Building adaptive design for vacation-type retirement community in Yongshan Village

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Abstracts

In the context of an aging global population, the research on retirement community design has received much attention from scholars. The research objectives of this paper are three: Key factors of building adaptive design for vacation-type retirement communities, design strategies, and design methods.

This paper used mixed research methods: First, the researchers completed the design research through literature, fieldwork, expert interviews, and user research. Secondly, the researchers carried out design practice to complete the building adaptive design of the vacation-type retirement community. Finally, the researchers collected expert design assessments, summarized them, and drew conclusions and recommendations.

The research conclusions: (1) the key factors of building adaptive design for vacation-type retirement communities include user needs, traffic accessibility, medical resources, the original buildings, the natural environment, and the human environment. (2) The design strategies for vacation-type retirement communities can be divided into addition, renovation, and expansion. (3) The methods of adapting a natural village into a vacation-type retirement community include: optimizing the ventilation and lighting of the building, optimizing the floor plan, adding resort facilities, and designing to incorporate the local culture.

Keywords: Vacation-type retirement communities; Retirement communities design; Building adaptive design; Yongshan Village

Introduction

The topic of this research is building adaptive design. The researcher explored the transformation of natural villages into vacation-type retirement communities through building adaptive design.

Research background

Population aging is a global trend (United Nations, 2022:1). In 2020, there were already 727 million people aged 65 years and older, accounting for 9.3% of the global population. It is expected that by 2050, the global elderly population will reach 1.5 billion, accounting for 16% of the total population (United Nations, 2020:1).

Only 2,362,908 natural villages remained in China in 2020. However, there were 3,773,162 natural villages in 1990 (Ministry of Housing and Urban-Rural Development of China, 1990-2020). In just 30 years, 1,410,254 villages had disappeared. Unfortunately, the demise of natural villages continues to the present day.

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Literature review

With the aging population, many retirement communities are being built worldwide. Meanwhile, scholars have started to study retirement community design. By consulting the Web of Science Core Collection (WoSCC) database, researchers retrieved 165 pieces of literature related to retirement community design (retrieved on July 2, 2023). Campbell (2015: 55-67) studied social spaces in retirement communities. The study results showed that participation in social activities is a critical way to enhance the quality of life of older initiatives, and paying attention to the design of social spaces in retirement communities can promote the health and well-being of retirement community residents. Pang and An (2017:3) studied the landscape spaces in retirement communities, and the findings showed the importance of designing humanized retirement community landscapes for seniors' physical and psychological needs. Zhou (2018:1) studied retirement community architectural design. The results of the study showed that the architectural design of senior living communities included general layout design, living space design, public space design, and service space design, and a specific design methodology for the architectural design of senior living communities was derived.

There is no uniform definition of building adaptive design to date, and different scholars have proposed different interpretations (Lanz & Pendlebury, 2022: 441-462); Zhang, 2018: 37-42. Gorgolewski (2005:1) considered adaptability as the ability of a building to adapt to future changes and meet its owners' evolving needs in the easiest way and at the lowest cost. According to Zhang and Kuang (2019: 8-10.), building adaptability is the ability of a building to adapt to the evolving needs of its occupants and environment through effective regulation, thereby maximizing the value of the building throughout its life cycle. By querying the Web of Science Core Collection (WoSCC) database, the researcher retrieved 4742 documents related to building adaptive design (retrieved on July 2, 2023). Currently, building adaptive design focuses on retrofitting buildings for energy. Castleton et al. (2010: 582-1591.) reviewed cases of retrofitting existing buildings and found a high potential for green roof retrofits in the U.K. Thomsen et al. (2016: 8-16) studied the Danish apartment Traneparken after an energy retrofit that included renovating the facade, windows, and insulation and adding rooftop photovoltaic installations; the study found a significant reduction in energy consumption and a significant improvement in indoor climate. By querying the WoSCC and Scopus databases, the researcher had yet to find a research paper combining a retirement community design with building adaptive design. This was a research Gap.

Significance of the problem

Through a literature review, researchers found that the number of studies on retirement community design was low, and the research results were insufficient to support building retirement communities. Research on building adaptive design is active, but most studies focus on the energy retrofitting of buildings.

The research problem of this paper was how to transform a natural village into a vacation-type retirement community through building adaptive design. The research question can be divided into three sub-questions: First, what were the key elements of building adaptive design for transforming natural villages into vacation-type retirement communities? Second, how to match the adaptive design strategies for vacation-type retirement communities? Third, what were the methods of building adaptive designs for transforming natural villages into vacation-type retirement communities?

