Nakhara: Journal of Environmental Design and Planning (2025)
Volume 24(2), Article 513
DOI: https://doi.org/10.54028/NJ202524513
Article Type: Research Article

Balancing Authenticity and Adaptive Reuse: Resident-Centric Conservation Strategies for Huizhou Traditional Dwellings

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Received 2024-12-14; Revised 2025-05-31; Accepted 2025-06-04

ABSTRACT

Amid rapid urbanization and modernization, traditional Huizhou dwellings face significant challenges in balancing the preservation of architectural authenticity with the practical needs of adaptive reuse. This study investigates the tensions between maintaining cultural and structural integrity and meeting evolving lifestyle and functional demands. Adopting a resident-centered perspective, the research employs a quantitative survey method, collecting 390 valid responses from two UNESCO-listed villages. A structural equation model (SEM) is used to examine the influence of conservation status, government policy, value recognition, and authenticity on residents' perceptions of adaptive reuse. While findings indicate strong resident support for preserving traditional architectural styles and cultural identity, concerns persist about compromised comfort, outdated spatial layouts, and limitations in daily functionality. These tensions illustrate a core challenge: how to sustain authenticity without obstructing modernization. The study contributes a validated analytical framework for heritage decision-making and offers practical insights for optimizing conservation strategies through policy support, stakeholder collaboration, and selective modernization.

Keywords: traditional Huizhou dwellings, authenticity, adaptive reuse, resident perspective, architectural conservation

INTRODUCTION

Traditional dwellings are integral to human civilization, embodying the cultural heritage of agrarian societies (Fu et al., 2021). These structures, rich in historical artifacts, encapsulate the diverse folk culture and spiritual beliefs of ethnic groups, forming the foundations of Chinese national culture (Yang, 2022). Huizhou traditional dwellings, esteemed as architectural treasures in Southeast China, are noted for their unique style and historical importance, as depicted in Figure 1. These dwellings incorporate Confucian spatial ethics, ancestral worship structures, and wood-carved symbolic motifs. Their layout reflects clan-based hierarchy, elevating them to cultural artifacts beyond mere architecture. In 2000, UNESCO recognized ancient villages like Xidi and Hongcun in the Huizhou region as World Heritage Sites, acknowledging these structures as historical witnesses and embodying the wisdom and aesthetic values of ancient Huizhou residents (The United Nations Educational, Scientific and Cultural Organization [UNESCO], 2000).

Although these dwellings are state-listed heritage sites, the authority to initiate modifications or conservation often rests with the property owners, making their perceptions and decisions pivotal to adaptive reuse outcomes. Conservation and modernization pose significant challenges in preserving traditional Huizhou dwellings, creating a dilemma for cultural heritage conservation (Wang et al., 2022). As shown in Figures 2 and 3, authenticity is crucial to cultural heritage conservation, highlighting the importance of maintaining the authenticity and integrity of cultural assets (The International Council on Monuments and Sites [ICOMOS], 1994). Balancing modern demands with traditional values challenges the preservation of authenticity. Cultural identity, lifestyle needs, and perspectives on traditional versus modern necessities are key factors influencing conservation outcomes.

This study tackles the central challenge of heritage conservation in Huizhou: reconciling the preservation of architectural authenticity with the functional and environmental needs of contemporary life. This conflict is particularly pronounced as residents modify traditional dwellings for modern use, often facing tensions between retaining historical features and ensuring habitability, safety, and comfort. The research provides theoretical and methodological insights into Huizhou dwelling conservation strategies, with broader implications for cultural heritage practices (Günçe & Mısırlısoy, 2019). It thoroughly examines the cultural significance of these dwellings, the necessity of preserving authenticity, and the critical role of residents. By exploring adaptive reuse from the residents' perspective, it assesses its impact on the authenticity of conservation efforts. The study seeks to enhance the understanding of how unique regional heritage can be effectively conserved and transmitted amid global and modern pressures.

Figure 1

Huizhou Traditional Dwellings

Note. This figure demonstrates the style of Huizhou traditional dwellings.

Figure 2

Current State of Some Huizhou Traditional Residences Dwellings

Note. This figure demonstrates the real challenges faced in the preservation of Huizhou traditional dwellings.

Figure 3

Current Issues in the Reuse of Huizhou Traditional Residences

Note. This figure demonstrates the real challenges faced in the preservation of Huizhou traditional dwellings.

LITERATURE REVIEW

Authenticity in the Conservation of Traditional Dwellings

Authenticity is pivotal in architectural heritage conservation, emphasizing historical truth. Key documents like the Nara Document on Authenticity (ICOMOS, 1994) and the Venice Charter (The International Council on Monuments and Sites [ICOMOS], 1964) emphasize preserving material and design authenticity. Recently, the notion of authenticity has expanded to include social and cultural dimensions, highlighting that a place's authenticity involves both its material aspects and its community significance (Günçe & Mısırlısoy, 2019). This broadened perspective necessitates conservation efforts that respect local characteristics, rather than merely replicating historical forms. These buildings

exemplify diverse interpersonal and social interactions, creating unique cultural ecosystems (Zhang & Wang, 2023), as illustrated in Figure 4.

Mi and Wang (2021) highlight that conservation repairs, such as the loss of original structures during renovations, can undermine the authenticity of traditional dwellings. Alterations and demolitions further compromise the original architectural forms. Preserving historical elements like doors, windows, walls, and roofs is crucial for maintaining authenticity and integrity. Effective conservation measures not only enhance residents' pride in their architectural heritage but also preserve its value, which is vital for the sustainable development of traditional dwellings (Li et al., 2021; Pereira & Van, 2011). Community perception, as shown in the Dinajpur Rajbari study (Madhury & Sarker, 2024), is essential in recognizing the heritage value and should be central to assessing the authenticity of traditional dwellings. Nevertheless, ensuring authenticity and integrity in conservation projects remains a complex challenge (Firzan & Keumala, 2023).

