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Study on Pro-Environmental Behavior to Enhance Rural Social-Ecological Resilience: The Role of Place Identity and Social Cohesion as Mediating Mechanisms

Yilin Sun [1], Li Zhu [2,*], Ni Zhang [2], Honglin Wu [2], Quhan Chen [2] and Haolong Wang [2]

[1] Research Center of Chinese Village Culture, Central South University, Changsha 410083, China; 210501002@csu.edu.cn
[2] School of Architecture and Art, Central South University, Changsha 410083, China; 221301003@csu.edu.cn (N.Z.); 221311060@csu.edu.cn (H.W.); 231301006@csu.edu.cn (Q.C.); 231311065@csu.edu.cn (H.W.)
* Correspondence: 207131@csu.edu.cn

Abstract: Villagers' pro-environment behaviors profoundly impact the sustainable development of the rural eco-environment. Based on a survey of three traditional Chinese villages dealing with the challenges posed by modern development, we use structural equation models to analyze the contribution of villagers' pro-environmental behaviors to rural social-ecological resilience (identification of disturbances, internal stability, absorption and transformation, and system innovation). The results show that the former positively impacts the latter. Strengthening public participation at the behavioral level and reusing traditional local knowledge at the cultural level are prominent factors. Place identity and social cohesion are the mediating factors and social mechanisms of the process. Additionally, the degree of ecological environment dependence, age, residence time, and other factors positively correlate with the perception of social-ecological resilience. Therefore, this paper proposes four strategies to strengthen multi-level environmental management, cultivate the local ecological memory, increase the diversity of management forces, and encourage villagers to develop the self-organizing ability of eco-environmental management, which are crucial to the sustainable development of the rural eco-environment. It also provides a promising reference for developing villages facing the same challenge.

Keywords: pro-environmental behavior; social-ecological resilience; place identity; social cohesion

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Citation: Sun, Y.; Zhu, L.; Zhang, N.; Wu, H.; Chen, Q.; Wang, H. Study on Pro-Environmental Behavior to Enhance Rural Social-Ecological Resilience: The Role of Place Identity and Social Cohesion as Mediating Mechanisms. *Land* **2024**, *13*, 2144. https://doi.org/10.3390/land13122144

Academic Editors: Hossein Azadi and André Samora-Arvela

Received: 13 November 2024
Revised: 6 December 2024
Accepted: 8 December 2024
Published: 10 December 2024

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1. Introduction

The tense relationship between the utilization and conservation of rural ecological resources has become increasingly highlighted worldwide [1], which has emerged as complex issues related to using, accessing, and managing natural resources [2]. Sustainable development in rural areas presents an increasingly complex challenge globally [3]. For instance, due to multiple pressures such as population expansion and industrial development, deforestation, and river pollution, there has been damage to the eco-environment in rural India, causing a continuous threat to the local environment [4]. The similar eco-environmental issues have arisen in rural China [5]. According to statistics, there are nearly 600,000 administrative villages and 2.6 million natural villages in China, and the rural population has reached 600 million [3,6]. In recent years, rural economic improvement has been accompanied by a massive demand for resources, resulting in environmental pressures such as water pollution, lack of solid waste treatment, and deforestation [7]. According to a survey by the Ministry of Health, the amount of waste produced in rural areas can reach 0.86 KG per person per day, and the annual amount of waste production can reach 300 million tons. In the face of the situation, the Chinese government issued a series of laws and regulations to enhance rural waste management and eco-environment protection. However, due to the

dispersibility and invisibility of the pollution situation, it is difficult for the government alone to manage it [8]. Driven by interests, villagers pay more attention to those things that can get money rather than eco-environment protection. The situation mentioned above can easily lead to the destruction of rural environmental systems, the decline of ecological diversity, and the demise of traditional ecological knowledge and values. These challenges harm the dynamics of the rural eco-environmental system in the long run, leading to new risks in rural areas [9]. Sustainability is complicated when the disturbance to the villages far exceeds the ability of the ecological system itself to counteract these problems [10], which affects environmental sustainability. Due to the irreversibility of these negatives, many social-ecological problems have emerged [11]. There is a call to develop methods to support resilient learning relationships between people and their environment to adapt to current and future risks [12–14]. Social-ecological system theory highlights the symbiotic relationship between human society and natural ecosystems [15,16]. Self-action and self-organization are essential features of this system. It can adjust its internal structure in response to external stimuli, which helps it learn and adapt to changing environments [17]. Thus, it is considered a complex adaptive system. Resilience is a dynamic property of the social-ecological system. This is the ability to ensure that the system maintains its core stability while being disturbed [18]. Therefore, resilience thinking starts from the systematic view, and it regards the ability to innovate as the requirement for the sustainability of the social-ecological system [19]. Four characteristics of the social-ecological system are defined as conditions for resilience: identification of disturbances, internal stability, absorption and transformation, and system innovation [20–22].

The purpose of studying social-ecological resilience is not to outline the state of the environment but to clarify the collective ways humans deal with the environment [22]. Essentially, human activities contribute to environmental problems [23]. As the dominant status of rural spatial eco-environment governance, rural residents do not understand pro-environmental behavior and environmental disruption, accounting for increasing the difficulty of implementing environmental protection and the cost of environmental governance [24]. Environmental damage refers to the negative impact of human activities on the natural environment. For example, villagers randomly place and discard household waste and construction waste. In most rural areas of China, 30% to 60% of solid waste has been dumped [25], leading to the deterioration of environmental quality. Plastic bottles, bags of fertilizer, and pesticides have been thrown by village residents on water surfaces and roads, polluting land and water sources. In addition, deforestation occurs in the countryside, resulting in forest destruction. These adverse environmental behaviors can easily result in the degradation of environmental ecosystems [26], making it difficult to recover when external disturbances occur in the future. The continued negative effects of this destruction may cause the loss of suitable places for future generations to live, resulting in unequal intergenerational distribution. Therefore, rural resident PEB plays a crucial role in environmental governance. In contrast, pro-environmental behavior deals with eco-environmental problems effectively, protects eco-environmental sustainability, and supports symbiosis between humans and nature [27]. In other words, pro-environmental behaviors are those that contribute to environmental sustainability [28]. Environmental sustainability is considered a development process that balances human activities and environmental protection, enabling residents to meet their needs and improve their well-being without harming the natural environment or exceeding the capacity of ecosystems. From a more practical point of view, this involves the long-term management of renewable resources, the reduction of waste and pollution, the efficient use of energy and materials, and the repair of the environmental damage caused by the development process of the countryside. The aim is to create a safe, inclusive, and healthy environment for all residents to live in for a long time. Because of the value of the agenda to the overall social well-being of current and future generations, the pursuit of environmental sustainability becomes a priority in the development process. Social-ecological resilience is the guarantee for eco-environmental sustainability [29]. Therefore, it is critical in this paper to explore how pro-environmental

behaviors promote the formation and development of rural social-ecological resilience. The core of a social-ecological system is shared resources and collective action [30–32]. Furthermore, the hypothesis proposed that place identity and social cohesion are the mediating effects of pro-environmental behavior to enhance social-ecological resilience. The literature suggests that these two factors better explain the social aspects of social-ecological resilience [33,34].

Although the issue of pro-environmental behaviors and rural social-ecological resilience has received considerable attention, the research on the potential relationship between the two is very limited. Studies usually adopt objective methods to obtain fixed quantitative results of rural social-ecological resilience assessment from environmental characteristics, but they lack consideration of individual factors in specific situations. The subjective approach can capture the intangible aspects of resilience [35], which provides an advantage for studying social-ecological resilience. Therefore, subjective assessment may help to understand what should be done to improve rural resilience in terms of villagers' feelings. Moreover, most scholars ignore the role of villagers' pro-environmental behaviors in coping with regional eco-environmental challenges in rural areas. It may lead to the failure to integrate the eco-environmental policies with the actual rural situation, which cannot fully mobilize the villagers' enthusiasm or use local cultural resources.

