

Article

Using a Modified DANP-mV Model to Explore the Improvement Strategy for Sustainable Development of Rural Tourism

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Abstract: Over the span of three decades, the development of rural tourism has substantially improved rural economies and the lives of rural residents; however, it has also negatively affected societies, cultures, and environments, which is not conducive to sustainable development. Motivated by the aim of meeting the Sustainable Development Goals, the balanced development of economic, social, cultural, and environmental factors in rural tourism can only be achieved by analyzing the current problems of rural tourism on the basis of an overall system. Therefore, this study developed an overall evaluation system for analyzing the sustainable development of rural tourism. This system contains an indicator framework for sustainable development of rural tourism and an analytical mechanism for an improvement strategy constructed using a modified DANP-mV model. In this study, the evaluation system was applied to the empirical case study of Yudong Village in China. The empirical case study results show that social sustainable development (D_2) is not the first priority for improvement, although it exhibits the largest gap. Instead, environmental sustainable development (D_4), which exhibits a smaller gap, should receive higher priority for improvement because it is the root cause of social sustainable development (D_2). The overall improvement strategy for Yudong Village should follow this path: environmental sustainable development (D_4) → social sustainable development (D_2) → economic sustainable development (D_1) → cultural sustainable development (D_3). In addition to demonstrating the effectiveness of the rural tourism sustainable development evaluation system, the empirical case study also demonstrated that the system is capable of identifying the root causes of rural-tourism-related sustainability problems and contributing to the formulation of improvement strategies.

Keywords: rural tourism; sustainable development goals (SDGs); tourism evaluation system; modified DANP-mV model; improvement strategy



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1. Introduction

Rural tourism is widely regarded as a method for promoting rural development [1]; thus, in the past three decades, rural tourism has developed rapidly, and the literature on rural tourism has expanded considerably during this period. After the United Nations Educational, Scientific, and Cultural Organization; United Nations Environment Program; World Tourism Organization adopted the Charter for Sustainable Tourism at the first World Conference on Sustainable Tourism in 1995, scholars have increasingly examined the topic of sustainable development in rural tourism [2]. In the relevant policies formulated by numerous countries or regions, sustainable tourism entails the balanced development of the economy, society, culture, and environment [3]. Therefore, evaluating and improving the sustainable development of rural tourism are topics that warrant further exploration.

Numerous studies have reported that rural tourism has generated economic benefits for rural areas. Rural tourism has supplemented the central agricultural structure, changed

the rural production mode [4,5], and promoted the adjustment of the industrial structure in rural areas [6]. Local residents are increasingly able to participate in tourism [7], which will improve employment rates and income levels in rural areas [8]. In general, the development of rural tourism has changed the original livelihood patterns of rural residents and considerably increased their economic income.

Rural tourism, however, also has negative effects [9], such as the social, cultural, and environmental shocks that affect rural areas. The social effect mainly manifests in the community contradictions caused by rural tourism. The development and operation of rural tourism involve multiple stakeholders such as the government, tourism enterprises, and local residents [10]. Among these stakeholders, local residents are usually in a weak position [11]; thus, their basic interests may be affected and they may be unfairly treated, which are situations that lead to community conflicts [12]. Cultural shock mainly manifests as cultural loss. Because of a lack of awareness of the importance of protecting traditional culture, numerous rural tourism destinations only focus on commercial development and neglect the gradual loss of local and national culture [13,14]. In addition, the nonrural culture created by urban tourists may gradually dominate rural communities [15], which increases the risk of a traditional rural culture becoming extinct. Environmental shock mainly manifests as environmental damage. To accommodate more urban tourists, the scale of rural tourism expands gradually, which harms village landscapes [16]. Furthermore, increases in tourist numbers and the generation and disposal of waste [8] are also factors that contribute to the destruction and extinction of fauna and flora [17]. All of these factors can harm and even destroy a rural environment.

The aforementioned studies reveal that, in practice, rural tourism development may be inconsistent with the goals of sustainable development. Several scholars have proposed solutions for improving sustainable rural tourism in terms of community participation [18], the self-efficacy of local communities [19], rural resident attitudes [20,21], the collective action of rural entrepreneurs [22], and the motivation of tourists to participate in sustainable development [23]. Park and Yoon [24] even developed indicators for measuring the sustainability of rural tourism. However, these proposed improvement solutions and methods only consider specific aspects of sustainable rural tourism development.

The sustainable development of rural tourism, however, is a comprehensive and systematic endeavor. Rural tourism does not entail the economic activities of large multinational corporations that operate amenity businesses but rather the efforts of compact local units. Therefore, in addition to the pursuit of economic benefits, creating employment opportunities and contributing to small business clusters are essential. Furthermore, rural tourism should be developed to not only improve the income of rural residents but also to improve their living and ecological environments; this is because rural tourism can promote economic, social, cultural, and environmental sustainability in rural areas [25]. Therefore, solutions for improving sustainable rural tourism must be based on a comprehensive consideration of all factors. If only specific factors are considered to the exclusion of others, the proposed improvement strategy may not be the most effective. This is because there is an interactive relationship between various factors, and it is impossible to identify the fundamental factors causing the problem by analyzing only some of them. It is only by identifying the fundamental factors that decision makers can implement improvements at the root, which is also the most efficient strategy. The improvement strategies proposed in the present study consider various factors of sustainable rural tourism, which distinguishes the present study from the relevant studies mentioned above (Table 1).

Table 1. Comparison of the present study with related studies.

Literature	Research Perspectives			
	Economic	Social	Cultural	Environmental
[18]		×		
[19]		×		
[20]		×		
[21]		×		
[22]	×	×		
[23]	×			×
[24]	×	×		×
The present study	×	×	×	×

How can we formulate an overall solution for the sustainable development of rural tourism by considering various influencing factors in an integrated manner? Davardoust and Karahan [26] proposed tourism development indicators as a primary method for assessing sustainability and guiding the improvement of rural tourism with respect to sustainability. Therefore, the present study proposed the establishment of a sustainable-development-oriented rural tourism evaluation system. In addition to being useful for evaluating the sustainability of rural tourism, this system also provides systematic improvement measures based on information collected regarding the views of rural residents to ensure that rural tourism in a given area aligns with the principle of sustainable development.

