

Aging in Place within Historical Heritage
- Timeworn Foundation, timeless care.

Bijia Li

Chalmers School of Architecture
Department of Architecture & Civil Engineering

Master Thesis 2025

Examiner: Walter Unterrainer
Supervisor: Tina Wik



CHALMERS
UNIVERSITY OF TECHNOLOGY

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Fig. 1 Typical exterior wall of Huizhou architecture

Abstract

China's rapid urbanization has intensified tensions between modernization and architectural heritage preservation, particularly in rural areas. Meanwhile, the aging population faces growing challenges in securing sustainable, elderly-friendly living environments. Traditional Chinese architecture holds cultural and environmental value, yet there is a gap in adapting these structures for contemporary elderly care while preserving their heritage. Many historical dwellings also reflect outdated social hierarchies, including rigid gender divisions in space.

This study explores the renovation of a historic Huizhou residential building in rural Anhui Province, integrating conservation, adaptive reuse, and sustainability to enhance elderly well-being. Through case studies, field research, interviews, and theoretical analysis, it evaluates key factors such as daylight, ventilation, accessibility, and cultural continuity. Based on these findings, a sustainable renovation design is proposed, balancing historical authenticity with modern functionality.

Grounded in theories of adaptive reuse, aging-in-place, and sustainable architecture, this study provides a model for transforming vernacular buildings into elderly-friendly spaces. It also considers how spatial modifications can challenge outdated hierarchies embedded in traditional architecture, making historic spaces more inclusive while retaining their cultural essence.

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INTRODUCTION

Background

In many rural regions of China, historical dwellings have been neglected during modernization, with many still inhabited by elderly individuals. Economic constraints, shifting policies, and urbanization trends have deprioritized rural heritage conservation, leading to inadequate restoration, structural deterioration, and poor living conditions. Many of these aging buildings lack proper ventilation, lighting, and accessibility, making daily life increasingly difficult for elderly residents.

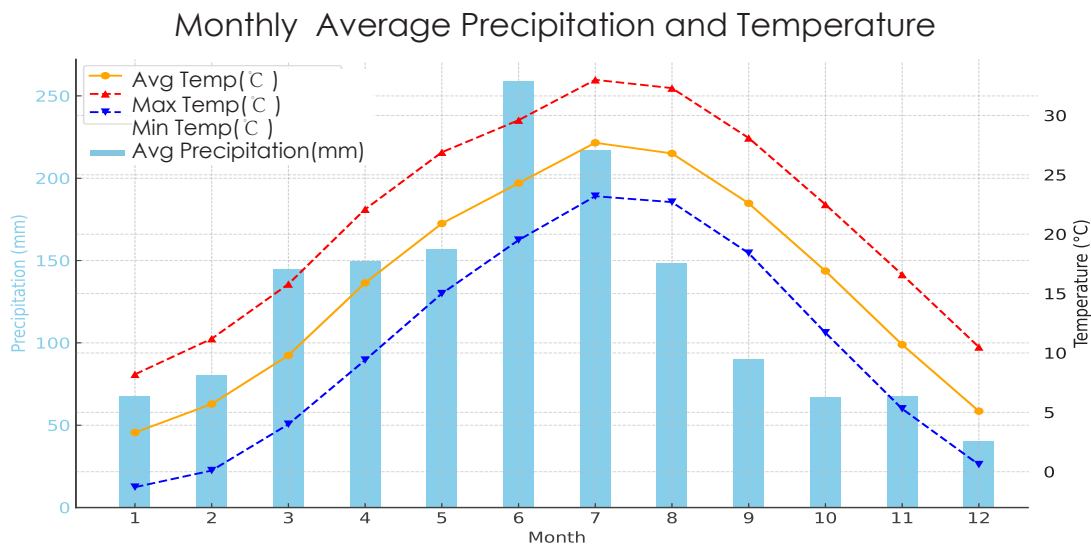
Among these, Huizhou architecture remains one of the most well-preserved and representative forms of traditional Chinese vernacular architecture. Defined by its wooden frameworks, intricate carvings, and enclosed courtyards, Huizhou dwellings reflect centuries of architectural wisdom, regional identity, and deep-rooted social structures. However, these buildings were designed within a strict Confucian hierarchy, which dictated spatial divisions based on status,

gender, and family roles. Women, for instance, were often confined to the innermost quarters, reinforcing their subordinate social position. While these spatial arrangements once aligned with societal norms, they no longer reflect contemporary values of gender equality and social inclusion.

Jiangcun Village, located in Anhui Province in eastern China, exemplifies Huizhou architectural legacy. Spanning 9.2 square kilometers with a history of over 1,300 years, Jiangcun is home to numerous Ming and Qing Dynasty (15th -20th centuries) buildings, including ancestral halls, traditional residences, and historic artifacts such as calligraphy, paintings, and genealogical records. However, like many rural settlements, Jiangcun faces demographic shifts, with a predominantly middle-aged and elderly population, as younger generations have migrated for work. While tourism has provided economic opportunities, many historical structures remain underutilized or deteriorating.



Fig. 2 The residential area of Jiangcun



Data source:

One such building in Jiangcun, constructed between 1906 and 1914, originally served as the residence of the affluent Jiang family. Despite its architectural and historical significance, the building suffers from structural weaknesses, poor lighting, and limited accessibility. Its vast yet underutilized spaces present both challenges and opportunities for adaptive reuse.

The building's condition is shaped by its environment, which also reflects traditional Huizhou strategies for managing humidity and temperature fluctuations. However, as the structure ages and usage patterns shift, these passive design become less effective, necessitating modern intervention .



Fig. 3 Front Facade of the Building

Jingde County, where Jiangcun is located, has a mild climate with an average annual temperature of 15.5°C and frequent seasonal rainfall. High humidity in summer and colder temperatures in winter contribute to issues such as damp interiors and poor insulation, exacerbating the discomfort of elderly residents. These environmental conditions, coupled with the aging infrastructure, highlight the need for sustainable interventions that improve living conditions while preserving historical integrity.

Preserving Huizhou architecture requires more than structural restoration; it demands an adaptive approach that integrates modern needs without compromising cultural heritage. Sustainable renovation must address accessibility, energy efficiency, and social engagement while reinterpreting outdated spatial hierarchies. By incorporating thoughtful, reversible design strategies, these historic dwellings can continue to serve as vibrant community spaces, balancing conservation with contemporary function.

Thesis questions

Main question:

“How can Huizhou residential buildings be sustainably renovated to meet the social and physical needs of elderly residents?”

Sub-question:

“How can traditional elements be retained while outdated or impractical aspects are improved?”

Purpose & Aim

This study explores the intersection of adaptive reuse, heritage conservation, and sustainable architecture, focusing on the age-friendly retrofitting of vernacular buildings. It examines how cultural, environmental, and social sustainability can be integrated into restoration strategies to maintain the values and character of historic structures. By analyzing existing challenges and opportunities, the research aims to identify design approaches that enhance the well-being of older adults while respecting the architectural and historical integrity of these buildings.

Delimitations

- This thesis focuses on the adaptation of Huizhou buildings in rural areas, particularly those inhabited by elderly residents. The study explores possible architectural interventions that balance heritage preservation with contemporary needs. The scope is limited to examining how spatial modifications can enhance accessibility, comfort, and social integration for older adults while maintaining the building's cultural and architectural integrity.

- The study excludes broader discussions on other demographic needs, such as housing for younger populations, multi-generational living, or alternative uses of vernacular buildings.

The research is limited to Huizhou architecture and does not provide a full comparative analysis of other Chinese vernacular typologies, though some references to related traditions may be included for contextual understanding.



Discourse

(1) Environmental Sustainability

This research promotes resource-efficient renovations by utilizing traditional materials and passive design strategies, minimizing the ecological footprint of historic building adaptations. By integrating sustainable construction techniques, it seeks to enhance energy efficiency while preserving the natural and built environment.

(2) Social Sustainability

The project aims to create a livable and inclusive environment that supports aging in place while fostering social interaction and intergenerational connections. By incorporating communal spaces and shared facilities, it encourages elderly residents to engage with both peers and younger generations, reinforcing social cohesion. Accessibility, mobility, and opportunities for community participation are prioritized to ensure that the built environment enhances the well-being and active lifestyles of older adults. Additionally, the careful preservation of heritage values strengthens local identity and cultural continuity, reinforcing a sense of belonging for residents.

(3) Cultural and Historic Sustainability

This project focuses on maintaining the architectural integrity and historical significance of the building while adapting it for contemporary use. Rather than treating the building as a static relic, the design emphasizes the preservation of traditional craftsmanship and materiality. Through thoughtful design interventions, the project ensures that these historic buildings continue to serve as cultural landmarks, preserving their relevance in modern society. This approach strengthens social sustainability by maintaining a shared sense of identity and cultural continuity within the community.

Method

(1) Architectural & Environmental Analysis

Site measurements, damage mapping, and digital 3D modeling are used to study spatial layout, structure, daylight, and ventilation. This helps assess retrofit potential and guides design decisions.

(2) Historical & Typological Study

The building is examined in relation to traditional Huizhou architecture to understand its original functions, symbolism, and how it evolved over time. This forms the basis for identifying elements worth preserving.

(3) Cultural-Historic Value Assessment

Evaluates the architectural, historical, and cultural significance of the chosen building, helping justify preservation over demolition. This includes facade, spatial configuration, craftsmanship, and symbolic meanings rooted in local traditions.

(4) Ethnographic Observation

On-site observation captures how elderly residents interact with the space in daily life, revealing needs and limitations not visible in drawings.

(5) Interviews with Stakeholders

Semi-structured interviews with residents, tourism workers, and community members provide insights into current use, social value, and expectations for future functions.

(6) Contextual & Social Mapping

The building is analyzed in relation to its village context—climate, economy, demographics, and infrastructure—to define realistic and site-specific reuse strategies.

(7) Case Study: Helps analyze real-life examples of ancient Chinese building renovations and their impact on elderly well-being, linking research findings to practical design outcomes.

(8) Design Prototyping & Simulation

Proposed design interventions are tested through digital models, including daylighting and ventilation simulations, to ensure improved performance for elderly users.

Process

Phase I: Preparation

Collecting Information

Reference research

Historical documents

Case study

Positioning

Site study (remote research)

Technology & software learning

Phase II: Mapping

Site visit & data collection

Diagramming & spatial analysis

Literature review & theoretical framework

Phase III: Design Phase

Design strategy & conceptual development

Design implementation & prototyping

Preliminary test results & evaluation

Phase IV: Reflection

Feedback & valuation

Refinement & iteration

Finalizing design details

Building conceptual/physical models

Phase V: Presentation & Discussion

INVESTIGATION

1. ARCHITECTURE



Fig. 4 Huizhou village

Huizhou architecture

History

Huizhou architecture originated in ancient Huizhou and is a quintessential example of Jiangnan (southern Yangtze) architectural style. Historically, Huizhou merchants conducted business in cities such as Yangzhou and Suzhou, significantly influencing local architectural traditions. Due to the region's strong scholarly culture, local residents followed a way of life that combined academic pursuits with commercial endeavors.

From the mid-Ming Dynasty (15th to 16th centuries) onward, the rise of Huizhou merchants and economic prosperity provided them with substantial wealth. This financial success led to the construction of grand residences for hosting guests, the expansion of ancestral halls to honor lineage and strengthen family ties, and the erection of memorial archways as symbols of prestige and legacy. As a result, a wealth of exceptional architectural works was left behind, showcasing the distinctive craftsmanship and aesthetic style of Huizhou architecture. These characteristics are best exemplified in the "Three Masterpieces of Huizhou Architecture" — memorial archways, ancestral halls, and residential buildings.

Connection with surrounding

Huizhou residential architecture emphasizes a deep connection with nature and the harmony between buildings and their surrounding environment. There is a traditional saying: "A dwelling is incomplete without mountains and water." Most ancient Huizhou homes are nestled amid lush mountains and flowing rivers, strategically positioned to integrate with the natural landscape. Alongside pavilions, terraces, towers, pagodas, and archways, these residences create a picturesque setting characterized by the timeless imagery of "small bridges, flowing water, and peaceful homes."



Fig. 5 The environment of Jiangcun

Huizhou architecture in Jiangcun

Jiangcun embodies these architectural traditions, with its built environment forming a well-structured system predominantly composed of Huizhou-style buildings.

Just as in other Huizhou settlements, Jiangcun's architecture extends beyond residential dwellings to encompass a diverse range of subsystems, including transport infrastructure, educational institutions, charitable organizations, ancestral worship sites, and religious structures.

These elements collectively reinforce the village's cultural and spatial continuity, ensuring that Jiangcun remains a living testament to the enduring legacy of Huizhou architecture.

"Three Masterpieces of Huizhou Architecture" in Jiangcun



Fig. 6 Memorial archway



Fig. 7 Ancestral hall



Fig. 8 Residential buildings

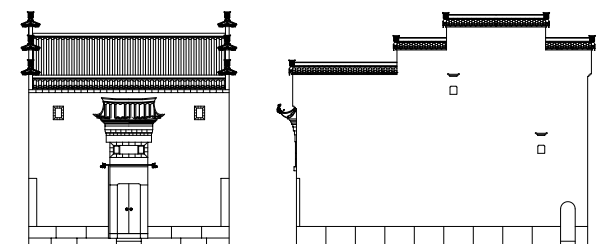
Architectural Features

Huizhou architecture is characterized by its adaptive site planning, seamlessly integrating with the natural landscape through thoughtful and harmonious design. In terms of spatial layout, it offers great flexibility and variation, with buildings typically oriented southward to optimize natural light, and a strong emphasis on internal courtyards to enhance daylight penetration and ventilation. The architectural composition is rich and rhythmically balanced, with iconic features such as horse-head walls and small gray tiles.

Constructed primarily from brick, wood, and stone, Huizhou buildings rely on wooden frameworks, with wooden beams bearing the structural load and brick, stone, or rammed earth forming the enclosing walls. The design centers around a main hall, often adorned with intricately carved beams, painted decorations, and elaborate roof and eave embellishments. A hallmark of Huizhou architecture is its masterful integration of carving techniques—stone, wood, and brick carvings are seamlessly combined, creating an ornate and majestic aesthetic.

