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Social Benefits Evaluation of Rural Micro-Landscapes in Southeastern Coastal Towns of China—The Case of Jinjiang, Fujian

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Abstract: Faced with the current situation of the decay and alienation of traditional public space and the broken and disorderly spatial structure caused by the rapid urbanization of the Chinese countryside, rural micro-landscape creation has become an effective way to improve human living environments. However, it is currently difficult for rural micro-landscape construction to achieve the sustainable development of social benefits due to the lack of scientific design guidelines. Evaluating the social benefits of completed projects and identifying the important influencing factors are key to realizing the evidence-based design of rural micro-landscapes. To this end, this study deduces the mechanism of social benefit generation based on the psychological process of spatial perception and establishes a structural equation model containing compound influence pathways to measure the social benefits of micro-landscapes. The evaluation model consists of four latent variables, "physical element characteristics", "perceptual quality", "cognitive experience", and "activity behavior", and 35 observed variables. The researchers selected 18 micro-landscape areas in Jinjiang City, Fujian Province, China, as the survey sample and analyzed the influence of the potential variables and the explanatory power of the observed variables through a quantitative analysis of objective environmental elements and perception data from 102 respondents. The results showed that "perceptual quality" and "cognitive experience" had the greatest direct effect on social benefits, and, based on the progressive influence relationships among the dimensions, "physical element characteristics" dominated the total social benefits through direct and indirect means. Compared with single-function green space, comfortable and diverse artificial facilities encourage residents to enter and use micro-landscapes and contribute to their social benefits. The purpose of this paper is to explore the ideal form of rural micro-landscape creation and provide a theoretical basis for the future practice of high-quality and sustainable rural micro-landscape construction.

Keywords: rural micro-landscape; social benefits; PLS-SEM; evaluation model

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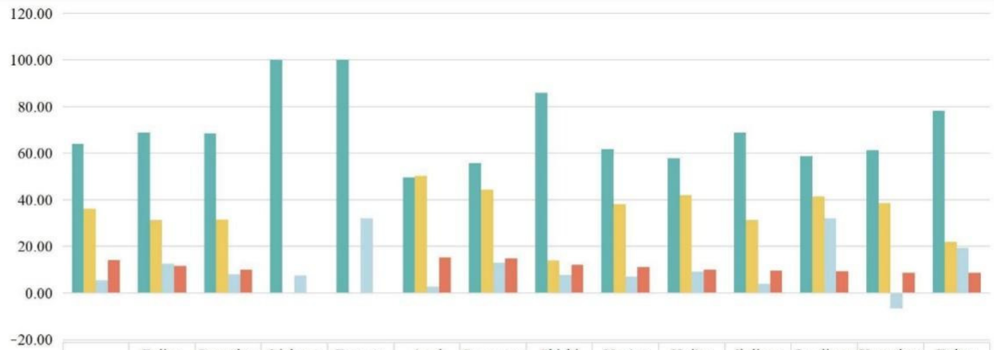
1. Introduction

Urbanization is an irreversible trend worldwide [1]. In China, the world's largest developing country, the development of urbanization proceeded rapidly from a modest starting point along with reform and industrialization [2]. During the 12th Five-Year Plan period, the land dedicated to urban construction increased by about 20%, much higher than the 11% increase in the urban population during the same period [3]. In the face of the disorderly expansion of cities and towns and the widening gap between urban and rural areas caused by the uneven use of land, a new model of in situ urbanization has emerged in rural areas of China [4]. Compared with the traditional urbanization process, which mainly involves rural to urban migration, in situ urbanization presents a human–land relationship of "leaving the land but not the countryside", with the rural population building new houses in villages to improve the living environment, forming highly urbanized villages [5].

This process is more prominent in densely populated southeastern coastal areas [4], such as Jinjiang, Fujian. This is the most economically developed county-level city in China, located in the Golden Triangle of Xiamen–Zhangzhou–Quan in southern Fujian (Figure 1), and is a typical representative of the high-level urbanization in southern Fujian. In the 13th Five-Year Plan of Jinjiang, the Jinjiang municipal government proposed the new urbanization concept of “one city in the city”, with all streets, towns, and villages actively or passively participating in the urbanization process; however, the proportion of its urban population did not show a strong growth trend, as shown in the Figure 2. This was due to the influence of the traditional clan concept in southern Fujian and the well-developed family enterprises in the villages—the rural population in Jinjiang is largely unwilling to transform into an urban population, choosing instead to build new residences in villages to improve the living environment. However, this collective or spontaneous construction behavior has led to disorderly land use and intricate spatial structures in villages [6], resulting in a large number of vacant lots and abandoned dwellings, fragmentation and disorderly decay, and the alienation of traditional rural public spaces, posing great challenges to improving the health and well-being of rural residents.

Figure 1. Golden Triangle of southern Fujian, China—Xiamen, Zhangzhou, and Quanzhou.



	China	Fujian Province	Quanzhou City	Licheng District	Fortress District	Anxi County	Quangang District	Shishi City	Nan'an City	Hui'an County	Jinjiang City	Luojiang District	Yongchun County	Dehua County
The proportion of urban residents (%)	63.89	68.75	68.50	100.00	100.00	49.63	55.66	86.00	61.74	57.90	68.69	58.68	61.28	78.13
The proportion of rural residents (%)	36.11	31.25	31.50	0.00	0.00	50.37	44.34	14.00	38.26	42.10	31.31	41.32	38.72	21.87
Ten-year population growth rate (%)	5.38	12.59	8.04	7.62	31.89	2.68	13.00	7.73	6.98	9.10	3.78	32.04	-6.56	19.53
The proportion of urban population rising in ten years (%)	14.21	11.66	10.10	0.00	0.00	15.24	14.84	12.19	11.09	10.05	9.65	9.38	8.63	8.63

Figure 2. Comparison of population data of Quanzhou City and its districts and counties in Fujian, China.

Green public space construction is seen as an important way to achieve sustainable development in post-industrial urbanized villages [7]. Numerous studies have confirmed the important role of ecosystem services provided by green public spaces in supporting sustainable development, improving habitats, and enhancing human health and well-being [8]. However, due to the limited amount of buildable land in the countryside, an obvious trend of the "miniaturization" and "fragmentation" of parkland has arisen in response to the demand for the intensive use of land resources, as well as a trend of "increasing and decreasing the distance" of parkland [9]. In this context, micro-landscapes that occupy small areas and can be flexibly arranged in streets and alleys have become an important form of public green space in villages. Each township successively released its village micro-landscape construction implementation plan using "activity-based" village construction, encouraging college students, professionals, and villagers to participate in the use of "four sides and four places" corner plots (i.e., in front of houses, ditches, waterbodies, and roadsides) to build rural micro-landscapes, gradually achieving the "One Step, One View" and "One Village, One Scene" objectives, as exemplified in Figure 3.

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

Figure 3. Construction of micro-landscapes in each township: (**a**) San'Ou County; (**b**) Dongpu County.

As it stands, the construction of rural micro-landscapes has made some progress in improving the rural ecological environment and enhancing village appearance. Most studies in this area explore the spatial design strategies of rural micro-landscapes from the perspectives of scale layout, landscape elements, material application, plant configuration, and aesthetic conception [10]. In addition, several studies have been devoted to the exploration of the development mode [11] and policy formulation with the participation of multiple subjects [12]. As can be seen, the research focuses on design strategies and policy promotion in the early stages of rural micro-landscape construction but lacks tracking studies on the characteristics of highly urbanized villages, residents' realistic needs, and their activity behavior after completion. Moreover, the designs are basically realized by universities through competitions, constituting "public welfare" activities that lack professional guidance. This leads to the majority of designs only pursuing aesthetic goals and copying the techniques of urban green areas, resulting in a large number of rural micro-landscape projects that perform a single function and present substantial homogeneity. In this context, scientific research methods and quantitative analysis are used instead of the previously implemented empirical approach to explore evidence-based design practices for rural micro-landscapes through the evaluation of the output effectiveness of rural micro-landscape construction, in order to improve the attractiveness and use efficiency of rural micro-landscapes.

Assessing the environmental, social, and economic benefits of landscape projects is becoming an increasingly important topic in landscape practice and research [13]. Landscape performance refers to the effectiveness of a landscape project in achieving its intended purpose and promoting sustainable development, aiming to trace the causal relationship between design strategies and actual benefits. In recent years, several scholars have argued that the long-standing research orientation of academia that overemphasizes the biophysical benefits of green space landscapes and ignores their socio-cultural benefits is an important cause of the current phenomenon of green space investment and construction that prioritizes ecology over society [14]. Compared with the environmental and economic benefits, the socio-cultural benefits of green space landscapes have greater potential for improving human well-being and sustainable development [15]. Although the factors influencing the realization of social benefits are complex, the consensus is that public green space achieves social benefits by increasing exposure to nature, outdoor activities, social interaction, and people's ability to participate in society. Rural micro-landscapes are important open spaces for rural residents to carry out outdoor activities and social interactions, and their social benefits are particularly reflected in their ability to solve social problems and meet human needs. The evaluation of the post-completion social benefits of rural micro-landscapes, the identification of the key influencing factors, and the promotion of evaluation-based construction can provide scientific evidence for the spatial design of rural micro-landscapes to meet real users' needs.

