

Construction and Evaluation of the Index System for the Construction of Ecological Civilized Villages in the Poor Mountainous Areas of Southwest China

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Abstract: The frequency analysis method is used to construct the screening evaluation index, and the index weight is determined by the hierarchical analysis method. Using the data of 2017-2018, the weighted summation method was used to evaluate the construction process of ecological and civilized villages in poverty-stricken mountainous areas in southwestern Sichuan Province. The results show that the construction of ecological civilization village in the mountainous area of southwest Sichuan Province, taking Jinping Town, Yibin City, as an example, had completed 80.28% of the target value in 2018. The overall development is in good condition. The improvement of village style civilization is on the rise. The development trend of development is relatively flat.

Keywords: poverty-stricken mountainous areas in the southwest; ecological civilization construction; indicator system

The construction of ecological and civilized villages is the necessary way and the best choice for the construction of a new socialist countryside, and is a powerful development way to accelerate the development of a well-off society in rural areas. However, due to the shortage of resources and the uneven cultural level of the peasants, the construction of ecological and civilized villages in the poverty-stricken mountainous areas in the southwest is far more difficult than in the plain areas. In order to vigorously develop the construction of ecologically-friendly villages in the mountains, the government has once again reaffirmed the importance of the construction of ecological civilization villages in mountainous areas in the construction of socialist civilization with Chinese characteristics, and re-writing the construction of ecological civilization into the "13th Five-Year Plan". As a result, the construction of ecological civilized villages in mountainous areas has become an effective carrier for the construction of new rural areas in mountainous areas. At the same time, during the "Thirteenth Five-Year Plan" period, Sichuan

Province has a clear goal of promoting urban and rural development. One of them is: By 2020, we will strive to build 30,000 happy and beautiful villages, accounting for more than 80% of the province's administrative villages. The overall requirement for promoting urban and rural development in Sichuan Province is to adhere to industry's support for agriculture, urban support for rural areas, vigorously implement the "two-oriented" interaction, urban and rural development strategy, improve the integration mechanism of urban and rural development, and promote the equal exchange and rational allocation of urban and rural elements, equalize rational allocation and basic public services.

1. Constructing the Principle of Evaluation Index System

1.1 Comprehensive Principles

It refers to the construction of the index system of ecological and civilized villages in the poverty-stricken mountainous areas in southwestern Sichuan Province (hereinafter referred to as the southwest mountainous areas). It needs to be complete and representative. It should comprehensively reflect the development process of ecological and civilized villages in the southwest mountainous areas and can reflect the present situation and prospect of the construction of ecological civilized village in southwest mountainous area from many angles.

1.2 The principle of Targeting

The index system constructed can reflect the true level of the development of ecological civilized villages in southwest mountainous areas. It is possible to propose corresponding improvement proposals based on local conditions to look forward to the future development process and planning of the region.

1.3 Scientific Principles

The evaluation index system should strictly follow the purpose of the construction of ecological and civilized

villages in the western region, and select the evaluation index which is accurate and effective in the light of the actual situation of the local economy. At the same time, the selection of index system should accord with the law of scientific development.

1.4 The Principle of Measurability.

The index system reflecting the construction process of ecological and civilized villages in the southwest mountainous areas needs to conform to the development law of time series, that is, it can carry out longitudinal comparison, and at the same time, it can also be compared with other ecologically-civilized village construction processes in similar development level areas, in order to accurately obtain the ecological civilization village. To achieve the degree, the indicators need to reflect their measurable degree.

2 Data Source and Evaluation Method

2.1 Data Source

Some of the data in this paper are from field research. In order to understand the progress of the ecological and civilized villages in the poverty-stricken mountainous areas in the southwest of Sichuan Province, the author went deep into some rural areas of southwest mountain area from 2014 to 2015, and analyzed the practice of ecological civilization village construction by means of questionnaire survey, discussion seminar and other survey methods. The survey area is mainly in the southwestern part of Sichuan Province, taking Jinping Town of Yibin City as an example. The subjects of the survey were 23 villages in Jinping Town District. A total of 300 questionnaires were returned, of which 278 were valid, with an effective rate of 92.67%. The survey targets different types of village representatives, such as village government cadres, tea fruit growers and rural self-employed households. The survey content closely focuses on the overall goal of the construction of ecological and civilized villages, covering four aspects: economic development, ecological improvement, village civilization and village cleanliness. The rest of the data comes from the relevant statistical yearbook.