Adaptive Reuse and Conservation of Traditional Dwellings

Adaptive reuse and conservation of traditional dwellings connect the past with the present to meet contemporary global demands (Chapman, 2004). This approach involves updating buildings for modern use while maintaining their historical features, playing a crucial role in sustainable development by minimizing the environmental impact of new constructions and preserving architectural and cultural value. Adaptive reuse revitalizes architectural heritage, supports cultural continuity, and deepens residents' understanding of historical transitions (Mısırlısoy & Günçe, 2016). The canal-side vernacular housing in

Figure 4

Huizhou Traditional Dwellings

Note. This figure demonstrates the reality of Huizhou traditional dwellings. From *Ancient Villages in Southern Anhui – Xidi and Hongcun*, by The United Nations Educational, Scientific and Cultural Organization 2024 (https://whc.unesco.org/en/list/1002/gallery/). Copyright 2024 by The United Nations Educational, Scientific and Cultural Organization [UNESCO].

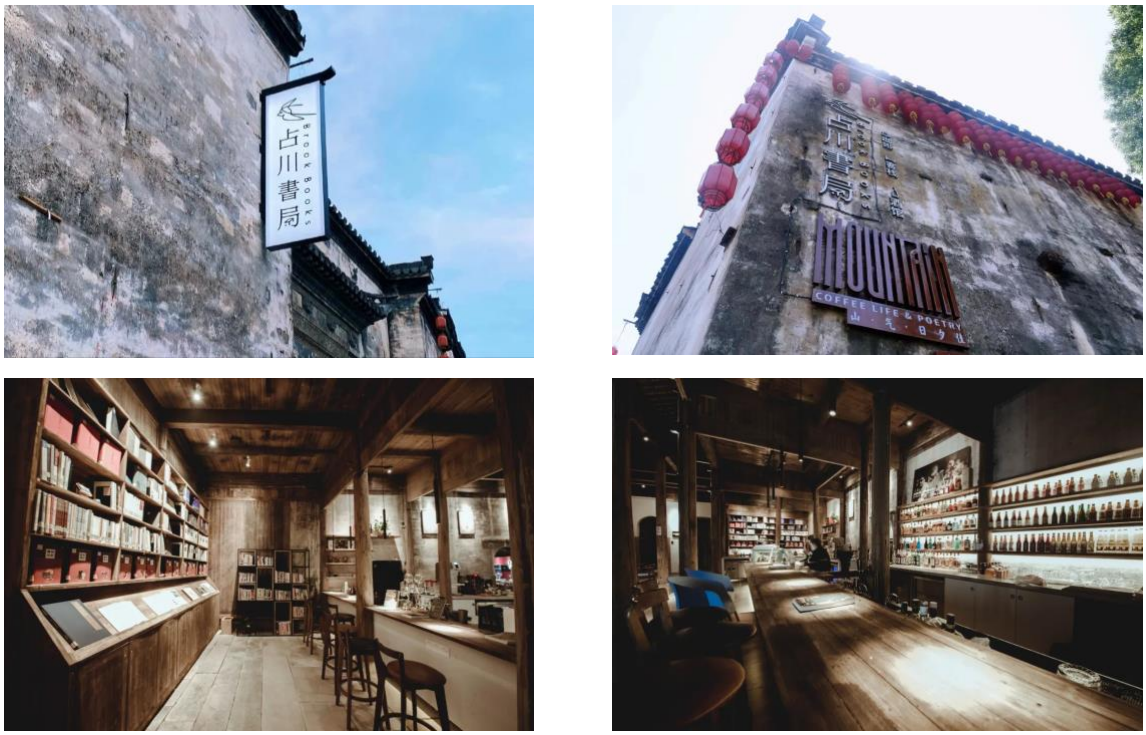
Western Bangkok exemplifies how historic residential forms can function as heritage assets and tourism drivers when reused thoughtfully (Kiatthanawat et al., 2024).

Successful adaptive reuse hinges on thorough research and a deep understanding of the original architecture and its functions, achieved through innovative designs that modernize these structures (Rao et al., 2022). It is essential to respect the historical features of architectural heritage while making functional changes that enhance rather than detract from its character (Li et al., 2021), as illustrated in Figure 5. Designers must preserve the original essence of a building while adapting it to meet contemporary needs (Fu et al., 2021). Thus, the protection and utilization of Huizhou's ancient residences should be intensified to fully leverage their unique artistic and cultural value through strategic renovations and restorations (Shi et al., 2023), thereby revitalizing traditional dwellings.

Traditional dwellings often fail to meet current functional needs, necessitating adaptive reuse to optimize functions such as improving indoor thermal environments and reducing energy consumption (Rao et al., 2022). To maintain the practical significance of architectural heritage, it is essential to introduce new functionalities (Mısırlısoy & Günçe, 2016). Similar to the integration of Lanna elements into modern architectural styles along Tha Phae Road (Laohaviraphap & Mahaek, 2023), adaptive reuse in Huizhou must preserve regional identity while accommodating contemporary needs. Effective protection of traditional dwellings should include adaptive reuse, particularly to enhance residential functions and integrate them into daily life. The future of conserving traditional dwellings largely depends on their integration into residents' everyday environments (Zivaljevic-Luxor et al., 2020).

Figure 5

Cases of Adaptive Reuse from Huizhou Traditional Dwellings



Note. This figure illustrates adaptive reuse cases of Huizhou traditional dwellings, with Shijia Dayuan as a representative example. From *The Timeless Secrets of Historic Architecture (III)*, by Huangshan Culture and Tourism Bureau, 2024 (https://mp.weixin.qq.com/s/lBn_CNtuGLoToLEKTPXQ9g). Copyright 2024 by Huangshan Culture and Tourism Bureau.