The purpose of this paper is to propose a social benefit evaluation method with regional characteristics to address the current situation and problems regarding the construction of micro-landscapes in urbanized villages along the southeast coast of China, with the goal of promoting evaluation-based construction and achieving the sustainable development of highly urbanized rural habitats. Taking Jinjiang, Fujian Province, China, as the research area, we summarize the overall landscape characteristics of its micro-landscape projects, determine the factors affecting the social benefits of micro-landscapes on the basis of a literature review, analyze the methods of realizing these social benefits, and construct a micro-landscape social benefit evaluation system in line with the characteristics of urbanized villages in southeast coastal China. In addition, empirical tests are carried out by entering measured data and observing model fit using structural equation models. These findings provide a reference for the construction and optimization of rural micro-landscapes in urbanized villages on the southeast coast of China, which is an effective way to pursue the creation of high-quality villages.

In summary, the main contributions of this paper are as follows:

(1) Our research objective is focused on the countryside rather than cities. Most existing studies focus on the role of green spaces in high-density cities, but there has been little exploration of the spatial benefits of landscape in the countryside. This has resulted in some rural micro-landscape construction plans copying the design techniques of

urban landscapes, which are detached from the needs of rural residents. This study summarizes the characteristics of rural micro-landscape construction and establishes a social benefit evaluation system with localized characteristics so as to develop practical rural micro-landscape design strategies.

(2) The characteristics and mechanisms of the social benefits provided by rural micro-landscapes are clarified. The complex representations of social benefits are elucidated based on the functional complexity of ecosystem services. In addition, the environmental perception theory is introduced, and the "physical environment–perception–cognition–behavior" social benefit generation mechanism is deduced from the spatial perception process.

(3) A localized social benefit evaluation model for rural micro-landscapes is constructed. We comprehensively consider the subjective and objective factors affecting the social benefits of rural micro-landscapes, identify and explain the important factors influencing the generation of social benefits based on local residents' current use habits, take into account the relationships between potential variables, and construct a multi-level rural micro-landscape social benefit evaluation model with a composite path system.

2. Literature Review

Rural micro-landscapes are proposed in contrast to large-scale landscapes at a macro level, similar to the concept of pocket parks. In this paper, we define rural micro-landscapes as accessible public green spaces in rural areas that have small footprints, a wide distribution, and occur in large numbers. Compared with urban parks, which are often arranged near commercial and office areas, rural micro-landscapes are closely connected to the surrounding communities. The small scale of micro-landscape projects limits their ability to improve the economy and ecology of a community. Related studies have focused less on consumer behavior and pedestrian movement through these spaces and more on self-organized community participation. It is this close connection to the local area that allows rural micro-landscapes to convey a degree of ownership and intimacy that can more deeply influence the realization of rural residents' well-being.

In this work, we selected rural micro-landscapes as the research object to explore the connotations and characteristics of their social benefits, essentially examining rural residents' use of green public spaces in the context of the highly urbanized countryside. We determined residents' perceptual activities in the physical environment and analyzed the generation path of social benefits to construct a social benefit evaluation system for rural micro-landscapes, as shown in Figure 4.

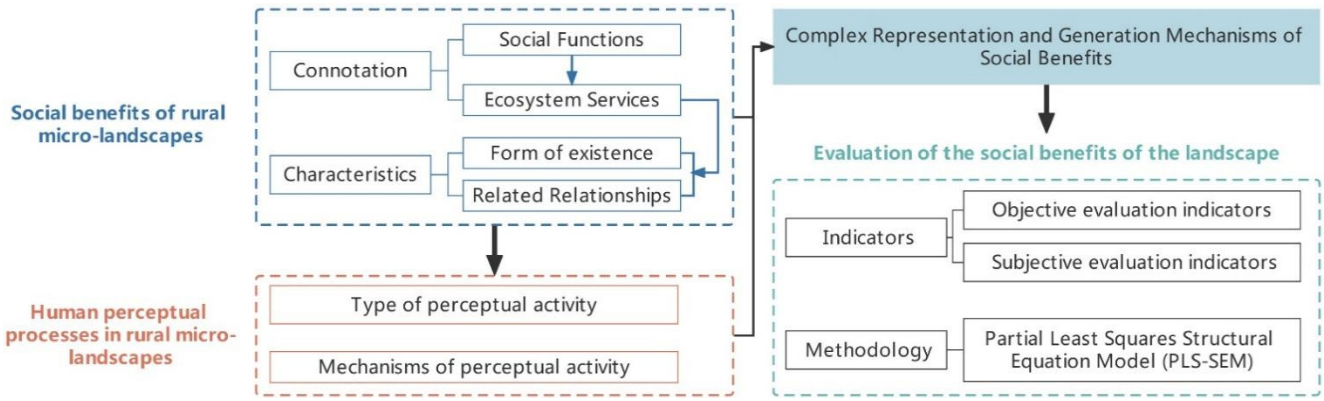


Figure 4. Theoretical framework for determining social benefits of rural micro-landscapes.

2.1. Connotations and Characteristics of Social Benefits of Rural Micro-Landscapes

Studies have shown that the social benefits of rural micro-landscapes are related to their social functions, reflected in their ability to solve social problems and meet human needs [16]. According to the theory of ecosystem services, the function of green infrastructure is to provide support, provision, regulation, and cultural services for human beings [17,18]. Among the many ecosystem services listed in the Common International Classification of Ecosystem Services (CICES), rural micro-landscapes mainly provide regulation and cultural services, as well as some provision services [19,20], which directly affect the well-being and quality of life of rural residents [21]. In terms of provision services, rural micro-landscapes encourage villagers to grow produce on their own by dividing up vacant plots of land for food provisions. In terms of regulation services, rural micro-landscapes can confer benefits such as regulating the microclimate of a site and reducing the effects of noise and bad odors. Cultural services, on the other hand, refer to the benefits obtained through spiritual satisfaction, cognitive development, reflection, leisure recreation, and aesthetic experience. Rural micro-landscapes can provide safe, comfortable, and pleasant recreational spaces that encourage residents to engage in various activities such as social recreation, fitness, and relaxation, thus improving their health [22]. However, not all micro-landscapes provide the same ecosystem services, which in turn causes variation in their social benefits. For example, differences in supply are caused by factors such as constituent elements, spatial layout, and artificial facilities, and differences in villagers' demand for micro-landscapes are caused by factors such as subjective preference, value orientation, and perception differences. Only by harmonizing the relevant factors on the supply and demand sides can villagers be encouraged to enter and use micro-landscapes, promoting their perceptual experiences and behavioral activities in these spaces and thus generating social benefits.

In terms of the physical form of these spaces, social benefits related to supply and regulation services are mainly derived from the innate value of rural micro-landscapes, i.e., the value conferred by their material structure and elemental characteristics, such as vegetation coverage, leisure, and recreational facilities. These are generally manifested as tangible, objective, and easily quantifiable material benefits. On the other hand, the generation of social benefits related to cultural services requires human use and participation. Such benefits vary according to the user and the spatial and temporal conditions, and they are non-material benefits that are subjective and difficult to quantify. Therefore, the social benefits of rural micro-landscapes present a complex range of manifestations, with potential benefits that cannot be directly observed and intricate, abstract correlations.

2.2. Generation Mechanism of Social Benefits of Rural Micro-Landscapes Based on Human Perception Process

Previous studies have pointed out that the physical environment characteristics of micro-landscapes have direct or indirect effects on their social benefits. The scale of vegetation, artificial facilities, and other features of micro-landscape spatial structures have an important impact on users' perceptions and behaviors and are closely related to human well-being [23,24]. However, the physical environment characteristics alone do not reflect people's overall view of a micro-landscape [25]. Analyzing the relationship between rural micro-landscapes and human perceptual experiences and behavioral activities and establishing a bridge between the objective material properties of micro-landscapes and subjective human thoughts and emotions provides a basis for the selection of social benefit evaluation indexes and the determination of their causal relationships.

Perceptual activity refers to the process of converting the objective physical environment into atmospheres, emotions, attitudes, and behaviors with subjective perceptual attributes through the human perceptual system, combined with the subject's memory and imagination [26]. Past studies have accumulated many subjective evaluation indicators of green space perception. Nasar measured the appreciation for these spaces from the perspective of visual quality [27]; Mehta suggested that a beneficial public space should be inclusive, support the occurrence of meaningful activities, offer a sense of security, achieve a level of convenience and comfort, and provide a pleasant spatial environment, and he established the Public Space Index (PSI) based on these principles [28]; and Hui-Yun Peng proposed that the perceived naturalness, distance, charm, and privacy of a community park can contribute to the health recovery of users [29].

However, the semantics of the descriptors of these indicators do not belong to the same category. Some describe the material element category, such as species richness, nature, and scenery; some describe the perceptual quality category, such as enclosure, complexity, and security; and others describe the experience category, such as promoting social activities. There are many overlapping areas within these categories, and their mutual influencing relationships are unclear. The framework of perceptual activities needs to be systematically analyzed to avoid the ambiguity of perceptual indicators. Nasar framed the study of perception into five dimensions (material attributes, perception, emotion, general well-being, and spatial behavior), consulting the literature on aesthetic perception to argue that there are probabilistic relationships among these dimensions [28]. Gjerde divided the perceptual experience into sensory perception, the perception of form, and the association of meaning and value and identified the relationships among the three [30]. C. Wan et al. developed a "perception–attitude–behavioral intention–actual behavior" model of green space use based on the theory of planned behavior and confirmed the mediating role of the spatial perceptions and attitudes of people in the process of green space use [31]. Related studies in the field of environmental psychology have divided the spatial perception process into the four steps of "sensory–perceptual–cognitive–behavioral", with progressive influence [32].

