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Heritage Protection Perspective of Sustainable Development of Traditional Villages in Guangxi, China

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Abstract: China's rapid urbanization process has had a significant impact on traditional villages, and a series of problems, such as heritage destruction, space abandonment, and population loss, have emerged. The village protection and development research process is considered to be a critical turning point. This paper aims to build a scientific evaluation system for the sustainable development of traditional villages in Guangxi, seek the contemporary development value in the process of heritage protection, and solve the contradiction between protection and development. In order to achieve this goal, firstly, relevant data from six sample traditional villages were obtained through the use of field surveys, in-depth interviews, and questionnaire surveys. The key indicators were determined by using the Delphi method and the analytic hierarchy process for scoring and evaluation, and the factors were given corresponding weights to complete the construction of the evaluation system and the classification of sustainable development levels. Secondly, the elements, functions, and values of traditional village heritage were statistically classified, and the differences between preserving the natural, historical living environment and adapting to modern development needs were analyzed. The results show that the sustainable development level of traditional villages in Guangxi needs to be balanced, and that the development degree in the living spaces and production spaces of villages in different distribution areas of geomorphic types is different. Therefore, additional protection and development modes should be adopted according to the specific environmental conditions of the traditional villages. Finally, this study proposes relevant heritage space protection and development strategies from aspects of heritage value extraction, characteristic industry development, spatial resources, and environment distribution, hoping to narrow the development gap between villages and to promote the sustainable development of village heritage spaces.

Keywords: village heritage; Guangxi traditional villages; space protection; sustainable development

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1. Introduction

1.1. Background

Traditional village refers to a spatial unit composed of people who have lived and reproduced in a fixed area in China for a long time [1] and who are mainly engaged in agricultural production. It retains much cultural heritage information, such as traditional architecture, production techniques, spiritual concepts, and folk etiquette [2]. It is an important carrier of and witness to China's rural society and farming culture. Traditional villages, formerly known as "ancient villages", were formed and developed in ancient times. In 2012, the Research Center for the Protection and Development of Chinese Traditional Villages officially changed the name from "ancient villages" to "traditional villages" [3]. At the same time, China's Ministry of Housing and Urban–Rural Development, Ministry of Culture, and other departments issued the Notice on the Survey of Traditional Villages, which pointed out that traditional villages refer to early villages that are rich in traditional resources and that have specific historical, cultural, scientific, artistic, social, and economic

values [4]. In 2012, 2013, 2014, 2016, 2019, and 2022, China published six batches of the "List of Chinese Traditional Villages"; a total of 8957 villages were recognized as national-level traditional villages and given corresponding legal status and ranked.

Increasing attention has been paid to protecting traditional villages. However, in recent decades, constant urban expansion has led to many villages' rapid decline or disappearance. For example, China's urbanization rate was only 17.9% in 1978, but increased to 36.2% in 2000 and reached 60.6% in 2022. In the face of such rapid development, there are also many drawbacks. Some local governments, to achieve performance goals, have misunderstood the value in traditional villages, using the thinking of urbanization and industrialization to build traditional villages, blindly demolishing many old buildings, and some villages have lost long-term value in terms of ecological, cultural, and economic sustainability.

In the face of a series of questions and phenomena such as accelerated urbanization, lagging rural construction and development, the continuous destruction of the living environment, and the continuous loss of villagers, the protection of traditional villages has also attracted the attention of scholars from all walks of life, and has become a hot topic in ethnology, sociology, architecture and other disciplines in China. With the implementation of China's rural revitalization strategy, more and more traditional villages have been developed [5]. Of course, corresponding difficulties have also been encountered during the study of village protection. Some scholars have questioned and reflected on the current protection methods used for traditional villages. In the past, research on the protection and utilization of traditional villages was mainly one-sided and focused on static protection, by turning them into "museums"; however, preserving lifeless remains is not ideal [6,7]. Therefore, it is urgent to research strategies for the survival and protection of traditional villages. Suppose the preservation of traditional villages is divorced from residents' real-life and development needs. In that case, the dilemma of traditional villages can only be partially solved even though a large amount of money is spent. Therefore, it has become an inevitable trend to study the sustainable development of traditional villages.

With the addition of Xidi Village, Hongcun Village, Kaiping Diaolou Village, and Fujian Tulou Village to the World Cultural Heritage List, the international community has recognized the role of traditional Chinese village heritage in the process of social and historical development. As an ethnic minority region along China's border and coastal areas, Guangxi is home to 12 ethnic groups, with a population of 20.77 million [8]. It has many traditional villages with long histories and unique characteristics, distributed in mountainous areas, hills, plains, coastal areas, and other landforms and exhibiting more than ten architectural forms. It contains rich historical information, cultural landscapes, and architectural skills [9]. However, the existing research on the protection of traditional villages in Guangxi could be undertaken faster, and research related to sustainable development needs to be completed. Therefore, this paper analyzes the status of the sustainable development of traditional villages in Guangxi from the perspective of heritage protection. By studying relevant heritage elements and growth-influencing factors, it constructs an evaluation system of the sustainable spatial development of traditional villages. Six typical traditional villages in Guangxi were selected as the sample villages used for this research. Based on the analysis of the spatial development status of traditional village heritage, appropriate sustainable development strategies are proposed for local governments.

1.2. Literature Review

The research literature on traditional Chinese villages has undergone several stages of development, and protection and utilization are the two key themes present in the research process. Previous studies focusing on traditional villages paid more attention to village hollowing out, regional protection, local cultural connotations, renewal mechanisms, spatial distribution, value recognition, development connotations, etc. Tourism planning and the development of traditional villages have also achieved more results and sound bites. Pang, J discussed the influence of changing public spaces in Zhuang villages, in Guangxi, on local memory, and formulated research principles and paths for reconstructing village

public spaces [10]. Bian, J adopted a geographic information system, spatial analysis, and mathematical statistics to analyze the spatial distribution characteristics and influencing factors affecting traditional Chinese villages, and concluded that the spatial distribution pattern of China is unbalanced, showing the characteristics of an agglomeration distribution, revealing the complex and diverse characteristics of traditional villages [11]. Based on the theory of rural value, Li, W.H. carried out innovative practices of inheritance and the protection of different types of traditional villages and built an integrated, shared, and co-construction mechanism of traditional village value dynamic inheritance and rural revitalization [12].

Theoretically, many research results have been achieved regarding the protection of traditional villages. However, problems still need to be solved, hence the need for more in-depth and comprehensive research. Previous research focused more on the material and intangible cultural characteristics of traditional villages, then, after a series of practices and setbacks, the research trend gradually shifted to the study of people and the countryside [2], and began to pay attention to such issues as village human settlement environment, village governance, heritage activation, resource evaluation, and value recognition. The research content involves theoretical and policy analysis under the background of new-type urbanization, rural revitalization, and urban–rural community construction. The sustainable protection and development of traditional villages became the focus of the research during this period.

Therefore, how to make sustainable use of village heritage, coordinate the relationship between protection and development, and promote the sustainable development of traditional villages have become significant issues faced by the whole of society [13]. In addition, the scientific establishment of a sustainable development system has become a concern of current managers and researchers [14]. Some scholars believe that sustainability includes economic, environmental, and socio-cultural dimensions, and that it is characterized by ecological sensitivity, economic feasibility, and social equity, taking joint development as the ultimate development goal [15,16]. As the chairman of the jury of the Pritzker Prize mentioned when discussing the reason for giving the award to the Chinese architect Wang Shu, "Discussing the appropriate relationship between the past and the present is a critical issue today because the current process of urbanization in China is triggering a discussion on whether architecture should be based on tradition or only oriented to the future." [17].

