independent variables would impact the villagers' perception of evaluating eco-livability construction as good or bad. Table 1 shows the coding of the variables:

Table 1: Dependent variable coding table

implicit variable	Coding situation
Y_0	0 = "Low recognition"
	1 = "Highly

A dependent variable X_1 -X_{25} uses each of the 25 tertiary indicators, and Table 2 shows the coded five options.

Table 2: Coding table for independent variables

independent variable	Coding situation
X_1 -X_{25}	1 = "Very dissatisfied"
	2 = "Less satisfactory"
	3 = "average"
	4 = "More satisfied"
	5 = "very satisfied"

The regression coefficients were obtained by eliminating the highly significant tertiary indicators after regression analysis using SPSS software with forward stepping.

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3.1.2 Model Results

With 25 tertiary indicators considered, finally screened out ten significant independent variables to get the regression model, which has an adjusted R-square of 0.379 > 0.1, indicating that the constructed model is acceptable. Equation (2) shows the final regression model expression.

$$\begin{aligned}\text{Logit}(p)= &- 1.610 + 0.140 \times \text{natural landscape appreciation} + 0.150 \times \text{richness of tourism resources} + 0.144 \times \text{concentration of public toilets} + 0.106 \times \text{degree of public security administration} + 0.142 \times \text{tourism infrastructure} + 0.151 \times \text{educational service level} + 0.141 \times \\ &\text{river and road health} + 0.126 \times \text{villagers' quality} + 0.101 \times \text{traffic infrastructure} + 0.095 \times \text{the incidence of natural disasters}\end{aligned} \quad (2)$$

3.1.3 Model Conclusions

In the regression model, the factors that have the most significant influence on the construction of ecologically livable villages are, in order, the level of educational services, the richness of tourism resources and the degree of aggregation of public toilets. The coefficients of these variables are 0.151, 0.150 and 0.144 respectively.

Enhancing educational services can promote villagers' knowledge and environmental awareness, and the Government should focus on strengthening academic inputs and service levels and optimizing teaching methods and content. For villagers, who may face problems such as low literacy and language barriers, traditional teaching methods may not meet their needs.

Increasing the aggregation of public toilets can improve the hygiene of tourist areas, reduce pollution and garbage, and provide a more comfortable tourist environment for tourists; village committees should increase the investment in the construction of public toilets, including funds, workforce and other aspects, and actively promote the construction of public toilets, increase the number of public toilets, and distribute them in the tourist attractions around the area or along the road and other easily accessible places, to facilitate tourists to use them. .

While the enrichment of tourism resources can increase local economic income and drive the development of related industries, protecting the local ecological environment and ensuring sustainable development is also necessary. Tourism practitioners and tourists, must strengthen publicity and education, guide them to respect local culture, history and ecological environment, and establish a sense of civilized tourism.

3.2. Analysis of Influencing Factors of Ecological Livability Construction Based on the Fuzzy Hierarchical Analysis Method

3.2.1. Fuzzy Comprehensive Evaluation Method [10, 11] Estimating Tertiary Indicator Scores

Based on the design of the questionnaire, we specify a quantitative scale of rating levels as "1" very dissatisfied (20 points), "2" relatively dissatisfied (40 points), "3" generally satisfied (60 points), "4" more satisfied (80 points), "5" very satisfied (100 points), to analyze the three-level indicators. Taking the ecological environment as an example, according to the villagers' evaluation of ecological environment, the frequency data are organized as shown in Table 3:

Table 3: Frequency table of villagers' evaluation of the ecological environment

	1	2	3	4	5
forest coverage	20	36	52	212	296
air quality	27	42	108	214	225
domestic water quality	23	42	80	227	244
natural landscape appreciation	22	37	62	230	265
the incidence of natural disasters	29	49	101	239	198

The fuzzy judgment matrix R is constructed from the elements aij in row i and column j of the frequency table, and then the scores are multiplied by the column vector and R to obtain the row vector of the scores.

After borrowing Matlab to calculate the above matrix, we get the scores of factor F1 as forest cover C15 (83.6364), air quality C25 (78.4416), Domestic water quality C35 (80.3571), natural landscape

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appreciation C45 (82.0455), andthe incidence of natural disasters C55 (77.1429), and similarly, we can get the scores of factor F2 to F5.

3.2.2. Hierarchical Analysis to estimate Secondary Indicator Scores

Constructing a judgment matrix also takes the ecological environment as an example. There are five constructive weight indicators, respectively M11, M12, M13, M14 and M15. The coefficients of the observed variables of the model are taken as the importance scores of the indicators, and the proportional judgment matrix for the comparison of the importance of each certain indicator by comparing the two by two.

The row arithmetic mean (RAM) method was applied to solve the weights, where the arithmetic mean was obtained row by row, and then the row arithmetic mean was normalized and calculated to get the weights W. Eventually, Table 4 shows the influence indices of the five factors.