Based on the above perception process, it is believed that there is a "physical environment–perception–cognition–behavior" mechanism behind the generation of social benefits by rural micro-landscapes, and the perceptual activities can be divided into three categories: "perception", "cognition", and "behavior".

(1) Perception: after receiving stimuli from the physical environment through sensory organs, people form a comprehensive view of their surroundings by the abstract generalization of the combined relationships between environmental elements or certain attributes of those elements, such as a sense of security, openness, attractiveness, availability, or comfort.
(2) Cognition: on the basis of perception, villagers combine their own experiences and cultural backgrounds to carry out emotional processing and logical reasoning, such as local attachment, the promotion of socialization, and the improvement of health.
(3) Behavior: villagers' interests, attitudes, and intentions towards rural micro-landscapes prompt different action responses, such as varied behavioral patterns, visitation frequencies, and activity durations; in addition, there is a probabilistic relationship between the characteristics of the physical elements of a rural micro-landscape and the three types of subjective perceptual activities.

2.3. Studies on the Social Benefit Evaluation of Landscapes

Previous research has developed and introduced many indicators and tools to assess the benefits of landscapes in terms of human well-being. Due to their different purposes and criteria, the indicators and evaluation methods identified by these studies to assess landscape performance vary.

In terms of indicator selection, earlier studies considered the existence of the natural environment as equivalent to the generation of human well-being and a priori acquiesced to the assumption that "people in the vicinity of the natural environment must enter and use nature" [33]. These studies assessed the service performance of green space landscapes from the perspective of green space supply and demand, using macro-planning indicators such as green space coverage, green space per capita, and the normalized vegetation index. Although such indicators have the advantage of being objective and easy to obtain [34], current research suggests that the effectiveness of green space landscapes may lie in their quality rather than quantity [35], and that more attention should be paid to the multi-level needs of users and the differentiation of the natural environment to explore the output effectiveness of various structural features and design elements of green space landscapes.

In 2010, the Landscape Architecture Foundation (LAF) proposed the concept of "landscape performance", which assesses the social benefits of landscapes according to ten indicators, including recreational and social value, cultural preservation, health and well-being, and safety and educational value [36]. In addition, the Sustainable Sites Initiative (SITES) in the U.S. and the Singapore Green Mark Evaluation System for Parks developed tools to assess the influence of landscapes on human health and well-being. However, due to the indirect and intangible characteristics of social benefits, their influencing factors are difficult to identify, and the existing evaluation indexes require improvements. Studies have been conducted to identify and select the key variables affecting social benefits by carrying out cross-sectional comparisons and regression analyses of the results of different completed projects and investigating the correlation between users' subjective evaluations and the physical/spatial characteristics of green space landscapes to verify the effectiveness of various site characteristics in achieving certain social benefits. For example, Kaplan argues that green spaces displaying the characteristics of distance, charm, extension, and compatibility benefit attention restoration [37]. Ting-Hong Guo considers the "use of nature" as a key link between green space environments and health benefits. By analyzing the role of the environmental characteristics of small parks in supporting or limiting residents' motivation to use them, he explored the extent to which objective environmental characteristics such as green space shape, vegetation ratios, topographic changes, artificial facilities, and external disturbances affect public health and well-being criteria, such as relaxation and stress reduction, social interaction, and sports and fitness [14]. In addition, landscape beauty, noise reduction, microclimate regulation, the provision of signs, strengthened maintenance management, and the organization of group activities are also important indicators for evaluating the social benefits of green area landscapes [38].

There are two main types of method for evaluating the social benefits of landscapes: subjective methods and objective methods. Subjective evaluation methods include the Delphi method and hierarchical analysis, whereby researchers assign weights to each index according to their subjective value judgments, and the results depend largely on the experience and knowledge of experts, thus adequately reflecting subjective will but lacking scientificity and stability. Of the objective methods, factor analysis and entropy weighting are the most common, whereby weights are assigned according to the characteristics of the data itself, which can eliminate the disadvantages of relying on experts' knowledge; however, these methods determine the weights according to the data differences alone, and the results cannot reflect the relative importance of the indicators themselves. Therefore, several studies have used a combination of subjective and objective assignment methods to overcome the limitations of single-method assignment and eliminate subjective bias and objective one-sidedness. These traditional evaluation methods usually assume that all indicators can directly assess the social benefits of landscapes and that each indicator is independent of the others [39]. However, considering the previously described perceptual process for rural micro-landscapes, it is clear that the social benefits of these spaces are affected by unobservable factors or latent variables, and that there are certain probabilistic relationships among the various types of subjective perceptual activity indicator; if these errors are ignored, the evaluation results will not accurately reflect the landscape's effectiveness.

Structural equation modeling (SEM), a statistical analysis validation method, allows for the existence of latent variable indicators consisting of multiple observed indicators and is able to model multiple correlations of potential factors [40]. Its theoretical basis is the analysis and verification of the complex relationships between each landscape element and the landscape effectiveness by observing the degree of matching between the theoretical model and empirical data. In terms of current research, SEM is used for studies on the restorative effects of urban park environments [29], evaluating the effectiveness of miniature landscapes at subway station entrances [39], urban sustainable development [41], and public space governance [42]. Partial least-squares structural equation modeling (PLS-SEM) focuses on mining sample information and is able to reflect the essential and structural characteristics of an object using a small number of samples and deal with both reflective and formative indicators [43]. PLS-SEM has been used in studies related to the effects of different sizes of green space on air pollution and respiratory mortality [44], the effects of residential soundscape quality on satisfaction [45], the effects of fare costs on commuting trips by subway passengers [46], and exploring the important influences on the development of traditional villages [47]. Thus, this method has high utility in elucidating the complex network of relationships between different variables and detecting direct and indirect effects. In this study, we used PLS-SEM to solve the problem of the unobservable nature of social-benefit-related variables and explain their complex mechanisms of action.

3. Research Framework and Methodology

In the previous section, we identified the influencing factors of the social benefits of urbanized rural micro-landscapes and demonstrated the feasibility and advantages of using structural equation models for social benefit evaluation. The research framework for the social benefit evaluation of urbanized rural micro-landscapes is as shown in Figure 5.

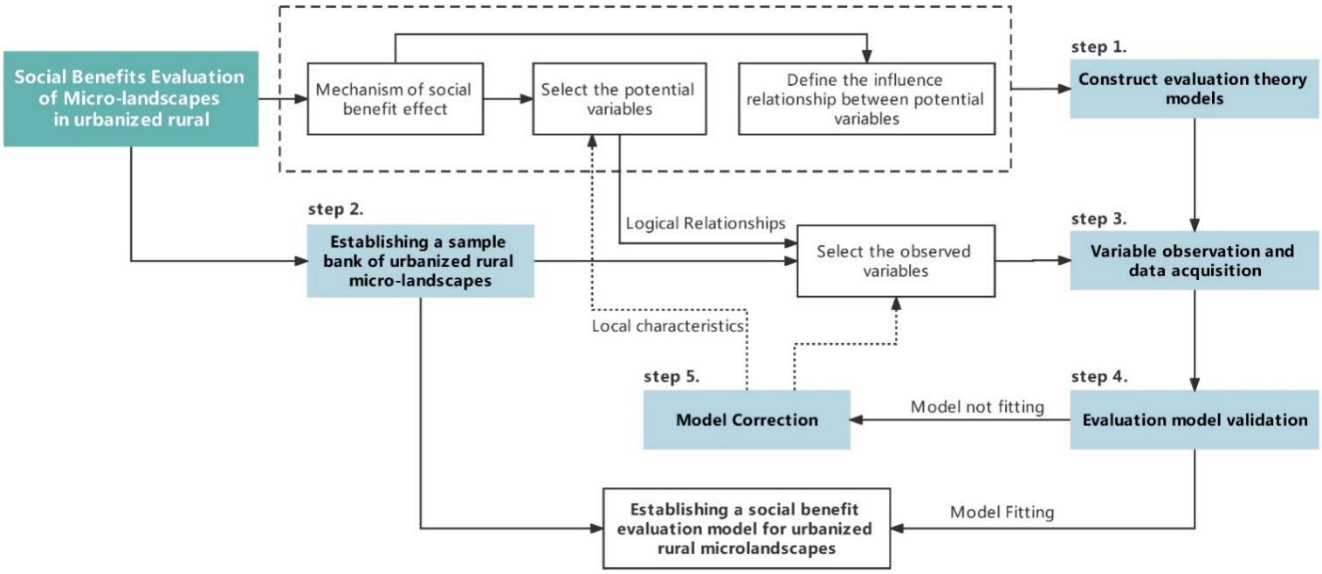


Figure 5. Framework for evaluating the social benefits of urbanized rural micro-landscapes.