The present study developed an evaluation system for assessing and improving the sustainability of rural tourism. There are two components to this system. The first is an indicator framework for sustainable development of rural tourism, and the second is an analytical mechanism for improving rural tourism's sustainable development. The evaluation system was used in an actual case study of rural tourism in the village of Yudong, China. During the study, the modified DANP-mV model was used. The model can help decision makers identify the fundamental factors causing the problem by analyzing the relationship of multiple factors interacting with each other. The present study identified key factors affecting the sustainable development of rural tourism in Yudong Village by using the modified DANP-mV model, which led to the formulation of improvement strategies.

The present study had three research objectives. (1) The first was to construct an indicator framework for the sustainable development of rural tourism; (2) the second was to use the modified DANP-mV model to construct an analytical mechanism for sustainable rural tourism development that enables policy makers to appropriately prioritize the various dimensions for improvement; (3) the third was to help villages undergoing tourism development (e.g., Yudong Village) to obtain feedback on how they can improve their sustainable development.

The subsequent subsections of the present study are organized as follows: Section 2 describes the construction of an indicator framework for sustainable rural tourism development, which was achieved by conducting a literature review and pretesting indicators. Section 3 explains the research methods and research process, and Section 4 demonstrates the application of the constructed indicator framework for sustainable rural tourism development to empirical case studies. The final section focuses on the key findings of the present study and discusses future research directions.

2. Literature Review on Establishment of Indicator Framework

Tourism affects all aspects of an economy, society, culture, and environment [9]. Therefore, the effect of rural tourism on the lives of rural residents is a complex and diverse topic. Atun et al. [27] contended that to achieve the sustainable exploitation of resources, the plan for said exploitation must balance environmental, economic, societal, and cultural factors in order to be acceptable to the local community. Therefore, minimizing the negative effect of rural tourism on the lives of rural residents and promoting the sustainable development of an economy, society, culture, and environment are essential strategies for rural tourism

destinations to achieve sustainable development. In 2016, the United Nations adopted the 2030 Agenda for Sustainable Development, which comprises 17 Sustainable Development Goals (SDGs). These goals emphasize the necessity of balancing economic, social, and environmental development [28], which is consistent with the concept of sustainable tourism. On the basis of the SDG framework and a literature review, this section discusses the constituent indicators of the four dimensions of sustainable development in rural tourism (i.e., economic, social, cultural, and environmental development) and a pretest involving the use of several indicators.

2.1. Indicator Framework for Sustainable Development of Rural Tourism

2.1.1. Economic Sustainable Development (D_1)

As an economic activity, a major objective of rural tourism is to increase the prosperity of a rural local economy. The number of tourists directly reflects the level of economic prosperity of rural tourism destinations. An increasing number of tourists are visiting the countryside because they are attracted to the local products and cuisines, natural landscapes, and other rural elements of rural tourism destinations [29–31]. The increased tourist numbers have also led to a rapid increase in consumption, which has, in turn, expanded the scale of the local tourism economy. In addition, the development of rural tourism can improve the industrial structure of rural areas [4] and contribute to the transformation of rural economies from agricultural economies to economies that are based on modern handicrafts and services. This form of industrial restructuring not only diversifies rural employment but also creates new jobs for rural residents [32]. The income structure of rural residents has changed, and they can obtain a higher income through the jobs created by rural tourism [7]. Therefore, rural tourism should play a role in promoting local economic development, increasing employment rates, and increasing the income of farmers [33,34]. For the dimension of economic sustainable development (D_1), the three applicable criteria are economic scale (C_{11}), job opportunity (C_{12}), and income level (C_{13}).

2.1.2. Social Sustainable Development (D_2)

To ensure the sustainability of rural tourism development, decision makers must address the risk of community tensions. Rural tourism development involves multiple stakeholders, such as the government, tourism enterprises, and local rural residents [35]. Because of the lack of knowledge and ability among local rural residents [36], they are often in a weaker position relative to other stakeholders [11]. This inequality is mainly reflected in the deprivation of the basic rights of local residents and an imbalance in income distribution [8,12], which lead to social conflicts. Therefore, improving the status of local rural residents and establishing a relationship of mutual trust and cooperation among stakeholders are essential to solving the social problems caused by rural tourism [37]. First, local rural residents should have more opportunities to participate in rural tourism management. Participating local residents can provide alternative perspectives and increase the transparency of management processes [38,39], which can help to resolve conflicts of interest. Second, local rural residents should have decision-making rights, which can contribute to the establishment of a joint decision-making mechanism for rural tourism destinations. Joint decision-making by stakeholders not only leads to local rural residents experiencing an improvement in their status but also enhances trust and understanding among stakeholders [40]; consequently, more equitable and appropriate decision-making results can be achieved [35]. Third, the income derived from rural tourism should be fairly distributed among stakeholders. Obtaining benefits is the economic motivation for stakeholders to participate in rural tourism, and the fair distribution of benefits can encourage local rural residents to participate actively in management and decision making, which reduces community tensions. In summary, the three criteria for the dimension of social sustainable development (D_2) are participation opportunity (C_{21}), decision-making mechanism (C_{22}), and benefit distribution (C_{23}).

2.1.3. Cultural Sustainable Development (D_3)

Rural tourism should be a means of protecting tangible and intangible culture and promoting the sustainable development of rural culture [41]. Local residents are the inheritors of traditional rural culture, and they should be the focus of cultural protection efforts. Therefore, a crucial task is to increase the understanding of traditional culture among local residents and increase their awareness of the protection of traditional culture [14], which can encourage them to actively participate in cultural protection activities. Local governments should also formulate effective cultural protection policies and guide the development of local characteristic culture through policies [42]. In addition, the excessive commercialization of rural tourism should be avoided in the sustainable development of culture. Economic motives have been gradually increasing the commercialization of rural tourism [43]. However, Peng et al. [15] highlighted that increasing commercialization is eroding the traditional cultures in rural areas. Commercialization results from efforts to cater to the preferences of urban tourists; however, excessive commercialization reduces the authenticity of traditional rural culture, eventually leading to the disappearance of such cultures [44]. Therefore, for the dimension of cultural sustainable development (D_3), the three criteria are awareness of cultural protection (C_{31}), cultural protection policy (C_{32}), and degree of commercialization (C_{33}).