The research approach of this paper was mainly abductive and deductive. The researcher explores the key factors for transforming natural villages into vacation-type retirement communities through abductive. The researcher discovered the building adaptive design strategies and design methods for transforming natural villages into vacation-type retirement communities through deductive.

This research combined retirement community design and building adaptive design in a unique way. Research results will provide insights for scholars to conduct research in related fields, architects to design solutions, and government officials to develop policies.

Research Objectives

1. Exploring the key elements of building adaptive design for vacation-type retirement communities through design research.
2. Matching the right design strategies for vacation-type retirement communities.
3. Explore methods to transform natural villages into vacation-type retirement communities through building adaptive design.

Research Scope

The geographical scope of this research is limited to Yongshan Village in Raoping, Guangdong Province, China. The age range of the users is 60-69 years old and in good health. The discipline of this research is limited to architecture, which focuses on the building adaptive design for vacation-type retirement communities.

Research Methodology

Conceptual framework

Figure 1 shows the conceptual framework of this research. This paper has three core concepts: natural villages, building adaptive design, and vacation-type retirement communities.

A natural village is a naturally occurring settlement of residents formed by one or more families, households, clans, or other factors, and its origin is the spontaneous formation of villages by villagers who have naturally congregated in the natural environment over a long period.

Building adaptive design refers to the use of flexible and versatile design strategies and methods in the design and construction of buildings so that the buildings can adapt to different user needs and environmental changes in the future and provide sustainable long-term use value for the buildings.

Vacation-type retirement communities provide a full range of services and amenities for retirees to enhance their quality of life and promote social interaction. Such communities are usually located in pleasant climates and scenic local landscapes with numerous resort amenities and provide appropriate medical, nursing and health care services, and health care services.

This paper examines how adaptive building design can transform natural villages into vacation-type retirement communities. This paper focuses on the key factors, building adaptive design strategies, and design methods for transforming natural villages into vacation-type retirement communities.

Research framework

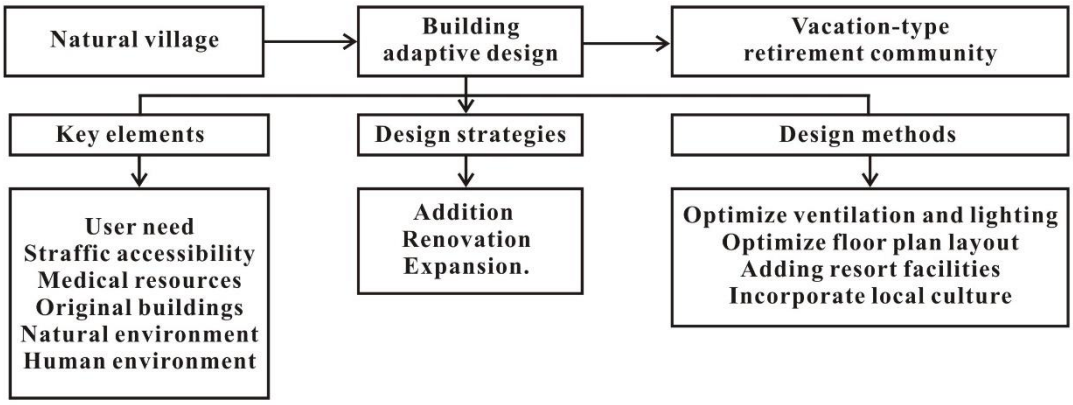

Figure 1 Conceptual framework
Source: Author，2023

Figure 2 shows the research framework. A mixed research approach was used in this research.