(1) Construction of theoretical model: Based on the psychological process of spatial perception, the set of evaluation indexes for rural micro-landscapes was refined from the four potential benefit dimensions of "physical element characteristics", "perceived quality", "cognitive experience", and "activity behavior". Subsequently, the evaluation model was constructed on the basis of analyzing the interactions between various evaluation factors.

(2) Establishing a sample database of micro-landscape projects: Micro-landscape projects in Jinjiang, Fujian, China, were screened according to the scale and functional characteristics of the sites, and the scope of observation measurement and evaluation was determined.

(3) Variable observation and data acquisition: Considering the potential variables affecting the evaluation of social benefits and the combination of the local characteristics of urban and rural micro-landscapes, suitable observation variables were selected. The variable data of each micro-landscape project sample were collected through field observations and measurements and questionnaire distribution, and the raw data were standardized and processed to eliminate the influence of different dimensions.

(4) Model validation: The PLS-SEM method was used to quantitatively analyze the objective environmental elements and subjective perception data, identify and determine the significant factors affecting the social benefits, and measure the degree of influence

of each potential variable to verify the rationality and validity of the model and form an intuitive representation of the generation mechanism and the evaluation of the social benefits of micro-landscapes.

(5) Model correction: When the matching of the theoretical model was poor, the initial model was locally adjusted and optimized until the evaluation model of the social benefits of urbanized rural micro-landscapes was successfully established.

3.1. Theoretical Model

As the "physical environment–perception–cognition–behavior" mechanism of action makes clear, the social benefits of rural micro-landscapes do not originate from a single physical environment feature but are generated by a complex correlation between multi-level perceptual activities. According to the previously mentioned arguments, these social benefits are mainly influenced by the characteristics of the physical elements, perceptual quality, cognitive experience, and activity behavior of micro-landscapes. This formed the basis of our theoretical model for evaluating the social benefits of urbanized rural micro-landscapes (Figure 6).

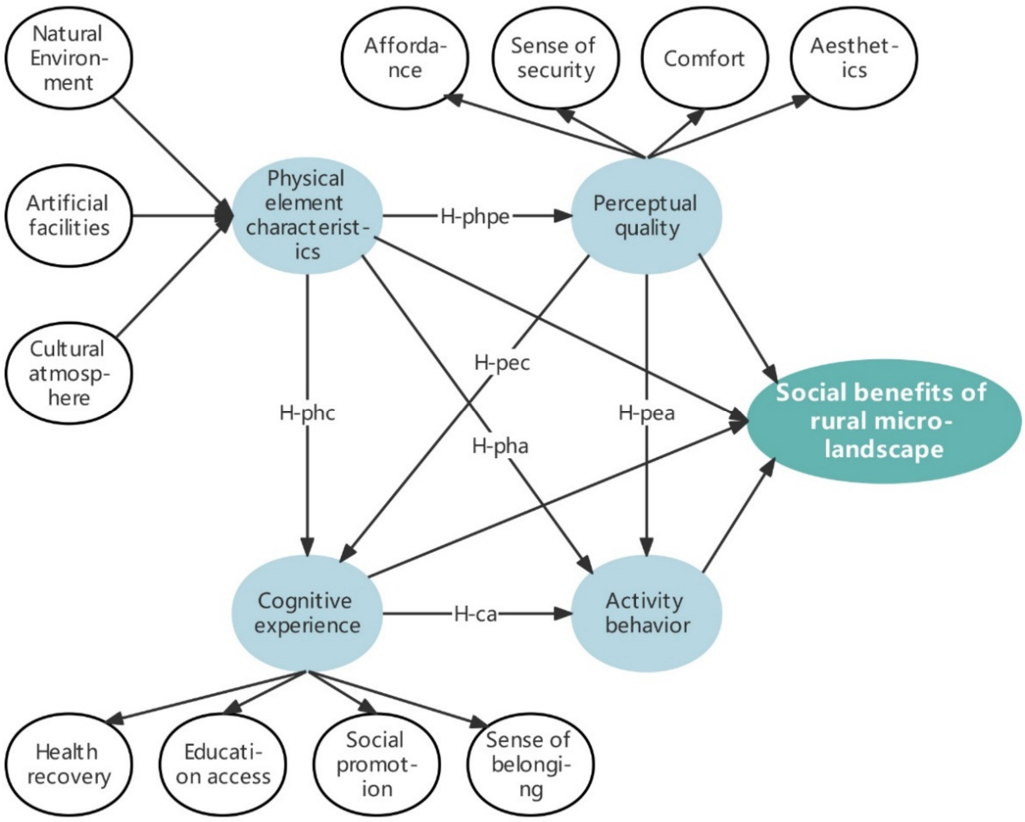


Figure 6. Theoretical model for evaluating the social benefits of rural micro-landscapes.

3.1.1. Physical Element Characteristics

According to previous studies, the characteristics of physical elements can be divided into two categories: natural and artificial facilities. The natural elements in a micro-landscape can purify the air and regulate the microclimate of the site and, at the same time, provide a comfortable social and recreational environment for human beings; the artificial facilities include pavilions, connecting corridors, resting tables and chairs, and fitness equipment to encourage human beings to enter and perform activities in the micro-landscape.

In addition, based on the localized characteristics of rural micro-landscapes, two other types of element, culture and food production, were taken into consideration. Culture, as the root of each village's unique architectural forms, spatial layouts, materials, and technical processes, influences the construction forms of the rural micro-landscapes and the behavioral activities of the villagers. The cultural characteristics of micro-landscapes can be directly expressed and preserved in the form of objects, such as historical relics with local characteristics, traditional farming tools, and vernacular materials and techniques; alternatively, the hidden, abstract cultural characteristics can be explored by evoking the collective memory of villagers pertaining to the deeds of famous people, traditional production methods and lifestyles, and local customs and beliefs. Food production is a unique function of rural micro-landscapes that separates them from urban green landscapes. Some micro-landscape projects divide up the site for villagers to grow produce by themselves, which not only generates food resources for the villagers but also realizes shared governance and promotes a sense of belonging and social cohesion.

3.1.2. Perceptual Quality

Perceptual quality refers to a villager's comprehensive reflection on the surroundings after experiencing the stimulation of the physical environment, including the four aspects of availability, security, comfort, and beauty. Availability refers to the opportunities provided by the micro-landscape so that villagers can reach and use the micro-landscape conveniently and fairly and carry out their required activities therein. Security is the most basic human need for the environment, and villagers' perceptions of security affect their tendencies to approach and/or avoid micro-landscapes [48]. Comfort refers to the degree of support for human activities provided by the micro-climate, site facilities, and surrounding environment. The comfort perception of villagers in a micro-landscape is an important factor affecting the duration and type of their activities. The sense of beauty pertains to humans' visual aesthetic requirements—a clean, interesting, and beautiful environment encourages villagers to enter the micro-landscape for activities.

3.1.3. Cognitive Experience

Based on perception, villagers combine their own experiences and cultural backgrounds for emotional processing and logical reasoning to form a cognitive experience of a micro-landscape, including the promotion of health recovery, education, socialization, and a sense of belonging. Micro-landscapes can provide residents with a natural environment to achieve health recovery effects such as reducing stress and mental fatigue, soothing emotions, and preventing depression [49]. Micro-landscapes can provide villagers with educational opportunities through the organization of exhibitions related to cultural relics and histories, facility tours, preaching activities, and study activities. Promoting socialization is an important function of rural micro-landscapes, which provide recreation and gathering areas and promote positive social interaction. A sense of belonging is a feeling of local attachment and identity formed by the intertwining of personal experiences and emotions with collective and local history, and micro-landscapes increase villagers' sense of belonging by creating opportunities for them to interact with their neighbors [50].

3.1.4. Activity Behavior

Villagers' interests, attitudes, and intentions toward rural micro-landscapes prompt different action responses, manifesting in different visitation frequencies, activity durations, and activity types.

3.1.5. Hypotheses

There are certain causal relationships between the influencing factors of each of the aforementioned dimensions; therefore, the following hypotheses were proposed:

(1) Hypothesis phpe, phc, pha (H-phpe, H-phc, H-pha): the characteristics of the physical elements of micro-landscapes impact the perceptual quality, cognitive experience, and activity behavior of users.
(2) Hypothesis pec, pea (H-pec, H-pea): the perceptual quality of a user impacts his or her cognitive experience and use behavior.
(3) Hypothesis ca (H-ca): a user's perceptual experience affects his or her activity behavior.

3.2. Observed Variables

The theoretical model section outlined the potential variables that influence the social benefits of urbanized rural micro-landscapes; these variables cannot be measured directly and need to be further specified into observable items based on previous studies. Based on the literature review, appropriate observation indicators were determined by combining the microscopic and localized characteristics of rural micro-landscapes in the urbanized coastal villages of southeast China.