2.2 Research Methods

2.2.1 Exponential transformation

The exponential change method [1] is a quantitative method for dimensionless processing of indicators. In this paper, the observed and target values of the index are compared to indicate the degree of realization of the index. Its calculation formula [2] is as follows:

$$X_i = \begin{cases} \text{forward pointer} & \begin{cases} M_i < N_i \\ M_i > N_i \end{cases} \\ \text{negative index} & \begin{cases} N_i < M_i \\ N_i > M_i \end{cases} \end{cases}$$

among them, X_i Indicates how well the indicator is

achieved ($0 \leq X_i \leq 1$) , M_i Indicates indicator observation data, N_i Indicates the target value of the indicator.

2.2.2 Analytic method

In the early 1970s, T.L.Saaty, a professor at the University of Pittsburgh, an American operational research scientist, proposed a hierarchical weight decision analysis method for the Department of Defense to study the topic of “Power distribution according to the contribution of various industrial departments to national welfare”. Based on the network system theory and multi-objective comprehensive evaluation method, a hierarchical weight decision analysis method was proposed.

The characteristic of this method is that on the basis of in-depth analysis of the essence, influencing factors and internal relations of complex decision-making problems, the thinking process of decision-making is digitized by using less quantitative information, thus providing a simple decision-making method for complex decision-making problems with multiple objectives, multiple criteria or no structural characteristics. The basic steps include: (1) establishing a hierarchical structure model; (2) constructing a judgment (pairwise comparison) matrix; (3) hierarchical single ordering and consistency checking; and (4) hierarchical total ordering and consistency checking.

2.2.3 Weighted summation method

The dimensionless values are given a certain weight to sum up in order to evaluate the degree of realization of ecological civilization village construction in the whole province and cities.

The evaluation model [3] is as follows:

$$Y = \sum_{i=1}^n L_i X_i \quad (i = 1, 2, 3 \dots n)$$

Among them, Y is the comprehensive score for the realization of ecological civilization villages.

Building a comprehensive evaluation index for the realization of the construction of ecological and civilized villages, L_i represents the weight of indicator i , X_i is the dimensionless value of indicator i , n is the total number of indicators.

3 Design Evaluation Index System

According to the basic objectives of the construction of ecological civilization village in Yibin City, Sichuan Province, the index system for real-time assessment of ecological civilization village assumptions in poverty-stricken mountainous areas in southwest China is designed, including economic development, ecological improvement, village civilization and village cleanliness [4]. This paper uses the analytic hierarchy process to comprehensively design indicators to screen and construct an evaluation index system for ecological

civilization construction in poverty-stricken mountainous areas in southwestern Sichuan Province.

3.1 Establishing a Hierarchical Structure

The ecological civilization village construction system in the poverty-stricken mountainous areas in southwestern Sichuan Province is decomposed into four levels: economic development, ecological improvement, village culture and village cleanliness. By analyzing each level of characteristics, exploring specific components and selecting representative indicators ,the hierarchical structure of four layers can be established: (1) the target layer. The target layer comprehensively describes and reflects the overall target of the evaluation object, this paper takes the construction of ecological civilization village in the southwest mountainous area of Sichuan Province as the comprehensive goal; (2) the criterion layer. The criterion layer is to establish the corresponding relationship between the comprehensive target and the system structure and the constituent elements. It consists of four subsystems: economic development, ecological improvement, village culture, and village cleanliness; (3) sub-criteria layer. The sub-criterion layer analyzes the constituent elements of the four sub-levels of the ecological civilization village, establishes the corresponding relationship between each level and the constituent elements, and reflects the specific index layer composition of the four criterion layers; (4) the establishment of specific indicator layers. The indicator layer consists of specific indicators.

3.2 Building an Indicator System

Under the four criteria of economic development, ecological improvement, village civilization and village cleanliness, construct 13 sub-criteria layers including Agricultural modernization, new industrialization of rural areas, scale of rural production, optimization of rural economic structure, policy support, farmers 'income

status, improvement of farmers' consumption level and quality of life, improvement of the environment, protection and utilization of resources, adjustment of production structure, cultural construction, construction of morality and legal system , democratic management. On the basis of the connotation of new rural construction and the evaluation index system of a well-off rural society, following the ecological theory, the index system composed of 138 indicators was constructed. After analyzing the characteristics of the indicator system, using frequency statistics and qualitative analysis method, according to the frequency of indicators and the contribution rate of ecological civilization village construction in various new rural construction and rural well-off society evaluation and combining with the investigation status of the construction of ecological and civilized villages of southwest mountainous areas in Sichuan Province, screening 138 indicators in the indicator system and finally determining the evaluation index system for the construction of ecological and civilized villages in the southwest mountainous area of Sichuan Province. The index system consists of four first-level indicators and 24 second-level indicators.

