

Research on the Universal Design of Rural Public Spaces in the Context of an Aging Society

Hongqi Zhou¹, Anmei Wang^{*,1,a}

¹Xianda College of Economics and Humanities, Shanghai International Studies University,
Shanghai, 200083, China.

^{*,a}1110190@xdisu.edu.cn

Abstract. Shanghai ranks supreme among Chinese metropolises in terms of an escalating elderly population, thereby making the enhancement of their quality of life a universally acknowledged societal concern. Rural public spaces serve as important places to carry out the activities of tourists and villagers. Catering to the physiological and psychological needs of the elderly, respecting their individual characteristics, and subsequently proffering an unprejudiced spatial service for all users, could more effectively gratify the demands of recreation and daily life. The primary focus of this dissertation is the design of public spaces in Shanghai's Zhonghua village. By conducting an earnest examination of the intrinsics of rural public space and universal design, the urgency of a universally accessible design for public spaces is analyzed. An on-site survey and interviews furnish insights into the current issues concerning the design of public spaces in Zhonghua village, and strategies to ameliorate spatial designs are proposed.

Keywords: Universal Design; Rural Area; Public Space; Zhonghua Village.

As society progresses, alongside the augmentation of living standards and advancements in medical technology, the average lifespan of the population is increasingly elongating, forming an unalterable trend towards an aging society. Shanghai is the pioneer among Chinese cities entering this aged phase, and it indeed has the highest degree of population aging among the major metropolises. Key data from the seventh national census of Shanghai suggests that as of November 1, 2020, the resident population of Shanghai numbered 24,870,895 with individuals over 60 years comprising 5,815,462 (23.4%) of the population, whereas individuals over 65 accounted for 4,049,012 (16.3%). The elderly, thus, is an expanding demographic in the societal populace. The challenge faced is how to integrate this aging demographic actively into society and secure their happiness, which has become a pivotal facet of urban construction in an aging society.

Spanning a total area of 6,340.5 square kilometers and inhabited by approximately 24 million residents, Shanghai stands as one of China's most expansive cities. Although massive in size and populous in nature, the urban core of Shanghai merely covers an area of over 440 square kilometers, with the suburban expanse reaching 5,900 square kilometers, and includes 33,000 natural villages. The suburban villages of Shanghai, blessed with efficient transportation, pictorial natural landscapes, and a rich cornucopia of traditional culture, provide idyllic conditions for city dwellers seeking to indulge in recreational tourism. Bolstered by hefty support from the Shanghai government, by the end of 2018, 325 leisure agriculture and rural tourism areas (spots) had been established in Shanghai, attracting an annual footfall of 19 million visitors. This spike in tourism bolstered the consumption to approximately 10 billion yuan and facilitated approximately 28,000 job opportunities. With the advancement of the Construction of Beautiful Village and all-for-one tourism, the rural development of Shanghai has observed continual progression. Nevertheless, issues such as lack of village characteristics, imperfect public space design, and subpar visitor

experience have also come to the fore. Rural public spaces denote carriers of the local historical culture and serve as crucial spaces for villagers and tourists to conduct public activities. They are quintessential spatial forms for urban and rural elders to engage in leisure tourism, wellness and health, and recuperative care. In the context of aging, paying attention to the construction of rural public space is of great significance for improving the quality of life in rural areas, improving the happiness and satisfaction of elderly users, and improving the rural landscape.

Universal design advocates for an all-inclusive approach, considering the heterogeneous nature of the user base from the outset. It envisions creating an environment and facilities through sensible design that fulfills the requirements of people across various age groups and abilities, thus preventing any differential treatment towards marginal groups. A thorough analysis, based on the principles of universal design, of public spaces in Shanghai's rural areas, can furnish targeted suggestions towards the design of rural spaces and public service facilities. The aim of such research endeavors remains the enhancement and improvement of the quality of rural public space construction in suburban.