In terms of physical characteristics, B. E. Selens developed the "environmental assessment of public recreation spaces" (EPRS) [51], which summarizes four physical elements that should be considered in the evaluation of public recreation spaces. J. Schipperijn, in a study on the environmental characteristics of parkland and human activities and health, used the presence or absence of EPRS elements to describe the physical environmental characteristics of parkland [52]. Referring to the EPRS elements and based on the actual circumstances of the selected sample, the following nine items were included as the observed variables in this study: "special vegetation (flower borders, shrub or tree forms, etc.)"; "vegetation maintenance"; "productive plants"; "sheltered sitting facilities (pavilions, galleries, etc.)"; "fitness and recreational facilities"; "unobstructed internal roads"; "cultural elements (display of old objects, sculptures, pagodas, etc.)"; "local materials (bricks, stones, clay pots, etc.)"; and "traditional techniques (construction using bricks and stone, etc.)". These variables were evaluated as "yes or no" through on-site observations. In addition, the "tree canopy coverage" and "plant species" characteristics of micro-landscapes can also influence users' perceptions and external behaviors, so these two indicators were included in the range of observation variables, and data were obtained by means of on-site surveys and UAV image-assisted measurements.

Data on villagers' perception qualities, cognitive experiences, and behavioral activities in the micro-landscapes were collected through questionnaires. The researchers chose to visit the sample micro-landscape projects during periods of comfortable climatic and weather conditions to administer the questionnaire to villagers using the spaces. The questionnaire was inspired by several national and international studies and consisted of three parts. The first part pertained to the basic personal characteristics of the respondents, including gender and age. The second part included the perception quality and cognitive evaluation of the respondents' experience of the micro-landscape, which was evaluated using the standard scale that has been implemented in the past and a seven-point Likert scale. The observed variable of "sense of security" was derived from İ. T. Doğrusoy's study and focused on the villagers' perceptions of the micro-landscape environment and the occurrence of unexpected events therein, as entering the micro-landscape at night without hesitation is an important manifestation of a sense of security. The "sense of beauty" and the measures of "aesthetics", "access to education", and "promotion of social interaction" were mainly based on the Leisure Satisfaction Scale (LSS) developed by Beard and Ragheb for the aesthetic, educational, and social dimensions [53]. The "health recovery" indicators were defined with reference to the European Quality of Life 5 Dimensions (EQ-5D), which defines health recovery benefits in terms of three factors: physical health, mental health, and mobility [54]. The "sense of belonging" item was derived from D. R. Williams' study on the evaluation of local identity and local attachment [50]. In addition, we defined the observed variables of "availability" according to three aspects (accessibility, usability, and meeting activity needs) and evaluated the "comfort" of micro-landscapes in terms of hearing, smell, temperature, and facilities. The third part of the questionnaire pertained to the respondents' use behavior in the micro-landscapes, including "activity duration", "activity frequency", and "activity diversity". The activities of the villagers were classified into seven categories, namely, sitting and relaxing, chatting and socializing (playing chess and drinking tea), walking and fitness, viewing beautiful scenery, parent–child activities, gathering activities, and others (purposeless stay), in order to evaluate the diversity of activities conducted in micro-landscapes. The observed variables are listed in Table 1.

Table 1. Observed variables related to social benefits of urbanized rural micro-landscapes.

Second-Order Latent Variables	First-Order Latent Variables	Observed Variables
Physical element characteristics	Natural environment	Tree canopy coverage Plant species Special vegetation (flower borders, shrub or tree forms, etc.) Vegetation maintenance Productive plants
	Artificial facilities	Sheltered sitting facilities (pavilions, galleries, etc.) Fitness and recreational facilities Unobstructed internal roads
	Cultural atmosphere	Cultural elements (display of old objects, sculptures, pagodas, etc.) Local materials (bricks, stones, clay pots, etc.) Traditional techniques (construction using bricks and stone, etc.)
Perceptual quality	Affordances	Af1—I have easy access to this micro-landscape. Af2—I have fair and easy access to this micro-landscape. Af3—I can perform the activities I need to in this micro-landscape.
	Sense of security	Se1—The environment of this micro-landscape makes me want to stay away from it because I am afraid. Se2—Something disturbing may happen in this micro-landscape. Se3—At night, I can enter this micro-landscape without hesitation.
	Comfort	C1—The temperature of this micro-landscape is suitable. C2—The sound of this micro-landscape is pleasant. C3—The smell of the micro-landscape is pleasant. C4—The facilities of this micro-landscape are comfortable.
	Aesthetics	Ae1—This micro-landscape is neat and clean. Ae2—This micro-landscape is interesting. Ae3—This micro-landscape is beautiful. Ae4—This micro-landscape is well-designed.
Cognitive experience	Health recovery	H1—My physical pain/discomfort is relieved by this micro-landscape. H2—My anxiety/depression/stress is relieved by this micro-landscape. H3—My energy level is increased by this micro-landscape.
	Education access	E1—This micro-landscape helps me gain insight. E2—This micro-landscape provides me with the opportunity to try new things. E3—This micro-landscape helps me understand the countryside.
	Social promotion	So1—I have social interactions with others in this micro-landscape. So2—I can make friends in this micro-landscape. So3—The people I meet in this micro-landscape are friendly.
	Sense of belonging	B1—This micro-landscape feels very alien to me. B2—This micro-landscape allows me to fit in. B3—If I leave for a while, I will miss this micro-landscape.
Activity behavior		Duration of activities Frequency of visits Diversity of activities

3.3. Model Validation

As demonstrated by the discussion in Section 2.3, PLS-SEM was highly applicable to this study, and so we used Smart PLS 3.0 to build a structural equation model and followed the PLS-SEM evaluation steps suggested by Hair et al. [55,56]. To evaluate the measurement model and the structural model using the disjoint two-stage approach, only the lower-order components in the model were considered in the first stage, and the latent variable scores were saved; in the second stage, these latent variable scores were used to measure the higher-order structure.

4. Demonstration Based on Examples

4.1. Study Sample Selection and Data Acquisition

This study investigated micro-landscape projects in the villages of San'ou, Huwei, and Dongpu in Yinglin Town, Jinjiang City, Fujian Province. Yinglin Town is located on the southern coast of Jinjiang City, across the sea from Kinmen, and has been a major commercial town in Fujian Province for 2 years. Its comprehensive strength ranks 51st among the top 1000 towns in China, with typical characteristics of a highly urbanized village. The micro-landscape projects of San'ou village, Huwei village, and Dongpu village cover an area of 100~800 m^2 and cost USD 7500~11,900 to build. They are small in area, low in cost, achieved outstanding results in the competition evaluation and assessment, and demonstrated high representativeness and research value. In this study, we selected 6 micro-landscape areas in San'ou village, 9 in Huwei village, and 3 in Dongpu village as the research samples, totaling 18 micro-landscape areas, as shown in Table 2.

The research team visited the sample micro-landscape projects from 26 to 28 November 2021 to conduct fieldwork research, measure and record the characteristics of the physical elements of the micro-landscapes, and distribute 120 questionnaires to villagers; 102 valid questionnaires were collected for model validation analysis.

Table 2. Sample micro-landscape projects.

Sample Micro-Landscape Project in San'ou Village		
		
a-1	a-2	a-3
		
a-4	a-5	a-6

Table 2. *Cont.*

Sample Micro-Landscape Project in Huwei Village		
		
b-1	b-2	b-3
		
b-4	b-5	b-6
		
b-7	b-8	b-9
Sample Micro-Landscape Project in Dongpu Village		
		
c-1	c-2	c-3

4.2. Model Correction and Testing

4.2.1. First-Order Measurement Model Assessment

Confirmatory factor analysis (CFA), an important component of measurement models in SEM, aims to confirm and refine the variables in a model [57]. The first-order measurement models in this study included formative measurement models and reflective measurement models. For formative measurement models, the variance inflation factors (VIFs) and weight significance should be tested. Internal consistency, convergent validity, and discriminant validity were used to test the reliability and validity of the measurement models.

(1) First-order formative measurement model assessment

"Physical element characteristics", as a second-order latent variable, included "natural environment", "artificial facilities", and "cultural atmosphere" as the three formative first-order latent variables. In terms of covariance, Table 3 shows that the variance inflation factor (VIF) values for all dimensions ranged from 1.58 to 2.66 and did not exceed the threshold value (5.0), thus indicating that there was no multicollinearity. Table 3 shows that the weights of the two items "tree canopy coverage" and "plant species" in the "natural environment" dimension were not significant (t-value < 1.60; p-value > 0.50); as the weights were below the threshold of 0.1, these two indicators were deleted [58]. Although the weights of the indicators "special vegetation", "productive plants", and "local materials" were not significant, as shown in Table 3, their external loadings were high (outer loading > 0.50), so these indicators were retained.

Table 3. Assessment of first-order formative measurement models.

Second-Order Latent Variable	First-Order Latent Variables	Observed Variables	Weight	VIF	t-Value	p-Value	Out Loading	Retained
Physical element characteristics	Natural Environment	Tree canopy coverage	0.015	2.086	0.056	0.956	0.431	No
		Plant species	−0.098	1.426	0.383	0.701	−0.184	No
		Special vegetation	0.031	1.970	0.086	0.931	0.584	Yes
		Vegetation maintenance	0.635	1.310	2.509	0.012	0.825	Yes
		Productive plants	0.551	2.696	1.381	0.167	0.788	Yes
	Artificial facilities	Fitness and recreational facilities	0.665	1.058	5.002	0.000	0.798	Yes
		Sheltered sitting facilities	0.512	1.076	3.102	0.002	0.439	Yes
		Unobstructed internal roads	0.488	1.117	2.785	0.005	0.501	Yes
	Cultural atmosphere	Cultural elements	0.685	2.174	2.804	0.005	0.919	Yes
		Local materials	0.022	2.211	0.086	0.931	0.739	Yes
		Traditional techniques	0.446	1.401	2.223	0.026	0.793	Yes

After removing the two indicators "tree canopy coverage" and "plant species", the model was recomputed, and the latent variable scores were kept to measure the higher-order model.

