Article

Optimization Approaches of Multi-Dimensional Environments in Rural Space Reproduction Driven by Tourism

Yingxing Chen [1], Qing Zhang [2], Difei Zhao [2,3,*], Sotiris Folinas [4] and Wei Zhang [5]

1   School of History, Culture and Tourism, Huaiyin Normal University, Huai'an 223001, China
2   Artificial Intelligence Research Institute, China University of Mining & Technology, Xuzhou 221116, China
3   International College, Kirik University, Bangkok 10220, Thailand
4   Department of Planning and Regional Development, University of Thessaly, 38334 Volos, Greece
5   Department of Spatial Planning, TU Dortmund University, 44227 Dortmund, Germany
*   Correspondence: difei.zhao@cumt.edu.cn

Abstract: Rural tourism is an important driving force for the transformation of rural society in the process of urbanization. However, besides promoting rural economy, it also interrupts the development of the rural living, human, manage and economic multi-dimensional environments. Space reconstruction in rural settlements is an important means to optimize multi-dimensional environments and revitalize rural tourism. Focusing on two types of rural settlements, namely the "relocation village" and the "sightseeing and settlement symbiosis village", this study has revealed the affecting mechanism of space reconstruction in rural tourist locations on the local multi-dimensional environment by establishing a multi-dimensional environment evaluation system through an analytic, hierarchical process. Subsequently, based on the theoretical perspective of the reproduction of the space and the paradigm of the three-fold model, a comprehensive optimization path of rural multi-dimensional environments has been proposed. The results show that in the space reconstruction process driven by tourism: (1) the multi-dimensional environments of the "sightseeing and settlement symbiosis village" generally develop better than the "relocation village"; (2) the ecological environment is the direct benefit while the management environment and economic environment are the bottlenecks; (3) the "sightseeing and settlement symbiosis village" is more appealing to tourists who are interested in rural tourism since it keeps more rustic characteristics than the "relocation village"; (4) in order to optimize the multi-dimensional environments, "relocation village" should pay more attention to the space needs of residents, improve space utilization rates, and increase the residents' sense of belonging; (5) "sightseeing and settlement symbiosis village" needs to resolve the contradiction between the tourism and living demands, improve the reproduction process driven by diversified entities, and reconstruct the neighborhood network under rural tourism.

Keywords: rural tourist place; settlement space reconstruction; multi-dimensional environment optimization; the reproduction of space theory

1. Introduction

Traditional rural settlements are mainly responsible for supporting farmers' daily lives. Nowadays, with the development of rural tourism and urbanization, rural settlements have undergone function reorganization and space reconstruction [1–3]. In 2018, 17 departments in China, including the Ministry of Culture and Tourism, jointly issued a Guidance on Promoting the Sustainable Development of Rural Tourism, which proposed a plan to improve the public service system of rural tourism. In some rural areas, tourism has already become the main driving force of economic and social transformation [4]. However, despite the great market potential, rural tourism is also confronted with ecological and environmental-friendly development difficulties [5]. In some tourist places, the relationships between people and people, human and land, individuals and collectives, collectives and capital,

and capital and resources have undergone drastic changes [6–8]. Specifically, the different purposes and benefits that subjects from multiple parties seek lead to multi-dimensionally reconstruction in rural settlements' ecological, resource, social, cultural, and economic environments [9]. Among them, some places have experienced regressions in living and natural environments, such as the destruction in ecological space, unbalanced human–land relationships, heterogeneity of landscape, declining cultural spaces, gradually disappearing rurality, and the capital's domination in the production space [10,11]. Well-developed multi-dimensional environments are the premise for developing rural tourism [12]. They provide basic natural and cultural resources for tourism activities and businesses. Therefore, a balance between exploiting and protecting the local resources, and sustainable rural tourism should exist. This, in turn, promotes the optimization of the multi-dimensional environments in rural settlements.

The theory of the production of the space is a useful tool to explore and explain the rural changes in multi-dimensional environments driven by tourism. Production, living, ecological, social, and cultural spaces are mutually infiltrated and integrated to form a multi-level and multi-dimensional rural space system [13,14]. Space reproduction in rural settlements refers to the phased transformation of the rural spatial pattern caused by the joint effects of various internal and external factors [15,16]. Since Lefebvre established the theory of the production of space in La Production de l'espace in 1974, many assumptions have been proposed to explain the factors that organize, influence, and produce spaces [17]. Harvey investigated it from the capitalist perspective and held that the space system and structure were determined by the needs of the capital [18]. Castells put the concept of collective consumption forward and emphasized that state intervention was important for maintaining space production [19]. Soja noted the influence of political power and ideology on space production [20]. The research on space spread from the urban to the rural context. Inspired by the conceptual triad from Lefebvre, Halfacre established the three-fold model of rural space and differentiated rurality into rural localities, formal representations of the rural, and everyday lives of the rural [21]. The social relations and actions are far more complicated in the settlements impacted by rural tourism. In this case, the social production of rural space in tourism has been preliminarily investigated in some research with an emphasis on the power of the agents, actors' social actions, and the tourists [22–24]. In China, with the implementation of the rural revitalization policy, the production of space theory has mainly been employed to explore the process, dynamic and the law of the rural change in tourism destinations with the aim of facilitating the economic and cultural prosperity of the rural settlements [25–27].

Despite the existing achievements of the investigation into the rural change impacted by tourism with the application of the production of space theory, little is known about the differences in the space production process in different types of rural settlements driven by tourism. Considering the variety of development modes of rural settlements and the different driven factors resulting from such modes, there is a need to make a comparison between them to understand the differences and identify the approaches to facilitate their sustainable development. Therefore, taking two types of rural communities impacted by tourism as study areas, namely Tianquan Community, a relocation village, and Doushan Village, a sightseeing and settlements symbiosis village, this research aims to reveal their respective affective mechanisms of rural space reconstruction on the local multi-dimensional environments and propose the corresponding optimization path to provide theoretical guidance for the sustainable development of the two types of rural tourist places.

2. Theory and Methodology

2.1. Research Method

Analytic Hierarchy Process (AHP) is a method proposed by T. L. Saaty for analyzing complicated decisions [28–32]. It decomposes relevant elements into objective, criterion, and index levels, and carries out qualitative and quantitative analysis accordingly. This re-

search applied AHP in the establishment of the multi-dimensional environment evaluation system. The main steps were as follows:

(1) Construct the judgment matrix

Through the hierarchical analysis of the top goal and influencing factors related to decision-making, a structured model was built. The model includes three levels. The objective was at the top level, criterion at the second level, and index at the lower level. First of all, the objective layer (Z) was determined to be the residents' overall satisfaction with the multi-dimensional environments. Next, the criterion layer (A) was divided into four systems, namely, the living environment (A1), human environment (A2), management environment (A3), and economic environment (A4). The living environment is the sum of the various factors that affect the life and development of the occupants in the spaces where people live. The rural living environment is influenced by ecological factors, housing conditions, economic factors, and other factors. The human environment refers to the wider social environment that constantly evolves as a result of human activity, including people's attitudes, perceptions, cultural activities, belief systems, cognitive environments, etc. The management environment is the sum of all objective factors that can act and influence administrative activities, both directly and indirectly, by those in power around administrative activities and administrative phenomena. The economic environment refers to the general economic situation of the country or region in which the village is located, including the income level of villagers, purchasing power, expenditure patterns, savings rates, the general price level of the community, and the current development of the industry.