Table 4: Table of indices for each impact factor

Impact factor index		Individual Index		Normalized weights
ecological environment	80.32	forest coverage	83.64	16.87
		air quality	78.44	22.08
		domestic water quality	80.36	19.67
		natural landscape appreciation	82.05	18.08
		the incidence of natural disasters	77.14	23.30
residential environment	73.97	resilience to External disasters	77.31	16.34
		comfort of living	72.50	21.24
		recycling of domestic waste	73.86	20.85
		river and road health	75.84	17.89
		concentration of public toilets	70.32	23.68
social environment	75.01	medical and health service	78.41	15.21
		educational service level	72.76	21.33
		endowment insurance coverage rate	75.10	20.69
		degree of public security administration	77.24	17.61
		perfection of rural governance	71.56	25.16
cultural environment	79.77	richness of tourism resources	82.76	16.60
		national characteristics	78.47	21.13
		diversity of rural activities	79.87	20.03
		villagers'quality	81.69	16.65
		propaganda force	76.04	25.59
environmental facilities	77.45	farmland water infrastructure	80.75	15.07
		tourism infrastructure	75.88	22.43
		Traffic infrastructure	77.50	18.19
		Internet infrastructure	79.42	19.24
		Public infrastructure	73.73	25.08

3.2.3. Satisfaction Influencing Factors Analysis

Based on the model, analyze each of the five secondary factors gradually.

The ecological environment factor is the most important, with an impact factor index of 80.32. The improvement of "forest coverage" is significant to the ecological environment. The "quality of living water" ranking is also relatively high, indicating that villages need to guarantee the quality of their water resources so that villagers can use water and drink with peace of mind.

The cultural environment factor is also very critical, with an influence factor index of 79.77, second only to the ecological environment factor. It is more important to have rich tourism resources, and the villagers' quality is also paramount. If the village has rich tourism resources, the environment is beautiful, the villagers' quality is high, and the relationship between neighbors is harmonious.

The impact index of the second-level factor of environmental facilities is 77.45, and villagers are highly satisfied with the environmental facilities in villages in Hangzhou. The Hangzhou municipal government should focus on its farmland water conservancy infrastructure and Internet infrastructure, and strengthening the construction of farmland water conservancy infrastructure can improve the yield and quality of crops and the production and living conditions of villagers; at the same time,

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strengthening the construction of Internet infrastructure in the villages can facilitate the lives of villagers, thus increasing the satisfaction of villagers in the villages.

The impact index of the secondary factor of social environment is 75.01, which requires improving the level of medical and health services and the degree of security management in villages. Improving medical assiatance can help villagers improve their health literacy and self-care ability. Suppose we still protect the personal safety of villagers. In that case, villages should also strengthen the prevention and management of public security, crack down on behaviors that infringe on the interests of villagers, and improve the order of social security in villages.

The impact index of the secondary factor of living environment is 73.97, which is less important than other factors. Improving the living environment can improve the quality of life. Improving the "resilience to external disasters" can protect the personal safety of villagers and improve their satisfaction with living.

3.3. Analysis of Influencing Factors of Ecological Livability Construction Based on Structural Equation Modeling

3.3.1. Selection of Variables

After reviewing the literature [12-15] and conducting survey interviews with some rural villagers in Hangzhou City, we organized the breakdown of each hidden variable, including Twenty-five variables of ecological environment, residential environment, social environment, cultural environment, and environmental facilities factors.

3.3.2. Modeling

Suppose there is no multicollinearity between the indicators, and they all obey a mean of 0, a constant of variance x is the residuals, and h is the error of the latent variable. Figure 1 shows the established structural equation model.

3.3.3. Evaluation of Model Fit

Table 5: Summary of goodness-of-fit indicators

Chi-square degrees of freedom ratio	GFI	RMSEA	RMR	CFI	NFI	NNFI
<3	>0.9	<0.10	<0.05	>0.9	>0.9	>0.9
1.579	0.939	0.031	0.044	0.977	0.939	0.974

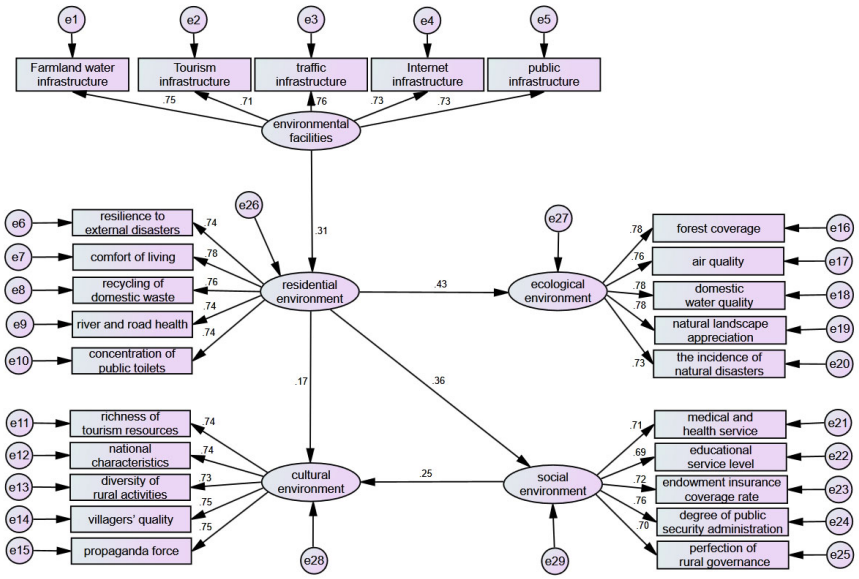

Figure 1: Structural equation modeling of the influencing factors of ecologically livable village construction