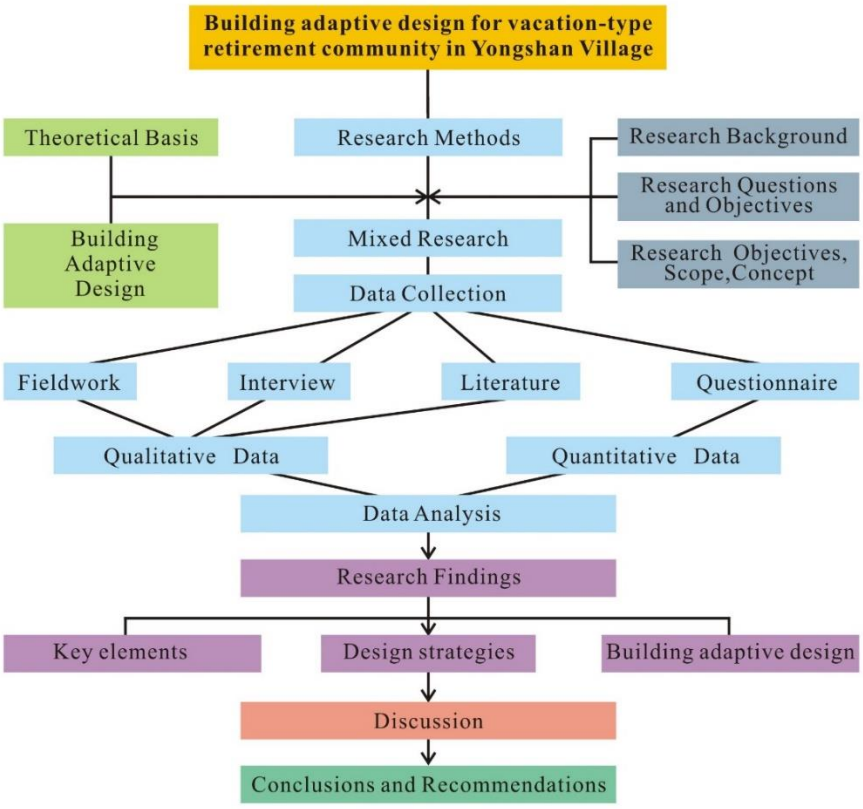

Figure 2 Research framework
Source: Author，2023

The research methodology of this paper was divided into five parts.

1 Research method. This research selected a mixed method, including qualitative and quantitative research, with qualitative research as the primary focus.

2 Data sources. There were two sources of data in this research: Primary and secondary. The researcher obtained primary data through fieldwork, interviews, and questionnaires. Literature data for this research was mainly sourced from three databases: the Web of Science Core Collection (WoSCC), Science Direct (Elsevier), and China National Knowledge Infrastructure (CNKI). Population and sampling data were obtained from two databases: the National Bureau of Statistics of China and the United Nations Population Division. Natural village data were obtained from the Ministry of Housing and Urban-Rural Development of China.

3 Population and sampling. Population and sampling for this research used census data and population sampling data from all levels of government.

4 Data collection. The data collection of this research included primary and secondary. Fieldwork, interviews, and questionnaire belong to primary data, which the researcher collected directly. Literature data, population and sampling data, and natural village data belong to secondary data and were obtained by the researcher by accessing specialized databases.

5 Data Analysis. First, pre-processing of data was conducted. The researcher removed data that were not relevant to this research and data that were problematic. Second, data integration was practiced. The researcher integrated data from different sources according to the research objectives. Finally, data visualization was performed. The researcher used Word to create tables, Coreldraw to draw frames, Auto CAD to design floor plans, and SketchUp to design renderings.

Research steps

Step 1: The researchers found the context of global population aging by reading the literature. Also, through the literature review, the researchers explored the current state of research on retirement communities and adaptive design of buildings, found the research gap, and completed to explore the significance of this research problem.

Step 2: To conduct the research orientation. This included defining the research objectives, defining the scope of the study, and selecting the research method.

Step 3: Research findings. Through literature research, expert interviews, fieldwork, and user interviews, the researchers identified key factors in the building adaptive design of vacation-type retirement communities and developed design strategies. The researchers then used the design strategy as a guide to complete the adaptive reuse design of the Donghua Building in Yongshan Village.

Step 4: Discussion. In the discussion session, the researchers presented the key findings and discussion, the significance of the research, and its limitations.

Step 5: Conclusions. Combining the findings and discussion, the researchers summarized the research by induction and concluded.

Step 6: Recommendations. The researcher recommended theoretical research and design practices to facilitate follow-up research.

Research Findings

1. Key elements

Shanghai Jiao Tong University (2022:1) proposed 15 evaluation indicators for vacation-type retirement communities, including natural and socio-economic indicators (Table 1). Based on these 15 indicators and considering the actual needs of retirement community design, this research summarized six elements by consulting with experts in retirement community design: User needs, traffic accessibility, medical resources, original building, natural environment, and human environment. Then, seven experts scored the importance of key elements to obtain the importance ranking of key elements (Table 2).