The criterion layer was refined into 14 factors in the index layer (B) are shown in Table 1, including housing environment (B1), road environment (B2), healthcare environment (B3), hygienic environment (B4), ecological environment (B5), security environment (B6), cultural activities (B7), inhabitation by outsiders (B8), policy support (B9), distribution of benefits (B10), management status (B11), land circulation subsidy (B12), working environment (B13), and economic income (B14). The hierarchical structure is shown in Figure 1.

Table 1. Description of 14 factors.

| Code	Factor	Description
B1	Housing environment	Space, quality, structure, decoration, and utilization of the residents' houses
B2	Road environment	Traffic convenience, accessibility, and road conditions
B3	Healthcare environment	Medical resources to cure diseases, health examination, and insurance of the physical and mental health of the residents.
B4	Hygienic environment	Clean water, fresh air, green food, and household waste disposal system
B5	Ecological environment	Conditions that influence the sustainable inter-relationship of the living organisms include plants, animals, and microbes
B6	Security environment	Protection of people's lives and property security
B7	Cultural activities	Celebration of traditional festivals and heritage of rural culture
B8	Inhabitation by outsiders	Immigrants who inhabit in the settlements because of work or vacation
B9	Policy support	Policy from the government to support the residents' daily lives as well as tourism businesses
B10	Distribution of benefits	Benefits received on land that is under collective ownership and are distributed by village officials
B11	Manage status	Government's establishment of the rules, goals, and strategic plans, as well as the operation of it
B12	Land circulation subsidy	Money that is paid by the government to the residents to acquire their agriculture and housing land
B13	Working environment	Physical environment, facilities, tools, teamwork communication, and working atmosphere
B14	Economic income	Wage, welfare, bonus, social insurance, paid vacation, interests, business income
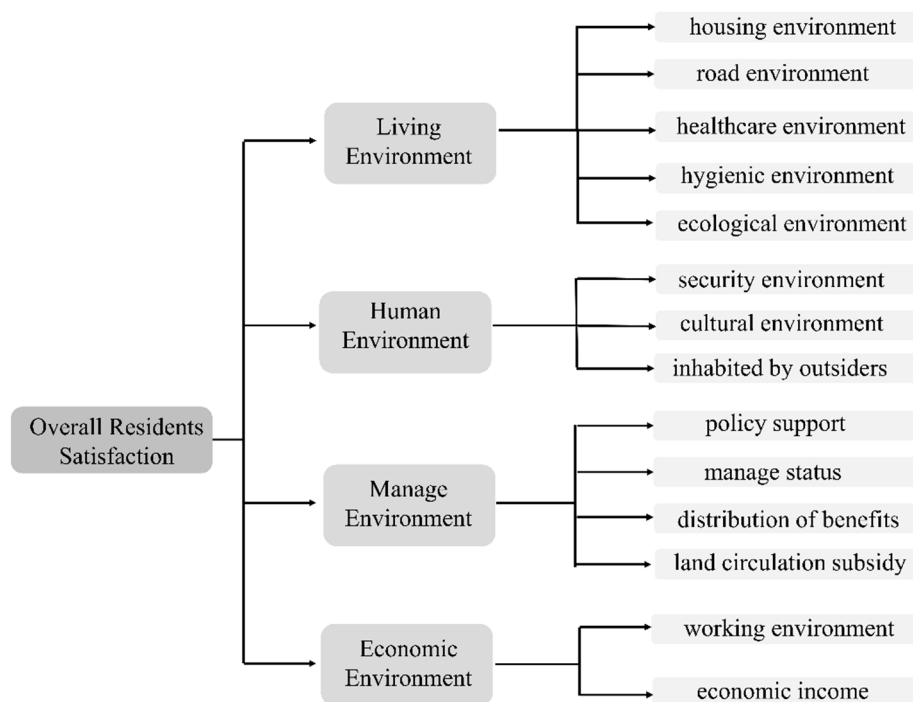
Figure 1. The hierarchical structure of multi-dimensional environment evaluation system.

Ten experts were invited to score the relative importance of the factors from a scale of one to nine, based on a pairwise comparison proposed by T. L. Saaty [33–35]. Six of the experts were professors of rural development from the universities, and four of them were experts from government planning sectors. The factors within each layer were compared with each other, and a pairwise comparison matrix (aka. judgment matrix) were thus generated. The elements in the matrix represented the relative ratio of the corresponding two factors.

Objective–criterion judgment matrix

$$
ZA = \begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \\ A_4 \end{array}
\begin{bmatrix}
A_1 & A_2 & A_3 & A_4 \\
1 & 2.353 & 1.270 & 1.455 \\
0.425 & 1 & 0.540 & 0.618 \\
0.787 & 1.853 & 1 & 1.145 \\
0.688 & 1.618 & 0.873 & 1
\end{bmatrix} \tag{1}
$$

Criterion–index judgment matrix

$$
A_1B = \begin{array}{c} \\ B_1 \\ B_2 \\ B_3 \\ B_4 \\ B_5 \end{array}
\begin{bmatrix}
B_1 & B_2 & B_3 & B_4 & B_5 \\
1 & 2.185 & 1.686 & 1.903 & 0.808 \\
0.458 & 1 & 0.771 & 0.871 & 0.370 \\
0.593 & 1.296 & 1 & 1.129 & 0.479 \\
0.525 & 1.148 & 0.886 & 1 & 0.425 \\
1.237 & 2.704 & 2.086 & 2.355 & 1
\end{bmatrix} \tag{2}
$$

$$
A_2B = \begin{array}{c} \\ B_6 \\ B_7 \\ B_8 \end{array}
\begin{bmatrix}
B_6 & B_7 & B_8 \\
1 & 1.093 & 3.105 \\
0.915 & 1 & 2.842 \\
0.322 & 0.352 & 1
\end{bmatrix} \tag{3}
$$

$$A_3B = \begin{bmatrix} & B_9 & B_{10} & B_{11} & B_{12} \\ B_9 & 1 & 1.189 & 0.815 & 1.073 \\ B_{10} & 0.841 & 1 & 0.685 & 0.902 \\ B_{11} & 1.227 & 1.459 & 1 & 1.317 \\ B_{12} & 0.932 & 1.108 & 0.759 & 1 \end{bmatrix} \tag{4}$$

$$A_4B = \begin{bmatrix} & B_{13} & B_{14} \\ B_{13} & 1 & 0.893 \\ B_{14} & 1.120 & 1 \end{bmatrix} \tag{5}$$

(2) Calculate the indicators' weight

The calculation of factor weights was performed by the sum–product method. The judgment matrix was first normalized by columns, and then summed by rows to obtain the row vector α.

$$\alpha = (\alpha_1, \alpha_2, \ldots, \alpha_n)^T, \tag{6}$$

where $\alpha_i = \sum_{j=1}^m q_{ij}$, and $q_{ij} = \frac{a_{ij}}{\sum_{k=1}^n a_{kj}}$. a_{ij} was the element of the *i*th row and *j*th column in the judgement matrix.