1. Facade and the “Horse-head” walls

The exterior walls of Huizhou residential buildings is mostly painted with white lime, and the roofs are covered with greenish-black tiles. The facade typically has no windows or only small high-set windows.



A typical facade of Huizhou architecture

Another defining feature of Huizhou building facade, horse-head walls are elevated sidewalls extending above the roofline, originally designed as firebreaks in tightly clustered villages where wooden structures were prone to fire. These walls also provide protection against wind, rain, and lightning, with their pointed tops acting like natural lightning rods to shield the main structure.

Beyond their functional role, horse-head walls carry cultural significance. Their stepped design, ranging from one to five tiers, reflects a household's heritage and social status—the more tiers, the more distinguished the family. The walls are often adorned with brick carvings and ornamental details, blending practicality with Huizhou's refined architectural aesthetics.



Fig. 9 The horse-head wall

2. Courtyard

The courtyard(tianjing) is a distinctive feature of Huizhou architecture, functioning as a transitional space between indoors and outdoors, it serves both practical and symbolic purposes, facilitating movement within the house while embodying wishes for prosperity and good fortune.

Characteristics

A typically enclosed central courtyard, formed by surrounding walls and rooms. It may be enclosed on four sides or partially open, with two or three walls forming the boundary. Generally located in the central axis of the house and flanked by side rooms, the courtyard floor is paved with blue bricks. Due to the surrounding high walls, natural light is limited, giving the space a deep, well-like appearance—hence the name tianjing ("sky well"). These courtyards connect the street and indoor spaces, creating a dynamic interplay of openness and enclosure.



Fig. 10 Huizhou building(Sohu,2017), shows the sloped roof and the courtyard

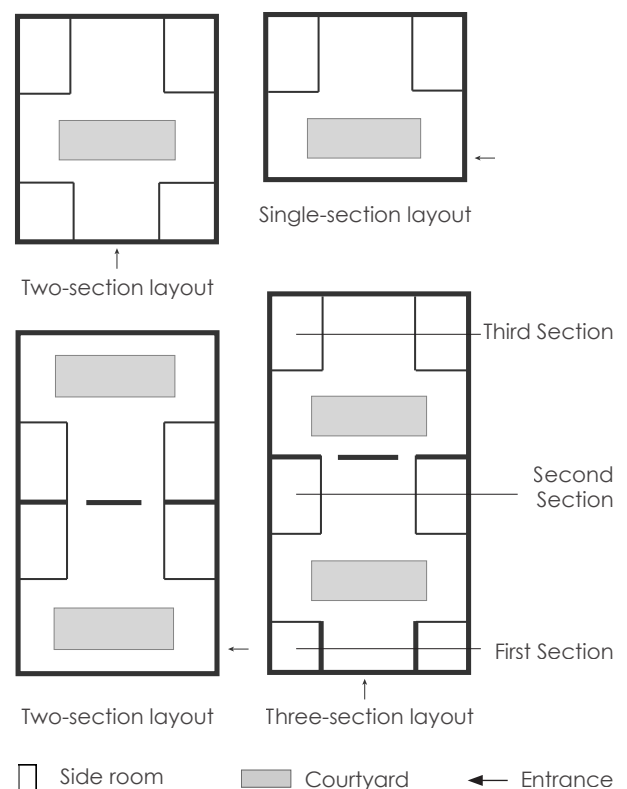


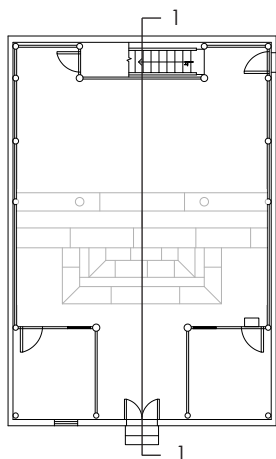
Fig.11 The upward view from courtyard

Huizhou buildings are typically rectangular and organized around a central courtyard, following a modular system based on "sections" (进). The most common layout consists of a front hall, a central courtyard, and a rear hall with side rooms, extending along a longitudinal axis. Larger residences may include additional sections.

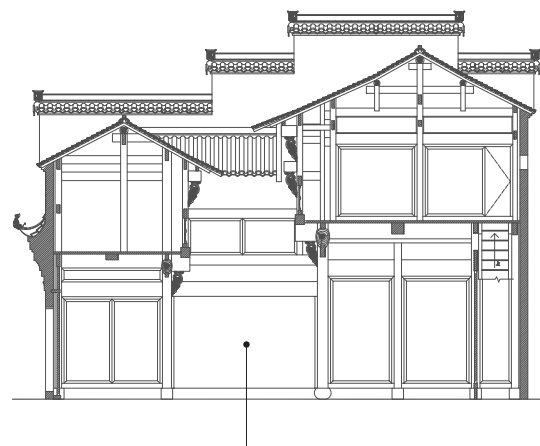
While the scale and form vary, Huizhou dwellings adapt to terrain and functional needs, maintaining the courtyard as a core element. Some layouts feature a single courtyard, while others incorporate multiple interconnected sections, often separated by courtyard, creating a seamless flow between spaces. These variations reflect the adaptability of Huizhou architecture, balancing functionality with environmental considerations.

Four main layout of Huizhou residential buildings





Typical floor plan of two-section Huizhou dwelling



1-1 Section Courtyard space bwtween two sections

Function

In the hot and dry summers of Huizhou, proper ventilation and lighting are crucial. The enclosed structure of traditional dwellings, with high walls and small windows, minimizes direct sunlight but also reduces natural illumination. The *tianjing* serves as the primary source of daylight, reflecting sunlight into interior spaces to create a softer, more diffused glow. Hollow-carved wooden doors in the surrounding rooms further enhance light penetration.

Beyond lighting, the *tianjing* plays a crucial role in passive cooling and ventilation. Acting as an air channel, it forms a natural ventilation system together with corridors and main halls. During the day, as sunlight heats the air in the courtyard, warm air rises, creating low pressure that draws cooler air from inside the house. At night, as the courtyard cools rapidly, air sinks, pushing fresh air into the rooms.

Water features such as ponds, vats or ditches in the courtyard further lower air temperature, making the space feel like a natural air-conditioning system. Functionally, the courtyard operates as an independent microclimate—externally enclosed yet internally open, balancing environmental factors within the home.



Fig.12 Ditches in courtyard



Fig.13 Ponds and vats in courtyard (Luzai, 2017)

3. Decorative carvings

Huizhou Three Carvings refer to the three traditional Chinese folk carving techniques in the Huizhou architectural style: brick carving, stone carving, and wood carving.



Fig.14 Stone carving on a memorial arch

Stone carving is widely used in columns, entrance walls, archways, and tombs.



Fig.15 Brick carving on the doorway

Brick carving, made from finely engraved gray bricks, adorning gates, eaves, and rooftops with elegance and dignity.



Fig.16 Wood carving in the Ancestral hall

Wood carvings were mainly used for decoration on buildings and household appliances.

Confucianism and Feng Shui

Confucianism, as a dominant system of thought, philosophy, and religion that originated in China, has profoundly shaped all aspects of Chinese society, including politics, economy, and architecture. Its core values—benevolence, righteousness, propriety, wisdom, and filial piety—emphasize social harmony, family ethics, and hierarchical order. These principles have left a deep imprint on Huizhou architecture, where spatial organization reflects Confucian ideals of family hierarchy, respect for ancestors, and community cohesion.

The central hall of Huizhou residences, for example, serves as a symbolic and functional space for ancestral worship and family gatherings, reinforcing traditional patriarchal structures.

In the past, women's space was mainly confined to the first floor, with poor visibility and lighting conditions. They often stayed at the more open area with railing, so this part of the space was called the "Meiren Kao" (Beauty Lean).

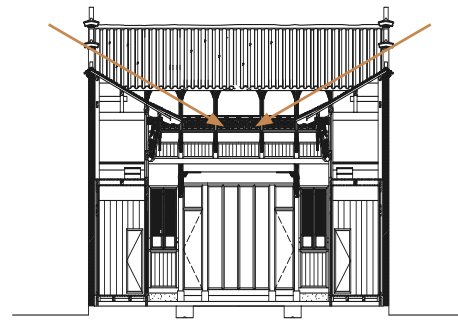


Fig. 17 Main hall



Fig. 18 View from the first floor (Beauty Lean)

Feng Shui, an ancient Chinese system governing spatial arrangement and energy flow, has also played a crucial role in shaping Huizhou architecture. The orientation, layout, and structure of buildings were designed to align with natural forces, ensuring harmony between human habitation and the environment. Huizhou residences often feature inward-facing courtyards and sloped roofs designed to collect rainwater, symbolizing the accumulation of wealth and prosperity—an idea deeply rooted in Feng Shui beliefs.



Section of courtyard next to the main hall
The inward-sloping roof helps collect rainwater and aligns with the Feng Shui concept of keeping wealth and good fortune within the home.

At the same time, the emphasis on enclosure and privacy was also a product of Confucian social norms, particularly regarding gender segregation. In traditional Huizhou society, where men frequently traveled for trade, women were largely confined to the domestic sphere. Architectural elements such as small, high-positioned windows on the first floor reinforced this separation, limiting external visibility and interaction.

These architectural features represent a valuable cultural heritage that embodies centuries of wisdom in fire prevention, climate adaptation, and spatial organization. Beyond their practical functions, they reflect the region's historical, social, and artistic traditions. As traditional Huizhou buildings face increasing threats from modernization and neglect, preserving and adapting them is essential to maintaining their architectural identity and cultural significance for future generations.



Fig. 19 Front facade of the selected building

Building Overview

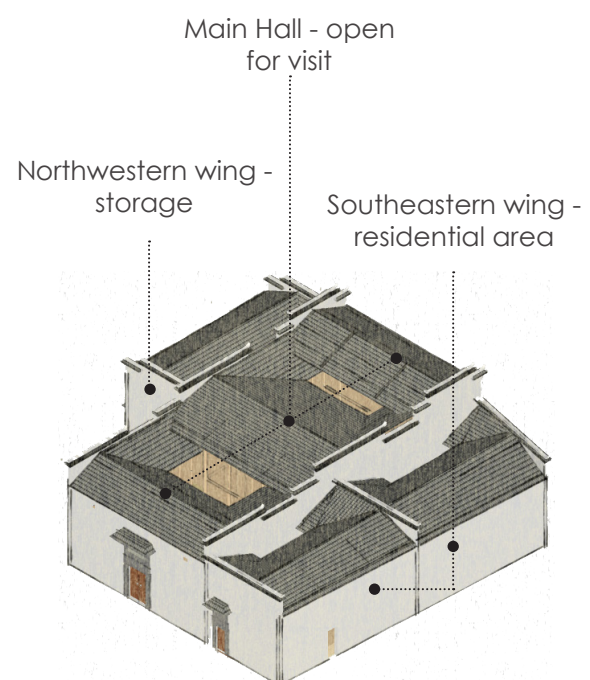
History

This two-story Huizhou building originally served as the residence of the affluent Jiang family, is over 100 years old. This building covers an area of 538.86 square meters. It is a brick-wood structure and is named "Jinxiu Hall," meaning a place for cultivating virtue and pursuing knowledge. The building follows a three-section layout, with each section rising higher than the previous one, symbolizing steady advancement. After the founding of the People's Republic of China in 1949, it was repurposed to accommodate multiple households. Today, it is home to an elderly couple, both 85 years old.

Current Situation

The main hall serves as the central structure, with the east and west wings, along with the kitchen, facing it in a seemingly symmetrical arrangement. The building features two large courtyards at the front and rear, with walkways and courtyard edges paved with stone slabs, while the rest is laid with diagonally arranged square bricks.

Currently, the elderly couple who own the house reside in the southeastern wing, while the main building is leased to a tourism company and open to visitors.



Existing Condition

Previous Repairs

Over the past century, this building has undergone multiple renovations. Previous issues such as roof leaks, fractured and decayed beams and columns, and cracked exterior walls have largely been repaired.

These repairs did not involve any structural changes, and the overall layout and form of the building have been largely preserved in their original state.

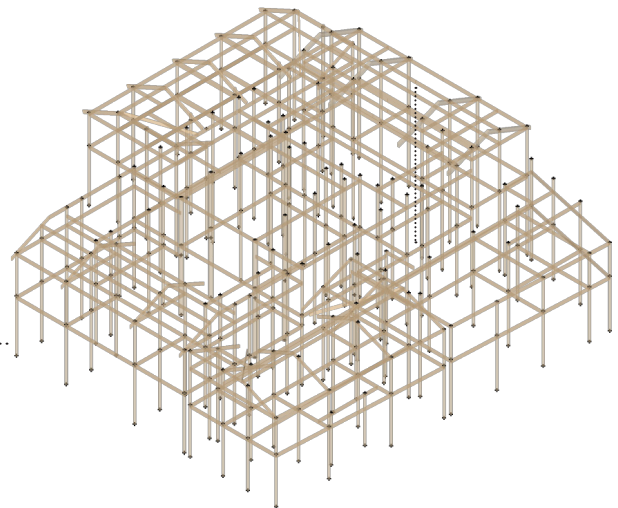
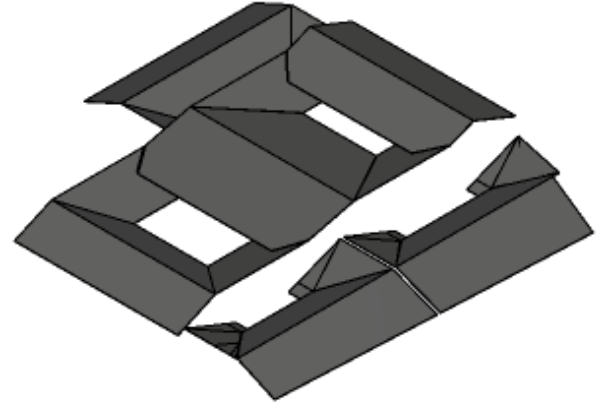


Fig. 20 First floor gallery



This is especially evident in the roof and windows, where the lighter-colored wood marks areas that have been more recently replaced.



Fig. 21 New drainage guttering



Fig. 22 New drainage pipe



Fig. 23 New drainage pipe



Fig. 24 Damaged first floor slab

Previous Intervention

During a government-led renovation about ten years ago, stainless steel drainage pipes were added to the building. These were installed along the eaves above the courtyard and included downpipes at roof corners and courtyard edges, directing rainwater into ground-level drains.