Table 1 Summer habitat evaluation factors for migratory bird retirement

Type	Evaluation Indicators
Natural Indicators	Average daily maximum temperature in July and August
	Temperature fluctuations in July and August
	Relative air humidity in July and August
	Air pressure suitability
	Air quality index
	Annual number of excellent weather
	Water quality
Socio-economic indicators	Number of Grade A tertiary hospital
	Number of physicians per 1,000 population
	Number of hospital beds per 1,000 population
	Number of A-class scenic spots
	Overall natural scenery and human landscape of the region
	Traffic accessibility
	Civilized city
	Per capita consumption expenditure

Source: 2022 China Migratory Bird Retirement Summer Habitat Suitability Index(Shanghai Jiao Tong University (2022:1))

Table 2 Ranking of key elements for building adaptive design in vacation-type retirement communities

Ranking	Design Elements	Average Score
1	User needs	4.57
2	Natural environment	4.43
3	Traffic accessibility	4.29
4	Medical resources	4.14
5	Oiginal building	4.00
6	Human Environment	3.86

1.1 User research

The users of this project were set to be the middle-income elderly group aged 60-70. This type of senior citizen was healthy, had a strong demand for vacation, had specific spending power, and liked the peaceful countryside life. Many seniors in this group were born in the

countryside or have lived in the country, so retaining the local flavor in the design was especially important.

1.2 Traffic accessibility

The project was in Yongshan Village, Shangrao Town, Raoping (Figure 3). Yongshan Village was in the eastern mountainous region of Guangdong, 96 kilometers from Chiu Chow and 120 kilometers from Meizhou. The provincial road S221 passed around the village with convenient and smooth traffic.

Figure 3 Yongshan Village, Raoping
Source: Google Earth，2022

1.3 Medical resources

Yongshan Village was far from the city and lacked medical resources. The village had a small clinic that could only meet the most basic medical needs of the villagers. Therefore, only healthy seniors aged 60-69 could be considered for occupancy when designing a vacation-type retirement community.

1.4 The original building

Donghualou was built in 1952. Sitting east to west, backed by mountains and facing the water, it was circular, 35 meters in diameter, with an area of 962 square meters (Raoping County Government, April 27, 2013:online). Donghualou was a house of the Binary, with a bungalow in the front and a building in the back, a well in the inner courtyard, and a gatehouse constructed of green bricks. Stonewall base and walls were built with rammed earth, gray tile roof, and overhanging roof gables. Donghualou was well-preserved and typical of Tulou architecture in the 1950s (Figure 4). Donghualou also suffers from the common shortcomings of earthen architecture: First, the number of windows on the exterior walls was minimal, and the windows opening was small, making ventilation and lighting poor. Secondly, the rooms lacked independent bathrooms, which made living inconvenient. At the same time, since the

Donghualou had an internal courtyard with an area of about 227 square meters, it was convenient for later renovation design.

Figure 4 Status of Donghualou
Source: Author,2022

1.5 The natural environment

Yongshan Village has a subtropical maritime climate. It has an average annual temperature of 21.2°C and abundant rainfall, with an average yearly rainfall of 1659.5 mm and 1,661 hours of sunshine (Raoping County Government, 2022:online). The climate is humid and pleasant, suitable for constructing a vacation-type retirement community.

Surrounded by mountains, Yongshan Village has beautiful scenery, fresh air, and rich landscape resources. Donghualou is located northeast of Yongshan Village, with a small stream to the west and a small field with flat terrain to the northwest. In addition, abundant loess, wood, and bamboo are suitable for building earthen buildings.

1.6 The human environment

Yongshan Village is a typical Hakka ancient village with more than 800 years of history. In October 2022, it was selected as one of China's "Sixth Batch of Traditional Chinese Villages." There are still 31 Hakka Tulou intact in the village, a typical Hakka residential building complex. The whole village of Yongshan is unified with the surname of Deng, with 345 households and a total population of 1,798. The typical Hakka culture and lifestyle are still preserved in Yongshan Village. The Hakka culture includes the architectural features of local Tulou, handicrafts, and Hakka customs. The lifestyle contains daily living habits, eating habits,

recreational activities, and social behavior. Regrettably, around Donghualou are houses built by villagers one after another later on, with a haphazard architectural style (Figure 5).