The vector α was normalized to obtain the weight coefficient vector W = (w1, w2, $\cdots$, wn), and wi represented the weight of indicator *i*.

(3) Conduct the consistency test

When using AHP for weight calculation, a consistency test analysis is required to ensure the reliability of the relative relationship of the judgment matrix factors. The test formula is

$$CR = \frac{CI}{RI} \tag{7}$$

where the consistency evaluation index $CI = (\lambda\_max - n)/(n - 1)$, and λ_max is the maximal characteristic root of the weight vector W. RI is the average random index obtained according to the table of the value of the average random consistency index.

When $CR < 0.1$, the judgment matrix passes the test and has good consistency; when $CR \geq 0.1$, it fails the test and needs to be adjusted until its consistency is acceptable [36]. If the CR value of each judgment matrix is less than 0.1, the matrix has good consistency and the AHP framework established can be used to evaluate the multi-dimensional environments.

2.2. Theory

The three-fold model proposed by Halfacree in 2006 was used in this research to propose the optimization path. Space reproduction in rural settlements refers to the phased transformation of the spatial pattern caused by the joint effect of various internal and external factors [37–40]. Lefebvre was the founder of the production of space. Halfacree, borrowing the conceptual triad from Lefebvre, exceeded the materialist and idealist dualism of rural space and built a "three-fold model" describing modern rural space's characteristics and states [41–43]. His model rearranged the scattered elements of rural space and achieves a re-understanding of rural space through restructuring rather than reconstruction [44,45]. The three-fold model is based on the framework of spatial practice (the perceived space), representations of space (the conceived space), and representational space (the lived experience), and suggests that rural space is a "three-fold space" that includes rural locality, representations of the rural, and lives of the rural [46].

Rural locality refers to space form after rural space is produced or consumed, such as through the physical manifestation of architecture, landscape, indoor and outdoor space, and industrial composition [47].

Representations of the rural rxcefer to the demands of capital, power, and politics, which drives changes in rural space and can be regarded as the space connotation [48].

Lives of the rural are the expression and communication of subjects' daily activities and culture in rural space, thus reflecting the value and meaning of the space and being termed as "space meaning" [49,50]. The logical line of the three-fold model is demonstrated in Figure 2.
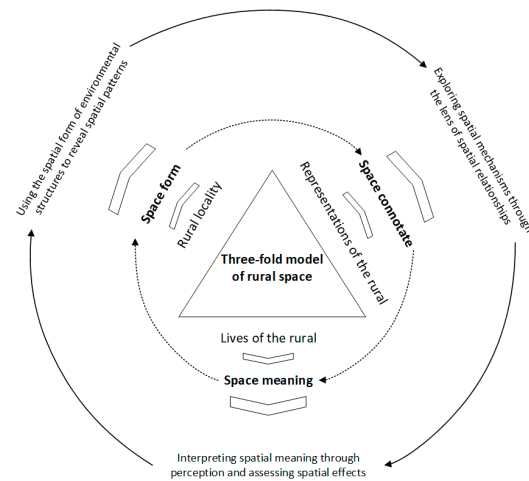
Figure 2. The three-fold model of rural space.

New rural settlements that are impacted or produced by tourism feature the overlap between scenic spots, ecological areas, and residence. They have the dual function of tourism development and environmental protection. Diversified interest entities are also involved in the tourism business. Property rights here are thus very complex, resulting in sharper and sharper contradictions between people and people, and human and land [40]. The aforementioned conditions create a complicated transition process of the multi-dimensional environments in rural settlements, and the production of space theory and the three-fold model based on it can help to understand this process and establish the optimization path accordingly.

3. Research Areas

Tianquan Lake Town is located in the southwest of Xuyi County, Huai'an City, at the junction of the Jiangsu and Anhui Provinces, about 110 km from Huai'an City. The town has an area of 242.48 km^2 and administrates three communities and sixteen villages under it. Tianquan Lake Town has a beautiful natural environment and rich tourism resources, with Tianquan Lake within its borders and being adjacent to Tieshan Temple National Forest Park. Tianquan Lake and Tieshan Temple National Forest Park are 4A level scenic spots and enjoy a stable flow of about five million tourists per year. In recent years, tourism of Tianquan Lake had developed rapidly, most notably in the Tianquan Lake Tourism Resort. As a result, the case areas for this research were chosen to be Tianquan Community and Doushan village, which are located on the southeast side of the Tianquan Lake Tourism Resort. Their geographical locations are shown in Figures 3 and 4.
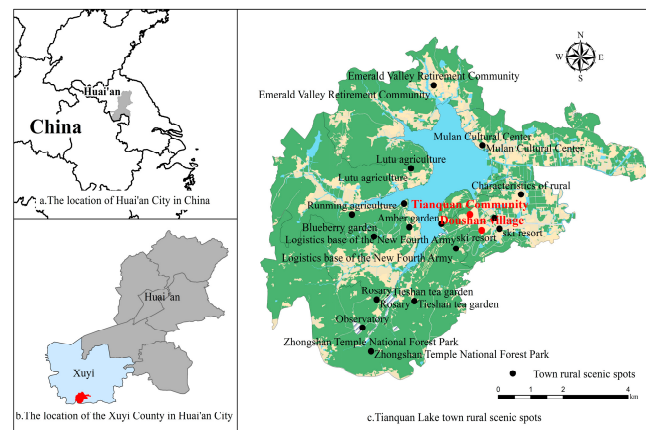

Figure 3. The geographical locations of research areas.

Figure 4. Satellite image of the location distribution of research areas.

Tianquan Community can be described as a "relocation village", which is located in the northwest of Tianquanhu Town, 40 km from Xuyi County. It covers an area of 24 km^2, and the total population of the whole community is 5195. Tianquanhu Community is mainly a centralized resettlement site for the surrounding farmers who were demolished when the Tianquanhu Tourist Resort was developed. Its main function is to provide tourist reception services for surrounding tourist attractions. As a resettlement center for farmers, the Tianquan community was planned and laid out in a unified architectural manner at the beginning of its construction. As a result, the community has been planned in a unified manner with a uniform architectural style and a relatively reasonable layout (Figures 4 and 5).
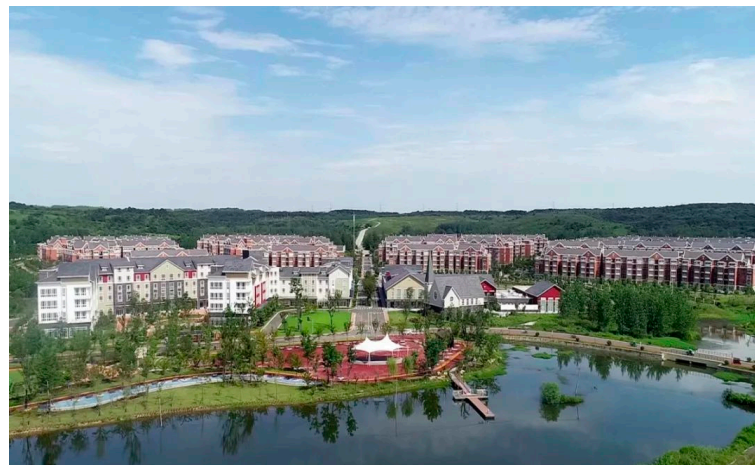

Figure 5. The picture of Tianquan Community.

