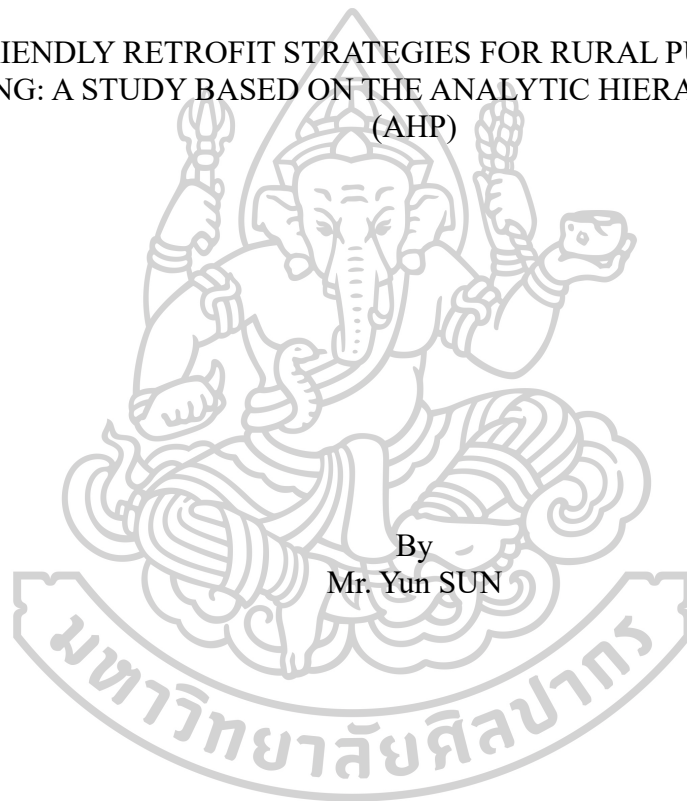




AGE-FRIENDLY RETROFIT STRATEGIES FOR RURAL PUBLIC SPACES IN
NANJING: A STUDY BASED ON THE ANALYTIC HIERARCHY PROCESS
(AHP)



By
Mr. Yun SUN

A Thesis Submitted in Partial Fulfillment of the Requirements
for Master of Fine Arts Program in Design
Silpakorn University
Academic Year 2024
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โดย
Mr. Yun SUN

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรศิลปมหาบัณฑิต
สาขาวิชาการออกแบบ แผน ก แบบ ก2
มหาวิทยาลัยศิลปากร
ปีการศึกษา 2567
ลิขสิทธิ์ของมหาวิทยาลัยศิลปากร



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Title Age-Friendly Retrofit Strategies for Rural Public Spaces in Nanjing:
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By Mr. Yun SUN
Field of Study Program in Design
Advisor Dr. Isarachai Buranaut

Faculty of Decorative Arts, Silpakorn University in Partial Fulfillment of the
Requirements for the Master of Fine Arts

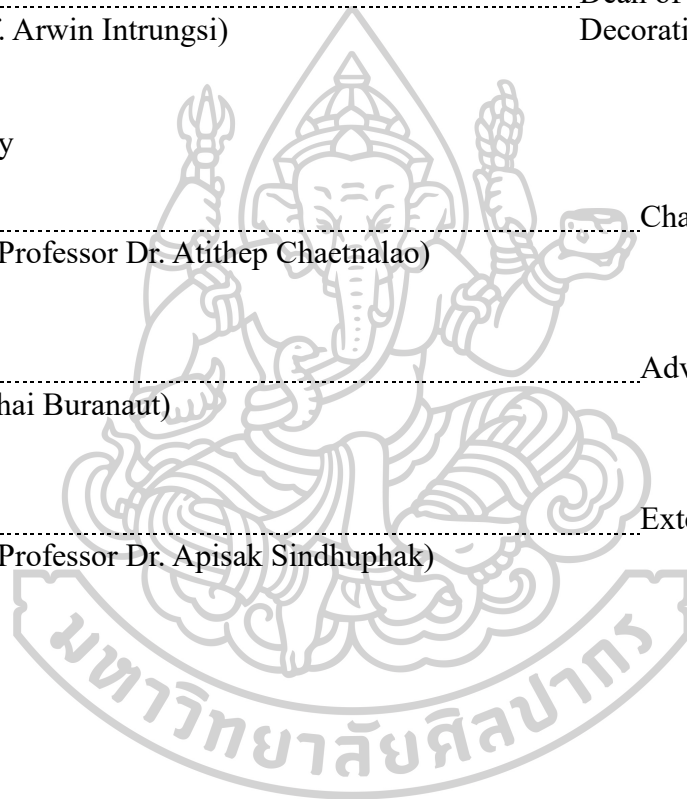
..... Dean of Faculty of
(Assoc.Prof. Arwin Intrungsi) Decorative Arts

Approved by

..... Chair person
(Assistant Professor Dr. Atithep Chaetnalao)

..... Advisor
(Dr. Isarachai Buranaut)

..... External Examiner
(Assistant Professor Dr. Apisak Sindhuphak)



660420021 : Major Program in Design

Keyword : Age-friendly design, Rural public space, KANO-AHP model, Elderly users' needs, Spatial retrofit strategies

Mr. Yun SUN : Age-Friendly Retrofit Strategies for Rural Public Spaces in Nanjing: A Study Based on the Analytic Hierarchy Process (AHP) Thesis advisor : Dr. Isarachai Buranaut

With the continuous acceleration of population aging in China, rural areas are facing increasing challenges due to the lack of age-friendly design in public spaces, which severely restricts the quality of life and social participation of elderly residents. This study, grounded in the concept of active aging, takes Guantang Village in Lishui District, Nanjing as the research site, and systematically explores retrofit strategies for rural public spaces in the context of Nanjing's countryside. The goal is to enhance outdoor activity participation, spatial comfort, and sense of belonging among the elderly through spatial design interventions.

In terms of methodology, this study integrates the KANO model and the Analytic Hierarchy Process (AHP) to identify and quantify the core needs and prioritization of rural elderly users in public space usage from a user-centered perspective. Through questionnaire surveys, in-depth interviews, and field observations, data were collected from three key groups: elderly residents, young villagers, and domain experts. Based on the findings, the study proposes a five-dimensional age-friendly spatial evaluation model consisting of "Access & Identification, Comfort & Safety, Uses & Activities, Communication, and Digital Construction", serving as a comprehensive guide for rural public space renovation.

In the design practice conducted in Guantang Village, the research team applied this five-dimensional model as the strategic framework. Taking into account the existing village conditions and residents' behavioral patterns, a series of systematic spatial optimization strategies were proposed—covering infrastructure upgrades, road network improvement, landscape enhancement, and the reconfiguration of leisure activity spaces. The post-renovation evaluation showed that spatial interventions significantly improved the accessibility and comfort of outdoor environments for the elderly. The frequency of space usage and levels of social engagement among older adults also increased notably. Follow-up satisfaction surveys revealed that the majority of elderly participants rated the renovated spaces as "satisfactory," validating the model's applicability and scalability in rural contexts.

The innovations of this study are threefold: (1) methodologically, it is the first to combine the KANO model with AHP in analyzing spatial needs for rural aging-friendly design; (2) it establishes a Five-Dimensional Design Model based on the behavioral patterns and psychological preferences of elderly users; (3) it bridges quantitative evaluation with practical design strategies, providing a replicable and transferable framework for rural spatial improvement.

In conclusion, this research constructs a relatively comprehensive theoretical system for rural age-friendly design and forms a practical strategy framework with

broad applicability. It offers meaningful insights for promoting high-quality and age-inclusive transformation of public spaces in Nanjing's rural areas. Future studies may extend the model to urban communities, wellness facilities, and other spatial types, while deepening interdisciplinary integration with digital technology, health management, and participatory design approaches.



ACKNOWLEDGEMENTS

I would like to express my heartfelt gratitude to my advisor, Isarachai Buranaut, whose invaluable guidance, support, and insight have made this work possible. His unwavering commitment to excellence and his willingness to share his profound expertise have not only enriched my research but have also inspired me to delve deeper into the subject. His patient encouragement and constructive criticism played a critical role in navigating the challenges throughout my study.

I am also immensely grateful to my colleagues and friends, whose stimulating discussions, constructive criticism, and shared moments of both inspiration and perseverance greatly contributed to refining my ideas and sustaining my motivation throughout this journey. Their support has been invaluable in pushing me to explore new perspectives and reach higher standards in my work.

My heartfelt thanks go to my family for their constant love and unwavering belief in my potential. In particular, I am indebted to my girlfriend, DAI Xiran, whose steadfast support and encouragement have been a personal cornerstone during this challenging yet rewarding academic pursuit. Her presence has offered both solace and strength in times of uncertainty.

Lastly, I wish to acknowledge the inspiring influence of JJLin's music, which has continuously uplifted my spirit and fueled my determination to press on, even when the path ahead seemed arduous. His melodies served as a constant reminder to remain resilient and passionate in my endeavors.

To everyone who has contributed to this academic journey, your support has been instrumental in shaping this thesis. Thank you for being an essential part of this experience.

Yun SUN

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CHAPTER 1

INTRODUCTION

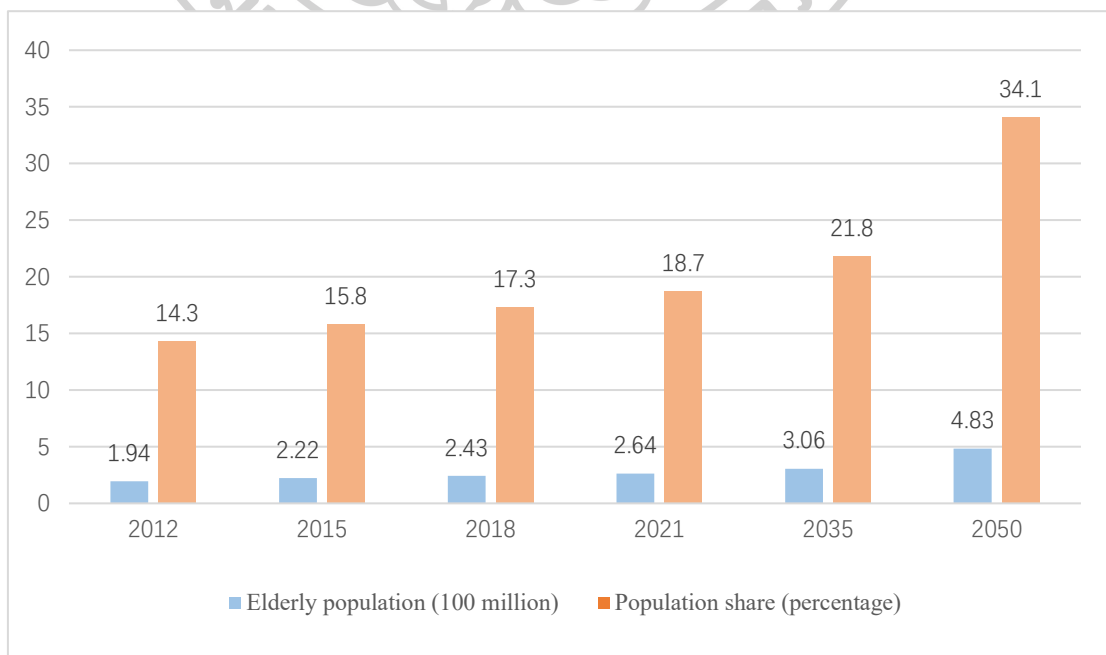
1.1 BACKGROUND

Population aging has become an irreversible global trend in the 21st century. As shown in Figure 1, China became an aging society in 2000, and its elderly population has continued to grow steadily (Luo et al., 2021). It is projected that by 2030, over 25% of China's population will be aged 60 or above, reaching more than 300 million elderly individuals (Wang et al., 2017). To mitigate the social impact of aging, China implemented the "Universal Two-Child Policy" in 2016 and the "Universal Three-Child Policy" in 2020, aiming to boost the birth rate and balance the proportion of elderly people in the overall population. However, due to the long-term effects of past family planning policies, China's aging population is expected to peak around 2040, with aging-related challenges persisting for the foreseeable future (Bao et al., 2022).

Amidst these demographic changes, the concept of Active Aging has gained increasing attention. Proposed by the World Health Organization, Active Aging emphasizes health, social participation, and security as essential factors for maintaining well-being in later life (Sixsmith & Gutman, 2013). The quality of public space plays a significant role in promoting Active Aging, as well-designed spaces can encourage social interaction, mobility, and community engagement. Thus, age-friendly public space transformation is crucial for supporting the physical and mental well-being of rural elderly residents.

Figure 1

Trends in China's aging population



Note. Author(2024)

1.1.1 NATIONAL EMPHASIS ON RURAL DEVELOPMENT

In recent years, the Chinese government has identified rural revitalization as a national priority(Xie et al., 2024). The Central No. 1 Document (2024) highlights the need for strengthening elderly care services and enhancing rural public spaces to foster inclusive and sustainable communities(Stoustrup, 2025).

Compared to previous policy directives, this document places greater emphasis on rural elderly welfare, urging local governments to develop age-friendly infrastructure.

Additionally, the 14th Five-Year Plan for the Modernization of Agriculture and Rural Areas underscores the importance of coordinated rural construction and governance innovation(Houkai, 2022). By 2025, China aims to establish a stronger rural infrastructure foundation, and by 2035, the goal is to achieve comprehensive rural revitalization(Tan et al., 2024). As part of this strategy, the transformation of rural public spaces into age-friendly environments is recognized as a key component of sustainable rural development.

1.1.2 THE NEED FOR IMPROVEMENT IN AGE-FRIENDLY RURAL PUBLIC SPACES

While urban areas have made progress in age-friendly infrastructure, many rural regions lack adequate planning and resources to support elderly-friendly public spaces(Pei & Zhang, 2025). The transformation of rural public spaces plays a vital role in improving elderly well-being, as these spaces provide opportunities for social interaction, physical activity, and cultural participation(Zhao et al., 2022).

However, rural infrastructure development in China has often followed urban models without considering local demographic and environmental characteristics(Yun, 2022). This has led to several design challenges:

- 1)Inappropriate spatial scale – leading to underutilization of public spaces.
- 2)Lack of elderly-centered design – reducing participation in outdoor activities.
- 3)Limited accessibility features – restricting mobility and social engagement.

Given the diverse nature of public spaces in rural China, there is an urgent need for evidence-based design strategies to create functional, inclusive, and engaging environments for elderly residents.

1.2 PROBLEM STATEMENT

At present, China's aging population has entered a rapid development stage and is one of the countries with the highest degree of aging in the world. Nanjing is a new first-tier city in eastern China. Its population aging problem is relatively serious. Due to the imbalance of urban and rural development, the problem of rural hollowing out is prominent. As the elderly grow older, their physical and mental levels will

inevitably change, and they may feel lost and helpless. As a group that cannot be ignored in rural areas, we should pay attention to their mental health while paying attention to their physiological needs. Therefore, how to provide them with a comfortable living environment is the focus of rural construction, so that the elderly can participate in various activities in the village more conveniently and enthusiastically, in order to eliminate their loneliness and other negative emotions.

1.3 SIGNIFICANCE OF THE STUDY

(1) Practical significance

Rural areas are areas with a high density of elderly people(Goes et al., 2019). According to the analysis of the latest census data, China will remain an aging society for a long time(Gong et al., 2022). Rural public spaces are used by the elderly for daily chatting, entertainment and rest, and are the link between neighbors. The aging-friendly transformation of rural public spaces in Nanjing can promote the construction of living environment and infrastructure for rural elderly people, enhance their sense of happiness and social identity. The optimization of rural public spaces for the aging-friendly environment can help the elderly population actively participate in various activities, and also increase the utilization rate of rural public facilities by the elderly. Studies have shown that appropriate outdoor exercise can prevent the occurrence of physical diseases in the elderly(Levinger et al., 2018). Therefore, creating a comfortable public space to enhance the willingness of the elderly to participate in outdoor activities can effectively improve the quality of life of the elderly. (Day, 2008).In addition, public spaces also carry local culture and emotions. Planning the design of public spaces can play a positive role in the villagers' cultural identity and emotional cohesion. (Sanei et al., 2017).

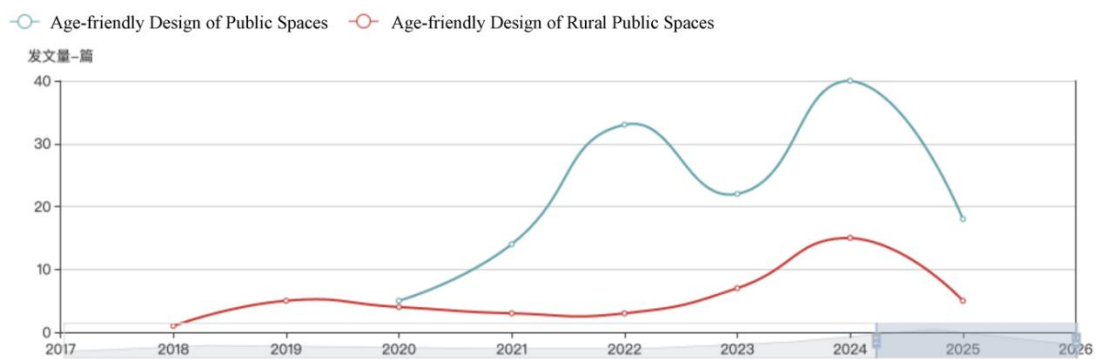
(2) Theoretical significance

At present, the level of urban and rural development in China is unbalanced(Xiong et al., 2020). With the improvement of the overall living standards of the people, the problem of rural living environment should also be taken seriously(LI et al., 2022). As shown in the Figure 2, data from CNKI up to April 2025 on publications related to age-friendly design in public spaces indicate that most research in China has focused on urban areas. Studies on age-friendly environments in rural regions remain in the early exploratory stage, although academic interest in this field is steadily increasing year by year. Although a small number of designers and scholars are studying the transformation of rural aging-friendly, there is no more perfect way to deal with it. Moreover, the texture of urban and rural areas is different, and the needs of urban and rural elderly people are also different. This study conducted a current situation survey on representative villages in Nanjing , and tried to use Kano analysis and hierarchical analysis to conduct evaluation and analysis. It summarized the more prominent problems of rural public spaces in Nanjing and the needs of rural elderly people, and proposed a method for transforming rural public

spaces in Nanjing, which provided theoretical reference for solving rural aging-friendly transformation in China and made certain contributions to the harmonious development of China's future society.

Figure 2

Research Trend Chart



Note. CNKI(2025)

1.4 RESEARCH QUESTION

(1)How can spatial design be optimized to meet the needs of the elderly in rural public spaces?

(2)How can design measures improve the applicability and convenience of public spaces?

(3)Can age-friendly design significantly enhance the social, health, and cultural participation of the elderly?

1.5 RESEARCH OBJECTIVES

(1)To research and explore the needs of people of different age groups in rural areas for public space elements, and study the direction and key points of design and transformation.

(2)The expectations of different age groups for public space elements in rural areas were analyzed, and the elements were classified according to the KANO-AHP model, aiming to balance the needs of other people while taking into account the needs of the elderly.

(3)To develop age-friendly spatial design strategies that enhance the applicability of rural public spaces and promote the elderly's participation in social, health, and cultural activities, while providing a reference framework for inclusive rural space renovation.

1.6 SCOPE AND LIMITATION OF THE STUDY

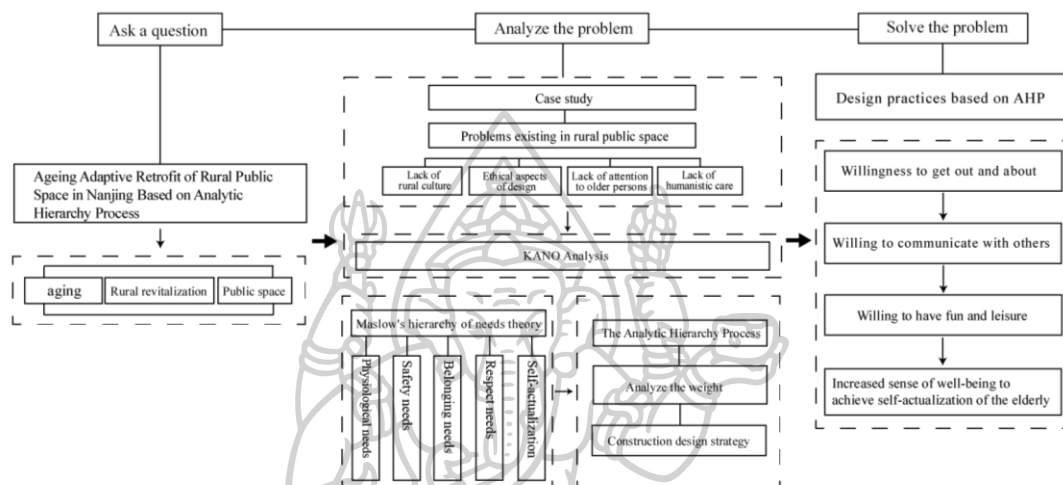
This study is centered on the age-friendly transformation of Guantang Village in Lishui District, Nanjing. It aims to provide practical and theoretical guidance for the design of rural public spaces that accommodate the needs of the elderly population in similar contexts. Due to time and resource limitations, the research scope is restricted

to the development of an elderly-friendly rural public space design guideline. This guideline is derived through field investigations, questionnaire surveys, KANO-AHP analysis, and a review of representative and successful age-friendly rural transformation cases in China.

1.7 RESEARCH CONCEPTUAL FRAMEWORK

Figure 3

Research conceptual framework



Note. Author(2024)

1.8 KEY WORDS INFORMATION

Age-friendly Design: Refers to design strategies and principles that accommodate the physical, psychological, and social needs of the elderly, enhancing their comfort, safety, and participation in daily life(da Silva, 2025).

Rural Community Development: Involves the planning and implementation of initiatives aimed at improving the quality of life, infrastructure, and social services in rural areas, with a focus on inclusivity and sustainability(Prayitno et al., 2023).

Public Space Design: The process of planning and organizing outdoor and communal areas to ensure accessibility, usability, and social engagement, particularly for diverse user groups including the elderly(Le, 2023).

Active Aging: A concept promoted by the World Health Organization that emphasizes continued participation in social, economic, cultural, and civic affairs, enabling older adults to live healthy, independent, and fulfilling lives(Teater & Chonody, 2017).

CHAPTER 2

LITERATURE REVIEW

2.1 PUBLIC SPACE

Public space is a shared area accessible and available to all people, collectively maintained by the public(Carr, 1992). It provides equal services to everyone and serves as a medium for social interaction. Public space does not belong to any specific individual or group(Carr, 1992).

In studying the types of rural public space, researchers can begin by observing the daily activities and behavioral patterns of villagers. Rural public space refers to areas where villagers can freely enter and exit, socialize, exercise, and participate in various recreational and leisure activities(Wen & Sima, 2022).

Based on differences in spatial scale and form, rural public spaces can be categorized into three types: point-shaped, line-shaped, and plane-shaped:

As Figure 4, Point-shaped spaces include small nodes such as residential forecourts, tree pits, and road intersections, often serving as places for resting, casual conversation, or entertainment.

Figure 4

Point-shaped spaces



Note. Author(2025)

As Figure 5, Line-shaped spaces refer to green belts, village roads, and rivers, which function both as transit routes and as social corridors linking various spaces.

Figure 5*Line-shaped spaces*

Note. Author(2025)

As Figure 6, Plane-shaped spaces encompass larger open areas such as parks and public squares, typically used for gatherings, festivals, and collective physical activities.

Figure 6*Line-shaped spaces*

Note. Author(2025)

Each of these “point,” “line,” and “plane” spaces possesses distinct characteristics and functions. Connected primarily through linear spaces, they together form the spatial framework of rural public life.

As rural residents engage in a variety of behaviors shaped by age, mobility, and social needs, each type of public space—point, line, and plane—assumes distinct

spatial attributes and functions. Among them, point-shaped spaces are the most widely distributed and frequently used, particularly by the elderly. These small-scale, scattered spaces—such as forecourts, tree bases, or village entrances—primarily serve as venues for rest, casual interaction, and light entertainment. Owing to their intimate scale, usually only a few to a dozen square meters, they offer a sense of semi-privacy that supports comfortable socialization. Their spontaneous nature also makes them ideal for unplanned group activities, which often emerge organically due to the unpredictable rhythms of daily rural life.

Line-shaped spaces, typically found along streets, alleyways, or village roads, support pedestrian mobility and incidental social encounters. For elderly villagers who primarily navigate their surroundings on foot, these linear paths not only connect various points of activity but also become dynamic spaces of interaction. In some cases, residential forecourts double as linear spaces, further blurring the boundaries between movement and gathering.

Plane-shaped spaces, by contrast, are larger, open communal areas used for organized activities such as village meetings, festivals, or collective exercises. While less intimate than point spaces, they play a vital role in sustaining cultural identity and community cohesion.

Furthermore, the definition of public space in rural China varies. In this study, public spaces are categorized into:


(1)Open public spaces: Village squares and parks, accessible to all residents(Ding et al., 2023).



(2)Community spaces: Common areas within elderly care centers with restricted access(Nguyen & Levasseur, 2023).

(3)Hybrid spaces: Semi-public areas where private institutions contribute to public welfare(Shen, 2014).

Table 1

Comparison of Rural Public Space Types

Type	Accessibility	Main Functions	Age-friendly Design Features	Examples
Open public spaces	Fully open to all residents	- Social interaction - Cultural activities - Exercise & leisure	- Barrier-free access (wheelchair-friendly) - Elderly-friendly seating (with backrests and	

Community spaces	Partially open, requires registration or is restricted to specific groups	<ul style="list-style-type: none"> - Elderly rehabilitation - Medical care - Cultural & educational activities 	<ul style="list-style-type: none"> armrests) - Safety railings (to prevent falls) - age-friendly lighting system (reduces nighttime hazards) 	
Hybrid spaces	Open at specific times, some facilities may have usage restrictions	<ul style="list-style-type: none"> - Community meetings - Religious & cultural events - Elderly daycare & support services 	<ul style="list-style-type: none"> - Multi-functional design (adaptable spaces) - Emergency assistance facilities (help buttons) 	

Note. Author(2025)

2.2 AGE-FRIENDLY DESIGN

2.2.1 CONCEPT OF AGE-FRIENDLY DESIGN

Age-friendly design refers to a comprehensive design strategy that prioritizes the specific physiological, psychological, and social needs of the elderly population (Fathololumi & Mohseni, 2023). With the rapid acceleration of global aging, especially in countries like China, the traditional design models that center on general users have become increasingly insufficient in addressing the challenges faced by aging individuals (Sun et al., 2016). Age-friendly design aims to create inclusive environments that promote safety, accessibility, dignity, and autonomy for older adults (Chau & Jamei, 2021).

This concept encompasses two primary dimensions. On the one hand, in the physical and spatial context, it focuses on tangible improvements such as barrier-free circulation systems, anti-slip flooring, appropriate lighting, and emergency response facilities, all of which mitigate the risks posed by age-related physical decline. On the other hand, in the context of technology and services, it includes the integration of intelligent features such as large-text digital interfaces, voice interaction systems, and simplified user experiences that reduce the cognitive load for elderly users engaging with smart devices.

Ultimately, age-friendly design is not merely about removing obstacles, but about proactively creating environments that support active aging, social engagement, and well-being (Salmistu & Kotval, 2023). It seeks to establish a responsive design framework that adapts to the real-life conditions and evolving capabilities of elderly individuals.

2.2.2 PRINCIPLES OF AGE-FRIENDLY DESIGN

Effective age-friendly design is guided by a set of principles that ensure environments are not only accessible, but also empowering for older adults (Chau & Jamei, 2021). These principles include:

Safety and Risk Reduction:

Designs must minimize potential hazards through measures such as non-slip surfaces, proper illumination, handrails, and clear signage. Safety is the foundational concern in all age-friendly environments (Meeks, 2022).

Accessibility and Mobility:

Physical spaces should accommodate individuals with reduced mobility, including wheelchair users (Kapsalis et al., 2024). This includes designing barrier-free pathways, ramps, elevators, and appropriately scaled furniture and facilities.

Simplicity and Intuitive Use:

Interfaces, signage, and spatial layouts should be easy to understand and navigate, especially for elderly individuals with cognitive or sensory impairments (Chang et al., 2008). Reducing complexity enhances confidence and independence.

Comfort and Human-Centeredness:

Environments should promote physical and emotional comfort through appropriate temperature control, ergonomic design, noise reduction, and use of natural materials and lighting to create welcoming atmospheres (Nousiainen et al., 2016).

Participation and Social Inclusion:

Spaces should be designed to encourage social interaction, community participation, and cultural engagement (Hassen & Kaufman, 2016). This includes providing communal seating areas, activity zones, and venues for intergenerational interaction (Kaplan et al., 2020).

Flexibility and Adaptability:

As aging is a dynamic process, designs should allow for future modifications or personal adjustments to meet changing needs over time (Al-Homoud, 2024).

Dignity and Aesthetic Quality:

Age-friendly design should not be utilitarian alone—it must respect the aesthetic preferences and emotional needs of the elderly, offering spaces that are both beautiful and dignified (Senetra & Czaplicka, 2024).

By adhering to these principles, designers can create environments that not only meet the basic needs of the elderly but also enhance their overall quality of life, contributing to healthier, more inclusive communities.

2.3 THE CONCEPTUAL ORIGINS OF ACTIVE AGING

The concept of Active Aging emerged in response to the global demographic trend of population aging, particularly from the 1990s onward, as policymakers and researchers sought more positive frameworks to reframe aging beyond decline and dependency (Zaidi, 2022). It was formally conceptualized and promoted by the World Health Organization (WHO), especially in its landmark 2002 policy document *Active Ageing: A Policy Framework*, which defined active aging as:

“The process of optimizing opportunities for health, participation, and security in order to enhance quality of life as people age.” (Organization, 2002)

This definition marked a paradigm shift from earlier models of aging that primarily emphasized physical decline, care dependency, or retirement. Instead, active aging promotes autonomy, engagement, and continued contribution, regardless of age-related limitations. Its conceptual origins are influenced by several disciplines:

Gerontology and social policy, which argue for older adults’ continued inclusion in family, community, and economic life (Greenfield et al., 2019).

Public health, which emphasizes preventive care, physical activity, and mental well-being across the lifespan (Meyer & Gullotta, 2012).

Urban and environmental design, which supports the creation of age-friendly spaces that promote mobility, safety, and social connection (Salmistu & Kotval, 2023).

The active aging framework also aligns closely with human rights and dignity-based approaches, advocating for the elimination of age discrimination and the empowerment of older persons (Banerjee et al., 2021).

The core elements of Active Aging include:

- **Health:** Elderly people should maintain physical health and have access to healthcare and preventive services, enabling them to live independently.
- **Participation:** Elderly people should play an active role in social, cultural, and economic activities, engaging in social interactions and exchanges.
- **Security:** Social and psychological support should be provided to ensure that elderly individuals have basic living conditions and emotional well-being.

This holistic view has laid the foundation for age-friendly design practices, especially in rural public space development, where environmental accessibility and social inclusion are critical to supporting aging populations. In this context, design strategies must go beyond basic safety to actively facilitate engagement, independence, and dignity for older adults (Cahill et al., 2017).

2.4 THE IMPORTANCE OF RURAL PUBLIC SPACES

Rural public space is not only an important place for residents' daily activities, but also a key place for social interaction, cultural heritage and psychological support(Ren et al., 2024). Especially in rural areas, since many elderly people live in relatively backward conditions, the quality of public space directly affects their daily quality of life.