4 Empirical Analysis

First of all, using the analogy method, referring to the relevant standards of new rural construction and rural comprehensive well-off society, taking the average rural development level of Sichuan Province as the basis for formulating relevant standards for the construction of ecological and civilized villages, and determining the two goals of low-middle and high-middle realized by ecological civilization villages. With the help of the analytic hierarchy process and expert brainstorming, a judgment matrix can be constructed and the weights of the monitoring indicators [4] can be determined (Table 1).

Table 1. Standard weights related to the construction of ecological civilization villages.

Indicator name	Low-middle		High-middle	
	Numerical value	Weights	Numerical value	Weights
Composite Index		100		100
1.Economic Development Index		33		31
Per capita annual net income of rural residents (yuan)	5000	10	8000	9
Engel coefficient of rural residents' living consumption (%)	35	5	30	4
Contribution rate of rural science and technology progress (%)	60	6	80	6
Rural cooperative medical coverage (%)	95	7	100	7
Rural social pension coverage (%)	50	5	100	5
2.The ecological improvement index		32		31
Forest cover rate(%)	35	8	50	7
Clean energy penetration rate (%)	20	5	50	5
Domestic sewage treatment rate (%)	40	5	80	4
Comprehensive utilization rate of crop straw (%)	80	3	100	3
Agricultural film recovery rate (%)	30	4	80	4
Courtyard economic development rate (%)	90	3	100	4
Non-polluted, green, organic agricultural base ratio (%)	10	4	30	4
3.The village wind civilization index		20		20
Average years of education for rural residents (years)	9	4	12	4
The proportion of rural residents' cultural, educational and entertainment consumption expenditure (%)	14	3	20	3
Proportion of collective cultural activities (%)	20	2	50	3

Civil disputes and number of criminal cases (pieces)	20	4	10	5
Family planning penetration rate (%)	90	3	95	2
Rural residents' satisfaction with village organizations (%)	80	4	95	3
4.The village cleanliness index		15		18
Green coverage rate (%)	30	2	50	3
Rural road hardening rate (%)	80	3	90	3
Health toilet penetration rate (%)	50	4	65	4
Unified planning rate of village construction (%)	90	3	95	2
Drinking water penetration rate (%)	60	2	90	2
Live garbage fixed point storage and removal rate (%)	50	1	80	2

Source of data: part of the data is obtained from research and analysis, and the other is provided by the local statistical department.

The data is processed by exponential transformation method [5]. Then the weighted summation method is used to empirically analyze the construction process of ecological and civilized villages in the poverty-stricken

mountainous areas in southwestern Sichuan Province. Finally the degree of achievement of the construction of ecological civilization village in the Southwest mountainous area of Sichuan Province and the comprehensive score of each index were obtained from 2017 to 2018 (Table 2).

Table 2. The degree of implementation and the comprehensive score of various indexes in the construction of the ecological civilization village in the southwest mountain area.

Indicator name	Degree of achievement in 2014	overall 1 rating	Degree of achievement in 2015	overall 1 rating
composite index	77.11	77.11	80.28	80.28
1.Economic Development Index		25.97		27.05
Per capita annual net income of rural residents (yuan)	91.25%	8.21	93.75%	8.44
Engel coefficient of rural residents' living consumption (%)	63.83%	2.55	73.17%	2.93
Contribution rate of rural science and technology progress (%)	63.75%	3.83	67.50%	4.05
Rural cooperative medical coverage (%)	94.00%	6.58	97.00%	6.79
Rural social pension coverage (%)	96.00%	4.80	97.00%	4.85
2.The ecological improvement index		24.36		25.63
Forest cover rate(%)	84.00%	5.88	84.00%	5.88
Clean energy penetration rate (%)	58.00%	2.90	62.00%	3.10
Domestic sewage treatment rate (%)	91.25%	3.65	97.50%	3.90
Comprehensive utilization rate of crop straw (%)	94.00%	2.82	98.00%	2.94
Agricultural film recovery rate (%)	100.00%	4.00	100.00%	4.00
Courtyard economic development rate (%)	81.00%	3.24	82.00%	3.28
Non-polluted, green, organic agricultural base ratio (%)	46.67%	1.87	63.33%	2.53
3.The village wind civilization index		13.02		13.08
Average years of education for rural residents (years)	50.00%	2.00	50.00%	2.00
The proportion of rural residents' cultural, educational and entertainment consumption expenditure (%)	55.00%	1.65	65.00%	1.95
Proportion of collective cultural activities (%)	84.00%	2.52	90.00%	2.70
Civil disputes and number of criminal cases (pieces)	40.00%	2.00	30.00%	1.50
Family planning penetration rate (%)	95.79%	1.92	97.89%	1.96
Rural residents' satisfaction with village organizations (%)	97.89%	2.94	98.95%	2.97
4.The village cleanliness index		13.76		14.51
Green coverage rate (%)	86.00%	2.58	92.00%	2.76
Rural road hardening rate (%)	78.89%	2.37	86.67%	2.60
Health toilet penetration rate (%)	80.00%	3.20	86.15%	3.45
Unified planning rate of village construction (%)	95.79%	1.92	97.89%	1.96
Drinking water penetration rate (%)	90.91%	1.82	90.00%	1.80
Live garbage fixed point storage and removal rate (%)	93.75%	1.88	97.50%	1.95