Doushan Village is a "sightseeing and settlement symbiosis village". It is connected to the Tianquan Lake Community in the northwest, 35 km from Xuyi County, covering an area of 13 km^2. The total village population is 5783. Doushan Village is located near Tieshan Temple National Forest Park, and the tourists to Doushan Village are those who pass through it on the way to the national park. Doushan Village develops rural tourism based on the cultural resources as well as other characteristic natural resources nearby. More than 300 people in the village are directly or indirectly engaged in happy farmhouse and other rural tourism support services. In 2021, more than 100,000 tourists visited Doushan Village. To attract more tourists and to meet their needs, Doushan Village has improved its landscape by reconstructing the residential environment and the external space. The village has been transited from a traditional settlement to a place with mixed functions

of sightseeing and residence. Although Doushan Village has maintained the original appearance of the countryside, the architectural style is not uniform and the functions are relatively chaotic (Figure 6).

Figure 6. The picture of Doushan Village.

Despite the geographical proximity of the two rural settlements and their similarities in terms of climate, environment, dialect, and food habits, there are many differences due to the different forms of the two settlements (see Table 2). Tianquan Community was established to uniformly relocate residents from nearby villages after their houses were demolished to develop a government project. Many young people moved to work and live in better conditions in the county after receiving compensation for the demolition, which lead to the population structure of Tianquan community being dominated by the elderly and children. However, Doushan Village retained its rural characteristics after the renovation, and the village itself has become a tourism attraction. With the development of rural tourism, such as fruit picking and agritainment businesses, which allows young people to earn as much money at home as they could obtain outside. As a result, the demographic structure of Doushan Village is relatively stable. In addition, the Tianquan community has taken advantage of its environment to attract foreign investment, turning the community into a large ecological retirement city with the health and retirement industries at its core. They have gradually changed the income of residents from receiving local tourists through recreation and tourism. Visitors to Dushan Village include not only those who travel to Tieshan Temple, but also those who are attracted by the village's rural tourism and come here specifically for that purpose.

Table 2. Comparison between Tianquan Community and Doushan Village.

Research Areas	Tianquan Community	Doushan Village
Types of rural settlements	Relocation Village	Sightseeing and Settlement Symbiosis Village
Population	5195	5783
Area (km^2)	24	13
Composition of the residential population	Relocated residents from surrounding settlements; the elderly and children as the major population	Indigenous residents as the major population, and immigrants as a supplement; the elderly, children, and middle-aged persons
Main economic activities	Health and wellness tourism; elderly care service	Leisure tourism; fruit farming; agritainment
Forms of spatial morphological change	Unified spatial planning; relatively well-equipped facilities; open space	Maximally retaining the original body of the building; reconstruction of the External Space; mixed functions; optimization of the landscape; open space
Exploitation and utilization pattern	Residence as the primary function; commercial and tourism as the secondary function	Living and tourism as the primary function

4. Research Design

This study firstly selected two representative rural settlements impacted by tourism as the study area. Then, a multidimensional environmental evaluation system was constructed by AHP to obtain the judgment matrix. Subsequently, the multi-dimensional environment evaluation data based on satisfaction of local residents were collected through questionnaires and in-depth interviews. On this basis, the changing mechanisms of multi-dimensional environments of "relocation village" and "sightseeing and settlement symbiosis village" in the space reconstruction process were analyzed. Finally, the "three-fold model of rural space" was used as the paradigm to propose the optimization approaches for multi-dimensional environments in the two types of rural settlements (Figure 7).
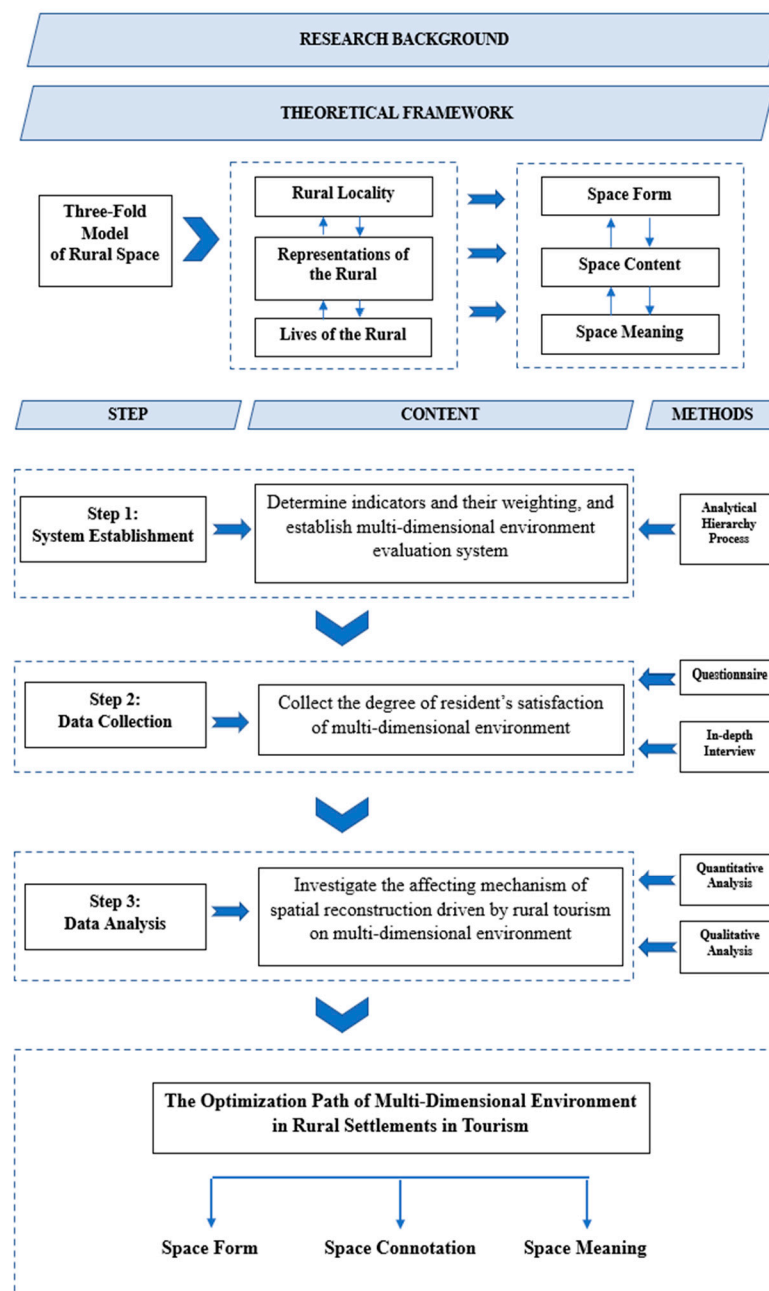
Figure 7. Research design.