The aim of this study is to establish a model of "pro-environmental behavior—place identity—social cohesion—social-ecological resilience" to assess the impact of pro-environment behavior on rural social-ecological resilience and to study (1) the key factors affecting the relationship between pro-environment behavior and social-ecological resilience; (2) the mediating role and potential social mechanism between the two; and propose feasible strategies. (3) the response and contribution of different groups to rural social-ecological resilience. The study results can provide a reference for establishing social-ecological resilience against risks in rural areas and balance the relationship between "development" and "protection". This has important theoretical and practical significance for developing rural eco-environment governance policies and constructing sustainable rural areas in the future.

2. Theoretical Background and Research Hypothesis

2.1. Link Pro-Environmental Behavior, Place Identity, and Social Cohesion

Pro-environmental behavior is defined as actions in which individuals or groups promote the sustainable use of natural resources [36]. Place identity refers to the connection between the self and the specific environment, reflecting the critical association between the individual and the environment [37]. It documents that residents' feelings and identification with this place will be much more profound when they make efforts to maintain their living environment [38]. Most studies demonstrate that the willingness and behavior to protect a place are positively associated with place identity [39,40].

Social cohesion refers to the state of primary solid networks at the community level (e.g., kinship and local voluntary organizations) [41], emphasizing the closeness among members and their perception of their own status in the group [42]. Social cohesion stems from homogeneity [43], including shared values and experiences, public participation, mutual trust, and a range of attitudes and norms among members of society [44,45]. The social approval and sanction from the pro-environment make personal behaviors meet shared norms. Members support each other in pursuit of environmental protection goals, forming a collective sense of responsibility and cooperation to enhance social cohesion [46]. This finding confirms that pro-environmental behaviors of residents may result in altruism and collective action, enhancing social cohesion [47].

Hypothesis 1 (H1). *Pro-environmental behavior positively affects place identity.*

Hypothesis 2 (H2). *Pro-environmental behavior has a positive effect on social cohesion.*

The identity model shows cohesion results from place identity, leading to social identity and sustainable cooperative in-group behavior [48]. Social groups that come together through physical proximity, shared ways of life, and common needs produce a corporate social identity, resulting in solid social cohesion. Thus, the path to sustainable development is that social identity associated with place generates social cohesion, which leads to pro-environmental behaviors. The study suggests that the development of community responsibility and the enhancement of problem-solving ability may be achieved by the close emotional connection among residents [49]. Place identity can create social cohesion and collective participation [50].

Hypothesis 3 (H3). *Place identity has a positive effect on social cohesion.*

2.2. Link Pro-Environment Behavior with Rural Social-Ecological Resilience

Studies have already confirmed that groups' past environmental behavior might affect their future environmental behavior [51,52]. When people become accustomed to engaging in pro-environmental behaviors, they simultaneously work together to restore and maintain the local eco-environment. This may contribute to improving communities' social-ecological resilience.

Hypothesis 4 (H4). *Pro-environmental behavior positively impacts rural social-ecological resilience.*

2.3. Link Place Identity, Social Cohesion, and Rural Social-Ecological Resilience

Place identity increases a sense of security, enhancing persons' adaptability in the face of ecological disruption. It can encourage communities to have a preparation for future risks [53]. In addition, villagers develop a connection between people and places by interacting with the place daily, which allows them to obtain cultural intimacy [54]. It inspires a commitment to the conservation and preservation of these places, thus encouraging resilient attitudes and practices [55].

Social cohesion can better explain the social aspects of social-ecological resilience [34]. Unity, trust, and respect from groups enable individuals to work together. They can use different knowledge, skills, and material resources to rearrange communities to respond to changing socio-ecological conditions, which can resist socio-ecological disruption effectively [56,57]. When individuals trust each other and feel obligated, communities are more likely to regulate the use of these resources sustainably [58,59]. Because it's collective action-oriented, people can effectively take environmental protection initiatives. This helps maintain villages' resilience and sustainability [46,60].

Hypothesis 5 (H5). *Place identification has a positive effect on the formation of rural social-ecological resilience.*

Hypothesis 6 (H6). *Social cohesion positively affects the formation of rural social-ecological resilience.*

3. Materials and Methods

3.1. Study Area

The main research sites were Shitoucheng Village in Lijiang City, A'zheke Village in Honghe City, and Nuogan Village in Pu'er City, Yunnan Province, China (Figure 1). They all had a long history and were selected in the directory of Chinese traditional villages [61]. A'zheke Village is located in the core area of the Honghe Hani Terrace World Cultural Heritage Area [62]. The Nuogan Village is located next to the World Heritage—Pu'er Jingmai Mountain ancient tea forest cultural landscape [63]. Shitoucheng Village is a demonstration center of Naxi traditional ecological culture conservation. In recent years of development, the eco-environment of these villages has been affected by external interference to varying degrees, but they still maintain good social-ecological systems on the whole. Not only have traditional local knowledge and ecological values been

preserved, but the complete "four-element isomorphism" (forests, villages, terraces, and water systems) ecological system [64] has not been fundamentally damaged. It embodies the harmonious social-ecological system of "production, life, and ecology". We found it closely related to residents' insistence on pro-environment behaviors. Therefore, it is essential to study how villagers developed the social-ecological resilience of local communities by organizing pro-environmental behaviors to prevent rural eco-environmental decline and implement new management strategies. This provides vital enlightenment for developing and protecting many traditional villages.

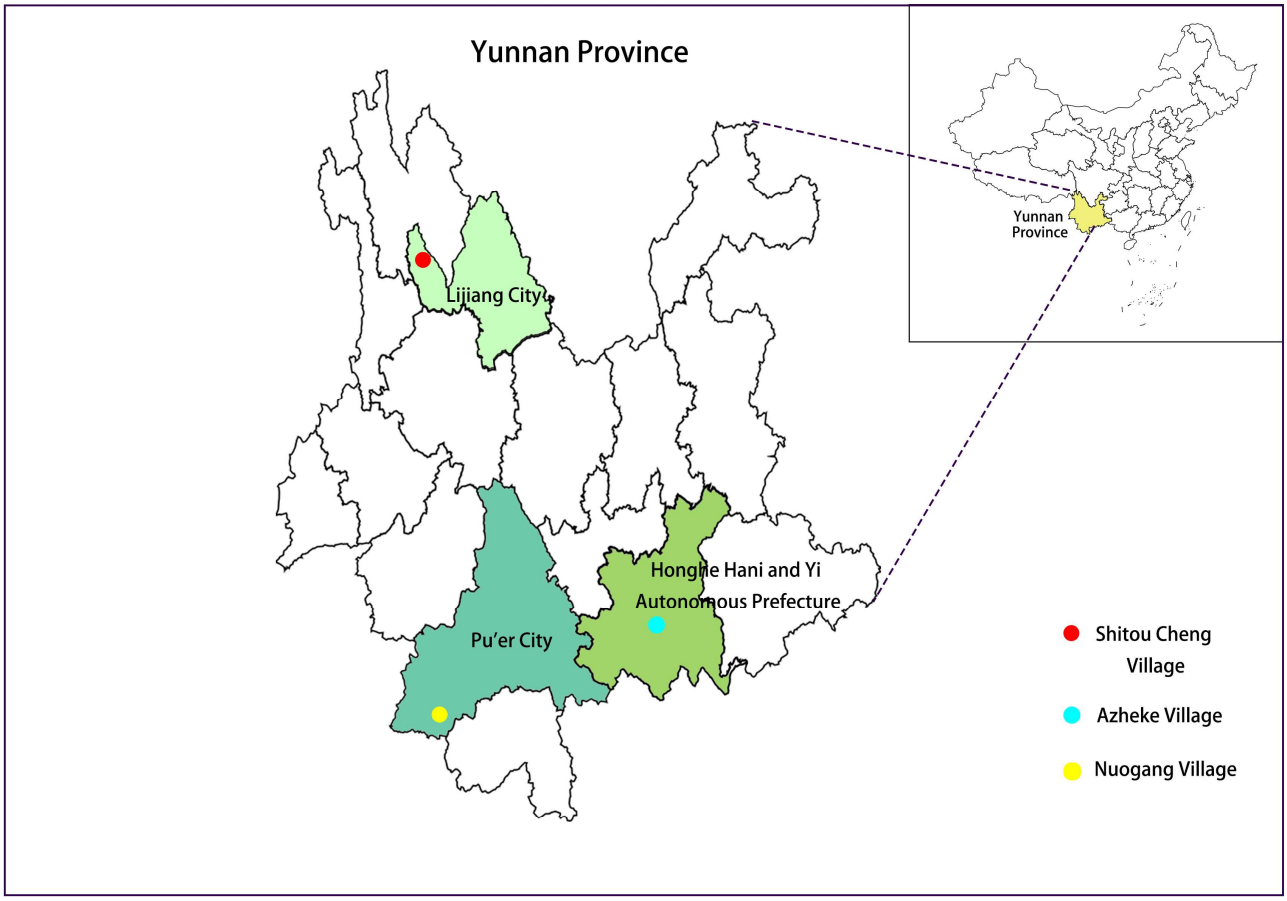


Figure 1. Schematic diagram of the study area.