In recent years, discussions concerning heritage and sustainable development have expanded to a more significant level. Barthel Boucher proposed that the cultural heritage pathway could be a valuable tool to solve the challenges related to maintaining a sustainable environment, emphasizing the tradeoff between scientific viewpoints, moral values, and traditional conservation techniques, and considering heritage as a social welfare [18]. In addition, heritage sustainability issues have expanded to issues related to social justice and a commitment to creating livable communities for all. This expanded research is reflected in rural areas, often in the broader understanding and development of village resources and the value of benefit distribution and reuse in the process [19]. Using the international mechanism for sustainability and ecological community assessment, Chang and others developed a model to examine ecological issues, safety, and disaster prevention for rural development. The results can be used to deal with problems such as rural development, reducing global warming, and improving rural ecology and living spaces [20]. Dumreicher's team conducted a five-year study of the SUCCESS project in rural China, aiming to build an image of the future with sustainable development. They are more concerned about establishing the importance of the rural environment and residential space as the foundation of China's future [21]. Xiao, Y analyzed the causes of sustainable change conditions by establishing the minimum cumulative resistance (MCR) model, and proposed to implement scientific land use development planning and ecological restoration suggestions to protect the ecosystem, and improve the sustainability of traditional villages, in Qiannan Prefecture [22]. While rethinking the development of industrial societies, research relating to sustainability has shifted to focus more on the wisdom of indigenous

communities in ecological restoration as a potential means of reversing global power dynamics [23].

The sustainable development of traditional villages is related to preserving traditional culture and renewing the modern lifestyle of most rural residents in China. It contributes to protecting the diversity of the world's rural heritage. This study has three main objectives: (1) Use the Delphi method to select critical indicators from numerous influencing factors, and classify and grade them, and then scientifically construct an evaluation system for the sustainable development of traditional villages in Guangxi and realize the classification of the sustainability levels of traditional villages by scoring the sustainable development of villages. (2) Perform a statistical analysis of the elements, functions, and values of traditional village heritage spaces and clarify the classification of heritage elements, the division of function types, and the demarcation of value levels, and provide a clear organizational framework for the protection of traditional village heritage spaces in Guangxi. (3) Based on the analysis of the differentiated development needs among different types of traditional villages, provide relevant strategies and suggestions for the sustainable development of traditional villages from the aspects of heritage value extraction, characteristic industry development, spatial resources and environment distribution, etc., to guide the scientific and orderly development of traditional villages in Guangxi and to solve the contradiction between protection and development.

2. Methods

2.1. Study Area

The study area is located in Guangxi Province in southern China, a border province that borders Vietnam. The region's total land area is 236,700 square kilometers, accounting for 2.47% of China's total area, ranking 9th among the provinces in China. Located in the subtropical zone, there are numerous rivers and mountains. The climate is hot, humid, and rainy. The population is distributed across 11 ethnic minorities, namely Zhuang, Jing, Miao, Mulam, Shui, Hui, Yao, Yi, Gelao, Maunan, and Dong. In the sense of law, traditional villages in China are assigned to three levels: the national level, the provincial level, and the city level. Among them, the traditional villages listed at the national level have the highest level, which is highly represented in the distribution of traditional buildings, village planning and location selection, and intangible cultural heritage. Based on fully considering the differences in the selected batch, site selection, heritage type, location and transportation, spatial form, and the protection of traditional villages, the research team decided upon six national-level traditional villages as sample villages to carry out the field research. The basic information related to these villages is shown in Figure 1 and Table 1.

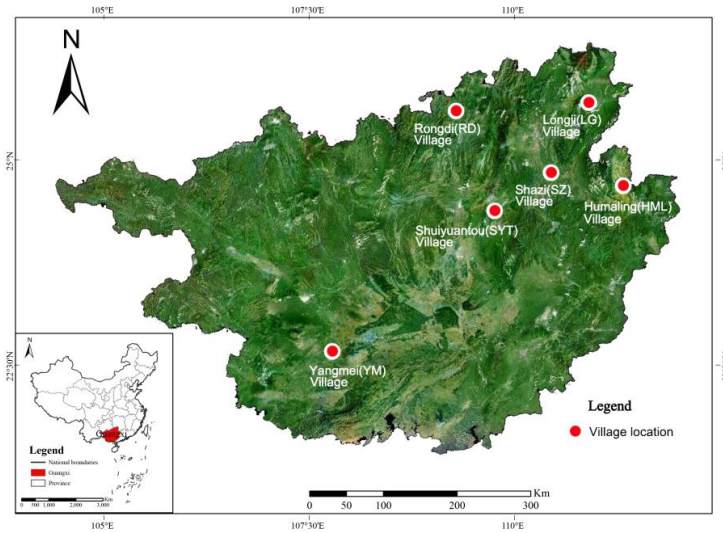


Figure 1. Distribution of sample traditional villages.

Table 1. Basic information of the case villages.

Village Name	Geographical Position	Type	Information and Characteristics
Longgi	Longji Town, Longsheng County, Guilin City	Alpine slope	The population is 6734 (2021), and the inhabitants are people of the Zhuang minority; the location of the village is relatively high, and the average altitude is 800 m; the industries are mainly agriculture, forestry, mineral resource development, and tourism; the natural and cultural landscapes are rich, and there is the famous Longji Terraced Field Scenic Area.
Rongdi	Strong Township, Rongshui County, Liuzhou City	Alpine slope	The population is 1287 (2021), and the inhabitants are people of the Dong minority; the average altitude is 810 m; the industries are mainly agriculture, animal husbandry, forestry, and tourism; the natural landscape resources, ethnic history, and cultural resources are rich.
Shuiyuantou	Baishi Township, Xing'an County, Guilin City	Hilly valley	The population is 416 (2021), and the inhabitants are people of the Han nationality; the average altitude is 250 m; there are large-scale building complexes; the industry is mainly based on agriculture and tourism; the historical and cultural landscape is rich, and there is the famous Qin Family Courtyard scenic spot.
Humaling	Xinhua Township, Fuchuan County, Hezhou City	Hilly valley	The population is 496 (2021), and the Yao minority population accounts for the majority of the inhabitants; the geographical location is unique; the average altitude is 320 m, at the junction of three provinces; the industry is mainly based on agriculture and aquaculture; Yao dance is included in the list of intangible cultural heritage.
Yangmei	Jiangxi Town, Jiangnan District, Nanning City	Plain waterfront	The population is 5042 (2021), and the Han nationality population accounts for the majority of the inhabitants; the average altitude is 70 m; it is surrounded by rivers on three sides (Zuojiang, Youjiang, and Yongjiang) and has eight wharves; the industries are mainly agriculture, aquaculture, and tourism; the historical and cultural landscape is outstanding.
Shazi	Shazi Town, Pingle County, Guilin City	Plain waterfront	The geographical position is superior, with a population of 480 (2021); the average altitude is 100 m; it is located at the junction of three counties, with highly convenient land and water transportation. The village is situated in the back of the mountains and faces the water. The industries are mainly agriculture, handicrafts, and commerce. The town has many historical streets and traditional buildings.

2.2. Data Source

The research group carried out a three-month field survey, field interviews, and questionnaire surveys. The research data mainly included the following five types of information: population, economy, and related planning data; public service, industrial scale, and environmental governance data (D18–25, D41–44, D56–59), which were obtained from various yearbooks of the National Bureau of Statistics, population or agricultural census, data and the Guangxi public data open platform; traditional building quantitative data (D1–13) and ecological landscape data (D14–16, D45–55) and other statistical data from the municipal government and township government portals; the historical and humanistic data (D26–31) were obtained from related news reports and academic literature collation; and the production and legacy development data (D33–40) were obtained through interviews, questionnaires, and operational data collection.

2.3. Methods

2.3.1. Field Investigation

Fieldwork is a standard method in anthropology. This paper adopted the method of field investigation to obtain data, and tried to understand and grasp the actual local situation as much as possible to provide a reliable, realistic basis for the research. Through long-term field observation, the villagers could achieve a detailed understanding of. and

experience with, participating in the investigation [24]. According to the different situations in the communication with villagers, the full use of structured, semi-structured, and unstructured interviews can enrich the first-hand information of the field investigation. From December 2021 to February 2022, the authors inspected six sample villages and learned about their development history through taking photos, participatory observation, surveying, and mapping.

2.3.2. Interview and Questionnaire Survey

The study adopted semi-structured, in-depth interviews and participant observation methods, combined with online websites, paper newspapers, and other literature, to collect qualitative data from six villages. By visiting village committees, households, heritage sites, production and operation institutions, and other places, six types of interviewees were identified by random sampling, including resident village cadres, middle school teachers, left-behind elderly, non-genetic heirs, foreign tourists, and local farmers. The questionnaire covers villagers' living conditions, production and operation conditions, and the ecological development environment, including village population composition, architectural history, cultural information, living and living conditions, public service facilities, production and management, environment for heritage development, and restrictions on their product. Through the use of a questionnaire survey, interviews, and field investigations, the actual situation of the six traditional villages was more accurately presented, and problems existing in the development of villages were summarized, which is conducive to in-depth research on the future sustainability of traditional villages.