5. Results and Discussion

5.1. The Multi-Dimensional Environment Evaluation System Based on AHP

Firstly, the weights of the criterion layer were calculated. Then, each criterion's weight was allocated to the factors in index layer according to the judgement matrix. The multi-dimensional environment evaluation system reflected by residents' satisfaction was thus established. As shown in Figures 8 and 9, in the criterion layer, the living environment had the largest weight, reaching 34.48%. The management environment and economic environment were weighted as 27.16% and 23.71%, respectively. The human environment ranked last with the weight of 14.66%. In the index layer, economic income, working environment and ecological environment were the strongest indicators affecting resident's satisfaction, and the inhabited by outsiders had the weakest influence (Figures 8 and 9).
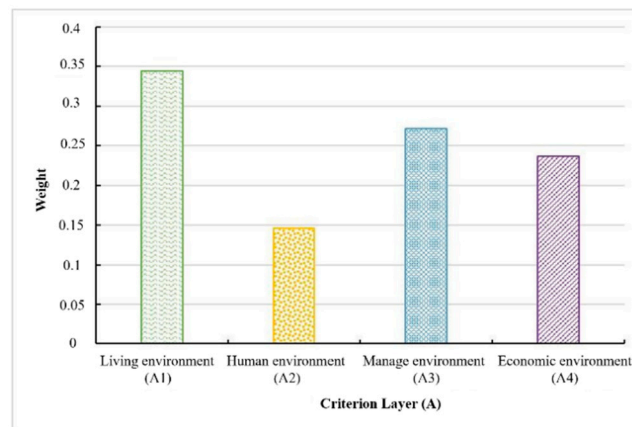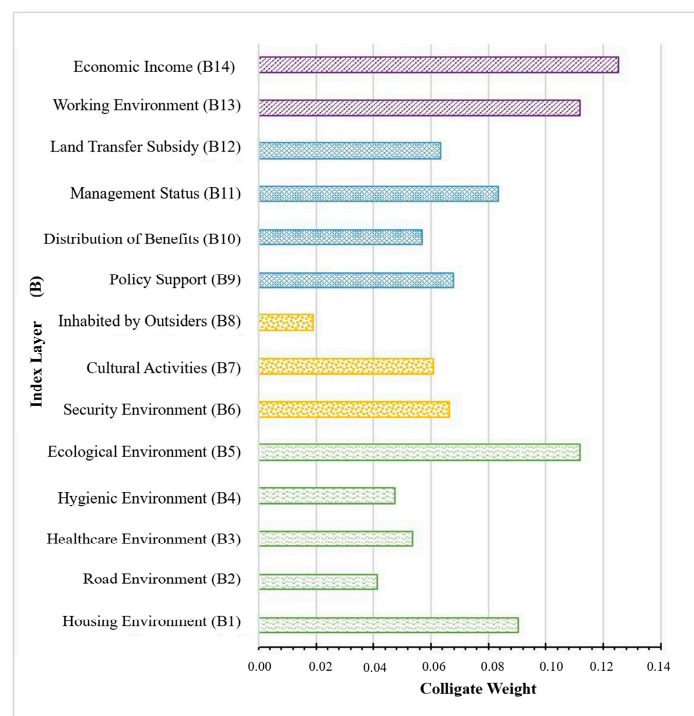

Figure 8. The weights in criterion layer.

Figure 9. The weights in index layer.

5.2. The Residents' Satisfaction of Multi-Dimensional Environments

Questionnaires on the residents' satisfaction with multi-dimensional environments were distributed in Tianquan Community and Doushan Village. A total of 360 question-

naires were distributed to the local residents in the two areas by random sampling. A total of 358 were collected, of which 326 were valid, with an efficiency rate of 90.56%. The amount of 142 questionnaires were from Tianquan Community, and 184 were from Doushan Village. The distribution of the samples, gender, age, education level, and monthly income in the two areas are shown in Figures 10 and 11, respectively. The Cronbach's alphas of the questionnaire from the two communities were 0.866 and 0.862, respectively, both higher than the standardized value of 0.858. Therefore, the consistency and reliability of the survey were proved. The five-point Likert Scale was applied in the questionnaire. Participants circled the score according to their level of satisfaction. The score ranged between 20 and 100, with a higher score indicating higher satisfaction [51]. The weighted satisfaction scores of the criterion and the objective layer were calculated successively by cumulating the scores of the corresponding index according to their weights. The comprehensive residents' satisfaction with multi-dimensional environments was thus obtained. The satisfaction of residents with each alternative was ranked according to scores. The results of the two rural communities are shown in Tables 3 and 4 respectively.
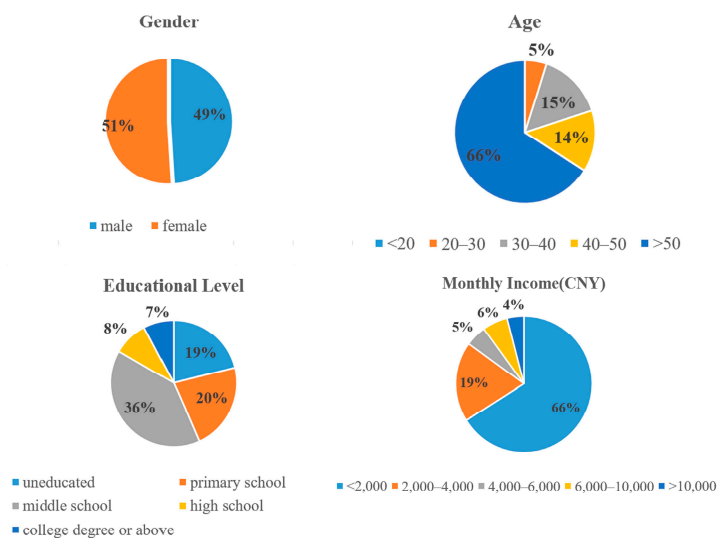

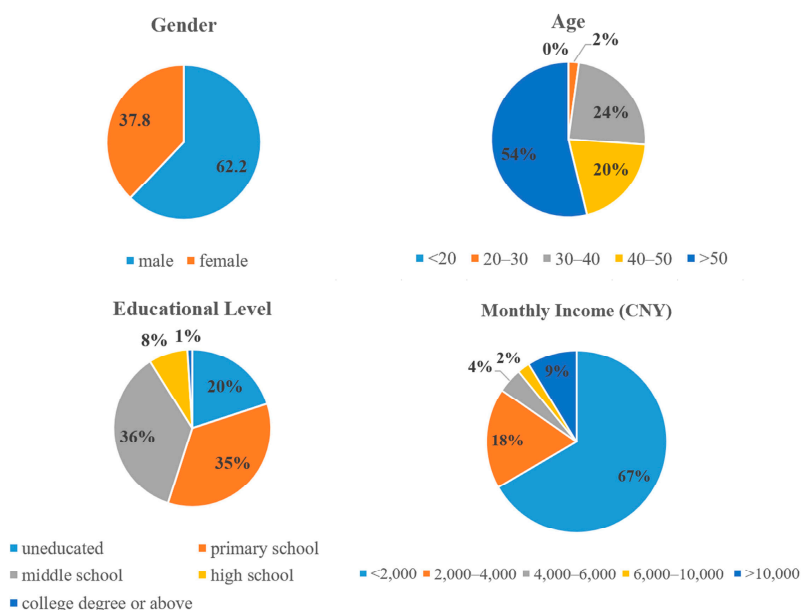**Figure 10.** The descriptive statistics of samples from Tianquan Community.