Social Function: Public space is an important place for daily social activities. The open spaces such as squares, seats, and farmland in the countryside provide a bridge for communication and negotiation for the elderly, and are an important part of the harmonious and united atmosphere of the villagers.

Cultural Transmission: China's culture is profound and extensive. Public space is an important place for rural culture. Using public space to hold celebrations, cultural publicity lectures, etc. can attract the elderly to actively participate in cultural inheritance and enhance national self-confidence.

Leisure and Recreation: Using rural public space to add facilities such as library reading rooms and smart device learning rooms can provide opportunities for leisure and entertainment for the elderly, which helps to improve their quality of life and physical health and reduce the digital divide with young people.

Therefore, a good rural public space design is very necessary. It not only carries the elderly's yearning for a better life and meets the elderly's use needs, but also should consider the psychological needs of the elderly and design more services for the elderly(Sheng & Yeom, 2022).

2.5 THE VALUE OF AGE-FRIENDLY DESIGN IN RURAL PUBLIC SPACES

Age-friendly design refers to designing suitable spaces and facilities based on the physiological and psychological characteristics of the elderly to improve their quality of life(Liao, 2024). Using active aging to guide age-friendly design allows the design to take more into account the needs of the elderly and allow them to actively participate in social activities, entertainment, and leisure.

Alleviating Physiological Decline: As the physical functions of the elderly deteriorate, more and more elderly people are worried about going out. By designing facilities such as barrier-free passages, armrests, and rest seats, we can reduce the problems of mobility difficulties for the elderly and encourage the elderly to take the initiative to go out. Slow down the body's degeneration(Yu et al., 2021).

Reduce Psychological Stress: A comfortable and pleasant natural environment combined with safe and comfortable public space facilities will help reduce the negative psychological impact of factors such as noise and fear of falling on the elderly. Providing safe and comfortable resting spaces can encourage the elderly to overcome psychological barriers and go out for activities(Liao, 2024).

Meet Social Needs: Through reasonable spatial layout and planning of social functional facilities, the elderly can get out of the house and be willing to share their wonderful old age with the villagers, promote the social activities of the elderly, and encourage the elderly to actively participate in building a beautiful home.

The core of active aging is to start from the needs of the elderly, create an environment that is conducive to their physical and mental health, significantly improve the quality of life of the elderly through the integration of aging-friendly design, and encourage the elderly to actively participate in social activities, allowing the elderly to actively participate in social activities (Del Barrio et al., 2018). The old man is no longer a bystander, but the owner of the countryside.

2.6 PPS: WHAT MAKES A SUCCESSFUL PLACE?

Figure 7 “What Makes a Successful Place?” by the Project for Public Space sets out criteria for good public spaces (Mohamed et al., 2020).

Figure 7

PPS: What Makes a Successful Place?



Note. <https://www.pps.org/article/grplacefeat?utm-medium=website&utm-source=archdaily.com> (2024)

Access & Linkages: As Figure 8, a successful public space should be visually and physically harmonious with the surrounding environment. A successful public space should be easy to enter and exit and pass through; and it should be easy to see from far and near (Yung et al., 2016).

Figure 8

Access & Linkages



Note. <https://www.pps.org/article/grplacefeat?utm-medium=website&utm-source=archdaily.com> (2024)

Comfort & Image: As Figure 9, whether a group of people are comfortable in a public space and whether they can show themselves well is the key to the success of a public space (Francis, 2003). A good public space needs to make the masses comfortable enough in the space so that the masses are willing to rest and have fun in the space.

Figure 9

Comfort & Image



Note. <https://www.pps.org/article/grplacefeat?utm-medium=website&utm-source=archdaily.com> (2024)

Uses & Activities: As Figure 10, one of the basic elements of a public space is to hold events. People go to public spaces often because there are activities to participate in. Frequent events can attract people to visit frequently (Cattell et al., 2008). On the contrary, if there are few activities, the space will appear cold, lonely and empty, which also indicates that the public space is not particularly successful.

Figure 10

Uses & Activities



Note. <https://www.pps.org/article/grplacefeat?utm-medium=website&utm-source=archdaily.com> (2024)

Sociability: As Figure 11, public spaces should provide sufficient social venues to promote interaction and communication between different groups of people (Ujang et al., 2018). People can build connections, share experiences and enhance their sense of belonging in these venues.

Figure 11

Uses & Activities



Note. <https://www.pps.org/article/grplacefeat?utm-medium=website&utm-source=archdaily.com> (2024)

The guidelines provided by PPS offer clear direction for designing successful public spaces. By following these principles, designers can ensure that spaces meet practical needs and foster social and cultural participation. However, the specific needs of elderly rural populations still require further consideration.

2.7 THE NATIONAL STANDARDS FOR AGE-FRIENDLY COMMUNITIES

IN CHINA

As part of its efforts to build an aging society, China has established the national standards for age-friendly communities. These standards cover various aspects from community infrastructure to service delivery, aiming to enhance the quality of life and social participation of the elderly (Chu & Zhang, 2022). As Table 2, the standards primarily include the following key areas:

Barrier-free Design: This includes features such as barrier-free pathways, accessible restrooms, and handrails to accommodate the mobility needs of elderly individuals.

Community Service Facilities: Communities should provide a range of essential services for daily living, such as medical service stations, activity centers for the elderly, and cultural and recreational facilities.

Social Participation: Communities should offer rich opportunities and spaces for elderly social activities, including cultural events, physical exercise, and interest groups, fostering interaction with other residents.

Safety Assurance: Communities need to be equipped with safety measures such as emergency alarm systems, slip-resistant floors, and emergency lighting to ensure the daily safety of elderly residents.

Table 2

Attribute analysis of public space under the National Guidelines for the construction of age-friendly communities of The State Council

Subject	classification	Public space attribute
Living environment	Garbage collection sorting	garbage collection station
Travel facilities	Road safety and convenience	People and vehicles diversion planning
	Street lighting	Streetlight planning and layout
	Seating space and seating Settings	Seat layout, rest square
	Set up sanitary toilets	Barrier-free public toilet
community services	Strengthen health education	Health education bulletin board
	Community	Cultural space, fitness space

	comprehensive service capacity building	
	Propaganda of anti-fraud knowledge and skills	Bulletin board
social participation	Expand agricultural production channels	Countryside market
	Facilitate community activities	Square, lecture hall
	Develop community education for the elderly	Educational lecture hall
	Respect the elderly, love the elderly and help the elderly theme activities	Lecture
science and technology service	Internet information construction	Public computer room
	Bridging the 'digital divide'	Digital education point
	Intelligent broadcasting station construction	Broadcast facility
Management guarantee	Increase investment in service facilities	Emergency alarm

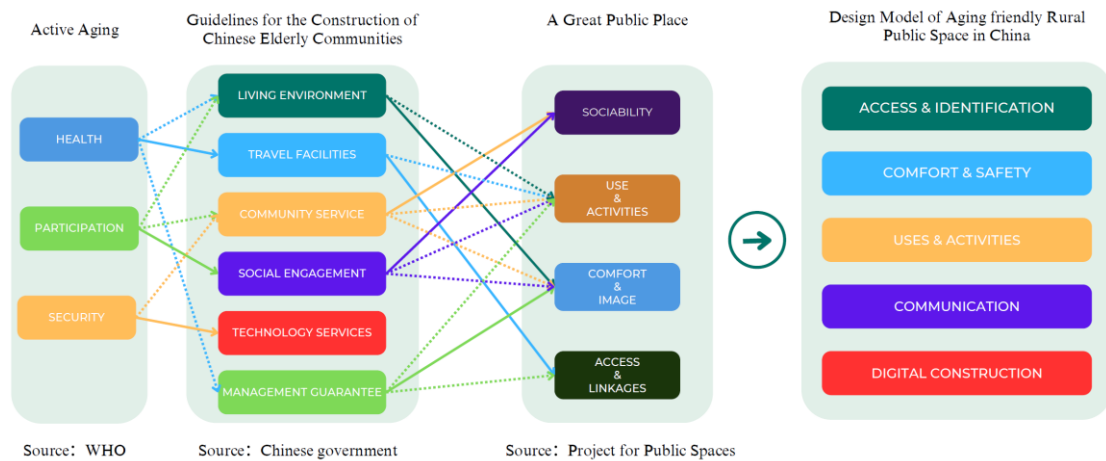
Note. Author(2024)

These standards emphasize the necessity of providing a safe, convenient, and comfortable living environment for elderly people. By integrating China's national standards for age-friendly communities, we can further refine and optimize the age-friendly design of rural public spaces(Liao, 2024).

2.8 CONSTRUCTION OF THE AGE-FRIENDLY DESIGN MODEL

As shown in Figure 12, based on the successful public space standards from PPS and China's national age-friendly community standards, this study creates a model for designing age-friendly rural public spaces. The model includes five main areas: Access & Identification, Comfort & Safety, Uses & Activities, Communication, and Digital Construction.

Figure 12
Theoretical Model Derivation Diagram



Note. Author (2024)

(1) Access & Identification

Access: Rural public spaces should have barrier-free pathways and walkways to ensure elderly people can easily access them. The transport network should connect to the main village roads and public transportation systems, making it easy for elderly people to travel.

Identification: The design of public spaces should consider the vision and cognitive needs of elderly people. It's important to have clear space layouts and signs. Using simple signs, color contrasts, and directional markers will help elderly users quickly identify and find the facilities they need.

(2) Comfort & Safety

Comfort: Temperature, humidity, and lighting should be adjusted to meet the needs of elderly people, ensuring a comfortable space. For instance, shading and cooling areas should be available in summer, while heating facilities should be provided in winter.

Safety: All public space facilities should be safe for elderly people. This includes slip-resistant floors, handrails, emergency call buttons, and other safety measures. According to China's national standards for age-friendly communities, all public spaces must be safe to reduce the risk of accidents.

(3) Uses & Activities

Uses: Public spaces should offer different areas for various activities, such as leisure zones, cultural spaces, and sports areas, to meet the diverse needs of elderly people. For example, quiet reading corners, spaces for dance or fitness, and areas for cultural events should be included.

Activities: Public spaces should encourage social interaction by including benches, plazas, and other places for elderly people to gather. This helps promote neighborhood connections and communication among elderly residents.

(4) Communication

Communication: Digital tools, such as smart broadcast stations and public TV screens, should be available so elderly people can easily access important information, like community events or emergency alerts.

(5) Digital Construction

Bridging the Digital Divide: Rural public spaces should include digital education centers to help elderly people learn basic digital skills. For example, digital learning centers can offer simple courses on using computers and mobile phones, helping reduce the digital skills gap for elderly people.

Information-based Services: Smart devices and digital platforms should be used to provide information on online healthcare, lifestyle services, and other needs. These services make it easier for elderly people to get help when needed. Not only do these services improve convenience, but they also help elderly individuals better connect with society.

2.9 CASE STUDY

2.9.1 CASE SELECTION CRITERIA

In this study, rural cases from different regions, with varying levels of economic development and aging degrees, were selected to ensure that the research findings have broad applicability and representativeness.

(1) Six Guarantees for the Elderly: The selected cases should ideally address all aspects of elderly life. Achieving the “Six Guarantees for the Elderly” is a goal of China’s aging policies and represents a comprehensive summary of the life needs of the elderly. These six aspects are: Elderly Support, Elderly Healthcare, Elderly Education, Elderly Contribution, Elderly Enjoyment, and Elderly Security (Du, 2013). The case selection aims to cover these aspects of the “Six Guarantees for the Elderly” as a standard.

(2) Consideration of Regional Differences: The study selected villages in the east, central and west of China to compare the design characteristics of rural public spaces in different geographical locations. For example, rural areas in the eastern region tend to be economically more developed with better infrastructure, whereas rural areas in the western region may face more development bottlenecks.

(3) Economic Development Level: Cases were selected from villages with different levels of economic development to analyze the impact of economic factors on the implementation of age-friendly design. In economically underdeveloped areas, there may be resource limitations that hinder the implementation of age-friendly facilities and designs.

(4) Degree of Aging: The villages were selected based on the proportion of the elderly population and the specific needs of elderly groups. This allows for a

comparative analysis of public space designs in rural areas with varying levels of aging within society.

(5)Success Case Justification: The selected case studies exemplify successful age-friendly rural public space transformation, driven by strong policy backing, active community engagement, and sustainable design strategies.

Policy Support: Nanjing Pension Center, a flagship project by Nanjing Construction Development Group, integrates elderly care services with public space planning, enhancing functionality while aligning with urban-rural development policies. Similarly, Dongqiao Village and Xikou Village are government-led initiatives under China’s Rural Revitalization Strategy, emphasizing elderly-friendly community planning to promote social well-being and sustainability.

Community Engagement & Utilization: Data indicates that, post-renovation, local elderly populations frequently use these spaces for social interaction and recreation. Their active participation highlights the practical effectiveness of these designs in meeting the evolving needs of aging rural communities.

Sustainable & Scalable Design: Each case employs cost-effective yet high-impact solutions, such as shaded seating, barrier-free pathways, and multi-functional spaces, ensuring accessibility and usability. These adaptable models serve as replicable blueprints for other rural areas facing similar demographic and infrastructural challenges.

Additionally, since this study aims to explore age-friendly transformation guidelines that are more applicable to Chinese rural areas, and given the difficulty of collecting materials from global cases, the ease of material collection was also considered as a factor in case selection. Based on these criteria, four rural cases were ultimately selected for study, with Table 3 presented to showcase the diversity of the selected cases across various aspects.

Table 3

Shows the Diversity of 3 Selected Cases

Case	Six Guarantees for the Elderly	Why It’s a Success Case
Nanjing Pension Center	Elderly Support Elderly Healthcare Elderly Education Elderly Contribution Elderly Enjoyment Elderly Security	Strong government support, integrates public spaces with elderly services, widely used by seniors.
Dongqiao Village	Elderly Support Elderly Contribution Elderly Enjoyment	Government-led rural revitalization initiative, promotes intergenerational activities, well-maintained community spaces.
Xikou Village	Elderly Support Elderly Education	Demonstrates sustainable, cost-effective public space transformation, strong

Lujia Village	Elderly Contribution Elderly Enjoyment Elderly Security Elderly Support Elderly Healthcare Elderly Education Elderly Contribution Elderly Enjoyment Elderly Security	community engagement. Integrating ecological design, community care, and smart services to support healthy aging in place.
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Note. Author(2024)

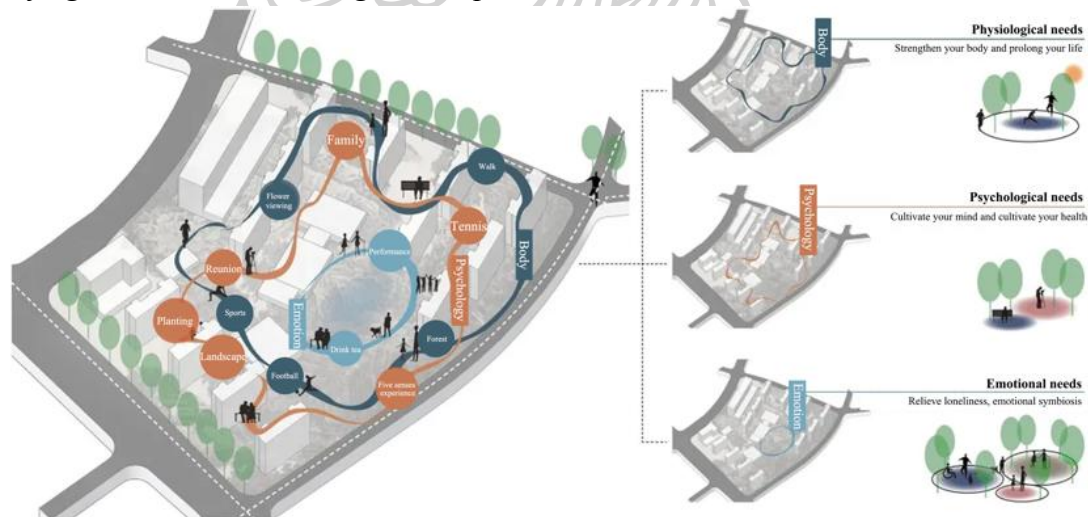
(1) Nanjing Pension Center

Project Introduction

The Nanjing Pension Center, located in Nanjing, serves as a benchmark for integrated, age-friendly community design in China. As show in Figure13,designed to meet the comprehensive physical, psychological, and social needs of elderly residents, the center blends medical care, leisure activities, smart services, and barrier-free spatial planning. The facility reflects the national agenda of promoting "active aging" and enhancing the well-being of older adults through inclusive and intelligent community environments.

Figure 13

Nanjing Pension Center Design Concept



Note. <https://moool.com/nanjing-pension-center-by-laurent.html> (2024)

Age-Friendly Public Space Analysis

Accessibility: Accessibility is foundational to the spatial logic of the Nanjing Pension Center. All infrastructure is designed with universal usability in mind, ensuring seamless mobility for elderly residents with varying degrees of physical ability. Wide, flat, and non-slip pavements connect all major facilities, and strategically placed ramps replace stairs at entry points and along corridors. Clear, high-contrast signage in large fonts supports visual identification, helping elderly

users navigate independently. At the center's entrances and key nodes, tactile paving and auditory signals assist those with visual impairments. This level of detail exemplifies the principle of inclusive access, reinforcing the idea that spatial equality begins with barrier-free design.

Safety: Physical and emotional comfort is enhanced through a meticulously planned environment that anticipates age-related challenges. Shaded rest areas are integrated along walking paths, with ergonomic seating and accessible water fountains. Indoor environments maintain optimal thermal conditions through smart climate control systems. Safety is ensured through 24/7 surveillance, emergency buttons installed in both public areas and private rooms, and anti-slip flooring across bathrooms and corridors. Grab bars and emergency pull cords are installed in all restrooms and shower areas. Residents are also equipped with wearable emergency alert devices, which connect directly to the center's control room, reducing response time during health incidents. This comprehensive risk mitigation framework addresses both visible and invisible vulnerabilities of aging.

Social Participation: Figure 14, The center encourages active aging by providing diverse opportunities for physical, intellectual, and social engagement. Facilities include a fitness center with age-friendly equipment, a swimming pool with adjustable-depth flooring, an audiovisual room, a multi-functional activity hall, and an elderly-friendly café and library. Notably, the center collaborates with Jinling Yihe Elderly University to offer structured lifelong learning programs, ranging from calligraphy and dance to digital literacy and foreign languages. These amenities promote cognitive stimulation, social interaction, and a sense of purpose among residents.

Interpersonal communication is actively encouraged through both spatial design and institutional programming. Semi-open courtyards and shared dining areas are designed to foster spontaneous conversations and group activities. Weekly communal events, such as tea parties, music evenings, and cultural heritage workshops, provide structured opportunities for interaction. The center also facilitates communication between residents and their families through digital platforms, allowing remote video calls, messaging, and health updates. Emotional connection and intergenerational communication are prioritized, supported by a staff trained in empathetic engagement. These efforts align with WHO's framework for age-friendly communication, which emphasizes accessibility, participation, and psychological security.

Figure 14*Nanjing Pension Center Effect Display*

Note. <https://moool.com/nanjing-pension-center-by-laurent.html> (2024)

As shown in Table 4, Interview feedback showed that the social activity design of Nanjing Pension Center not only enriched the daily lives of elderly residents, but also promoted social interaction and enhanced their sense of belonging and happiness.

Table 4*Nvivo Thematic Analysis Table: Social Participation*

Theme	Example Quote	Interviewee
Social Participation	"Attending calligraphy and choir classes at the activity center brings back the joys of my younger days."	R2
Social Participation	"I used to stay home most of the time, but now with these activities, I have more chances to meet old friends."	R3
Community Engagement	"The government's support for these cultural programs is great; the elderly are very willing to participate."	O1

Note. Author(2024)

Services & Technology: Technology is a cornerstone of the center's operation. An integrated IoT platform links smart beds, health monitoring wearables, surveillance cameras, and facility management systems. Residents can schedule medical appointments, access their health records, and control room settings via user-friendly touch screens or voice-command devices. The Health Management Office, established in partnership with Nanjing Gulou Hospital, enables regular checkups, telemedicine consultations, and fast-track emergency care. Digital tools not only streamline operations but also empower older adults, minimizing dependence and enhancing autonomy in aging (Cahill et al., 2017).

As shown in Table 5, Several residents highlighted the benefits of these technological innovations during interviews. The use of smart health monitoring and

emergency alert systems was frequently mentioned as a key improvement in elderly care.

Table 5

Nvivo Thematic Analysis Table: Smart age-Friendly Services

Theme	Example Quote	Interviewee
Health Monitoring	"I use the smart health monitoring device every morning to check my blood pressure. It's very convenient and saves me a trip to the hospital."	R3
Smart Technology	"By combining medical care and elderly care, the elderly can have better security and improve their sense of happiness in life. "	D1

Note. Author(2024)

Key Findings and Implications

Nanjing Pension Center exemplifies an integrated approach to age-friendly rural public space design. Its barrier-free infrastructure, safety measures, and extensive social participation programs make it a successful model for elderly care communities. However, the suburbanization effect remains a challenge, necessitating further initiatives to strengthen intergenerational social ties. Future developments could focus on enhancing transportation connectivity to urban centers, fostering community partnerships, and expanding outreach programs to mitigate the risk of social isolation among elderly residents.

(2) Dongqiao Village, Chongqing

Project Introduction

Dongqiao Village, located in Wanzhou, Chongqing, is a mountainous rural settlement characterized by an aging population and challenging topography. The village covers 9.54 square kilometers and has a population of 2,348, with a significant proportion of elderly residents. As younger generations migrate for work, many seniors face limited mobility, social isolation, and inadequate public infrastructure. To address these issues, the local government has led an age-friendly transformation initiative, integrating spatial improvements and social programs to enhance the well-being of elderly residents.

Age-Friendly Public Space Analysis

Accessibility: Improving spatial accessibility in a village with complex topography was a foundational element of the transformation project. The intervention began with the reconstruction of narrow and uneven paths, replacing steep staircases with gently sloping, anti-slip walkways. These new pathways enable elderly residents to navigate the village with the aid of walkers, wheelchairs, or canes.

Handrail, tactile paving, and edge protection placed strategically improves safety and usability even more. Clear signage and lighting systems were placed along paths leading to important locations including village squares, clinics, and rest areas in order to handle concerns of orientation and visibility. Improvements in accessibility

were planned with local environmental conditions and aging-related mobility issues in mind, so allowing more freedom and autonomy for the elderly population.

One interviewee pointed out: "The new ramps make it much easier for me to move around the village without assistance." (R5)

Safety: As shown in Figure 15, Elderly-friendly safety infrastructure was integrated into both indoor and outdoor public environments. Public toilets and community halls were equipped with barrier-free access, grab bars, anti-slip tiles, and emergency pull cords. Resting nodes—featuring wide benches made from thermally appropriate materials—were placed at frequent intervals throughout the village.

Solar-powered LED lighting was first installed along main roads and public squares to provide night-time safety and lower fall and accident risk. Particularly among older women living alone, villagers said they felt more comfortable and secure. Together with informal surveillance systems including neighbor-based care networks and frequent community health patrols, these spatial improvements enhanced the social fabric and supported localised safety governance.

Figure 15

Dongqiao Village



Note. <https://moool.com/nanjing-pension-center-by-laurent.html> (2024)

Designer said: " In order to ensure safety under the condition of limited funds, We installed more lights and railings to make it safer for the elderly to walk at night."(D2)

Social Participation: A key strength of the Dongqiao Village model is its participatory planning and design process, which actively involved elderly residents in both decision-making and monitoring. Through community consultations, door-to-door surveys, and village assemblies, seniors voiced their preferences for public space layouts, seating arrangements, and cultural design elements.

Along with the change, the flexible-use community areas—open squares and pavilion areas—where people gather for morning workouts, chess games, seasonal celebrations, and classic opera performances—have been established. Elderly citizens participated in event planning and upkeep of shared facilities, so acting as cultural carriers and community leaders in addition to passive beneficiaries.

Along with improving the mental health of senior citizens, this focus on empowerment and inclusion strengthened intergenerational cohesiveness. The process shows how much social participation is about spatial access as well as social agency.

Dongqiao Village included localised cultural and service elements into public space renewal in line with the great connection between rural identity and agricultural legacy. Important treatments consisted in:

- Agricultural landscape nodes exhibiting traditional farming implements and heritage crops;
- Garden-style gathering areas provide symbolic links to residents' agricultural pasts as well as places for leisure;
- Community service booths offering vital information on agricultural subsidies, healthcare, and pensions.

Although digital infrastructure remains limited, pilot initiatives in telehealth and community-based eldercare services are underway. Local medical staff visit elderly homes regularly, while service boards in public squares post information about visiting doctors, vaccination schedules, and wellness campaigns.

Importantly, As shown in Table 6, the village avoided the imposition of urban design models, instead choosing to preserve and reinterpret traditional architectural and cultural elements. This not only safeguarded rural identity but also made elderly residents feel emotionally connected to the spaces, promoting long-term place attachment and daily engagement.

Table 6

Nvivo Thematic Analysis Table: Services & Cultural Integration in Dongqiao Village

Theme	Example Quote	Interviewee
Cultural Connection	"The traditional farming spaces remind me of my younger days. It's comforting to be surrounded by familiar sights."	R5
Community Spaces	"We designed the new public areas to reflect village's cultural heritage while making them senior-friendly."	D2

Note. Author(2024)

Key Findings and Implications

Figure 16 compares before and after the change. Dongqiao Village provides a good model of how context-sensitive design, cultural continuity, and grassroots involvement help to solve issues of rural ageing challenges. Main lessons consist in:

- Improvements in accessibility have to consider terrain complexity, particularly in mountainous rural areas, where universal design ideas mix with regional building methods.
- Safety should be addressed holistically, including unofficial community care systems together with physical infrastructure.
- When older people are seen as active participants rather than just consumers, social involvement blossoms.
- Design of public spaces reflecting cultural identity supports emotional well-being, pride, and community resilience.

To help ageing in place, Dongqiao Village could investigate future expanded integration of smart ageing technologies, especially in the areas of telemedicine, remote monitoring, and digital communication. Its approach shows how, in other rural areas around China, bottom-up innovation combined with suitable policy support can act as a blueprint for age-friendly transformation.

Figure 16

Dongqiao Village before and after



Note. <https://moool.com/nanjing-pension-center-by-laurent.html> (2024)

(3) Xikou Village, Zhejiang

Project Introduction

Located in Quzhou, Zhejiang Province, Xikou Village offers a forward-looking model of rural ageing adaptation motivated by technological innovation. The village has seen a thorough makeover combining smart infrastructure, digital services, and age-friendly design ideas with proactive local government support. Reacting to the twin issues of an ageing population and rural depopulation, Xikou's development plan emphasises not only on improving physical space accessibility and safety but also on encouraging digital inclusion and social participation. As Figure 17 shows, the project represents a complete and sustainable way to create technologically advanced, age-friendly rural towns.

Figure 17
Xikou Village layout



Note. <https://moool.com/dongqiao-village-changling-town-wanzhou-district-chongqing-city-by-donhome.html>(2024)

Age-Friendly Public Space Analysis

Accessibility: For elderly people in Xikou Village, physical mobility and independent navigation take front stage. Wide, barrier-free walkways built from non-slip materials have been rebuilt in the village square and adjacent public parks to enable wheelchair, cane, and mobility aid use. Pathways with low slope and mild turns help those with limited strength or balance.

Apart from the mobility infrastructure, the village has set up rest areas at regular intervals, shaded pergolas, and ergonomic outdoor seating to provide comfort in hotter summer months as well as in colder seasons. Regular physical activity is promoted by the inclusion of easily available exercise stations catered for seniors (such low-resistance strength equipment, balance training units).

Clear bilingual signage supports wayfinding, and colour, texture, and landscaping cues visually distinguish landmarks to help people with early-stage cognitive disabilities confidently negotiate public areas.

One interviewee said: "The wide walkways make it easy for me to move around the village without assistance." (R6)

Safety: Xikou Village makes sure older citizens feel safe in their daily movements and social events by including a variety of clever safety elements into the public space design. Sensor-based lighting, emergency call buttons, and non-slip flooring abound in public spaces including restrooms, squares, and halls. Real-time

health data including fall detection and aberrant stay alerts comes from the sensor-equipped public restrooms.

A 24-hour smart surveillance system covers major public nodes, interfacing with a community management platform that alerts caretakers or relatives in the event of emergencies. For elderly people who might live alone or have chronic illnesses, this real-time environmental and health monitoring is absolutely vital.

One interviewee pointed out: "Having emergency call stations in the public areas makes me feel much safer." (R6)

Furthermore forming a dual system of digital and human-based safety are community patrols, which consist of both volunteers and trained care workers and provide regular health checks and help with errands.

Social Participation: To combat loneliness and maintain cultural vibrancy, Xikou Village places strong emphasis on intergenerational and cultural engagement. A key innovation is the establishment of an Elderly University, which offers a diverse curriculum including calligraphy, handicrafts, local storytelling, digital skills, and health education.

This institution serves as a centre for social interaction and emotional fulfilment in addition to an educational one. Seniors actively help to plan daily tai chi sessions on the village square, seasonal celebrations, and classic opera presentations. Often entwined with local customs and heritage themes, these occasions strengthen cultural identity and a feeling of belonging.

As Figure 18 shows, younger generations can also enter these areas, so promoting community solidarity and intergenerational learning.

Figure 18

Digital Community Service Platform



Note. <https://moool.com/dongqiao-village-changling-town-wanzhou-district-chongqing-city-by-donhome.html>(2024)

Xikou Village distinguishes itself by including cutting-edge digital technologies into community administration as well as healthcare. One smart community platform available via mobile devices offers:

- Real-time health monitoring and medical alarms;
- Appointment scheduling with nearby medical facilities;
- Digital availability of public service announcements, entertainment, and news;
- Online systems for ordering goods and services.

Wearable health monitors driven by artificial intelligence (AI) in the village track heart rate, blood pressure, and movement patterns, so alerting family members or local medical professionals in case of abnormalities. These gadgets link to the village health centre, which keeps digital health records for every elderly person.

Regular tech training courses, where volunteers and students teach older adults how to use smartphones, scan QR codes, and run healthcare devices, help to close the digital literacy gap, as Table 7 shows. This improves seniors' participation with the digital world in addition to helping them to better control their health.

Table 7

Nvivo Thematic Analysis Table: Services & Cultural Integration in Dongqiao Village

Theme	Example Quote	Interviewee
Smart Technology	"The traditional farming spaces remind me of my younger days. It's comforting to be surrounded by familiar sights."	R6
Smart Technology	"We designed the new public areas to reflect village's cultural heritage while making them senior-friendly."	R6
Digital Literacy	"Initially, many of people didn't know how to use smart devices, but after the village training, they learned quickly."	D3

Note. Author(2024)

Key Findings and Implications

Xikou Village is a technology-driven but human-centered model of rural age-friendly development. The village creates an inclusive environment where elderly people are not only passive consumers of care but active participants in forming their life and community by matching smart infrastructure with cultural sensitivity and social engagement.

Key insights include:

- Digital infrastructure has to be accompanied by accessibility and education; without basic digital literacy support, even the most sophisticated systems may go underused or be abused.

- Design of public spaces that combines technology with cultural expression produces an environment where elderly people feel both emotionally connected and empowered.