2.3.3. Index Screening

The hierarchical design of the evaluation index system can be classified into the objective, criterion, and index layers. First, starting from the primary conditions, such as the terrain and location of Guangxi, and following the objective, scientific, and feasible principles, the objective layer was constructed from the three dimensions of living construction, agricultural production, and ecological protection, namely the general index of achieving sustainable development. The criterion layer was mainly set according to the connotations of spatial functions. It refers to the evaluation and identification index system of traditional villages, key points in formulating a plan for the protection and utilization of traditional villages in China in 2020, a technical guide used in the assessment of resource and environment carrying capacity and the suitability of territorial space development, and the progress of local heritage protection. The index layer is the specific index used to measure each sub-function, focusing on measuring the function size of different evaluation units. The evaluation factors of ecological space sustainability were selected from the perspective of the importance of their ecosystem service function and ecological sensitivity [25]. In contrast, production and living sustainability were set from the perspective of topographic conditions, architectural heritage conditions, historical and cultural conditions, geological disaster conditions, land production status, and other conditions [20]. The key indicators were selected by analyzing and concluding the index screening process of the above principles and analyzing the collected expert feedback and questionnaires. These indicators were derived from three major categories (Tier B), 15 medium categories (Tier C), and 59 small categories (Tier D). Through field interviews and questionnaires, it was found that the per capita road area, number of squares, tourism income, public parking spaces, road convenience, heritage attraction, production form, and renewable energy utilization rates were the issues that local villagers pay close attention to.

2.3.4. Index System Construction

Based on the main spatial types, structures, and divisions of the sustainable development of traditional villages, the functional interaction mechanism, which refers to the relevant research results, and combined with the respective functional characteristics of

the study region, the evaluation index system of the sustainable spatial development of traditional villages in Guangxi was constructed.

Living space refers to the space requirements for living, resting, communication, entertainment, tourism, and other functions given to human beings in the process of survival and development. Therefore, the overall goal of living space is to build a sustainable modern rural living space. It comprises four sub-functions: living communication, recreation, safety and convenience, and history and humanity. Thirty-two indices, including terrain slope, building type, street width, and the number of major historical events, were selected to measure the sustainable living function of the space.

Lefebvre's theory of space production argues that space is generated from the production activities present in human societies [26]. Production spaces guarantee human existence, providing products and services for human beings and solving problems related to survival and livelihood. The deeper that the future industrial development of the village integrates with the local characteristics [27], the higher the vitality level of its production field [16]. Therefore, the overall goal of production spaces should be to build a rich industrial environment and achieve sustainable development of the production economy. This comprises three sub-functions: production environment, heritage development, and financial industry. Twelve indicators, such as soil texture, production form, and villagers' employment rate, were selected to evaluate the sustainable production function of spaces.

Ecological spaces refer to areas with conservatory, regulatory, ecologically protective, and ecological service supply functions, that are formed by human beings in the process of material circulation and energy conversion, that maintain life through the use of nature. It is the sum of the material and spiritual achievements made by human beings through their interaction with the original ecological environment and includes two major parts, as follows: material ecology and spiritual ecology [28]. Precisely, material ecology consists of the characteristics of the natural environment and the spatial characteristics of the village. The larger the material heritage, the more distinctive and diversified the village. Spiritual ecology is composed of political organization ecology and cultural ecology [29]. The better the villagers' awareness and participation, the more influential the political organization ecology of the village [16]. Therefore, the overall goal of ecological spaces is to establish an environmental pattern characterized by political stability, ecological conservation, and cultural carrying functions. It comprises the following three sub-functions: natural landscapes, cultural landscapes, and restoration and governance. Fifteen indicators, such as the forest coverage rate, public participation rate, and renewable energy utilization rate, were selected to quantify the sustainable ecological functions of a space.

2.3.5. Expert Consultation

Delphi's method can reflect objective facts to some extent, and integrate most experts' experience and subjective judgments. The selection of experts is the key to the success or failure of the Delphi method [30]. According to the criteria for selecting consulting experts, experts should not be limited to one field. The selection of experts should be a purposeful procedure, generally involving 15 to 50 people [31]. Considering that there are many professional fields involved in the sustainable development of traditional villages, the researchers of this paper selected experts from several related fields, including heritage conservation (3), geography (3), architecture (3), ecological environment (3), social economics (3), and historical humanities (3), a total of 18 experts. As the research area is located in Guangxi, these experts are distributed across universities and relevant government departments in Guangxi. They have been engaged in traditional villages for a long time and enjoy high prestige in society.

This consultation was carried out in two different periods. The first round was mainly to score the importance of the primary indicators and fill in the expert information. By counting the scoring results of the experts, four low-volume indicators, such as the average, the number of fractions, and the coefficient of variation, were excluded: commercial value of heritage, heritage style, residential comfort level, and protection degree. In the second

round, the experts scored the revised indicators again. Finally, they formed an evaluation system for the sustainable development of traditional villages that included three first-level indicators, fifteen second-level indicators, and fifty-nine third-level indicators.

2.3.6. Weight Determination and Scoring Criteria

As the effect and influence of each evaluation index are different, it is necessary to assign relevant weights to each index. This paper uses the Delphi method and analytic hierarchy process to determine the weights of each evaluation index of the living, production, and ecological spaces. Delphi's method can reflect objective facts to a certain extent and integrate most experts' experiences and subjective judgments. Eighteen experts, in related fields, were consulted to score the indicators for evaluating the sustainability of various spaces. The weight of each index is made more objective through the analytic hierarchy process (AHP) formula algorithm. The SPSS software was used to ascertain the score value, construct the judgment matrix, and calculate the feature vector of the judgment matrix and the weight of each index factor. Finally, a consistency test was carried out, and the weight data of each factor were derived after passing the test. A comprehensive evaluation includes qualitative and quantitative indicators. Focusing on qualitative indicators, five grades (I, II, III, IV, V) were established to represent the corresponding state, and 20 points were assigned to each grade; that is, the score intervals of the stages are 0–20, 21–40, 41–60, 61–80, and 81–100. The corresponding five-grade percentage system score was formulated according to the quantitative indicators and the relevant standards. The higher the evaluation score, the higher the sustainability, and vice versa. The evaluation score used was a 100 points system; that is, the best score is 100 points, the worst score is 0 points. The specific formula is as follows:

$$O = \sum_{i=1}^{n} X_i Y_i \times 100$$

where O is the core value of the comprehensive evaluation, X_i is the quantitative value of the index, Y_i is the weight of the index i, and n is the number of items included in the evaluation item. The evaluation index system is shown in Table A1 in Appendix A.

3. Results

3.1. Index Weight Value Analysis

According to the AHP model of the sustainable spatial evaluation of traditional villages in Guangxi, the questionnaire was assigned to 18 experts for evaluation, and the weight of the score was determined. The software calculated the final weight value of the indicators in the evaluation system. During this period, 60 villagers were visited, and the questionnaires, determined by experts, were distributed to the villagers to participate in the evaluation through meetings and questionnaire interviews. From the distribution of the weight ratio, the factors that influence sustainable spatial development are as follows: living space > production space > ecological space. Based on the comprehensive analysis of the living space criterion layer, traditional architecture, C1, (0.1319), cultural heritage, C7, (0.0853), and entertainment square, C3, (0.0608) have higher weights, while public service, C6, (0.0256) has a lower weight. In the criterion layer of production space, the weight of economic industry, C11, (0.3675), is the largest, while the weight of the production environment, C9, (0.077), is the lowest. In the ecological space criterion layer, the weight of the natural landscape, C12, (0.088), is the largest, while the weight of restoration and governance, C14, (0.048), is low. Combined with the actual development situation of traditional villages in Guangxi, it can be seen that the material basis is always the most important influencing factor on the road toward sustainable development, which is precisely in line with the backward economic development data, the continuous outflow of population, the severe hollowing out of rural areas, and other phenomena in Guangxi. Guangxi has a perfect ecological environment, and rural residents also advocate feng shui and maintain advanced ecological values, which are well-known throughout the country. Therefore,

faced with the process of the sustainable development of traditional village environmental spaces, the pressure is usually relatively small.