3.2. Data Collection

From May 2023 to July 2023, we mainly constructed the observed variables in the questionnaire through on-site observation and interviews. Informed consent was issued to the respondents before the interview. After obtaining their consent, we conducted questionnaire surveys on them. In order to reduce their psychological burden, this survey questionnaire was an anonymous survey. We promised to keep the interviewee's personal data and information strictly confidential. This manuscript did not include any potentially identifiable personal images or data. This study did not include minors. Moreover, to reduce the interference of subjective bias, the questionnaire questions avoided the personal subjective views or emotional words for reducing certain preferences or expectations to the respondents. The questionnaire used neutral, objective language and provided neutral options for each question, avoiding only extreme options.

The questionnaire was first released to 20 villagers to check whether the questionnaire could be understood easily and the rationality of the question set. Based on the feedback, the questionnaire was revised. We rephrased some questions to make people better understand. The final questionnaire consisted of four parts: self-assessed pro-environmental

behaviors, place identity, social cohesion, and social-ecological resilience attributes. In some studies, self-assessment methods that rely on residents' perceptions and attitudes were more reliable in studying environmental sustainability [65]. This was because environmental sustainability was directly related to residents' pro-environmental behavior. Their pro-environmental behavior is closely related to environmental cognition [66]. From August 2023 to October 2023 and July 2024 to September 2024, we got data for analysis by questionnaires. 360 villagers in the three villages volunteered to participate, and they were of different ages, occupational statuses, and residence times. 120 questionnaires were sent to each village to ensure the universality and authenticity of the questionnaire data recovery. We eliminated 24 invalid questionnaires, which were not carefully answered. A questionnaire that was not carefully answered would decrease the data's authenticity and mask the real and meaningful results [67]. This was reflected in practice as a decrease in the reliability of statistical data. Because we used a Likert-5 scale for the test, three methods were chosen to screen the questionnaire that did not answer carefully. The first was proactive approaches [68]. We embedded a bogus item in every questionnaire, meaning the respondent could answer correctly. The questionnaire set the question, "There are 30 h in a day". Respondents should choose "strongly disagree". If the different answer was chosen, the paper was judged as an invalid questionnaire. The second was based on the choice of questions in the test paper. Straight-line answers were one of the signs of a lack of attention on the Richter scale. There were 22 questions in the questionnaire, except for personal information. If more than 12 consecutive questions were answered with the same answer, the questionnaire was invalid. The third category was based on the respondent's response time. In the actual process of questionnaire distribution, the response time was generally concentrated in 5–10 min. If the answer time was very short, it was believed that essential reading and thinking had not been completed before answering questions [69]. Therefore, if the answer to the questionnaire is less than 3 min, it would be marked as not seriously answering the questionnaire. In the end, 332 questionnaires were valid from 356 collected, with an effective questionnaire rate of 93.26%.

3.3. Questionnaire Design

The research process was as follows: Based on the previous research and literature review, we designed a structured questionnaire with five target levels, including demography, villagers' pro-environmental behavior, place identity, social cohesion, and social-ecological resilience. There were 22 factors. The information in the questionnaire was translated into statements in concise and easy-to-understand affirmative sentences with specific examples that villagers could evaluate.

First, we collected demographic data to understand the structure of the respondents, such as gender, age, occupational status, and length of residence. Secondly, the factors of pro-environment behavior were selected according to the scale of pro-environment behavior [64,70,71] and the actual situation of the villages. In line with the actual needs, the pro-environment behaviors were divided into public and private dimensions [72]. The former was an environmental behavior with the nature of "collective action", which mainly explored villagers' willingness to participate in the government and group organizations, their protection and management of the public eco-environment, and their concern for the actual environmental problems [64]. The latter referred to individual or family-centered environmental behaviors closely related to daily life, mainly exploring the villagers' repeated use of resources in daily private life and their attention to eco-environmental information, such as garbage classification, resource reuse, and discussion with neighbors. The pro-environment behavior scale contained eight factors that could fully reflect the villagers' tendency toward pro-environment behavior in life.

Then, place identification and social cohesion were the mediating factors in the analytical model. The place identity in this paper includes the emotional link to physical space and the self-identity based on the place. For example, people had a unique emotional connection between persons and the place, a strong sense of belonging to the environment

of the place, a good understanding of the environment, a strong sense of identity and security through community recognition, recognized the cultural resources, distinguished me from other individuals' identities through the place, and so on. These items were derived from used place identification scales [73,74]. The place identity scale included five indicators, assessing participants' identity with their community.

Social cohesion emphasized the closeness of the member's self to other group members [42]. Social cohesion was assessed using five factors: resource sharing among villagers, trust, cooperation to reduce risks, mutual encouragement to cope with environmental change, and conscious conservation of the environment under value norms. The scale assessed how united people are within a community.

Social-ecological resilience assessed the impact of pro-environmental behaviors in responding to ecological disturbances and risks. Based on observations and measuring scales [9,75], four characteristics of social-ecological resilience (identification of disturbances, internal stability, absorption and transformation, and system innovation) could be expressed. First, rural communities could respond quickly when the eco-environment was destroyed or disturbed. The second was to cultivate ecological memory, retain and protect traditional local knowledge, and form the sustainable use of resources recognized by the villagers, which promoted the villagers' conscious participation in ecological environment management. The third was to adapt to the development of The Times, transform the external interference into the participation of the social ecology in the village, establish a knowledge-sharing mechanism, and integrate local knowledge and scientific knowledge, which promoted the diversified development of the social ecosystem. The fourth was to seek social organization innovation in the social ecosystem, enhance the self-organizing strength of villagers, and carry out fair management and distribution of rural ecological resources. This measuring scale could fully determine the effect of social-ecological resilience.

All scales were scored using a five-point Likert scale. Scores for each item range from "strongly disagree" (1) to "strongly agree" (5).

3.4. Construction of Structural Equation Model (SEM)

Resilience was regarded as a potential property unable to be directly measured [9]. Latent variables could be inferred from some measured variables [76]. In order to deal with latent variables and the relationships among multiple variables, we applied an SEM as an effective analytical method [77,78]. In the SEM, the assumed relationships among variables were represented in a path model, where factors were linked with arrows to the underlying structures they measured. The underlying structures were linked based on their relationships [78]. We built a basic model framework based on the assumptions mentioned above (Figure 2). The factors from the questionnaire were used to measure the latent variables. An SEM was developed to explore the relationship between pro-environmental behavior, place identity, social cohesion, and social-ecological resilience.

3.5. Statistical Analysis

There were two test methods to be used for data analysis in this paper.

3.5.1. One-Way Analysis of Variance (One-Way ANOVA) and the Least Significant Difference (LSD) Method

One-way analysis of variance (one-way ANOVA) is one of the significance tests of difference. The method was usually applied to analyze whether there were significant differences in the mean values of multiple sample groups under the influence of a single control variable. Control variables refer to variables that may interfere with the model, including fundamental sociodemographic information such as occupation, age, and residence time in the paper. Therefore, it could provide us with evidence of the appropriateness of the "pro-environmental behavior—place identity—social cohesion—social-ecological resilience" model to focus on the results of the control variables. Based on the results of the one-way ANOVA, the LSD method was further adopted to make multiple comparisons

of the mean values to analyze which group had a significant difference from the groups' means. This study adopted the method to examine the relationship between objective data of the three single control variables (occupation, age, and residence time) and the dependent variables and the perceived social ecological resilience in order to obtain the differences in the perceived social ecological resilience at different occupations, ages, and residence times, respectively. This test was implemented through SPSS 26.0 (IBM Corp., Armonk, NY, USA).