- Safety in age-friendly environments has to combine social, technological, and physical aspects to guarantee resilience and redundancy.

- Older involvement in community governance and education can turn public space from a passive background to an active forum for agency, purpose, and pride.

The situation of Xikou Village supports the larger lesson that, when suitably localised, technology can overcome age-related restrictions and rural-urban divisions, so promoting sustainable, dignified ageing in place.

(4) Lujia Village, Zhejiang

Project Introduction

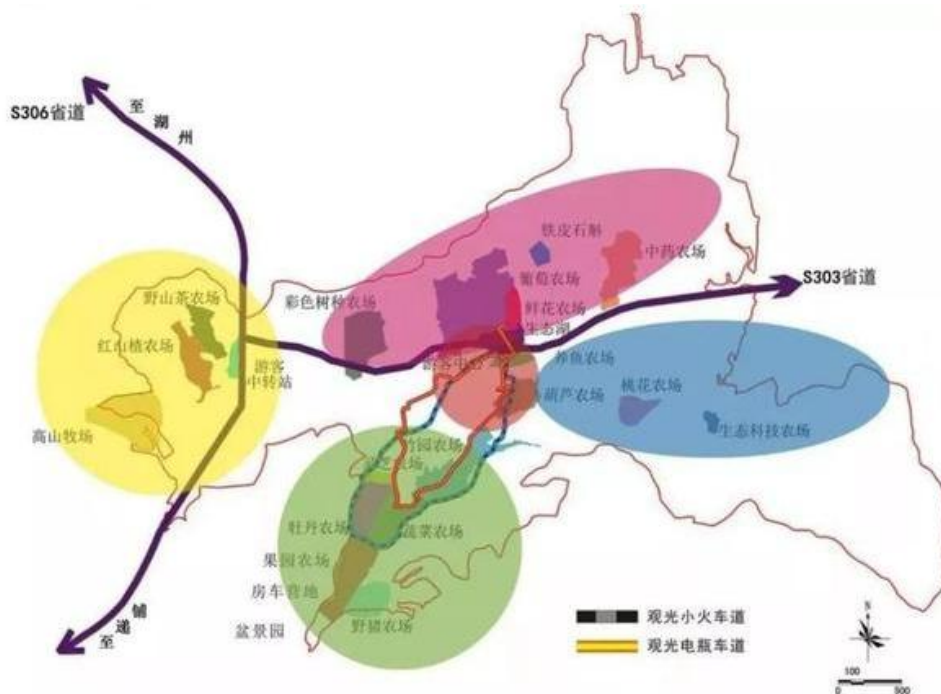
Widely known as a trailblazer of age-friendly rural development in China, Lujiacun is in Anji County, Zhejiang Province. It has evolved over the past ten years from a typical mountain town into a model of environmentally friendly, livable rural rejuvenation. Over 30% of the population in Lujiacun is over 60 years old, thus the town has given top priority to building inclusive, health-conscious public areas that enable active ageing. Renowned nationally for its creative approach, the village's design strategy combines environmental sustainability, cultural preservation, and smart technology to satisfy changing needs of elderly people.

Age-Friendly Public Space Analysis

Access & Identification: Mobility and spatial orientation are two major challenges facing elderly residents in rural areas, especially those with declining physical or cognitive functions (Xu et al., 2019). Lujia Village addresses these challenges through both physical accessibility and visual-spatial legibility.

As seen in Figure 19, the village creates a logical pedestrian circulation system linking public squares, markets, health centres, and residential areas—among other important nodes. Widened, level, and completed with non-slip paving materials are primary and secondary pathways. At all elevation changes, slopes and handrails guarantee barrier-free movement. Moreover, directional signage supports visual recognition and ease of navigation by means of high-contrast fonts and colours with unambiguous symbols.

Figure 19
Lujia village



Note. <https://www.163.com/dy/article/HV6D1CJ505328UPK.html> (2024)

Older people's cognitive memory is triggered by natural landmarks including wells, historic gateways, and heritage trees. While adding visual vitality, colour-coded zones—yellow for leisure paths, green for health walks—help to support easy navigation. This method lessens confusion, advances independence, and improves the general sense of spatial familiarity.

Comfort & Safety: Age-friendly public space must satisfy not only functional safety but also emotional comfort (Zhang et al., 2022). To maximise comfort and lower physical risks, Lujia Village combines psychological and environmental techniques.

Along main pedestrian paths, shaded corridors, pergolas, and plant buffers are placed as seen in Figure 20 to help to reduce climatic stress. These microclimate interventions protect elderly people from too strong wind, rain, or sun. Every 100 meters there is seating with arm supports and backrests. Gathering nodes with their circular tables, chessboards, and walking cane holders promote laid-back, low-stress social contact.

Figure 20
Lujia village



Note. <https://www.qianzhan.com/analyst/detail/220/180428-3255a22e.html> (2024)

Nighttime safety is ensured through solar-powered ambient lighting and motion-sensor lamps that illuminate key spaces such as toilets, intersections, and pavilions. Ground surfaces are textured for traction, and slope gradients are kept below 8% to minimize slip risk. Emergency pull cords, surveillance cameras, and audio alert systems are placed in key public toilets and activity zones. Such measures allow elderly users to respond to incidents promptly, bolstering their psychological sense of safety.

Uses & Activities: A vibrant public space is one that invites interaction, supports a variety of uses, and promotes daily physical and social routines (Cattell et al., 2008). Lujia Village excels in creating multifunctional environments that cater to the diverse lifestyles of its older population.

As shown in Figure 21, outdoor fitness zones in the central square include equipment for stretching, balance, and light cardiovascular exercise. Elderly residents regularly gather for tai chi, square dancing, and morning walks, reinforcing healthy habits and daily rhythms. Small-scale recreational nodes—such as shaded courtyards and forecourt spaces—are outfitted with chess tables, tea benches, and personal lockers. These micro-public spaces support informal gatherings and leisure.

Figure 21
Lujia village



Note. http://lyj.zj.gov.cn/art/2020/5/28/art_1229051673_43671101.html (2024)

Apart from daily activities, the community organises seasonal cultural events including opera presentations, local celebrations, and folk-art seminars. Ancestral halls and temple courtyards are redesigned as sites for intergenerational events. Many public areas are intended for adaptive use—that is, a "shared courtyard" might be both a family reunion venue and a workshop classroom depending on the demand.

Communication: Social inclusion and a sense of belonging are vital components of active aging (Levasseur & Naud, 2022). By means of several engagement platforms and grassroots governance, Lujia Village encourages communication and involvement.

Regular listening sessions run by a committed "Silver Citizen Council" allow senior citizens to express issues and co-plan public projects. This bottom-up government approach improves civic identity and ownership. Public noticeboards, local loudspeakers, digital kiosks, and WeChat groups create layered channels for delivering health alerts, event invitations, and emergency information, so ensuring that no resident is left behind because of digital illiteracy.

Under the direction of volunteers, the village committee funds community clubs including walking groups, calligraphy circles, and senior choirs. Along with being recipients, elderly residents take on roles including cultural archivists, community gardeners, and peer trainers. A points-based volunteer incentive system encourages

mutual assistance even more by allowing older participants to accumulate redeemable credits by helping neighbours or attending seminars.

Lujia Village incorporates smart technology into its age-friendly public infrastructure in line with China's "Digital Village" approach, so ensuring that older people gain from rather than are excluded by, technological developments.

Installed at strategic points, smart health kiosks let users check their blood pressure, glucose levels, or heart rate and automatically upload information to a cloud-based health monitoring system. Real-time updates given to village doctors enable them to act when anomalies develop. Wearable GPS-enabled bracelets with fall detecting and emergency buttons equip high-risk seniors.

Through which elderly users or their carers may schedule medical appointments, register for community events, reserve meals at the senior canteen, and apply for subsidies—the village has created an integrated digital platform "Cloud Lujia." Older adults are taught how to use cellphones, avoid scams, and communicate online in weekly digital literacy seminars housed at the community centre. Seniors' continuous education helps them to stay independent in a society growingly linked.

The case study of Lujia Village shows how much a comprehensive, community-driven approach to age-friendly rural design might improve the quality of life for senior citizens. The village deftly redefines the function of public space in ageing communities by including physical accessibility, comfort, social participation, and digital inclusion. Its focus on participatory governance, cultural continuity, and adaptive spatial programming offers another rural community confronting demographic ageing a repeatable model. The project provides insightful advice for planners, legislators, and designers working on rural revitalisation and elder care since it emphasises the need of customising treatments to local settings by using both traditional practices and technological innovation.

2.10 SUMMARY OF RESEARCH FINDINGS

This work integrates the idea of Active Ageing with the theory of successful public space development to build an age-friendly rural public space design framework. As is show in table 8 through an in-depth analysis and comparison of three case studies—Nanjing Pension Center, Dongqiao Village, and Xikou Village, Lujia Village—the feasibility and effectiveness of the proposed model are validated. The following key findings emerge:

Table 8

Cross-case analysis comparison

Elements	Nanjing Pension Center	Dongqiao Village	Xikou Village	Lujia Village
Access & Identification	Well-defined navigation, barrier-free	Improved walkways, reduction of	Digital signage, driven	Barrier-free roads, color-coded

	pathways, wheelchair accessibility	steps, street lighting for safety	navigation for elderly residents	wayfinding
Comfort & Safety	Emergency response systems, indoor safety features	Community-installed safety rails, street surveillance	Smart safety monitoring, automated alerts	Emergency response stations, upgraded home safety
Uses & Activities	Cultural & fitness programs, university for the elderly	Social gathering spaces, agricultural cultural activities,	Digital learning hubs, virtual interaction platforms	Elderly activity center, eco-farming gardens
Communication	Community events, elderly-led management	Strong elderly participation in design	Online social networks, remote consultation	volunteer home visits, and suggestion feedback systems
Digital Construction	Basic digital access, limited smart services	Minimal technology integration	Fully digitized community services, telemedicine	Smart elderly care platform, telemedicine services

Note. Author(2024)

2.10.1 INTEGRATION OF ACTIVE AGING AND AGE-FRIENDLY

DESIGN:

Results show that including Active Ageing concepts into rural public space design greatly improves elderly well-being. Public spaces have been created across all kinds to encourage social participation, physical activity, and cultural involvement, so supporting the idea that well-planned surroundings help to support the better quality of life for the elderly.

Older citizens gain from accessible, inclusive environments, according to Nvivo interview analysis. For instance, elderly residents of Dongqiao Village actively helped to design and run public areas, so encouraging a feeling of ownership and belonging. While in Xikou Village technology-driven projects enabled increased participation in digital and cultural events, programs guaranteed regular community involvement in Nanjing Pension Centre.

These findings align with previous research demonstrating that environments designed with Active Aging principles support not only physical accessibility but also emotional and social well-being (Levasseur et al., 2017).

2.10.2 VALIDATION OF THE AGE-FRIENDLY MODEL ACROSS

DIVERSE CONTEXTS

Notwithstanding variations in geographic conditions, economic development, and ageing demographics, every case study shows context-specific adaptations of the age-friendly design model:

To guarantee complete elderly services, government-supported senior living institution Nanjing Pension Centre effectively combines residential care with public space.

Emphasising bottom-up involvement where elderly people actively shape public space planning, Dongqiao Village epitomises a community-driven transformation.

Using digital technology, Xikou Village shows how clever infrastructure improves elderly access, security, and participation.

Lujia Village offers a hybrid approach with digital care services mixed with ecological design. In a low-density rural environment, it provides physical comfort as well as clever healthcare access by combining environmental sustainability with age-friendly elements.

These cases confirm that an age-friendly approach can be implemented in many rural environments; long-term success depends on local adaptation.

The conclusion is reinforced by nvivo interview insights. While residents of Dongqiao Village stressed the need of cultural and social integration, elderly people in Nanjing Pension Centre praised the accessibility and safety measures. Although the shift to digital platforms first presented difficulties in Xikou Village, training initiatives helped close the digital literacy disparity among senior citizens.

2.10.3 DIVERSITY IN PUBLIC SPACE DESIGN STRATEGIES:

Beyond only improving physical infrastructure, age-friendly rural public space design must incorporate local culture, social interaction, and digital inclusion to create really inclusive settings for the elderly (Padrón Nápoles et al., 2021). While fundamental elements such as barrier-free design and safety measures are present across all cases, their approaches to social and cultural programming vary.

At Nanjing Pension Centre, recreational and educational events give senior citizens consistent chances for involvement that advance lifetime learning and well-being. By means of community-driven participation, Dongqiao Village encourages seniors to participate in traditional activities, village planning, and intergenerational projects, so strengthening a feeling of belonging. Xikou Village adopts a more technologically driven strategy, combining digital platforms and smart infrastructure to enable virtual community interactions, online learning, and remote healthcare access. At Lujia Village, the approach revolves on localised care services and environmental integration. Using environmentally friendly materials and restorative green areas to improve both physical and emotional well-being, the village embeds

elderly-centered design within its natural setting. It also provides regionally tailored smart care solutions—such as app-based communication tools and mobile health checkups—that support aging-in-place while maintaining rural way of life.

These results underline the need of flexibility in age-friendly public space development. Although all cases start with universal accessibility and safety criteria, the integration of local cultural and technological elements is quite important in improving social involvement and general well-being. Developing sustainable, elderly-friendly rural public spaces that efficiently meet social as well as physical needs depends on a flexible, multi-dimensional approach(Xu & Tian, 2025).



CHAPTER 3

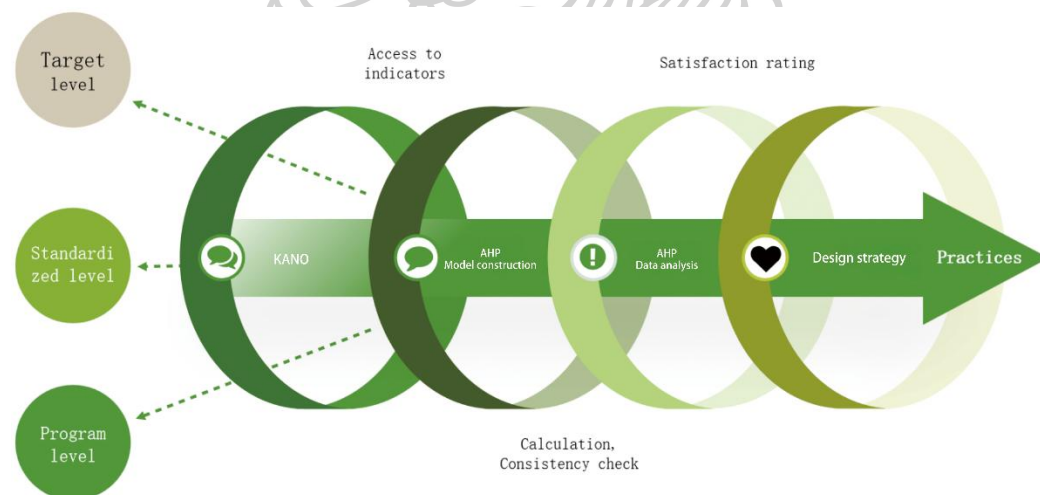
RESEARCH CONTENT AND METHODS

3.1 RESEARCH CONTENT

This research mainly studies the renovation of public spaces in rural areas of Nanjing for the elderly. Through field research, the needs of the elderly population in Nanjing are analyzed; interviews and questionnaires are used to understand the use needs of public spaces by the elderly population in rural areas of Nanjing; and combined with the survey results, the current problems of rural public spaces in Nanjing are analyzed, and the design points of rural public spaces for the elderly are proposed. As shown in Figure 22, The Kano analysis method is used to analyze the necessary attributes, expected attributes, and attractive attributes of the renovation, and the AHP hierarchical analysis method is further used to analyze the needs of rural public spaces for the elderly, quantify the functions of public spaces for the elderly, calculate the weight values, and analyze the key points and strategies that need to be focused on in the renovation of rural public spaces for the elderly in Nanjing, so as to achieve the renovation of public spaces that meet the needs of the elderly.

Figure 22

Research Methodology Flowchart



Note. Author(2024)

3.2 RESEARCH SUBJECTS (POPULATION AND SAMPLE)

Against the backdrop of increasing rural aging in China, the demand for age-friendly design in public spaces has become more prominent. In order to more accurately assess the current state of space usage and the actual needs of different groups, this research focuses on optimizing the design of age-friendly public spaces in rural China. It combines the KANO model and AHP method to precisely identify user

needs and conduct layered weight analysis. As shown the Table 9 , three key research subjects were selected: elderly rural residents, young villagers, and experts and scholars in urban and rural planning and design. Core information and judgment basis from these three groups were collected through field surveys and structured questionnaires, in order to construct a scientific and reasonable demand classification and evaluation system.

Table 9

Research Subjects

Category	Description	Methodology
Elderly Residents	Primary users of public spaces; rely on outdoor spaces .	KANO model and activity frequency observations.
Young Villagers	Secondary users; play a key role in space management and maintenance;	KANO questionnaire and interaction analysis.
Experts	Provide expert input ensure theory-practice alignment.	AHP collaborative scoring for model building.

Note. Author(2024)

3.2.1 ELDERLY RESIDENTS

The main users of public spaces are elderly rural people, thus their daily activities mostly rely on outdoor environments including alleys, village squares, and shaded areas. Older persons using these facilities run many difficulties and hazards due to ageing buildings, crude designs, and lack of accessibility. Under Nanjing City, this study made field visits in typical rural areas where observations and questionnaires gathered the space usage behaviours, demand preferences, and satisfaction levels of elderly people 60 years of age and above.

Apart from serving as the KANO questionnaire's core response group, the elderly sample directly forms the original data for demand classification. The questionnaire consists of both positive and negative items to help classify basic, expected, and excitement needs; during the field survey, time-point records and activity frequency observations were used as complementary validation methods, so laying a basis for later spatial recommendations.

3.2.2 YOUNG VILLAGERS

Though most of the rural population is elderly, young residents who stay in the village year-round still significantly contribute to space management and upkeep. Observed their interactions with the elderly, the study noted their degree of participation in the space environment, and recorded daily usage frequency and types of behaviours of young people in connection to the spaces. Working with the elderly group to create a demand profile from a two-way standpoint, they were involved as secondary users in the KANO questionnaire survey, so exposing the variations in

space perception between generations. This lends a reference for creating more inclusive design plans.

3.2.3 EXPERTS

As shown in Table 10, to ensure the scientific and practical value of the study, experts in relevant fields were invited to participate. These experts provided literature resources and analytical frameworks during the early stages and offered professional guidance and decision-making support during the questionnaire design, model construction, and demand weight determination stages.

Table 10 List of experts

Table 10

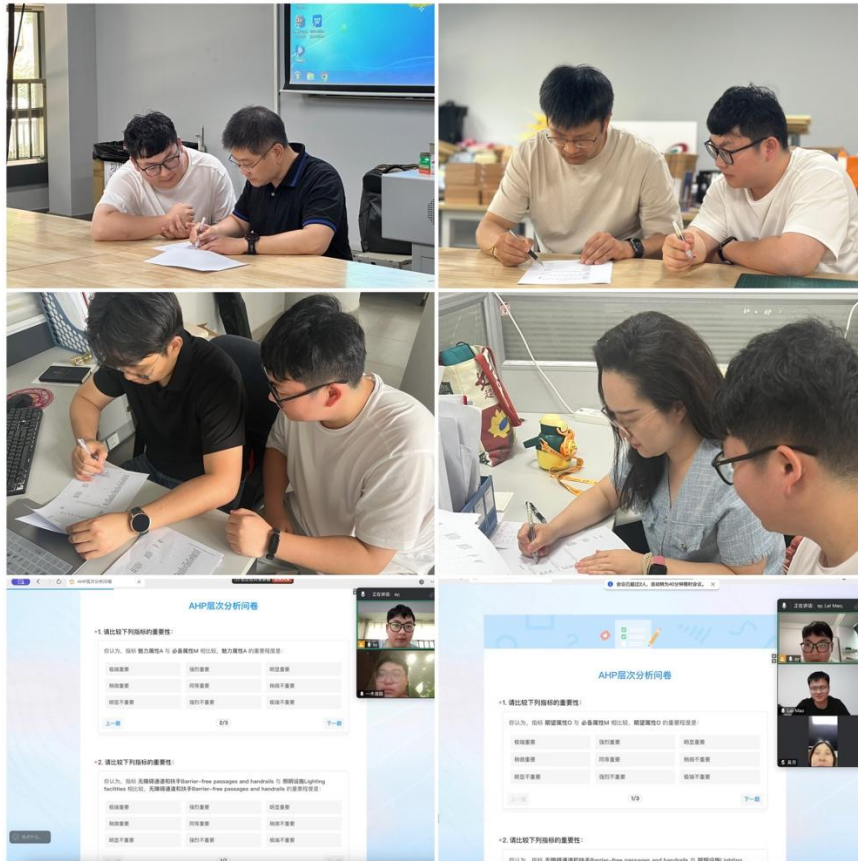
List of experts

Name	Position
Lei Mao	PhD student at Xi'an Jiaotong-Liverpool University
Guoping Yang	Associate Professor, Nanjing City Vocational College
Zhong Wei	Associate Professor, Nanjing Tech University Pujiang Institute
Ling Liu	Assistant Professor, Nanjing Tech University Pujiang Institute
Yongshuai Zhang	Design Consultant, Shitouji (Nanjing) Digital Technology Co., Ltd.
Zijian Huang	Design Director, Yimu Garden Landscape Design Company

Note. Author(2025)

Specially selected experts included designers with hands-on experience in rural projects, scholars who have long focused on age-friendly issues, and government consultants familiar with local policies and implementation processes, to ensure a close connection between theoretical research and practical situations. As shown in Figure 23, through expert interviews and collaborative scoring using the Analytic Hierarchy Process (AHP), the systematization and persuasiveness of the research results were enhanced.

Figure 23
Expert Interview Recruitment Photos



Note. Author

3.3 LITERATURE RESEARCH

The literature research method serves as the theoretical foundation of this study (Snyder, 2019). By systematically analyzing both domestic and international research on age-friendly design practices and theories, this method allows for the extraction and refinement of core academic viewpoints. Relevant books, scholarly articles, online publications, government reports, and authoritative databases are consulted to build a comprehensive understanding of current advancements and gaps in the field.

By means of this process, the study reveals important themes, approaches, and evaluation criteria often followed in age-friendly rural design. Particularly, focus is on participatory planning models, successful public space interventions, and the spatial needs of ageing populations. Following this classification, synthesis, and critical evaluation of the literature forms a knowledge base that guides the choice of case studies, design plans, and evaluation systems in next phases of the research.

This method not only aids in framing the research direction but also ensures that the study aligns with established academic discourse while identifying opportunities for innovation and contextual adaptation in rural China.

3.4 FIELD RESEARCH METHOD

The field research method is employed to obtain firsthand data on the current condition of rural public spaces in Nanjing, with a focus on their suitability for an aging population. Fieldwork involves visiting selected sample villages to conduct direct observations, take systematic photographs, and document spatial layouts, infrastructure, and user behavior (Burgess, 2003). The main emphasis is on evaluating the spatial distribution of public areas, road accessibility and safety, signage visibility and legibility, state of public facilities, and general physical environment.

For elderly users, environmental factors including noise levels, temperature, shade availability, and seating conditions are also measured to assess comfort and usability. Observations of outdoor activities among elderly people across several times of day and places help to expose spatial preferences and usage patterns.

Furthermore sent to local residents—especially elderly people—are questionnaires meant to gather personal assessments and lived experiences. Semi-structured interviews with elderly users, village leaders, carers, and local officials offer qualitative insights into community needs, social behaviours, and apparent access and participation barriers.

Together, these qualitative and quantitative methods provide a comprehensive, ground-level understanding of the age-friendliness of rural public spaces, laying the groundwork for evidence-based design interventions.

3.5 CASE ANALYSIS

By consulting the literature, we can understand the practice cases of aging-friendly design at home and abroad, and collect and organize the relevant information and data of each case.

Secondly, on the basis of collecting and organizing the case data, it is necessary to summarize the design focus of each case. This includes identifying the aging-friendly design strategies, design elements, and design solutions used in each case.

Next, compare the various cases to find out the similarities, differences, and connections between them.

Finally, based on the comparative analysis, four relatively successful village design cases are selected for in-depth comparison, providing theoretical support for subsequent research and design practice.

3.6 INTERVIEW METHOD

To learn about public space use, accessibility issues, and policy execution, six elderly residents, two government officials, and three designers were interviewed all together. Using Nvivo-assisted thematic coding, transcribed interviews were

examined under design effectiveness, policy restrictions, and elderly social participation. Following a number denoting the particular respondent (e.g., R1, R2 for elderly residents), interviewees were assigned R (Elderly residents), O (Government officials), and D (Designer).

This study guarantees a thorough and methodical approach to grasp how design of rural public space influences elderly well-being by combining these techniques. Future age-friendly design strategies benefit from the combined analysis strengthening the validity and applicability of the conclusions of the study.

3.7 KANO ANALYSIS

The KANO model is a widely used tool for customer needs analysis and product design, introduced by Professor Noriaki Kano from the Tokyo Institute of Technology in the 1980s (Rotar & Kozar, 2017). The KANO model's basic concept is to classify consumer needs depending on their varying responses to particular product or service attributes. This clarifies the variety of consumer needs and enables designers to maximise goods or services so improving customer satisfaction.

3.7.1 BASIC CLASSIFICATION OF THE KANO MODEL

As shown the Figure 24, The KANO model classifies customer needs into the following five main categories:

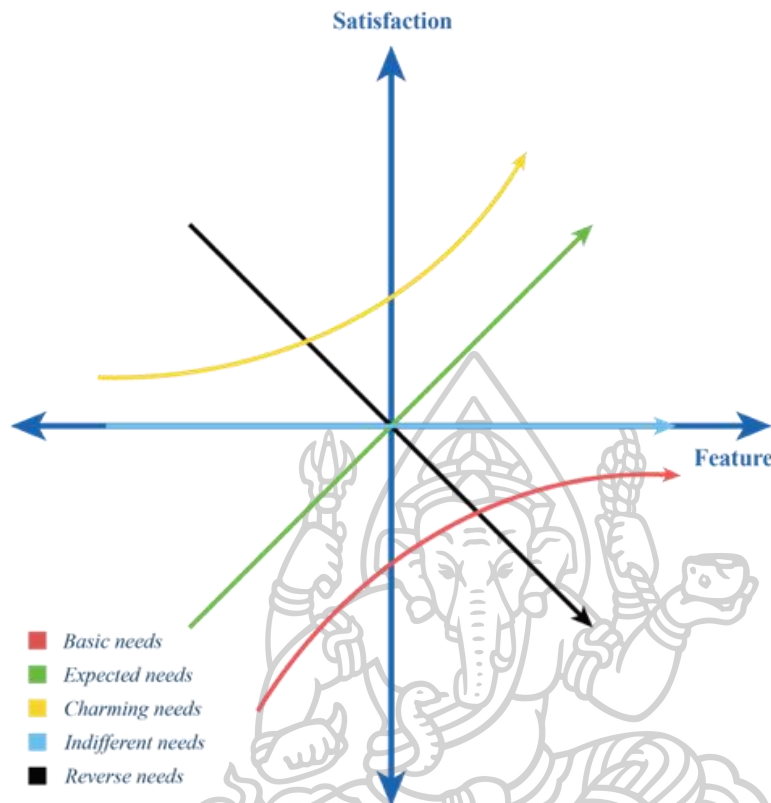
Basic Needs: These are the basic needs clients of a good or service must satisfy. Should these needs not be satisfied, consumers will become unhappy. However, fulfilling these needs will not significantly increase customer satisfaction, as these needs represent the minimum expectations of the customer (Shahin et al., 2013).

Performance Needs: These are characteristics that customers clearly expect, and their level of satisfaction is positively correlated with the extent to which these needs are met (Shahin et al., 2013). Stated differently, the customer's satisfaction increases with increasing fulfilment of these needs.

Excitement Needs: These are needs that customers do not explicitly expect, usually features that exceed customer expectations (Shahin et al., 2013). While meeting these needs will make clients happy and greatly raise their level of satisfaction, failing to meet them will cause discontent.

Indifferent Needs: These needs do not affect customer satisfaction (Shahin et al., 2013). Whether or not these features are present, customer satisfaction will not change.

Reverse Needs: Reverse needs refer to customer reactions that are negative towards certain characteristics (Shahin et al., 2013). In other words, some features may make customers dissatisfied and even affect their user experience.

Figure 24*KANO model element relationship*

Note. Author(2024)

The KANO model is a research method used to assess audience needs and effectively categorize attributes. This study, based on the rural population in Nanjing, collects key insights and needs from elderly residents, other villagers, village heads, government officials, and designers through interviews. By collecting survey results and using both positive and negative questionnaires, the study accurately categorizes the demand attributes. The key points and needs are classified into basic needs, performance needs, excitement needs, indifferent needs, and reverse needs. The elements of positive needs are then selected to construct the subsequent AHP model.

3.8 ANALYTICAL HIERARCHY PROCESS (AHP)

First, the demand attributes are classified using the KANO model, which divides user needs into three categories: basic needs, expected needs, and attractive needs. These three categories form the criterion layer, while the specific demand indicators within each are categorized into the sub-criterion layer. This creates a disciplined hierarchy that enables a more objective, methodical investigation.

Following the guidelines described in Figure 25, a group of professionals and designers are invited to pairwise compare the elements inside each layer using the 1–9 scale method, so assigning values that correspond with the relative significance of

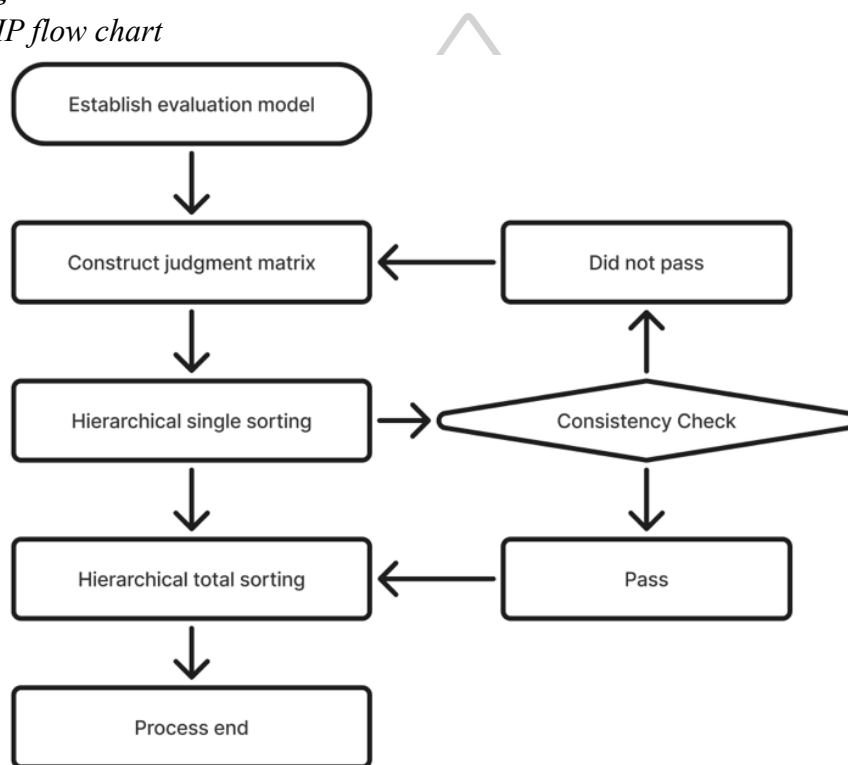
every factor. The consistency test comes next to guarantee the dependability of the professional opinions.