2.1.4. Environmental Sustainable Development (D_4)

Environmental protection necessitates stringent requirements for the development of rural tourism [45]. In view of the limited environmental carrying capacity of rural areas [46], preventing the environmental burden caused by overexploitation should be prioritized. The overexploitation of resources can damage a rural landscape and cause biodiversity loss [16,47], eventually leading to the destruction of a rural ecosystem [48]. The awareness of environmental responsibility and behavior among tourists also affects the ecological environments of rural tourism destinations [49,50]. Therefore, the proactive participation of tourists in the protection of local environments is a crucial aspect of rural tourism sustainability. In addition, each local government should also establish an environmental governance mechanism [51] that includes the establishment of a special environmental protection institution, allocation of sufficient environmental protection funding, timely detection of environmental pollution and implementation of improvement measures, and promotion of environmental awareness among local residents and tourists. Therefore, the three criteria for the dimension of environmental sustainable development (D_4) are degree of exploitation (C_{41}), environmental behavior of tourists (C_{42}), and environmental governance mechanism (C_{43}).

On the basis of the literature review, the indicator framework for sustainable rural tourism development was established, and it comprises 4 dimensions and 12 criteria (Table 2).

2.2. Pretest of Indicators

To ensure the effectiveness of its evaluation framework, the present study pretested the importance of the proposed indicators. The pretest comprised three stages and the use of a semistructured questionnaire. The consistency of the dimensions and criteria in relation to the SDGs was verified in the first stage, the criteria were defined in the second stage, and the importance of each criterion was assessed in the third stage. During the pretest, data were collected through an expert survey. The survey was conducted using a questionnaire and interview to fully understand the opinions of experts. In the present study, 11 experts from the field of rural tourism were surveyed. Among them, five were experts who were directly involved in rural tourism management, and six were scholars who were engaged in rural tourism research. During the first and second stages of the survey, the experts expressed their opinions that the proposed dimensions and criteria are consistent with the SDGs, and they guided the researchers on how they could revise the definitions of the criteria.

Table 2. Evaluation framework for the sustainable development of rural tourism.

Dimension	Criterion	Description	Cited References
Economic sustainable development (D_1)	Economic scale (C_{11})	The tourist numbers in rural tourism continue to grow, and the scale of the tourism economy is increasing.	[4,6,29–31,34]
	Job opportunity (C_{12})	The number of jobs available to local rural residents has increased due to rural tourism development.	[7,8,32,34]
	Income level (C_{13})	Rural residents receive increased income because of the development of rural tourism.	[7,8,33]
Social sustainable development (D_2)	Participation opportunity (C_{21})	Rural residents can participate in the planning, design, exploitation, and improvement of rural tourism.	[7,18,38]
	Decision-making mechanism (C_{22})	A mechanism for joint decision making by stakeholders has been established.	[12,35,37]
	Benefit distribution (C_{23})	The income from rural tourism can be fairly distributed among stakeholders.	[8,11]
Cultural sustainable development (D_3)	Awareness of cultural protection (C_{31})	Rural residents proactively protect their local traditional culture.	[13,14]
	Cultural protection policy (C_{32})	Policies designed to protect traditional culture have been formulated and implemented.	[42]
	Degree of commercialization (C_{33})	The traditional rural lifestyle is maintained, and rural tourism areas have not been commercially reconstructed to cater for the aesthetic preferences of urban tourists.	[15,43]
Environmental sustainable development (D_4)	Degree of exploitation (C_{41})	Villages are not excessively or blindly exploited.	[16,47,48]
	Environmental behavior of tourists (C_{42})	Tourists have a good awareness of environmental protection, and no tourists litter or damage the landscape.	[8,17,23,49,50]
	Environmental governance mechanism (C_{43})	An environmental governance mechanism has been established. The mechanism helps rural tourism destinations to swiftly detect pollution or damage pertaining to water, air, and soil resources and to implement effective treatment measures.	[17,51]

The third stage of the expert survey involved the administration of a closed questionnaire. The experts were asked to judge the importance of each criterion on a 5-point Likert scale (1, 2, 3, 4, and 5 points indicating a “very unimportant”, “not important”, “not notably important”, “important”, and “very important” response, respectively). The expert scores for each criterion were averaged to determine the importance of each criterion. The scores of 3 and 4 were set as thresholds. A criterion with a score of more than 4 was regarded as a highly important criterion and accepted, whereas a criterion with a score of less than 3 was regarded as a criterion of low importance and rejected. A score of between 3 and 4 points for a given criterion indicated that a consensus had not yet been reached regarding the importance of the criterion; thus, it was reinvestigated. The questionnaire responses of the 11 experts yielded scores of more than 4 for all criteria, indicating that they were all of high importance. The three criteria with the lowest scores were decision-making mechanism (C_{22}), benefit distribution (C_{23}), and environmental behavior of tourists (C_{42}); nevertheless, the scores of these three criteria were 4.09 (i.e., >4). Therefore, the evaluation framework for sustainable rural tourism development passed the pretest.

3. Methods

The DANP-mV model is a hybrid multicriteria decision-making model that integrates three technologies, namely, the Decision-Making Trial and Evaluation Laboratory (DEMATEL), analytic network process (ANP), and modified Vlsekriterijumska Optimizacija I Kompromisno Resenje (mVIKOR). The core process of the DANP-mV model is as follows.

First, the total influence relation matrix and the influential network relation map (INRM) of dimensions and criteria are obtained through DEMATEL. Second, the influential weights (IW) of the dimensions and criteria are calculated using ANP and the total influence relation matrix. Finally, the gap ratio between actual performance and aspiration level is calculated using mVIKOR [52]. This process allows decision makers to identify not only gaps but also their causes through an INRM, thereby enabling the implementation of systematic and fundamental improvement measures. The DANP-mV model is widely used in various fields for evaluation and improvement because of its performance advantages [53].