According to the relevant theories for evaluating the goodness of fit of models in structural equation modeling, the indicators of the model's goodness of fit in this paper are summarized as shown in Table 5. From the data in the table, all indicators meet the requirements. Therefore, the present model is

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identified as the final structural equation model.

3.3.4. Model Conclusions

The latent variable residential environment has a direct positive effect on the ecological environment of the analyzed item. The residential environment cannot be static, and any environmentally destructive behavior by villagers will affect the ecological environment in which they live.

The latent variable residential environment has a direct positive effect on the social environment of the analyzed item. The living environment affect the comfort of the villagers, and a poor living environment can lead to problems in the four areas of health care, sanitation, education, and security.

The latent variable residential environment has a direct positive effect on the cultural environment of the analyzed items. A good or bad living environment tends to affect the cultural environment of the whole village, and the degree of clustering of public toilets and recycling of household garbage largely affect the villagers' evaluation of the current living environment.

The latent variable social environment has a direct positive effect on the cultural environment of the analyzed items. Good security management and village governance systems affect the larger social environment, where villages can create their own culture. In contrast, the social environment allows villagers to live in the villages without fear.

The latent variable environmental amenities has a direct positive effect on the living environment of the analyzed items. Environmental amenities usually come from government support and community cooperation, and a good or bad environmental amenity improves the living environment.

4. Conclusions and Recommendations

4.1. Main Findings

Education level, tourism resources, and the degree of aggregation of public toilets significantly affect villagers' evaluation of ecological livability construction. Using SPSS to establish a logistic regression model, the regression coefficients of the effects of the independent variables education level, tourism resources and public toilet aggregation on the dependent variable recognition are 0.150, 0.141 and 0.140, respectively, and they all show a positive relationship. A good education level improves the knowledge and education of villagers, excellent tourism resources drive the economic development of villages, and reasonable arrangement of public toilets saves foreign tourists from running back and forth when they need it.

The importance of the ecological and cultural environments to constructing eco-livability is high. After analysis by fuzzy hierarchical analysis, the indexes of the influence factors of ecological and cultural environments are 80.33 and 79.77, respectively. Among the two influence factors, "forest coverage," "natural landscape appreciation," "richness of tourism resources," and "quality of villagers," these items rank in the first place, indicating that letting the environment establish its protection is of high importance to the construction of ecological livability, "richness of tourism resources," "quality of villagers," these items are ranked in the first place, which indicates that letting the environment establish its protection mechanism and self-repair mechanism requires that people do not litter, do not discharge sewage, do not cut down indiscriminately, and protect the natural scenery; create a characteristic civilized village, and enrich the village's tourism resources. Civilized villages enhance the tourism resources of villages, improve villagers' quality of life, and cultivate their awareness of protecting the environment.

The living environment significantly affects the ecological and social environment. Using the SPSS design SEM structural equation model, the standardized coefficient of living environment on the ecological environment is 0.426. The standardized coefficient of living environment on the social environment is 0.359, which shows a positive relationship. A comfortable living environment makes villagers more reliant on their living environment so that they will have the idea of caring for the environment in their brains, which will subconsciously influence the social environment of the countryside.

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4.2. Main Recommendations

The Government should strengthen the ecological, residential and social environment in villages. Regarding ecological environment construction, the Government should increase the forest coverage rate, improve air quality, protect water resources and other measures to protect the rural ecological environment. Regarding residential environment construction, the Government should strengthen garbage classification and treatment, promote clean energy, develop environmentally friendly agriculture, and build modern public facilities to improve the rural residential environment. Concerning the social environment, the Government should improve the quality of the rural social environment by strengthening medical and health services, raising educational services, strengthening public security management, and promoting the construction of a rural governance system.

The Government should pay more attention to education, tourism resources and the degree of aggregation of public toilets. Increase support for villagers' education, support the development of rural tourism, provide better public transportation facilities, and increase the number of public toilets.

The village committee organizes activities to promote villagers' participation in community building. Villagers should build up an awareness of environmental protection and take action to reduce waste and pollution. They should also actively participate in eco-livability building and environmental protection activities, such as tree planting, garbage sorting, energy saving and emission reduction, to promote an ecological environment in villages.

Support the upgrading and development of rural industries. Recommend rural tourist attractions and specialties to the public to attract more tourists to experience them. Villagers participate in rural industrial development and offer constructive advice. In addition, villagers should actively publicize the local culture and lifestyle and promote rural tourism and unique agricultural products.

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