Once consistency is verified, a judgment matrix is established and used to calculate the weight of each criterion using the geometric mean method. These weights represent the priority of each factor in the context of age-friendly rural space design and serve as a quantitative foundation for subsequent transformation proposals.

At last, a focused transformation plan is suggested depending on the final weight ranking to guarantee that design choices reflect the real needs and preferences of senior citizens.

Figure 25

AHP flow chart



Note. Author(2024)

3.8.1 1–9 SCALE METHOD

Two elements in a pairwise comparison are ranked in relative importance using Saaty's 1–9 scale method. The scale runs from 1—equal importance—to 9—extreme importance of one over another. When a judgement falls between the stated intensities, intermediate values—2, 4, 6, 8—are used. This lets professionals state complex preferences between design criteria.

3.8.2 CONSTRUCTION OF THE JUDGMENT MATRIX

From the second level of the hierarchy onwards, a pairwise comparison judgment matrix must be constructed to assess the relative importance of each criterion in relation to the others. Let this matrix be denoted as A , with criteria labeled as $A_1, A_2,$

A_3, \dots, A_n . The comparative weights between each pair of criteria are expressed as A_{ij} , representing the relative importance of criterion i over criterion j . Table 11 shows a structure of such a matrix. This stage lays the groundwork for computing precise priority weights—necessary for the next levels of hierarchical analysis.

Table 11

Sample Judgment Matrix for AHP

A	A1	A2	A3	...	A_n
A1	A11	A12	A13	...	A1n
A2	A21	A22	A23	...	A2n
A3	A31	A32	A33	...	A3n
...
A_n	A_{n1}	A_{n2}	A_{n3}	...	A_{nn}

Note. Author(2025)

3.8.3 HIERARCHICAL RANKING (SINGLE-LEVEL SORTING)

After the judgment matrices are constructed, the geometric mean method or eigenvector method is used to calculate the relative weights (priority vectors) of each element within the same hierarchy. These weights enable one to ascertain which user needs should be given top priority during the design process by showing the contribution of every sub-criteria to their parent criterion.

3.8.4 CONSISTENCY TEST

The consistency ratio (CR) is calculated to assess the reliability of expert evaluations. If $CR < 0.1$, the matrix is considered consistent and acceptable. If not, the matrix must be revised to improve consistency. The consistency index (CI) and random index (RI) are used in this calculation:

$$CI = \frac{\lambda_{max} - n}{n - 1}, CR = \frac{CI}{RI}$$

3.9 CONSTRUCTION OF THE KANO-AHP MODEL

In the study of rural age-friendly public space design, the weighting of user needs plays a crucial role in determining design priorities following the classification of demand attributes through the KANO model. The effectiveness and relevance of weight-based ranking are essential for guiding targeted interventions. However, while the KANO model efficiently categorizes user needs into basic, expected, and attractive types, it lacks a clear hierarchical representation of the relative importance of these attributes. Subjectivity and imprecision often limit conventional methods of weight determination within the KANO framework, such as the Better-Wise index or Delphi technique.

In contrast, the Analytic Hierarchy Process (AHP) offers a systematic and quantitative method for solving multi-criteria decision problems, effectively calculating the relative importance of various indicators (Hill et al., 2005). Moreover, the three demand categories of the KANO model can be combined as layers of qualitative criteria inside the AHP system. AHP applied to the KANO model helps one to create a more accurate and open ranking of user needs. This hybrid method not only improves the objectivity of the hierarchical structure built in AHP but also solves the intrinsic restrictions of conventional KANO-based weighting.

Thus, a scientific and practical analytical framework for age-friendly rural public space design is provided by the integration of the KANO and AHP models. The fundamental procedure of this combined model consists in the following phases:

- (1) Using the KANO model, determining and grouping elderly users' spatial needs in rural public spaces;
- (2) Using the AHP approach to determine the weight of indicators under various demand criteria helps one to identify important user needs and guide design process.

3.10 SUMMARY

This chapter mostly introduces the research material, approaches, and several research strategies applied. By means of an in-depth investigation of the renovation of public spaces for the elderly in rural areas of Nanjing, this study intends to investigate how to improve the suitability of rural public spaces for elderly population by means of scientific design optimisation. To fully and methodically grasp the present situation of rural public spaces and the needs of the elderly, the study combines many techniques including literature review, field research, case analysis, expert interviews, and the KANO model with the Analytic Hierarchy Process (AHP).

Theoretically, the literature review offers the groundwork for this study. Synthesising domestic and international research helps to pinpoint important problems with rural public space design and provides direction for later design plans. Conversely, field research directly collects main data from public areas in rural Nanjing, exposing real issues in spatial design and the preferences and needs of the elderly. Case analysis, by means of comparison with successful cases, also offers insightful design ideas and experience, so strengthening the design framework for this study.

Three main groups comprise the research subjects for this project: experts in the field, young villagers, and elderly residents. A scientifically sound demand classification and evaluation system was created by gathering and combining data from these several groups. While AHP, by means of expert evaluations, further quantified the relevance of each need, so providing a strong basis for later design improvements; the KANO model helped identify and classify the multi-layered needs of elderly users in public spaces.

By means of these all-encompassing approaches, this study not only precisely points out the fundamental problems in the design of rural public spaces for the elderly but also suggests practical design enhancements depending on the top priorities of various groups. While thinking about intergenerational interaction and shared spaces to guarantee inclusiveness and sustainability, future designs should concentrate on enhancing accessibility, functionality, and comfort in infrastructure.

Overall, the research methods presented in this chapter provide a scientific basis for subsequent design practices and lay the groundwork for optimizing rural age-friendly public spaces. Furthermore, this research offers valuable insights that can inform public space renovation in other regions, with both practical significance and theoretical value.



CHAPTER 4

ANALYSIS AND DESIGN

4.1 QUESTIONNAIRE DESIGN AND DATA VALIDITY VERIFICATION

4.1.1 STRUCTURE AND DESIGN LOGIC OF THE QUESTIONNAIRE

Questionnaire Structure: This study first conducts an audience needs analysis based on the KANO model. It involves a questionnaire survey aimed at classifying identified needs into different KANO attributes. The Analytic Hierarchy Process (AHP) is then introduced to determine the weight coefficients of every demand indicator, so clarifying the prioritising of needs in rural public space design and pointing out main user demands to direct design strategies.

Design Logic : The questionnaire was developed through a two-step approach. First, extensive user demands for rural public spaces were collected through preliminary research. Then, each identified demand was formulated into paired functional (positive) and dysfunctional (negative) items in the questionnaire, with five response options for each, as shown in Table 12.

Table 12

KANO Questionnaire

Options	Dislike	Acceptable	Indifferent	Like	Love
Question					
Functional: Design this feature	1	2	3	4	5
Dysfunctional: Do not design this feature	1	2	3	4	5

Note. Author(2025)

Next, the survey results were analyzed using the KANO evaluation Table 13, classifying each demand into one of five categories: Must-be (Basic), One-dimensional (Performance), Attractive (Excitement), Indifferent, or Reverse(Nzumile & Taifa, 2021). Indifferent and Reverse demands—considered negative needs—were excluded from further analysis.

Table 13

KANO Evaluation

User Needs	Dysfunctional				
	Dislike	Acceptable	Indifferent	Like	Love
Dislike	Q	R	R	R	R
Acceptable	M	I	I	I	R
Functional Indifferent	M	I	I	I	R
Like	M	I	I	I	R
Love	O	A	A	A	Q

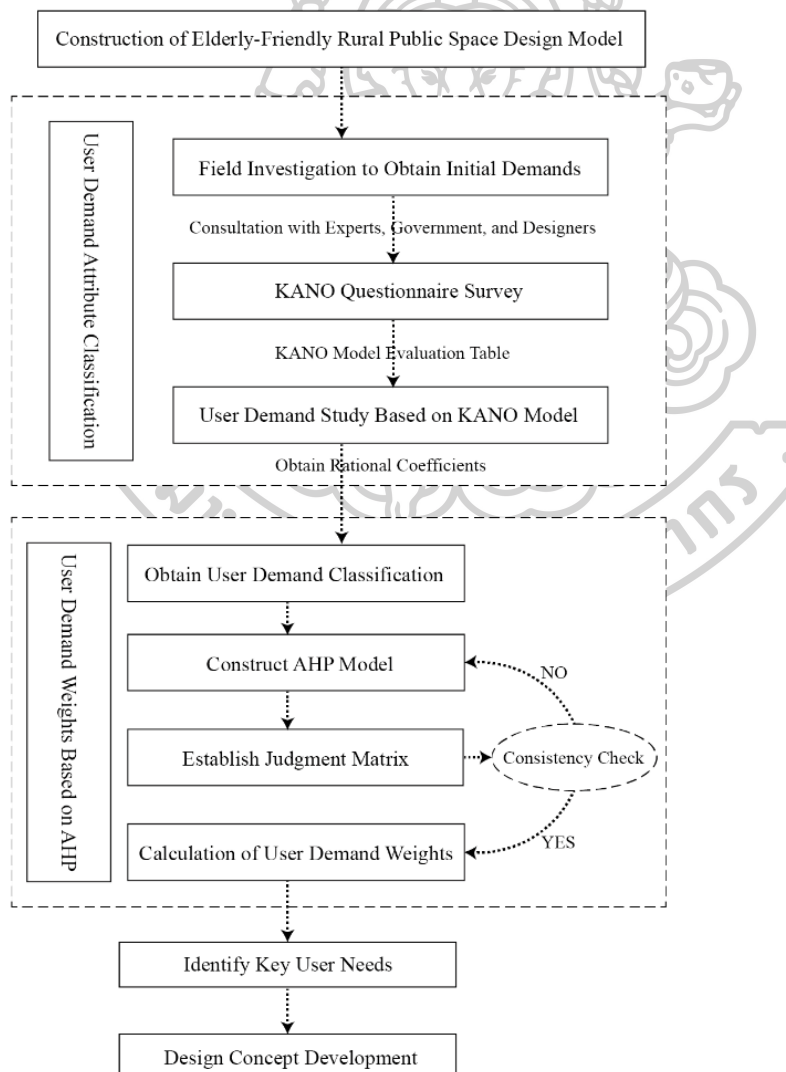
Note. Author(2025)

At last, AHP was used to estimate the weight of every legitimate user demand for age-friendly rural public space design. A complete KANO-AHP hierarchy model was built using the hierarchical structure and modelling ideas of AHP together with the demand characteristics from the KANO model. The age-friendly conversion of rural public space is the design goal; the Criteria Layer consists of must-be, performance, and aesthetically pleasing elements. Under these criteria, every particular user demand creates the Sub-criterion Layer.

As shown in Figure 26, a judgment matrix was constructed accordingly, and the geometric mean algorithm was applied to compute the weight of each demand. This allowed for the prioritization of user needs, serving as a foundation for the targeted conceptual development of age-friendly design strategies in rural public spaces.

Figure 26

Model Process



Note. Author(2025)

4.1.2 EXPERT EVALUATION AND IOC (ITEM-OBJECTIVE CONGRUENCE) CONSISTENCY TEST RESULTS

Combining quantitative and qualitative approaches, this study, "Age-Friendly Retrofit Strategies for Rural Public Spaces in Nanjing: A Study Based on the Analytic Hierarchy Process (AHP)" guarantees the validity of the variables and questionnaire items used as well as the appropriateness and effectiveness of the research instruments. Chapter 3 lists the thorough techniques and design principles.

Under invitation by the thesis advisor, three experts in the fields of urban-rural planning and age-friendly environments reviewed the survey to further guarantee the validity and consistency of the questionnaire, especially in terms of variable alignment and item clarity. The item-objective congruent (IOC) approach was applied for the assessment (appendix). After computing the IOC results and verifying a final value of 1, the questionnaire was judged valid for usage in this study and then sent to the intended population.

4.1.3 DATA COLLECTION METHOD AND SAMPLE OVERVIEW

Targeting elderly residents and their family members in Guantang Village, Nanjing, this study gathered data using a questionnaire survey approach. Official data show that 4,516 people live in Guantang Village overall. Using the standard sample size formula helped one to ascertain the necessary minimum sample size so ensuring both representativeness and statistical dependability (Milanzi et al., 2015):

$$\text{Sample size} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N}\right)}$$

N = population size • e = margin of error (expressed as a decimal) • z = Z-score, with a confidence level set at 90% (Z-score = 1.65) and a margin of error of 5%. Based on the calculation, the required minimum sample size was 259.

There were 280 questionnaires sent overall in the actual survey process, and 261 valid responses were gathered, so producing a response rate of 93.21%. For rural public spaces, the questionnaire concentrated on behavioural preferences, environmental perceptions, and functional needs spanning elderly, middle-aged, and younger groups. It addressed the evaluation criteria needed for the following AHP analysis and the KANO model-based classification of needs. The gathered information gave a strong basis for the hierarchical study and modelling in the next phases.

4.2 ANALYSIS OF KANO MODEL CLASSIFICATION RESULTS

4.2.1 IDENTIFICATION OF USER NEEDS FOR AGE-FRIENDLY

RURAL PUBLIC SPACE DESIGN

This study done in-depth using observation, field surveys, and interviews with 11 people from the target user group to identify user needs in rural public space design for ageing populations. The results show that most rural communities have distributed public areas, lack age-friendly care features and barrier-free infrastructure, and lack leisure spaces and entertainment facilities. These problems greatly lower the desire of older people to interact with public areas and discourage them from going outside.

An analysis of outstanding domestic rural renovation cases showed that, although many focus on “age-friendliness,” the service targets and uneven distribution of cultural resources lead to significant regional variation. Therefore, a unified solution cannot meet the needs of all rural areas. This study focuses specifically on rural public space renovations in Nanjing.

Following data collection and refinement, a total of 12 preliminary user needs were identified, as summarized in Table 14.

Table 14

Initial user needs

No.	Requirement Item(s)	No.	Requirement Item(s)
1	Lighting facilities	7	Barrier-free passages and Handrails
2	Cultural and entertainment facilities	8	Activity venues
3	Public toilets	9	Smooth roads
4	Seating	10	Crop drying facilities
5	Community smart service points	11	Greening and landscape
6	Notice boards	12	Fitness equipment

Note. Author(2025)

4.2.2 CLASSIFICATION OF NEEDS BASED ON THE KANO MODEL

Based on the identified needs, a KANO-based questionnaire was developed. Each user need was addressed using a pair of functional and dysfunctional (positive and negative) questions to preliminarily classify the need into specific KANO categories (Sharif Ullah & Tamaki, 2011). The survey targeted residents of Guantang Village, with 280 questionnaires distributed and 261 valid responses collected.

SPSSAU was used for reliability study. Table 15 shows that the questionnaire produced a Cronbach's alpha value indicating good internal consistency: values above 0.8 are regarded as excellent, those above 0.7 are acceptable, values above 0.6 suggest the scale may require revision but still retain value, and those below 0.6 indicate a

need for redesign(Youssef et al., 2023). Therefore, the reliability of this questionnaire is deemed satisfactory.

Table 15

Cronbach α -coefficient

Sample capacity	The number of projects	Cronbach. α coefficient
261	25	0.857

*Note.*Author(2025)

Due to the diverse demographics in rural areas, elderly individuals, while being the primary target group, are not the only users of public spaces. Differences in gender and age groups can lead to varying needs and expectations. Therefore, in order to better organize and summarize the demands of different user groups for rural public spaces, basic demographic information was collected through the questionnaire, as shown in Table 16. This data aims to analyze how the needs for rural public spaces differ across age groups, with the goal of enhancing user satisfaction.

Table 16

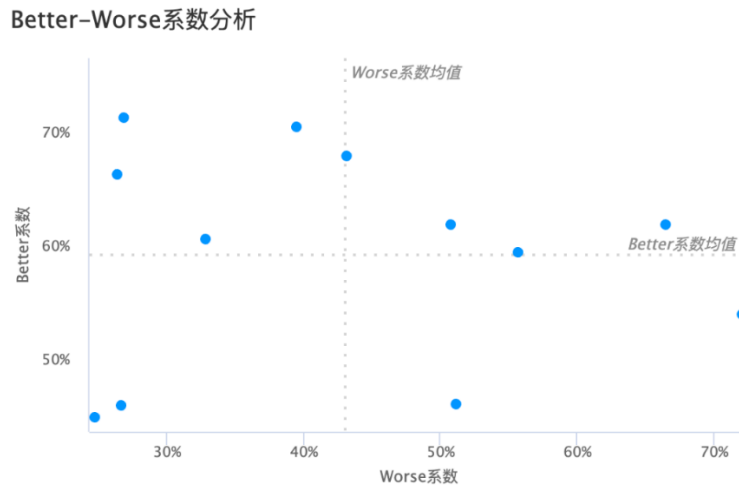
Basic Information Items of the Respondents

	Option	Quantity (person)	Percentage (%)
Sex	Man	108	41.38%
	Woman	153	58.62%
Age (year)	Under 18	6	2.3%
	19-29	113	43.3%
	30-50	39	14.94%
	51-69	59	22.61%
	Above 70	44	16.86%

*Note.*Author(2025)

As shown in Figure 27, a scatter plot was created based on the absolute values of the Better and Worse indices derived from the survey results for each function. The first quadrant denotes Performance (One-Dimensional) Attributes; the second quadrant denotes Attractive Attributes; the third quadrant indicates Indifferent Attributes; and the fourth quadrant corresponds to Must-Be Attributes. The average values of all functions divide the quadrants(Xi et al., 2020).

Figure 27
Analysis of Better and Worse Coefficients



Note. Author(2025)

To further identify user needs, the KANO evaluation table was used to statistically analyze each questionnaire item, with the Better and Worse coefficients plotted on a scatter diagram for data visualization. The results are presented in Table 17.

Table 17
Results Analysis

Requirement Item(s)	M	O	A	I	R	Q	KANO Attributes
Lighting facilities	36.4%	34.1%	18.77%	8.43%	0.77%	1.53%	
Barrier-free passages and handrails	31.8%	17.62%	27.2%	20.31%	0.38%	2.68%	M
Cultural and entertainment facilities	3.83%	34.48%	33.72%	25.29%	0.77%	1.92%	
Activity venues	5.36%	36.78%	29.89%	26.05%	0%	1.92%	O
Public toilets	10.73%	38.7%	21.84%	26.44%	0.38%	1.92%	
Smooth roads	21.07%	43.3%	16.48%	15.71%	0.38%	3.07%	
Seating	24.9%	29.5%	28.35%	14.56%	0.38%	2.3%	
Crop drying facilities	3.07%	23.37%	45.98%	24.9%	0.38%	2.3%	
Community smart service	4.6%	21.07%	43.68%	28.35%	0.38%	1.92%	A

points						
Greening and landscape	7,66%	24.52%	34.1%	31.03%	0.77%	1.92%
Notice boards	7.28%	18.77%	26.05%	45.98%	0.38%	1.53%
Fitness equipment	4.21%	19.92%	23.75%	49.81%	0.38%	1.92% ^I

Note. Author(2025)

As shown in Table 17, well-equipped bulletin boards and fitness equipment fall under the category of Indifferent Attributes, indicating that the presence of these features in public spaces does not significantly impact user satisfaction. Consequently, the next design process will not give such functions top priority. Among the must-be qualities are enough lighting and the provision of handrails and accessible paths. Absence of these elements influences satisfaction, which results in a decline in perceived quality; hence, further improvement of these elements does not greatly raise satisfaction. Therefore, they need to be guaranteed in the design of age-friendly rural public areas even if great optimisation is not required.

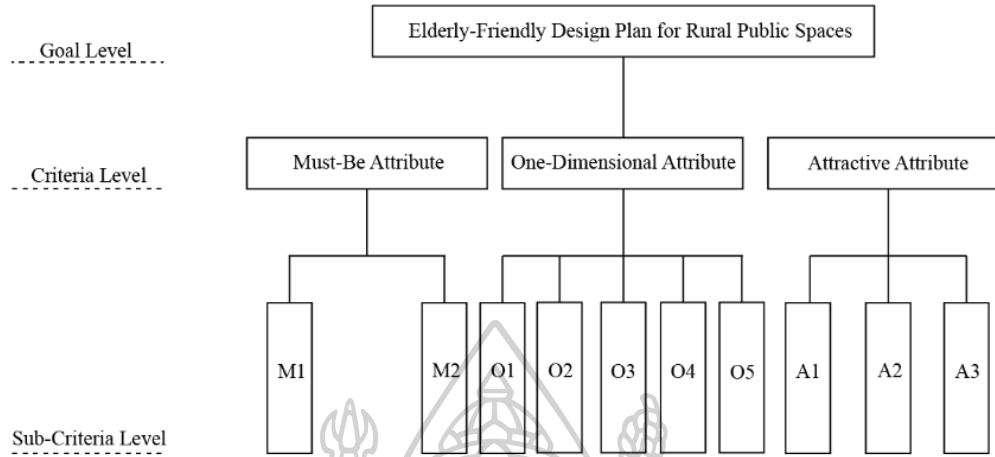
Cultural and recreational facilities such as reading rooms, exhibition areas, and activity rooms are classified as Performance (One-Dimensional) Attributes. Satisfaction increases notably when these needs are well met and decreases when they are lacking. Therefore, greater attention should be paid to such demands to enhance overall satisfaction.

Attractive Attributes, such as crop drying facilities, landscaping and greenery, and community smart service points, do not cause dissatisfaction when absent but greatly boost user satisfaction when present. Incorporating these features into age-friendly rural public space designs can significantly enhance potential usage and improve the overall well-being of the target population.

4.3 AHP WEIGHT CALCULATION AND RANKING

4.3.1 ESTABLISHING THE HIERARCHICAL STRUCTURE MODEL

As shown in Figure 28, although the KANO model accurately classifies the user needs for age-friendly design in rural public spaces, it does not intuitively reflect the hierarchical importance of these needs. To ensure an objective and scientific design process in the subsequent stages, the KANO model is integrated with the AHP (Analytic Hierarchy Process) to calculate the weight of each user need. This allows for a more precise identification of the most important user needs in rural age-friendly public space design (Choedon & Lee, 2018). The attribute classification is based on the KANO analysis results and is applied to the basic concept of AHP to build a hierarchical analysis model.

Figure 28*KANO-Based Analytic Hierarchy Process (AHP) Model**Note.* Author(2025)

4.3.2 CONSTRUCTING THE PAIRWISE COMPARISON MATRIX

To ensure the accuracy of the calculated needs for age-friendly rural public space design, and to enhance the scientific validity and rationality of the weight calculation results, six experts in environmental and age-friendly design were invited to participate in constructing the AHP pairwise comparison matrix. These included three professors specializing in environmental and age-friendly design, two landscape designers, and one doctoral candidate in age-friendly design. The experts were asked to compare and rate each pair of needs within the hierarchy using the 1–9 scale. We calculated weight using their average rating as the basis. Then the weight of every user need in the rural age-friendly public space design was calculated using the geometric mean approach. The exact computation process is described as follows:

- (1) Calculate the product of each row's comparison values:

$$M_i = \prod_{j=1}^m b_{ij} \quad (i = 1, 2, \dots, 3)$$

In this formula, m denotes the overall number of demand criteria while b_{ij} stands for the element in the i -th row and j -th column of the judgement matrix for user demand criteria (Ye et al., 2023).

- (2) Compute the geometric mean of each row's product:

$$a_i = \sqrt[m]{M_i} \quad (i = 1, 2, \dots, 3)$$

- (3) Calculate the relative weights:

$$W_i = \frac{a_i}{\sum_{i=1}^m a_i}$$

- (4) Calculate the maximum eigenvalue λ_{\max} :

$$\lambda_{\max} = \frac{1}{n} \sum_{i=1}^n \frac{B_{W_i}}{W_i}$$

In this formula, B_{w_i} represents the i -th component of the product of matrix B and weight vector w , and n is the order (size) of the matrix (Golub & Meurant, 2020).

(5) Conduct consistency test:

$$CI = \frac{\lambda_{\max} - n}{n - 1}$$

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

In the formula, CR stands for the Consistency Ratio; n is the order of the judging matrix; RI is the Random Index (average random consistency index), which relates to a particular value for every matrix size.

If $CR \leq 0.1$, it indicates that the consistency test has passed;

If $CR > 0.1$, it indicates the test failed and the judgment matrix needs to be reviewed, adjusted, and recalculated (Abbas, 2016).

To ensure that respondents maintain consistency in their thinking while filling out the judgment matrix, a consistency check is performed on the calculation results. Based on the computed data, all CR values are less than 0.1, indicating that the consistency requirement is met.

4.3.3 HIERARCHICAL PRIORITIZATION AND CONSISTENCY

CHECK

Tables 18, 19, 20, and 21 respectively present the judgment matrix scoring results from six experts in relevant fields for the criteria level and the three sub-criteria levels.

Table 18

KANO Judgment Matrix

	M	O	A	W	λ_{\max}
M	1	0.244	0.667	0.474	3.011
O	4.091	1	2	1.739	
A	1.5	0.5	1	0.787	

Note. Author(2025)

Table 19

Must-Be Attribute Judgment Matrix

	Lighting facilities	Barrier-free passages and handrails	W	λ_{\max}
Lighting facilities	1	0.171	0.293	2
Barrier-free passages and	5.833	1	1.707	

handrails*Note.* Author(2025)**Table 20***One-Dimensional Attribute Judgment Matrix*

	Cultural and entertainment facilities	Activity venues	Public toilets	Smooth roads	Seating	W	λ_{ma}
Cultural and entertainment facilities	1	0.222	0.143	0.138	0.171	0.184	
Activity venues	4.5	1	0.143	0.152	0.222	0.412	5.30
Public toilets	7	3.462	1	0.289	0.556	0.922	2
Smooth roads	7.269	6.562	3.462	1	2	2.205	
Seating	5.833	4.5	1.8	0.5	1	1.276	

Note. Author(2025)**Table 21***Attractive Attribute Judgment Matrix*

	Crop drying facilities	Community smart service points	Greening and landscape	W	λ_{ma}
Crop drying facilities	1	2.733	0.242	0.639	
Community smart service points	0.366	1	0.171	0.292	3.049
Greening and landscape	4.127	5.833	1	2.068	

Note. Author(2025)

Based on the calculated weights of user needs for elderly-friendly rural public space design, combined with the analytical principles of the KANO model, the following conclusions can be drawn: Designers, when planning rural public spaces, must not only account for Must-Be requirements but also pay close attention to Attractive and One-Dimensional (Performance) needs. In particular, high-priority demand attributes—such as leisure seating, landscape greenery, centralized activity areas, and drying/planting zones—should be carefully addressed in the design to align with users' expectations and significantly improve user satisfaction.

4.3.4 FINAL WEIGHT RANKING RESULTS OF EACH DEMAND ITEM

The overall prioritization in the hierarchy involves sorting all elements of the judgment matrix by their weight values relative to the target level, from highest to lowest. For easier comparison, the weight values across all levels have been summarized, as shown in Table 22.

Table 22

Overall hierarchical ranking from the judgment matrix

Attribute	Project	CI	RI	CR	Result of the consistency test	Weight
M						0.158
O		0.005	0.52	0.01	PASS	0.579
A						0.262
	Lighting facilities					0.146
M	Barrier-free passages and handrails	0	0	-	-	0.853
	Cultural and entertainment facilities					0.036
	Activity venues	0.076	1.12	0.067	PASS	0.082
	Public toilets					0.184
	Smooth roads					0.441
	Seating					0.255
	Crop drying facilities					0.213
	Community smart service points	0.024	0.52	0.047	PASS	0.097
A	Greening and landscape					0.689

Note. Author(2025)

As the consistency ratio (CR) of the judgment matrix is less than 0.1, the matrix is deemed to have satisfactory consistency(Hamka, 2020).

The user-oriented public space design for Guantang Village in Nanjing fully considers the actual experiences of its users, so allowing the scientific and efficient planning of every functional need. This method helps prevent typical problems in rural building, including low usage rates, lack of safety, and mismatches between functions and actual user needs. Designers of rural public spaces should first make

sure Must-Be criteria are satisfied, maximise the inclusion of Attractive features, minimise Indifferent qualities, and remove Reverse attributes.

To meet the key needs of users in the elderly-friendly renovation of Guantang Village's public space, the subsequent design should incorporate essential elements such as leisure seating, landscape greenery, centralized activity areas, and drying/planting zones. These features aim to address users' pain points, design challenges, and entry points in the space. The goal is to enhance the cultural depth of the space, emphasizing the integration of cultural heritage with active aging.

In addition, the design should also consider the inclusion of public restrooms, roads, and signage to meet the needs of elderly users while also accommodating other rural users and supporting the preservation and transmission of local culture.

For Must-Be attributes, every space should be equipped with accessible pathways and handrails for the users. To ensure a sense of safety and encourage active use of public space by elderly users, adequate lighting should be provided in all functional areas.

By planning smooth and level roads to guarantee safe mobility for the elderly, and by arranging enough seating for resting and appreciating the rural scenery, the design should refine user demands for seating and paths—by so improving Performance (one-dimensional) attributes. Public toilet installation will help older users venture outside without thinking twice.

For centralized activity areas, their inclusion can encourage social interaction among the elderly and between elderly and younger users, fulfilling social and recreational needs.

Regarding attractive qualities, the area should be enhanced with suitable vegetation and landscape elements to produce a natural but friendly surroundings. While smart service points help close the digital divide and promote generational communication, installing crop drying facilities meets old needs for drying food.

By means of careful integration of these demand characteristics, elderly users can increase their chances to experience and enjoy life in public space, so fostering interest in outdoor activities and raising general life satisfaction.

4.4 AGE-FRIENDLY DESIGN PRACTICES IN RURAL PUBLIC SPACES OF NANJING

4.4.1 PROJECT OVERVIEW

As shown in Figure 29, this study selects Guantang Village in Lishui District, Nanjing as the focus area to analyze and propose aging-friendly renovation strategies for rural public spaces. On Lishui's urban edge, Guantang Village is a typical Jiangnan-style rural community. Its close proximity to recently created urban areas makes it a representative site for urban-rural transition zones.

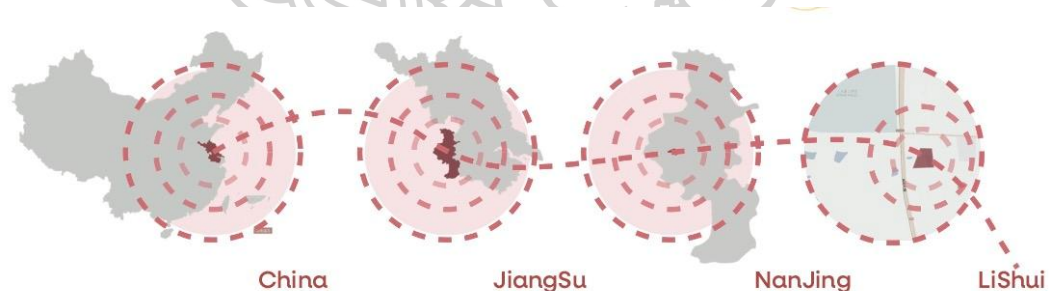
Emphasising integrated urban and rural development, infrastructure enhancement, and improvement of the living environment, Lishui District has pushed its development strategy as a "New City of Culture, Art, Science, and Education," in recent years. In this framework, Guantang Village has progressively taken front stage for creative community governance and cultural revitalisation.