The most prominent disadvantage of the DANP-mV model is that experts must assess numerous items, which considerably increases the difficulty of decision making for experts. Qu et al. [54] focused on this disadvantage and improved the model to create the modified DANP-mV model. In the modified DANP-mV model, experts are not required to conduct pairwise comparisons of all criteria; instead, they only need to first conduct a pairwise comparison of a dimension and then conduct a pairwise comparison of the criteria in that dimension. Therefore, this modified version has only 168 questions relative to the 650 found in the traditional model. Qu et al. [54] also reported that the modified model mostly retained the effects of the traditional model. Given the higher efficiency of the modified model relative to the traditional model, the modified DANP-mV model was used in the present study to evaluate and improve the sustainable development of rural tourism.

To achieve the SDGs, rural tourism must balance the sustainability of the economy, society, culture, and environment. An interactive relationship must also be established among the economy, society, culture, and environment. Therefore, we must consider the sustainability of rural tourism from a systemic perspective. To achieve the sustainability of rural tourism, we must first measure the gap of each criterion, calculate the mean group utility of a group of gaps on the basis of IWs, and identify the dimension or criterion with the largest gap. Subsequently, the factors that affect the dimension or criterion with the largest gap must be identified through the INRM. Finally, we propose improvement strategies based on the influential relationships that were identified. Throughout the aforementioned process, the INRM and IWs were obtained by applying the modified DEMATEL and ANP (mDANP), and the gap of each criterion was obtained by applying mVIKOR. The operation of the overall method is demonstrated in Figure 1. Reference is made to Qu et al. [54] for the steps of the modified DANP-mV model.

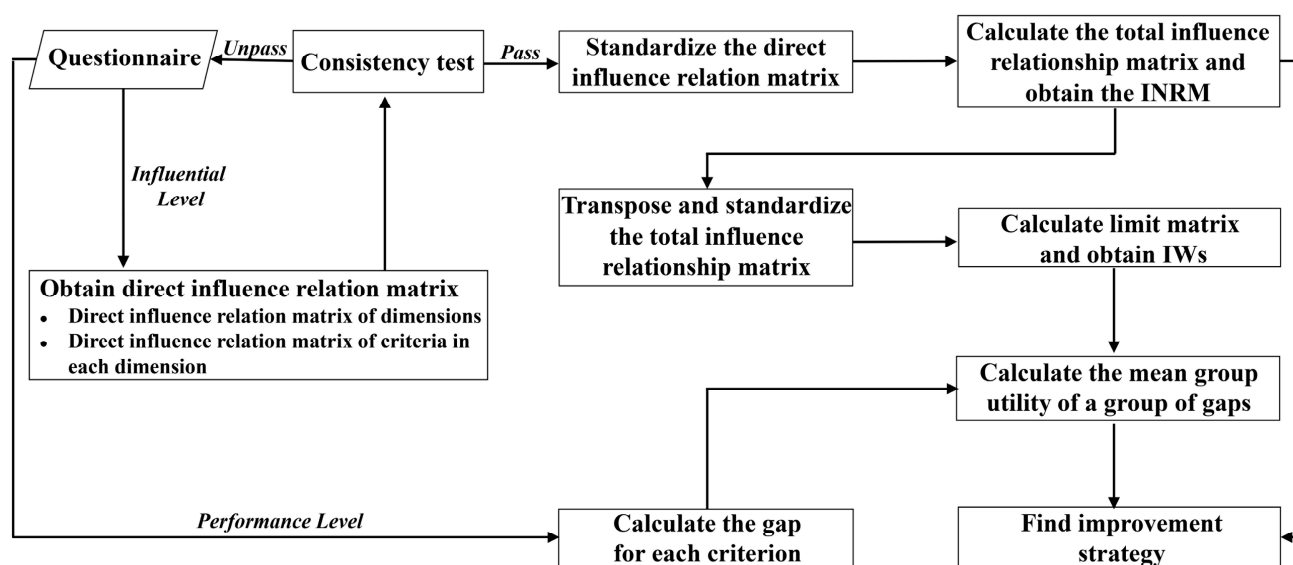


Figure 1. Operation of the modified DANP-mV model.

4. Empirical Case Study

4.1. Empirical Case Description

Yudong Village is famous for being “one of the most beautiful villages in China.” Located in the western suburb of Quzhou City, Zhejiang Province, China, the village is only 20 km from the city center. It is rich in river and mountain forest resources; thus, visitors can enjoy beautiful sceneries at this village. Because of its favorable geographical location and rich tourism resources, Yudong Village began to develop rural tourism in approximately 2000. After 20 years of development, Yudong Village was rated as one of the Ten Most Beautiful Villages in China in 2020. The lifestyle of the local residents of Yudong Village has changed because of rural tourism, which has contributed to the village’s economic, social, cultural, and environmental development. The general development process of rural tourism in Yudong Village in the last 20 years is illustrated in Figure 2.