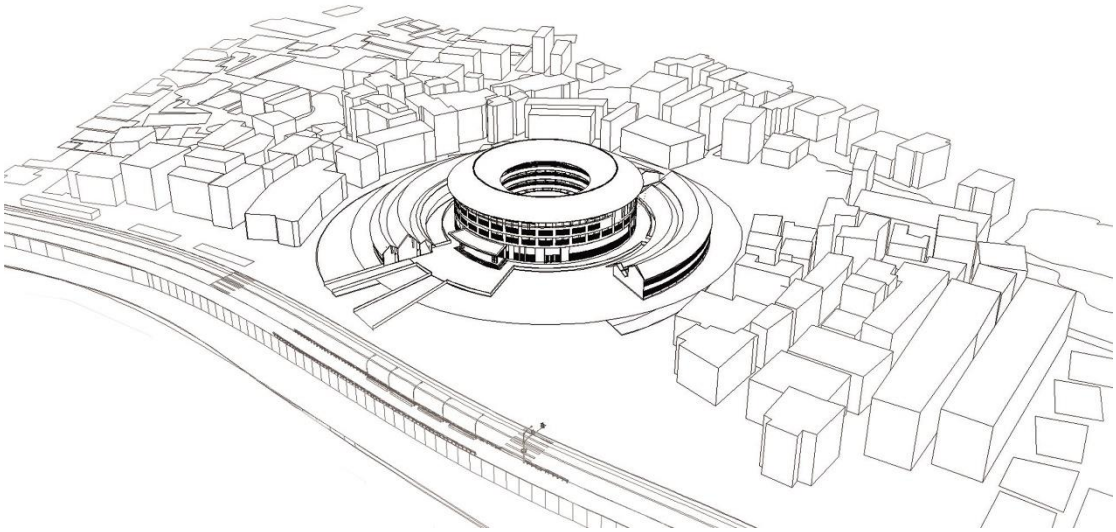

Figure 5 Bird's eye view of Yongshan Villag
Source: Designed by Xie, J.M, He, T.S, Zhou, X.L., Guo, W.X,
Design directed by Huang, B. 2022

2. Design strategies

Building adaptive design strategies were flexible according to different functional requirements and original building conditions. Three building adaptive design strategies were used in this project (Table 3).

Table 3 Design strategies

No.	Design strategies	Contents
1	Addition and Expansion	Adding bathrooms to rooms, expanding windows, and optimizing the floor plan
2	Renovation	Change the use of the original space and add resort functions, including lobby, restaurant, and tea room
3	Addition	Adding landscape facilities, including pool, swimming reflection pool; Adding elevator and fire fighting equipment

3. Building adaptive design

3.1 Floor plan design

The original building was mainly used for residential functions and lacked the necessary resort facilities. Therefore, the original building was renovated when arranging the functional layout, and resort functions were placed. The lobby, lobby bar, elevator hall, full-time restaurant, and small stores are on the first floor. Water features were installed in the inner and outer courtyards of the building to enhance the landscape quality. A parking lot was set up near the entrance of the building. The second and third floors were mainly used to arrange various types of guest rooms to meet the needs of different users. The fourth floor was primarily

set up with leisure function areas, including a swimming pool, gym, billiard room, table tennis room, and bar (Figure 6).