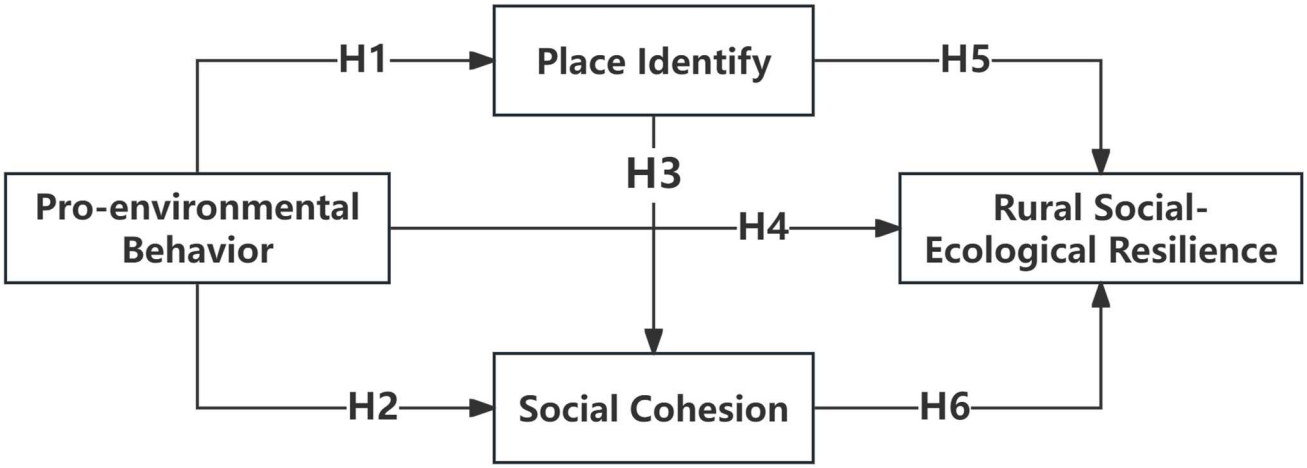


Figure 2. Diagram of the model framework.

3.5.2. SEM Analysis

The SEM analysis encompasses data analysis in four aspects in the paper.

(1) Confirmatory factor analysis. The confirmatory factor analysis in this paper includes reliability analysis and validity analysis. Since this questionnaire was a 5-point Likert scale, the alpha reliability coefficient method was adopted to evaluate the authenticity and validity of 332 available questionnaires collected. The calculated Cronbach's Alpha value mainly determined it. The primary purpose of validity analysis was to determine whether the 22 questions written (except the basic information) in the scale could truly reflect the pro-environmental behaviors, place attachment, social cohesion, and social-ecological resilience that the study intended to express. It was realized by KMO and Bartlett's sphericity test. In order to better achieve the detection goal, we tested convergence validity and difference validity to verify that the recovered data had both consistency and certain differentiation. It was measured based on AVE square root reflection differentiation validity. The result also showed the factor load value for each measurement item. This analysis was implemented through SPSS 26.0 (IBM Corp., Armonk, NY, USA).

(2) Model fit analysis. Based on the established model, the values were brought in to test whether the "pro-environment behavior-social-ecological resilience" model can get effective results. In this analysis, Chi-square, Chi-square/freedom, RMR, RMSEA, NFI, RFI, IFI, TLI, CFI, AGFI, GFI, etc., were commonly used to evaluate the degree of fit of the model. When the model met more than one metric, it showed that the data collected by the questionnaire fit the "pro-environmental behavior-place identity—social cohesion—social-ecological resilience" of the framework. The statistical calculation was implemented by Amos 26.0 (IBM Corp., Armonk, NY, USA).

(3) Path hypothesis analysis. After proving that the data and framework fit well, the 6 positive hypotheses in this paper were verified. The path relationships among pro-environmental behavior, place identity, social cohesion, and social-ecological resilience were examined. A standard coefficient was generally used to evaluate the relationship between the factors, and a p-value was used to determine whether the path was statistically significant. The statistical calculation was mainly implemented by Amos 26.0 (IBM Corp., Armonk, NY, USA).

(4) Mediate effect analysis. Based on the previous proof, the total effect, direct effect, and indirect effect among the dependent variables of pro-environmental behavior, place identity, social cohesion, and social-ecological resilience were calculated. After excluding the interference of other mediating paths, the effect of a single mediating path could be observed, and the effect of each path could be compared. The statistical calculation was mainly implemented by Amos 26.0 (IBM Corp., Armonk, NY, USA).

4. Result

4.1. Participants' Sociodemographic Characteristics

The surveyed participants' sociodemographic characteristics are as follows: (1) most of the participants were aged 31–59 (75.9%), and the people aged 18–30 and 60 and above accounted for 12.7% and 11.4%, respectively; (2) their occupations were primarily local farmers (66.7%), followed by businessmen (22.6%), and at least civil servants (11.8%); (3) all participants had lived in the area for at least 5 years, with the majority residing for more than 10 years (56.6%) (Table 1).

Table 1. Participants' sociodemographic characteristics.

Characteristics	Title	Frequency	Number (%)
Gender	male	112	33.7
	female	220	66.3
Age (years old)	18–30	42	12.7
	31–45	114	34.3
	46–59	138	41.6
	60 and above	38	11.4
Occupation	businessman	75	22.6
	civil servant	36	11.8
	farmer	221	66.7
Duration of residence in the village (years)	Within 5	98	29.5
	5–10	46	13.9
	Above 10	188	56.6

4.2. Analysis of Relationships of Demographic Characteristics on Social-Ecological Resilience

The following conclusions were drawn through the statistical test of age, occupation, and residence time. First of all, there were statistically significant differences among the means of the four age groups through one-way ANOVA ($F = 4.803$, $p = 0.003$, <0.05). According to the further result by the LSD method, "60 and above" had the highest correlation with "social-ecological resilience", followed by "46–59" and then "31–45", while "18–30" had the lowest. The test results showed that people's perception of social-ecological resilience became stronger with the increase of age (Table 2). It was considered that people's perception of social-ecological resilience became stronger with the increase in age (Table 2).

Secondly, there were statistically significant differences among the means of the three occupational statuses through one-way ANOVA ($F = 3.807$, $p = 0.023$, <0.05). It demonstrated that the difference between "businessman" and "farmer" was the most conspicuous from the further result by the LSD method. The farmers had a stronger perception of social-ecological resilience, clearly. In contrast, the businessman perceiving the resilience of their society was the least (Table 3).

Thirdly, the mean of the resident time had statistically significant differences ($F = 5.541$, $p = 0.04$, <0.05). Based on the further result, the difference between "within 5 years" and "over 10 years" was the most obvious. Participants who have lived for more than 10 years had a stronger perception degree, obviously; that is, they were more actively involved in developing social-ecological resilience. Instead, those who lived for less than 5 years had the lowest level (Table 4). It was believed that the higher the dependence on environmental resources, the stronger the correlation with the perceived social-ecological

resilience. In addition, the length of time in a place also determines the level of perceived socio-ecological resilience.

Table 2. LSD test for the effect of age on social-ecological resilience (N = 332).

Dependent Variable	(I) Age (Year)	(J) Age (Year)	Mean Difference (I–J)	Standard Error	Significance
Social-ecological resilience	18–30	31–45	−0.02906	0.13558	0.830
		46–59	−0.27616 *	0.13258	0.038
		60 and above	−0.45074 *	0.16785	0.008
	31–45	18–30	0.02906	0.13558	0.830
		46–59	−0.24710 *	0.09411	0.009
		60 and above	−0.42168 *	0.13947	0.003
	46–59	18–30	0.27616 *	0.13258	0.038
		46–59	0.24710 *	0.09411	0.009
		60 and above	−0.17458	0.13656	0.202
	60 and above	18–30	0.45074 *	0.16785	0.008
		31–35	0.42168 *	0.13947	0.003
		46–59	0.17458	0.13656	0.202

Note: *, $p < 0.05$.

Table 3. LSD test for the effect of occupation on social-ecological resilience (N = 332).