This helps avoid problems caused by excessive water pooling in the courtyard, especially the safety risks for the elderly. However, the choice of materials doesn't fully align with the architectural style and characteristics.

Damages

Due to the absence of regular occupancy and use in the main structure, certain damages and issues persist, requiring urgent attention.

- Structural deterioration.

The First floor has not been maintained or reinforced, with thin flooring that provides poor sound insulation and raises safety concerns.

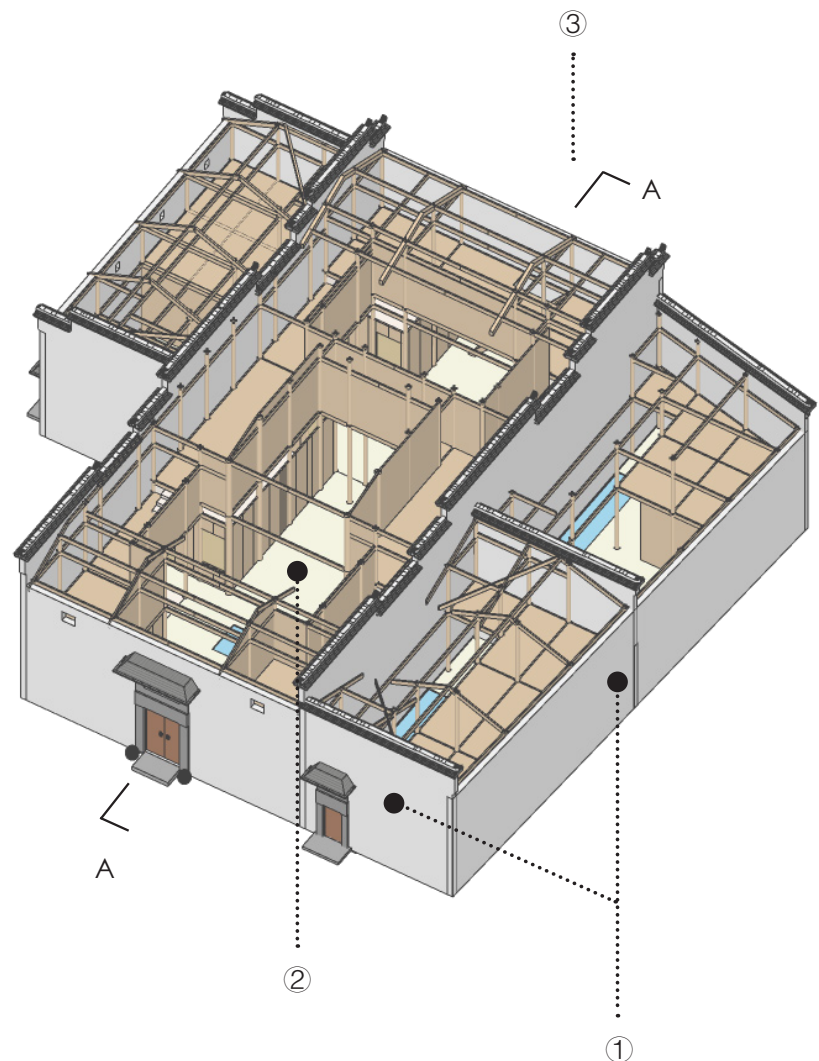
Value

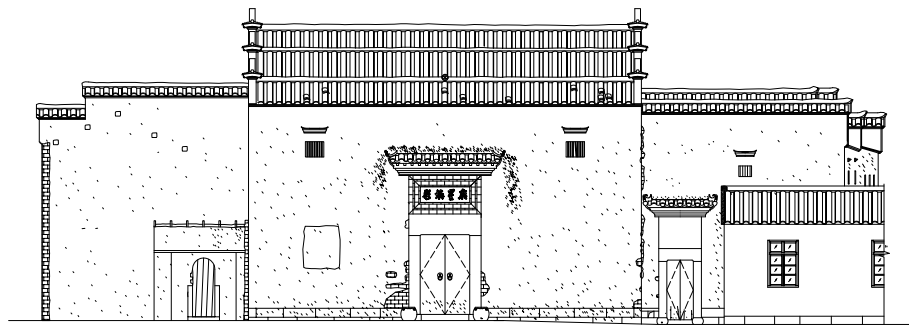
By evaluating the architectural, historical, and artistic significance of the selected buildings, the assessment helps identify which elements should be restored, preserved, or adapted.

The value of the building lies primarily in several key aspects: its well-preserved traditional façade, which reflects the typical stylistic language of Huizhou architecture; the distinctive three-section layout with two internal courtyards, offering spatial depth and climatic responsiveness; and the intricate wood carvings, which carry both artistic merit and cultural symbolism.

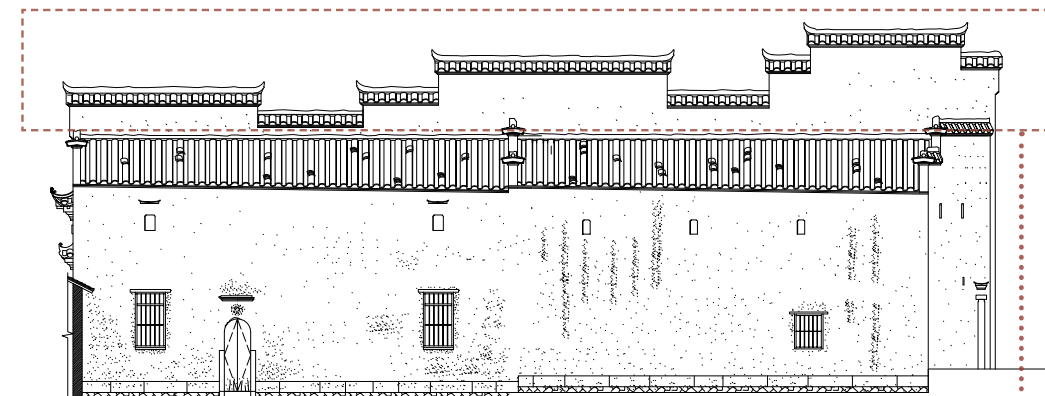
These features serve as the foundation for informed conservation decisions, guiding which components warrant careful preservation and which areas allow for sensitive adaptation.

This process ensures that conservation efforts are aligned with both cultural heritage values and contemporary functional needs, enabling a balanced approach that maintains authenticity while enhancing usability.





Front Facade



Eastern Facade

The "horse-head" wall

① Typical facade

The building's facade features a classic Huizhou-style design, with white walls, grey-tiled roofs, and horse head walls on both sides.



Fig. 25 View of eastern side of the building

② Three-section layout with two courtyards

This building follows a typical three-section layout, with additional structures on the east and west side to accommodate the large family size. This exemplifies the flexible spatial organization of Huizhou Architecture within established design principles.



Fig. 26 View of the courtyard from the first floor



Fig. 27 View of the opening from the ground floor

③ Wood carvings

The building's interior is entirely wooden, including beams, columns, walls, and flooring, reflecting traditional craftsmanship worth preserving.

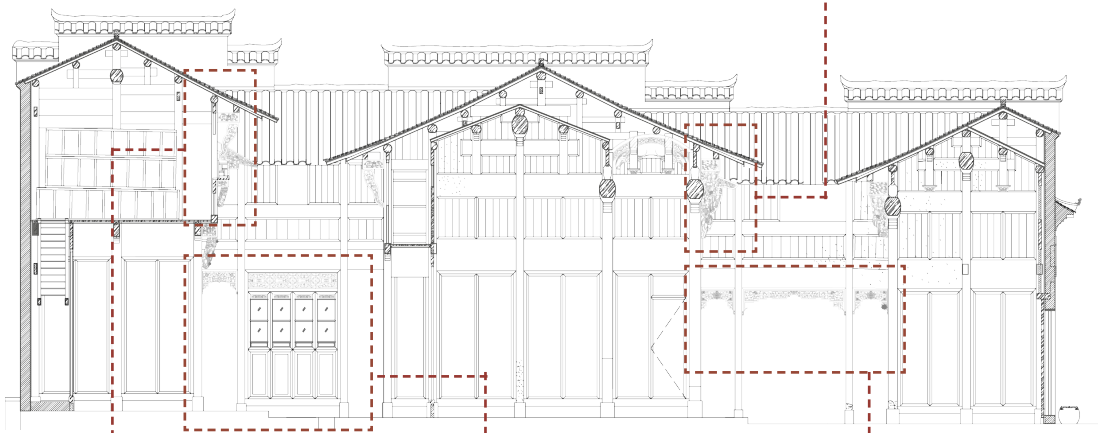
The two courtyards surrounded by intricate plaques and wood carvings of historical and aesthetic value. Many doors and windows, as well as the outer sides of interior columns, are also adorned with fine carvings.

C



Fig. 28 Wood carving in the Main Hall

Location of wood carvings on section



A-A Section

a



Fig. 29 Wood carving on the of the colimuns

b



Fig. 30 Windows with Wood carving

d

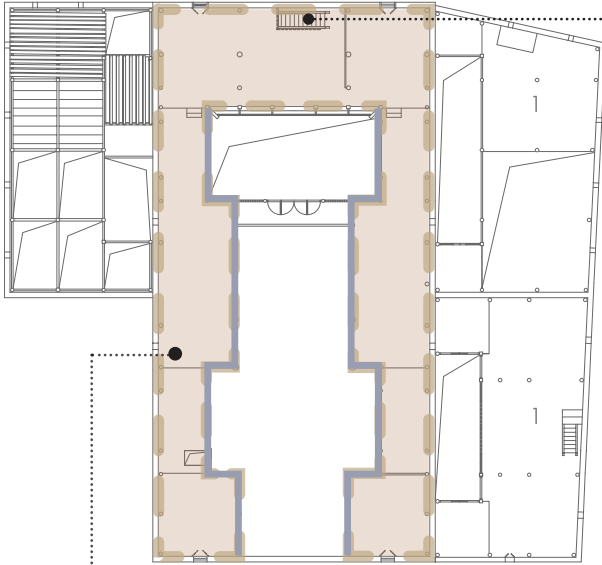


Fig. 31 Windows with Wood carving

The building's value lies in its characteristic Huizhou facade, well-structured spatial organization, and refined wood carvings, all of which reflect its historical and artistic merit. Its courtyard layout and ornamental details not only showcase traditional craftsmanship but also contribute to the building's livability and cultural identity. Preserving these key elements will uphold the integrity of Huizhou architecture while enabling sustainable revitalization for future use.

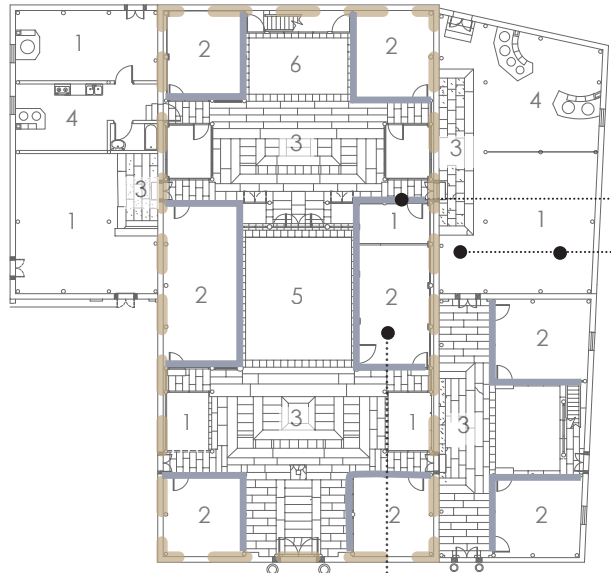
Problems

First floor plan



Influenced by traditional Confucian values, the building was originally designed with a focus on hierarchy and inward-facing spatial arrangements, which limits natural light and accessibility. Combined with a lack of funding for regular maintenance and functional upgrades, these factors have led to several usability issues.

Ground floor plan



- 1 Storage
- 2 Bedroom
- 3 Courtyard
- 4 Kitchen
- 5 Living room
- 6 Main hall
- Open to visitor
- Double-height area
- Floor deterioration
- Uninsufficiently insulated interior wall



Fig. 32 First floor gallery



Fig. 33 Room on Ground floor

· Lack of sunlight
The Building has limited windows, leading to poor natural lighting on first floor and rooms on ground floor.

- Accessibility limitations. The narrow and steep stairs make it difficult for elderly residents to move around easily and safely.



Fig. 34 Staircase

- Uninsufficiently insulated. Thin wooden walls and open courtyards make the house, especially bedrooms, extremely cold in winter.



Fig. 35 Thin wooden patio



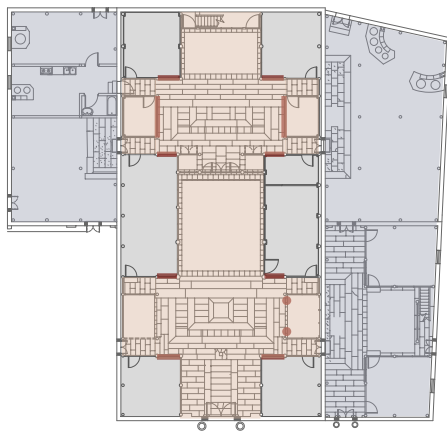
Fig. 29 storage area

- Ineffective use of space. The absence of proper wall partitions on the eastern side of the building reduces functional organization.