According to the weight analysis at the sub-index factor level, the main indices that have a significant impact on the spatial sustainability evaluation of traditional villages in Guangxi are the richness of building functions, D6, (0.0437), street width, D8, (0.0117), type of square, D11, (0.0231), disaster prevention distance, D18, (0.0102), utilization frequency of public service facilities, D23, (0.0121) and heritage type of production, D26, (0.0376), the number of historical figures, D31, (0.0201), the form of production, D36, (0.0325), the proportion of secondary and tertiary industries, D41, (0.1398), the type of natural landscape, D48, (0.0281), and historical sites, D51, (0.0231) (Table 2).

Table 2. Layer weight value analysis.

Layer B	Weight	Layer C	Weight	Layer D	Weight	Layer C	Weight	Layer D	Weight
B1	0.45	C1	0.1319	D1	0.0093	C5	0.0331	D18	0.0102
				D2	0.0369			D19	0.0061
				D3	0.0118			D20	0.0077
				D4	0.0157			D21	0.0091
				D5	0.0145			D22	0.0058
		C2	0.0309	D6	0.0437	C6	0.0256	D23	0.0121
				D7	0.0098			D24	0.0029
				D8	0.0117			D25	0.0048
				D9	0.0094				
		C3	0.0608	D10	0.0176	C7	0.0853	D26	0.0376
				D11	0.0231			D27	0.0094
				D12	0.0103			D28	0.0179
				D13	0.0098			D29	0.0204
		C4	0.0388	D14	0.0073	C8	0.0436		
				D15	0.0124			D30	0.0134
				D16	0.0108			D31	0.0201
				D17	0.0083			D32	0.0101
B2	0.35	C9	0.077	D33	0.013	C11	0.3675	D41	0.1398
				D34	0.0161			D42	0.033
				D35	0.0154			D43	0.1249
				D36	0.0325			D44	0.0698
		C10	0.0945	D37	0.0321				
				D38	0.0199				
				D39	0.034				
				D40	0.0085				
B3	0.2	C12	0.088	D45	0.0097	C14	0.048		
				D46	0.0203			D56	0.0172
				D47	0.0088			D57	0.0128
				D48	0.0281			D58	0.0062
				D49	0.0062			D59	0.0116
				D50	0.0149				
				D51	0.0231				
				D52	0.0153				
		C13	0.064	D53	0.0071				
				D54	0.01				
				D55	0.0085				

3.2. Evaluation Results

By assigning the corresponding weight to the evaluation factor, the weight of the element and the evaluation value can then be multiplied to achieve the evaluation score of each space (Table 2). The larger the evaluation score, the higher the spatial sustainability, and vice versa. According to the total score of the evaluation, the results were divided into five grades, as follows: the most sustainable (80–100), highly sustainable (60–80), medium sustainable (40–60), low sustainable (20–40), and unsustainable (0–20). The evaluation

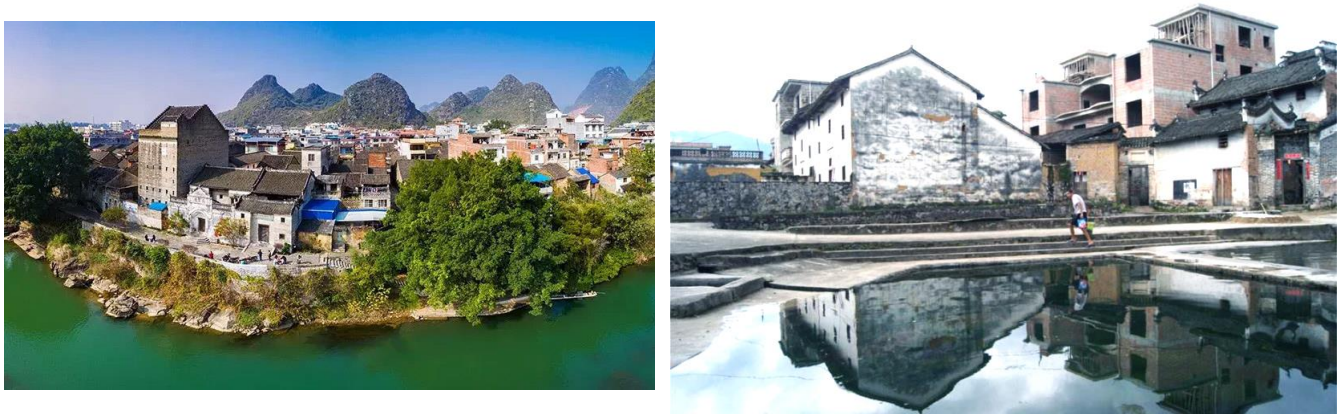
score of each index and the classification of the sustainability grade, are convenient for researchers to better understand the status quo of sustainable development of traditional villages in Guangxi and the differences of specific spaces. The grades of sustainability of traditional villages are shown in Table 3. The abbreviations of village names are as follows: Longji (LG), Rongdi (RD), Shuiyuan (SYT), Huma Ling (HML), Yang Mei (YM), and Sand (SZ).

3.2.1. Living Space Evaluation

According to the evaluation results of the living space sustainability of the six villages, YM, SZ, LG, and SYT had high levels of sustainability, and RD and HML had medium levels of sustainability. Among these villages, YM (Figure 2) and SZ (Figure 3) belong to plain waterfront villages with excellent location conditions and are close to towns, have flat terrain and a high traffic convenience, a large land scale, concentrated residential areas, and a wide range of infrastructure services, reflecting a high level of public services. This type of village is generally distributed along rivers and land routes. As a result of the developed transport by water, the number of piers in many squares is also increasing, attracting more foreign tourists and an intense business atmosphere.

(**a**) (**b**)

Figure 2. (**a**) Yangmei Village; (**b**) Yangmei Village Heritage Style.



(**a**) (**b**)

Figure 3. (**a**) Shazi Village; (**b**) Shazi Village Heritage Style.

Table 3. Sustainability assessment scores of six traditional villages.

Layer B	Score						Layer C	Score						Layer D	Score						Weight
	LG	RD	SYT	HML	YM	SZ		LG	RD	SYT	HML	YM	SZ		LG	RD	SYT	HML	YM	SZ	
B1	32.416	22.766	31.344	24.39	36.758	28.512	C1	11.032	7.306	11.324	8.792	12.954	9.898	D1	0.186	0.186	0.744	0.744	0.93	0.93	0.0093
														D2	3.69	2.214	3.69	2.214	3.69	2.952	0.0369
														D3	0.708	0.472	0.708	0.236	0.944	0.708	0.0118
														D4	0.628	0.942	0.942	0.942	1.57	0.942	0.0157
														D5	1.45	0.87	0.87	1.16	1.45	0.87	0.0145
														D6	4.37	2.622	4.37	3.496	4.37	3.496	0.0437
							C2	1.44	1.712	2.096	1.908	2.292	2.096	D7	0.784	0.588	0.784	0.784	0.98	0.784	0.0098
														D8	0.468	0.936	0.936	0.936	0.936	0.936	0.0117
														D9	0.188	0.188	0.376	0.188	0.376	0.376	0.0094
														D10	1.056	0.704	0.704	0.704	0.704	0.704	0.0176
							C3	3.834	2.628	3.02	2.422	3.482	2.824	D11	1.386	0.924	0.924	0.924	1.386	0.924	0.0231
														D12	0.412	0.412	0.412	0.206	0.412	0.412	0.0103
														D13	0.98	0.588	0.98	0.588	0.98	0.784	0.0098
														D14	0.73	0.73	0.584	0.73	0.73	0.73	0.0073
							C4	3.498	3.498	3.136	3.282	3.282	3.282	D15	1.24	1.24	1.24	1.24	1.24	1.24	0.0124
														D16	0.864	0.864	0.648	0.648	0.648	0.648	0.0108
														D17	0.664	0.664	0.664	0.664	0.664	0.664	0.0083
														D18	0.204	0.408	0.408	0.612	1.02	1.02	0.0102
							C5	1.12	1.324	1.628	1.528	2.24	2.058	D19	0.244	0.244	0.366	0.244	0.366	0.366	0.0061
														D20	0.308	0.308	0.308	0.308	0.308	0.308	0.0077
														D21	0.364	0.364	0.546	0.364	0.546	0.364	0.0091
														D22	0.348	0.232	0.232	0.348	0.348	0.348	0.0058
							C6	1.874	1.266	1.42	1.44	1.778	1.778	D23	0.968	0.726	0.726	0.726	0.968	0.968	0.0121
														D24	0.174	0.116	0.174	0.174	0.174	0.174	0.0029
														D25	0.384	0.192	0.288	0.192	0.288	0.288	0.0048
														D26	3.76	1.504	2.256	2.256	3.008	2.256	0.0376
							C7	8.342	3.958	5.902	3.944	7.778	4.898	D27	0.752	0.564	0.94	0.564	0.94	0.752	0.0094
														D28	1.79	1.074	1.074	0.716	1.79	1.074	0.0179
														D29	2.04	0.816	1.632	0.408	2.04	0.816	0.0204
														D30	0.268	0.268	0.804	0.268	0.536	0.268	0.0134
							C8	1.276	1.074	2.818	1.074	2.952	1.678	D31	0.402	0.402	1.206	0.402	1.608	0.804	0.0201
														D32	0.606	0.404	0.808	0.404	0.808	0.606	0.0101