1. Study of Related Concepts

1.1 Concept of Rural Public Space

Public spaces in modern villages primarily comprise a wide spectrum of interconnected yet independent elements like village parks, activity squares, village entrances and exits, and alleyways. From primeval altars to contemporary squares and parks, these spaces have always embodied the heart of rural spaces. They act not only as hubs for village activities and communication, but also as the critical showcase for a village's external image. The development of society and the prosperity of rural tourism around big cities have bestowed new implications upon these rural public spaces. In a broad sense, rural public space refers to those open places were conceived to facilitate a range of activities for both villagers and visitors, encompassing regular and festive gatherings, leisure activities, entertainment, communication, production, daily life rituals, interpersonal encounters, physical fitness, transportation, among others.

1.2 Universal Design

Universal design refers to the creation of products and environments without adaptability and specificity, intending to be utilized by as many individuals as possible, ideally everyone. Universal design is an extension of barrier-free design, aiming to ensure the usability of products and spaces, while also addressing the psychological needs of users. British architect Selwyn Goldsmith explicitly stated in his seminal work, "Universal Design" (2003), that designers should contemplate broadening the applicability of facilities, diminishing the proviso of special facilities for the disabled, and avoiding problems caused by inappropriate design, which lead to disuse or inconvenient use, or result in unjust treatment during usage. The fundamental tenet of universal design is that the target audience for any design should inherently be as inclusive as possible (see Figure 1), disregarding distinctions of gender, physical condition, or age. This principle eschews discrimination and through rational design enables as many individuals as possible to utilize the facilities and environment.

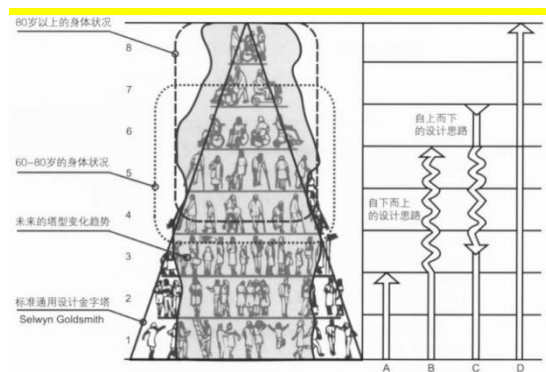


Figure 1: The universal design pyramid
(Image Source: Universal Design)

2. Analysis of the Necessity for Universal Design in Rural Public Spaces

2.1 Analysis of Universal Design for Elderly Users

As individuals age, their physiological functions decline while the central nervous system progressively becomes dulled, leading to slower movements and impaired operational skills. Compounded with brittle bones, reduced resilience, and deformed joints, this may lead to difficulties in rising from a seated position, instability while standing, and general mobility issues. These gradual physiological changes that occur with aging can evoke feelings of fear, depression, and anxiety amongst the elderly. Impaired mobility and lack of social interaction often lead to their general isolation from society and engender a pervasive sense of loneliness, intensifying their need for emotional engagement and respect. The elderly, possessing a strong sense of self-esteem, do not wish to use dedicated or elder-specific services or facilities; instead, they aspire to live as ordinarily as possible. Recognizing these physiological and psychological issues that the elderly face, and paying attention to their unique needs, can guide the development of public spaces that promote healthy living for the elderly. Consequently, this focus will enhance the quality of life for both the elderly and their family members.

2.2 Analysis of Design Needs for Diverse Users

Elderly individuals value familial bonds, and engaging in joint activities with family members is a potent stimulus for their physical and emotional health. This underscores the necessity for public spaces to accommodate the diverse needs of multi-generational households. Suburban rural spaces offering convenient transport, favorable ecological environments, and easy access to food resources can lure the elderly and their families to spend their weekends or holidays there, reveling in nature's tranquility. In particular, offering the elderly an opportunity to rejuvenate amidst nature, fostering an appreciation and understanding of the natural world among children, and providing a relaxing space for adults will all contribute to the overall physical and emotional well-being of all users, thereby fostering familial harmony. Hence, the development and design of rural public spaces based around the behavior patterns of a diverse set of users has become a salient issue. Only by meticulously considering the characteristics and needs of users and efficiently avoiding conflicts between individual abilities and the use of space, can we simplify and enhance the living experience of all individuals.