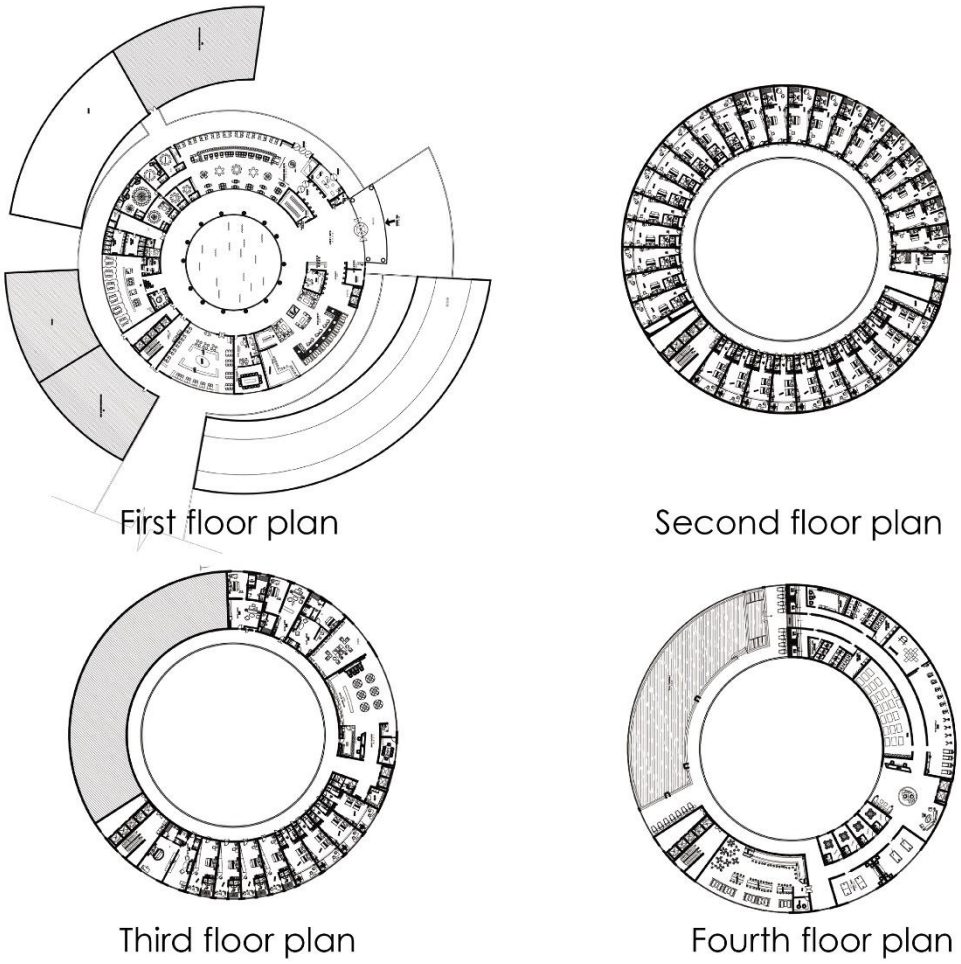

Figure 6 Floor plan design
Source: Designed by Xie, J.M, He, T.S, Zhou, X.L., Guo, W.X,
Design directed by Huang, B. 2022

3.2 Architectural design

The exterior of the original building was well preserved, so the original appearance was retained in the adaptive reuse process, with only the windows enlarged for functional needs. The enlarged windows improve both the ventilation and lighting of the original building and take advantage of the rich landscape resources. The inner courtyard of the original building was retained, both as a venue for recreational activities and due to ventilation (Figure 7). In addition, by increasing the gable size of the building's roof to 1200 mm, the gable shaded the sun during the summertime; during winter, the sunlight could shine into the interior (Figure 7).

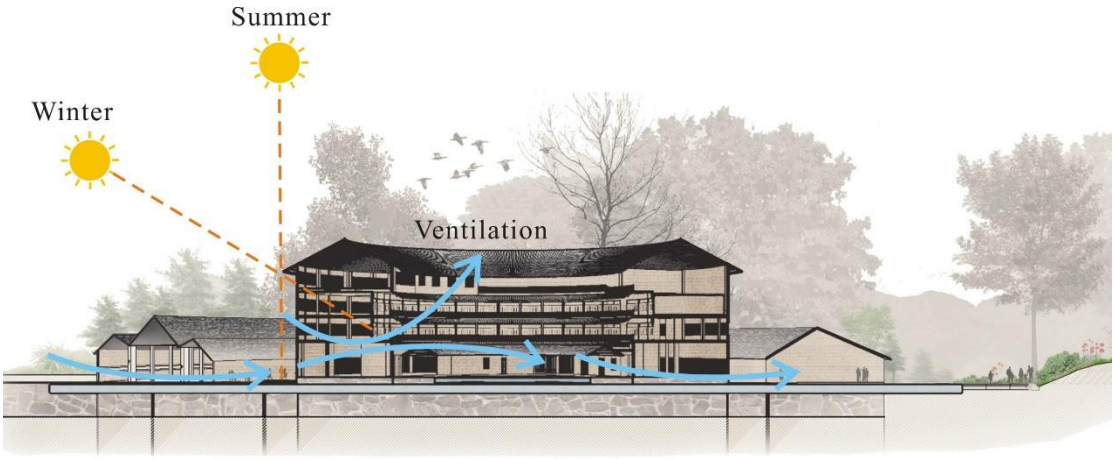

Figure 7 Ventilation and light analysis
Source: Designed by Xie, J.M, He, T.S, Zhou, X.L., Guo, W.X,
Design directed by Huang, B. 2022

3.3 Landscape design

Due to the cluttered style of the buildings added around the base, it was decided to demolish some surrounding buildings and replace them with reflecting pools, dotting the perimeter with landscape pine trees and lighting decorations to create a rural and serene atmosphere (Figure 8).