With the acceleration of population aging, the proportion of elderly residents in the village continues to rise (Bai & Lei, 2020). The current public space infrastructure does not satisfy the needs of the elderly population; it causes issues including poor barrier-free design, illogical spatial layout, limited functionality, and low involvement among older citizens (Haowei, 2023). Thus, maximising public space to better serve the ageing population has become a major entrance point for improving living quality and revitalising rural communities.

In response, this project concentrates on improving current public areas in Guantang Village. By means of on-site research and suggestion of a set of pragmatic, flexible, and context-sensitive aging-friendly design strategies, it conforms with local development policies and daily life demands by spotting spatial issues. With an eye towards both theoretical support and practical reference for aging-friendly rural public space development, the research stresses not only functional improvements and safety enhancements but also the integration of social interaction, cultural continuity, and convenience in daily life.

Figure 29

Location Analysis Map



Note. Author(2025)

4.4.2 LOCATION OVERVIEW

As shown in Figure 30, Guantang Village is located in the center of Shiqiu Town, Lishui District, covering an area of 0.49 square kilometers. It is close to the G235 National Road and has convenient transportation. The village is divided into the south and north by a lake, and the villagers mainly rely on planting and breeding.

Figure 30
Aerial view



Note. <https://www.google.com/maps>(2025)

4.4.3 CURRENT SITUATION ANALYSIS

Figure 31 shows how greatly disorganised Guantang Village's present spatial layout is in both circulation systems and vegetation. Tree planting lacks a method; some trees are already dead or withering while others block important paths of access. Many abandoned or deteriorated homes also occupy public spaces, so invading the space meant for daily community contact. Particularly for elderly residents with limited mobility, these buildings not only block sightlines and circulation routes but also create major safety risks.

Figure 31
Site status



Note. Author(2025)

As Figure 32 shows, the village's current public facilities—including signs, seating, lighting, and activity platforms—are rather old and badly maintained. Most long-term residents of these facilities are elderly, thus their basic functional and comfort needs are not satisfied(Williams et al., 1997). The public spaces that do exist are either underutilized or misused, with little zoning or management, resulting in

inefficient use of land and resources. For instance, spaces meant for community gatherings are now crowded with random constructions or acting as temporary storage. Moreover, the lack of specific areas makes simple daily activities like sun-drying clothes, casual social interaction, and outdoor resting poorly supported.

Figure 32

Site status



Note. Author(2025)

All things considered, Guantang Village's public space now shows several structural and functional flaws including inadequate accessibility, safety concerns, and general lack of elderly-friendly architecture. These problems compromise social cohesiveness, lower the inclination of elderly people to go outside, and help to either efficiently or even completely neglect valuable open space. Therefore, it is both necessary and urgent to apply aging-friendly renovation strategies that react especially to the living habits, mobility conditions, and emotional needs of the local elderly population.

4.4.4 SWOT ANALYSIS

As shown in Table 23, The current conditions of the Guantang Village site were analyzed using a SWOT analysis of the design target.

(1) Strengths

Strong foundation of local culture: Guantang Village possesses a rich rural cultural atmosphere, making it suitable for the development of public spaces with distinctive local characteristics. This supports cultural preservation and strengthens community identity.

High willingness of villagers to participate: Questionnaire surveys and interviews indicate that local residents hold a positive attitude toward improving public spaces, showing a high level of enthusiasm for participation, which provides a solid community foundation for future design and implementation.

Possibility of infrastructure renovation: Though present infrastructure is rather basic, it is upgradeable. Comfort and usability can be much improved with careful design.

High representativeness: Guantang Village's present situation is typical of many Jiangnan villages, thus it is a suitable and normal case for age-friendly design research.

(2) Weaknesses

Lack of age-friendly facilities: The absence of barrier-free paths, resting seats, lighting, and signage systems limits elderly residents' ability to use public spaces safely and comfortably.

Scattered functional layout: Public space is not well-organized; activity areas are dispersed, making it difficult to generate a cohesive and vibrant community environment, thus reducing spatial efficiency.

Limited funding and resources: Guantang Village, a rural area, struggles to attract professional talent and fund projects, so impeding the depth and breadth of design and implementation.

Lack of systematic planning: Previous enhancements of public space have been patchy and haphazard without a thorough age-friendly development plan.

(3) Opportunities

Support from national rural revitalisation programs: National strategies are encouraging the enhancement of rural living surroundings by means of policy and financial support for age-friendly transformation projects.

Growing trend of an ageing society: The demand for age-friendly public space in rural areas is also expanding as China deals with increasing population ageing, so offering a major development potential.

Designers, colleges, government agencies, and social organisations could all jointly engage in the project to offer professional support and outside resources.

Age-friendly design can be included with tourism development to improve Guantang Village's appeal as interest in rural tourism keeps increasing.

(4) Threats

High population mobility and youth outmigration: The continuous outflow of young people causes disturbance in the composition of public space users, so influencing the long-term efficacy of the design.

slow pace of village growth: Long building times and low general economic growth might cause doubt on the execution and encouragement of the design concept.

Some local officials and residents lack sufficient knowledge or awareness of age-friendly ideas, which could hinder the application of design.

Table 23

SWOT analysis

Strengths	Weaknesses
1. Strong foundation in local culture, conducive to culturally rich spaces.	1. General lack of aging-friendly facilities like ramps, seating, lighting.
2. High willingness of villagers to participate in improvements.	2. Scattered functional layout limits spatial efficiency.

- | | |
|---|---|
| 3. Existing infrastructure has potential for renovation. | 3. Limited funding and shortage of professional resources. |
| 4. High representativeness—typical of Jiangnan rural areas, ideal case study. | 4. Lack of systematic planning; past efforts were fragmented. |

Opportunities

1. Strong policy support from national rural revitalization programs.
2. Rising demand due to accelerating aging population in rural areas.

3. Potential for multi-party collaboration (designers, universities, NGOs).

4. Opportunity to integrate cultural tourism with public space improvement.

Threats

1. High population mobility and youth outmigration weaken user stability.
2. Slow development pace and uncertain project implementation timelines.

3. Insufficient awareness of aging-friendly design among local stakeholders.

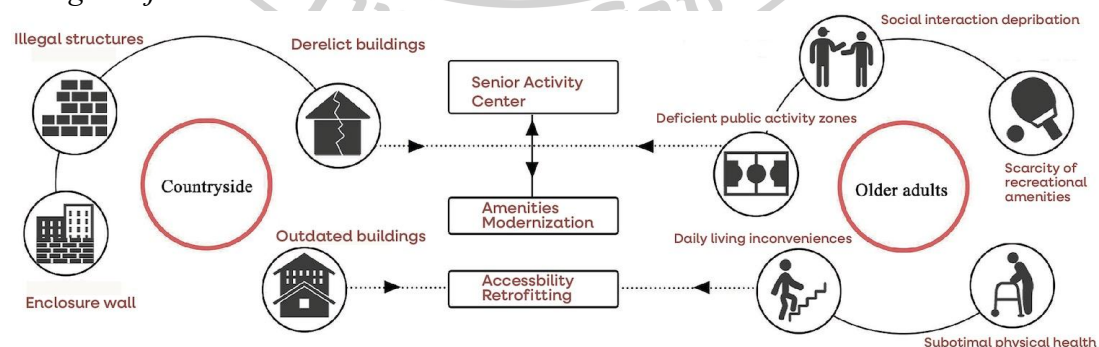
Note. Author(2025)

4.4.5 DESIGN OBJECTIVES

As shown in Figure 33, This design adheres to the core principles of local identity, safety, comfort, and inclusivity, aiming to respect the original landscape patterns of Guantang Village and the daily behavioral habits of its aging population. Based on the comprehensive evaluation results discussed in the previous sections, the design strategy focuses on optimizing key indicators that affect the elderly's quality of life in rural public spaces. The renovation is carried out across four main dimensions: activity spaces, green landscape, infrastructure, and road circulation systems, with the ultimate goal of creating a rural environment that promotes a sense of comfort, security, and well-being for older adults.

Figure 33

Design Objectives



Note. Author(2025)

Infrastructure Enhancement

Given the physical needs of the elderly, the design adds several age-friendly infrastructure components all around the village. Using ergonomic benches with backrests and armrests, comfortable seating places are set out at regular intervals along walking paths and communal nodes. Major intersections and entrances feature

clear, legible signs that increase navigability. To guarantee inclusiveness and independent access, the plan also combines basic elderly services including community activity rooms, smart learning stations, accessible toilets, and universal design elements (e.g., handrails, ramps, tactile paving).

Green Landscape Improvement

Landscape designers stress both aesthetic comfort and ecological fit. Priority is given to indigenous plant species, particularly those non-toxic and non-allergenic for the elderly so guaranteeing safety and simplicity of maintenance. Rich spatial textures and seasonal visual interest are created by a layered planting approach combining trees, shrubs, and ground cover. Greening front garden areas, road edges and communal open spaces not only for beauty but also for microclimate control and visual orientation, so enabling elderly residents to quickly recognise and emotionally connect with their surroundings.

Road and Pathway Optimization

The design suggests selective widening and surface improvement of important paths to guarantee barrier-free circulation while respecting the current road network and minimising major demolition or reconstruction. With an eye towards pedestrian-friendly paths, circulation is rearranged to separate traffic flows wherever feasible in order to handle present conflicts between pedestrians and cars. Designed for simplicity of navigation and made of non-slip, low-glare materials, walking paths guarantee safe, direct, and comfortable movement for the elderly.

Activity Space Redevelopment

Understanding the need of daily social interaction for the elderly, the design presents a distributed system of multifarious activity areas all around the village. These comprise little fitness or rehabilitation stations, shaded resting nodes, and intergenerational areas where both young and elderly can participate in leisure or games. Architectural details or plant groups gently define the spatial limits of these zones to produce intimate microclimates that support residual and spontaneous interactions. Strategically used as outdoor gathering spaces, vacant lots and empty in-between spaces help to maximise land-use efficiency and provide social opportunities for elderly citizens.

4.4.6 DESIGN PRINCIPLES

The fundamental idea of "people-oriented" design has to be maintained in the planning and thorough design of age-friendly activity venues (Lee & Chan, 2024). By means of a methodical set of design principles, the physical, psychological, and social needs of the elderly population are to be satisfied. This project follows five fundamental ideas to guarantee accessibility, comfort, safety, multifunctionality, and technological integration:

(1) Access & Identification

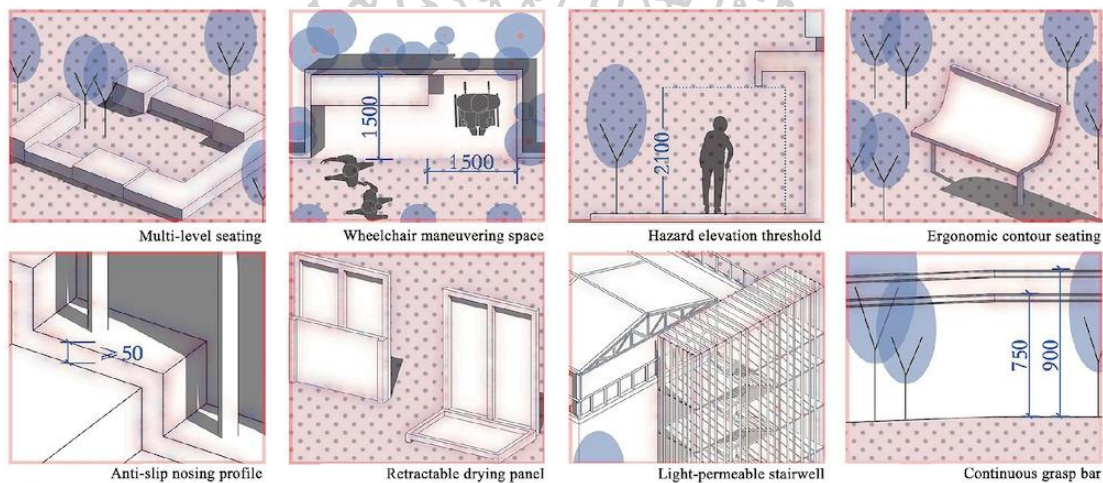
The main focus of age-friendly design is making sure old users may quickly access and recognise the area. Complementing clear signage and wayfinding systems, the design stresses continuity of paths and barrier-free circulation so enabling even those with limited mobility or cognitive decline to orient themselves properly. With mild slopes, handrails, and anti-slip precautions guaranteeing safe and fair access for elderly users with different physical ability, all functional areas are well connected.

(2) Comfort & Safety

As Figure 34 shows, the quality of age-friendly environments depends first on comfort and safety. While seating heights, shading structures, and rest points follow ergonomic criteria to meet elderly users' needs for rest, sun protection, and thermal comfort, the design includes soft materials and slip-resistant paving. Sharp edges and hazards are reduced, and in high-use areas emergency call systems and lighting are set up to improve psychological comfort as well as physical safety.

Figure 34

Design Details



Note. Author(2025)

(3) Uses & Activities

The design stresses versatile and flexible use of space to meet the several and layered needs of elderly people. Integration of several activity zones—rest areas, planting gardens, wellness plazas, blessing squares, and children's playgrounds—allows a dynamic and age-inclusive surroundings. Every space is scaled, furnished, and controlled to fit daily routines and tastes of senior users, so promoting their active involvement and independence.

(4) Communication

The design enhances the social and interactive qualities of the space, so promoting elderly users' communication. Shared activity areas, circular seating, and semi-open layouts all help to promote informal meetings and social bonding. To foster intergenerational interaction and social cohesiveness, culturally significant sites

including the blessing plaza, festival hubs, and farming experience areas are also included to help to build a feeling of belonging and community identification.

(5) Digital Construction

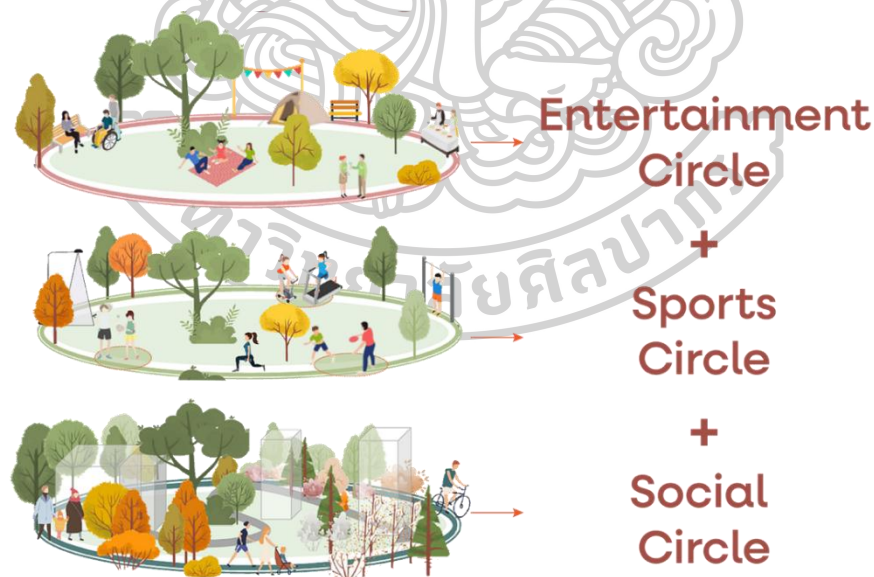
In the context of digital transformation, age-friendly spaces should also integrate smart technologies and digital management systems. Intelligent service points provide features such as health monitoring, navigation assistance, and event scheduling, making services more accessible to elderly users. Data analysis supports dynamic adjustments to space usage and service offerings, driving smart and precise management. Technology also enhances safety and operational efficiency, offering reliable support for elderly well-being.

4.4.7 DESIGN STRATEGIES

In the construction of age-friendly spaces in rural areas, a rational functional layout and spatial organization are essential. As shown in Figure 35, based on the daily behavioral habits and psychological needs of the elderly, the entire activity space is structured around three core zones: the Entertainment Circle, Sports Circle, and Social Circle. This composite spatial organization not only ensures complementary functions but also enhances seniors' sense of participation and overall well-being.

Figure 35

Design Strategies



Note. Author(2025)

(1) Entertainment Circle

Emphasising light involvement and intergenerational interaction, this zone comprises resting areas, gardening spaces, and children's playgrounds. To guarantee comfort and security, it features shaded sections, seating, and easily available paths.

Ornamental value and low allergenicity of plants help to create a friendly and natural surroundings.

(2) Sports Circle

Focused on good physical exercise, this zone includes farming plots, circular walking paths, and areas of fitness equipment. It motivates daily mobility among elderly people. Adaptive facilities, constant paths, and non-slip materials help to suit different physical conditions. Smart gadgets also help with management and monitoring of health.

(3) Social Circle

Emphasising cultural identity and community belonging, this zone comprises the Prayer Plaza, picturesque passageways, and rural sight-seeing sites. It builds neighbourhood ties by means of festive events and spatial interaction. Clear signs, digital information displays, and voice systems help older people to participate more easily in the space.

4.5 DESIGN OUTCOME DISPLAY

4.5.1 DESIGN ELEMENT EXTRACTION

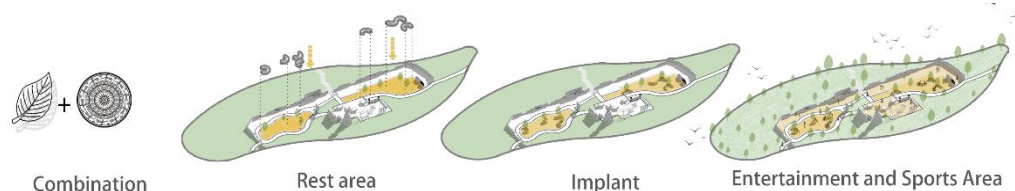
As shown in Figure 36, the design mainly extracts Nanjing Yuhua tea and tree rings as the main elements.

First of all, Guantang Village is one of the origins of Nanjing Yuhua tea. The use of Yuhua tea elements can make villagers confident in their rural culture, and can also allow young people and children to understand the characteristics of the countryside, learn and inherit the characteristics of the countryside; in addition, the outline of the tree ring is extracted. The tree ring is a recorder of natural time. The addition of the tree ring shows the blessing and hope for the healthy life of the elderly.

The planning of the activity area uses the leaf shape of Yuhua tea as the main appearance, and interactive devices with the outline of annual rings are interspersed in it, making the planning more lifelike.

Figure 36

Element extraction



Note. Author(2025)

4.5.2 FLOOR PLAN

The design project focuses on Guantang Village in Nanjing City, with the aim of improving the elderly-friendly public spaces in the village through scientific design methods, addressing the spatial adaptation challenges brought about by the increasing

aging trend in rural areas across China. In the overall design strategy, the project uses the KANO model to identify the hierarchical features of the elderly's needs, and employs the AHP method to perform quantitative weight analysis of multi-dimensional needs. This allows for the identification of the core pain points and priorities of the village in the elderly-friendly transformation, thus achieving a precise, "human-centered" planning approach.

The original functional spaces of Guantang Village were relatively simple, with a lack of public activity spaces, a loose green landscape system, and incomplete infrastructure, making it difficult to meet the diverse needs of the elderly for daily rest, activities, and socialization. Based on these issues, the design respects the original texture of the village and, following the design goals and strategies presented earlier, proposes an overall transformation focusing on spatial layout, traffic organization, landscape creation, and functional improvement. The design intent is expressed in detail through the floor plan. The key design elements are as follows:

Infrastructure Enhancement:

This design significantly enhances the coverage and functional diversity of the village's infrastructure, especially by adding resting seats, shading facilities, barrier-free toilets, night lighting devices, and waste classification facilities in high-frequency elderly activity areas and core activity zones. This improves both convenience and safety for the elderly. Additionally, in line with the trend towards smart technologies, elderly-friendly smart terminals such as electronic health information boards and emergency call devices are incorporated.

Green Landscape Optimization:

In terms of plant configuration, the design follows the principles of "combining trees, shrubs, and grasses with distinct seasonal views and clear layers." Local, weather-resistant, and aesthetically pleasing plants such as camphor trees, photinia, and golden thread oat grass are chosen to optimize the plant community structure. Considering the elderly's sensitivity to color and seasonal changes, plant theme nodes are set along key landscape axes and activity spaces, creating a comfortable walking and leisure environment.

Road Space Reconstruction:

Addressing the narrow village roads and the lack of clear zoning, the design expands the main roads, adjusts the alignment of branch roads, and differentiates the paving materials to create a traffic system that clearly distinguishes between main and secondary roads and separates moving and stationary areas. Special emphasis is placed on pedestrian and non-motorized vehicle separation, with elderly-friendly directional signage and gentle slope transitions, significantly improving the continuity and safety of elderly movement.

Diverse Activity Space Layout:

The activity spaces follow the principles of “clear zoning, rational layout, and accessibility to neighbors,” forming multiple community activity nodes with point-based distribution. Quiet spaces such as chess squares and morning exercise areas are provided, as well as moderately open spaces for square dancing, cultural promotion corridors, and agricultural experience areas, meeting the social and entertainment needs of different elderly groups. The spatial configuration focuses on the division between active and quiet areas, as well as ventilation and lighting conditions, ensuring comfort and orderly behavior in the environment.

As shown in Figure 37, through a systematic review of Guantang Village’s overall space and the integration of elderly-friendly functions, this plan not only responds to the current realities of aging development in the village but also provides a replicable and scalable reference for rural public space optimization in Nanjing City and broader areas. The complete floor plan, while reflecting the rationality of functional zoning, also presents the beauty and humanization of spatial forms, laying a solid foundation for creating a "livable, touristic, and nurturing" modern rural environment.

Figure 37
Floor Plan



Note. Author(2025)

4.5.3 DESIGN OF ELDERLY-FRIENDLY INFRASTRUCTURE

As elderly individuals age, their physical abilities gradually decline, and the risk of acute illnesses increases. Without proper medical facilities, elderly people may

miss the best opportunity for timely treatment. In rural areas of Nanjing, elderly people often have more leisure time for socializing and resting. However, the lack of infrastructure is a common problem. While many villages have activity spaces, the facilities are inadequate, incomplete, and cannot meet the elderly's daily living and activity needs. Some facilities are not designed according to the physical characteristics of elderly people, leading to inconvenience in use, and the materials and safety of these infrastructures are often poor.

Elderly people tend to gather for socializing, but the lack of adequate infrastructure in public activity spaces in many rural areas reduces their enthusiasm to use these spaces. Therefore, infrastructure is a crucial hardware element for elderly outdoor activities. For the renovation of Liaodi Village, this design will prioritize the infrastructure design and layout based on the weighted values derived from the judgment matrix, aiming to maximize the quality of life for elderly people.

(1) Rest Facilities

Figure 38

Current Situation Map of Guantang Village

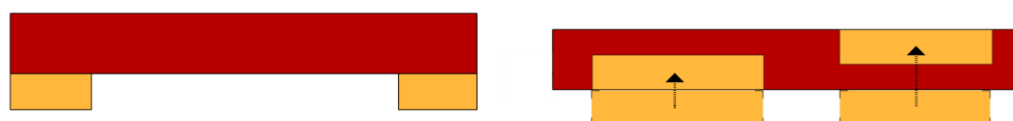


Note. Author(2025)

As shown in Figure 38, the existing public seating in rural areas generally suffers from issues such as insufficient height and limited functionality, posing significant safety risks.

Figure 39

Evolution of Seating Modules



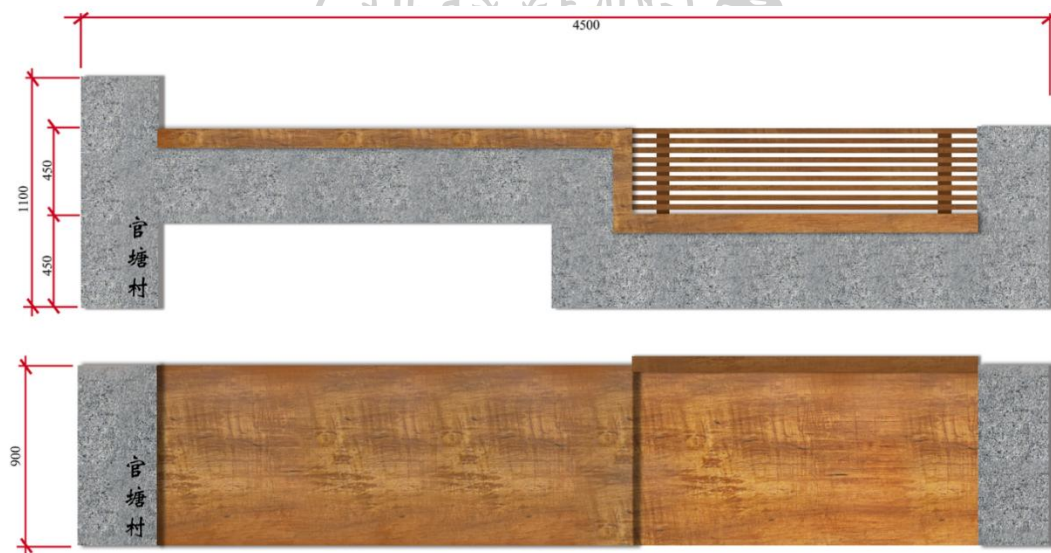
Note. Author(2025)

In response to the existing issues of public seating, the redesign—illustrated in Figure 39—retains the original seating form while deconstructing and rearranging its

components. This approach allows the seating to fulfill not only its primary function of providing rest but also additional functions such as accommodating the placement of personal items.

As shown in Figure 40, Due to the physical degeneration that comes with aging, long periods of sitting can lead to fatigue. Therefore, when designing seating, special attention should be given to the elderly's need for support. The seat should include a complete backrest to effectively support the back and shoulders, reducing fatigue caused by prolonged sitting. Since elderly individuals' leg joints have limited mobility, the seat height should be around 450 mm, and the seat width should range between 360 mm and 450 mm to ensure a comfortable sitting position. Elderly people generally need armrests when sitting and standing, so the design should include curved armrests approximately 150 mm above the seat to assist them in sitting down and standing up, improving ease of use.

Figure 40
Rest Facilities



Note. Author(2025)

(2) Public Restroom Design

The original rural public spaces were lacking in public restroom facilities. Through KANO-AHP analysis, a high level of demand for public toilets among villagers was identified. Consequently, the design process prioritized the incorporation of age-friendly features within the internal configuration of the restroom facilities.

As shown in Figure 41, to ensure elderly individuals can easily and safely use public restrooms, the design suggests that the restroom should offer spacious space, suitable facility heights, and barrier-free design. The restroom should be equipped with safety features such as non-slip flooring and support bars, and the toilet seat height should be adjusted according to the needs of elderly users(Hussain et al.,

2023). Armrests should be designed to help elderly individuals use the restroom comfortably. Additionally, the width of the restroom door should be wide enough for wheelchair access, and clear signage should be provided to guide elderly users to these facilities.

Figure 41

Public Restroom Design

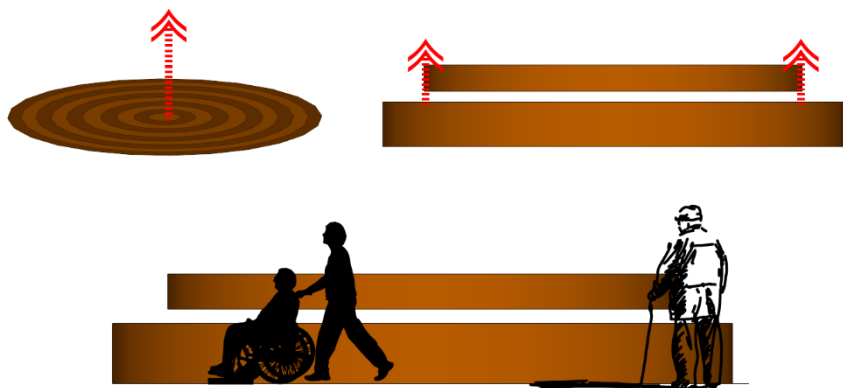


Note.Author(2025)

(3) Crop Cultivation & Drying Facilities

Figure 42

Concept Generation



Note.Author(2025)

As shown in Figure 42 the drying and planting experience area is designed in the form of concentric growth rings. This form extends outward and incorporates varying heights to accommodate the needs of elderly users, including those in wheelchairs. The design aims to create an inclusive environment where people of all ages can participate in and enjoy the rural experiences of crop cultivation and drying.

As shown in Figure 43, in rural areas, elderly people often dry their crops themselves, so it is essential to design suitable drying facilities. This design proposes dedicated drying areas with adjustable drying racks or lines to prevent elderly individuals from having to bend over to use low drying racks, reducing labor intensity. The drying area should be located in a shaded area to avoid direct sunlight, and wind protection facilities should be in place to ensure effective drying and preserve the quality of the crops. Considering the convenience for elderly users, the height and width of the drying racks should be designed based on their needs to reduce bending and stretching, minimizing physical strain.

Figure 43

Crop Drying Facility Design



Note. Author(2025)

(4) Barrier-Free Design

Figure 44

Current Situation Map of Guantang Village



Note. Author(2025)

As shown in Figure 44, the rural roads are uneven and lack essential features such as handrails, which is one of the primary reasons why elderly residents are reluctant to go outdoors. In areas with numerous obstacles and trees, the design proposes the addition of accessible handrails to assist elderly individuals and wheelchair users in navigating the rural pathways more safely and comfortably.

As shown in Figure 45, barrier-free design is key to ensuring that elderly individuals can move freely and safely in public spaces. This design focuses on addressing the needs of elderly individuals with limited mobility by recommending the installation of barrier-free pathways in all public areas and roads. This includes smooth paving, the use of ramps instead of stairs, and the installation of sufficient handrails. Buildings should be equipped with barrier-free elevators to ensure elderly individuals can easily access multi-story buildings. In addition, the design of roads and squares should avoid high steps and uneven surfaces, providing a comfortable and safe walking space to help elderly individuals navigate daily activities.

Figure 45
Barrier-Free Design



Note. Author(2025)
(5) Road Signage Design

Figure 46
Element Extraction



Note.Author(2025)

As shown in Figure 46, the wayfinding system incorporates three basic geometric forms: square, circle, and triangle. In the redesigned version, to foster a sense of belonging among local residents, the signage primarily adopts a square form. Circular elements symbolizing tree rings are embedded within the signs, while the roofline of traditional rural architecture is abstracted and applied to the top of the signage. This approach enhances the local architectural identity of the wayfinding system and allows it to better integrate into the rural context. As shown in Figure 47, to ensure the safety and convenience of elderly individuals in the village, the design of road signage is crucial. All signage should use clear, simple graphics and text, making it easy for elderly individuals to understand. In high-traffic areas, visible and sufficient directional signs should be set up to guide elderly people to key locations such as rest areas and restrooms. Additionally, considering elderly individuals' vision impairments, the font size of the signs should be large enough with high contrast, and overly complex symbols should be avoided. For elderly individuals with poorer vision, tactile signage or audio prompts should be considered to provide additional assistance.

Figure 47

Road Signage Design



Note. Author(2025)

By incorporating these elderly-friendly infrastructure designs, the public space in Liaodi Village will be more suitable for elderly living and activities, improving their quality of life and social participation. The renovation of infrastructure not only addresses the basic needs of daily life but also focuses on enhancing elderly people's safety, comfort, and social interaction, laying a solid foundation for building a more livable and elderly-friendly rural environment(Kumar et al., 2023).