Dependent Variable	(I) Occupation	(J) Occupation	Mean Difference (I–J)	Standard Error	Significance
Social-ecological resilience.	businessman	civil servant	−0.14364	0.15210	0.346
		farmer	−0.27243 *	0.10003	0.007
	civil servant	businessman	0.14364	0.15210	0.346
		farmer	−0.12879	0.13516	0.341
	farmer	businessman	0.27243 *	0.10003	0.007
		civil servant	0.12879	0.13516	0.341

Note: *, $p < 0.05$.

Table 4. LSD test for the effect of residence time on social-ecological resilience (N = 332).

Dependent Variable	(I) Residence Time (Year)	(J) Residence Time (Year)	Mean Difference (I–J)	Standard Error	Significance
Social-ecological resilience	Within 5	5–10	−0.12590	0.13293	0.344
		Above 10	−0.30543 *	0.09350	0.001
	5–10	Within 5	0.12590	0.13293	0.344
		Above 10	−0.17952	0.12198	0.142
	Above 10	Within 5	0.30543 *	0.09350	0.001
		5–10	0.17952	0.12198	0.142

Note: *, $p < 0.05$.

4.3. Measurement Model Analysis

4.3.1. Reliability and Validity Analysis

Evaluating the data of 332 questionnaires was done using SPSS 26.0. The results showed that the reliability and validity of sample data were excellent and suitable for exploratory factor analysis. Cronbach's Alpha value was 0.931 (>0.700). Cronbach's Alpha coefficients of public pro-environment behavior (public-PEB), private pro-environment behavior (private-PEB), place identity (PI), social cohesion (SC), and social-ecological resilience (SER) were all greater than 0.7. The sampling adaptability of KMO was 0.928 (>0.700) by the Bartlett test and KMO analysis. The significance probability reached the significance level (p = 0.000 < 0.001), confirming the results' validity.

Each item's standard factor load range was 0.671–0.858. The combined reliability (CR) (>0.7) and the average variance extraction (AVE) (>0.5) [68] confirmed that the variables had good convergence validity. The survey had excellent reliability (Table 5).

Table 5. The results of the confirmatory factor analysis.

Variable	Items	Standard Factor Load	CR	AVE	Cronbach's Alpha Value
Public—pro-environment behavior (Public-PEB)	A1 [79]	0.829	0.871	0.629	0.869
	A2	0.858			
	A3 [80]	0.730			
	A4	0.747			
Private—pro-environment behavior (Private-PEB)	A5 [81]	0.676	0.857	0.601	0.854
	A6	0.819			
	A7 [64]	0.791			
	A8 [80]	0.805			
Place Identify (PI)	B1 [40]	0.767	0.873	0.58	0.872
	B2 [73]	0.772			
	B3	0.671			
	B4 [74]	0.783			
	B5 [82]	0.808			
Social Cohesion (SC)	B6 [42]	0.807	0.894	0.627	0.893
	B7 [83]	0.846			
	B8 [83]	0.751			
	B9	0.734			
	B10 [84]	0.817			
Social-ecological Resilience (SER)	C1 [75]	0.834	0.867	0.621	0.866
	C2	0.794			
	C3 [84]	0.755			
	C4 [9]	0.766			

Note: Details of the questionnaire items are in Appendix A (Table A1). All the items (except A2/A4/A6/B3/B9/C2) were adapted from the previous literature. A2/A4/A6/B3/B9/C2 were compiled according to the actual situation in villages.

The table showed that each variable's AVE square root coefficient was more significant [69], indicating that the differential validity of the scale was good (Table 6).

Table 6. The assessment of differential validity.

	PEB	PI	SC	SER
PEB	**0.795**			
PI	0.531 **	**0.762**		
SC	0.419 **	0.481 **	**0.792**	
SER	0.502 **	0.578 **	0.640 **	**0.788**

Note: **, $p < 0.01$. Black bold value is AVE square root.

4.3.2. SEM Goodness of Fit Analysis

All fitting indicators met the significance level of the study criteria ($p < 0.050$) [70] (Figure 3). The model was considered to be a good fit (Table 7).

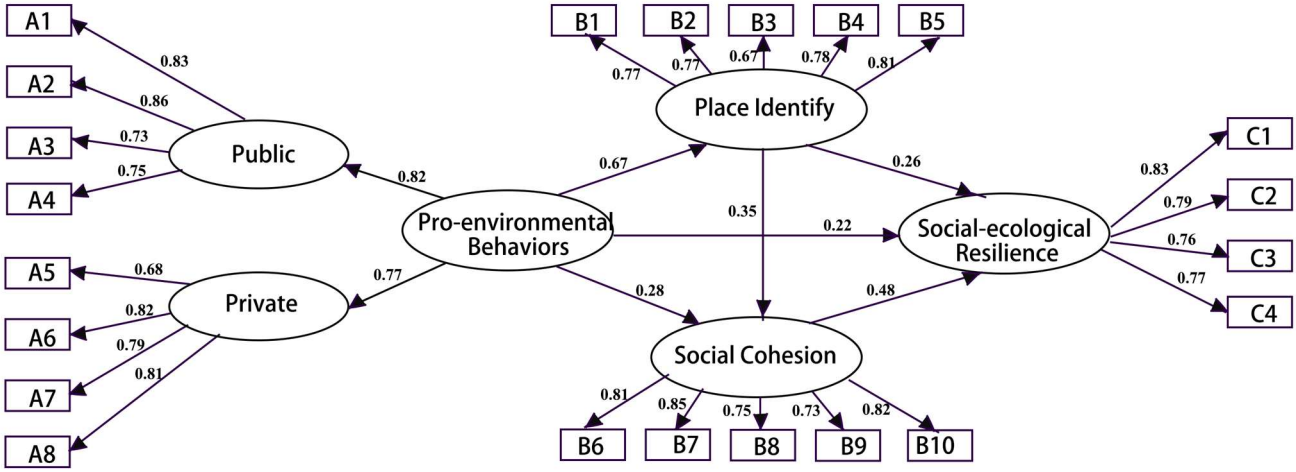


Figure 3. SEM path coefficient model.

Table 7. Test results of model fit degree.

Model Fitting Index	Optimal Standard Value	Statistical Value	Fitting Condition
CMIN	——	298.974	——
DF	——	201	——
CMIN/DF	<3	1.487	Excellent
RMR	<0.08	0.037	Excellent
GFI	>0.8	0.924	Excellent
AGFI	>0.8	0.904	Excellent
NFI	>0.9	0.932	Excellent
IFI	>0.9	0.977	Excellent
TLI	>0.9	0.973	Excellent
CFI	>0.9	0.976	Excellent
RMSEA	<0.08	0.038	Excellent

4.4. Path Hypothesis Test and Mediate Effect Test

From the following table, it could be seen that PEB had a significant positive effect on PI (β = 0.667, $p < 0.05$). PEB had a significantly positive effect on SC (β = 0.282, $p < 0.05$). PI had a significant positive effect on SC (β = 0.35, $p < 0.05$). PEB affected SER (β = 0.218, $p < 0.05$) positively. PI had a positive effect on SER (β = 0.255, $p < 0.05$). SC had a significant positive effect on SER (β = 0.479, $p < 0.05$). Through the path hypothesis test, all the hypotheses of this study were valid (Table 8).

Table 8. Path hypothesis test.

Path			Standardization Coefficient	Non-Standardization Coefficient	S.E.	C.R.	*p*-Value	Hypothesis
PI	←	PEB	0.667	0.738	0.093	7.974	***	Supported
SC	←	PEB	0.282	0.342	0.115	2.958	0.003	Supported
SC	←	PI	0.35	0.383	0.096	3.993	***	Supported
SER	←	PEB	0.218	0.227	0.083	2.724	0.006	Supported
SER	←	PI	0.255	0.24	0.068	3.517	***	Supported
SER	←	SC	0.479	0.411	0.052	7.869	***	Supported

Note: ***, $p < 0.001$.

Therefore, place identity (PI) and social cohesion (SC) played mediating roles and might be two stages in which villagers construct social-ecological resilience (SER) through pro-environmental behaviors (PEB) (Table 9).

Table 9. Mediate effect test.