Public Participation and the Conservation of Traditional Dwellings

Resident engagement has been demonstrated to significantly improve public acceptance and social sustainability of development initiatives (Verdini et al., 2017). Active community participation reveals and reinforces local identity, cultivating cultural pride within communities (Cheng et al., 2017). Consequently, community consultation and resident involvement have become standard practice in contemporary heritage conservation projects.

Preserving traditional dwellings safeguards cultural heritage and collective memory, empowering the public to engage in decision-making processes that impact their lives. Historically, issues such as commercialization, erosion of traditions, limited public participation, and weak cooperative intentions have challenged villagers (Wang et al., 2023a). Thus, public involvement is essential for achieving conservation goals (Alana et al., 2019). It can mediate conflicts among residents, tourists, stakeholders, and governments in the conservation of traditional dwellings (Verdini et al., 2017). While public participation is beneficial for addressing conservation issues, it also presents challenges (Yung & Chan, 2011). Nevertheless, public engagement remains central to heritage conservation (Li et al., 2021). Integrating public participation into traditional dwelling conservation is crucial for involving communities in decision-making (Huibin & Marzuki, 2012). Recognizing urban heritage and incorporating local voices, as demonstrated in Bangrak's conservation case (Jhearmaneechotechai, 2022), enhances authenticity and promotes meaningful participation in heritage management.

Current mechanisms for public participation are flawed, and the lack of legal provisions threaten to silence public voices (Xie & Zhang, 2018). Conservation practices frequently neglect resident involvement in discussions about their interests, highlighting inadequate pathways for public input in preserving traditional dwellings (Li et al., 2020). This deficiency in participation mechanisms restricts residents' voices and impacts conservation management.

Policies and Regulations in the Conservation of Traditional Dwellings

Research indicates that governments play a crucial role in ensuring the accuracy and enforcement of legislation (Azhari & Mohamed, 2012). Crafting appropriate legal standards is vital for the protection and adaptive reuse of cultural heritage (Kozien, 2021). Policies and regulations establish the framework, standards, and measures necessary for safeguarding architectural heritage, offering institutional protection, as shown in Appendix Table A1. These policies delineate the scope, standards, and technical support mechanisms, frequently including financial and planning assistance (Li et al., 2020; Lu & Liu, 2023).

Policy alignment with cultural adequacy, as examined in the Nang Loeng case (Marome et al., 2023), is vital for successful heritage conservation. Although top-down policies indicate institutional intent, they often diverge from residents' perceptions and priorities. For instance, legislative measures to preserve original materials and layouts can be seen by residents as hindrances to modernizing their living conditions (Zhou & Sun, 2022). Cheng et al. (2017) noted that while residents favor financial incentives and infrastructure improvements, they are less supportive of strict restoration rules that restrict practical renovations.

Challenges like inconsistent enforcement, outdated legal clauses, and insufficient localized adaptation have impeded policy effectiveness (Condotta & Zatta, 2021). The disconnect between regulatory provisions and real-world experiences can result in passive resistance or informal changes that compromise conservation efforts. Bridging the gap between formal policy and community needs is crucial. Promoting inclusive policy-making and participatory planning could address these mismatches, enhancing the sustainability of heritage conservation strategies.

The Role of Innovative Technologies

Conventional methods have predominantly guided the conservation of traditional dwellings, often overlooking the potential of innovative approaches and emerging technologies for adaptive reuse. Innovative conservation techniques enhance the documentation, assessment, and restoration of these structures, offering new avenues for preserving architectural heritage while maintaining authenticity (Mi & Wang, 2021). In adaptive reuse, the integration of digital heritage technologies and image-processing methods facilitates precise restoration and preservation, providing essential technical support for the enduring protection of traditional dwellings.

Otero (2022) notes that many traditional buildings of cultural and artistic significance have diminished in value due to inadequate protection. Research shows that virtual reality technology enhances the authentic experience of architectural heritage and informs restoration decisions (Li et al., 2023). Given the limitations of traditional methods, nondestructive technologies are increasingly employed for documenting and restoring architectural heritage (Biagini et al., 2016). Historical Building Information Modeling (H-BIM) has notably improved the efficiency and effectiveness of heritage conservation (Bruno et al., 2018). Moreover, digital innovation models have been shown to boost the efficiency of conservation projects (Trillo et al., 2021). Yang et al. (2024) support this view, advocating for a digital twin approach in preserving and revitalizing Suzhou's ancient city.

RESEARCH METHODS

This study employed a multifaceted approach to investigate the factors influencing the preservation and adaptive reuse of traditional dwellings in the Xidi and Hongcun regions. First, a comprehensive literature review and field research were conducted to identify the key determinants of authenticity preservation and adaptive reuse, which informed the development of a hypothetical model. Second, surveys were administered in two traditional villages to collect empirical data. Third, the impact of various factors on the adaptive reuse and preservation of traditional dwellings was analyzed. Fourth, a structural equation model (SEM) was utilized to elucidate the principal factors shaping the conservation and adaptive reuse of traditional dwellings. Finally, the interactions among preservation, adaptive reuse, and sustainable development of traditional dwellings within the village system were examined, leading to recommendations for optimizing and sustainably developing adaptive protection and utilization of these cultural assets.

Identify the Influence Factors: Literature and Questionnaire Survey

As traditional villages advance economically, residents experience improved living conditions and explore adaptive reuse of traditional structures. Public interest frequently centers on factors affecting this reuse. Residents' perceptions of the value of these dwellings directly impact their preservation and adaptive reuse (Fang & Li, 2022).

The adoption of innovative technologies (INT) in conservation efforts is often viewed as a potential means to enhance intervention performance (Okpalanozie & Adetunji, 2021). However, the extent to which the advancement of INT may impact the effectiveness of protecting and reusing traditional dwellings remains unclear. While much of the existing literature portrays INT as a method to safeguard architectural heritage, interactions with residents of Xidi and Hongcun suggest that governmental support and policies are external factors that influence the adaptive reuse of traditional dwellings and shape residents' decision-making processes. The subsequent section provides a summary and explanation of these key dimensions.