(2) First-order reflectivity measurement model assessment

As shown by the theoretical model, "affordances", "sense of security", "comfort", "aesthetics", "health recovery", "education access", "social promotion", "sense of belonging", and "activity behavior" were all reflective latent variables. The internal consistency, convergent validity, and discriminant validity of these models were assessed.

As shown in Table 4, the Cronbach's alpha (CA) values were used to measure the internal consistency among the indicators for each latent variable, and the CA values for most of the indicators were higher than the 0.7 thresholds suggested by Nunnly (1994). The CA value for "activity behavior" was 0.646, with acceptable reliability. In addition, the composite reliability (CR) values for all constructs ranged from 0.809 to 0.899, higher than the recommended value of 0.7, demonstrating the reliability of their internal consistency [59].

The convergent validity of the measurement model was examined based on the factor loadings and average variance extracted. As shown in Table 4, the factor loadings for all indicators except "C2" and "frequency of visits" were higher than 0.7, indicating a high reliability level. The factor loadings for "C2" and "frequency of visits" were in the range of 0.6 to 0.7, considered "acceptable in an exploratory study" [60]. On the other hand, the AVE values were greater than 0.5, indicating the validity of the measured model convergence [40].

Table 4. Assessment of first-order reflective measurement models.

Second-Order Latent Variables	First-Order Latent Variables	Observed Variables	Loading	CA	CR	AVE
Perceptual quality	Affordances	Af1 Af2 Af3	0.891 0.836 0.794	0.795	0.879	0.707
	Sense of security	Se1 Se2 Se3	0.837 0.838 0.834	0.789	0.875	0.700
	Comfort	C1 C2 C3 C4	0.774 0.680 0.781 0.779	0.759	0.841	0.570
	Aesthetics	Ae1 Ae2 Ae3 Ae4	0.806 0.718 0.876 0.848	0.830	0.887	0.663
Cognitive experience	Health recovery	H1 H2 H3	0.841 0.833 0.823	0.778	0.871	0.693
	Education access	E1 E2 E3	0.816 0.771 0.860	0.750	0.857	0.667
	Social promotion	So1 So2 So3	0.877 0.876 0.840	0.831	0.899	0.747
	Sense of belonging	B1 B2 B3	0.812 0.837 0.862	0.787	0.876	0.701
Activity behavior		Diversity of activities Duration of activities Frequency of visits	0.807 0.829 0.651	0.646	0.809	0.588

Note: CA = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted.

We examined the differential validity using the Fornell–Larcker criterion to determine the degree of differentiation between constructs [60]. As shown in Table 5, the square root of each first-order latent variable AVE value was higher than its cross-loading values with various constructs, so the discriminant validity between the constructs met the requirements.

Table 5. Differential validity for first-order reflectivity measurement models.

First-Order Latent Variables	Affordances	Sense of Security	Comfort	Aesthetics	Health Recovery	Education Access	Social Promotion	Sense of Belonging	Activity Behavior
Affordances	0.841								
Sense of security	0.296	0.836							
Comfort	0.368	0.204	0.755						
Aesthetics	0.407	0.371	0.656	0.814					
Health recovery	0.620	0.366	0.345	0.487	0.832				
Education access	0.417	0.137	0.318	0.489	0.374	0.817			
Social promotion	0.643	0.222	0.399	0.345	0.619	0.412	0.864		
Sense of belonging	0.621	0.339	0.490	0.556	0.684	0.587	0.725	0.837	
Activity behavior	0.547	0.345	0.583	0.488	0.683	0.427	0.670	0.739	0.767

In summary, the first-order formative and reflective measurement model was refined and confirmed by evaluating the relevant parameters, and the applicability of the measurement model was initially verified.

4.2.2. Higher-Order Measurement Models Assessment

After checking the applicability of the first-order measurement model, the second-order measurement model was evaluated. As shown in the theoretical model, the second-order latent variables were all formative constructs, and the "physical element characteristics" included three first-order constructs: "natural environment", "artificial facilities", and "cultural atmosphere". "Perceptual quality" consisted of four constructs: "affordances", "sense of security", "comfort", and "aesthetics". "Cognitive experience" consisted of four first-order constructs: "health recovery", "education access", "social promotion", and "sense of belonging". As shown in Table 6, the variance inflation factor of each construct was below 5.0, and there was no covariance problem. The weight of "sense of security" was lower than 0.10 and insignificant (p-value = 0.620 > 0.050), and the external loading was also low (outer loading = 0.411 < 0.500), so this construct was removed after expert review. The results of the "education access" weighting were also insignificant (p-value = 0.192 > 0.05), but its external loading was higher (outer loading = 0.613 > 0.50), so it was retained. The remaining first-order constructs exhibited weights above the threshold of 0.10, and the results were significant, providing empirical support for the retention of all indicators.

Table 6. Assessment of second-order measurement models and selection of conceptions.

Second-Order Latent Variables	First-Order Latent Variables	Weight	VIF	*t*-Value	*p*-Value	Out Loading	Retained
Physical element characteristics	Natural environment	0.293	1.072	2.232	0.026	0.480	Yes
	Artificial facilities	0.668	1.051	6.201	0.000	0.799	Yes
	Cultural atmosphere	0.472	1.114	3.445	0.001	0.691	Yes
Perceptual quality	Affordances	0.542	1.267	7.130	0.000	0.821	Yes
	Sense of security	0.051	1.203	0.497	0.620	0.411	No
	Comfort	0.311	1.805	3.039	0.002	0.762	Yes
	Aesthetics	0.367	2.015	3.241	0.001	0.810	Yes
Cognitive experience	Health recovery	0.356	2.005	3.856	0.000	0.857	Yes
	Education access	0.114	1.529	1.304	0.192	0.613	Yes
	Social promotion	0.228	2.241	2.234	0.026	0.831	Yes
	Sense of belonging	0.463	3.210	3.975	0.000	0.939	Yes

After deleting "sense of security", the model was recomputed, and the results are shown in Table 7. The three dimensions of physical characteristics, "natural environment", "artificial facilities", and "cultural atmosphere", all showed a positive correlation with physical characteristics. In contrast to the results of previous studies, the "natural environment" dimension had a smaller influence on the characteristics of physical elements, with a weight of 0.295. In terms of perceptual quality, the "affordances" of rural micro-landscapes showed a greater positive effect (0.555). "Health recovery" and "sense of belonging" contributed more to the cognitive experience, with weights of 0.367 and 0.454, respectively, while "education access" and "social promotion" showed a smaller contribution.

Subsequently, the second-order latent variable scores of the optimized model were used to measure the third-order constructs. As shown in Table 8, the social benefits of rural micro-landscapes as formative constructs consisted of four dimensions: "physical element characteristics", "perceptual quality", "cognitive experience", and "activity behavior". The variance inflation factor (VIF) values did not exceed the threshold value (5.0) for any dimension, thus indicating that there was no multicollinearity problem. In addition, the weights of each dimension were higher than 0.100 and significant at the 1% level. Therefore, the higher-order measurement model was reliable and valid. There was a significant positive correlation between "physical element characteristics", "perceptual quality", "cognitive experience", and "activity behavior" and the social benefits of rural micro-landscapes; among these dimensions, "perceptual quality" and "cognitive experience" had a greater impact.

Table 7. Assessment of the optimized second-order measurement models.

Second-Order Latent Variables	First-Order Latent Variables	Weight	*t*-Value	*p*-Value
Physical element characteristics	Natural environment	0.295	2.181	0.029
	Artificial facilities	0.654	6.288	0.000
	Cultural atmosphere	0.486	3.783	0.000
Perceptual quality	Affordances	0.555	8.194	0.000
	Comfort	0.292	3.017	0.003
	Aesthetics	0.396	3.674	0.000
Cognitive experience	Health recovery	0.367	3.898	0.000
	Education access	0.117	1.382	0.167
	Social promotion	0.225	2.313	0.021
	Sense of belonging	0.454	4.002	0.000

Table 8. Assessment of third-order measurement models.

Third-Order Latent Variable	Second-Order Latent Variables	Weight	VIF	*t*-Value	*p*-Value
Social benefits of rural micro-landscapes	Physical element characteristics	0.264	1.976	35.231	0.000
	Perceptual quality	0.301	3.124	37.870	0.000
	Cognitive experience	0.301	3.479	36.190	0.000
	Activity behavior	0.287	2.734	40.379	0.000

4.2.3. Structural Model and Hypothesis Testing

The outcome model test involved an assessment of the relationship between the constructs and the predictive power of the model, measuring the degree to which the structural model predicted the endogenous latent variables by examining the magnitude of the path coefficients and their significance, the f^2 values, the coefficients of determination (R^2), and the predictive correlations (Q^2) in the model.