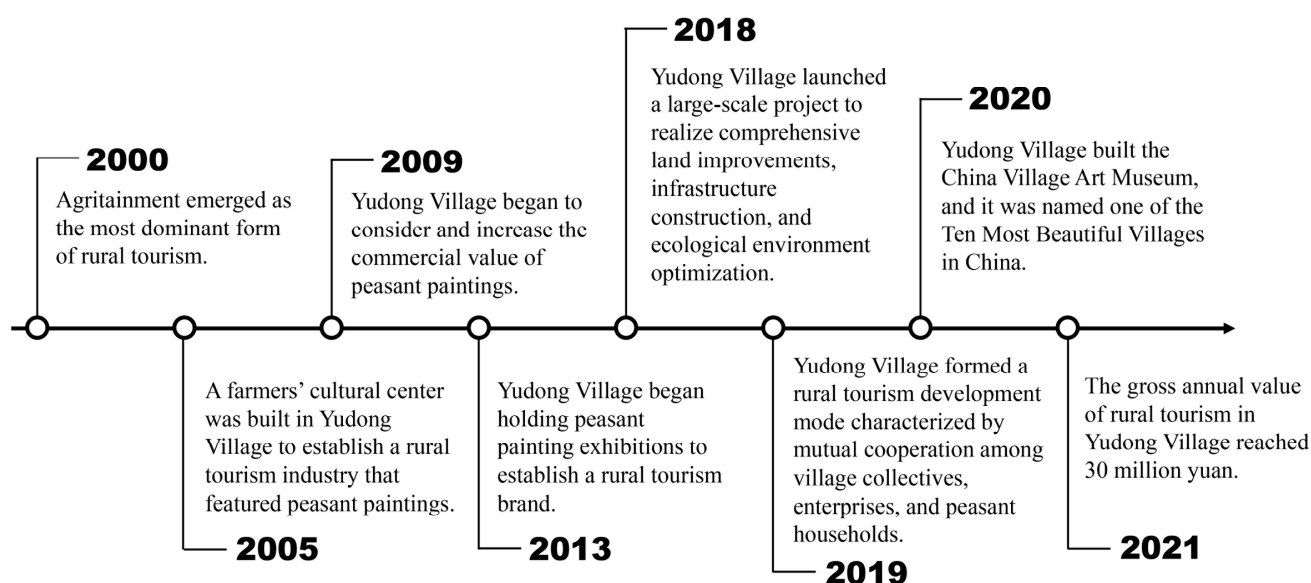


Figure 2. Development process of rural tourism in Yudong Village.

4.1.1. Economy

Rural tourism has considerably contributed to the economic development of Yudong Village. More than 1 million tourists visit Yudong Village annually, and these tourists are major consumers. The prosperity generated by tourism has created new jobs; thus, the local residents of the village have more job opportunities and have increased their income. In 2021, the gross annual value of rural tourism in Yudong Village reached CNY 30 million, and the per capita income of its local residents reached CNY 40,000.

4.1.2. Society

The rural tourism sector in Yudong Village includes three main types of stakeholders, namely, the local government, tourism enterprises, and local residents. No major social conflicts have been reported in Yudong Village, which is related to the simple folk customs and participation and distribution mechanisms of Yudong Village. To facilitate the participation of local residents in rural tourism, Yudong Village built a social networking platform that accommodates local residents, tourism enterprise managers, and government representatives. The platform incorporates a point-based system through which local residents can obtain points by expressing their views and suggestions on the platform. Because the distribution of benefits is determined by the points obtained, local residents are highly incentivized to participate in rural tourism. Yudong Village has also established a “226” distribution mechanism through which 20% of the village’s annual collective income is allocated to public welfare projects, 20% is set aside as the villagers’ dividends, and 60% is allocated for follow-up investments. However, the local residents of the village have

few opportunities to make rural-tourism-related decisions because the primary decision makers are the local government and tourism enterprises.

4.1.3. Culture

The characteristic culture of Yudong Village centers on peasant painting. Peasant paintings are characterized by their bright colors and exaggerated compositions, and their content reflects the daily work of farmers. Yudong Village has a population of only 800, of whom more than 300 are peasant painters. To develop this characteristic culture, the local government actively publicized and promoted it and built the China Village Art Museum. It also opened several galleries to develop derivative products of peasant painting and established a system that comprises the full process of research, development, production, and sales of relevant products to obtain commercial benefits.

4.1.4. Environment

Yudong Village has focused on environmental protection during the development of its rural tourism, and it has developed a digital governance platform for environmental governance that allows for the real-time monitoring of air and water quality. When the village's environmental quality decreases to a specific level, the automatic alarm system of the platform is triggered, allowing for the timely disposal of pollutants. In addition, to encourage pro-environmental behavior among tourists, Yudong Village vigorously promotes environmental protection to tourists, and it has imposed punitive measures aimed at punishing tourist behavior that damages the environment.

4.2. Data Collection

The data examined in the present study were collected in two stages. In the first stage, 15 experts were surveyed, and the data collected from them were analyzed through mDANP. In the second stage, 150 local residents of Yudong Village were surveyed, and the data collected from them were analyzed through mVIKOR.

In the first stage, an mDANP questionnaire was distributed to 15 experts. Among these experts, nine were involved in rural tourism management and had extensive experience in this field, and the other six were scholars who conducted rural tourism research. All of them have a deep understanding of Yudong Village. To enhance the validity of the survey, structured interviews were incorporated, and responses that could potentially be confusing were clarified by the researchers. During the investigation process, the experts determined the influences of the interactions between dimensions and those of the interactions between the criteria of each dimension. The influence score ranged from 0 (not at all influential) to 4 (highly influential). Because the modified DANP-mV model was used, the number of questions asked during this stage of the survey was only 36 (i.e., $4 \times 3 + 3 \times 2 \times 4$), which is considerably fewer than the 132 (12×11) used in the traditional model. Therefore, the modified model substantially reduced the time required for the experts to complete the corresponding questionnaire, allowing them to focus on decision making. Specifically, for the experts, the average time taken to complete the questionnaire was approximately 50 min. For the survey, the researchers recovered 12 valid and 3 invalid questionnaire responses. The three invalid responses were regarded as invalid responses because the respondents who provided them did not clearly understand the purpose and process of the mDANP questionnaire.

In the second stage, local residents took the survey. Because the economic, social, cultural, and environmental development due to rural tourism directly affects the lives of local residents, their views are crucial. The local residents' perceptions of the indicators of sustainable rural tourism development could help us to identify the gaps that can be addressed through improvement measures.

At this stage, the researchers distributed 150 mVIKOR questionnaires by means of a Random Visit Survey. Among all respondents, there were 56 males and 94 females; of them, 4 were aged 17 and younger, 23 were aged 18 to 35, 28 were aged 36 to 45, 26 were aged 46

to 59, and 69 were aged 60 and older. For the survey, respondents were required to score their agreement with each item on a scale from 0 (absolutely disagree) to 10 (absolutely agree). The researchers used this score to determine the performance level and gap for each criterion. Considering two factors, namely, lack of knowledge and communication barriers caused by dialect, the researchers believed that some respondents (mainly villagers aged 46 and above) did not really understand the meaning of the questionnaire items. Therefore, 25 questionnaires were considered invalid, and the actual number of valid questionnaires returned was 125.