Conservation Status of Traditional Dwellings

Rapid societal development and urbanization have profoundly threatened the continuity of traditional dwellings, leading to the disappearance of structures that embody distinct regional characteristics, deep cultural

significance, and high conservation value (Li et al., 2019). Resident feedback indicates that the preservation status of these traditional dwellings is crucial for their adaptive reuse potential and quality.

Numerous dwellings remain abandoned and neglected, with some facing the threat of structural failure. Inadequate maintenance has led to severe internal damage and prolonged deterioration. Our empirical survey indicates these dwellings exhibit poor insulation, rendering them ill-equipped to withstand cold conditions. Furthermore, the widespread reliance on electric heaters, in the absence of air conditioning, presents safety concerns.

Traditionally designed residences often relied on courtyards and skylights for ventilation and lighting, which could result in dimly lit interiors if not properly managed. Many of these two-story dwellings featured dark, damp stairwells with steep staircases. Some roofs had sustained damage, leading to substantial water intrusion. In occupied homes, complex electrical wiring installed to meet modern demands posed safety hazards throughout the interior. Additionally, cramped and cluttered kitchen and bathroom spaces, filled with an array of items, contributed to an overall congested and disorderly appearance.

Resident-driven renovations and maintenance have modified the traditional aesthetics of certain dwellings. The incorporation of modern materials in repairs has disrupted stylistic uniformity. Additionally, the village has seen the emergence of modern and European-style structures that conflict with traditional Huizhou architecture. Air conditioning units on exterior walls and clothes hanging on electrical wires further mar the façades and overall environment. These factors pose significant challenges to the preservation and adaptive reuse of traditional dwellings.

Authenticity in the Conservation of Traditional Dwellings

Authenticity is a fundamental principle in the conservation of traditional dwellings, encompassing both the preservation of physical structures and the continuation of cultural heritage. Gao et al. (2020) classify authenticity into three categories: objective, constructive, and existential. This study focuses primarily on objective and constructive authenticity, with particular attention to residents' subjective perceptions in the context of adaptive reuse and conservation. The conceptual framework of this study aligns with the principles of authenticity outlined in the Venice Charter (ICOMOS, 1964) and the Nara Document on Authenticity (ICOMOS, 1994).

Objective authenticity is primarily manifested through physical attributes, including structural integrity, architectural features, spatial organization, and interior elements (Wang et al., 2023b). The preservation of original components, such as doors, windows, walls, and roofs, is crucial for maintaining the architectural continuity of traditional dwellings (Firzan & Keumala, 2023). However, the assessment and application of authenticity in practice pose significant challenges. Inappropriate restoration efforts can inadvertently damage original structures and undermine the essence of authenticity (Mi & Wang, 2021).

Existential authenticity is reflected in lived experiences and the cultural meanings embedded in architectural spaces. Traditional dwellings represent historical local lifestyles, with their authenticity rooted in deep integration with regional culture (Kubontubuh & Martokusumo, 2020). For example, Huizhou traditional dwellings symbolize regional cultural continuity and spatially reflect the hierarchical social structures and ritual systems of ancient Chinese society.

Based on a synthesis of existing research, the authenticity of Huizhou traditional dwellings can be conceptualized across five distinct dimensions. Architectural authenticity encompasses the physical characteristics of buildings, including materials, forms, and traditional craftsmanship. Historical and cultural authenticity emphasizes the preservation of the evolutionary trajectory of local culture, rather than reconstructing an idealized past (Gfeller, 2017; Zhang et al., 2018). Functional-spatial authenticity concerns the continuity of spatial functions and the retention of traditional practices that shape daily life (Dewi, 2017; Liang et al., 2023). Authenticity in the conservation process is particularly relevant to traditional Chinese timber structures, where careful attention must be paid to culturally appropriate repair methods and contextual coherence (Xiong et al., 2023).

Environmental-spatial authenticity reflects the harmonious integration of built forms with natural landscapes and cultural settings, contributing to the legibility and recognizability of traditional settlements (Deghati Najd et al., 2015; Wang et al., 2019).

Government Support and Policies

The Chinese government has implemented a suite of policies mandating local authorities to bolster the protection of historical and cultural heritage (Yang & Tian, 2023). Notably, national-level policies and regulations, including legislative frameworks, have effectively driven the preservation of historic buildings (Cheng et al., 2017), as evidenced by preservation planning initiatives in Wuhan (Qian, 2007). Governments should incorporate public input to ensure the precision and efficacy of such policies (Azhari & Mohamed, 2012). Crucially, governmental financial, policy, and technical support, particularly for adaptive reuse strategies (Zhou & Sun, 2022), are essential for the sustainable development and cultural transmission of traditional dwellings.

Protecting traditional dwellings requires preserving their architectural and cultural integrity while ensuring their continued habitability (Buda et al., 2021). Governments should implement strategies to safeguard building materials and structures, harmonizing conservation with functional needs (Li et al., 2021), thus fostering adaptive reuse and sustainable development. Clear policy regulations standardize heritage protection practices, offer institutional safeguards, and reinforce the legal framework for architectural heritage conservation (Yarrow, 2019). Table A1 outlines the legal statutes pertaining to the protection of Huizhou architecture.

Recognition of the Value of Traditional Dwellings by Residents

Enhancing public awareness and participation is crucial for the preservation of cultural heritage (Olivier, 2017). Traditional dwellings are widely recognized for their cultural significance, which is vital in guiding decisions on architectural heritage conservation (De La Torre, 2013). However, local residents often lack awareness and understanding of the cultural value of such heritage, which can hinder the effectiveness of conservation efforts (Xie & Zhang, 2018). Raising residents' awareness of the value of traditional dwellings fosters a stronger sense of belonging and promotes active participation in conservation (Cheng et al., 2017). Therefore, increasing residents' awareness of the importance of protecting traditional dwellings is necessary (Alana et al., 2019). Huizhou's traditional dwellings represent a valuable architectural heritage, and their significance should guide the extent of their protection and management.