Table 3. *Cont.*

Layer B	Score						Layer C	Score						Layer D	Score						Weight
	LG	RD	SYT	HML	YM	SZ		LG	RD	SYT	HML	YM	SZ		LG	RD	SYT	HML	YM	SZ	
B2	23.12	22.382	30.064	21.102	35.702	32.398	C9	2.58	2.58	5.12	5.12	6.092	6.092	D33	1.3	1.3	1.3	1.3	1.3	1.3	0.013
														D34	0.322	0.322	1.288	1.288	1.61	1.61	0.0161
														D35	0.308	0.308	1.232	1.232	1.232	1.232	0.0154
														D36	0.65	0.65	1.3	1.3	1.95	1.95	0.0325
							C10	5.84	5.102	6.35	3.78	7.56	6.312	D37	1.926	1.926	1.926	1.284	2.568	2.568	0.0321
														D38	1.194	0.796	1.194	0.796	1.592	1.194	0.0199
														D39	2.04	2.04	2.72	1.36	2.72	2.04	0.034
														D40	0.68	0.34	0.51	0.34	0.68	0.51	0.0085
														D41	5.592	5.592	5.592	5.592	8.388	8.388	0.1398
							C11	14.7	14.7	18.594	12.202	22.05	19.994	D42	1.32	1.32	1.32	1.32	1.98	1.32	0.033
														D43	4.996	4.996	7.494	2.498	7.494	7.494	0.1249
														D44	2.792	2.792	4.188	2.792	4.188	2.792	0.0698
B3	11.318	9.74	12.19	10.36	14.002	11.46	C12	6.566	6.424	6.582	6.582	7.108	6.352	D45	0.97	0.776	0.582	0.582	0.776	0.582	0.0097
														D46	1.624	1.624	1.624	1.624	1.218	1.218	0.0203
														D47	0.176	0.352	0.704	0.704	0.88	0.88	0.0088
														D48	1.686	1.686	1.686	1.686	2.248	1.686	0.0281
														D49	0.62	0.496	0.496	0.496	0.496	0.496	0.0062
														D50	1.49	1.49	1.49	1.49	1.49	1.49	0.0149
														D51	0.462	0.462	1.848	0.924	1.848	1.386	0.0231
														D52	0.306	0.306	0.612	0.306	0.918	0.918	0.0153
							C13	2.08	1.28	2.972	1.742	3.878	2.816	D53	0.142	0.142	0.142	0.142	0.142	0.142	0.0071
														D54	1	0.2	0.2	0.2	0.8	0.2	0.01
														D55	0.17	0.17	0.17	0.17	0.17	0.17	0.0085
														D56	0.688	0.688	1.032	0.688	1.032	0.688	0.0172
														D57	1.024	0.512	0.768	0.512	1.024	0.768	0.0128
							C14	2.672	2.036	2.636	2.036	3.016	2.292	D58	0.496	0.372	0.372	0.372	0.496	0.372	0.0062
														D59	0.464	0.464	0.464	0.464	0.464	0.464	0.0116
Amount	66.854	54.888	73.598	55.852	86.462	72.37	Amount	66.854	54.888	73.598	55.852	86.462	72.37	Amount	66.854	54.888	73.598	55.852	86.462	72.37	1

LG is a high-slope village with a complex terrain, with an elevation generally above 500 m. The settlements are small and scattered, and the buildings are mostly arranged along the mountain contour line, basically distributed on the cliff, mountainside, and steep slope [32]. It is difficult to construct buildings on steep slopes where the slope is more than 30°, and the living space is more cramped. The intuition is that space sustainability would not be very high, but the result is quite the opposite. According to the data analysis and evaluation results, LG has ten architectural functions, a rich architectural heritage, and many plazas. In geographically remote mountainous areas, which are less affected by urbanization, the life attributes of ethnic unity provide excellent regional characteristics. Residents create architectural forms and village layouts conducive to their survival and life, according to their living habits. Considering the narrow space for building, gravel and clay are used to construct platforms of corresponding height. The center of gravity of the buildings are directly located on the platform and embedded in the side of the mountain. Some overhead space is appropriately used to protrude outwards, forming the architectural form of stilted buildings and semi-stilted columns. The scattered spatial patterns built on the mountain, and the terraces distributed in the mountain, are perfectly integrated, and the production and living functions are integrated, forming a unique mountain natural landscape. The streets are mostly 2–4 m in width, providing good practicability and communication. The paving materials are mostly gravel or pebbles, sourced from between the mountains. The interaction between artificial structures and the natural environment reflects the strong living ability of the local villagers. The natural landscape of terraced fields also drives local tourism development. The ability to explore native plants and integrate them with the countryside is constantly improved, making local villagers feel a strong sense of satisfaction and exhibiting high livability and sustainability.

Of course, LG Village is a rare case. Not all villages with high mountain slopes are highly sustainable. RD Village (Figure 4) and LG Village (Figure 5) are both high mountain and slope villages, but the living space score was 22.766, about 10 points lower than LG Village. SYT (Figure 6) and HML (Figure 7) belong to hilly and valley villages, but the sustainability of the living space is different. The specific differences are reflected in the indices of traditional architecture, C1, cultural heritage, C7, and historical events, C8, while the scores of green landscape, C4, and emergency disaster prevention, C5, are similar.

3.2.2. Production Space Evaluation

According to the evaluation results of the sustainability of the production spaces of the six villages, YM scored the highest score, with SZ and SYT also at the highest sustainability level. Compared with other villages, YM Village has the most advantageous location conditions. It is 36 km away from Nanning, the central city of Guangxi, and Yongjiang on three sides (namely Zuojiang, Youjiang, and Jiangjiang); YM Village has a strong ability to receive resources and enjoys the honorary title of one of the four ancient towns in Guangxi. YM Village has rich tourism resources for heritage development (C11) and fulfils productive functions (C9). It has a good economic performance in relation to agriculture, forestry, animal husbandry, and fishing, and its per capita GDP income is very high (D42). The scores of SZ village and SYT village are close, the geomorphic conditions (D34) are relatively good, the distribution density of irrigation facilities (D35) is high, and the soil texture (D33) is primarily red and purple soil, which shows high production suitability and has the foundations required for the development of modern agriculture (D36). Of these two, SYT has great advantages in terms of the development of secondary and tertiary industries (D41) and population return rate (D43), which can be attributed to the development of heritage resources (Qin Jia Courtyard ancient building complex). It has become a famous film and television, scientific research, and photography base in China, promoting the employment of villagers and attracting the return of part of the population.

(**a**) (**b**)

Figure 4. (**a**) Rongdi Village; (**b**) Rongdi Village Heritage Style.

(**a**) (**b**)

Figure 5. (**a**) Longji Village; (**b**) Longji Village Heritage Style.

(**a**) (**b**)

Figure 6. (**a**) Shuiyuantou Village; (**b**) Shuiyuantou Village Heritage Style.

(**a**) (**b**)

Figure 7. (**a**) Humaling Village; (**b**) Humaling Village Heritage Style.