2.3 Analysis of Economic Feasibility and Practicality of Spatial Construction

The construction of rural public spaces necessitates significant investment in physical and financial resources. Not taking into consideration the needs of the users can result in both a squandering of resources and establishing barriers to utilization. For instance, designing steps at the main entrances and exits can present obstacles for certain users (such as those with physical impairment or elderly individuals with mobility concerns), causing substantial issues during real-world usage. This could demand a reevaluation and reconstruction of the route plans, leading to increased expenditure and wastage of resources. Therefore, in the initial stages of public space design, one should strive to imbue the spaces and facilities with aspects of 'universal' design. That is, considering the needs of all users equitably, providing an environment and facilities that can be used by both special-needs groups and the general public thus minimizing duplication of design and construction efforts, alleviating the burden of construction, and economizing expenses.

3. Principles of Universal Design for Rural Public Spaces

The increasing prevalence of rural tourism and the development of rural construction enhance the positive significance of research on universal design in public spaces. Grounded in principles of barrier-free design, tolerance design, and universal design, it is necessary to propose principles of universal design in rural public spaces to suitably accommodate the manifold needs of diversified users.

1) Principle of Equitable Use: The design of rural public spaces should grant primacy to fairness in usage. The design should be suitable for all individuals; all users, ranging from the elderly, children, those with disabilities, to the average person, should be able to use it conveniently. Circumstances that may engender user discomfort due to usability issues should be evaded wherever feasible.

2) Principle of Wide-ranging Adaptability: The design of spaces should take into account user characteristics, covering a wide array of user needs and abilities. By creating a diverse range of spaces and facilities, users are offered the chance to choose their preference.

3) Principle of Safety: During the utilization of space, user behavior should be taken into account. Rational design can, thus, minimize any adverse consequences arising from dangerous, thoughtless, or inadvertent actions.

4) Principle of Comfort: Regardless of user category, space design should offer comfort to all users. This necessitates that designers pay attention to their target users, furnishing facilities and spatial forms of suitable scale for comfortable usage.

5) Principle of Environmental Harmony: Public space design should account for site characteristics, regional culture, and surrounding environment, and should strive to express regional characteristics. The design should harmoniously blend with nature, avoiding monotonous and similar rural public spaces, thereby offering users a better experience.

4. Investigation and Analysis of Design Cases

Zhonghua Village is situated in the western part of Langxia Town, Jinshan District, Shanghai. It shares a boundary with Shantang Village to the east, sees Zhongfeng Village across Liu Li River in the west, borders with Lima Village of Guangchen Town, Pinghu City, Zhejiang Province to the

south, and is adjacent to Zhongmin Village to the north. Spanning an area of 294 hectares, the village stretches 2.05 kilometers from east to west and 1.96 kilometers from north to south. The village terrain is flat, with a temperate and wet climate, fertile land, conducive to the growth and propagation of various flora and fauna, encapsulating the quintessential farming cultural characteristics of Shanghai's suburbs.

Beginning in 2006, through initiatives such as the development of the Jingjiang Zhonghua Village agritainment venture and natural village transformations, the overall image of Zhonghua Village has undergone notable enhancements. It now presents a tidy and visually pleasing ambiance, with lush banks and crystal-clear waters, drawing a significant number of visitors for dining, leisure, and recreation, thereby becoming a national agricultural tourism demonstration spot and a Chinese characteristic village . According to a survey of the Zhonghua Village annals , it was found that the village hosts a permanent resident population of 499 households equivalent to 1873 individuals, among which there are 415 elderly individuals aged 60 and over, constituting 22.16% of the total population, indicating the ageing demographic trend in the village.

Also, the cultural memory and rural environment of Zhonghua Village are well-received by the elderly population residing in adjacent towns, as well as other user groups, establishing it as a typical tourist destination. For this reason, the investigation and design of the public spaces in Zhonghua Village carry representative and typical implications. Fieldwork primarily revolves around public spaces including Zhonghua Village's leisure ecological forest, Party-building theme park, and riverside areas, with the aim to understand the landscape environment and various facilities in the public spaces (see Table 1). Unstructured interviews, involving random inquiries to local villagers and visitors, were employed to gauge the perceptions of the users of these spaces.