4.3. Results and Discussion

After compiling the scores of the 12 valid responses collected from the experts and calculating their average score, we obtained a direct influence relation matrix. By applying the modified DANP-mV model processing program, we obtained a total influence relation matrix. The relevant results are presented in Tables 3–7. In each of these tables, the left section presents the direct influence relation matrix, and the right section presents the total influence relation matrix. Table 3 lists the results for the dimensions; specifically, the consistency value was 0.026 (<0.05), which indicates that the experts reached an overall consensus. Therefore, the overall system achieved convergence. Tables 4–7 list the results pertaining to the criteria for each dimension; the results reveal that the system passed the consistency test.

The total influence relation matrix was used to obtain the INRM of the present study (Figure 3). The INRM clearly displays the system structure of the interactions in the model of sustainable rural tourism development. By examining the influence of relationships between the dimensions, we determined the priority of influences to be $D_4 > D_2 > D_1 > D_3$. This result indicates that environmental sustainable development (D_4) is the most fundamental influencing factor for achieving sustainable rural tourism development.

Table 3. Direct influence relation matrix and total influence relation matrix of dimensions.

Direct Influence Relation Matrix	D_1	D_2	D_3	D_4	Total Influence Relation Matrix	D_1	D_2	D_3	D_4
D_1	0	3.583	2.917	1.417	D_1	0.685	1.225	1.167	0.855
D_2	1.417	0	2.250	1.750	D_2	0.669	0.664	0.882	0.701
D_3	1.083	1.917	0	1.917	D_3	0.607	0.807	0.610	0.677
D_4	2.833	1.667	1.833	0	D_4	0.884	0.976	0.976	0.610

Consistency value = 0.026 < 0.05 .

Table 4. Direct influence relation matrix and total influence relation matrix of criteria in D_1 .

Direct Influence Relation Matrix	C_{11}	C_{12}	C_{13}	Total Influence Relation Matrix	C_{11}	C_{12}	C_{13}
C_{11}	0	3.583	2.500	C_{11}	2.001	2.926	2.917
C_{12}	1.833	0	3.500	C_{12}	2.031	2.276	2.720
C_{13}	2.333	2.417	0	C_{13}	1.958	2.424	2.199

Consistency value = 0.016 < 0.05 .

Table 5. Direct influence relation matrix and total influence relation matrix of criteria in D_2 .

Direct Influence Relation Matrix	C_{21}	C_{22}	C_{23}	Total Influence Relation Matrix	C_{21}	C_{22}	C_{23}
C_{21}	0	3.500	3.750	C_{21}	2.600	3.000	3.300
C_{22}	2.833	0	3.750	C_{22}	2.700	2.500	3.100
C_{23}	3.333	3.000	0	C_{23}	2.680	2.733	2.707

Consistency value = 0.007 < 0.05 .

Table 6. Direct influence relation matrix and total influence relation matrix of criteria in D_3 .

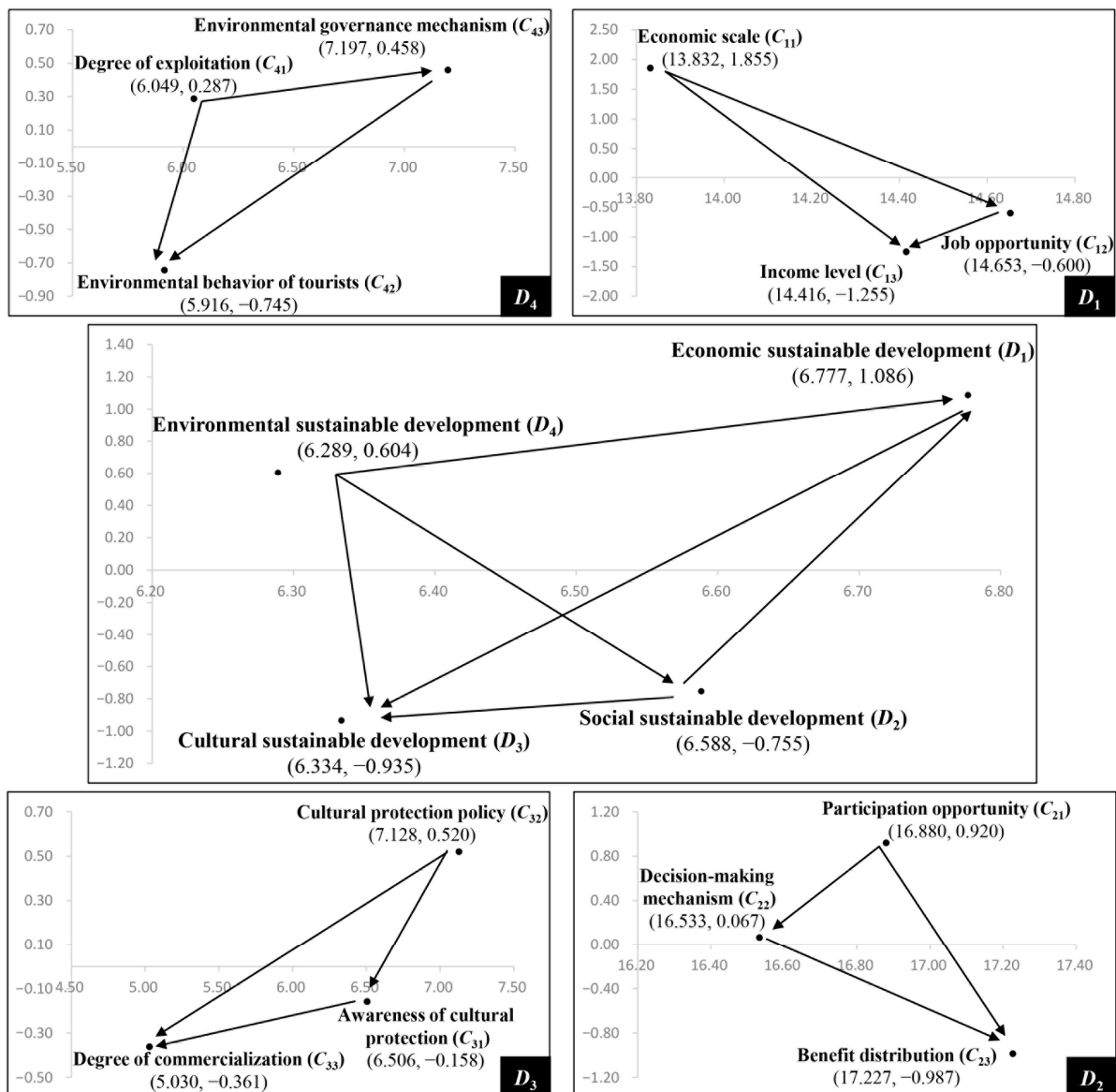
Direct Influence Relation Matrix	C_{31}	C_{32}	C_{33}	Total Influence Relation Matrix	C_{31}	C_{32}	C_{33}
C_{31}	0	3.083	1.250	C_{31}	0.955	1.279	0.940
C_{32}	3.500	0	2.500	C_{32}	1.504	1.122	1.198
C_{33}	1.333	1.750	0	C_{33}	0.873	0.903	0.558