Before the structural model evaluation, we tested its covariance. As shown in Table 8, the VIF values of each construct were below 5.0, and there was no covariance problem. Table 9 shows the direct relationships between the constructs, and three paths were verified: "physical element characteristics → perceptual quality" ($\beta_{\text{H-phpe}}$ = 0.700 ***); "perceptual quality → cognitive experience" ($\beta_{\text{H-pec}}$ = 0.697 ***); and "cognitive experience → activity behavior" ($\beta_{\text{H-ca}}$ = 0.659 ***). In addition, their f^2 values of 0.960, 0.578, and 0.517 were higher than 0.350, indicating that "physical element characteristics" had a significant effect on "perceptual quality", "perceptual quality" on "cognitive experience", and "cognitive experience" on "active behavior". This result indicates the progressive influence of "physical environment–perception–cognition–behavior".

Regarding the prediction ability of the model, we tested the prediction accuracy and prediction correlation. As shown in Table 10, the coefficients of determination (R^2) were 0.490 (>0.25) for "perceptual quality", which indicated weak predictive accuracy. The R^2 values of "cognitive experience" and "activity behavior" were higher than 0.50, indicating moderate prediction accuracy. Q^2 is a measure of the predictive relevance of the model, and the Q^2 values of each construct were greater than 0, as shown in Table 10, indicating good predictive relevance.

Table 9. The direct effect of inter-conceptual results.

	Path Relationship	Path Factor	*t*-Value	*p*-Value	f^2	Hypothesis Result
H-phpe	Physical element characteristics → Perceptual quality	0.700	13.177	0.000	0.960	Supported
H-phc	Physical element characteristics → Cognitive experience	0.080	0.919	0.358	0.008	Not supported
H-pha	Physical element characteristics → Activity behavior	0.041	0.493	0.622	0.002	Not supported
H-pec	Perceptual quality → Cognitive experience	0.697	8.479	0.000	0.578	Supported
H-pea	Perceptual quality → Activity behavior	0.146	1.313	0.189	0.019	Not supported
H-ca	Cognitive experience → Activity behavior	0.659	7.851	0.000	0.517	Supported

Table 10. Assessment of structural model predictive power.

Second-Order Conception	R^2	SSO	SSE	Q^2 (=1-SSE/SSO)
Physical element characteristics	-	306.000	306.000	-
Perceptual quality	0.490	306.000	209.344	0.316
Cognitive experience	0.571	408.000	254.300	0.377
Activity behavior	0.640	306.000	197.718	0.354

5. Analysis and Discussion

Using the above-mentioned empirical research methods, we screened and confirmed the subjective and objective factors affecting the realization of the social benefits of rural micro-landscapes; revealed the progressive influence relationship between "physical environment", "perception", "cognition", and "behavior" in the process of spatial perception; and built an evaluation model of the social benefits of rural micro-landscapes. As shown in Figure 7, the social benefits of rural micro-landscapes were positively correlated with "physical element characteristics", "perceptual quality", "cognitive experience", and "activity behavior", with all having different degrees of positive correlation. In addition, there were complex intrinsic relationships among these influences that should inform the design strategies of particular rural micro-landscapes. Therefore, the results must be discussed from two perspectives.

5.1. Objective Factors Affecting the Realization of Social Benefits

The physical features (objective factors) of a rural micro-landscape that affect its social benefits include "natural environment", "artificial facilities", and "cultural atmosphere". As shown in Figure 7, compared with the subjective factors, the direct influence of the physical features on the social benefits was relatively small, with a path coefficient of 0.264. Nevertheless, as predictors of "perceptual quality", "cognitive experience", and "activity behavior", they can be used to estimate the social benefits of a micro-landscape, as they have an indirect impact on social benefits through their progressive influence on users' subjective feelings and behaviors in the micro-landscape. Table 11 shows that the overall impact of physical features on social benefits was 0.793. This finding confirms that improving the spatial design of a micro-landscape is an effective way to enhance its overall social benefits.

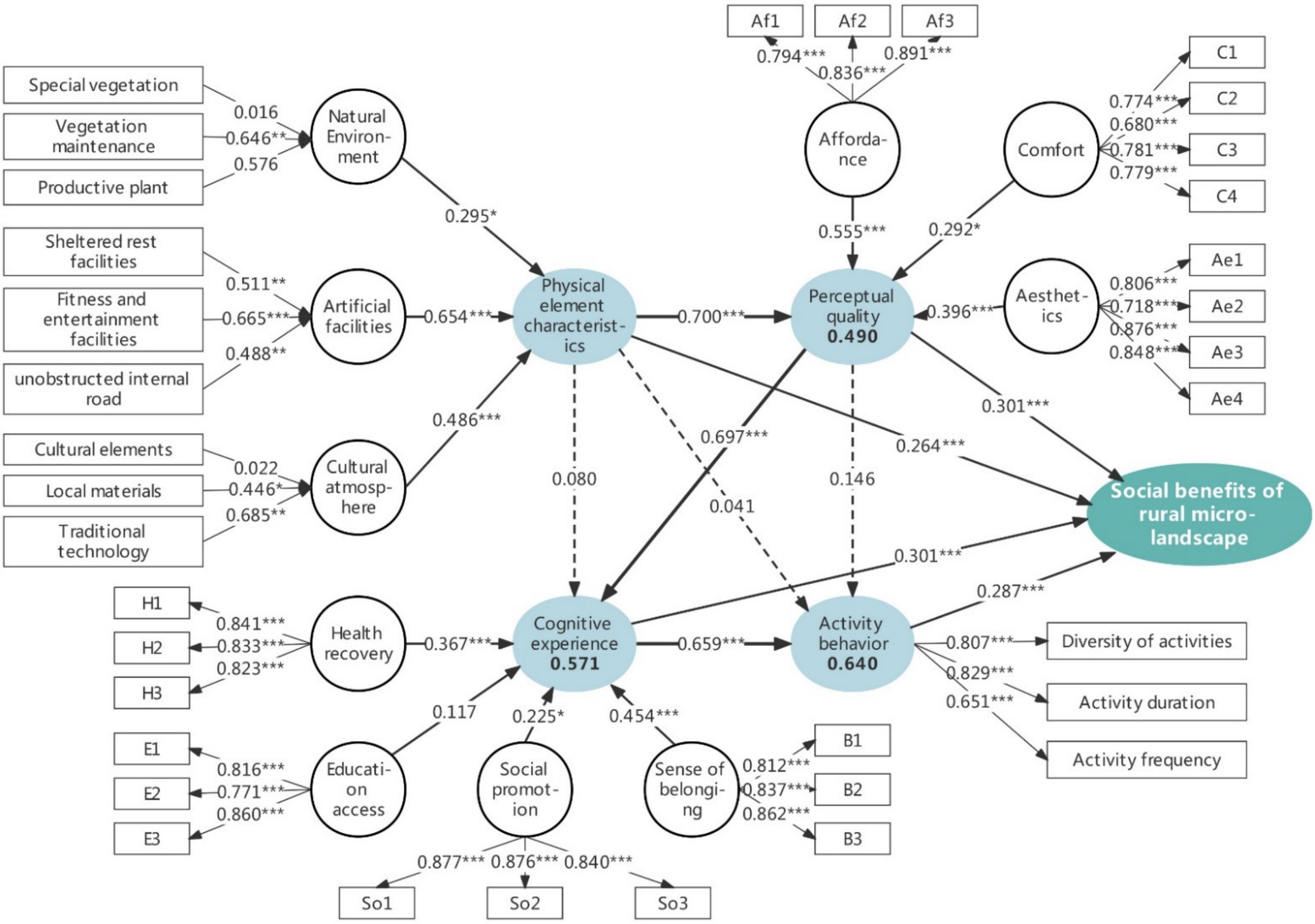


Figure 7. Validation results of the social benefit evaluation model for rural micro-landscapes. Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 11. Overall impact on the social benefits of rural micro-landscapes.

Path Relationship	Path Coefficient	*t*-Value	*p*-Value
Physical element characteristics → Social benefits	0.793	23.259	0.000
Perceptual quality → Social benefits	0.683	14.907	0.000
Cognitive experience → Social benefits	0.489	17.223	0.000
Activity behavior → Social benefits	0.286	10.481	0.000

The most significant influence was demonstrated by the artificial facilities element. Resting facilities under the shade of pavilions, corridors, and trees can provide a comfortable micro-environment for users, and specific fitness and recreational facilities can enrich the functional attributes of the micro-landscape and promote villagers' outdoor activities and community interaction. Smooth internal roads can encourage villagers to enter the micro-landscape for activities. Adopting local masonry materials and traditional construction techniques of brick and stone and including cultural features such as displays of old objects and pagodas to create a localized cultural atmosphere in rural micro-landscapes are also important for the realization of a micro-landscape's social benefits. In contrast, the contribution of the natural environment to the social benefits was weak. Unlike previous studies on urban green spaces, which emphasized the scale of the spaces and the number of green plants, the "tree canopy coverage" and "plant species" of rural micro-landscapes were not statistically significant. The reasons for this are as follows: (1) the total area of the micro-landscapes was small, and the difference in canopy coverage among the sample projects was not large enough to significantly affect villagers' perceptions and activities;

(2) the construction density in rural areas is not as high as that in cities, and the accessibility of green areas is high, so rural residents have a lower demand for green areas than urban residents. For rural residents, an orderly natural environment that is carefully maintained and managed is more attractive. At the same time, cluttered, barren, and unmaintained vegetation is the main reason for the lack of vitality of some micro-landscapes. The results of this study further prove that people's preferences for a landscape do not lie in the scale of its green space but in the quality of the space. Therefore, in the design process of rural micro-landscapes, the scale of green space should not be pursued, as large, unmaintained green spaces are not conducive to the realization of social benefits [61]. The allocation of certain sites for villagers to plant produce by themselves so that they can participate in the maintenance and management of the micro-landscape not only generates food resources for the villagers, but also reduces the maintenance cost of the micro-landscape and realizes common governance and sharing by the villagers.