Table 1: Investigation on the Current Status of Public Spaces in Zhonghua Village

Characteristic Landscape of Zhonghua Village				
				
Public Spaces				
				
leisure ecological forest	leisure ecological forest	Party-building theme park	Party-building theme park	Party-building theme park

				
riverside areas	riverside areas	riverside areas	the great lawn	the great lawn

From a synthesized analysis of various surveys and interviews, Zhonghua Village has created public spaces such as an ecological forest, Party-building theme park, riverside recreation area, and the great lawn according to rural site characteristics, hence, infused with a certain pastoral charm. The village has well-constructed roads, with flat surfaces, facilitating access to all public leisure spaces.

On normal days, the public spaces are mainly occupied by villagers, with activities focused on the Party-building theme park where the elderly chat, sunbathe, and enjoy the scenery under the park gallery. After supper, square dance activities are common. Over the weekends and holidays, primary users of the public spaces are tourists, with the majority comprising family units, spanning elderly, adults, and children. The activity area for these family tourists is mainly concentrated around the Party-building theme park and riverside corridor area. The Party-building theme park is a primary congregation area for several reasons. One of them is that the villagers sell their subsidiary agricultural products, Lianxiang Cake and other foods in the resting gallery area, spontaneously setting up a small rural market, which attracts many visitors to interact and partake in activities. Moreover, many elders watch over their grandchildren and view the busy body of visitors, contributing to gatherings.

Given its proximity to the agritainment dining district, the riverside corridor area is often frequented by visitors for a stroll post-meal. The ecological forest is less crowded due to its distant location from the core village area where the rustic agritourism and parking lot are situated. The village has designed a bicycle greenway along the main road connected to Langxia Ecological Park and Shantang Village. However, without supporting transportation facilities, no station or resting facilities are established; hence, the recreational value of this greenway is undisplayed.

The overall design of the public space reflects certain regional characteristics, but there are several apparent issues when viewed from a universal design perspective. 1) The space is relatively single-functional, and the facilities don't harmonize with the environment. Residents and tourist interviews reflected a lack of distinctive features in the space, absence of leisure activities for the elderly, and a dearth of entertainment spaces for children. After dining, residents and visitors can only stroll around the village, which feels incredibly monotonous. Some visitors suggested that while the architecture is distinctive, many facilities are overly industrialized and discordant with their surroundings. 2) The design lacks fairness. For instance, the rest pavilion only has steps, making it impossible for strollers to enter smoothly; it's virtually unusable by individuals in wheelchairs or those with physical disabilities. Public restrooms lack a seated toilet and handrails, posing difficulties for the elderly and wheelchair users. 3) The convenience of using public environmental facilities is lacking. This problem is mainly manifested in the environmental signage system, where the signage's font is small, positioned high, shallow in color, and significant difficulty in identification. Some facilities in the rest space have not installed handrails, lack sun shades, and are not comfortable enough. 4) Safety is insufficient. Zhonghua village has numerous waterways, which are one of the primary leisure and recreation areas. Both villagers and tourists

call attention to the current lack of efficient protection along the riverside area, posing considerable risks to children playing and elderly individuals with mobility difficulties. In general, although public spaces in Zhonghua Village are promptly accessible and display certain regional characteristics, space functions are monotonous, and designs do not adequately consider user diversity and real needs. There is a call for further research and enhancements in space design to improve its quality.

5. Micro Renewal Strategies for Spaces Based on Universal Design

Rural public spaces serve both as a living domain for villagers and a key area for tourists to experience the village life. Meticulous design, well-coordinated with surrounding environments and taking into account the users' behaviors and needs, is vital to enhance the structural integrity and appeal of such spaces.

5.1 Focus on User Needs

With the rapid urbanization development in China since the dawn of the 21st century, and powered by the advancements in modern technology, urbanites now demand higher living standards. It is essential to cater to the users in public space design, creating barrier-free environments for as many individuals as possible, truly manifesting the fairness and respect inherent in design. For example, Zhonghua Village has limited rest facilities along its various pathways. While this doesn't affect the average users, it can cause inconvenience for the elderly, children, and pregnant women. By moderately increasing the number of facilities and providing diversified forms, a more comfortable leisure experience can be created. Shrouded by large trees, Zhonghua Village's greenway showcases scenic rural landscapes of farmlands and orchards by the road, enhancing the recreational value of the path. The greenway serves a multiplicity of functions for all user categories, including the elderly, adults, and children – it facilitates daily activities, physical fitness, and leisure relaxation. Consequently, it should offer corresponding transportation facilities, reasonably positioned rest-stops, sanitation facilities, and rest chairs, genuinely fulfilling the actual usage requirements of its users.