Figure 8 Building exterior and landscape rendering
Source: Designed by Xie, J.M, He, T.S, Zhou, X.L., Guo, W.X,
Design directed by Huang, B. 2022

3.4 Interior design

Lobby design. The lobby used a design method adapted to the local culture: The entire space retained the size of the original foyer, with a pleasant scale, and the facade retained the original rammed earth wall, with a local increase in wood veneer and embellished with local bamboo hats to increase the artistic effect. The roof was designed as a sloping roof, with a bamboo fish basket chandelier in the center. The lighting used 3000K color temperature to make users feel at home (Figure 9).

Figure 9 Lobby design
Source: Designed by Xie, J.M, He, T.S, Zhou, X.L., Guo, W.X,
Design directed by Huang, B. 2022

Tea room design. As tea drinking is an important leisure activity for seniors in eastern Guangdong, the tea room's design is essential. Figure 10 shows that the design of the tea room continued the design approach of the lobby, retaining the original rammed earth walls, sloping roof molding, and old wooden doors, and embellished with local bamboo farming tools, dustpans, rakes, and bamboo baskets, full of life atmosphere. The coffee table and seats adopted the classic new Chinese style, and the pine bonsai was placed on the coffee table to create a spatial mood.

Figure 10 Tea room design
Source: Designed by Xie, J.M, He, T.S, Zhou, X.L., Guo, W.X,
Design directed by Huang, B. 2022

Restaurant design. The restaurant was an integral part of the resort facilities. In the restaurant design, the dining room was conventionally designed to be divided into a lobby dining area and a private dining area. The design approach continued the culturally adaptive design strategy, using local bamboo as the primary material to create a resort atmosphere (Figure 11).

Figure 11 Restaurant design
Source: Designed by Xie, J.M, He, T.S, Zhou, X.L., Guo, W.X,
Design directed by Huang, B. 2022

Room design. According to the different needs of the users, the rooms were designed into four types (Figure 12). Since the original building was circular, each room was divided according to the modulus of the original building. Each room is narrower near the inner courtyard side and broader near the outer courtyard side. This original architectural framework increases the design's difficulty and interest. The design changes the positions of the bathroom, bed, sofa, and coffee table to create different spatial temperaments. In the facade design, the most characteristic rammed earth wall of the Tulou was retained, and the frame was supported by part of the wooden structure. The flooring was made of solid wood and partially embellished with carpets. Some of the walls were decorated with bamboo bucket hats with local characteristics. The ceiling retained the structure of the sloping roof, the lighting adopted

3000K color temperature, and the warm tones looked warm and comfortable (Figure 12, Figure 13).

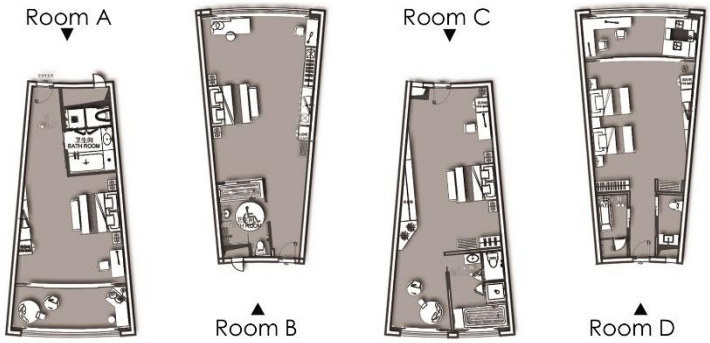

Figure 12 Room floor plans
Source: Designed by Xie, J.M, He, T.S, Zhou, X.L., Guo, W.X,
Design directed by Huang, B. 2022

Figure 13 Twin bed room design and King bed room design
Source: Designed by Xie, J.M, He, T.S, Zhou, X.L., Guo, W.X,
Design directed by Huang, B. 2022

Discussion

This paper focuses on three questions:(1) What are the key elements for transforming natural villages into vacation-type retirement communities? (2) How do building adaptive design strategies match the transformation of natural villages into vacation-type retirement communities? (3) How to transform natural villages into vacation-type retirement communities through building adaptive design?

Key findings and discussion

1. Key elements for the transformation of natural villages into vacation-type retirement communities.

Table 4 shows the key findings of this research. The results of this study showed that the key elements for transforming natural villages into vacation-type retirement communities include user needs, traffic accessibility, medical resources, the original buildings, the natural environment, and the human environment.