Traditional Huizhou dwellings represent a significant material cultural phenomenon and repository of local architectural heritage. Preserving these structures can foster community pride and appreciation for this legacy (Pereira & Van, 2011). However, some residents now perceive traditional dwellings as symbols of outdated living standards, diminishing their perceived value and objective assessment. Consequently, this has led to resident frustration and alienation. Furthermore, as the younger generation increasingly pursues a more urban lifestyle, their attachment to and need for traditional dwellings has waned.

Innovative Technologies

The preservation of traditional dwellings faces significant challenges, with substantial losses of valuable architectural records and technical information over time leading to high maintenance and restoration expenses, thereby compromising conservation sustainability (Gursel et al., 2009). The accurate assessment of building structures and materials is crucial for the adaptive reuse of traditional dwellings, enabling the development of effective protection and reuse strategies (Gulotta & Toniolo, 2019). Emerging technologies, such as advanced material analysis tools, facilitate the rapid identification of causes of material degradation, allowing for more targeted protection and restoration approaches (Fan et al., 2024). Repairs employing these technologies not only reduce maintenance costs but also better preserve the cultural and structural authenticity of the buildings.

Building Information Modeling (BIM) platforms have become increasingly vital for the protection and adaptive reuse of traditional dwellings.

Structural analysis and virtual modeling via BIM platforms not only assist in the management and maintenance of heritage structures but also provide robust data to support reuse design decisions (Cruz et al., 2021). Further research emphasizes the importance of protecting and reusing cultural heritage to achieve sustainable development (Mansuri et al., 2021), particularly in traditional dwelling reuse practices. Integrating innovative technologies with traditional conservation methods enables the adaptive reuse of traditional dwellings, maintaining their cultural value and historical authenticity while balancing sustainability and cost-effectiveness in protection strategies.

A conceptual model for the adaptive reuse of Huizhou traditional dwellings (ARH) has been developed based on relevant theories (Figure 6). This model comprises four key hypotheses: conservation status of traditional dwellings (CSD), government support and policies (GSP), residents' recognition of the value of traditional dwellings (RRV), and authenticity in the conservation of Huizhou traditional dwellings (ACH). Each of these hypotheses significantly influences the ARH process. Additionally, innovative technologies (INT) play a moderating role in this process.

Formulation of Model Hypotheses

In this study, eight hypotheses are proposed:

H1: The conservation status significantly influences the adaptive reuse of traditional Huizhou dwellings.

H2: Government support and policies significantly impact the adaptive reuse of traditional Huizhou dwellings.

H3: Residents' recognition of the value significantly affects the adaptive reuse of traditional Huizhou dwellings.

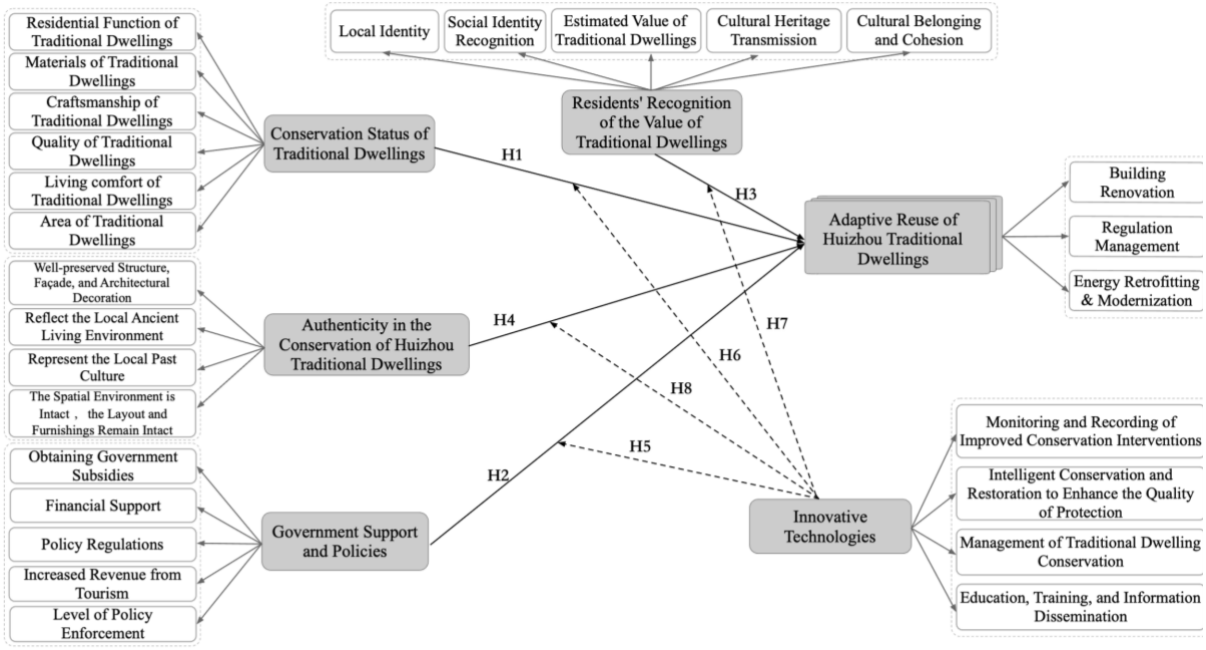
H4: Authenticity in conservation significantly influences the adaptive reuse of traditional Huizhou dwellings.

H5: Innovative technologies strengthen the relationship between conservation status and adaptive reuse of traditional Huizhou dwellings.