5.2 Expand Comprehensive Functions of the Space

The construction of rural public spaces addresses various types of users. Offering diversified spatial functions can enhance the user experience and make leisure activities lively and interesting. For example, the function of the small square in the Party-building theme park in Zhonghua Village needs comprehensive consideration — it could not only serve as a resting area, but also host rural markets, children's activity zones, and rural innovation experience areas, amongst others, to attract more people into the outdoor space. This approach can better leverage the functionality of space, enabling individuals to achieve satisfaction from diverse activities within the outdoor space.

5.3 Creating a Cultural Space with Local Characteristics

Experiencing local culture and traditions is a crucial motivating factor for rural life experiences. The creation of public activity spaces through distinctive rural culture is a significant aspect of rural construction. By promoting cultural, artistic, and intangible heritage activities, the attractiveness of the space can be enhanced, adding uniqueness to the village. Elderly individuals experience visual deterioration, diminishing their ability to distinguish fine details and remember objects for a short

time; simultaneously, their sense of direction becomes dull. This makes it challenging for them to recognize environments without obvious features, increasing the likelihood of getting lost or misidentifying locations. Using the natural attributes, cultural characteristics, and landmark landscapes of sites to design varied spatial environments can compensate for the physiological limitations of the elderly, creating spaces with a sense of familiarity and identification. For instance, public spaces in Zhonghua Village could employ local characteristic symbols such as farmer paintings, Chinese paper-cuttings, and other unique elements to create spaces reflecting regional characteristics. Area culture and tradition activities can also be utilized in squares or rest spaces to create areas of participation and interaction, augment the enjoyment of activities, and enhance place recognition perception.

5.4 Enhancing the Functional Use of Environmental Facilities

Public environmental facilities form an integral part of the space, safeguarding the activities of residents and visitors. Therefore, facility design should consider systemic integration, blending into the environment as seamlessly as possible. Considering the user's needs, directional signage should be holistically planned and designed, with adjustments made to color and graphics, maximizing the use of distinct and highly recognizable graphics and text to meet the needs of groups such as the elderly and children. Diversify leisure facilities, moderately adding handrails and backs to seats; trees, flower beds, and other facilities can be designed with a variety of materials to enhance comfort and safety. Restrooms should offer complete barrier-free designs, with seated toilets and handrails for the elderly, baby seats for toddlers, and coat hooks on toilet booth walls. Improving facility functionality better serves users, thus enhancing satisfaction during recreational activities.

5.5 Sculpting a Safe Spatial Form

Shanghai's terrain is flat, bordered by the sea and lakes, and the suburbs' rural regions predominantly comprise woodlands, water bodies, and fields that form the natural landscape of the village, reflecting the characteristics of Southern water towns. Dense woodlands and waterfront zones contribute to the uniqueness of the space, but also introduce elements of instability. Therefore, the construction of public spaces should ponder providing a safe, comfortable environment for users. Waterfront roads should be flat, avoiding disparities in height; safety guardrails or other forms of protection should be offered, along with signage for reminders to preempt instances of elderly or children accidentally falling into the water; ample lighting should be provided at night for safe activity execution for all users. Public restrooms and tourist-populated areas could moderately install aid or alarm systems to better provide safety protection to users.

The Nineteenth National Congress of the Communist Party of China has made a comprehensive deployment of the rural revitalization strategy, proposing a series of guidelines and policies for prioritized development of agriculture and rural areas. Rural public spaces not only carry villagers' lives but also serve as an essential window for tourists carrying out rural tourism activities and experiencing rural life. The design of public spaces must consider principles of equality, safety, comfort, and environmental harmony. In the context of an aging population, special attention should be paid to the varying needs of the elderly and diverse user groups. Enhancing the universality of public space design, creating a public activity space that is ecological, suitable for tourism, and habitable, can provide high-quality services for all users.

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