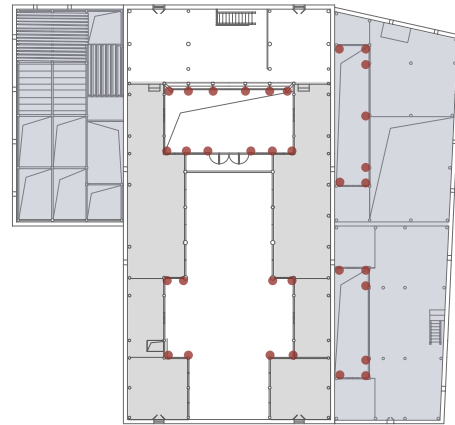


Fig. 36 Current Kitchen and storage area

Assessment of Design Potential






Ground floor



First floor

- Wood-carved windows
- Exterior-attached wood carving

Based on the analysis of damages and historical significance, the building can be divided into three categories:

-  *Areas of historical-architectural value*
This section highlights the traditional three-section layout of Huizhou architecture, a defining feature of the building's spatial organization. The courtyards, adorned with intricate plaques and wood carvings, hold both historical and aesthetic significance, showcasing traditional craftsmanship. These key elements are critical to its cultural heritage and should be preserved with minimal alteration.
-  *Areas for improvement*
These rooms lack natural light due to smaller or fewer windows, so additional light may be needed later depending on the function.
-  *Areas for flexible transformation*
The ancillary parts of the building lack distinctive Huizhou-style features or preservation-worthy elements, thereby offering greater potential for flexible transformation in terms of both function and facade design.

2. Cultural & Societal Context



Fig. 37 Renovated Huizhou-style buildings and new Huizhou-style residential building

Site Analysis & Interview



Pond

River

Private garden

Bathroom

Outdoor storage

Farmland

Main building

Private garden

Storage

Public green area

Farmland

Entrance

Property boundary

Newly-built residential buildings

Existing Site Plan

1:500

In recent years, more and more newly built residences mimicking Huizhou architectural aesthetics have emerged alongside the original structures in the village.

Surrounding situation



Fig. 38 View from river side

The building faces southwest, aligning with the overall orientation of the village, with a small stream to its northwest. And there is a short wall runs along the road



Fig. 39 Farmland

A plot of farmland lies directly adjacent to the southeast side of the building, where the elderly couple living here engage in daily agricultural work.



Fig. 40 Private garden

On the north and east sides of the building, there are enclosed private gardens separated by boundary walls. While part of the area has been used by the owner as farmland, large portions remain as open space with unmanaged green area.

All these space has great potential to be restored.



Fig. 41 Newly built residential buildings with modern features



Fig. 42 Newly built residential buildings with modern features

The newly built residences in the surrounding area retain some Huizhou architectural features, such as white walls, black tiles, and horse-head walls, while also incorporating modern elements like glass windows, metal doors, and railings.

Tourism development of the village

Jiangcun Village is a famous tourism attraction today, known as Jiangcun Scenic Area, was established in 1999 alongside Jiangcun Tourism Company. On May 21, 2001, then-President Jiang Zemin visited the village, boosting its recognition and attracting investment for preserving ancestral halls, memorial archways, and ancient residences, as well as improving tourism infrastructure.

By August 2002, key historical buildings had been restored, the outer ring road expanded, parking facilities upgraded, and the Jiangcun History and Culture Exhibition Hall redesigned. A dedicated tourism route was introduced, along with new roads and essential facilities to enhance both village life and tourism.

Tourism can bring both opportunities and challenges, particularly for its

elderly residents. It also supports local businesses, such as family-run guesthouses, traditional crafts, and local cuisine, providing elderly residents with opportunities to engage in cultural tourism. Many seniors can participate by sharing local history, leading cultural workshops, or preserving traditional skills, allowing them to stay active and socially engaged.

Moreover, tourism can enhance public services and community facilities, improving healthcare access and overall quality of life. The revitalization of traditional industries, such as handicrafts and tea culture, allows the elderly to pass down knowledge to younger generations, strengthening cultural heritage. On the other hand, unregulated tourism development may disrupt the traditional way of life.



Fig. 43 Jiangcun



Fig. 44 Jiangcun



Fig. 45 Jiangcun



Fig. 46 The interior of a Huizhou building in Jiangcun, which has been transformed into a restaurant

Interviews with people on the site



1) Hotel Owner – Middle-aged, Non-local

"Most visitors are middle-aged and elderly, but in recent years, there has been a growing trend of younger tourists."

"To accommodate the increasing number of visitors, we are renovating additional accommodations in the village and considering opening a café or tea house, which is currently missing in the area."

2) Hotel Staff – 25 years old, Local, Summer Part-timer

"There are no peers in the village and no entertainment activities."

"Tourists are mostly present during holidays. Some visitors heading to nearby famous attractions also stay here, and a shuttle runs daily between the sites."

3) Ticket Inspector – 63 years old, Local

"The tourism company provides job opportunities. The work is simple and easy, and it adds to our income."

4) Elderly Couple – 85 years old, Local, Current Residents of the Studied Building

"It's quite cool in the summer but extremely cold in winter. Our children all live and work elsewhere and don't want to return."

"We rent the house to the tourism company to increase our income."

"There isn't much to do daily for us, mainly just farming ."

Insights for program

The interviews revealed that the development of tourism has significantly influenced the local commercial structure and residents' daily lives.

With sustainable tourism practices, Jiangcun can balance economic development with the well-being of its aging population, ensuring that tourism remains a driver of community resilience and cultural preservation.

Existing social problems

1) Aging Population and Outmigration
Many younger generations have moved to cities for work, leaving behind an aging population with limited social support. The elderly, like the couple interviewed, face isolation and a lack of engagement in daily activities.

2) Tourism-driven Development vs. Cultural Preservation
While tourism provides economic opportunities, much of the development focuses on accommodating visitors rather than preserving the village's cultural and architectural heritage. The expansion of accommodations and commercial ventures may alter the traditional landscape.

- 3) Reinterpreting Tradition for Modern Adaptation
Additionally, the presence of modern architectural elements in the surrounding buildings—such as glass windows and metal railings—creates an opportunity for contemporary design interventions. However, using materials like wood framing instead of metal can better respect the building's original style, allowing updates to blend into the environment without feeling out of place.

These newly built buildings have

adapted to modern living needs in terms of functionality, but their appearance and form leave much to be desired. One cannot help but worry whether the original Huizhou architectural style will gradually fade away with the passage of time. It is essential to approach and handle these historically valuable structures with caution and reverence, as this is the key to preserving their legacy.

4) Challenging Outdated Perceptions Through Architectural Language
While some design principles were historically significant, some aspects, particularly those tied to feudal gender restrictions, are no longer applicable in modern society. However, rather than discarding these traditional elements outright, their reinterpretation offers an opportunity to balance cultural preservation with progressive adaptation. By rethinking spatial configurations while retaining the artistic and environmental wisdom of Huizhou architecture, it is possible to sustain its heritage while fostering more inclusive and functional living environments.

This approach lays the groundwork for the next phase of architectural transformation, where tradition and modernity can coexist in a more equitable and sustainable manner.



Fig. 47 Jiangcun villagers

Reference Projects

These reference projects are transformations of Huizhou buildings, focusing on cultural preservation and technology integration, as well as humanistic care.

Ancestral Hall

Cangkou Village, Lishui City, Nanjing Province, China



Fig. 48 left: before; right: after renovation(Mix Architecture, 2021)

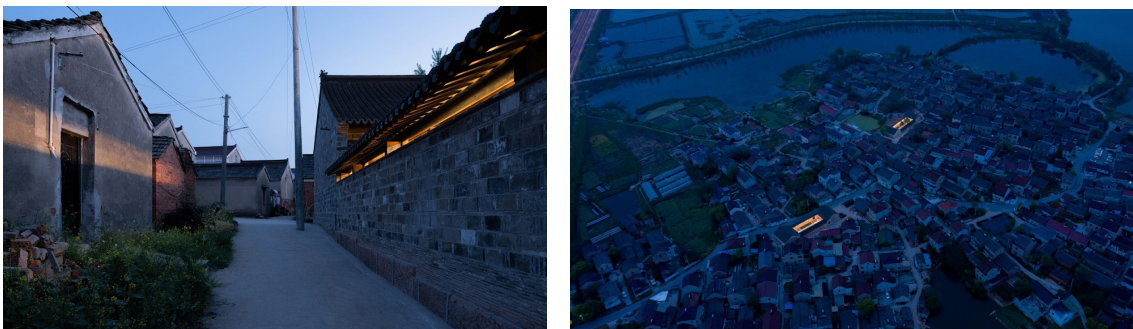


Fig. 49 The penetrating light
(Xiao, b., 2021)

Fig. 50 Night view(Xiao, b., 2021)

This project maintains the building's privacy while creating a connection with the surrounding streets through the controlled distribution of interior light.

By allowing natural light to flow from the interior to the exterior, the design fosters interaction between the building and the villagers who cannot directly access the space. This approach not only enhances the public realm but also embodies humanistic care, offering visual engagement and indirect access to the historical and cultural essence of the building.

History Museum of Qifeng Village

Shitai County, Chizhou City, Anhui Province, China
SUP Atelier/ School of Architecture, Tsinghua University



Fig. 51 Inner street on the northeast side after renovation(Wang, R., 2018)



Fig. 52 Clerestory windows were added to the roof(Wang, R., 2018)

This project transforms a former residential compound into a community space and a history museum, while carefully opening up certain facades to improve daylight access and spatial transparency. The design utilizes local materials, focusing on recycling and processing, with techniques familiar to local craftsmen. Given the area's climate—hot summers and cold winters—clerestory windows were added to enhance ventilation and daylight, especially during the humid and hot spring and summer months.

Insights for Implementation

The Qifeng Village History Museum demonstrates the value of low-tech, climate-responsive design strategies. However, the museum's oversized front opening, while visually striking and potentially effective in drawing tourist attention, compromises thermal comfort. It allows excessive heat gain in summer and makes indoor temperature regulation more difficult, reducing energy efficiency. Moreover, the scale and expression of this large entrance diverge from typical of traditional Huizhou architecture, making it less contextually appropriate.

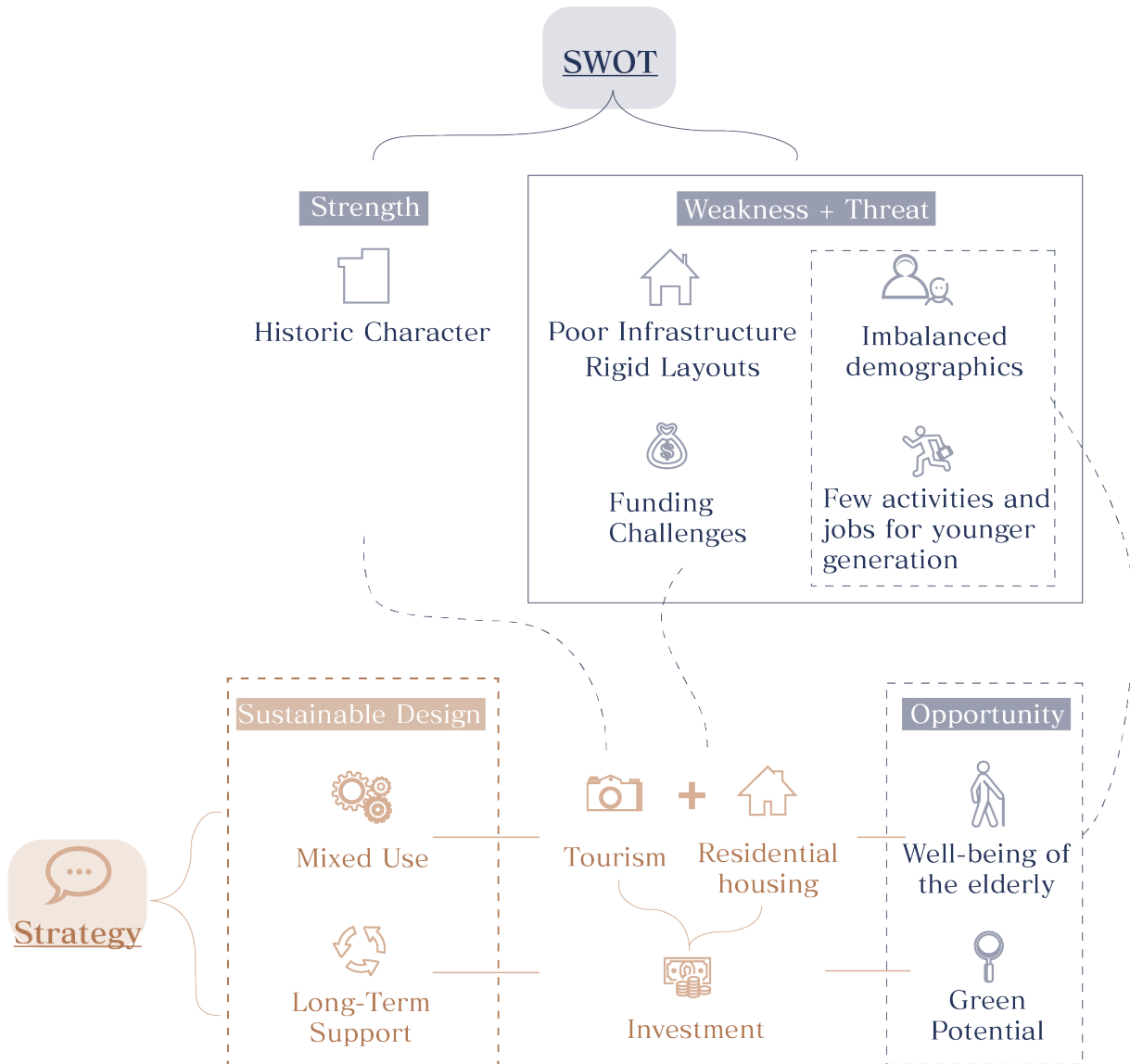
Despite this, the museum's overall strategy—minimal intervention, respect for traditional materials, and flexible space for future community use—remains a valuable reference for heritage reuse in rural settings.

Similarly, the renovation of the Ancestral Hall emphasizes the balance between maintaining spatial privacy for residents and opening the space to foster social inclusion. This sensitivity to community dynamics is essential to my own design approach, particularly in supporting aging in place.

Both projects treat cultural and historical value not as decorative afterthoughts, but as integral to the design process. In my project, I will adopt and adapt these principles to safeguard Huizhou-style features, ensuring the building remains culturally resonant and functionally relevant for the local community.

3. Programme Analysis

Through a SWOT analysis of the building and site, the direction of the renovation can be further defined.



It shows that focusing on elderly care needs while integrating with the local tourism industry offers strong development potential. This approach can support both the sustainable development of the historic building and the exploration of new models in the elderly care sector.

Possible changes

The building features extensive unused space both inside and outside, offering significant potential and flexibility for future renovation. These vacant areas provide opportunities to introduce new functions while preserving the historical character of the structure.