H6: Innovative technologies enhance the relationship between government support and the adaptive reuse of traditional Huizhou dwellings.

Figure 6

Hypothetical Model of Factors Influencing the Reuse of Traditional Dwellings



Note. This figure demonstrates the variable relationships among the research factors.

H7: Innovative technologies intensify the relationship between residents' value recognition and the adaptive reuse of traditional Huizhou dwellings.

H8: Innovative technologies elevate the relationship between authenticity in conservation and the adaptive reuse of traditional Huizhou dwellings.

Analysis Method: Structural Equation Modeling

Structural equation modeling (SEM) offers a robust analytical framework for examining the relationships between independent and dependent variables, enabling researchers to address intricate research questions effectively (Al-Emran et al., 2018). Particularly in the context of adaptive reuse decisions for traditional dwellings, SEM presents several key advantages. Firstly, it facilitates a comprehensive analysis of complex relationships between latent variables and their observed indicators, ensuring both depth and breadth of investigation. Secondly, the model clarifies the direct and indirect effects between variables through path analysis, enhancing the clarity of causal inferences. Thirdly, SEM is well-suited for scenarios involving multiple factors and complex effects, such as the roles of cultural values, socio-economic impacts, and technological factors in adaptive reuse decisions. These distinctive capabilities establish SEM as a powerful tool for assessing and optimizing adaptive reuse strategies.

In structural equation modeling, the structural model reflects the relationships between latent variables, expressed by the equation:

$$\eta = \beta\eta + \Gamma\xi + \zeta$$

Where β represents the coefficients depicting the relationships among endogenous latent variables, Γ is the matrix of effects from the exogenous latent variables ξ on the endogenous latent variables η, and ζ denotes the residuals of the endogenous latent variables.

In the measurement model, which illustrates the relationships between latent variables and their observed variables, the relationships are described by:

$$X = \Lambda_x\xi + \delta$$

$$Y = \Lambda_y\eta + \varepsilon$$

where X represents the exogenous observed variables, and Y the endogenous observed variables. Λ_x and Λ_y are matrices depicting the loadings of exogenous latent variables ξ and endogenous latent variables η on their respective observed variables, while δ and ε are the error terms for X and Y, respectively.

Structural equation modeling (SEM) integrates exploratory factor analysis and structural path analysis, enabling the concurrent assessment of measurement and structural models (Hair et al., 2017). This approach encompasses both observable and latent variables, where observable variables are directly measurable, and latent variables are inferred through indirect means. The measurement model defines the relationships between observable and latent variables, while the structural model elucidates the interactions and influences among the latent variables.

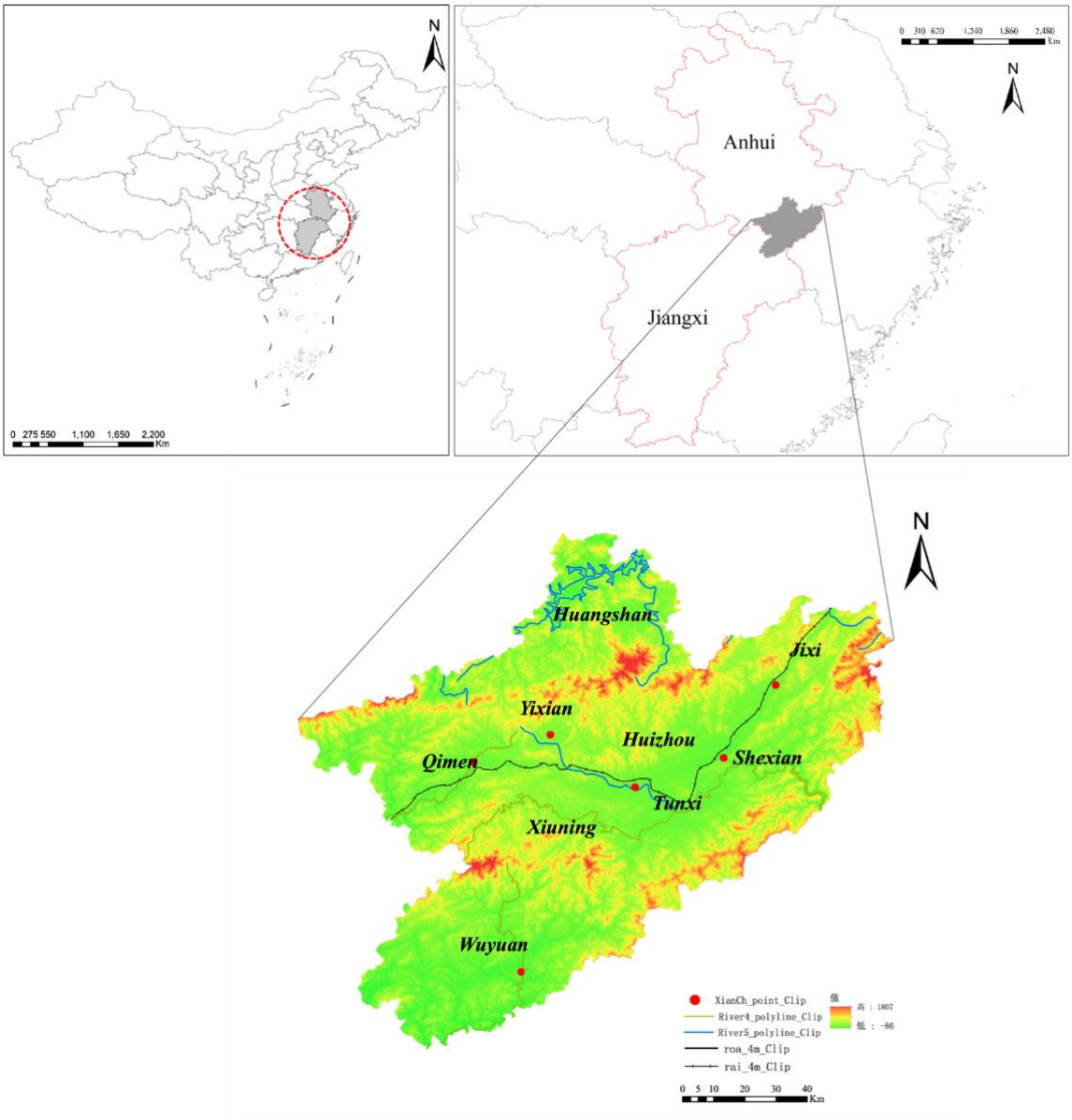
Questionnaire Surveying and Data Processing

The Huizhou region, historically situated at the intersection of Anhui, Zhejiang, and Jiangxi provinces at 118° east longitude and between 29° to 30° north latitude, was a formally established and relatively stable area (Figure 7).