From the above data analysis, the overall data of 2017-2018 shows an overall upward trend. The overall score in 2018 is 80.28 points, indicating that the poverty-stricken mountainous area in the southwest of Sichuan Province completed the construction index of 80.28% in Jinping Town of Yibin City. The overall completion index in this year was 77.11%, which was 4.11% higher than 2017, reflecting the rapid pace of ecological civilization construction in Jinping Town,

Yibin City, Sichuan Province. In the development of economic indicators, it shows an upward trend; in the ecological improvement indicators, except for the development of forest coverage and agricultural film recovery rate, the other indicators are basically rising, which also reflects the contribution made by the Jinping Town government in the construction of ecological civilization [6] is great; in the construction of villagers' civilization, the satisfaction of the villagers with the

construction of local ecological civilization has also increased year by year, indicating that the villagers attach more importance to the construction of ecological civilization; for the neatness of the village, the indicators are basically changing in a more positive direction, which shows that the outstanding work done by the local government in the construction of ecological and civilized villages has shown the results. Of course, in terms of the contribution rate of rural scientific and technological progress, there is still a lot of room for development in the region. It also shows that local economic development still belongs to the traditional economic development model, and it is necessary to actively introduce more science and technology to strengthen the momentum of economic development. In this case, the clean energy utilization rate in the village is low. In the process of building an ecological civilization, we must pay attention to the combination of ecological protection. That is how clean energy works [7]. In terms of the education level of the villagers, the average education period of the villagers is 6 years. That means the majority of villagers graduated from primary school. In the future development process, it is necessary to raise the importance of education development that it can be more comfortable for accepting new things. The control of civil disputes and criminal cases is relatively well in place in the region. There is a tendency to reduce such cases year by year, indicating that the security situation in the village is great.

5 Conclusion and Enlightenment

Take the Jinping Town of Yibin City as an example in the poverty-stricken mountainous area in the southwest of Sichuan Province, the overall indicator for the construction of ecological and civilized villages in 2018 reached 80.28%, indicating that the ecological civilization construction in the region is on the right track and is gradually improving the areas that are not up to standard. Under the guiding ideology of "Build roads before you want to be rich", the road leading to the town is also accelerating the improvement work of the construction of ecological civilization. The former village road has been widened from 3.5 meters before to the current 5 meters, reflecting that the work in the region has been paid more and more attention to the economic construction and the appearance of the village. It also shows the determination of government departments to build ecological civilization. In the future construction work, it is very important to increase the introduction of science and technology. The scientific contribution rate

in this region is only 67.50%, and there is still much room for improvement. It is imperative to transform from the traditional economic development model to the scientific economic model. At the same time, the clean energy utilization rate of the region is only 62%, which shows that the villagers have a slight lack of knowledge on ecological protection [8]. It is necessary for the government departments to increase the propaganda in these areas and gradually improve. The future work needs to focus on the construction of civilization, such as education, villagers' cultural activities and so on to improve the interest and knowledge of the villagers' civilized construction, strengthen the construction of rural reading rooms, entertainment stations, cultural and leisure squares, and actively promote healthy entertainment activities and rural democracy construction and combine local development bottlenecks to build. Taking Jinping Town of Yibin City as an example, the region in the poor mountainous area of southwest Sichuan Province is built into an ecological civilization area of southwest China with demonstration effect.

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