Consistency value = 0.011 < 0.05.

Table 7. Direct influence relation matrix and total influence relation matrix of criteria in D_4 .

Direct Influence Relation Matrix	C_{41}	C_{42}	C_{43}	Total Influence Relation Matrix	C_{41}	C_{42}	C_{43}
C_{41}	0	1.083	2.750	C_{41}	0.798	1.101	1.269
C_{42}	1.333	0	1.750	C_{42}	0.843	0.749	0.993
C_{43}	2.250	3.167	0	C_{43}	1.240	1.480	1.108

Consistency value = 0.012 < 0.05.

**Figure 3.** The INRM of the total influence relationships.

Similarly, for the dimension of economic sustainable development (D_1), the INRM was used to reveal the following priority of influences: $C_{11} > C_{12} > C_{13}$. For the dimension of social sustainable development (D_2), the priority of influences was as follows: $C_{21} > C_{22} > C_{23}$. For the dimension of cultural sustainable development (D_3), the priority of influences was as follows: $C_{32} > C_{31} > C_{33}$. For the dimension of environmental sustainable development (D_4), the priority of influences was as follows: $C_{41} > C_{43} > C_{42}$. These results reveal that economic scale (C_{11}), participation opportunity (C_{21}), cultural protection policy (C_{32}), and degree of exploitation (C_{41}) are the most fundamental influencing factors in their respective dimensions.

IWs were obtained by transposing and standardizing the total influence relation matrix and calculating the limit matrix. After combining the IWs with the mVIKOR questionnaire results, we calculated the performance and gaps of the dimensions and criteria. The relevant results are presented in Table 8.

Table 8. The performance and gap evaluation of the case study using the modified DANP-mV model.

Dimensions/Criteria	Local Weight	Global Weight	Performance	Gap
Economic sustainable development (D_1)	0.222		5.762	4.238
Economic scale (C_{11})	0.282	0.063	7.016	2.984
Job opportunity (C_{12})	0.354	0.079	6.464	3.536
Income level (C_{13})	0.364	0.081	4.104	5.896
Social sustainable development (D_2)	0.278		4.420	5.580
Participation opportunity (C_{21})	0.317	0.088	5.232	4.768
Decision-making mechanism (C_{22})	0.325	0.091	3.704	6.296
Benefit distribution (C_{23})	0.358	0.100	4.352	5.648
Cultural sustainable development (D_3)	0.276		5.846	4.154
Awareness of cultural protection (C_{31})	0.355	0.098	7.608	2.392
Cultural protection policy (C_{32})	0.359	0.099	5.248	4.752
Degree of commercialization (C_{33})	0.286	0.079	4.408	5.592
Environmental sustainable development (D_4)	0.224		5.887	4.113
Degree of exploitation (C_{41})	0.303	0.068	6.336	3.664
Environmental behavior of tourists (C_{42})	0.342	0.077	5.496	4.504
Environmental governance mechanism (C_{43})	0.355	0.080	5.880	4.120
Total performance			5.439	
Total gap				4.561

Table 8 indicates that the total performance and total gap scores were 5.439 and 4.561, respectively, meaning that, although rural tourism has been developing rapidly in Yudong Village, it still requires substantial improvements. The gaps presented in the table indicate the areas that require the most improvements; specifically, the dimension of social sustainable development (D_2) should be improved first because it has the largest gap among the dimensions. However, to achieve the goal of sustainable development, a rural tourism destination must achieve the coordinated development of its economy, society, culture, and environment. Furthermore, the results obtained through the INRM indicate that social sustainable development (D_2) is affected by environmental sustainable development (D_4); thus, improving environmental sustainable development (D_4) can promote social sustainable development (D_2). Similarly, economic sustainable development (D_1) is affected by environmental sustainable development (D_4) and social sustainable development (D_2). Cultural sustainable development (D_3) is affected by environmental sustainable development (D_4), social sustainable development (D_2), and economic sustainable development (D_1). In general, the improvement path for rural tourism development in Yudong Village is as follows: environmental sustainable development (D_4) $\rightarrow$ social sustainable development (D_2) $\rightarrow$ economic sustainable development (D_1) $\rightarrow$ cultural sustainable development (D_3). This implies that decision makers must first address the root problem of environmental sustainable development (D_4). A favorable ecological environment enables the residents of rural tourism destinations to develop a healthy body, mentality, and high

quality of life. Consequently, they can easily establish friendly folk customs and a favorable social order. An excellent ecology and a harmonious social atmosphere attract more tourists and promote the sustainable development of a local economy. An increase in tourist numbers creates an environment more conducive to the dissemination and inheritance of local characteristic culture. The aforementioned factors increase the likelihood that rural tourism development leads to the achievement of the SDGs. The specific improvement strategies for each dimension are discussed in the following.

For the dimension of environmental sustainable development (D_4), the environmental behavior of tourists (C_{42}) is the criterion with the largest gap. However, the results of the interaction between the criteria indicate that degree of exploitation (C_{41}) is the root problem. The results suggest that, to improve the environmental behavior of tourists (C_{42}), Yudong Village should first improve the degree of exploitation (C_{41}) and develop a deeper understanding of the adverse consequences of blind exploitation. Therefore, formulating an excellent rural tourism development plan is essential. Development planning aimed at protecting the ecological environment of the village should become a component of its environmental governance mechanism. An excellent environmental governance mechanism can guide and restrict the behaviors of tourists. Finally, a protected ecological environment is conducive to sustainable development.