Figure 11. The descriptive statistics of samples from Doushan Village.

Table 3. Residents' satisfaction scores with multi-dimensional environments in Tianquan Community.

Objective Layer Score (Z)	Criterion Layer Score (A)	Index Layer Score (B)	Rank
Residents' Overall Satisfaction (63.73)	A1 Living Environment (76.52)	B1 Housing Environment (75.76)	4
		B2 Road Environment (74.55)	5
		B3 Healthcare Environment (73.74)	6
		B4 Hygienic Environment (78.99)	2
		B5 Ecological Environment (80.20)	1
	A2 Human Environment (76.30)	B6 Security Environment (78.79)	3
		B7 Cultural Activities (70.91)	7
		B8 Inhabited by Outsiders(68.68)	8
	A3 Management Environment (52.56)	B9 Policy Support (61.17)	10
		B10 Distribution of Benefits (51.71)	13
		B11 Management Status (57.17)	12
		B12 Land Circulation Subsidy (47.07)	14
	A4 Economic Environment (58.71)	B13 Working Environment (63.02)	9
		B14 Economic Income (57.37)	11

Table 4. Residents' satisfaction scores with multi-dimensional environments in Doushan Village.

Objective Layer Score (Z)	Criterion Layer Score (A)	Index Layer Score (B)	Rank
Residents' Overall Satisfaction (69.89)	A1 Living Environment (81.13)	B1 Housing Environment (80.50)	4
		B2 Road Environment (79.00)	5
		B3 Healthcare Environment (78.00)	6
		B4 Hygienic Environment (84.50)	1
		B5 Ecological Environment (84.00)	2
	A2 Human Environment (80.24)	B6 Security Environment (83.50)	3
		B7 Cultural Activities (75.50)	7
		B8 Inhabited by Outsiders (72.00)	8
	A3 Management Environment (64.16)	B9 Policy Support (57.00)	14
		B10 Distribution of Benefits (61.50)	13
		B11 Management Status (70.50)	9
		B12 Land Circulation Subsidy (63.00)	11
	A4 Economic Environment (64.17)	B13 Working Environment (69.50)	10
		B14 Economic Income (62.50)	12

5.3. The Affecting Mechanism of Space Reconstruction on Multi-Dimensional Environments

(1) The "sightseeing and settlement symbiosis village" generally develops better multi-dimensional environments than the "relocation village".

In terms of overall resident satisfaction, Doushan Village (69.89) outperformed Tianquan Community (63.73). In the criterion layer, Doushan Village scored higher than Tianquan Community in all criteria. In the index layer, 13 of the 14 indexes in Doushan Village were higher than those in Tianquan Community, except for that of policy support. Therefore, the multi-dimensional environments in "the sightseeing and settlement symbiosis" Doushan Village were better than those of "the relocation" Tianquan Community. The gap between the two was strongest in management environment, especially in the sub-layer of management status, with scores of 70.50 and 57.17, respectively.

(2) Ecological environment: the direct benefit of rural tourism in the space reproduction process

The scores of the residents' satisfaction with their living environment were 76.52 and 81.13, respectively, both ranking first in their respective criterion layers. In the specific sub-indexes of the living environment, the ecological environment ranked first and second in each settlement. Therefore, ecological environment is the significant improvement in the space reconstruction in rural tourist settlements. The changing mechanisms of the ecological environments in the two settlements' space reconstruction processes are as follows.

① Tianquan Community is endowed with an advantageous ecological environment, with important natural resources including 9 km^2 Tianquan Lake and 61.58 km^2 of Tieshan Temple National Forest Park. Tianquan Lake is the largest mountain lake in the northern Jiangsu Province, and its water quality consistently maintains water quality above the second-class drinking water requirement. In Tieshan Temple National Forest Park, there are 533 species of higher plants, 170 species of migratory birds, 40 species of wild animals,

and 250 species of insects, which together, make up a full ecological system. Amid them, Metasequoia Glyptostroboies, Davidia Involucrate, Ginkgo Biloba, Eucommia Ulmoides, Juglans Regia, Brachystachyum Densiflirum, Changium Smyrnilides, and Glycine Soja are the National Key Protected Plants [52]. In the establishment and development of Tianquan Community, the government took measures such as ecological conservation, resource utilization, and ecological environment management to ensure an intact ecological appearance. Various ecological facilities were built to minimize the production of pollutants. In addition, policies such as the Ecological Protection Plan and the Tieshan Temple Forest Park Protection Regulations were formulated, and regular environmental protection and remediation meetings were held to carry out the long-term ecological management.

② The ecological environment in Doushan Village has also been optimized under the joint governance of multiple interested entities. The government has implemented several projects in Doushan Village to improve the local water conditions and the ecological environment through financial bidding, including the short water system amelioration, water environment management and improvement, and small watershed management and landscape improvement projects. Most importantly, the villagers' enthusiasm and responsibility have been maximized in environmental protection. Systematic regulations have been imposed to clarify the individual responsibilities in protecting the environment. The regulations cover the aspects of garbage disposal, sewage discharge, and street cleaning. In addition, the supervisory role of residents has been given full play through social media platforms such as WeChat and public accounts. Environmental problems such as poor management and environmental pollution can be published on social media and solved in a timely manner by the relevant responsible persons. As a result, under the co-governance of many entities, Doushan Village's ecological and residential environment has been well-maintained and optimized. The village was awarded the title of China Beautiful Leisure Village in 2020.

(3) Management environment and economic environment: the bottleneck of multi-dimensional environments in the space reconstruction process.

The management and economic environments are the shortcomings of the multi-dimensional environments' development in both settlements. Specifically, their respective issues are as follows.

① In Tianquan Community, the support initiatives are mainly related to the financial and personnel assistance in the unified planning and construction of the communities' facilities, houses, and roads. Government policies also contributed to the protection of eco-environment to ensure the sustainable development of tourism. However, the main problem that the residents of Tianquan Community face is livelihood security after the transfer of residents' land use right, which is called land circulation in China. Inhabitants moved here in 2009 from nearby villages due to land circulation and permanent house swap policies. The government has provided subsidies to the residents to compensate for their losses when they transferred their agricultural land and houses to the government to develop projects. However, the land transfer subsidies the locals got were insufficient to cover their living expenditures. At the same time, they lost their reliable source of income from farming, which increased their anxiety. Additionally, the ineffective information of the land transfer and financial subsidy policies also increased residents' displeasure with the government. In terms of employment, the residents were provided with opportunities to work, but they barely met the employment demands of the enterprises due to insufficient professional skills. As a result, young people started to leave the community and work in other places. The subsequent increased housing vacancy rates, community hollowing, and aging issues were brought on by population decline.