This region is recognized as one of the four major traditional village clusters in China. Xidi and Hongcun, located in the Huizhou area, are exemplary traditional villages renowned for their unique regional culture. These villages have preserved their original layout, landscape design, architectural style, decorative elements, and construction techniques spanning the 14th to 20th centuries (UNESCO, 2000), as illustrated in Figure 8.

Figure 7

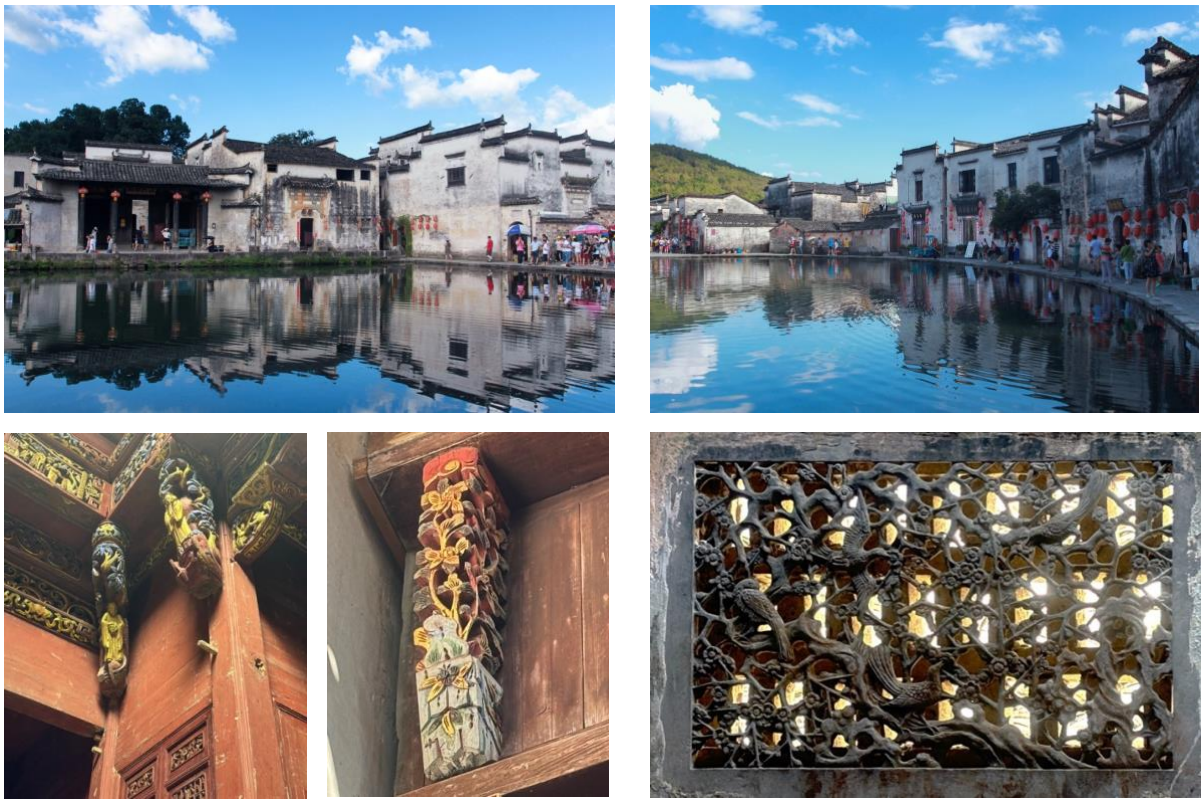
Location of the Huizhou Region



Note. This figure demonstrates the geographical area of the study. Created by the author using ArcGIS Desktop 10.8.

Figure 8

Huizhou Traditional Dwellings and Typical Components



Note. This figure demonstrates the style of Huizhou traditional dwellings and typical components.

The study employed a sample size of 385, which Hasan and Kumar (2024) have determined to be appropriate for investigating population proportions using theoretical models. Participants were randomly selected during village visits, and face-to-face interviews were conducted to ensure high response rates and reliability. This approach was adopted to accommodate the lower educational levels of some residents, which could have impacted their comprehension of the survey content. Interviewers assisted respondents in completing the questionnaires promptly. The survey, limited to one questionnaire per household, was carried out in May 2024, resulting in 390 distributed and 387 effectively retrieved questionnaires. The survey instrument was designed around a hypothesis model and included five latent variables, each represented by multiple observable variables. Respondents were asked to describe their personal experiences and decision-making processes regarding the adaptive reuse and preservation of authenticity in traditional dwellings. The questionnaire and its description are presented in Appendix Table A2.

DATA ANALYSIS AND RESULTS

Descriptive Statistical Analysis

The first part of the questionnaire gathers demographic information to understand participants' basic profiles and provide insights into the study area. It collects data on respondents' gender, age, education level, and income (Table 1).