Effect		Standardized Effect Value	Bias-Corrected		Percentile	
			95% CI		95% CI	
			Lower	Upper	Lower	Upper
PEB-SER	Total effect	0.635	0.479	0.791	0.477	0.790
	Direct effect	0.218	0.032	0.439	0.029	0.435
	Indirect effects1	0.17	0.031	0.346	0.026	0.343
	Indirect effects2	0.135	0.037	0.279	0.029	0.261
	Indirect effect3	0.112	0.044	0.211	0.032	0.195

Indirect effect 1 PEB-PI-SER, indirect effect 2 PEB-SC-SER, indirect effect 3 PEB-PI-SC-SER influence pathways were all established. The most significant path was the indirect effect 3 PEB-PI-SC-SER.

5. Discussion

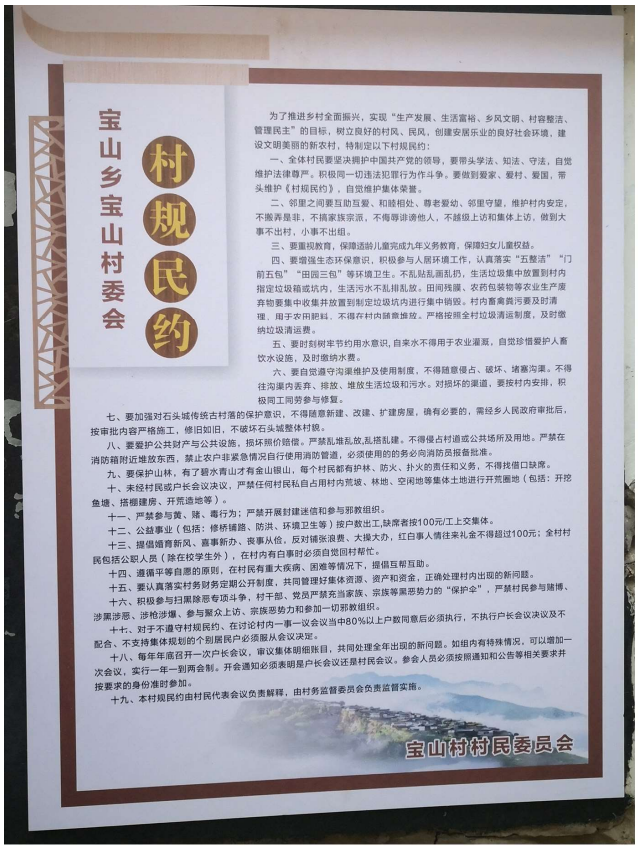
5.1. Two Critical Factors of the Effect of Pro-Environmental Behaviors on Social-Ecological Resilience

5.1.1. Public Participation

Strengthening public participation is one of the key factors. It could be seen in the model that the influence of public pro-environmental behavior on social-ecological resilience was more potent than that of private pro-environmental behavior. When the eco-environment was threatened, the primary condition was to identify the crisis quickly and draw lessons from it. It could ensure the sustainable development of the social-ecological system [20]. In this respect, social-cultural groups were significant, as they responded to crises and played a leading role in management [22]. This explained why the active participation of villagers in environmental activities organized by governments and environmental groups in pro-environmental behavior was significant in developing social-ecological resilience.

Two different modes of cultural groups' involvement in ecological governance have been formed in different villages. The first is the top-down model, in which the state manages the rural ecological environment through the practice of the villagers' group. Culture, as the meaningful structure of social activities in rural communities, determines the surface rules and operation modes [18]. Since the members of the village group are all local farmers, they have rich local ecological knowledge, experience, as well as leadership formed by trust and prestige [34]. They can effectively conduct ecological management from the local situation and ensure that most villagers will participate in it. The foundation of trust within rural societies comes from contractual agreements and the reliability of compliance with norms of conduct and established rules [11]. Therefore, the village group can be regarded as a cultural activity collective composed of villagers, who can also be identified as the last level of the villagers' grassroots autonomous social organization. This is a positive solution to the common dilemma of rural governance: China's agricultural tax reform, which was once carried out to increase farmers' income, has reduced the ability of grass-roots governments to organize, mobilize, and provide public goods [27]. The traditional historical experience that the government mainly provides rural public goods also leads to the psychological formation of institutional path dependence [31]. As a result, farmers' subjectivity has declined. They hold a negative attitude towards village-level public affairs such as rural living environments and believe that environmental management has nothing to do with them. The phenomenon of the "government-run agriculture view" is widespread [32]. The emergence of village groups as a grassroots self-organization, relying on the internal supervision of acquaintance society and the place identity, effectively activated villagers' sense of responsibility to participate in environmental management and strengthened the effectiveness of the government's rural management practice.

For instance, Shitoucheng village's government had set up "village regulations", of which 4 to 6 proposed clearly to enhance the awareness of ecological-environmental protection and water conservation and ways to dispose of garbage and maintain ditches (Figure 4a). However, it is difficult to ensure the implementation of these plans and measures. In this case, it is crucial that villagers established solid social relationships through customs, norms, and obligations passed down from generation to generation [85]. Further, villagers would form written regulations or oral agreements to protect local ecological resources. The self-organization of Shitoucheng Villagers, called "the meeting of the village leaders" formed village regulations on the management of water resources and posted them in the village. The content was, "After a meeting of village leaders, it was decided that the water regulations to 'E'zekaimen' (the name of a local river) should be implemented from 9 am on 23 May. Individuals must take water from top to bottom and from left to right" (Figure 4b). Village regulations reflect the rationality of the distribution of village regulations, the appropriateness of regulations, and the self-organizing ability of village communities. Villagers are willing to voluntarily comply with these regulations because they are often formulated based on traditional livelihood experiences with good reasoning and logic. They are rules governing the use of resources and the fulfillment of obligations in the event of difficulties [85]. Therefore, rural communities should focus on user self-organization capacity building, establish conflict management mechanisms, achieve self-organization of equitable access and allocation of resources, match the scale of ecosystem governance, and create multi-level governance.



(a) **village regulations of Shitoucheng village** (b) **village regulations on the management of water resources**

Figure 4. Ecological management treaty of Shitoucheng village.

The second is the co-management mode; that is, villagers form collective activities because they have common cultural interests in the absence of administrative organization. It is not intended to challenge or supplement local governments but to take on its own some functions and tasks that local governments have not performed as required or expected. Environmental conditions, including high dependence on daily livelihood resources, affect these processes. Villagers show a strong tendency to participate in village affairs, and they consider this sense of justice a cultural practice [86]. They operate on information sharing, conflict resolution, and potentially self-organization. Co-management is a mechanism for sustainable governance and has been shown to be a viable alternative to centralized bureaucratic governance methods [87,88]. Co-governance has evolved from a simple power-sharing arrangement between government and local communities to a dynamic, cross-scale, and cross-level institutional structure and process characteristic of complex socio-economic strategies [89]. In co-management, emphasis is placed on negotiation, problem-solving, shared functions and responsibilities, and shared learning. Co-governance should be understood as an ongoing process of deliberation and negotiation, knowledge generation, networking, and power-sharing [89]. Strong group cohesion can help cushion the overexploitation of resources. Dependence on local resources can also be an essential incentive for collective action. This has largely dispelled the modern concept from humanity-based to money-based [83], which has brought potential challenges to the traditional community environmental governance in rural areas. The villagers' original close interpersonal communication is replaced by everyone's busy making money, which negatively affects compliance with social norms and the continuation of social trust. Thus, they are no longer enthusiastic about participating in public affairs. The atomization and individualization of rural society led to the weakening of farmers' collective consciousness, while social norms did not constrain their sense of self-interest [90]. "Rational smallholders" and "profit-oriented smallholders" were more prominent.

Nuogan villagers were united in preventing hard surfaces such as asphalt or concrete roads from being built in or around the village. They considered that the hard surface would prevent rainwater from seeping underground, disrupting the overall water circulation in the village. Additionally, they believed that the chemicals used in paving, such as asphalt, might contaminate the local water and soil, negatively affecting the quality of the tea of Jingmai Tea Mountain. Therefore, they insisted on using the original local stone slabs to pave the village roads. Correspondingly, the villagers teamed up with the government to use natural gravel to pave the surrounding roads outside the village. This ensured that the water and soil were not contaminated (Figure 5). When villagers realized that a certain development may affect local resources, they formed cultural groups to give timely feedback for resisting adverse effects. They could make decisions and behaviors conducive to the rural ecological environment. This mode emphasizes cooperation and consciously safeguards rural ecological resources together. This is an environmental behavior with the nature of "collective action" [72]. It advocates "creating opportunities for self-organization" in terms of socio-ecological resilience and promotes participatory strategies that enable groups and communities to self-organize.