② As a "sightseeing and settlement symbiosis village", Doushan Village has mainly benefited from government support through renovation of village appearance, road enhancement, and environmental improvement. However, the policies concerning residents' tourism business and house construction are insufficient. First, there are limited policies or funding from the government to support residents in managing their own tourism

ventures despite their desire to get involved in the expanding rural tourism. In addition, the government has issued policies to control the houses' size, the number of floors in buildings. Illegal constructions will be demolished, which ignores the living demand of residents and aggravates dissatisfaction and distress. The mismatch between the policy support and the residents' actual needs has prevented the locals of Doushan Village from fully benefiting from and playing a full role as rural subjects in the rapidly developing local rural tourism. The vitality of rural tourism has thus been weakened.

5.4. The Optimization Path of Multi-Dimensional Environments in Rural Settlements

Based on the "three-fold model" proposed by Halfacree [53], this research has constructed a comprehensive optimization path of rural multi-dimensional environments including three aspects of space form, space connotation, and space meaning, as shown in Figures 12 and 13.

(1) The optimization path of Tianquan Community:

① Space form: to construct space to meet the actual needs of residents

The absolute advantage of power and capital in the space reproduction processes in Tianquan Community have been characterized by many aspects, ranging from utilization and protection of the natural resources, to determination of layout and zoning of the residential landscape, the local industrial structure, the employment structure, and land-use. Although government management has contributed to the effective utilization and protection of the natural environment, its conception of settlements is usually unrealistic and its unified planning is barely consistent with the actual needs of the residents, which has resulted in a high rate of housing vacancies and changes in the facilities and building functions. Therefore, for spaces that are still under construction, the government should avoid imposing their own preferences and instead consider the demands, daily routines, and identities of locals throughout the planning phase. For already-constructed areas, ongoing maintenance and repair, functional transformation, and refinement in line with actual usage are required to cut down on resource waste and raise resident satisfaction. Rural revitalization cannot be achieved unless the living environment is continuously improved, infrastructure building is encouraged, and ecological environment protection principles are followed.

② Space connotation: to broaden the participation channels of residents and improve the voice of the village collectivity

The unreasonable demands of capital and power are often at odds with that of residents in the community. The residents cannot protect their important interests, and their participation as living subjects in the settlements' construction and development is also weakened. Therefore, in space reconstruction processes, government and businesses should improve their communication with locals through strategies like offline seminars or online media to better understand their needs in areas like employment and subsidy. The village collectivity can use information technology to develop intelligent rural tourism. It can also deeply explore the attractive traits of the rural areas to promote cultural tourism and raise its earnings. The growth of the tertiary industry can pave the way for the collectivity to fully transform from an externally dependent entity to an independent one. When its reliance on higher government spending and outside funding is lessened, its voice and influence in the space reproduction process can grow. The village collectivity can also set up a profit-sharing mechanism and the local residents can become shareholders through the housing, land and technical resources, which will improve the residents' involvement in the reproduction process of rural spaces.

③ Space meaning: to improve space utilization and increase a multi-dimensional sense of belonging

The quality of each rural space depends on how that space is constructed. Reasonable space usage results from natural growth rather than intentional planning [54–56]. As the center for relocating residents, Tianquan Community has a unified design and distinct zone divisions. However, as the lifestyles of residence change and more locals leave for

employment purposes, a significant number of vacant homes emerge. This means that the majority of the facilities and buildings are not used for their intended purposes. Therefore, the community plan should focus on increasing the space utilization rate rather than merely pursuing space enlargement. To accomplish this, a systematic investigation and analysis of the space usage mode and everyday behavior of local inhabitants should be carried out in the planning phase. The functional zones, including residential areas, agricultural areas, life service areas, and leisure tourism areas, should be designed scientifically according to rules of rural space utilization. Vacant homes can be actively revitalized and used as bed and breakfast services, retirement communities, and centers for creative culture and sports. The size of agricultural regions can be increased to accommodate farming requirements for locals. Infrastructure such as water, electricity, and sanitation might be enhanced to improve their effective and unified utilization. The unique cultural and landscape characteristics of the community can be explored further to integrate and optimize the natural environment, rural social networks, spatial functions, and overall settlement appearance to comprehensively improve spatial utilization and enhance the residents' multi-dimensional sense of belonging.

(2) The optimization path of Doushan Village:

① Space form: to resolve the conflicts between sightseeing and residential demands,

Doushan Village performs dual roles as both a place of residence and a tourist attraction. Therefore, its spatial form issue is primarily the conflict between the sightseeing demands of tourists and the living demands of residents. The initial village reconstruction and renovation rely greatly on the government's financial resources, and the village collectivity resources are insufficient for the maintenance of the construction. This can cause inconsistencies in the styles of the village's appearance. In addition, the government regulates the size and number of floors of residences to meet the demand for tourism and sightseeing, which makes it challenging to meet the residents' living demands. The reconciliation of the tension between residential and tourism demands is the important optimization direction for the space form of the multi-dimensional environment in sightseeing and settlement symbiosis villages. In terms of space maintenance, the government can provide policy support by creating long-term plans and complement it with ongoing financial support for the maintenance and improvement of village appearances. The village collectivity can also extend income sources by looking into new rural tourism-related industries to strengthen their maintenance capability. Additionally, they need to actively attract tourism construction investments to boost social capital and technical assistance to ensure the ongoing upkeep of the village. Finally, the government should improve the housing reconstruction policy for citizens by streamlining the application process and offering guidelines for the construction plan. This will simultaneously meet the residents' living demand and ensure that the reconstruction adheres to the settlement's unified planning, which facilitates the long-term development of the sightseeing and settlement symbiosis village.

② Space connotation: to exploit the rural characteristics and enhance the balanced development of sightseeing and settlement symbiosis village

Doushan Village achieved a more reasonable spatial reproduction process and a better multi-dimensional environmental development through the co-governance of multiple subjects. In this process, the government employs planners to carry out renovation planning and design through policy and financial support. The village collectivity implements the design and introduces investors to conduct tourism businesses to attract tourists and develop the relevant industries. The government, the village collectivity, planners, and investors collaborate to improve the multi-dimensional environments in Doushan Village. The local unique culture has been fully explored from the macro-level, in aspects such as transportation, the meso-level, in aspects such as settlement space and infrastructure, to the micro-level, in aspects such as architectural design. As a result, the village's unique qualities are prominently highlighted. This is good for growing rural tourism. In the future, Doushan Village should continue to promote the co-governance of diversified

entities. At the same time, it needs to focus more on the crucial part that locals play in the space reproduction process in rural tourism. Residents' opinions and suggestions can be incorporated when formulating or revising policies, and financial assistance can be provided to help residents run independent tourism businesses to emphasize the residents' role in the exploitation of rural features. This is beneficial for the sustainable growth of rural tourism, and the optimization of multi-dimensional environments.