4.5.4 AGE-FRIENDLY LANDSCAPING DESIGN

Through on-site surveys, several issues with the existing landscaping design were identified. Firstly, the plant combinations lack a sense of space, as the mix of trees, shrubs, and herbaceous plants is not thoughtfully considered, resulting in a lack of depth in the overall landscape. This is especially noticeable along the roadside, where the street trees are not paired with planting beds, creating a monotonous green line that fails to enhance the aesthetic appeal of the space. Additionally, some rural areas lack evergreen species that can provide continuous greenery throughout the seasons. In autumn, when the leaves fall, the village lacks greenery, leading to a desolate atmosphere. Furthermore, the plant arrangements at the intersections of different functional zones are not effectively softened, making the landscape appear rigid and lacking natural transitions. Secondly, the diversity of plant colors is insufficient, with an overwhelming amount of greenery that creates a monotonous visual effect. Older adults, however, require more varied environmental colors to stimulate their vision, a need that is not fully addressed in the current design. Finally, the choice of plants poses safety concerns, as some trees with strong odors may not be conducive to the health and well-being of elderly residents. Based on these issues, this design focuses on the age-friendly landscaping transformation of Guantang Village, aiming to address the existing problems in the greenery and improve the quality and age-friendly nature of the village's landscaping.

(1) Planting Combinations

In landscape design, good plant combinations can not only enhance visual beauty but also create different spatial effects. The methods of planting include clump planting, group planting, and row planting, each suitable for specific scenarios.

Clump Planting: Clump planting involves grouping 3-10 plants of the same or different species together, and is typically used in small-scale landscape designs. This method can create rich layers and artistic effects in limited spaces. It helps foster a closer relationship between plants, resulting in a natural landscape effect. It is especially suitable for private spaces or small leisure areas.

Group Planting: Group planting involves planting a set of plants of the same type together, usually consisting of a dozen or more plants, emphasizing the group effect. It is ideal for large areas and can highlight the overall landscape atmosphere,

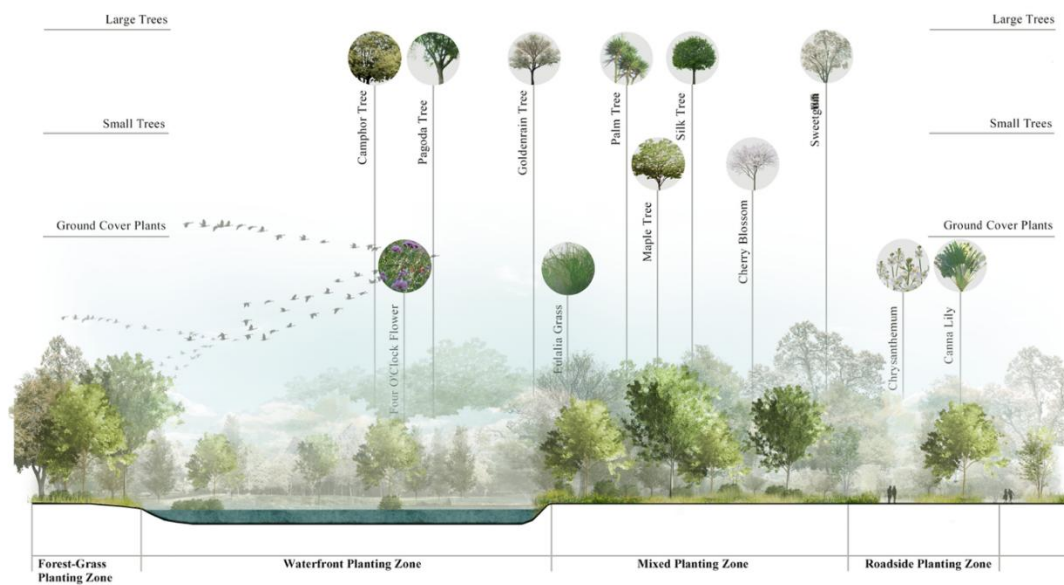
especially in scenic areas, parks, or botanical gardens, where it helps create a lively and layered environment.

Row Planting: Row planting involves planting plants in a linear arrangement, commonly seen in street landscaping and along streets. This method creates a sense of order in the design, offering strong functionality and visual guidance. It is particularly suitable for urban streets and around public transport systems.

As shown in Figure 48, when selecting plant species, consideration should be given to local climate conditions and the suitability of tree species, while also accounting for the aesthetic appeal and seasonal changes. To meet the needs of older adults for diverse colors, it is recommended to choose plants with rich and varied colors, such as seasonal flowers and shrubs of different hues. This not only enhances the visual effect but also creates a more layered and dynamic green space, improving the living environment for the elderly.

Figure 48

Planting Combinations



Note. Author(2025)

(2) Creating a Spatial Atmosphere

Spatial sense refers to the feeling generated when people interact with their surrounding environment. In landscape design, using plants to shape the spatial atmosphere is a common approach, adjusting the design details according to different spatial types. Based on the degree of enclosure, space can be categorized into enclosed spaces, semi-open spaces, and open spaces.

Therefore, as shown in Table 25, the plant selection and arrangement in the renovation process were designed with consideration of spatial perception, color harmony, and plant safety, aiming to provide elderly residents with a safe and aesthetically pleasing rural landscape.

Table 24
Plant Selection Strategy

Project	Problem	Strategy	Objective
Spatial Perception	Disorganized planting and irrational combination of individual trees	A well-balanced combination of trees, shrubs, and groundcovers to create a sense of spatial hierarchy	Consideration of native plant species in spatial vegetation composition
Color	Monotonous color palette with little variation	Incorporate multicolored foliage and diverse plant species	Enhance visual stimulation for the elderly through rich color contrasts
Safety	Presence of plants with irritating odors	Avoid plant species with harmful or unpleasant odors	Avoid plants with thorns or strong odors
Aesthetic Quality	Disorganized or incoherent plant combinations	Apply a coherent and site-specific combination of native plants	Create a visually pleasing and harmonious green landscape
Seasonal Variation	Monotonous tree species lacking seasonal variation	Introduce a diversity of plant species with staggered blooming and foliage cycles	Ensure year-round visual interest through seasonal landscape change

Note. Author(2025)

Enclosed Space: As shown in Figure 49, enclosed spaces are typically formed by planting taller trees or shrubs, creating an enclosure through dense planting or the use of tall plants to block the view, providing a sense of intimacy and privacy. In age-friendly design, enclosed spaces are ideal for creating quiet, independent rest areas where older adults can feel more secure and enjoy their privacy.

Figure 49*Design Rendering**Note. Author(2025)*

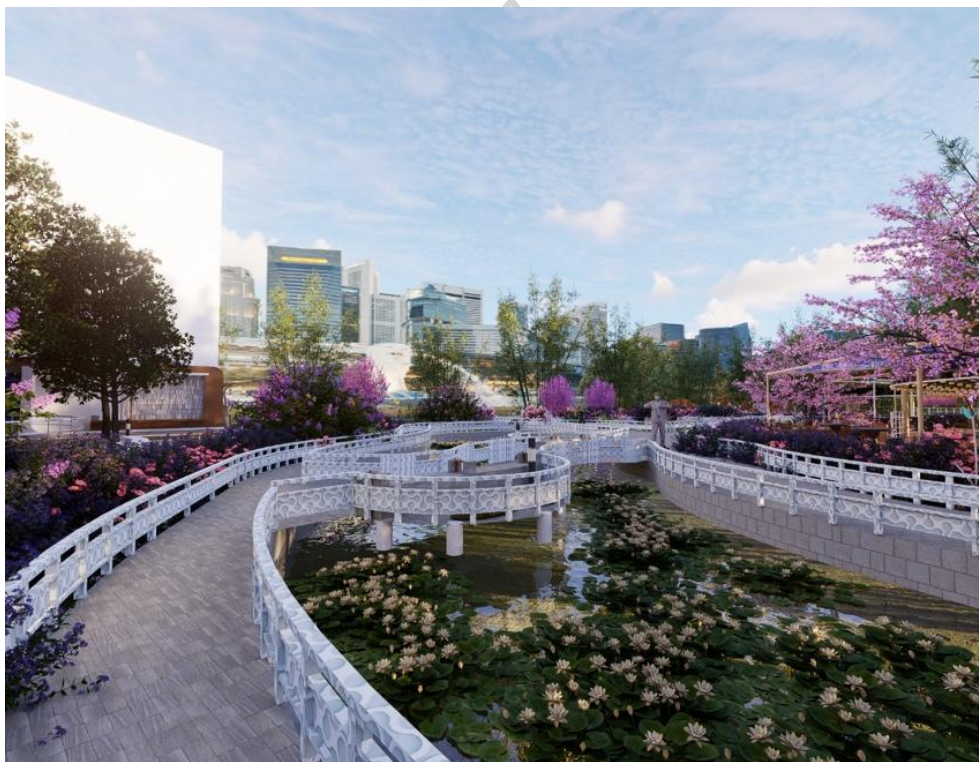
Semi-Open Space: As shown in Figure 50 semi-open spaces are formed by leaving one or more sides open, with the remaining sides enclosed by plants, offering a blend of openness and privacy. For instance, bamboo or shrubs could be used to enclose the background or sides of a space, while the opposite side remains open to an expansive area. This design offers a sense of privacy while allowing older adults to maintain a wide field of vision, facilitating social interaction and engagement.

Figure 50*Design Rendering**Note. Author(2025)*

Open Space: As shown in Figure 51, open spaces involve planting that does not obstruct the view, typically using low-growing ground cover plants or grass. Open spaces provide expansive views and encourage interaction and communication among people. In age-friendly design, open spaces are crucial as they allow older adults to feel open and free. For public activity areas, the design can include lawns or other soft spaces, which provide additional venues for rest and activities. Benches can be added to the lawn to make it easier for older adults to relax in the sun during winter or seek shade in the summer.

Figure 51

Design Rendering



Note. Author(2025)

Grass selection should focus on durability, ease of maintenance, and long-term usability. The lawn should provide enough space and comfort, allowing older adults to relax and relieve physical and mental stress in a natural setting.

(3) Safety Considerations

In age-friendly landscaping design, the safety of plants is a crucial aspect that cannot be overlooked. Some plants with strong odors or those that may cause allergic reactions should be avoided, especially in areas frequently visited by older adults. For plants that may cause discomfort, it is important to choose tree species and flowers that are harmless to human health.

Additionally, care should be taken to prevent plants from growing excessively and interfering with the walking or activity space around them. For example, tall

shrubs and climbing plants that are not regularly pruned may obstruct the movement of older adults and increase the risk of falls. Therefore, it is essential to control plant growth and regularly trim them to ensure safety and accessibility.

4.5.5 AGE-FRIENDLY ROAD DESIGN

As society ages, the design of age-friendly roads becomes increasingly important. Elderly people face many difficulties in their daily travel, particularly in walking, resting, and road safety. Poor design can easily lead to falls or other accidents. Therefore, age-friendly road design in rural areas not only needs to meet functional requirements but also consider the special needs of the elderly, ensuring that they feel safe and comfortable during use (Montayre et al., 2022). Specific design elements include road paving, resting spaces, and road smoothness.

(1) Road Pavement Selection

The selection of road paving directly affects the slip-resistance and safety of roads, which is particularly important for elderly individuals. Unsuitable paving can increase the risk of falls. According to surveys, the main locations where elderly people experience accidental injuries are walking paths, areas near water features, and stairways. This is because the paving materials in these areas are too smooth or unstable, causing elderly individuals to lose their balance while walking, leading to falls. Therefore, during the age-friendly renovation process, special attention must be paid to the choice of paving materials (Gong et al., 2025).

Table 25

Road Design Strategy

Project	Problem	Strategy	Objective
Road Safety	Insufficient road width	Separate pedestrian and vehicular traffic	Widen the roadway to improve circulation and safety
Road Surface Leveling	Uneven rural roads with surface irregularities	Level and resurface the roads	Facilitate safe travel for the elderly and reduce the risk of accidents
Anti-Slip Road	Pavement surface is overly smooth and slippery	Use of anti-slip paving materials	Ensure safe and accessible walking conditions for the elderly

Note. Author(2025)

As shown in Figure 52, as elderly individuals experience a decline in physical abilities and reaction speeds, they need more slip-resistant designs when walking. Paving materials should therefore be chosen for their excellent slip-resistance and permeability. Common slip-resistant materials include rough stone, rubber pavements, and specially designed anti-slip tiles, which can effectively reduce the risk of falls.

Additionally, while highly reflective paving materials can provide good visual guidance during the day, strong sunlight reflections can cause glare, affecting the visual comfort of the elderly. Therefore, highly reflective materials should be avoided in designs, especially in areas with strong sunlight.

Figure 52

Design Rendering



Note. Author(2025)

In the design of walkways, the needs of elderly individuals who use walking sticks or wheelchairs should also be considered. Smooth materials and cobblestone paving, which are unsuitable for elderly people, should be avoided as they may cause inconvenience and increase the risk of falls. However, moderate use of cobblestone paving in activity spaces can add interest to the area, provide foot massage effects that promote blood circulation, and enhance the natural and approachable feeling of the space.

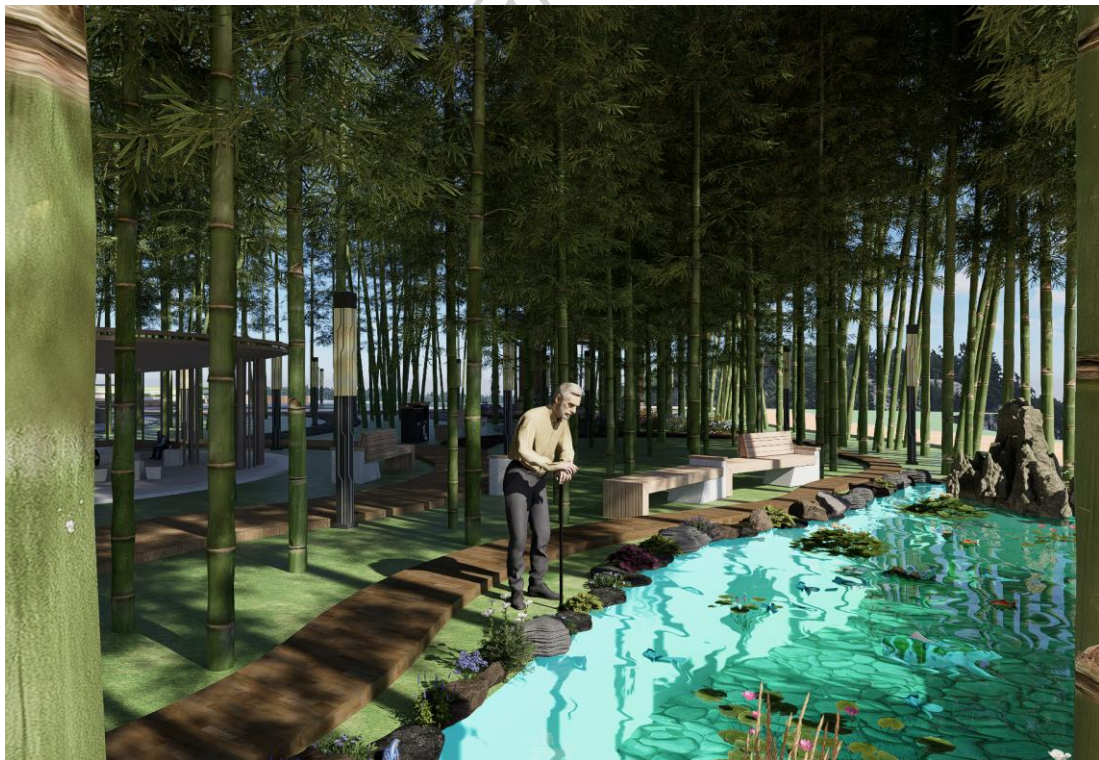
Paving materials in different functional areas should also vary. In the design of roadways and pedestrian paths, strongly contrasting paving materials can help elderly individuals with weakened vision recognize changes in the road, enhancing visual guidance. Moreover, resting areas should use darker-colored hard paving materials, as dark tones help create a calm and relaxing atmosphere, making them more suitable for elderly individuals to rest. In activity areas, brighter, softer paving materials, such as rubber or plastic, should be chosen to provide a comfortable walking experience and, in the event of a fall, offer some cushioning to maximize safety.

(2) Road Resting Space Design

As shown in Figure 53, elderly individuals generally have reduced mobility and cannot walk for extended periods. Therefore, the proper design of resting spaces, providing sufficient areas to rest, is a key component of age-friendly road design. Research indicates that the maximum walking time for elderly individuals is around 10 minutes, with walking distances ideally not exceeding 450 meters. Without suitable resting places, elderly individuals may give up traveling due to fatigue or discomfort, which not only reduces their willingness to go out but also negatively affects their quality of life.

Figure 53

Design Rendering



Note. Author(2025)

In age-friendly road design, resting spaces should be set up according to local road and landscape conditions. Generally, a small resting space should be designed every 150 meters to allow elderly individuals to rest during their walk. These resting spaces not only shorten the perceived walking distance for the elderly but also provide a comfortable environment that encourages more outdoor activity.

The design of resting spaces should focus on comfort and functionality. The scientific combination of plants can create a quiet and relaxing atmosphere, forming semi-open resting spaces that avoid overly closed or monotonous designs. Through thoughtful plant selection, the resting areas can provide shade in summer and shield from the wind in winter, allowing elderly individuals to feel comfortable and warm

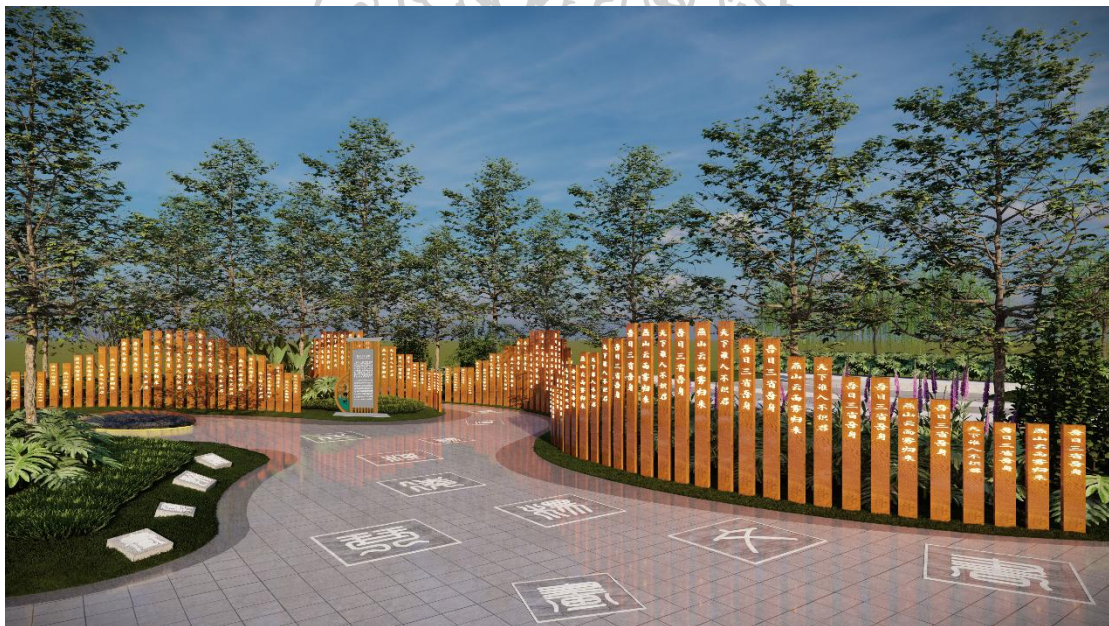
even in cold weather. Adequate sunlight exposure is also an important design consideration, as sunlight can effectively alleviate physical and mental stress, providing relaxation for elderly individuals.

(3) Road Smoothness Design

As shown in Figure 54, for elderly people, smooth roads are crucial when walking. As people age, their physical abilities decline, and their balance and reaction speeds decrease compared to younger individuals. Therefore, ensuring that roads are smooth and level is essential for the safety of elderly travelers. In age-friendly road design, the surface should be free of bumps, depressions, and obstacles such as stones, tree roots, or mud, as these can impede walking and increase the risk of falls. The smoothness of the road directly affects the walking experience of elderly individuals. Only by maintaining a flat and smooth surface can elderly individuals feel more comfortable and safe while walking.

Figure 54

Design Rendering



Note. Author(2025)

Additionally, the road design should consider width, avoiding excessively narrow pathways that could hinder elderly people's movement. Wider roads provide better walking space, reducing congestion and allowing elderly individuals to move freely, preventing traffic blockages and the safety risks posed by overcrowding. Especially in public areas and busy roads, reasonable road widths should be planned to ensure that elderly individuals can pass easily.

Furthermore, As shown in Figure 55, traffic obstacles such as roadblocks should be minimized or eliminated. If obstacles must be set up, they should be clearly

marked, and elderly individuals should be informed of alternative routes to avoid unnecessary risks.

Figure 55

Design Rendering



Note. Author(2025)

4.5.6 ELDERLY-FRIENDLY ACTIVITY SPACE DESIGN

With the intensification of population aging, the demands of the elderly population for living environments are increasing, especially for the design of activity spaces (Shan et al., 2020). In this context, the design of elderly-friendly activity spaces is not merely a matter of spatial layout; it also involves multi-dimensional considerations of safety, comfort, functionality, and the physical and psychological needs of the elderly (Qian, 2024). The design of elderly-friendly activity spaces must respect the characteristics of the elderly population, fully considering their mobility, social needs, and mental state, enabling them to derive more enjoyment and relaxation from these spaces.

In the design of elderly-friendly activity spaces, the rationality of the space is of paramount importance. This includes not only the layout of the space but also the selection and configuration of facilities. First and foremost, activity spaces must ensure the safety of the elderly, preventing accidents such as falls due to improper design (Marcus & Sarkissian, 2023). During the design process, in addition to considering the anti-slip performance of the ground materials, attention should be paid to the arrangement of obstacles to ensure smooth and unobstructed paths. Moreover, elderly-friendly spaces must consider the varying mobility and needs of the elderly.

For instance, spaces should provide wheelchair-accessible pathways, rest areas, and facilities that cater to their physical needs.

Regarding space layout, each area of the activity space should be designed according to its function and the needs of the users. The rational configuration of leisure spaces, sports spaces, social spaces, and private spaces is essential for ensuring the physical and mental well-being of the elderly(Zhou, 2021). The plant arrangement within the activity space is equally important; it can not only enhance the beauty of the space but also have a positive impact on the elderly's physical health(Marques et al., 2019). The selection of plants should focus on those beneficial to the elderly's health, avoiding those with strong odors or those that might trigger allergies.

(1) Alley Resting Space

As shown in Figure 56, the design of the alley resting space aims to provide the elderly with a private and comfortable resting area. This space considers the potential fatigue from long walks, so it is designed to provide sufficient seating and resting areas, allowing elderly people to stop and rest as they move, alleviating physical strain. Alley resting spaces are typically equipped with tables, chairs, and chess tables, which meet the recreational needs of the elderly while also providing a social platform(Patil, 2021). Additionally, surrounding greenery, such as flowerbeds and landscape sculptures, can be incorporated to create a diverse environment, attracting both independent and assistive elderly individuals to engage in activities, thus enhancing social interactions.

Figure 56

Design Rendering



Note. Author(2025)

As shown in Figure 57, this semi-private space not only provides rest but also helps create an intimate and natural atmosphere. The design elements such as flowerbeds and sculptures offer psychological comfort to the elderly, making them feel close to nature, avoiding the oppressive feeling of overly closed or monotonous environmental designs.

Figure 57

Design Rendering



Note. Author(2025)

(2) Planting Entertainment Zone

As shown in Figure 58, the planting entertainment zone is an important part of the elderly-friendly activity space. This area, through careful plant selection, provides a space for both recreational activities and connecting with nature. After retirement, many elderly people have more time for leisure and entertainment activities. The planting entertainment zone offers them a place to enjoy gardening while relaxing both physically and mentally. Regular gardening activities help the elderly maintain their physical and psychological health. Moreover, the plant arrangements in this area consider health benefits, using plants such as herbs or aromatic plants, which not only improve air quality but also provide psychological comfort.

Figure 58*Design Rendering**Note.* Author(2025)

The design of the planting entertainment zone also encourages the elderly to participate in daily activities such as plant cultivation and maintenance. This increases their physical activity, helping them maintain fitness, while also offering a sense of achievement through plant care, further enhancing their happiness.

(3) Multi-functional Activity Area

The multi-functional activity area is one of the core components of elderly-friendly space design. It is designed to meet the needs of people of different age groups, especially to be adaptable to the diverse activity requirements of the elderly. Circular elements are used in the design to divide the space into several functional areas in a natural way, meeting the needs of the elderly population while also accommodating other groups.

Sunshine Farm:

As shown in Figure 59, in addition to the need for drying crops at home, villagers also require nearby spaces to dry their agricultural products directly in the fields. This demand was taken into account in the design process. Moreover, given the labor-intensive nature of farming, adequate resting spaces are also necessary. However, the current farmland areas lack sufficient resting zones. Therefore, in this phase of the renovation, multifunctional spaces were designed and distributed in a dotted pattern across the fields—serving both as rest areas and as platforms for crop drying.

Figure 59*Current Situation Map of Guantang Village**Note.* Author(2025)

As shown in Figure 60, the Sunshine Farm makes use of the rural terrain and natural resources, combined with plant cultivation and rest facilities, to create a place for the elderly to enjoy the sun, relax, and socialize. The space is open, avoiding excessive barriers, making it more free and inviting. At the same time, it provides an opportunity for young people to connect with rural life, attracting them to engage more with the countryside, thus increasing intergenerational interaction.

Figure 60*Design Rendering**Note.* Author(2025)

Entertainment Space: As shown in Figure 61, the entertainment space is equipped with adequate seating and facilities suitable for group activities, such as chess tables and card tables, to meet the elderly's recreational needs. Additionally, plant barriers are used to create a semi-open space, allowing elderly people to enjoy social activities while maintaining privacy and a sense of security.

Figure 61

Design Rendering



Note. Author(2025)

Children's Playground:

In the children's play area, the design incorporates the curvilinear form of rivers, symbolizing the continuous inheritance of rural culture. The integration of a digital footpath with the play zone not only enhances the functional experience but also creates opportunities for elderly residents to engage with younger generations, fostering intergenerational interaction and communication.

As shown in Figure 62 and 63, the design includes a playground suitable for younger children, with swings, slides, sand dunes, and other play facilities to meet the playful needs of children. For the elderly, seating is provided in the playground, allowing them to rest while watching their grandchildren, enjoying time with them, and relaxing both mentally and physically.

Figure 62
Design Rendering



Note. Author(2025)

Figure 63
Design Rendering



Note. Author(2025)

Quiet Rest Area: As shown in Figure 64, located at the westernmost part of the activity area, the quiet rest area is surrounded by various plants, with limited connections to other spaces, providing elderly individuals with a space for solitude and relaxation. The design focuses on privacy and tranquility, ensuring the elderly can fully rest and unwind here.

Figure 64

Design Rendering

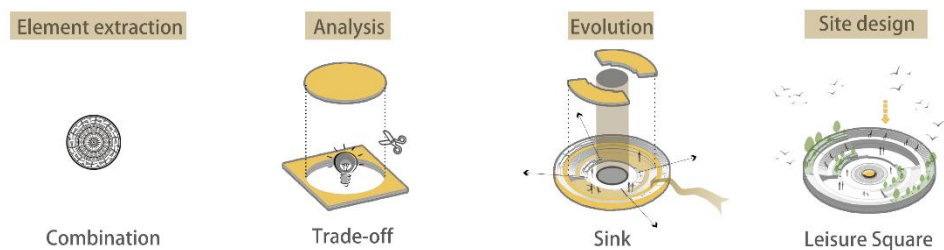


Note. Author(2025)

(4)Health and Wellness Plaza

Figure 65

Element Extraction



Note. Author(2025)

As shown in Figure 65, the design of the health interaction area draws inspiration from the tree ring pattern, which is deconstructed and recombined as a basis for the spatial layout. A sunken space is created following this motif, providing a functional

area that meets the social and physical activity needs of elderly users. Meanwhile, the recessed design helps to minimize noise impact on surrounding residents.

As shown in Figure 66, the Health and Wellness Plaza is located at the center of Liao Di Village and is specifically designed as a leisure park for the elderly. Originally a neglected space filled with weeds, this area was transformed into a health and wellness leisure park that emphasizes the integration of natural and cultural environments. The design introduces undulating terrain to create a varied landscape, allowing elderly individuals to enjoy different views in different areas of the park. The concept of "changing scenery with every step" enhances the enjoyment of walking and relieves mental and physical stress.

Figure 66

Design Rendering



Note. Author(2025)

As shown in Figure 67 the plaza also features an exercise path made of rubber material, designed as a circular route about 400 meters in length, which meets the elderly's daily exercise needs. The path is integrated with the surrounding landscape, creating a harmonious atmosphere that encourages the elderly to engage in regular physical activity, promoting good health.

Figure 67
Design Rendering



Note. Author(2025)
(5) Agricultural Tourism Area

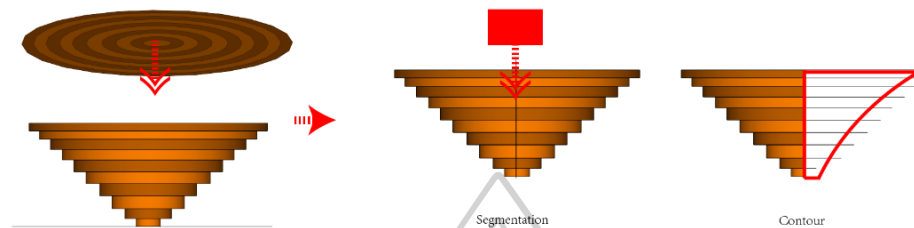
Figure 68
Current Situation of the Village



*Note.*Author(2025)

Figure 69

Element Extraction



*Note.*Author(2025)

As shown in Figure 68, the accumulation of ruins along the rural lakeside currently poses significant challenges to the daily life and safety of elderly residents. Taking into account the unique topography of the lakeside, the design integrates these features to create resting and social landscape facilities. As illustrated in Figure 69, the resting seats are derived from the tree ring motif and arranged in alternating half-ring patterns, symbolizing the collaborative spirit between the elderly and younger generations in building a better rural community.

As shown in Figure 70 and 71 the agricultural tourism area is designed to enhance the natural landscape of the countryside, attracting outside visitors while providing ample social opportunities for the elderly. It serves as an important window for visitors to learn about local culture and as a space for elderly individuals to interact and socialize. By offering simple work opportunities, the agricultural tourism area also provides employment chances for elderly individuals with labor capacity, allowing them to participate in rural economic activities and gain social recognition.