5.1.2. Local Traditional Culture

Accumulation and development of local traditional culture is another key factor. It was found that local traditional cultures were crucial to developing social-ecological resilience. People learned local knowledge for resource management, which played a significant role in accumulating experience to cope with change. Social memory served as a source of innovation and novelty [21] by contributing innovative and even previous approaches to addressing the function of the system [20]. It showed that traditional local culture provided a multi-purpose "adaptive system". United Nations Educational, Scientific and Cultural Organization (UNESCO) defined culture as "the whole and unique way of a people or a society's lifestyle" [91]. The environmental theories in Eastern cultural traditions (e.g., Feng shui) managed rural ecological environments effectively [92,93]. A'zheke villagers carried

out ecological management of deep forest resources based on the strong traditional Hani culture. They regarded the forest above the village as an important sacred place and called it the "Village God forest" (Figure 6). Every year, villagers held sacrificial ceremonies in the forest because they believed they could pray for the "Village God" to protect people's happiness and grain harvests. Local customs prohibited unauthorized access to and use of the forest resources, which was stipulated as a warning sign. The context was that all villagers protected every tree and blade of grass in the forest, and nothing dirty was allowed to be thrown away. The essence of this was to use local traditional cultures and beliefs to connect people emotionally with significant ecological resources, such as forests, to promote the sustainable development of the eco-environment. It was consistent with previous findings [94,95]. Therefore, rural communities should combine traditional knowledge and historical beliefs embedded in local communities to promote more effective resource management and ensure ecological resilience when they have a very long history and numerous traditions to resist changes in the ecological environment.



(a) Roads inside the village paved with local original stone

(b) Roads outside the village paved with natural gravel

Figure 5. Road conditions of Nuogan Village.

The social-ecological resilience required the maintenance of its essential identity and function through a 'diversity' pathway that favors dynamic state over static balance [96]. At the same time, it is also a practical necessity. Similar to most villages in China, the urbanization process has resulted in many local young people of A'zheke village working outside. The resulting hollowing out and aging of rural areas pose difficulties for collective action on environmental governance. In addition, as A'zheke is assessed as a traditional village by the Chinese government, many businessmen flow into the village to do business with the booming development of tourism. The stable social networks of rural residents were replaced by "diverse" social interactions. When villagers participated in solving complaints and appeals for environmental problems, they might turn to external forces. It was how villagers responded to the disturbance of the ecological environment and pursued diversified solutions. Local people possessed knowledge of local ecological system dynamics naturally through contact with ecological systems for sustenance and livelihood

in the long term [97]. They used the intellectual, spiritual, and moral values accumulated over generations to demonstrate their ability to adapt to external pressures and disturbances in their own way. Therefore, the dynamic culture and experience of the ecological system were irreplaceable and needed to be included as part of overall management. For all these reasons, it was necessary for the village to develop the capacity to inspire people to manage resources independently. Effective measures may include building institutions for learning and memory, as well as creativity and forming mechanisms. It can promote people sharing knowledge and integrating local and scientific knowledge.



Figure 6. Billboards "Village God forest".

The "A'zheke Plan" was not only for improving the quality of life of villagers but also ensuring the stability of the local eco-environment during the economic development, so as to solve the villagers' concerns about the possible ecological damage. First of all, at the beginning of the plan, the government has positioned rural tourism as the development of original ecological and cultural tourism, which means that the ecological environment and ecological cultural concepts should be preserved and protected as much as possible in rural development. On this basis, we will build a boutique village to attract more tourists. Secondly, university students and the municipal government's youth cadres settled in the village, leading the villagers to set up the A'zheke tourism company. In the process of economic development, they helped and guided villagers to protect the "four-element isomorphism" agricultural ecosystem (forests, villages, terraces, and water systems) and promoted the "three uses of water, more harvest from fields, and co-farming of grain and fish" of local ecological characteristics. Administrators also determined the dividend plan, which is rural tourism development income of 30% to the village collective tourism company for the daily operation and 70% to the villagers. The dividend returned to the villagers is divided into four parts, namely 40% of the traditional residential protection dividend, 30% of the terrace protection dividend, 20% of the residential dividend, and 10% of the household registration dividend [98]. The new development model and cooperation mechanism have effectively stimulated the enthusiasm of villagers to protect the rural environment and strengthened the diversity of village eco-environment protection mechanisms. Through the cooperation between the government and the university, the villagers' participatory management of environmental resources and modern knowledge has been promoted, strengthening the diversity of eco-environmental protection and development. Then, the company launched a standardized and reasonable cultural experience project, including experiencing traditional farming and learning traditional crafts. The traditional knowledge of the local ecosystem is also shown to tourists, which increases the diversity of its transmission objects and enhances the identity of tourists with national

culture. It resolves the impact of foreign culture on the national culture in a benign way. Moreover, because of the increased economic income, many migrant workers returned to their hometowns for jobs, which enhanced the learning and creation potential of the local social-ecological system and developed its resilience. Ultimately, a diverse social network has been reorganized and formed. With communication and interaction, it is necessary for people to recreate their place identity and cultural identity in the social network and stimulate the subjectivity and participation enthusiasm of rural residents [99].

5.2. Social Mechanisms of Pro-Environmental Behaviors to Develop Social-Ecological Resilience

5.2.1. Place Identity

Place identity is one of the mediating variables in the relationship between pro-environmental behaviors and social-ecological resilience and had a positive effect. The reason was that the place could cultivate a sense of commitment and responsibility. Research showed that identifying with the local environment might be transformed into a commitment to the environment [82], promoting people's sense of responsibility for the place and encouraging more villagers to participate in positive and lasting interaction with the environment. They strengthened their connection to ecological resources and their place identity as they managed their resources. They were likely to regard their environment as part of themselves, which helped them build cooperation based on shared values and stimulate the potential for self-management within the villagers. When faced with external damage to the ecological environment, they could respond on time because of their sense of responsibility for the eco-environment.

Secondly, the essence of place identity was a kind of cultural resource. Villagers acquired traditional local knowledge from the physical space. They understood the local eco-environment deeply, laying a foundation for cultivating ecological memory and developing knowledge diversity. A key part of "knowledge" was an essential factor in social-ecological resilience. In some cases, cultural or religious beliefs affected an individual's openness to generating, absorbing, and processing information about social-ecological changes. For example, protecting forests in A'zheke Village and maintaining soil quality in Nuogan Village demonstrated respect for traditional knowledge, experience, values, and customs on eco-environmental maintenance. It was also the basis for informing and educating villagers about contemporary environmental protection knowledge and creating an environment to share what they knew about ecology. Rural communities had always recovered from the effects of shocks and emergencies through their experience, skills, knowledge, and "trial and error" approach.

Finally, place identity implied self-identity based on the physical factor of "place space". Self-identity promoted self-esteem and belonging [100]. Self-identity emphasized the similarity of the in-group and the difference from the out-group, which helped the individuals who identified with the group to adopt the group behavior pattern. Residents could distinguish themselves from villagers in other communities. Therefore, a strong sense of identity drove them to carry out local ecological protection, self-organizing ecological protection to carry out resource allocation, and consciously manage resource management. Social cohesion was another mediating variable and had a positive effect.

5.2.2. Social Cohesion

Villagers consciously participated in the maintenance of rural ecological resources, and social cohesion is one of the social mechanisms behind it. It has already been confirmed that social cohesion is a universal mode of social adjustment [101]. One of the primary reasons was Chinese cultural psychology's preference for social cohesion. Social cohesion is related to collective thinking in China [102], which made the Chinese more interdependent and group-oriented towards the community. Individuals prioritized consistency, solidarity, interdependence, and cooperation [103]. The core of social cohesion was to have one's own social identity within a social group through shared values. How group solidarity through social cohesion enabled individuals to use their diverse knowledge, skills, and

resources to sustain their communities more effectively. Under the bonds of a rural-based collective identity, individuals worked together effectively to adapt to social-ecological disruptions. People could use different knowledge, skills, and material resources to rearrange communities in response to socio-ecological disruption.