This adaptability allows for thoughtful redesigns that can accommodate modern needs while respecting the building's architectural heritage.



- Enhancing Accessibility While Preserving Historical Aesthetics



- Improving Natural Daylighting & Insulation Using Traditional Design Principles



- Introducing Additional/ Reversible Modern Interventions

*According to standards, the recommended indoor temperature for elderly residents is around 18°C. However, due to regional constraints and building conditions, this proposal considers maintaining the indoor temperature within a range of 16–18°C as acceptable.

Challenge

However, several challenges need to be addressed during the renovation process. For example, improving daylight access and thermal insulation is essential for creating a comfortable and safe environment for elderly users, but such upgrades must be carefully implemented to avoid compromising

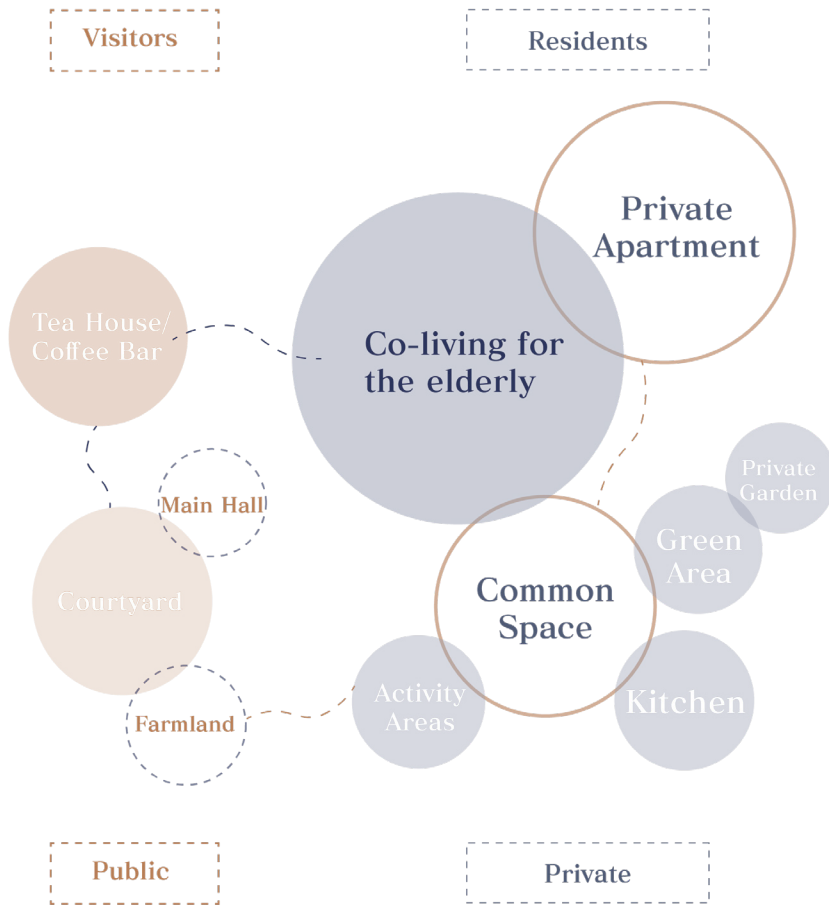
the building's original character and heritage value. Solutions may include using reversible interventions, integrating insulation materials into less visible areas, and employing traditional methods with modern adaptations to preserve authenticity while enhancing performance

IMPLEMENTATION

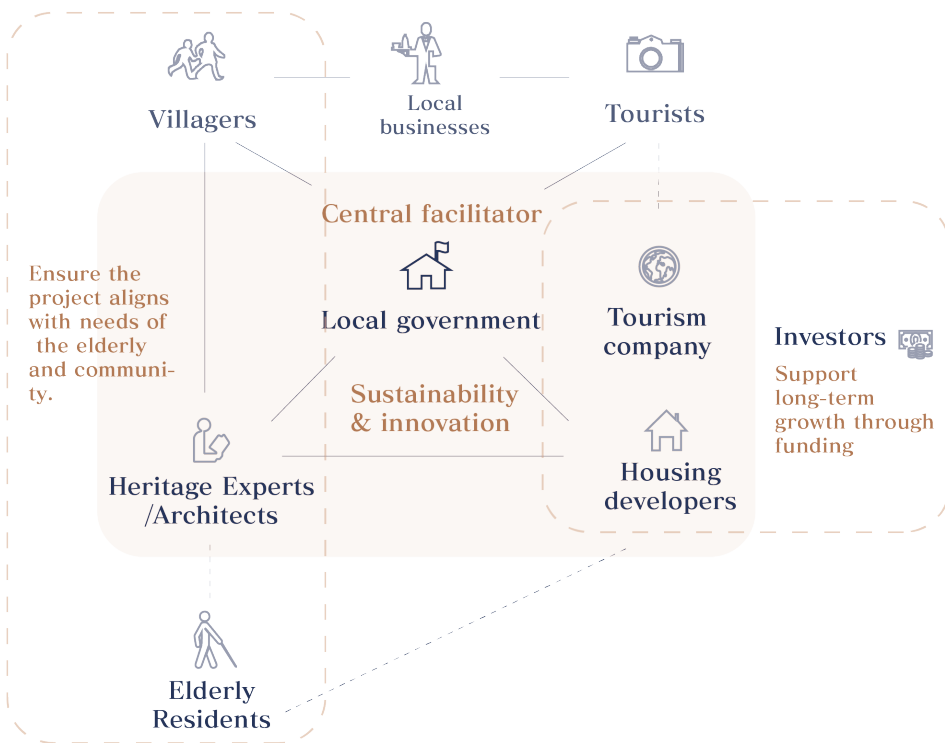


Fig. 53 Skylight design for increasing light

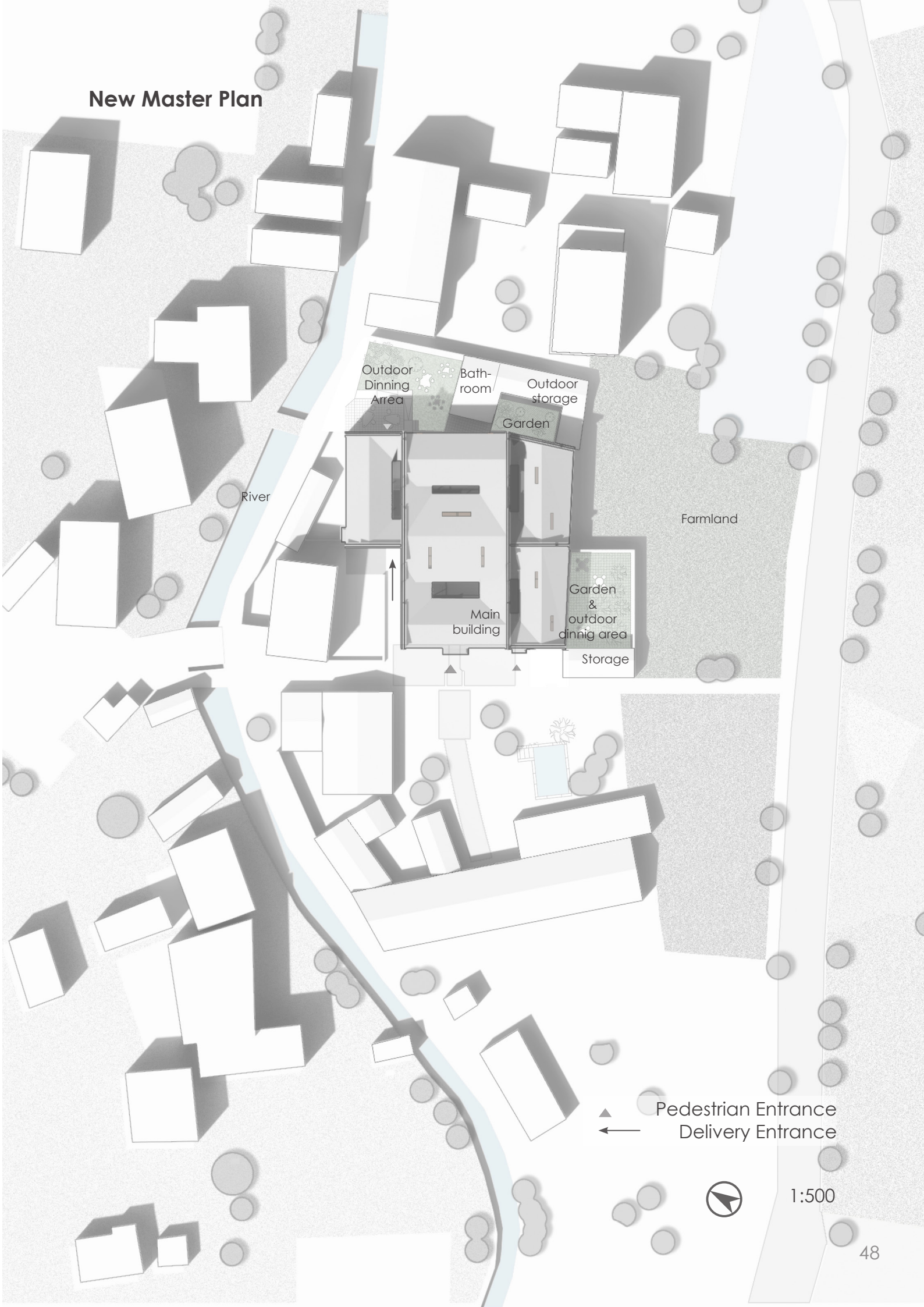
Programme



Stakeholders



New Master Plan



River

Outdoor Dining Area

Bathroom

Outdoor storage

Garden

Farmland

Main building

Garden & outdoor dining area

Storage

▲ Pedestrian Entrance
← Delivery Entrance



1:500

New floor plan

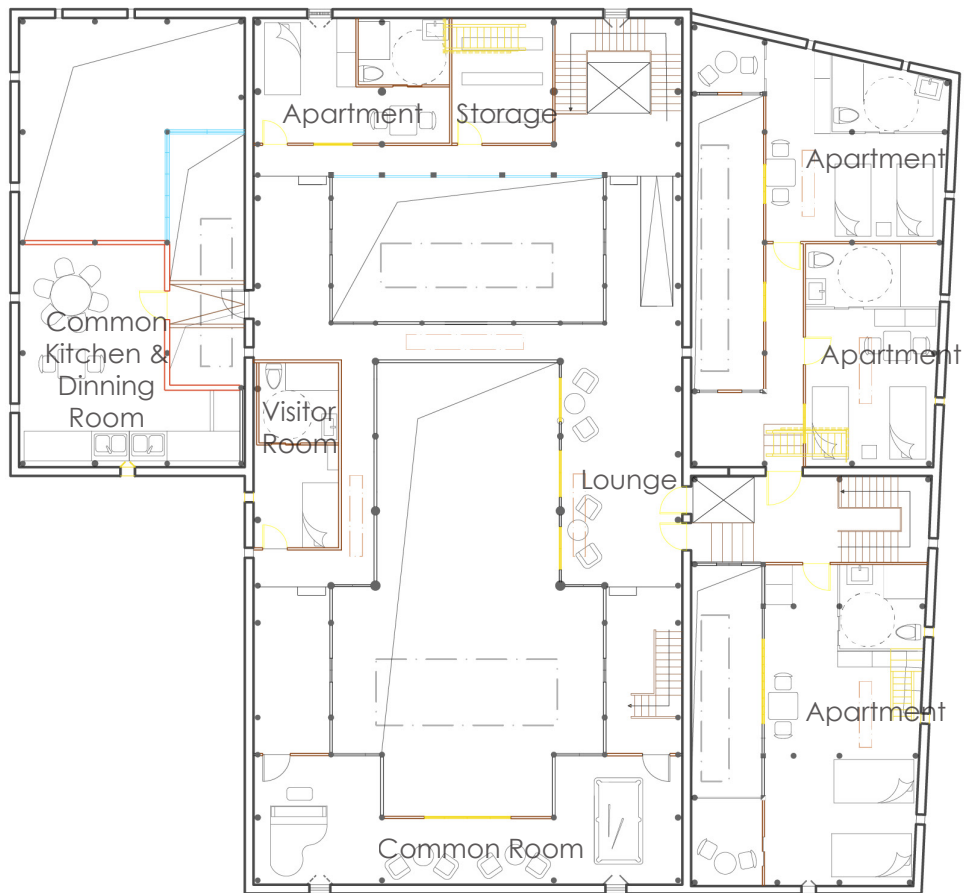


Ground floor plan 1:200

▲ Entrance

□ Skylight above

Outdoor space



First floor plan 1:200

- | | | | |
|--|---------------------|--|-------------------------|
| | Existing to remain | | |
| | To be demolish | | |
| | New windows | | |
| | New brick wall | | |
| | New glass wall | | Double-Hight space |
| | New wooden elements | | New opening in the roof |