③ Space meaning: to reconstruct the neighborhood network

The neighborhood is the most significant aspect in the settlement's social and geographic relationships. It is essential for preserving village cohesiveness, emotional communication, and interpersonal relationships among the residents [57–59]. The traditional neighborhoods of Doushan Village have been influenced by modernization, urbanization, and rural tourism, resulting in the aging of interaction participants, network-based communication, and decreased communication frequency. Under the new rural tourist background, slowing down population loss, developing neighbors' shared interests, and promoting rural values, and culture are the measures to improving the neighborhood network. The government can entice young people to settle back in their hometowns and launch their own tourism businesses by offering financial and policy support such as tax rebates and interest-free loans, with the aim to ameliorate the village-hollowing problems and increase the subjects of neighborhood interaction. The village collectivity can work with social workers and organize activity groups to create interaction opportunities among neighbors. Cooperative and mutual aid organizations for residents' tourist businesses can be established to enhance the common interests among villages. The rural value of neighborhood watch, honesty and courtesy, diligence, and frugality can be re-cultivated to improve the civilized quality of the residents and develop a harmonious neighborhood.
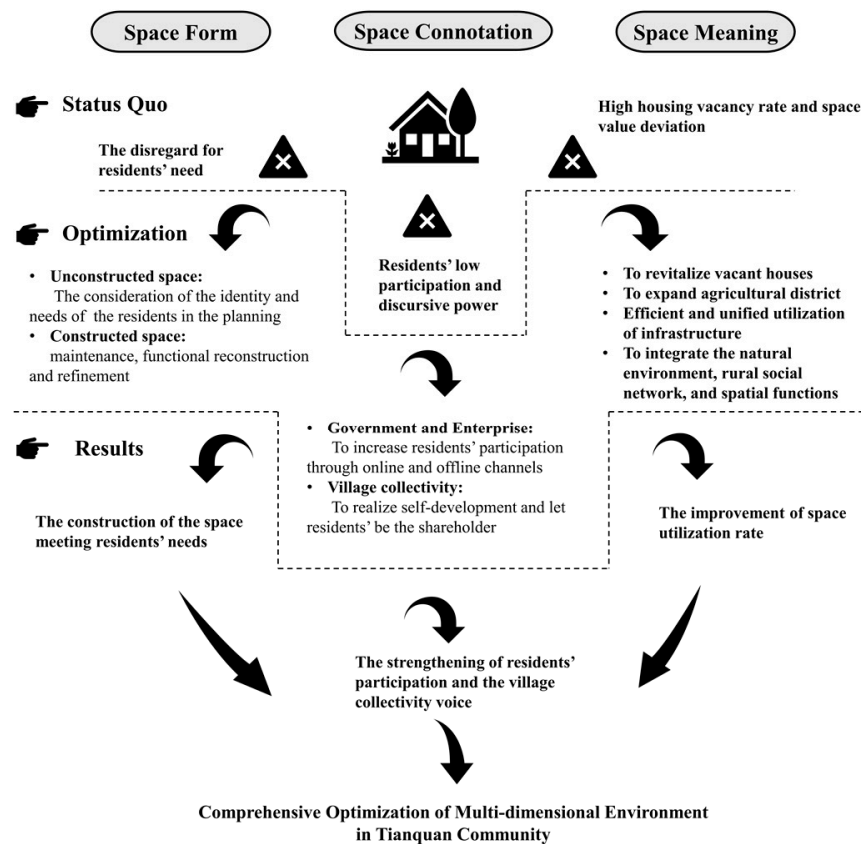

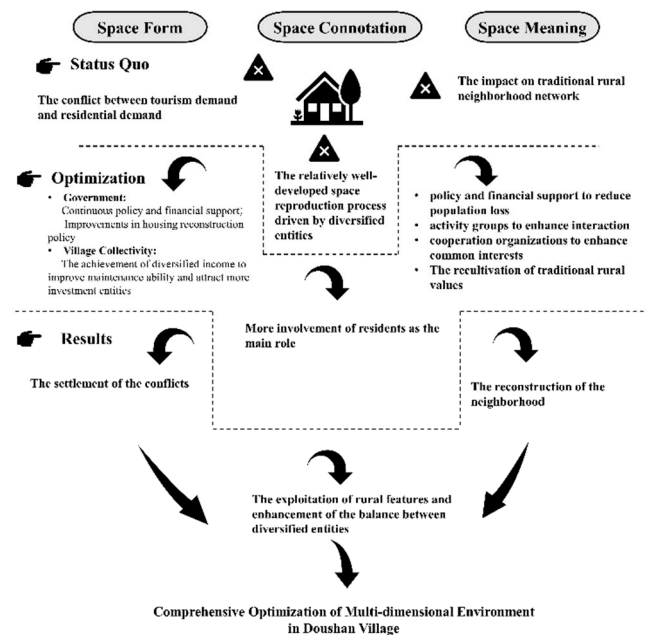**Figure 12.** The optimization path of multi-dimensional environment in Tianquan Community.

Figure 13. The optimization path of multi-dimensional environment in Doushan Village.

6. Conclusions

This research has constructed a multi-dimensional environment evaluation system based on the satisfaction of local residents with the application of an analytic hierarchy process and explored the affecting mechanism of space reconstruction on the multi-dimensional environment driven by rural tourism in a relocation village and sightseeing in a settlement symbiosis village. Finally, based on the theoretical perspective of the reproduction of the space, a comprehensive optimization path of multi-dimensional environment was proposed for the two types of rural settlements. The following conclusions are reached.

1. From the perspective of residents' satisfaction, "sightseeing and settlement symbiosis village" develops better multi-dimensional environments than "relocation village", which indicates a more reasonable reproduction process of the rural space and a more sustainable development of rural tourism.

2. Ecological environment is the most significant improvement for both "sightseeing and settlement symbiosis village" and "relocation village" in the spatial reproduction process driven by tourism. The rural tourism and the ecological environment protection in the two case areas share a mutually reinforcing relationship.

3. Management environment and economic environment are the bottlenecks of the multi-dimensional environments. Specifically, the shortcoming of the "relocation village" is the livelihood security of the residents after land transfer, and the shortcomings of the "sightseeing and settlement symbiosis village" is the policy support.

4. The "sightseeing and settlement symbiosis village" retains more rural elements than the "relocation village" and is more attractive to visitors who has interest in rural tourism. This gives more chances for the villagers who live in "sightseeing and settlement symbiosis village". Their income mainly comes from agriculture and rural tourism, thus, the tourism income source for "sightseeing and settlement symbiosis village" is more extensive than that of "relocation village".

5. In order to optimize the multi-dimensional environment, relocation villages should construct the space that meets the actual needs of residents, broaden the participation channels of residents, and improve the voice of the village collectivity, improve the utilization rate of space, and increase residents' multi-dimensional sense of belonging. Sightseeing and settlement symbiosis villages should resolve the conflicts between sightseeing and residential demands, exploit the rural characteristics and enhance the balanced develop-

ment of sightseeing and settlement symbiosis village, and reconstruct the neighborhood network.

This research can shed light on the sustainable development of the "relocation village" and "sightseeing and settlement symbiosis village" in rural tourism. However, only two representative types of villages in rural tourism are subjected to investigation due to the limitation of the research subject, which may limit the universality of the conclusion. Therefore, in the future, more types of villages in rural tourism will be further explored and compared to enrich the research of optimization approaches of the settlements in rural tourism. On that basis, sustainable rural tourism, and its advantages on social and economic prosperity of rural settlements can be promoted.

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