Figure 70
Design Rendering



Note.Author(2025)

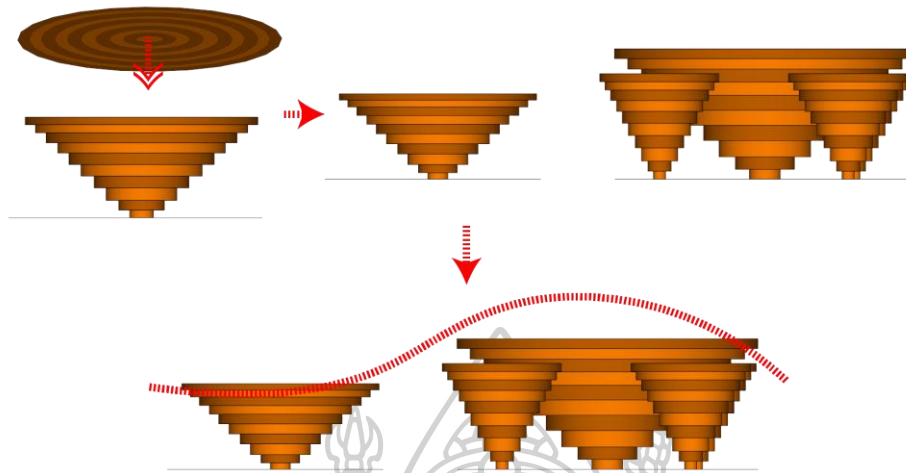
Figure 71
Design Rendering



Note.Author(2025)

(6) Smart Device Service Points

Figure 72
Design Rendering



Note. Author(2025)

As shown in Figure 72, the design adopts the motif of tree rings, which extends downward to form a tree-like structure. Various sizes of rings are composed in a nested manner, with larger rings encompassing smaller ones—symbolizing how the elderly in rural communities provide protection and support for the younger generations. Additionally, the form of a traditional Chinese arch bridge is integrated as a connecting element, representing the bridging of the generational digital divide. This conveys the hope that through collective efforts, the elderly, middle-aged, and youth can grow harmoniously together while jointly preserving and advancing the cultural heritage of the countryside.

As shown in Figure 73 and 74, with the development of technology, the introduction of smart device service points in elderly-friendly activity spaces has become a trend. These devices can provide the elderly with more convenient services, including health monitoring, activity recommendations, and virtual tours, helping them better understand their surroundings and available activities. Additionally, smart devices offer emergency assistance, enhancing the elderly's sense of security within these activity spaces.

Figure 73*Design Rendering**Note. Author(2025)***Figure 74***Design Rendering**Note. Author(2025)*

Through thoughtful design of elderly-friendly activity spaces, the elderly can engage in various activities in a safe, comfortable, and well-equipped environment, enjoying richer social, recreational, and leisure experiences, which in turn enhances their quality of life and happiness. This design not only meets the basic needs of the elderly but also makes them feel cared for and valued by society.

(7) Blessing Plaza Design

Figure 75*Element Extraction*

Note. Author(2025)

As shown in Figure 75, the design extracts and integrates two symbolic forms: the square, representing man-made structures, and the flowing form of water, symbolizing nature. The combination of these elements embodies the harmony between humanity and the natural world. The resulting space serves as a memorial plaza for prayer and reflection—commemorating the tragic history of the Nanjing Massacre, while the embracing, hopeful qualities of the water element convey a sense of optimism and confidence for a better future.

As shown in Figure 76, as a key component of elderly-friendly activity spaces, the Blessing Plaza not only serves as a place for spiritual sustenance for the elderly, but also plays a vital role in cultural heritage and community cohesion through spatial layout. As people age, their needs on a spiritual level gradually increase—especially in rural areas with strong traditional cultural atmospheres, where activities such as offering blessings, paying respects, and praying remain indispensable in the daily lives of many seniors. Therefore, the design of a Blessing Plaza should fully integrate local culture, belief systems, and landscape aesthetics to create a space that offers both cultural identity and emotional comfort.

Figure 76*Design Rendering*

Note. Author(2025)

To enhance the overall environmental quality of the plaza, natural elements and traditional materials are widely used in its design, creating a tranquil and solemn atmosphere. Non-slip stone or traditional grey bricks are used for paving, while well-maintained green belts are arranged around the perimeter. Plants with auspicious symbolism are selected to reinforce the elderly's sense of connection and belonging to the space.

In terms of functional expansion, the Blessing Plaza can also serve as a key venue for festive events. On traditional holidays such as the Spring Festival and the Double Ninth Festival, villagers may organize activities like honoring the elderly, ancestral worship, lighting candles, and releasing wish lanterns. These celebrations not only enrich the rural atmosphere but also strengthen emotional bonds between generations, enhancing a sense of belonging and cohesion within the village.

4.6 DESIGN SATISFACTION EVALUATION

Following the completion of the design proposal, a satisfaction survey was conducted to evaluate users' perceptions of the redesigned public spaces and to preliminarily assess the effectiveness of the proposed interventions. The questionnaire employed a five-point Likert scale (1 = very dissatisfied, 5 = very satisfied), using images of the renovated public spaces to assist respondents in evaluating specific design elements as well as overall spatial satisfaction. A total of 60 valid responses were collected.

As shown in Table 26, participants rated various aspects of the redesigned public spaces, resulting in an overall satisfaction score of 3.93. This indicates a generally positive response to the design scheme. The findings suggest that the design interventions were well-received by most users, particularly in terms of addressing previously unmet needs within rural public space environments. Furthermore, the survey results provide valuable feedback for iterative improvement and offer empirical support for the practical applicability of the aging-friendly design strategies adopted in this study.

Table 26

Rural transformation satisfaction test

Project	Score
Barrier-free handrails	4.02
Accessible public toilets	3.7
Lake Trail	3.72
Sports Trail	3.95
Leisure Plaza	3.62
Resting observation deck	4.17
Planting entertainment area	3.32
Blessing Square	4.2
Lake Observation Deck	3.65
Children's entertainment area	3.98

Digital entertainment area	4.05
Digital Trail	3.93
Recreation Area	3.87
Overall renovation satisfaction	3.93

Note. Author(2025)

4.7 SUMMARY

This chapter conducted a systematic analysis and prioritization of elderly-friendly spatial design requirements based on the combined KANO-AHP model. First, the KANO model was used to identify the dimensions of design elements that elderly users focus on during spatial use, categorizing them into basic, performance, and attractive needs. Then, the Analytic Hierarchy Process (AHP) was applied to quantitatively calculate the weight of each requirement, providing a scientifically grounded reference for practical design.

Guided by the results of the model analysis, the research outcomes were applied to the elderly-friendly renovation project of Guantang Village in Nanjing. By aligning high-weight design factors, the project optimized spatial layout, service facilities, functional activities, and cultural landscapes. This enabled a shift from "passive adaptation" to "active participation" in elderly-oriented spaces, enhancing the sense of belonging, safety, and well-being for senior residents.

The application of the KANO-AHP method not only improved the systematic and scientific quality of the renovation design but also provided a reference framework and practical path for similar rural aging-friendly projects. After completing the design scheme, in order to evaluate whether the proposed elderly-friendly rural public space met users' needs, a five-point Likert scale questionnaire was administered targeting residents of Guantang Village and the design proposal. A total of 65 questionnaires were distributed, with 60 valid responses collected. The results indicated a satisfaction score of 3.93 out of 5 for the elderly-friendly public space design in Guantang Village. This demonstrates that the design approach guided by this study can, to a certain extent, enhance user satisfaction and improve the quality of life for the elderly.

CHAPTER 5

CONCLUSION AND OUTLOOK

5.1 SUMMARY OF RESEARCH CONCLUSIONS

This research focuses on the theme of "aging-friendly transformation of rural public spaces" in response to the increasing aging population in China. Specifically, it examines the current status of rural space development in Guantang Village, Lishui District, Nanjing, and aims to explore the needs of different age groups in rural areas for public space elements. The research employs a combination of qualitative and quantitative methods to analyze the needs and preferences of various age groups, particularly the elderly, and to identify priority areas for transformation in rural public spaces.

(1) Objective 1 : To research and explore the needs of people of different age groups in rural areas for public space elements, and study the direction and key points of design and transformation.

This study collected the needs of people of different ages for rural public spaces through field research and interviews. After summarizing and integrating, a total of 12 effective public space needs were collected, including drying devices, public toilets, activity squares, etc., which served as the basis for the subsequent classification of public space needs.

(2) Objective 2 : The expectations of different age groups for public space elements in rural areas were analyzed, and the elements were classified according to the KANO-AHP model, aiming to balance the needs of other people while taking into account the needs of the elderly.

Based on the twelve public space needs previously identified, this study first conducted a KANO questionnaire survey, collecting a total of 261 valid responses. According to the KANO model, the twelve public space needs were categorized into two must-be attributes, five attractive attributes, three one-dimensional attributes, and two indifferent attributes. Subsequently, ten positively evaluated needs were selected as the criteria layer for the AHP (Analytic Hierarchy Process) analysis. Six relevant experts were invited to complete the AHP questionnaire, resulting in the determination of the weight values for the importance of these ten public space needs. Through the combination of the KANO model and AHP method, this research more objectively and effectively identified the actual needs of various rural population groups and established a prioritized weighting of public space needs, providing a solid foundation for subsequent design practices.

(3) Objective 3 : To develop age-friendly spatial design strategies that enhance the applicability of rural public spaces and promote the elderly's participation in social, health, and cultural activities, while providing a reference framework for inclusive rural space renovation.

This research proposes a comprehensive age-friendly design model that includes five key dimensions: Access & Identification, Comfort & Safety, Uses & Activities, Communication, and Digital Construction. The model provides a guiding framework for the transformation and upgrading of rural public spaces, aiming to promote the participation of elderly residents in social, health, and cultural activities. The model emphasizes the creation of spaces that are not only physically accessible but also socially inclusive and digitally connected, thereby improving the overall quality of life of the elderly in rural communities. The research has put the above five-dimensional model into design practice. According to user needs and the five-dimensional model, the villagers are satisfied with the renovation of rural aging-friendly public spaces. It can effectively improve the social participation and happiness of the elderly.

Overall, the research demonstrates that aging-friendly public space design plays a vital role in enhancing the well-being, social participation, and mobility of rural elderly populations, offering both theoretical and practical support for promoting Healthy Aging and Rural Revitalization strategies in China.

5.2 RESEARCH INNOVATIONS

This research introduces several innovations in methodology, practice, and design strategy:

(1) Methodological Innovation

The study is among the first to combine the KANO model with AHP for the identification and prioritization of spatial needs in rural aging-friendly design. KANO helps classify user needs, while AHP offers a structured way to assign scientific weights to each item, enhancing the logic and precision of design decisions.

(2) Practical Innovation

The study integrates theory with practice by applying survey findings directly to spatial strategies, forming a full-cycle model from "theoretical framework → demand identification → strategy formulation → spatial response," thus creating an operational framework for rural aging-friendly renovation.

(3) Strategic Innovation

The design approach transcends the traditional function-centered mindset by constructing a multi-dimensional integration strategy that combines "behavioral support, emotional comfort, and cultural identity," achieving a dynamic balance between functionality, aesthetics, and locality.

5.3 RESEARCH LIMITATIONS AND REFLECTIONS

Despite the accomplishments in both theoretical analysis and design application, this study still has several limitations:

(1) Limitations in Data Collection

One key limitation of this study lies in the relatively small sample size for field data collection, primarily due to time and resource constraints. This issue was particularly evident in the representation of expert participants and younger demographic groups, whose perspectives are critical for a comprehensive understanding of rural public space needs. The limited sample may have affected the robustness, representativeness, and generalizability of the findings, especially in relation to the needs assessment and the corresponding weight calculations. Future studies should aim to expand the scope of data collection to include a more diverse and balanced sample, ensuring that the resulting analysis captures the full spectrum of user expectations across different social and age groups.

(2) Limitations in Model Application

Although the integration of the KANO model with the Analytic Hierarchy Process (AHP) offers practical value in structuring and prioritizing user needs, the methodology inherently involves a degree of subjectivity. The development of evaluation criteria and the assignment of weights are influenced by the design of the questionnaire and the respondents' interpretation and understanding of each item. This may lead to variations in the results and limit the consistency and reliability of the conclusions. To enhance methodological rigor, future research could consider incorporating complementary quantitative or qualitative methods—such as expert interviews, user workshops, or Delphi techniques—to validate and triangulate the evaluation process.

(3) Lack of Expert Involvement in the Design Research Process

A notable limitation of this study is the insufficient involvement of domain experts during the design development phase. Although expert input was integrated in the AHP stage to determine the weightings of public space needs, the subsequent spatial design process lacked professional guidance. As a result, some design proposals may fall short in depth, technical rigor, and practical feasibility, potentially leading to a gap between theoretical analysis and implementable solutions. This limitation may reduce the robustness and long-term applicability of the proposed strategies. Future research should adopt a more collaborative approach, involving designers and experts in local governance throughout the design process to ensure the scientific validity, contextual adaptability, and implementability of rural public space interventions.

5.4 FUTURE RESEARCH OUTLOOK

To further improve the theoretical framework and practical applications of aging-friendly rural public space design, future research can expand in the following directions:

(1) Methodological Enhancement and Model Optimization

To further improve the precision and inclusiveness of need assessment in aging-friendly rural design, future research could enhance the existing KANO-AHP

framework through integration with other evaluation and decision-support tools, such as Quality Function Deployment (QFD) and the Delphi method. QFD can help systematically translate user needs into technical design features, while the Delphi method can refine expert input and reduce subjectivity through iterative consensus-building. This methodological expansion would enhance the validity, consistency, and stakeholder inclusivity of the evaluation process, ultimately contributing to more user-centered and evidence-based design decisions.

(2) Expanded Applicability and Comparative Studies

The applicability of aging-friendly design principles could be expanded by conducting comparative studies across varied spatial and social contexts, including urban communities, suburban neighborhoods, and senior housing facilities. Such comparative investigations would allow researchers to identify both universal strategies and localized adaptations, offering a nuanced understanding of how aging-friendly design functions in different settings. This broader scope would also support the development of flexible design guidelines that can be adapted to diverse geographic, cultural, and demographic conditions, thereby increasing the transferability and impact of research outcomes.

(3) Cross-disciplinary Integration

Given the complex needs of aging populations, future research should strengthen cross-disciplinary integration by incorporating insights from fields such as health sciences, environmental psychology, sociology, and artificial intelligence. This convergence of knowledge can shift the focus from merely designing physical spaces to creating intelligent, responsive, and human-centered systems. For example, healthcare data can inform ergonomic interventions; psychological insights can improve spatial comfort and well-being; and AI technologies can enable real-time environmental adaptation based on user behavior. Such interdisciplinary collaboration is essential for developing holistic solutions that address both the physical and emotional dimensions of aging in rural environments.

(4) Participatory Design and Long-term Feedback Mechanisms

To ensure design outcomes truly reflect the lived experiences of elderly users, future projects should establish participatory design processes that actively involve older adults throughout all stages of design and implementation. Moreover, long-term post-occupancy evaluations should be institutionalized to monitor usage patterns, behavioral changes, and user satisfaction over time. These feedback mechanisms can provide valuable empirical evidence to refine design strategies, promote iterative improvement, and enhance the long-term sustainability and adaptability of aging-friendly public spaces. Such user-driven approaches also empower older residents, fostering a sense of ownership and deeper community engagement.

(5) Consideration of Intergenerational Integration and All-Age Design

Future research should broaden the focus from aging-specific needs to encompass the spatial requirements of the entire rural population, promoting intergenerational inclusivity. Rather than isolating the elderly as the sole user group, future design strategies could adopt an all-age design approach that accommodates children, youth, adults, and seniors within shared public spaces. This shift enables the creation of more cohesive and vibrant rural environments that foster intergenerational interaction, mutual support, and social cohesion. Investigating how aging-friendly principles can be integrated within a broader all-age design framework will help ensure that rural public spaces are not only inclusive but also socially sustainable over time.

(6) Integration of Public and Residential Spaces in Villages

Important direction for future research involves exploring the dynamic relationship between newly designed public spaces and existing residential environments in rural villages. The introduction of new public spaces can influence residents' behavior patterns, trigger spontaneous modifications of adjacent private or semi-public spaces, and reshape the social fabric of village life. Conversely, the physical and cultural characteristics of traditional housing may also shape the way new public spaces are used or appropriated. Future studies could focus on how these spatial interfaces evolve, how new and old spaces interact, and how spatial design can mediate this relationship to promote community vitality. Longitudinal observations and behavioral mapping can provide valuable insights into how space transforms over time and how design can support organic regeneration processes.

In summary, this study combines theoretical innovation with practical exploration to provide a systematic, feasible, and replicable design logic and strategic path for the aging-friendly renovation of rural public spaces in China. It is hoped that further research and applications can build upon this foundation to promote inclusive, livable environments for the aging population.

APPENDIX

IOC INVITATION LETTER

No.8610/ 0612



Faculty of Decorative Arts, Silpakorn University
Na Phra Larn Rd., Phra Borom Maha Ratchawang
Phra Nakhon, Bangkok 10200 Thailand

27 January 2025

Subject: Request for Information and an Interview

Dear Dr. Pat Wongpradit

Mr. Yun SUN, Student ID 660420021 student in Design at the Faculty of Decorative Arts, Silpakorn University. who is currently working on the dissertation titled "Ageing Adaptive Retrofit of Rural Public Space in Nanjing Based on Analytic Hierarchy Process.", would like to request some information and request an interview with in order to collect data as a part of her dissertation research.

On behalf of the Faculty of Decorative Arts, Silpakorn University, we kindly request your cooperation and assistance in providing information and participating in an interview. For additional details, please contact Mr. Yun SUN at telephone number 095-9699128, who will serve as a direct coordinator.

Yours faithfully

A handwritten signature in blue ink, appearing to be 'Arwin'.

(Assoc.Prof. Arwin Intrungsi)

Dean of Faculty of Decorative Arts,
Silpakorn University

Contact to : info.decsu@gmail.com

Tel. +662-221-5874, +662-221-5832

No.8610/ 0610



Faculty of Decorative Arts, Silpakorn University
Na Phra Lam Rd., Phra Borom Maha Ratchawang
Phra Nakhon, Bangkok 10200 Thailand

27 January 2025

Subject: Request for Information and an Interview

Dear Dr. Suriyun Chansawang

Mr. Yun SUN, Student ID 660420021 student in Design at the Faculty of Decorative Arts, Silpakorn University. who is currently working on the dissertation titled "Ageing Adaptive Retrofit of Rural Public Space in Nanjing Based on Analytic Hierarchy Process.", would like to request some information and request an interview with in order to collect data as a part of her dissertation research.

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(Assoc.Prof. Arwin Intrungsi)

Dean of Faculty of Decorative Arts,
Silpakorn University

Contact to : info.decsu@gmail.com

Tel. +662-221-5874, +662-221-5832

No.8610/ **0611**



Faculty of Decorative Arts, Silpakorn University
Na Phra Larn Rd., Phra Borom Maha Ratchawang
Phra Nakhon, Bangkok 10200 Thailand

27 January 2025

Subject: Request for Information and an Interview

Dear Dr.Thanick Muenkhamwang

Mr. Yun SUN, Student ID 660420021 student in Design at the Faculty of Decorative Arts, Silpakorn University, who is currently working on the dissertation titled "Ageing Adaptive Retrofit of Rural Public Space in Nanjing Based on Analytic Hierarchy Process.", would like to request some information and request an interview with in order to collect data as a part of her dissertation research.

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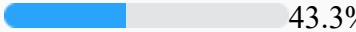
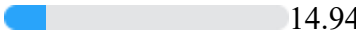
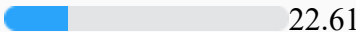
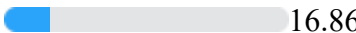
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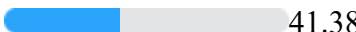

QUESTIONNAIRE DATA

Ageing Adaptive Retrofit of Rural Public Space in Nanjing Based on KANO-AHP

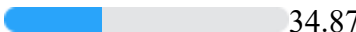
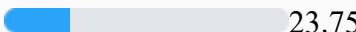
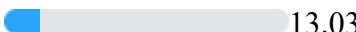
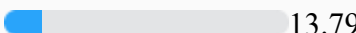
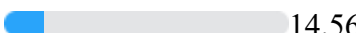
1. What is your age?

Options	Subtotal	Proportion
Under 18 years old	6	 2.3%
19 to 29 years old	113	 43.3%
30 to 50 years old	39	 14.94%
51 to 70 years old	59	 22.61%
70 years old and above	44	 16.86%
Number of valid responses to this question	261	

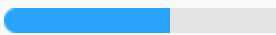
2. What is your gender?

Options	Subtotal	Proportion
Male	108	 41.38%
Female	153	 58.62%
Number of valid responses to this question	261	

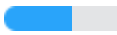
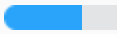

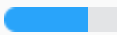
3. What is your occupation?

Options	Subtotal	Proportion
Student	91	 34.87%
Farmer/farmer	62	 23.75%
Rural self-employed person	34	 13.03%
Retired person	36	 13.79%
Other	38	 14.56%
Number of valid responses to this question	261	








4. How long have you lived here?

Options	Subtotal	Proportion
Short-term rural residence [1 to 10 years]	108	 41.38%
Long-term rural residence [more than 10 years]	153	 58.62%
Number of valid responses to this question	261	






5. How often do you use/visit rural public spaces?

Options	Subtotal	Proportion
Lack of barrier-free facilities	63	 24.14%
2 to 3 times a week	73	 27.97%
Once a week	46	 17.62%
Less often/hardly ever	79	 30.27%
Number of valid responses to this question	261	




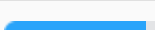
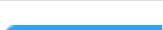
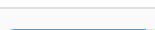
6. (Multiple choice) What difficulties or inconveniences do you encounter most often in rural public spaces?

Options	Subtotal	Proportion
Lack of barrier-free facilities	141	 54.02%
Irrational entrance and exit design	104	 39.85%
Insufficient lighting	129	 49.43%
Lack of rest seats	156	 59.77%
Lack of entertainment or fitness facilities	141	 54.02%
Poor hygiene conditions	151	 57.85%
Lack of sense of security	81	 31.03%
Number of valid responses to this question	261	




7. Do you think the current rural public space needs to be renovated or improved?

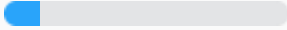

Options	Subtotal	Proportion
Very much	158	 60.54%
Yes	95	 36.4%
Need	7	 2.68%
Generally	0	 0%
No Unclear	1	 0.38%
Number of valid responses to this question	261	

8. (Multiple choice) If renovation is necessary, what aspects do you think need to be improved most urgently?

Options	Subtotal	Proportion
Accessibility and safety	162	 62.07%
Sanitary environment and infrastructure	203	 77.78%
Rest seats, sunshade and rain protection equipment	183	 70.11%
Greening and landscaping	131	 50.19%
Public activity areas or cultural and sports facilities	147	 56.32%
Cultural and entertainment facilities	131	 50.19%
Number of valid responses to this question	261	

9. What aspects do you value most when using rural public spaces?

Options	Subtotal	Proportion
Access & Identification	40	 15.33%
Comfort & Safety	126	 48.28%
Uses & Activities	54	 20.69%

Communication	34	 13.03%
Digital Construction	7	 2.68%
Number of valid responses to this question	261	



Ageing Adaptive Retrofit of Rural Public Space in Nanjing Based on KANO-AHP—
—KANO

Summarize data

Function	KANO property	Better coefficient	Worse coefficient
11. Have complete lighting facilities	Must-be Quality	54.12%	-72.16%
10. Have complete barrier-free passages and handrails	Must-be Quality	46.25%	-50.99%
19. Have complete cultural and entertainment facilities (book houses/exhibition halls/activity rooms, etc.)	One-dimensional Quality	70.08%	-39.37%
16. Have centralized activity venues (squares/cultural halls, etc.)	One-dimensional Quality	67.97%	-42.97%
13. Have complete public toilets	One-dimensional Quality	61.96%	-50.59%
15. Have smooth roads	One-dimensional Quality	61.9%	-66.67%
12. Have complete seating	One-dimensional Quality	59.45%	-55.91%
17. Have complete crop drying facilities	Attractive Quality	71.26%	-27.17%
20. Have complete community smart service points (smart device teaching points, computer rooms)	Attractive Quality	66.27%	-26.27%
18. Have complete greening and landscape	Attractive Quality	60.24%	-33.07%
21. Have complete notice boards	Indifferent Quality	45.7%	-26.56%
14. Have complete fitness equipment	Indifferent Quality	44.71%	-24.71%

Detailed data

10. Have complete barrier-free passages and handrails

KANO ATTRIBUTE NAME	Must-be Quality	One-dimensional Quality	Attractive Quality	Indifferent Quality	Reverse Quality	Suspicious
KANO ATTRIBUTE VALUE	31.8%	17.62%	27.2%	20.31%	0.38%	2.68%

Have\Not have	Like it very much	Take it for granted	No matter	Reluctantly accept	Very dislike
Like it very much	2.68%	0.38%	4.98%	21.84%	17.62%
Take it for granted	0%	2.3%	3.45%	11.11%	31.8%
No matter	0%	0.77%	1.15%	0.38%	0%
Reluctantly accept	0%	0%	0%	1.15%	0%
Very dislike	0%	0%	0%	0.38%	0%

11. Have complete lighting facilities

KANO ATTRIBUTE NAME	Must-be Quality	One-dimensional Quality	Attractive Quality	Indifferent Quality	Reverse Quality	Suspicious
KANO ATTRIBUTE VALUE	36.4%	34.1%	18.77%	8.43%	0.77%	1.53%

Have\Not have	Like it very much	Take it for granted	No matter	Reluctantly accept	Very dislike
Like it very much	1.53%	0.38%	1.53%	16.86%	34.1%
Take it for granted	0.77%	3.07%	0.38%	3.07%	36.4%
No matter	0%	0.38%	0.38%	0%	0%
Reluctantly accept	0%	0.38%	0%	0.77%	0%
Very dislike	0%	0%	0%	0%	0%

12. Have complete seating

KANO ATTRIBUTE NAME	Must-be Quality	One-dimensional Quality	Attractive Quality	Indifferent Quality	Reverse Quality	Suspicious
KANO ATTRIBUTE VALUE	24.9%	29.5%	28.35%	14.56%	0.38%	2.3%

Have\Not have	Like it very much	Take it for granted	No matter	Reluctantly accept	Very dislike
Like it very much	2.3%	1.15%	4.21%	22.99%	29.5%
Take it for granted	0.38%	3.07%	0.77%	9.58%	24.9%
No matter	0%	0%	0.38%	0.38%	0%
Reluctantly accept	0%	0%	0%	0.38%	0%
Very dislike	0%	0%	0%	0%	0%

13. Have complete public toilets

KANO ATTRIBUTE NAME	Must-be Quality	One-dimensional Quality	Attractive Quality	Indifferent Quality	Reverse Quality	Suspicious
KANO ATTRIBUTE VALUE	10.73%	38.7%	21.84%	26.44%	0.38%	1.92%

Have\Not have	Like it very much	Take it for granted	No matter	Reluctantly accept	Very dislike
Like it very much	1.92%	1.15%	4.98%	15.71%	38.7%
Take it for granted	0.38%	2.3%	6.13%	16.86%	10.34%
No matter	0%	0%	0.38%	0.38%	0%
Reluctantly accept	0%	0%	0%	0.38%	0.38%
Very dislike	0%	0%	0%	0%	0%

14. Have complete fitness equipment

KANO ATTRIBUTE NAME	Must-be Quality	One-dimensional Quality	Attractive Quality	Indifferent Quality	Reverse Quality	Suspicious
KANO ATTRIBUTE VALUE	4.21%	19.92%	23.75%	49.81%	0.38%	1.92%

Have\Not have	Like it very much	Take it for granted	No matter	Reluctantly accept	Very dislike
Like it very much	1.92%	0.38%	8.05%	15.33%	19.92%
Take it for granted	0%	2.3%	13.41%	19.16%	3.83%
No matter	0%	0%	12.26%	1.92%	0%
Reluctantly accept	0%	0%	0%	0.77%	0.38%
Very dislike	0%	0%	0%	0.38%	0%

15. Have smooth roads

KANO ATTRIBUTE NAME	Must-be Quality	One-dimensional Quality	Attractive Quality	Indifferent Quality	Reverse Quality	Suspicious
KANO ATTRIBUTE VALUE	21.07%	43.3%	16.48%	15.71%	0.38%	3.07%

Have\Not have	Like it very much	Take it for granted	No matter	Reluctantly accept	Very dislike
Like it very much	3.07%	0%	3.07%	13.41%	43.3%
Take it for granted	0.38%	2.3%	1.92%	9.58%	20.69%
No matter	0%	0.77%	0.38%	0.38%	0%
Reluctantly accept	0%	0%	0%	0.38%	0.38%
Very dislike	0%	0%	0%	0%	0%

16. Have centralized activity venues (squares/cultural halls, etc.)

KANO ATTRIBUTE NAME	Must-be Quality	One-dimensional Quality	Attractive Quality	Indifferent Quality	Reverse Quality	Suspicious
KANO ATTRIBUTE VALUE	5.36%	36.78%	29.89%	26.05%	0%	1.92%

Have\Not have	Like it very much	Take it for granted	No matter	Reluctantly accept	Very dislike
Like it very much	1.92%	1.15%	5.36%	23.37%	36.78%
Take it for granted	0%	2.68%	3.45%	13.03%	5.36%
No matter	0%	0%	5.75%	0.38%	0%
Reluctantly accept	0%	0%	0%	0.77%	0%
Very dislike	0%	0%	0%	0%	0%

17. Have complete crop drying facilities

KANO ATTRIBUTE NAME	Must-be Quality	One-dimensional Quality	Attractive Quality	Indifferent Quality	Reverse Quality	Suspicious
KANO ATTRIBUTE VALUE	3.07%	23.37%	45.98%	24.9%	0.38%	2.3%

Have\Not have	Like it very much	Take it for granted	No matter	Reluctantly accept	Very dislike
Like it very much	2.3%	0.38%	8.43%	37.16%	23.37%
Take it for granted	0%	2.3%	2.68%	8.81%	3.07%
No matter	0%	0%	7.66%	1.53%	0%
Reluctantly accept	0%	0.38%	0.38%	1.15%	0%
Very dislike	0%	0.38%	0%	0%	0%

18. Have complete greening and landscape

KANO ATTRIBUTE NAME	Must-be Quality	One-dimensional Quality	Attractive Quality	Indifferent Quality	Reverse Quality	Suspicious
KANO ATTRIBUTE VALUE	7.66%	24.52%	34.1%	31.03%	0.77%	1.92%

Have\Not have	Like it very much	Take it for granted	No matter	Reluctantly accept	Very dislike
Like it very much	1.92%	0.38%	9.58%	24.14%	24.52%
Take it for granted	0.38%	2.68%	3.83%	21.84%	7.66%
No matter	0%	0.38%	1.53%	0%	0%
Reluctantly accept	0%	0%	0%	0.77%	0%
Very dislike	0%	0%	0%	0.38%	0%

19. Have complete cultural and entertainment facilities (book houses/exhibition halls/activity rooms, etc.)

KANO ATTRIBUTE NAME	Must-be Quality	One-dimensional Quality	Attractive Quality	Indifferent Quality	Reverse Quality	Suspicious
KANO ATTRIBUTE VALUE	3.83%	34.48%	33.72%	25.29%	0.77%	1.92%

Have\Not have	Like it very much	Take it for granted	No matter	Reluctantly accept	Very dislike
Like it very much	1.92%	0.38%	8.05%	25.29%	34.48%
Take it for granted	0.38%	1.92%	3.45%	14.94%	3.83%
No matter	0%	0.38%	3.45%	0.77%	0%
Reluctantly accept	0%	0%	0%	0.38%	0%
Very dislike	0%	0%	0%	0.38%	0%

20. Have complete community smart service points (smart device teaching points, computer rooms)

KANO ATTRIBUTE NAME	Must-be Quality	One-dimensional Quality	Attractive Quality	Indifferent Quality	Reverse Quality	Suspicious
KANO ATTRIBUTE VALUE	4.6%	21.07%	43.68%	28.35%	0.38%	1.92%