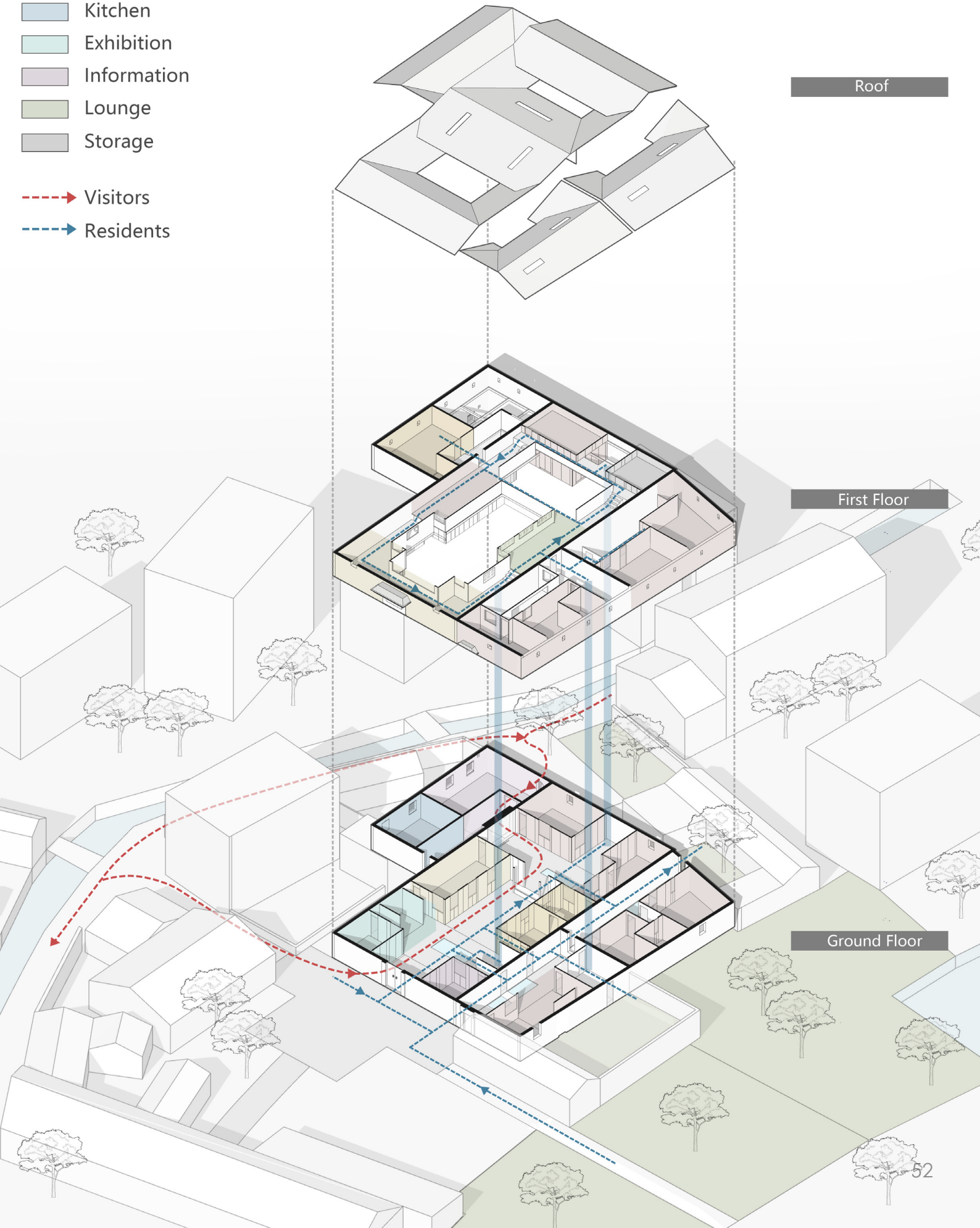
Function and Circulation Analysis

Residents primarily use the main entrance but also have access to a separate, resident-only side entrance. Visitors can enter the building either through the main entrance or via the teahouse located along the pedestrian path. From there, they may explore the central courtyard, where limited interaction with residents naturally takes place. Public functions are concentrated on this side to reduce potential conflicts, even when spaces are shared.

Visitors are restricted to the ground floor and can only access shared spaces like the courtyard and teahouse. This layout encourages light interaction while maintaining privacy and minimizing disturbance for daily residential life.

- Apartment
- Common Room
- Common Kitchen&Dinning Room
- Tea House/Coffee Bar
- Kitchen
- Exhibition
- Information
- Lounge
- Storage