LG and RD ranked fourth and fifth, respectively. The scores of productive heritage development (C10) were similar to those of the top villages. However, the production environments and economic industries differed, and the scores could have been better. Due to the limitations of the terrain conditions, the villagers are mainly engaged in individual production on a small scale, which cannot be upgraded into a modern and collectivized form of mass production. The villagers are still at the self-sufficient small-scale peasant economy level and do not enjoy the benefits of modern advanced production technology. Despite the above difficulties, they are still at a sustainable high level according to the score, which is attributed to the fact that the existence of heritage resources has dramatically improved the villagers' internal ethnic and cultural identities, and the population has not been lost in large numbers. According to the field research and interviews, LG Village's government has developed more types of heritage projects by utilizing the natural environment and agricultural heritage resources to attract investment, maintain the economic income of villagers in the form of "production + tourism", and constantly attract tourists from outside the city to travel and consume. Now LG Village has famous visibility and influence in the world.

Although the C9 score of the production environment is at the medium level, the C10 and C11 are lower than those of the other villages. The main reason is that this village is located at the junction of Hunan, Guangdong, and Guangxi provinces, encouraging the continuous outflow of the already low population. Only some young and older adults stay in the village. The majority of the village's population is of the Yao minority, with a long history of dance culture. The Yao people attach great importance to folk culture. Therefore, young people who go out to work during holidays and festivals will come back to the village for a reunion. However, the vitality of the village still needs to grow, which also negatively impacts the sustainable development of the village.

3.2.3. Ecological Space Evaluation

According to the score results, YM Village scored a high level of sustainability, while the other five villages scored a medium level of sustainability. Ecological space determines the planning and layout of traditional villages in Guangxi. It is the material carrier of villages and the natural basis on which the residents live. The six cases of the villages selected in this paper cover the ecological space, which is composed of three different landforms: high mountain slopes, low hills, and plain waters. The total scores of YM Village's natural landscape (C12), cultural landscape (C13), and restoration and governance (C14) are all in leading positions. The landscape types (D48) are rich, covering six different types: mountains, water, forests, fields, lakes, and grassland. The ecological service capacity (D58) and public participation rate (D57) are continuously improving, along with the enhancement of heritage attractions and influence. In turn, it promotes the development of renewable energy utilization (D59), ecological restoration, and waste recycling (D56).

The high forest coverage (D46) scores and ecological land proportion (D49) of LG, RD, SYT, and HML are due to their natural geomorphic advantages. The space shows a high clustering and is less interfered with by human activities, but it also brings difficulties to highway construction and heritage development. The scores for renewable energy use and environmental cleaning could be better. The utilization rate of ecological resources is inferior to that of plain waterfront areas. Production, living, and environmental space are closely related and complementary, and no relationship will affect the sound and sustainable development of the whole village system.

3.3. Results Summary

The different landforms of the villages present different levels of sustainable development. Generally speaking, plain waterfront villages have advantages, such as population gathering, convenient transportation, suitable production, convenient irrigation, and abundant resources, so they exhibit higher levels of sustainable development. Hilly valley-type and high-slope-type villages are greatly affected by natural terrain environmental factors; the terrain is complicated, reclamation is relatively complex, and the road traffic construction process is slow. Small production scale and low levels of agricultural modernization will cause certain obstacles to large-scale planting and industrialization development, and the level of sustainable development needs to catch up to other types of villages.

The level of sustainable development presented by villages of the same landform type in living and production heritage spaces is at different levels, and the specific differences are mainly reflected in the quantity of traditional buildings, cultural heritage, and historical events. In the case of similar topography, the attraction level of the natural landscape remains stable, while the architectural relics and cultural heritage are characterized by distinct diversity, which plays a vital role in sustainable development.

In the process of analyzing the sustainable development of the spatial dimension of the ecological heritage of traditional villages in Guangxi, we found that the common features of these villages lies in the severe shortage of clean energy and low carbon utilization, which leads to the slow progress of ecological civilization construction at the level of sustainable development. Although these areas are environmentally friendly, the sustainable development of the environmental heritage space of traditional villages cannot be realized without the guidance of reasonable energy structures and effective policies, systems, and management supervision, and the residents here cannot truly transition from an agricultural society to a modern society.

4. Discussion

4.1. Analysis of the Heritage Value of Traditional Villages in Guangxi

The point of heritage preservation is to physically record where we were and how far away we are now. According to the index evaluation system, it can be seen that heritage elements play an essential role in the sustainable development process of life, production, and ecological space of traditional villages in Guangxi. The total scores of RD and HML were ranked as the last two. According to the scores of various indicators, the scarcity of types of heritage elements was an important reason. Therefore, it is necessary to discuss the heritage elements and spatial values of traditional villages to facilitate the future protection and development of traditional villages in Guangxi.

4.1.1. Heritage Element Analysis

Heritage mainly includes material and immaterial aspects, among which material heritage can be understood as both natural and manmade aspects. Natural heritage includes the terrain, landforms, hills, water systems, vegetation, animals, farmland, gardens, crops, landscape forests, feng shui forests, and other landscapes [26]. Traditional Guangxi villages cleverly use the natural environment to form a spatial pattern with solid regional characteristics during site selection, planning, and construction. Guilin's landscape has attracted a large number of foreign tourists. Its natural heritage value has been gradually

discovered and recognized by the world. Manmade material heritage mainly refers to various structures built by villagers using raw materials and traditional construction techniques, such as folk houses, ancestral halls, gatehouses, archways, temples, stages, bridges, ponds, streets, and other elements.

However, according to many surveys and studies, it is difficult for material heritage to directly assume the functions of social and economic life in modern rural areas [33]. Social progress also prompts residents to have more spiritual and cultural needs, and intangible heritage is becoming increasingly crucial in heritage protection, including villagers' daily lifestyles, social relations, and local culture. Guangxi is a city with a multi-ethnic population. Its intangible cultural heritage covers language, literature, music, dance, hand-and-mouth skills, worship, season, customs, and delicacies [27].

4.1.2. Heritage Space Value

The generation, retention, continuation, and death of heritage is the lifecycle of heritage, moving through the past, present, and future. People are forgetful, but historical heritage can help us remember; heritage value can help us to re-understand history, and links a nation's past and future. The traditional village heritage space in Guangxi is mainly divided into three categories: living, production, and ecology, each with different values and functions.

The living heritage space embodies the core value function of the village. The core space is usually the central symbolic building in the village, such as the drum tower, stage, or ancestral hall, where various social activities of the whole village are carried out. It is the spirit and activity center of the village and reflects the cohesion and organizational power of the core public area in the spatial order of the village.

The production heritage space undertakes the value function of the field in the village. Production spaces are usually restricted spaces, combining steps, roads, and paved floors into a complete form, so that villagers engaged in production activities can have a sense of belonging and security, thus becoming a positive space that promotes communication. At the village entrance, ancient trees are often planted to mark the village, indicating the boundary of the village domain and the marker and starting point for identifying the whole of the village environment.

The ecological heritage space performs the boundary value function in the village. The edge area of the village space is an environmental barrier composed of forests, mountains, water, and terraced fields. Traditional villages attach great importance to the relationship between architecture and natural landforms and the surrounding landscape environment when they are constructed, to form an overall coordinated, unified, and distinctive village space edge form, which is a kind of ecological support system that can resist natural disasters and realize the sustainable development of descendants' reproduction and livelihood.

After the above discussion, classification and classification construction will be carried out in combination with the relationship between heritage elements and heritage spatial value to present the aspects of Guangxi's traditional village heritage in a more straightforward manner (Table 4).

4.2. Spatial Sustainable Development Strategy of Traditional Villages in Guangxi

Previous studies on the protection and utilization of traditional villages have mainly focused on static protection. Issues such as the economic development level of some villages not being significantly improved, the ecological environment damage caused by excessive tourism development, and the copy–paste phenomenon of traditional villages caused by a lack of human factors, have yet to be fundamentally solved. There are still considerable obstacles to the protection and development of villages. On 14 February 2021, the traditional Wa village in Weng Ding Village, Yunnan Province, China, suffered a fire. More than one hundred ancient buildings burned down, only four survived, and the entire Wa historical heritage site was destroyed. The reason is that the old village's tourism company took the ancient village as a tourist base after the original residents moved, and

developed restaurants and tourist commodity stores. They only pursued economic benefits, lacked the support of the indigenous people, and failed to protect the ancient buildings, which led to the fire in the village. The most important issues are protecting ancient villages and preserving traditional historical culture [34].

Table 4. Guangxi traditional village heritage composition.