Table 4 Key findings

No.	Design strategies	Contents
1	Key elements	user needs, traffic accessibility, medical resources, the original buildings, the natural environment, and the human environment
2	Design strategies	addition, renovation, and expansion
3	Design methods	optimizing the ventilation and lighting, optimizing the floor plan, adding vacation facilities, and designing to incorporate the local culture

Shanghai Jiao Tong University (2022:1) suggested 15 evaluation indicators for vacation-type retirement communities (Table 1). Many of the 15 indicators were combined in the same category. For example, “Average daily maximum temperature in July and August,” “ Temperature fluctuations in July and August,” “ Relative air humidity in July and August,” “Air pressure suitability,” “ Air quality index,” “ Annual number of excellent weather,” “Water quality” was merged into “the natural environment”.“Number of Grades A tertiary hospitals, ” “Number of physicians per 1,000 population,” “Number of hospital beds per 1,000 population” was merged into "medical resources. ” Some key factors were missing in the Shanghai Jiao Tong University study and were added in this research, such as “user needs” and “the original buildings.”

2. Building adaptive design strategies for the Transformation of Natural Villages into vacation-type retirement communities.

The research results showed three strategies for building adaptive design strategies for converting natural villages into vacation-type retirement communities: Addition, Renovation, and Expansion. Broekhuizen et al. (2020: 69-77) concluded that four strategies are usually used for building adaptive design: conversion, expansion, renewal, and adaptive reuse. This conclusion was close to the conclusion of our research. Among them, "Expansion" and "Renovation" were the same. "Addition," "Conversion," and "Adaptive Reuse" were similar. The reason for this may be the difference in the research object: the object of this research was natural villages in China, while the object of Broekhuizen et al.'s research was an elementary school in the Netherlands. Aksamija (2016: 185-195) proposed a passive design strategy, which was completely different from the design strategy of this research. The reason for the different findings was the difference in the content of the two studies. Aksamija studied building energy efficiency, while this paper studied building design.

3. Building adaptive design methods for transforming natural villages into vacation-type retirement communities.

The research results showed four design methods: optimizing the ventilation and lighting, optimizing the floor plan, adding vacation facilities, and designing to incorporate the local culture. Due to the relatively new field, the researcher has not reviewed the literature on this topic. Upon completion of the proposal, expert feedback was received from Silpakorn University, Guangdong University of Finance and Economics, and Changshu Institute Of Technology: (1) The researcher incorporated the Hakka culture into the design, which aligns with the localized design trend. (2) The researchers optimized the floor plan and also the

ventilation and lighting of the original building, adding resort facilities such as a swimming pool, lobby, restaurant, and tea room, which was aligned with the design positioning of the vacation-type retirement communities.

Significance of the research

This research used a mixed method to combine building adaptive design and retirement community design research, which had a certain originality. This research selected a typical Hakka village as the research object, which could have universal applicability and specific promotion value. This research could provide a reference value for related scholars, designers, and government agencies.

Limitations of the research

Due to space limitations of the paper, only small-scale projects were selected for this study, but not medium-sized and large-scale vacation-type retirement communities, which had certain limitations. In addition, the type of villages in this research was a small suburban type and did not involve a suburban type, which also had limitations regarding the type of villages. These research limitations need to be overcome in subsequent research.

Conclusions

First, the research results indicate that the key elements of adaptive design for vacation-type retirement communities include user needs, traffic accessibility, medical resources, the original buildings, the natural environment, and the human environment.

Second, depending on the state and functional needs of the original building, the design strategy for vacation-type retirement communities can be divided into addition, renovation, and expansion.

Third, the method of transforming natural villages into vacation-type retirement communities through building adaptive design consists of optimizing the ventilation and lighting of the buildings, optimizing the floor plan, adding vacation facilities, and designing to incorporate the local culture.

Recommendations

Recommendations for theoretical research

This research has achieved the research objectives regarding design elements, design strategies, and design methods for vacation-type retirement communities, and phased research results have also been achieved. However, the depth of the research needs to be further expanded, and the research system needs to be improved to facilitate the construction of a complete theoretical system in the future.

Recommendations for design practice

This research has completed the design of a vacation-type retirement community and wholly designed the project's architecture, landscape, and interior. However, the scale of the project is small and relatively simple. It is necessary to study further the design of medium and large-scale vacation-type retirement communities to improve the design practice.

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