- Visitors
- Residents



Roof

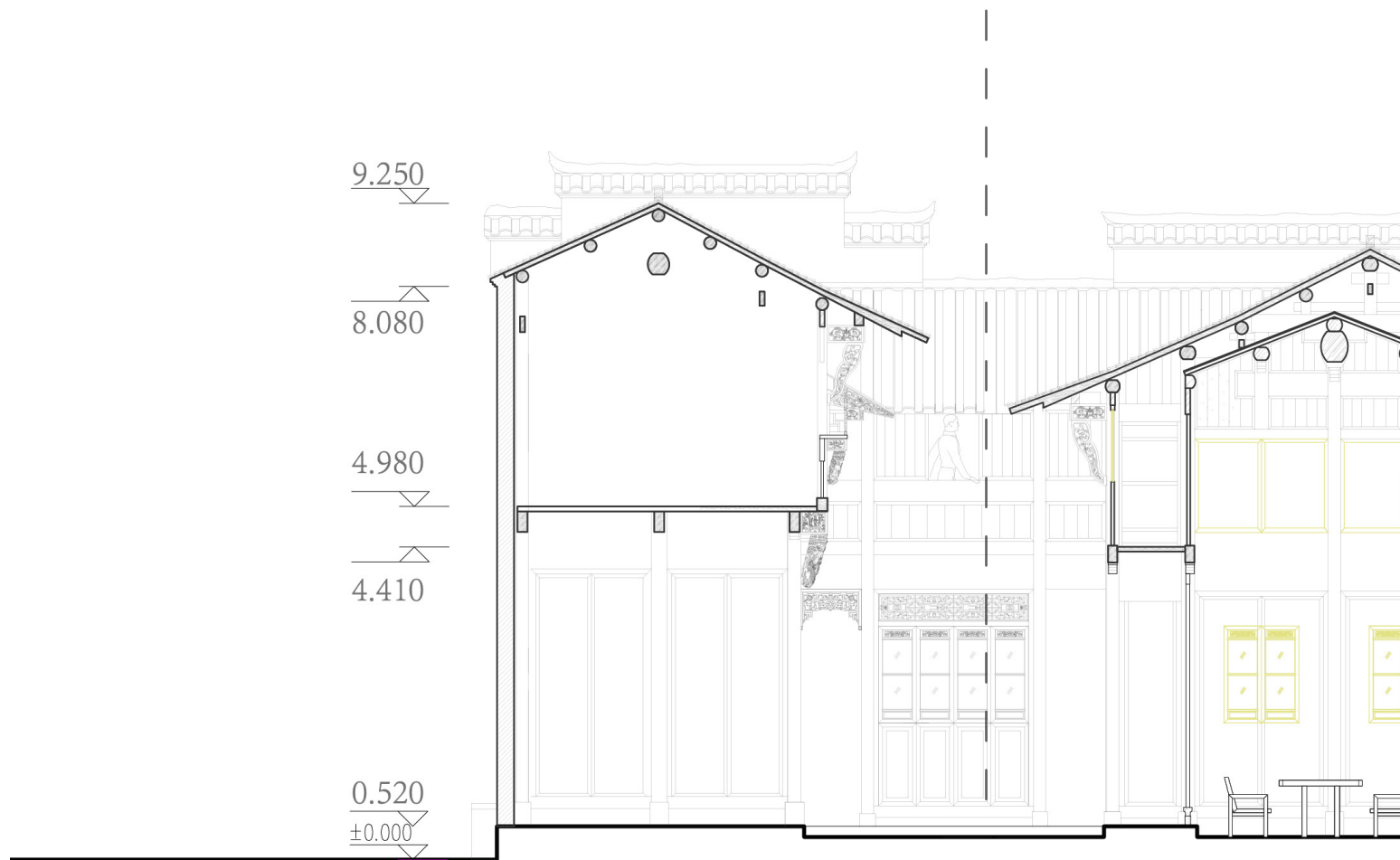
First Floor

Ground Floor

New Section



Courtyard

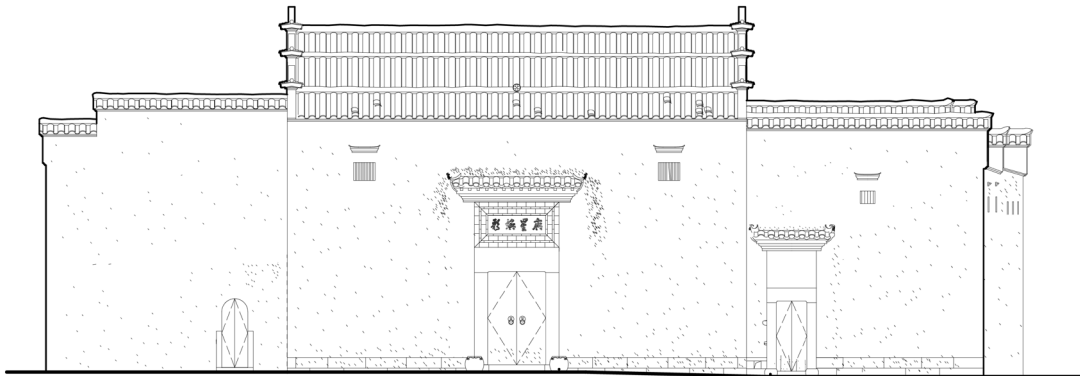


Courtyard

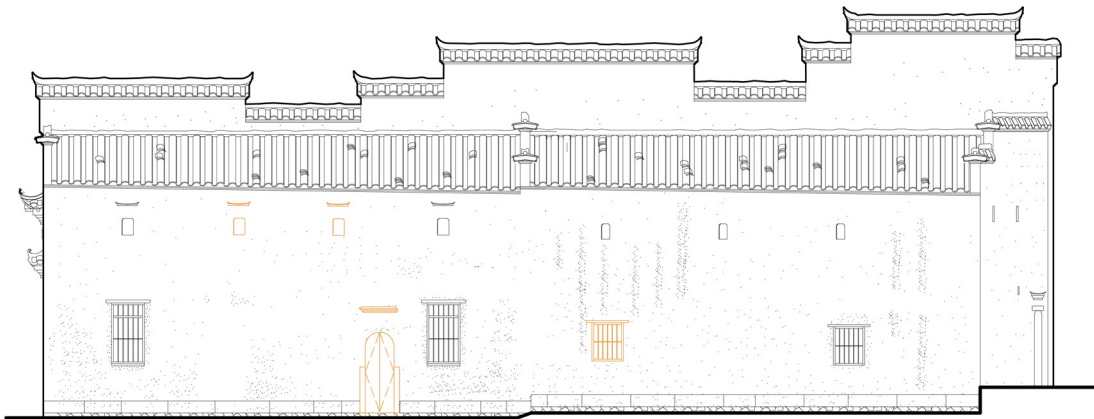


A-A Section 1:100

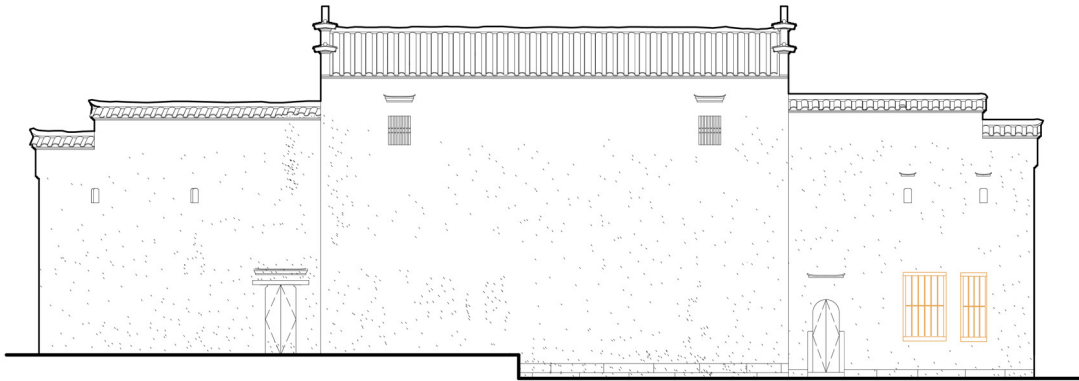
New facade



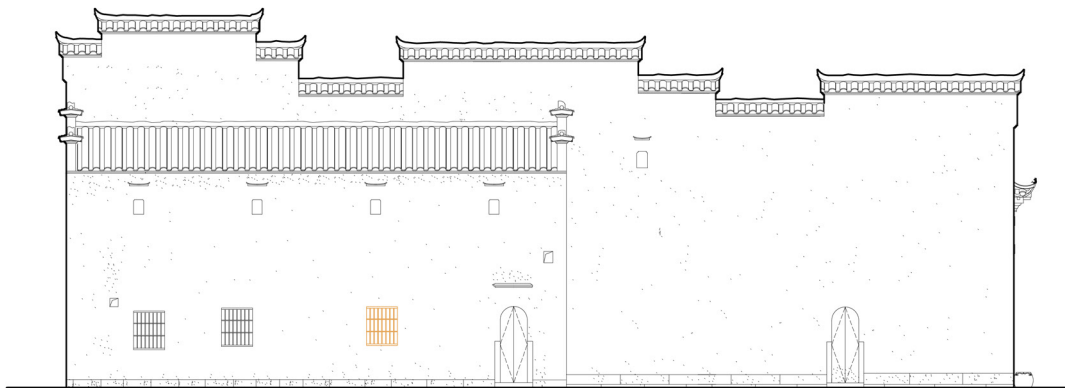
Front Facade 1:200



Eastern Facade 1:200



Back Facade 1:200



Western Facade 1:200



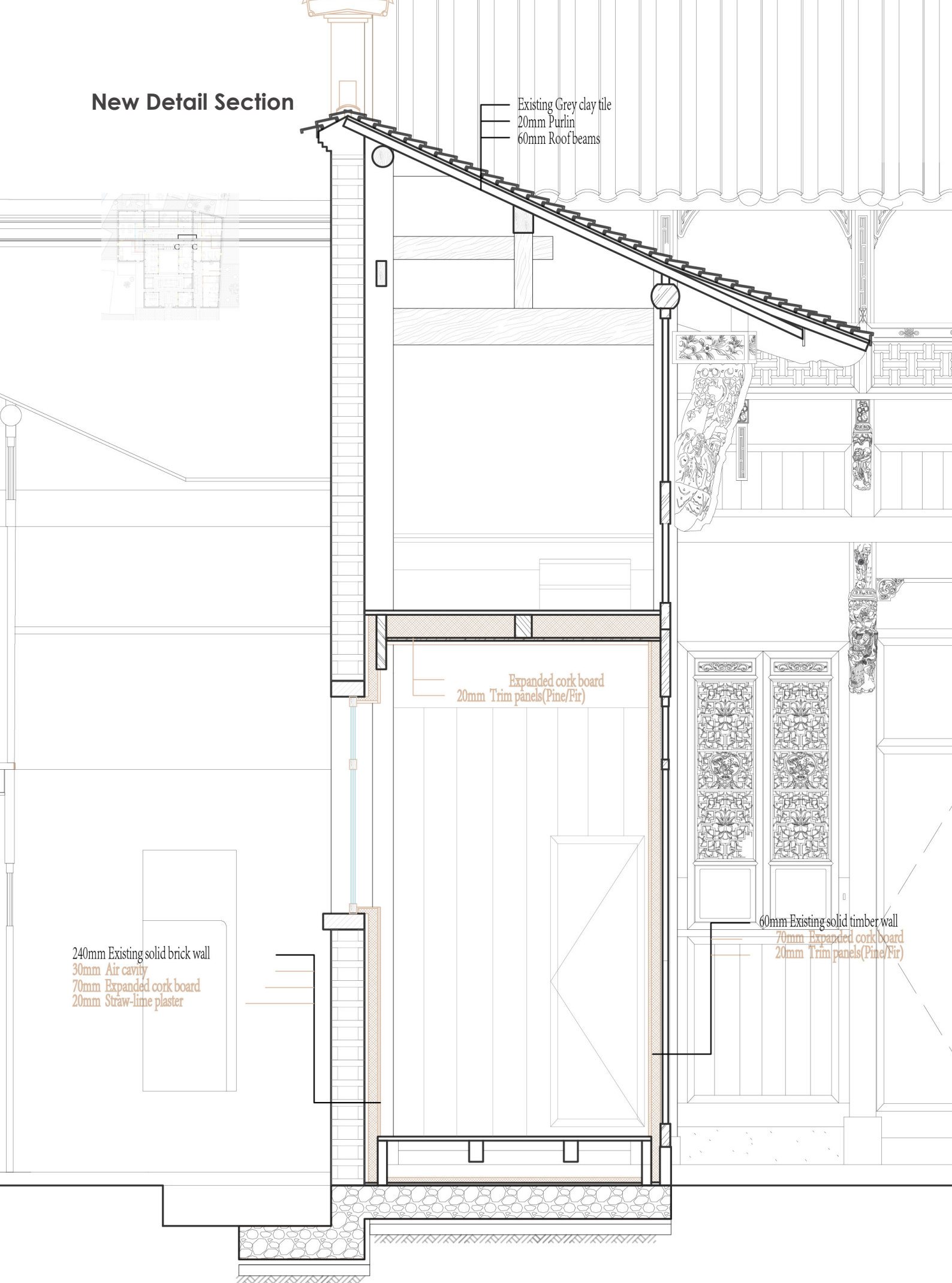
New windows/
doors

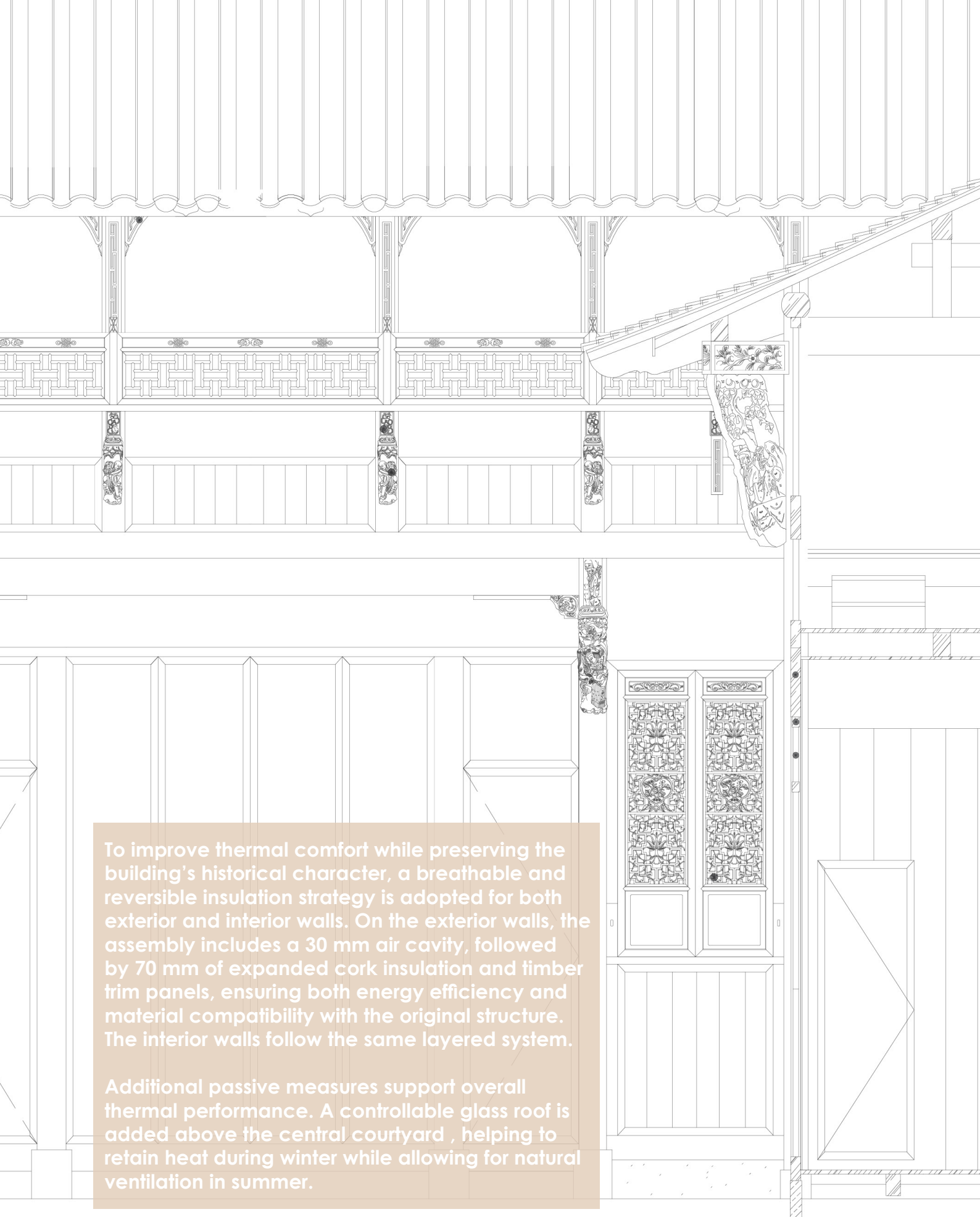
The new facade underwent only minimal alterations, primarily to accommodate additional windows that enhance natural lighting and ventilation based on updated interior functions. The new openings are carefully designed to match the original Huizhou architectural style in both scale and detailing, ensuring respect for the building's traditional character. Similar adjustments were also applied to the other two facades, maintaining overall visual coherence and historical integrity.





New Detail Section





To improve thermal comfort while preserving the building's historical character, a breathable and reversible insulation strategy is adopted for both exterior and interior walls. On the exterior walls, the assembly includes a 30 mm air cavity, followed by 70 mm of expanded cork insulation and timber trim panels, ensuring both energy efficiency and material compatibility with the original structure. The interior walls follow the same layered system.

Additional passive measures support overall thermal performance. A controllable glass roof is added above the central courtyard, helping to retain heat during winter while allowing for natural ventilation in summer.

C-C Section



Ventilation analysis

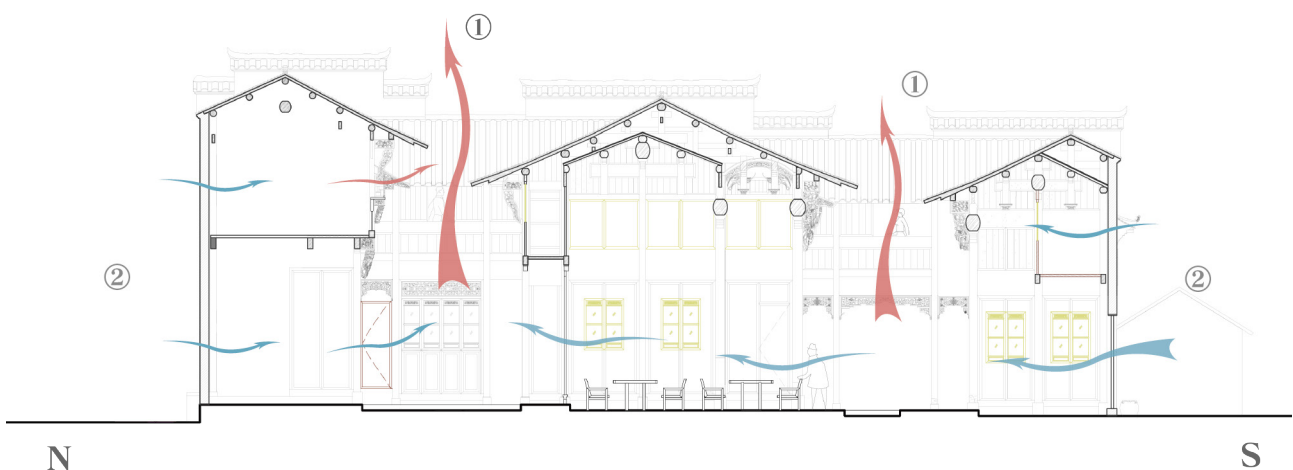
Summer daytime

- With prevailing wind typically from south and southeast



Wind enters through lower windows or doors, passes through the courtyard, and exits through upper windows or roof vents on the north side. Warm indoor air is carried upward and out, enabling cross-ventilation.

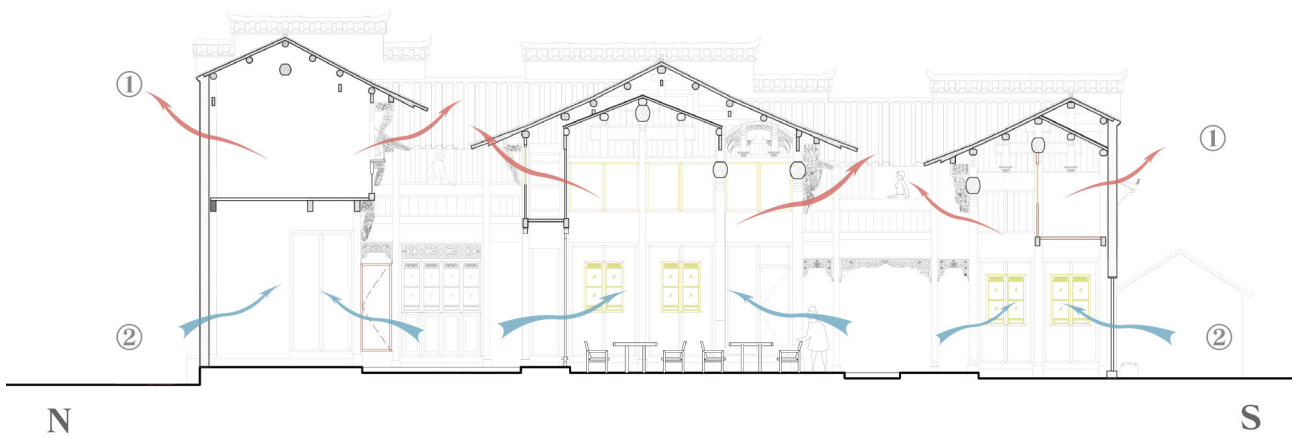
-No wind + high solar radiation



Frequent low or no wind conditions during summer. Courtyard and indoor air heat up and rises, escaping through the opening beyond the courtyard. This creates a slight negative pressure at the lower level, drawing cooler air inside from shaded doors and windows.

Summer Night

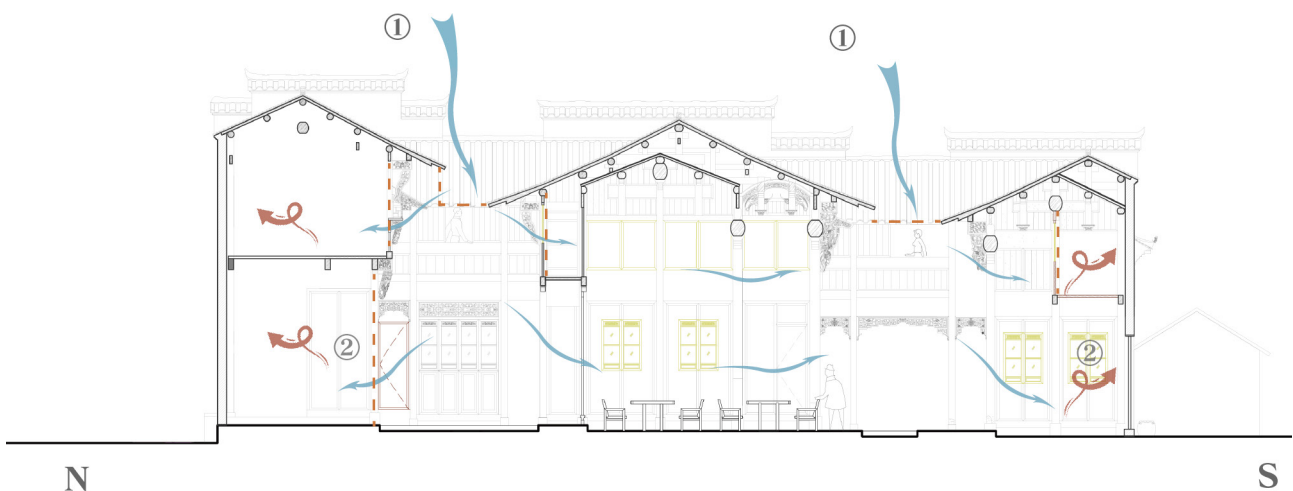
- Light or No Wind



Warm indoor air rises and exits through upper vents and courtyard opening. Cooler outdoor air sinks and enters from ground-level openings. If vegetation or water is present in the courtyard, the cooling effect is enhanced.