Have\Not have	Like it very much	Take it for granted	No matter	Reluctantly accept	Very dislike
Like it very much	1.92%	0.38%	11.11%	32.18%	21.07%
Take it for granted	0.38%	1.53%	2.68%	14.56%	4.6%
No matter	0%	0%	7.28%	0.38%	0%
Reluctantly accept	0%	0.38%	0.38%	1.15%	0%
Very dislike	0%	0%	0%	0%	0%

21. Have complete notice boards


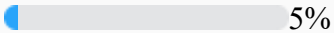
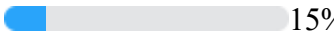
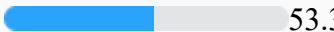
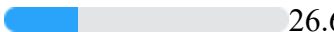
KANO ATTRIBUTE NAME	Must-be Quality	One-dimensional Quality	Attractive Quality	Indifferent Quality	Reverse Quality	Suspicious
KANO ATTRIBUTE VALUE	7.28%	18.77%	26.05%	45.98%	0.38%	1.53%

Have\Not have	Like it very much	Take it for granted	No matter	Reluctantly accept	Very dislike
Like it very much	1.53%	0%	7.66%	18.39%	18.77%
Take it for granted	0.38%	1.53%	7.28%	26.82%	6.9%
No matter	0%	0.38%	8.43%	0.77%	0%
Reluctantly accept	0%	0%	0%	0.77%	0.38%
Very dislike	0%	0%	0%	0%	0%

Survey on Satisfy Degree of Rural Age-Friendly Renovation

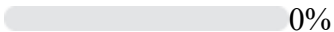
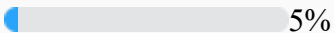
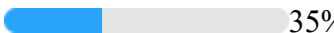
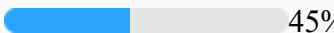
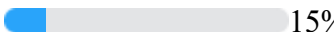
Question 1: Add barrier-free facilities to the design of rural areas suitable for the elderly

Average score for this question: 4.02

Options	Subtotal	Proportion
Very dissatisfied	0	 0%
Dissatisfied	3	 5%
Generally	9	 15%
Satisfy	32	 53.33%
Very Satisfy	16	 26.67%
Number of valid responses to this question	60	

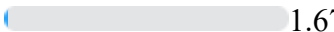
Question 2: Add barrier-free public toilets to the design of rural public spaces suitable for the elderly

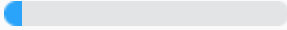

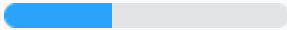

Average score for this question: 3.7

Options	Subtotal	Proportion
Very dissatisfied	0	 0%
Dissatisfied	3	 5%
Generally	21	 35%
Satisfy	27	 45%
Very Satisfy	9	 15%
Number of valid responses to this question	60	

Question 3: Reconstructing the lakeside trail in the design of rural public spaces suitable for the elderly

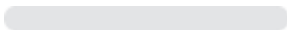
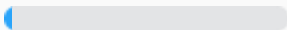
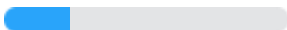

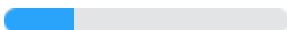
Average score for this question: 3.72

Options	Subtotal	Proportion
Very dissatisfied	1	 1.67%

Dissatisfied	4	 6.67%
Generally	19	 31.67%
Satisfy	23	 38.33%
Very Satisfy	13	 21.67%
Number of valid responses to this question	60	

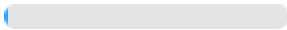
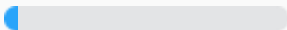
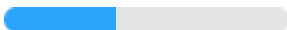
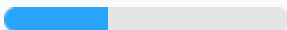
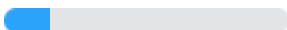
Question 4: Reconstructing sports trails in the design of rural public spaces suitable for the elderly

Average score for this question: 3.95

Options	Subtotal	Proportion
Very dissatisfied	0	 0%
Dissatisfied	2	 3.33%
Generally	14	 23.33%
Satisfy	29	 48.33%
Very Satisfy	15	 25%
Number of valid responses to this question	60	

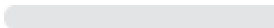
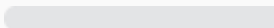
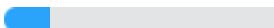

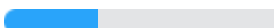
Question 5: Reconstructing leisure squares in the design of rural public spaces suitable for the elderly

Average score for this question: 3.62

Options	Subtotal	Proportion
Very dissatisfied	1	 1.67%
Dissatisfied	3	 5%
Generally	24	 40%
Satisfy	22	 36.67%
Very Satisfy	10	 16.67%
Number of valid responses to this question	60	

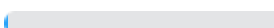
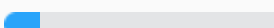

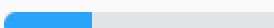
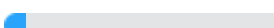
Question 6: Reconstructing the rest viewing platform in the design of rural public space suitable for the elderly

Average score for this question: 4.17

Options	Subtotal	Proportion
Very dissatisfied	0	 0%
Dissatisfied	0	 0%
Generally	10	 16.67%
Satisfy	30	 50%
Very Satisfy	20	 33.33%
Number of valid responses to this question	60	

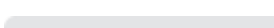
Question 7: Adding planting and entertainment areas to the design of rural public spaces suitable for the elderly

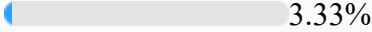
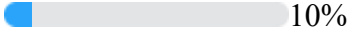
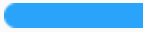

Average score for this question: 3.32

Options	Subtotal	Proportion
Very dissatisfied	1	 1.67%
Dissatisfied	8	 13.33%
Generally	27	 45%
Satisfy	19	 31.67%
Very Satisfy	5	 8.33%
Number of valid responses to this question	60	

Question 8: Reconstructing the Prayer Square in the Design of Rural Public Spaces Suitable for the Aged

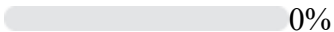
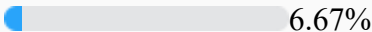
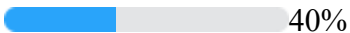
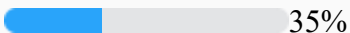
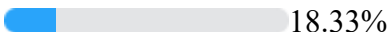
Average score for this question: 4.2

Options	Subtotal	Proportion
Very dissatisfied	0	 0%

Dissatisfied	2	 3.33%
Generally	6	 10%
Satisfy	30	 50%
Very Satisfy	22	 36.67%
Number of valid responses to this question	60	

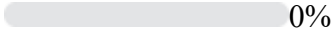
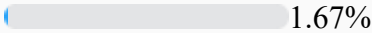

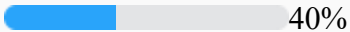
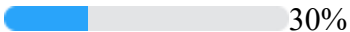
Question 9: Add a lake viewing platform to the design of rural public spaces suitable for the elderly

Average score for this question: 3.65

Options	Subtotal	Proportion
Very dissatisfied	0	 0%
Dissatisfied	4	 6.67%
Generally	24	 40%
Satisfy	21	 35%
Very Satisfy	11	 18.33%
Number of valid responses to this question	60	

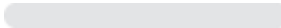
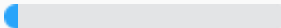
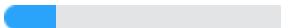
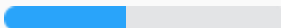
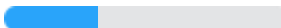
Question 10: Add children's entertainment areas to the design of rural public spaces suitable for the elderly

Average score for this question: 3.98

Options	Subtotal	Proportion
Very dissatisfied	0	 0%
Dissatisfied	1	 1.67%
Generally	17	 28.33%
Satisfy	24	 40%
Very Satisfy	18	 30%
Number of valid responses to this question	60	

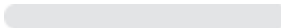
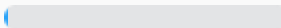
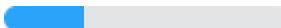

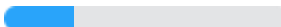
Question 11: Add digital entertainment areas to the design of rural public spaces suitable for the elderly

Average score for this question: 4.05

Options	Subtotal	Proportion
Very dissatisfied	0	 0%
Dissatisfied	3	 5%
Generally	11	 18.33%
Satisfy	26	 43.33%
Very Satisfy	20	 33.33%
Number of valid responses to this question	60	

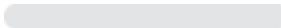
Question 12: Add digital trails to the design of rural public spaces suitable for the elderly

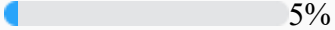

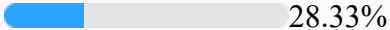

Average score for this question: 3.93

Options	Subtotal	Proportion
Very dissatisfied	0	 0%
Dissatisfied	1	 1.67%
Generally	17	 28.33%
Satisfy	27	 45%
Very Satisfy	15	 25%
Number of valid responses to this question	60	

Question 13: Adding recreational areas to the design of rural public spaces suitable for the elderly

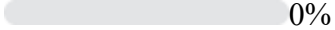
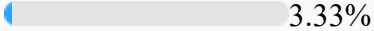
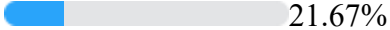
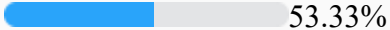

Average score for this question: 3.87

Options	Subtotal	Proportion
Very dissatisfied	0	 0%

Dissatisfied	3	 5%
Generally	21	 35%
Satisfy	17	 28.33%
Very Satisfy	19	 31.67%
Number of valid responses to this question	60	

Question 14: How satisfied are you with the village after the overall renovation?

Average score for this question: 3.93

Options	Subtotal	Proportion
Very dissatisfied	0	 0%
Dissatisfied	2	 3.33%
Generally	13	 21.67%
Satisfy	32	 53.33%
Very Satisfy	13	 21.67%
Number of valid responses to this question	60	



QUESTIONNAIRE RELATED PICTURES



4. 您在此地居住多久?
How long have you lived here?

在乡村居住1-10年 (Short term rural residence (1 to 10 years))

在乡村居住10年以上 (Long term rural residence (more than 10 years))

5. 您多久会使用附近的乡村公共空间?
How often do you use/visit rural public spaces?

几乎每次 (Almost every time)

每周1-2次 (1 to 2 times a week)

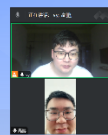
每月1次 (Once a month)

偶尔或不常去 (Less often/rarely etc)

6. 乡村公共空间中, 您最常遇到的问题或不便之处?
What difficulties or inconveniences do you encounter most often in rural public spaces?

【多选题】

- 缺乏无障碍设施 (Lack of barrier-free facilities)
- 出入口设计不合理 (Irrational entrance and exit design)
- 照明不足 (Insufficient lighting)
- 缺少休息座椅 (Lack of rest seats)
- 缺少娱乐或健身设施 (Lack of entertainment or fitness facilities)



11. 乡村公共空间配备了完善的照明设施
Have complete lighting facilities

很有次	相当自然	刚刚好	勉强接受	很不满意
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

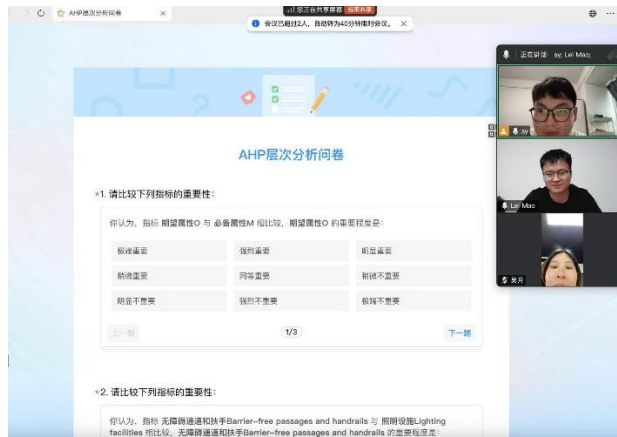
12. 乡村公共空间配备了完善的休息座椅
Have complete seating

很有次	相当自然	刚刚好	勉强接受	很不满意
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>





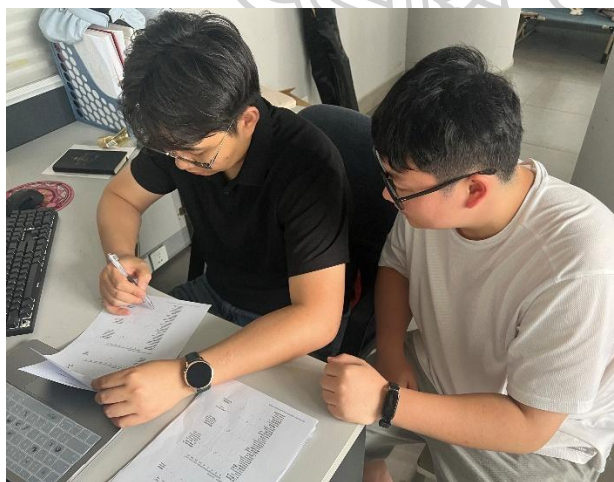
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PhD Candidate



Landscape Design Director



Landscape Design Director



Associate Professor



Associate Professor



Assistant Professor



JOURNAL PUBLICATION

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<https://doi.org/10.69650/jcdrhs.2025.906>



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REFERENCES



- Abbas, M. S. (2016). *Consistency analysis for judgment quantification in hierarchical decision model* [Portland State University].
- Al-Homoud, M. (2024). Enhancing Supportive and Adaptive Environments for Aging Populations in Jordan: Examining Location Dynamics. *Sustainability*, *16*(24), 10978.
- Bai, C., & Lei, X. (2020). New trends in population aging and challenges for China's sustainable development. *China Economic Journal*, *13*(1), 3-23.
- Banerjee, D., Rabheru, K., de Mendonca Lima, C. A., & Ivbijaro, G. (2021). Role of dignity in mental healthcare: impact on ageism and human rights of older persons. *The American Journal of Geriatric Psychiatry*, *29*(10), 1000-1008.
- Bao, J., Zhou, L., Liu, G., Tang, J., Lu, X., Cheng, C., Jin, Y., & Bai, J. (2022). Current state of care for the elderly in China in the context of an aging population. *Bioscience trends*, *16*(2), 107-118.
- Burgess, R. G. (2003). *Field research: A sourcebook and field manual* (Vol. 4). Routledge.
- Cahill, J., McLoughlin, S., O'Connor, M., Stolberg, M., & Wetherall, S. (2017). Addressing issues of need, adaptability, user acceptability and ethics in the participatory design of new technology enabling wellness, independence and dignity for seniors living in residential homes. International Conference on Human Aspects of IT for the Aged Population,
- Carr, S. (1992). *Public space*. Cambridge University Press.
- Cattell, V., Dines, N., Gesler, W., & Curtis, S. (2008). Mingling, observing, and lingering: Everyday public spaces and their implications for well-being and social relations. *Health & Place*, *14*(3), 544-561.
- Chang, Y.-J., Tsai, S.-K., & Wang, T.-Y. (2008). A context aware handheld wayfinding system for individuals with cognitive impairments. Proceedings of the 10th international ACM SIGACCESS conference on Computers and accessibility,
- Chau, H.-W., & Jamei, E. (2021). Age-friendly built environment. *Encyclopedia*, *1*(3), 781-791.
- Choedon, T., & Lee, Y.-C. (2018). Classification and evaluation of service requirements in mobile tourism application using Kano model and AHP. *The Journal of Information Systems*, *27*(1), 43-65.
- Chu, Y., & Zhang, H. (2022). Do age-friendly community policy efforts matter in China? An analysis based on five-year developmental plan for population aging. *International Journal of Environmental Research and Public Health*, *19*(20), 13551.
- da Silva, T. M. H. R. (2025). Designing for Longevity: Economic Perspectives on Age-Friendly Housing and Urban Development. In *Perspectives on the Economics of Aging* (pp. 151-176). IGI Global Scientific Publishing.
- Day, R. (2008). Local environments and older people's health: Dimensions from a comparative qualitative study in Scotland. *Health & Place*, *14*(2), 299-312. <https://doi.org/https://doi.org/10.1016/j.healthplace.2007.07.001>
- Del Barrio, E., Marsillas, S., Buffel, T., Smetcoren, A.-S., & Sancho, M. (2018). From active aging to active citizenship: The role of (age) friendliness. *Social Sciences*, *7*(8), 134.

- Ding, F., Zheng, Y., Zhu, J., & Li, C. (2023). Sustainable Well-being of Rural Environment: Elderly-oriented Evaluation of Outdoor Public Space Design in Suburban Villages-A Case Study of Beijing.
- Du, P. (2013). Intergenerational solidarity and old-age support for the social inclusion of elders in Mainland China: The changing roles of family and government. *Ageing & Society*, 33(1), 44-63.
- Fathololumi, P., & Mohseni, A. (2023). Principles for Designing Age-Friendly Environments to Enhance Social Sustainability and Prevent Alzheimer's Among the Elderly. *Journal of Design Thinking*, 4(1), 105-116.
- Francis, M. (2003). *Urban open space: Designing for user needs*. Island Press.
- Goes, M., Lopes, M., Oliveira, H., Fonseca, C., & João, M. (2019). Quality-of-life profile of the elderly residing in a very low population density rural area.
- Golub, G. H., & Meurant, G. (2020). Matrices, moments and quadrature. In *Numerical analysis 1993* (pp. 105-156). CRC Press.
- Gong, J., Wang, G., Wang, Y., Chen, X., Chen, Y., Meng, Q., Yang, P., Yao, Y., & Zhao, Y. (2022). Nowcasting and forecasting the care needs of the older population in China: analysis of data from the China Health and Retirement Longitudinal Study (CHARLS). *The Lancet Public Health*, 7(12), e1005-e1013.
- Gong, M., Wang, N., Chu, Y., Wu, Y., Huang, J., & Wu, J. (2025). Optimizing Public Spaces for Age-Friendly Living: Renovation Strategies for 1980s Residential Communities in Hangzhou, China. *Buildings*, 15(2), 211.
- Greenfield, E. A., Black, K., Buffel, T., & Yeh, J. (2019). Community gerontology: A framework for research, policy, and practice on communities and aging. *The gerontologist*, 59(5), 803-810.
- Hamka, M. (2020). Application of fuzzy preference relations method in AHP to improve judgment matrix consistency. IOP Conference Series: Materials Science and Engineering,
- Haowei, P. (2023). RESEARCH ON PUBLIC SPACE DESIGN IN OLD COMMUNITIES BASED ON THE PERSPECTIVE OF MICRO-RENEWAL.
- Hassen, N., & Kaufman, P. (2016). Examining the role of urban street design in enhancing community engagement: A literature review. *Health & Place*, 41, 119-132.
- Hill, M. J., Braaten, R., Veitch, S. M., Lees, B. G., & Sharma, S. (2005). Multi-criteria decision analysis in spatial decision support: the ASSESS analytic hierarchy process and the role of quantitative methods and spatially explicit analysis. *Environmental modelling & software*, 20(7), 955-976.
- Houkai, W. (2022). China's Rural Development in the 14th Five-Year Plan Period. *China Economist*, 17(1), 2-11.
- Hussain, M. R., Haron, N. A., Ahmad Effendi, R. A. A. R., Rokhani, F. Z., Ahmad, S. A., Ashari, A., Hassan, M. K., Dolah, M. S., & Ramli, S. H. (2023). Design Requirement of

- Bathroom and Toilet for the Elderly in Malaysia. *Pertanika Journal of Science & Technology*, 31(4).
- Kaplan, M., Thang, L. L., Sánchez, M., & Hoffman, J. (2020). Intergenerational contact zones. *Intergenerational contact zones: place-based strategies for promoting social inclusion and belonging*. New York: Routledge.
- Kapsalis, E., Jaeger, N., & Hale, J. (2024). Disabled-by-design: effects of inaccessible urban public spaces on users of mobility assistive devices—a systematic review. *Disability and rehabilitation: assistive technology*, 19(3), 604-622.
- Kumar, S., Underwood, S. H., Masters, J. L., Manley, N. A., Konstantzos, I., Lau, J., Haller, R., & Wang, L. M. (2023). Ten questions concerning smart and healthy built environments for older adults. *Building and Environment*, 244, 110720.
- Le, T. T. H. (2023). Public open spaces for the elderly in urban areas. A case study of Ho Chi Minh City, Vietnam.
- Lee, K.-y. E., & Chan, W.-w. V. (2024). Building Social Capital and Community Integration: A Case Study of Prosperous Garden. In *Inclusive Housing Management and Community Wellbeing: A Case Study of Hong Kong* (pp. 211-258). Springer.
- Levasseur, M., Dubois, M.-F., Généreux, M., Menec, V., Raina, P., Roy, M., Gabaude, C., Couturier, Y., & St-Pierre, C. (2017). Capturing how age-friendly communities foster positive health, social participation and health equity: a study protocol of key components and processes that promote population health in aging Canadians. *BMC public health*, 17, 1-11.
- Levasseur, M., & Naud, D. (2022). The application of salutogenesis for social support and participation: Toward fostering active and engaged aging at home. *The Handbook of Salutogenesis*, 249-258.
- Levinger, P., Sales, M., Polman, R., Haines, T., Dow, B., Biddle, S. J., Duque, G., & Hill, K. D. (2018). Outdoor physical activity for older people—The senior exercise park: Current research, challenges and future directions. *Health Promotion Journal of Australia*, 29(3), 353-359.
- LI, Y.-r., CAO, L.-z., WANG, P.-y., & CHANG, G.-j. (2022). Rural living environment improvement and rural revitalization. *Journal of Natural Resources*, 37(1), 96-109.
- Liao, Y. (2024). *Designing age-friendly public space in the context of China* [Cardiff University].
- Luo, Y., Su, B., & Zheng, X. (2021). Trends and challenges for population and health during population aging—China, 2015–2050. *China CDC weekly*, 3(28), 593.
- Marcus, C. C., & Sarkissian, W. (2023). *Housing as if people mattered: Site design guidelines for the planning of medium-density family housing* (Vol. 4). Univ of California Press.
- Marques, B., McIntosh, J., & Kershaw, C. (2019). Healing spaces: Improving health and wellbeing for the elderly through therapeutic landscape design.
- Meeks, S. (2022). Age-friendly communities: Introduction to the special issue. In (Vol. 62, pp. 1-5): Oxford University Press US.

- Meyer, A. L., & Gullotta, T. P. (2012). *Physical activity across the lifespan: Prevention and treatment for health and well-being*. Springer.
- Milanzi, E., Njeru Njagi, E., Bruckers, L., & Molenberghs, G. (2015). Data representativeness: issues and solutions. *EFSA Supporting Publications*, 12(2), 759E.
- Mohamed, A., Samarghandi, S., Samir, H., & Mohammed, M. F. (2020). The role of placemaking approach in revitalising AL-ULA heritage site: Linkage and access as key factors. *Int. J. Sustain. Dev. Plan*, 15(6), 921-926.
- Montayre, J., Foster, J., Zhao, I. Y., Kong, A., Leung, A. Y., Molassiotis, A., Officer, A., Mikton, C., & Neville, S. (2022). Age - friendly interventions in rural and remote areas: a scoping review. *Australasian journal on ageing*, 41(4), 490-500.
- Nguyen, T. T., & Levasseur, M. (2023). How does community-based housing foster social participation in older adults: Importance of well-designed common space, proximity to resources, flexible rules and policies, and benevolent communities. *Journal of Gerontological Social Work*, 66(1), 103-133.
- Nousiainen, M., Lindroos, H., & Heino, P. (2016). Restorative environment design.
- Nzumile, J. M., & Taifa, I. W. (2021). Stratification of students' satisfaction requirements using the Kano model.
- Organization, W. H. (2002). Active ageing: A policy framework. *The Aging Male*, 5(1), 1-37.
- Padrón Nápoles, V. M., Gachet Páez, D., Esteban Penelas, J. L., García Pérez, O., Martín de Pablos, F., & Muñoz Gil, R. (2021). Social inclusion in smart cities. In *Handbook of smart cities* (pp. 469-514). Springer.
- Patil, D. R. (2021). Rethinking Urban Public Spaces in Residential Neighbourhoods for the Elderly in Pandemic Times. *Urban India*, 41(2), 45-58.
- Pei, H., & Zhang, J. (2025). Research on the Behavioral Characteristics and Needs Profile of the Elderly in Fujian Tulou Village Neighborhood Open Space: A Case Study of Taxia Village, Nanjing County.
- Prayitno, G., Ari, I. R. D., Hiddlestone-Mumford, J., Siankwilimba, E., & Mulyawati, A. I. (2023). *Regional Planning and Rural Development*.
- Qian, C. (2024). *Smart Elderly Care in Urban China: Policies, Practices, and Older Adults' Perception* [University of Liverpool].
- Ren, H., Yang, F., Zhang, J., & Wang, Q. (2024). Evaluation of Cognition of Rural Public Space Based on Eye Tracking Analysis. *Buildings*, 14(6), 1525.
- Rotar, L. J., & Kozar, M. (2017). The use of the Kano model to enhance customer satisfaction. *Organizacija*, 50(4), 339.
- Salmistu, S., & Kotval, Z. (2023). Spatial interventions and built environment features in developing age-friendly communities from the perspective of urban planning and design. *Cities*, 141, 104417.
- Sanei, M., Khodadad, M., & Ghadim, F. P. (2017). Effective Instructions in Design Process of Urban Public Spaces to Promote Sustainable Development. *World Journal of*

Engineering and Technology, 05(02), 241-253.

<https://doi.org/10.4236/wjet.2017.52019>

- Senetra, A., & Czaplicka, M. (2024). Dudzińska, M.; Dawidowicz, A. Functional and Aesthetic Factors for Well-Being in Age-Friendly Residential Areas (AFRA) in Poland: An International Comparative Perspective. *Sustainability* 2024, 16, 8571. In.
- Shahin, A., Pourhamidi, M., Antony, J., & Hyun Park, S. (2013). Typology of Kano models: a critical review of literature and proposition of a revised model. *International Journal of Quality & Reliability Management*, 30(3), 341-358.
- Shan, W., Xiu, C., & Ji, R. (2020). Creating a healthy environment for elderly people in urban public activity space. *International Journal of Environmental Research and Public Health*, 17(19), 7301.
- Sharif Ullah, A., & Tamaki, J. i. (2011). Analysis of Kano - model - based customer needs for product development. *Systems Engineering*, 14(2), 154-172.
- Shen, Y. (2014). Community building and mental health in mid-life and older life: evidence from China. *Social Science & Medicine*, 107, 209-216.
- Sheng, Y., & Yeom, J. Y. (2022). A Study on the Spatial Design Direction of elderly Facilities Considering Environmental Psychological Elements-With a Primary Focus on Public Elderly Facilities in the Anhui Province in China. *만화애니메이션연구*, 581-628.
- Sixsmith, A., & Gutman, G. (2013). *Technologies for active aging* (Vol. 9). Springer.
- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of business research*, 104, 333-339.
- Stoustrup, S. W. (2025). Rural development as the propagation of regional 'communities of values': A case study of local discourses promoting social innovation and social sustainability. *Sociologia Ruralis*, 65(1), e12496.
- Sun, J., Guo, Y., Wang, X., & Zeng, Q. (2016). mHealth for aging China: opportunities and challenges. *Aging and disease*, 7(1), 53.
- Tan, L., Cui, Q., Chen, L., & Wang, L. (2024). An Exploratory Study on Spatial Governance Toward Urban-Rural Integration: Theoretical Analysis with Case Demonstration. *Land*, 13(12), 2035.
- Teater, B., & Chonody, J. (2017). Promoting actively aging: Advancing a framework for social work practice with older adults. *Families in Society*, 98(2), 137-145.
- Ujang, N., Kozłowski, M., & Maulan, S. (2018). Linking place attachment and social interaction: towards meaningful public places. *Journal of Place Management and Development*, 11(1), 115-129.
- Wang, Y., Gonzales, E., & Morrow-Howell, N. (2017). Applying WHO's Age-Friendly Communities Framework to a National Survey in China. *Journal of Gerontological Social Work*, 60(3), 215-231. <https://doi.org/10.1080/01634372.2017.1292980>
- Wen, L., & Sima, L. (2022). Analysis of outdoor activity space-use preferences in rural communities: an example from Puxiu and Yuanyi village in Shanghai. *Land*, 11(8), 1273.

- Williams, J., Lyons, B., & Rowland, D. (1997). Unmet long-term care needs of elderly people in the community; A review of the literature. *Home health care services quarterly*, 16(1-2), 93-119.
- Xi, L., Zhang, H., Li, S., & Cheng, J. (2020). Integrating fuzzy Kano model and fuzzy importance–performance analysis to analyse the attractive factors of new products. *International Journal of Distributed Sensor Networks*, 16(5), 1550147720920222.
- Xie, K., Zhang, Y., & Han, W. (2024). Architectural heritage preservation for rural revitalization: Typical case of traditional village Retrofitting in China. *Sustainability*, 16(2), 681.
- Xiong, N., Wong, S. W., Ren, Y., & Shen, L. (2020). Regional disparity in urbanizing china: Empirical study of unbalanced development phenomenon of towns in southwest China. *Journal of Urban Planning and Development*, 146(3), 05020013.
- Xu, H., Dupre, M. E., Østbye, T., Vorderstrasse, A. A., & Wu, B. (2019). Residential mobility and cognitive function among middle-aged and older adults in China. *Research on aging*, 41(1), 3-30.
- Xu, J., & Tian, M. (2025). A Study on the Age-Friendly Landscape Evaluation System for Rural Communities in Western Zhejiang: A Case Study of Quzhou. E3S Web of Conferences,
- Ye, J., Ren, Z., Fang, Y., Wu, Y., Xu, M., & Yang, C. (2023). Research on Design Method for Online Panoramic Tourist Website Based on AHP-QFD. International Conference on Human-Computer Interaction,
- Youssef, N., Saleeb, M., Gebreal, A., & Ghazy, R. M. (2023). The internal reliability and construct validity of the evidence-based practice questionnaire (EBPQ): Evidence from healthcare professionals in the Eastern Mediterranean Region. *Healthcare*,
- Yu, J., Ma, G., & Wang, S. (2021). Do age-friendly rural communities affect quality of life? A comparison of perceptions from middle-aged and older adults in China. *International Journal of Environmental Research and Public Health*, 18(14), 7283.
- Yun, S. (2022, 2022/06/01). Study on the Interior Design of the Leisure Space in Guantang Village of Lishui Under the Background of the Rural Revitalization. Proceedings of the 2022 8th International Conference on Humanities and Social Science Research (ICHSSR 2022),
- Yung, E. H., Conejos, S., & Chan, E. H. (2016). Social needs of the elderly and active aging in public open spaces in urban renewal. *Cities*, 52, 114-122.
- Zaidi, A. (2022). Active aging and active aging index. In *Encyclopedia of Gerontology and Population Aging* (pp. 32-36). Springer.
- Zhang, Y., Chen, G., He, Y., Jiang, X., & Xue, C. (2022). Social interaction in public spaces and well-being among elderly women: towards age-friendly urban environments. *International Journal of Environmental Research and Public Health*, 19(2), 746.
- Zhao, X., Ju, S., Wang, W., Su, H., & Wang, L. (2022). Intergenerational and gender differences in satisfaction of farmers with rural public space: Insights from traditional village in Northwest China. *Applied Geography*, 146, 102770.

Zhou, P. (2021). Affordable and enjoyable health shopping: Commodified therapeutic landscapes for older people in China's urban open spaces. *Health & Place*, 70, 102621.



VITA

NAME

Yun SUN

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PUBLICATION**

Silpakorn University

Sun, Y., & Buranaut, I. (2025). Age-friendly Rural Communities: A Multi-Case Study on Public Space Innovations for Active Aging. *Journal of Community Development Research (Humanities and Social Sciences)*, 18(2), 11–30. <https://doi.org/10.69650/jcdrhs.2025.906>