Another major reason was that the foundation of Chinese rural society relied on social cohesion. Social cohesion in rural areas included mutual trust among villagers and good cooperation between villagers and the local government. The government maintained the order of the village itself [104]. For local governments, the main goal was to strike a balance between economic development and eco-environmental protection in rural areas most effectively [105]. It allowed villages to rely on social cohesion as a whole and better adapt to changing needs without undermining social stability.

5.3. Influence of Demographic Characteristics on Social-Ecological Resilience

According to the participants' sociodemographic factors, the development of rural social-ecological resilience was correlated with age, occupation, and residence time. With the increase in age and residence time, the higher the villagers' perception of social-ecological resilience. Firstly, traditional rural communities in China are organized autonomously by consanguineous and geographical ties [105]. It has already been proven that time spent in a place correlates positively with place identity and social cohesion [106]. The longer people stayed in villages, the more likely they were to acquire moral constraints in participating in pro-environmental behaviors, forming responsibility, and motivating them to carry out sustainable environmental protection. In addition, they had a better understanding and more local knowledge, which gave them a stronger sense of belonging. As a result, they might be more active in sharing knowledge and participating in collective eco-environmental activities.

Farmers have more perceived social-ecological resilience, followed by civil servants and businessmen. It indicated that the more dependent on ecological resources, the higher the correlation. Farmers' production and life depended highly on rural resources [107], so they had the strongest perceived social-ecological resilience. Local civil servants led villagers to implement eco-environmental protection and construction [7,105]. They were all critical human forces in developing social-ecological resilience. The results were similar to those of previous research [108]. It reflected the necessity of stimulating self-organization in the construction of rural humanity. The businessmen were mainly composed of non-locals who came here to do business. Most of them came here for rural development in response to policies in recent years. They might not pay enough attention to the construction of rural ecological resilience due to their lack of traditional knowledge and deep understanding of cultural values and beliefs. Their perception was lower than that of local farmers and civil servants.

5.4. Actual Impact

The practical significance of this study lies in the proposed model, which helped us understand the positive significance of villagers' pro-environmental behavior and promoted the development of social-ecological resilience. Place identity and social cohesion were social mechanisms behind the correlation. In addition, it summarized the key factors that had the most significant impact on the construction of rural social-ecological sustainability from the level of villagers' behavior. One was public participation, and the other was the accumulation and sharing of local traditional knowledge. These findings contributed to the system's stability, diversity, and innovative development. Secondly, according to the research results, this paper put forward four strategies to balance the relationship between the threat to the eco-environment in the process of rural development and the sustainable development of the system, which provided a positive reference for the modernization of a large number of rural areas.

5.5. Limitations and Further Study

However, there were limitations to the empirical results reported in this paper. First of all, due to space constraints, we will only study traditional villages in China and not cover other types of rural areas in China. In addition, this study did not measure the pro-environmental behavior of rural migrant workers. Later studies will pay more attention to rural migrants' views on rural social-ecological resilience. Due to space limitations, we have not studied more about the impact of economic modernization or national policy changes on farmers' pro-environmental behavior. This will be an important direction for our future research. Finally, it takes time to develop local identity and social cohesion, so a deeper causal relationship cannot be provided in the study. In future studies, we will investigate the causal relationship between behavior and social-ecological resilience through longer-term research follow-up and test the effects of psychological experience behind the observed associations.

6. Conclusions

This paper proposed a model to help us understand the positive significance of villagers' pro-environmental behavior in promoting the development of social-ecological resilience. Since multiple complex and latent variables were integrated into one model, this reduced the risk of missing variables [109]. The following three conclusions and four strategies are drawn through demographic analysis and structural equation model (SEM) analysis of pro-environmental behavior, place identity, social cohesion, and rural social-ecological resilience.

Three conclusions: Firstly, the more dependent on the eco-environment, the older the villagers and the longer the residents lived, the more likely they were to perceive social-ecological resilience. Secondly, pro-environmental behavior positively correlates with rural social-ecological resilience, and place identity and social cohesion play an intermediary role. These are the social mechanisms that realize the positive correlation between them. Third, the key factors affecting the development of socio-ecological resilience are "strengthening public participation at the behavioral level" and "reuse of traditional local knowledge at the cultural level".

Four strategies: Firstly, by enhancing the cooperation between the government and villagers and strengthening ecological awareness, the village can increase the relationship and sensitivity to the disturbance of the local rural ecological environment, ensuring timely feedback on the disturbance. Secondly, the local ecological memory should be cultivated, and the traditional values should be inherited to ensure that villagers can develop stable pro-environmental behaviors when dealing with eco-environment disturbances and to ensure the stable operation of the rural ecological system. Thirdly, rural communities should be good at absorbing the interference force and transforming it into a part of the diversity of the social-ecological system. They need to introduce external forces to participate in rural social-ecological environment management to enhance the diversity of local knowledge and management power. Finally, villagers are encouraged to develop self-organizing ability in ecological and environmental management, stimulate the autonomy of villagers as the main body of environmental management, and encourage them to combine the rich traditional local knowledge and the actual situation of the rural eco-environment to establish an innovation mechanism, including equitable management of resource acquisition and allocation. It can achieve sustainable innovation of the social-ecological system.

The construction of traditional villages guided by social-ecological resilience is the future trend of rural development, providing a new way of thinking about rural protection and sustainability.

Author Contributions: Conceptualization, Y.S. and L.Z.; methodology, Y.S., N.Z. and H.W. (Honglin Wu); software, H.W. (Honglin Wu) and Q.C.; validation, Y.S., L.Z. and N.Z.; formal analysis, Y.S.; investigation, Y.S., N.Z. and Q.C.; resources, Y.S.; data curation, Y.S. and N.Z.; writing—original draft, Y.S.; writing—review and editing, Y.S. and L.Z.; visualization, H.W. (Haolong Wang); supervision, L.Z.; project administration, Y.S. and L.Z.; funding acquisition, Y.S. and L.Z. All authors have read and agreed to the published version of the manuscript.

Funding: The research was funded by the Major program of the National Social Science Found of China, grant number 19ZDA191; the Key program of the Social Science Found of Hunan Province, grant number 21ZDB003; and the High-end think tank program of Central South University, grant number 2022znzk09.

Data Availability Statement: We do not provide public access to the dataset due to protection of the privacy of participants. Regarding the details of the data, please contact the corresponding author.

Acknowledgments: We would like to thank the editors and the anonymous reviewers for their time and feedback, which substantially improved this work.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Table A1. Questionnaire items.

Items
A1 I participated in environmental protection activities organized by the government and groups in the village.
A2 I abide by the village regulations on ecological environment and resources and cherish natural resources.
A3 I learned local traditional knowledge for resource management through public activities.
A4 I am involved in resolving the village's environmental complaints and appeals and will even suggest external forces to solve the problem.
A5 I use reusable shopping bags.
A6 I pay attention to the environmental information from the radio and notices in the village.
A7 I sort the garbage.
A8 I discussed eco-environmental issues with each other.
B1 This place has a special meaning for me, and I think I need to be responsible for the environment.
B2 I have a strong sense of identity and security in the place where I live, and I would protect my living environment.
B3 I understand the eco-environmental advantages and disadvantages of this place, so I could protect the environment easily.
B4 I understand the traditional ecological customs of the village and participate in the ecological management habitually.
B5 I know traditional local knowledge about ecological conservation.
B6 I had a strong sense of involvement in my community and followed the environmental protection regulations consciously.
B7 Other villagers and I shared different eco-environmental knowledge, skills, and material resources to manage the community jointly.

Table A1. *Cont.*

Items
B8 The village's relation network promoted cooperation by reducing cooperation risks.
B9 We encourage each other to protect the eco-environment.
B10 Mutual trust makes it possible for villagers to regulate the use of environmental resources in a sustainable way.
C1 My companions and I can quickly discover the phenomenon of ecological environment pollution in the village and give feedback to the community.
C2 We have traditional local ecological knowledge and values and follow these rules in our production and life.
C3 We hope to learn local traditional ecological knowledge according to the changes of The Times through different channels and platforms. We try to diversify our ecological knowledge.
C4 We hope to increase more opportunities for self-management among villagers in order to solve problems more reasonably and distribute resources fairly.

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