Category	Level	Material Heritage	Intangible Heritage	Value
Living space	First-order space	Folk houses; ancestral halls; gatehouses; archways; puddles; stage; temples; streets; drum towers; ancient trees; famous trees; ancient wells; sundecks; ferry; wharf	The national language; folk literature; folk art, folk music; folk dance; opera; folk art; folk acrobatics; life etiquette and customs; traditional sports	Core
Production space	Secondary space	Palace temple; Wind and Rain bridge; farmland; garden; pasture; grassland; workshop; mill; ditch	Traditional handicrafts; farming culture; Traditional medicine; production; trade customs	Domain
Ecological Space	Three-level spatial	Mountain; water; river; lake; terrace; landscape forest; "Feng Shui" forest	Folk beliefs; ecological living; folk customs; folk knowledge	Boundary

The protection of heritage sites should be a dynamic, constantly updating process, rather than a static museum [28]. The common problems faced by villages with less development are as follows: (1) The village characteristics need to be distinct, the exploration of connotation values needs to be expanded, and unified and effective planning needs to be improved. (2) Many villagers leave the village to work, causing severe population losses and economic downturns. (3) With increasing difficulties in inheriting historical culture and heritage values, the population retaining these values tends to be aging, and the discontinuity phenomenon arises. (4) The industrial structure is disorderly, the order cannot be formed, and the development form is simple.

4.2.1. Space Enhancement, Cluster Development Strategy

All of the traditional villages in Guangxi have unique environmental resources, which may be a natural geographic space composed of mountains and rivers, or a local cultural space composed of living customs, residential buildings, and history and culture. Heritage space, similar to an organism, may be aging or migratory, and needs to be multiplied and renewed with the development of the times. Space is relatively static; the diversity of human activities activates the space. To improve spatial vitality, requires an in-depth analysis of the constraints of village spatial development, relying on superior resources to cultivate characteristic industries, promote cluster development, improve the "hematopoietic" function of traditional villages, and build a sustainable system of self-survival, self-profit, and self-development of traditional villages.

There is a strong correlation between cultural and internet resources, tourism resources, and industrial resources in traditional villages, which has enough potential to encourage development [25]. Using spatial transformation, such as superposition, replacement, and renovation, legal resource protection is combined with modern life's needs. A new concept of combining the vitality of traditional village living spaces, agglomerating the scale of production spaces, and linking the development of the ecological area has been created; therefore, villages can continue surviving on their own natural and social conditions. The introduction of heritage conservation concepts through participatory learning, cultural design, and experience with agricultural tools has positively impacted local villages' sustainable development, and paved the way for local government officials and external stakeholders to demonstrate more creative opportunities [24].

For example, parking lots, tourist reception centers, and other buildings and landscapes with public service functions can be added to the village entrance square, appropriately endowing the heritage with new parts and values, improving the quality of life of the villagers, and enriching the experience and appreciation value of foreign tourists. The development of traditional villages is also a continuous organism, and the village

space needs to grow and be repaired to meet the needs of changing uses and functions. Christopher Alexander points out that, after comparing living and human habitation in terms of raw experience, cells need to be constantly repaired and adjusted, dead cells should be excreted, and damaged cells should be healed to maintain the primary form of the tissue.

4.2.2. Spatial Integration, Complementary Development Strategy

The purpose of spatial integration is to meet villagers' needs for diversified modern lifestyles. By exploring the relationship and function among material spaces, spiritual spaces, and social spaces, integrating relevant heritage elements to handle the relationship between tradition and modernity, and constructing a complementary system incorporating old and new, it is better to realize the interflow of resources between traditional villages and promote a reasonable and balanced spatial layout. The importance of cultural heritage as an enabler of sustainable development is widely acknowledged [35]. Agricultural production is the primary function of rural areas, but working in the same space for production would be boring. It is necessary to use local natural resources fully, integrate social elements such as history, culture, and customs to meet spiritual needs, transform the agricultural production mode, expand the agricultural planting scale, and innovate agricultural operation forms. Furthermore, products should be developed with local characteristics, forming a characteristic leading industry to realize the value of the social space level. Rural communities must develop several nonfarming activities coupled with agricultural systems (adapted to local geographical conditions), to become more resilient to economic shocks or environmental disturbances in the context of climate change [33].

For example, Rongdi Village (RD) and Humaling Village (HML), in the case of this paper, have low scores in terms of the production environment and heritage resources. The reason is that their space needs to be more organized and requires effective functional integration. These villages should rely on natural and cultural resources and historical sites, realize the diversification and compound extension of the industrial chain, integrate with culture, tourism, education, and other industries, and build multiple functional industrial spaces for heritage research, tourism, and cultural experiences, to create more jobs and attract young people to return and inject vitality for the sustainable development of the villages. Thus, realizing the sustainable and reasonable conversion of resources to assets.

4.2.3. Spatial Reconstruction, Symbiotic Development Strategy

Due to the impact of rapid urbanization, many peoples' lifestyles are constantly changing. There is indeed a difference between rural and urban cultural life. When rural areas cannot renew themselves, and provide supporting infrastructure and public services to meet the needs of modern life, there will be a certain degree of separation between traditional and contemporary spaces. Such phenomena as population mobility, space weakening, and even space loss will continue to occur. The symbiosis theory is introduced to promote the exchange of human, material, and information flow through space reconstruction, build a harmonious symbiotic environment, and form a new development mode highly complementary to urban resources. Strong evidence shows that the construction of heritage spaces is directly related to the revitalization of rural areas' social and economic structures, the most direct manifestation of which is the promotion of the development of heritage sites and the increase in the income of local villagers [36].

The three heritage spaces of living, production, and ecology are closely related in the time and space dimensions. They are interdependent and co-existing under the same social and historical development background, and have experienced human intervention and internal environmental restrictions in a comparable period. The three heritage spaces show strong vitality through the interaction relationship of power output, service supply and demand, material exchange, etc.

Therefore, under the background of heritage protection, symbiotic development will be more suitable for guiding the sustainable development of traditional village spaces,

creating new endogenous spaces with the help of the external environment, guiding its regular operation, and forming a symbiotic virtuous cycle, which is of great significance for the construction of sustainable development of traditional village spaces. The reuse of heritage spaces has a strong social relevance as a means of building and site regeneration, it is an exciting and helpful way to initiate or establish a close relationship with the site, as it is directly integrated into the needs of the new function and its contemporary historical creation, as well as being a means of building and site regeneration [37]. For example, adhering to the traditional village development concept of "promoting development through protection and protection through development", combined with the characteristics of village heritage to develop diversified industries while preserving the value of estate, providing new vitality to life, and displaying the cultural significance and artistic charm of local initiatives in a more direct way, which not only retains beautiful memories but also sustainably inherits them.

5. Conclusions

This paper innovatively constructs an system for evaluating the sustainable development level of traditional villages in Guangxi, and finds that the sustainable development level of traditional villages in Guangxi presents an unbalanced development state. Based on the spatial distribution of different geographical features in Guangxi, the sustainable development levels of three village types, namely basic waterfront type, hilly valley type, and high mountain slope type, are ranked from high to low, respectively. In addition, the relevant indicators also reflect the phenomenon that sustainable development has different characteristics in the three spatial categories of survival, production, and ecology, especially the development gap between the living space and the production space between villages is apparent. The research data also prove that the distribution and utilization of heritage space have the most direct relationship with the sustainable development of villages, which affects the growth and change of traditional villages in social, economic, and structural aspects. Therefore, given the adverse impacts introduced by multiple factors, such as the uneven distribution of heritage resources, differences in geomorphic spatial distribution, the abandonment of heritage space, and population loss, this study discusses the potential of heritage spaces in promoting the sustainable development of traditional villages as modern civilization progresses. By proposing three development strategies for heritage spaces, namely "spatial enhancement + industrial cluster," "spatial integration + resource complementarity," and "spatial reconstruction + village symbiosis," the authors hope to alleviate the low efficiency of sustainable development within traditional villages, and finally realize the balance between protection and development, while both witnessing its historical value and giving play to its current value.

According to our research results, more insights have been provided for future research, which can not only continue to excavate the historical and contemporary values of heritage spaces reflected in the development process of villages and cities, but also give full play to the advantages of traditional villages in coping with the challenges of global sustainable development beyond this study, which will help local governments issue more incentive policies and planning guidance. While protecting their material heritage, villages should promote the mining of regional history and culture and the inheritance of skills, reasonably allocate the infrastructure, industrial environment, and public services suitable for the lives of residents, and find a broad path for traditional villages to achieve international sustainable development. In short, this study's findings will help to provide systematic data and meaningful recommendations for regions and countries engaged in heritage conservation and research into sustainable rural development. We welcome scholars and stakeholders from all over the world who are interested in the heritage space of traditional villages to collaborate on the study and preservation of these authentic heritage sites.