5.2. Subjective Factors Affecting the Realization of Social Benefits

In addition to the physical properties of rural micro-landscapes, the generation of their social benefits also depends on the perceptual processes that occur between people and the environment. The perceptual quality, cognitive experience, and activity behavior of rural residents in a micro-landscape have roughly the same direct impact on its social benefits.

The most significant impact on perceptual quality was contributed by the perceived availability of the micro-landscape; an area being "easy to reach and use" and "offering a variety of activities" were the main reasons for rural residents choosing to enter a micro-landscape for activities. In addition, a comfortable environment and beautiful design enhanced villagers' perceptual quality of the micro-landscapes. During the study, it was found that the effect of "sense of security" on the social benefits was not significant, and it was attributed to the familiarity of rural residents with the environment. Due to the limitation of scale, the influence range of a rural micro-landscape is small, so the people who use it are nearby residents who are familiar with their environment, and most of the users know each other well. This familiarity provides them with a high perception of safety in the micro-landscape [62,63], so the "sense of security" did not significantly influence the social benefits.

In terms of cognitive experience, "sense of belonging" is a key feature that characterizes community cohesion. As a public place where people gather for leisure, recreation, and social purposes, rural micro-landscapes promote the integration of rural residents into community life and create a strong sense of local dependency, thus generating positive social impacts [64]. As shown in Table 12, the factors of "affordances", "artificial facilities", and "cultural atmosphere" had significant positive effects on "sense of belonging". Accessible and unobstructed trails, shaded areas that support relaxation, functional facilities that encourage recreational activities, and the use of cultural elements to create a sense of daily life and shared presence provide a sense of pride and belonging. Secondly, "health recovery" had a greater contribution to positive cognitive experiences. The health benefits that users obtain in micro-landscapes mainly include physical recovery, psychological recovery, and social recovery: (1) "affordances" ($\beta = 0.516$ ***) and "artificial facilities" ($\beta = 0.273$ **) support physiological and social recovery by promoting physical activity and social interaction; (2) "aesthetics" ($\beta = 0.354$ *) and "cultural atmosphere" ($\beta = 0.219$ *) achieve psychological recovery by creating aesthetically pleasing, familiar, and safe places to stabilize one's mood and relieve stress.

Table 12. Summary of influences among the factors.

Path Relationships between Second-Order Latent Variables	Path Relationships between First-Order Latent Variables	Path Coefficient
Physical element characteristics → Perceptual quality 0.700 ***	Natural environment → Affordances	0.205 ^{ns}
	Natural environment → Comfort	0.227 *
	Natural environment → Aesthetics	0.365 *
	Artificial facilities → Affordances	0.228 *
	Artificial facilities → Comfort	0.464 ***
	Artificial facilities → Aesthetics	0.267 ***
	Cultural atmosphere → Affordances	0.297 **
	Cultural atmosphere → Comfort	0.132 ^{ns}
	Cultural atmosphere → Aesthetics	0.403 ***
Physical element characteristics → Cognitive experience 0.080 ^{ns}	Natural environment → Health recovery	0.179 ^{ns}
	Natural environment → Education access	0.078 ^{ns}
	Natural environment → Social promotion	0.157 ^{ns}
	Natural environment → Sense of belonging	0.130 ^{ns}
	Artificial facilities → Health recovery	0.273 **
	Artificial facilities → Education access	0.139 ^{ns}
	Artificial facilities → Social promotion	0.342 ***
	Artificial facilities → Sense of belonging	0.329 ***
	Cultural atmosphere → Health recovery	0.219 *
	Cultural atmosphere → Education access	0.459 ***
	Cultural atmosphere → Social promotion	0.171 *
	Cultural atmosphere → Sense of belonging	0.305 ***
Physical element characteristics → Activity behavior 0.041 ^{ns}	Natural environment → Activity behavior	−0.009 ^{ns}
	Artificial facilities → Activity behavior	0.515 ***
	Cultural atmosphere → Activity behavior	0.181 *
Perceptual quality → Cognitive experience 0.697 ***	Affordances → Health recovery	0.516 ***
	Affordances → Education access	0.206 *
	Affordances → Social promotion	0.547 ***
	Affordances → Sense of belonging	0.444 ***
	Comfort → Health recovery	−0.106 ^{ns}
	Comfort → Education access	−0.018 ^{ns}
	Comfort → Social promotion	0.131 ^{ns}
	Comfort → Sense of belonging	0.095 ^{ns}
	Aesthetics → Health recovery	0.354 *
	Aesthetics → Education access	0.278 ^{ns}
	Aesthetics → Social promotion	−0.053 ^{ns}
	Aesthetics → Sense of belonging	0.289 *
Perceptual quality → Activity behavior 0.146 ^{ns}	Affordances → Activity behavior	0.371 *
	Comfort → Activity behavior	0.272 **
	Aesthetics → Activity behavior	0.188 ^{ns}
Cognitive experience → Activity behavior 0.659 ***	Health recovery → Activity behavior	0.304 **
	Education access → Activity behavior	0.030 ^{ns}
	Social promotion → Activity behavior	0.173 ^{ns}
	Sense of belonging → Activity behavior	0.251 *

Note: ^{ns} = not significant; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The "activity behavior" of rural residents in micro-landscapes, as the most intuitive influencing factor of social benefits, is reflected in the diversity, duration, and frequency of activities, which can comprehensively characterize the satisfaction of users with physical elements, perception, and cognition. The improvement and diversification of the leisure and recreational facilities and the increased availability of the micro-landscape can encourage rural residents to conduct activities therein and enhance the vitality of the space.

6. Conclusions

Both general perceptions and scientific research indicate that rural micro-landscapes confer many social benefits for habitat enhancement and civic life. However, these social benefits are influenced by multiple factors, and so the micro-landscapes built with the participation of university students and villagers are not sustainable due to the lack of scientific guidance. Based on the localized characteristics of rural micro-landscapes in coastal towns in southeast China, this study used PLS-SEM to construct a social benefit evaluation system and used data from 18 micro-landscapes in China to verify the scientific validity of the evaluation system and identify the key factors influencing the social benefits of rural micro-landscapes.

Compared with previous studies, this paper made improvements in three areas: the research object, the theoretical reasoning, and the evaluation model. Firstly, the inclusion of rural micro-landscapes in landscape performance research is a novel approach. In this study, we screened suitable evaluation indicators based on local micro-landscape case studies in order to explore the characteristics of micro-landscape design strategies that are distinct from urban ones. Secondly, we attached great importance to the derivation of the theoretical model. On the basis of clarifying the complex manifestations of the social benefits of rural micro-landscapes, considering the psychological process of spatial perception, we determined and summarized the "physical element characteristics–perceptual quality–cognitive experience–activity behavior" mechanism of social benefits, so as to select evaluation indicators and build an evaluation system containing compound paths. Finally, unlike previous evaluation models in which the indicators are independent of each other, our evaluation model based on PLS-SEM reflected the influencing relationships among the dimensions. In contrast to other methods such as entropy weighting and hierarchical analysis, which rely on data or experts' subjectivity, we determined the importance of the factors influencing the social benefits of rural micro-landscapes based on the causal relationships among the indicators. However, it should be noted that there are still some limitations to this study. Firstly, since the majority of the respondents were elderly (uneven age distribution), the differences in user perceptions arising from variations in individual socioeconomic characteristics (e.g., gender, age, income, or education level) were not explored. In follow-up studies, the responses of different user groups should be compared so that the evaluation results can help designers to develop strategies for specific groups. Secondly, the scope of this study was limited to Jinjiang City, Fujian Province, China. Given the differences in the facilities and cultures of different regions, the results of this study are only applicable to the more urbanized areas in the southeastern coastal region of China, and there is no guarantee that the conclusions are generalizable to other regions; therefore, more rural micro-landscape projects should be included in the research sample for a comprehensive comparative analysis to further verify the scientific validity of the model.

Despite its limitations, this study provides a scientific basis for future micro-landscape design by parsing the causal relationships between physical environmental elements and social benefits and translating the evaluation results onto the operational physical space level. The results highlight residents' demands for comfortable and multifunctional leisure, fitness, and recreational facilities, as well as their preference for micro-landscapes that provide opportunities for socializing and growing vegetables and inherit indigenous construction techniques over the pursuit of green space scale. Our findings can inform government decision-making processes, such as the publication of standard atlases, and promote the multi-participation of grassroots organizations and the public. It should be acknowledged that the design strategies proposed here are specific, but we also developed a systematic approach in terms of the theoretical model construction, factor screening, path optimization, and measurement methods to establish a generalized framework for landscape efficiency research based on structural equation modeling. This evaluation model could be used to retrospectively analyze other small landscape spaces, help designers identify design flaws, and provide a feasible research approach to explore localized solutions for micro-landscape areas in different cultural and physical environments.

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