Winter

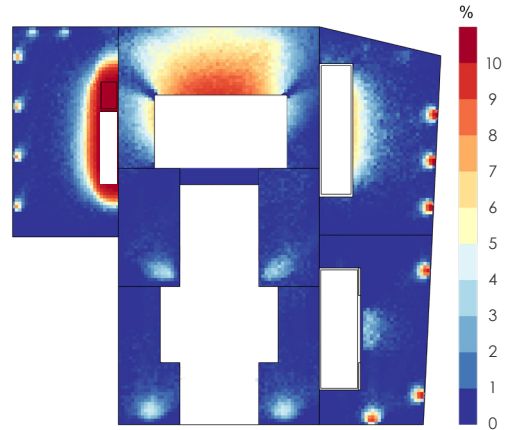
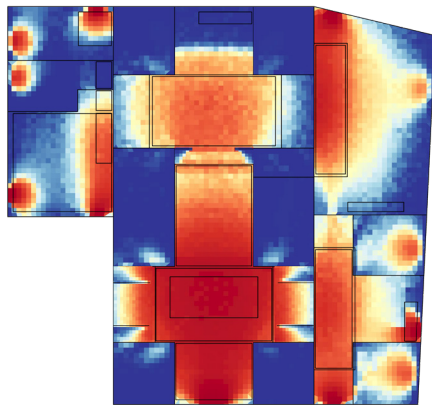
-- With prevailing wind typically from North and Northeast



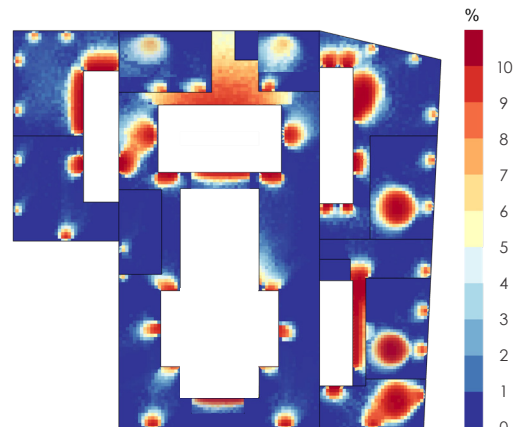
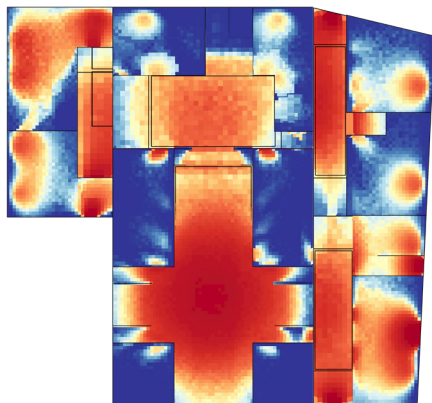
Most windows and doors are closed during winter. Air enters through small or elevated vents, and is buffered and slightly warmed as it passes through the courtyard. Indoor warm air exits. Therefore, enhancing the building's insulation at the walls where gases enter and exit helps insulate the building,

Daylight analysis

Daylight Factor



Before

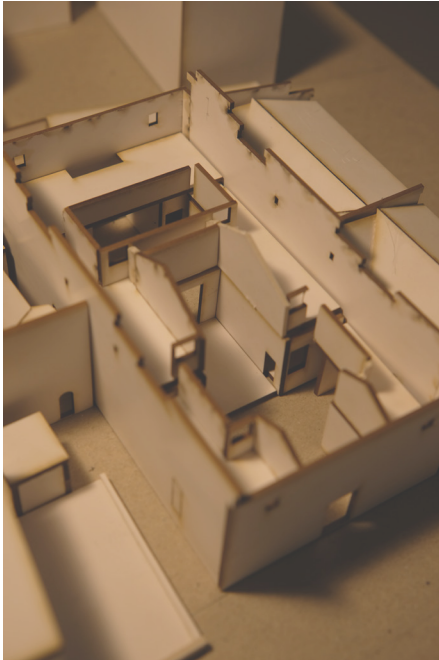


After

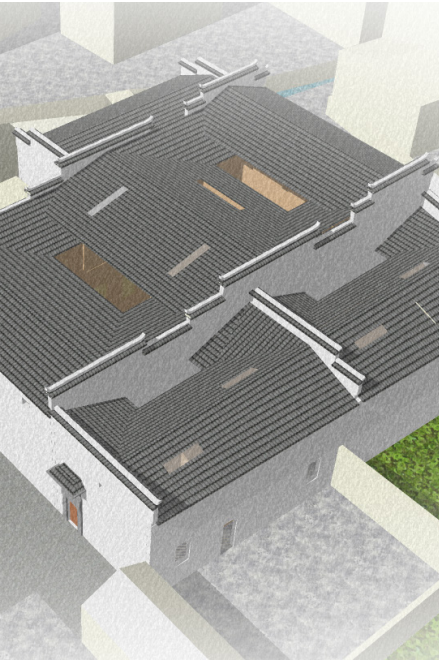
Overall, the addition of new openings in the walls and roof has improved daylight access in several interior spaces. However, this improvement remains limited and uneven across the building. This outcome reflects a deliberate compromise to

preserve the visual integrity and historical composition of the façades, where extensive alterations could disrupt the balance and rhythm characteristic of traditional Huizhou architecture.

Model



Before



After

Sustainability and Technical Approach for Adaptive Intervention

This renovation builds upon the inherent sustainability of the historic Huizhou building by integrating environmentally conscious materials and thoughtful spatial adaptations that meet contemporary needs—particularly those of an aging population—while preserving its cultural and architectural identity.

Functionality & Accessibility:

The building's spatial layout is reinterpreted to support both daily life and limited public activity. A small café, opening toward the main pedestrian route, serves as a community anchor. Circulation paths for residents and visitors are clearly separated to minimize disturbance. Ramps, handrails, and level thresholds are added to support accessibility and safety, especially for elderly users, enabling aging in place.

Ventilation & Daylighting:

Improved courtyard layouts, louvered windows, and operable skylights enhance natural light and airflow. These interventions support the building's original passive climate strategies, reducing the need for mechanical systems and contributing to a healthier indoor environment.

Thermal Comfort & Insulation:

To support year-round comfort, natural and breathable insulation materials—such as straw panels and cork boards—are added. These passive solutions improve energy performance while respecting the breathable nature of traditional construction.

Material Strategy & Heritage Respect:

All additions employ low-carbon, regionally available materials that are compatible with the historic structure. Wood, brick, and stone are reused or locally sourced, ensuring visual coherence and reversibility. New elements follow the same sustainable and repairable logic as the original construction, ensuring long-term adaptability and continued cultural relevance. Reversible construction methods are used to ensure future adaptability and heritage preservation.

DISCUSSION

- Response to Thesis Questions

This thesis demonstrates that Huizhou residential buildings can be sustainably renovated to meet the physical and social needs of elderly residents while maintaining architectural authenticity. By integrating subtle, reversible interventions—such as lightweight partitions, natural light strategies, and accessible circulation elements—modern functions were introduced without compromising historical integrity. Furthermore, the case studies reveal that preserving spatial typologies (e.g., courtyards, carved woodwork) while upgrading thermal comfort and accessibility is both feasible and culturally sensitive. Traditional elements can be retained when treated as adaptable frameworks rather than rigid constraints.

- Evaluation of Purpose and Aim

The aim of integrating adaptive reuse, heritage conservation, and sustainable design for aging-in-place was largely achieved. Through contextual analysis and design prototyping, the project offers a methodology that respects traditional architectural values while addressing contemporary needs. The integration of social programming, spatial comfort, and cultural meaning aligns with the project's goal to enhance elderly well-being without erasing the past.

However, due to practical constraints, certain design intentions faced limitations in implementation. For instance, only a limited number of new windows could be introduced to preserve the visual integrity of the façades, resulting in uneven daylight conditions in some interior spaces. In addition, not all barrier-free routes could be fully realized due to spatial or topographic constraints, requiring the use of temporary or movable accessibility aids in some areas.

- Sustainability discourse

Environmental Sustainability

The use of passive strategies—such as improving daylighting through clerestories and courtyard adjustments, and enhancing ventilation using traditional roof forms—demonstrates ecological responsiveness. Design choices prioritized the reuse of local materials and compatibility with vernacular construction techniques, reducing embodied energy and construction waste. Though energy simulations were not fully implemented at this stage, the proposed interventions are consistent with low-carbon, climate-sensitive architecture.

Social Sustainability Outcomes

The project contributes to aging-in-place by enhancing accessibility, safety, and opportunities for social engagement within a familiar cultural environment. The introduction of shared semi-public spaces fosters intergenerational interaction, reinforcing social inclusion. Importantly, preserving local identity through architectural language and detailing supports emotional well-being and place attachment among elderly residents. This aligns with broader social sustainability goals and highlights the importance of culturally embedded care environments.

Cultural and Historic Sustainability

Rather than isolating the historic building as a museum artifact, the project engages with its living heritage. Key architectural features—including structural systems, material palettes, and decorative wood carvings—are preserved and adapted for current use. The emphasis on continuity over replication ensures that the site remains relevant to local communities. Moreover, the building's transformation into a multi-functional care space reasserts its role as a community anchor.

- Additional Aspects of Sustainability Economic Sustainability through Cultural Tourism

Although not a central focus, the project recognizes the role of cultural tourism in sustaining rural heritage. By preserving and activating a historically valuable building within a tourism network, the intervention supports local economic development. This contributes to a more holistic sustainability model that integrates social care with economic revitalization.

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Figure

The official website of Jiangcun Tourism Co.(2010) Jinxiu Hall. Available at: <http://www.cnjiangcun.com/index.php/detail/jcjd/58.html>

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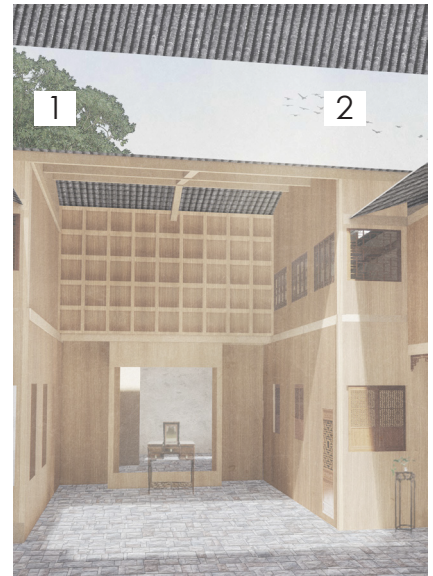
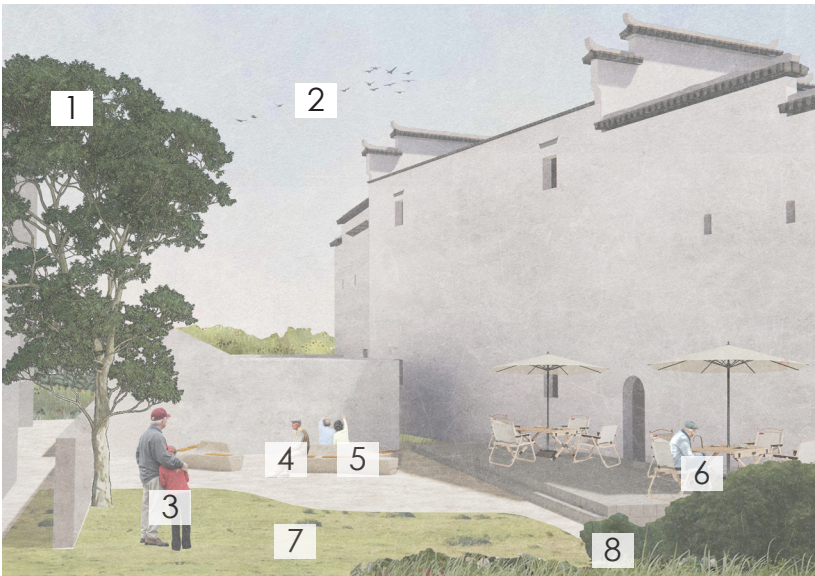
Xiao, b.(2021) The penetrating light becomes the street lamp of the roadway. Available at:<https://www.goood.cn/two-examples-of-renovation-of-the-ancestral-hall-in-cangkou-village-lishui-nanjing-by-mix-architecture.htm>

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Wang, R.(2018) Inner street on the northeast side after renovation. Available at: <https://www.goood.cn/history-museum-of-qifeng-village-china-by-sup-atelier.htm>

Wang, R.(2018) Clerestory windows were added to the roof. Available at: <https://www.goood.cn/history-museum-of-qifeng-village-china-by-sup-atelier.htm>

Unless otherwise noted, all photographs in this thesis were taken by the author during the fieldwork conducted in Anhui Province in January 2025.



Collage elements

Fig.1 GoguetCapucine. (n.d.). [Tree][Painting]. <https://se.pinterest.com/pin/68748900285/>

Fig.2 Birds Flying In The Sky [Photograph]. https://toppng.com/free-image/birds-flying-in-the-sky-PNG-free-PNG-Images_88496

Fig.3 Tanya. (n.d.). [Senior man with his granddaughter] [Photograph]. <https://se.pinterest.com/pin/3377768463701719/>

Fig.4 Elf. (n.d.). [Sitting senior][Photograph]. <https://se.pinterest.com/pin/66920744457215760/>

Fig.5 Taifariyballot.(n.d.). Old Age People Couples Gesture [Photograph]. <https://imgbin.com/png/z8LMkTrt/old-age-people-couples-gesture-png>

Fig.6 Uno_san. (n.d.). [Sitting senior][Photograph]. <https://se.pinterest.com/pin/10836855346443998/>

Fig.7 vad_7.(n.d.). Texture of green grass on the lawn [Photograph]. https://www.freepik.com/premium-photo/texture-green-grass-lawn-seamless_12360191.htm?epik=dj0yJnU9R2N5cmZPeXVIWGM5TV9md0ICTXFMN2FhVW9aalBrMjkmcD0wJm49Q0U5aGxQMFRLeEd1N3BpcnB3R05JUSZ0PUFBQUFBR2hCVVpJ

Fig.8 Cut out trees and plants [Digital illustration]. <https://se.pinterest.com/pin/14636767534515828/>

Website

<https://zhuanlan.zhihu.com/p/626928941>

https://mp.weixin.qq.com/s?__biz=Mzg2MDU5Mjc3MQ==&mid=2247491436&idx=1&sn=c7b991e66fbe176f2221f3b7ef76f798&chksm=ce255080f952d99623ff0648306acc2ed09864f9cd30324f26223b45cd125d262a093e45af6c&scene=27

AUTHOR BACKGROUND

Education

Bachelor in Architecture
Shanghai University

2016 - 2021

Master's Program,
Architecture and Planning Beyond Sustainability(MPDSD)
Chalmers University of Technology

2023 - now