However, this study has limitations, because it is still exploratory. First, the number of traditional villages is constantly updated every few years, and only six typical traditional villages were selected for analysis in this study. There needs to be more than a limited

sample size to represent other villages in Guangxi. In future studies, multiple villages should be selected in batches as much as possible, and their characteristics should be summarized. Secondly, sustainable development is a dynamic process, and its evaluation methods and basis will also change with the theme of the times, social progress, and the development of natural conditions. Moreover, rural heritage protection will also go through different stages of development, which also depend on the long-term persistence and maintenance of the local government. Therefore, future studies need to continue optimizing traditional villages' spatial sustainability analysis methods and follow up the follow-up survey in the previous period. Through dynamic difference analysis, we can further understand the influencing factors to measure the scientific nature of the research process and results at a particular stage, and finally realize the adaptive protection and sustainable development of traditional village heritage.

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Appendix A

Table A1. The evaluation system of sustainable development of traditional villages in Guangxi.

Layer B	Layer C	Layer D	Description of Factors				
Living space B1	Traditional Building C1	D1 Terrain Slope (°)	[0, 5)	[5, 10]	(10, 15]	(15, 25]	>25
		D2 Age (year)	>200	(100–200]	(50, 100]	(30, 50]	[0, 30)
		D3 Artifact scarcity	>5	(3, 5]	(2, 3]	[1, 2]	[0, 1)
		D4 Land size (ha)	>5	(3, 5]	(2, 3]	[1, 2]	[0, 1)
		D5 Occupation ratio (%)	>60	(40, 60]	(20, 40]	[10, 20]	[0, 10)
		D6 The richness of architectural functions	>5	(3, 5]	(2, 3]	[1, 2]	[0, 1)
	Road/street C2	D7 Street intersection distance (m)	(20, 40]	[0, 20]	(40, 60]	(60, 100]	>100
		D8 Street width (m)	>6	(4, 6]	(2, 4]	[1, 2]	[0, 1)
		D9 Road area per capita (m^2)	>10	(5, 10]	(3, 5]	[2, 3]	[0, 2)
	Entertainment plaza C3	D10 Number of squares	>10	(7, 10]	(4, 7]	[1, 4]	[0, 1)
		D11 Kind of plaza	>7	(5, 7]	(3, 5]	(2, 3]	[0, 2)
		D12 Public parking spaces (people/one)	[0, 1]	(1, 3]	(3, 5]	(5, 10]	>10
	Green landscape C4	D13 Age of history (year)	>100	(50, 100]	(30, 50]	[10, 30]	[0, 10)
		D14 Open area (%)	(80, 100]	(80, 100]	(50, 80]	(0, 50]	0
		D15 Convenience (m)	[0, 100]	(100, 200]	(200, 300]	(300, 400]	>400
		D16 Native plant species	>6	(4, 6]	(2, 4]	[1, 2]	0
		D17 Local integration ability	strongest	strong	moderate	weak	poor
	Emergency disaster prevention C5	D18 Disaster prevention distance	>500	(350, 500]	(250, 350]	[100, 250]	[0, 100)
		D19 Types of drainage facilities	>6	(4, 6]	(2, 4]	[1, 2]	0
		D20 Flood control emergency number	>10	(6, 10]	(2, 5]	[1, 2]	0
		D21 Coverage of firefighting facilities (%)	100	(80, 100]	(60, 80]	[20, 60]	[0, 20)

Table A1. *Cont.*

Layer B	Layer C	Layer D	Description of Factors				
Production space B2	Public service C6	D22 Walking service radius (minutes)	[0, 3]	(3, 5]	(5, 10]	(10, 15]	>15
		D23 Satisfaction of living facilities	best	better	well	bad	worse
		D24 Happiness perception (%)	(80, 100]	(60, 80]	(40, 60]	[20, 40]	[0, 20)
	Cultural Heritage C7	D25 Types of special services	>10	(5, 10]	(3, 5]	(1, 3]	[0, 1]
		D26 Number of heritage types	>5	(4, 5]	(2, 3]	(1, 2]	[0, 1]
		D27 Inheritance time (year)	>200	(100, 200]	(50, 100]	[30, 50]	[0, 30)
		D28 Proportion of participants in large-scale folk activities (%)	>70	(50, 70]	(25, 50]	[10, 25]	[0, 10)
		D29 Folklore events attract tourist numbers	>50,000	(20,000, 50,000]	(5000, 10,000]	[1000, 5000]	[0, 1000)
	Historical Events C8	D30 Number of major historical events	>4	(3, 4]	(2, 3]	[1, 2]	[0, 1)
		D31 Number of famous people in history	>5	(3, 5]	(2, 3]	[1, 2]	[0, 1)
		D32 Degree of spreading the word	Be active	persistence	weakness	degradation	none
	Production environment C9	D33 Soil texture	Red purple soil	Brown Shan soil	Yellow Shan soil	Silt sand	Blue mud field
		D34 Terrain slope (°)	[0, 2]	(2, 6]	(6, 15]	(15, 25]	>25
		D35 Irrigation distance	(0, 100]	(100, 150]	(150, 200]	(200, 250]	>250
		D36 Production form	Diversified production	Modernized production of companies	Modernized production of company	Modernized production of groups	Individual production
	Heritage Development C10	D37 Primary production type (agriculture, forestry, fishing, animal husbandry, and gathering)	>6	(4, 6]	(2, 4]	(0, 2]	0
		D38 Heritage Resources	most	many	moderate	less	none
		D39 Types of Heritage Development Projects	>5	(3, 5]	(2, 3]	(1, 2]	(0, 1]
	Economic Industry C11	D40 Number of production heritage items	>10	(8, 10]	(5, 8]	[3, 5]	[0, 3)
		D41 The proportion of secondary and tertiary industries (%)	>60	(40, 60]	(10, 40]	(0, 10]	0
		D42 GDP growth rate per capita (%)	>7	(5, 7]	(3, 5]	(1, 3]	[0, 1]
		D43 Population return growth rate (%)	>20	(10, 20]	(5, 10]	(0, 5]	0
		D44 The employment rate of villagers (%)	100	(80, 100)	(50, 80]	[20, 50]	[0, 20)
Ecological Space B3	Natural Landscape C12	D45 Number of ancient and famous trees	most	many	moderate	few	none
		D46 Forest cover rate (%)	>80	(60, 80]	(40, 60]	[20, 40]	[0, 20)
		D47 Terrain slope (°)	<5	(5, 15]	(15, 25]	(25, 35]	>35
		D48 Landscape type (landscape, forest, farmland, lake, grass, and sea)	>7	(5, 7]	(3, 5]	(1, 3]	[0, 1]
		D49 The proportion of ecological land	>90	(80, 90]	(60, 80]	[50, 60]	[0, 50)
		D50 Grade of water quality	I	II	III	IV	V
	Cultural Landscape C13	D51 Historical landmark	>5	(4, 5]	(2, 3]	(1, 2]	[0, 1]
		D52 Garden monuments	>5	(4, 5]	(2, 3]	(1, 2]	[0, 1]
		D53 Water Conservancy Scenic Area	National-level	provincial-level	Municipal-level	County-level	none
		D54 Scenic Area	National-level	provincial-level	Municipal-level	County-level	none
		D55 Nature Reserve	National-level	provincial-level	Municipal-level	County-level	none
	Fix governance C14	D56 Garbage disposal rate (%)	>90	(70, 90]	(30, 70]	[10, 30]	[0, 10)
		D57 Public participation rate	strongest	strong	moderate	weak	none
		D58 Ecological service level	highest	high	moderate	weak	none
		D59 Renewable energy usage (%)	100	(80, 100]	(50, 80]	(0, 50]	0

Notes: (a, b) represents the range of an interval, where "a" and "b" are real numbers, "a" is the left endpoint of the gap, "b" is the right endpoint of the interval, "(" means excluding the minimum number ")" means excluding the maximum number, "[" means including the minimum number "]" means including the maximum number.

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