For the dimension of social sustainable development (D_2), the gaps for decision-making mechanism (C_{22}) and benefit distribution (C_{23}) are high. The results for the interactions between the criteria indicate that participation opportunity (C_{21}) is the root problem. Therefore, to improve the decision-making mechanism (C_{22}) and benefit distribution (C_{23}), Yudong Village should first improve participation opportunity (C_{21}). The village already uses a social networking platform through which local residents can participate in rural tourism; however, the role of this platform is still limited. Therefore, the platform should introduce new functions (e.g., proposal submissions and resolution voting) that can promote the establishment of a joint decision-making mechanism. Benefit distribution should also be included in the scope of joint decision making to promote the fair and reasonable distribution of rural tourism income.

For the dimension of economic sustainable development (D_1), income level (C_{13}) is the criterion with the highest gap. The results of the interactions between the criteria indicate that economic scale (C_{11}) is the root problem. Therefore, to improve the income level (C_{13}), Yudong Village should first improve the economic scale (C_{11}); in addition to increased publicity, Yudong Village can also attract tourists by launching additional rural-characteristic-based projects and organizing activities based on rural characteristics. A greater number of rural tourism projects and activities can create jobs and further increase the income of local residents.

For the dimension of cultural sustainable development (D_3), the degree of commercialization (C_{33}) is the criterion with the highest gap. However, the results of the interactions between the criteria indicate that cultural protection policy (C_{32}) is the root problem. Therefore, to improve the degree of commercialization (C_{33}), Yudong Village should first improve cultural protection policy (C_{32}). At the time of writing, the characteristic culture of Yudong Village is well-developed, but the development of the village's other traditional cultures has been ignored. Therefore, a comprehensive cultural protection policy is urgently required for Yudong Village. Such a comprehensive policy can help protect all of the village's traditional cultures and enable more of its local residents to participate in cultural protection efforts. Through policy constraints and the active participation of local residents, excessive commercialization can be avoided.

5. Conclusions

The present study used a modified DANP-mV model to explore sustainable development strategies for rural tourism. The research results contribute to the reversal of the negative effect of rural tourism and the attainment of the SDGs. First, on the basis of previous research, we established a systematic indicator framework that can be used to evaluate

the sustainability of rural tourism. Second, we used the modified DANP-mV model to evaluate an existing rural tourism destination and proposed systematic and fundamental improvement measures. In the empirical case study of Yudong Village, we discovered that social sustainable development (D_2) exhibits the largest gap. However, social sustainable development (D_2) is not the first priority for improvement. The reason is that we found that social sustainable development (D_2) can be influenced by environmental sustainable development (D_4). Moreover, environmental sustainable development (D_4) is the fundamental factor among all. Therefore, to achieve the SDGs, Yudong Village should prioritize solving problems related to environmental sustainable development. In general, we believe that the improvement strategies for rural tourism development in Yudong Village should follow the paths: (1) at the dimensional level, environmental sustainable development (D_4) → social sustainable development (D_2) → economic sustainable development (D_1) → cultural sustainable development (D_3); (2) for the dimension of environmental sustainable development (D_4), degree of exploitation (C_{41}) → environmental governance mechanism (C_{43}) → environmental behavior of tourists (C_{42}); (3) for the dimension of social sustainable development (D_2), participation opportunity (C_{21}) → decision-making mechanism (C_{22}) → benefit distribution (C_{23}); (4) for the dimension of economic sustainable development (D_1), economic scale (C_{11}) → job opportunity (C_{12}) → income level (C_{13}); (5) for the dimension of cultural sustainable development (D_3), cultural protection policy (C_{32}) → awareness of cultural protection (C_{31}) → degree of commercialization (C_{33}).

Compared to existing relevant studies, the present study extends the research perspective and methodology. This study was conducted from an overall systematic perspective and an evaluation system was developed to address the issue of sustainable rural tourism development. In this evaluation system, the proposed indicator framework integrates multiple factors affecting rural tourism sustainable development; the analytical mechanism constructed based on the modified DANP-mV model identifies the key factors in rural tourism sustainable development. Using Yudong Village as an example, this evaluation system appears to be effective.

In practice, the proposed indicator framework and the analytical mechanism based on the modified DANP-mV model can be used as a reference for other villages. As an example, in China, with the implementation of the rural revitalization strategy, more and more Chinese villages are going into the rural tourism industry. Similar to Yudong Village, these villages have a roughly similar rural tourism development pattern. Although Yudong Village is one of the most developed villages in terms of rural tourism, there are still significant gaps in terms of sustainable development. Therefore, sustainability is a common issue in the development of rural tourism in Chinese villages. For the sustainable development of rural tourism in Chinese villages, the main implication from the present study is that decision makers should focus on the essential causes of a problem and formulate an overall solution.

Limitations should be mentioned. First, the survey data used to assess the performance of the evaluation system were obtained from local residents of Yudong Village. Although they are the direct beneficiaries of rural tourism development, and the main purpose of rural tourism should be to improve the quality of life of local residents, they may have provided subjective responses to safeguard their own interests. Future studies should include tourist surveys to enhance their results for the assessment of evaluation system performance. Second, the improvement strategy of the present study is aimed at the rural tourism of Yudong Village, and improvement strategies should be adjusted depending on the unique characteristics of individual tourism destinations. Therefore, although the evaluation framework formulation process and improvement strategy analytical mechanism of the present study can be used as a reference for other rural tourism destinations, unique and heterogeneous characteristics must be considered. In Yudong Village, for example, rural tourism featuring peasant paintings was developed, and the gap in cultural sustainable development (D_3) of Yudong Village was exhibited as minimal. Therefore, cultural sustainable development (D_3) was not a major improvement factor for

Yudong Village. Future research should be conducted in more villages. These villages should include other features such as leisure travel and farming experiences. This will further enrich the research findings on sustainable development strategies by exploring different forms of rural tourism.

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