Table 1

Descriptive Statistics of Basic Sample Information

Sample Information		Frequency	Percentage (%)
Gender	Male	180	46.5
	Female	207	53.5
Age	(21, 30)	69	17.8
	(31, 40)	102	26.4
	(41, 50)	114	29.5
	(51, 60)	81	20.9
	more than 60=5	21	5.4
Educational Level	Elementary school and below	85	21.9
	Junior high school	130	33.7
	High /Technical secondary school	102	26.4
	Bachelor's degree	48	12.3
	Master’s degree and above	22	5.7
Occupation	Government/Public servant	39	10.1
	Public institution	68	17.7
	Self-employed	71	18.3
	Employee	149	38.4
	Tourism services and others	60	15.5

Note. This table demonstrates the demographic information of the study.

The data in Table 1 indicate a relatively balanced distribution of respondent demographics, including gender, age, education, and average monthly income. The majority of residents have completed junior high or senior high/vocational education, suggesting a modest educational background. This educational profile may pose challenges for the effective implementation and acceptance of new policies and technologies. The survey further reveals that 72.2% of residents are engaged in local entrepreneurship or employment, highlighting how preserving the authenticity of traditional dwellings supports the local cultural landscape and generates job opportunities, thereby significantly impacting economic development in the region.

The Huangshan region has witnessed a remarkable transformation in its rural tourism landscape. According to data from the Huangshan Municipal Government, by 2023, approximately 70% of the villages in the area had integrated tourism into their economic activities, with 30% emerging as prominent tourist destinations. This shift has led to the creation of over 100,000 jobs in tourism-related sectors. In Hongcun Village, for instance, ticket revenue reached RMB 159 million, driving more than RMB 1 billion in tourism-related spending. This growth has provided employment opportunities for over 80% of the local farmers, effectively lifting the entire village out of poverty.

Results of Questionnaire Reliability and Validity Analysis

Adequate sampling is a critical prerequisite for factor analysis. In survey research, Cronbach's alpha is a widely used metric to evaluate the reliability of questionnaires by assessing the interrelationships among observed indicator variables. A reliability coefficient between 0.7 and 0.8 is considered reliable, while a value between 0.8 and 0.9 is highly reliable. Data is deemed suitable for factor analysis if the Cronbach's alpha is at least 0.70 (Jafari, 2015). Additionally, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity are used to assess the adequacy and correlation of the data. Data is considered appropriate for factor analysis if the KMO value exceeds 0.6 and Bartlett's test result is significant at the 95% confidence interval ($p < 0.05$) (Howard, 2016).

The questionnaire's reliability and validity were assessed using SPSS 27.0. As shown in Table 2, Cronbach's alpha values for each component ranged from 0.8 to 0.95, indicating high reliability. Exploratory factor analysis, including KMO and Bartlett tests, was conducted on the survey data. The minimum commonality was 0.653 (GSP4), with overall values above 0.4, meeting the requirements for all factors. Additionally, the KMO values for each component were above 0.7, and the Bartlett test was highly significant ($p < 0.001$), confirming good construct validity and the appropriateness of the correlation matrix for factor analysis. These validations demonstrate the suitability of the data for factor analysis.

Results of Model Fit Validation Analysis

A structural equation model was developed to elucidate the relationships between latent constructs and their observed indicators. Standardized factor loadings, presented in Table 4, exceeded the 0.5 threshold, signifying robust associations between the observed variables and their corresponding latent dimensions. This finding highlights the model's capacity to capture meaningful dependencies and observational linkages.

Results of Confirmatory Factor Analysis

The study assessed the convergent validity and composite reliability of the scale's dimensions within the framework of a well-fitted structural equation model (SEM). Standardized factor loadings for each measurement item were calculated using the established confirmatory factor analysis (CFA) model, and average variance extracted (AVE) and composite

Table 2

Cronbach's Alpha Reliability Test Value

Latent Variable	Cronbach's a Value	KMO Index	Bartlett's Test	Significance Level
CSD	0.903	0.893	1337.318	<.001
GSP	0.875	0.866	924.759	<.001
RRV	0.881	0.884	941.191	<.001
ACH	0.870	0.832	731.810	<.001
INT	0.889	0.835	863.724	<.001

Note. This table demonstrates the information on the Cronbach's alpha reliability test values and significance levels of the study.

Results of Confirmatory Factor Analysis

The study assessed the convergent validity and composite reliability of the scale's dimensions within the framework of a well-fitted structural equation model (SEM). Standardized factor loadings for each measurement item were calculated using the established confirmatory factor analysis (CFA) model, and average variance extracted (AVE) and composite reliability (CR) were subsequently computed using their respective formulae.

The results presented in Table 3 demonstrate that the minimum requirement of 0.5 is met, with the lowest GSP4 value at 0.653. Each measurement indicator's standardized factor loading exceeds 0.6 and is statistically significant at the $p < 0.001$ level. The composite reliability (CR) for the latent variables exceeds 0.7, indicating good reliability. Furthermore, the average variance extracted (AVE) for all measures meets the threshold of 0.5, confirming acceptable convergent validity. These findings suggest that the model's convergent validity and composite reliability are robust, indicating a high model fit suitable for the subsequent fit-testing phase.

Table 3

SEM Path Coefficients and Reliability Test Results

Path Relationship			S.E.	C.R.	P	Standardized Factor Loading	AVE	CR
CSD1	<---	CSD				0.827		
CSD2	<---	CSD	0.056	16.940	***	0.767		
CSD3	<---	CSD	0.052	18.464	***	0.817	0.611	0.904
CSD4	<---	CSD	0.054	16.483	***	0.752		
CSD5	<---	CSD	0.053	16.657	***	0.758		
CSD6	<---	CSD	0.053	16.827	***	0.764		
GSP1	<---	GSP				0.809		
GSP2	<---	GSP	0.057	14.990	***	0.720		
GSP3	<---	GSP	0.058	17.193	***	0.803	0.585	0.875
GSP4	<---	GSP	0.058	13.314	***	0.653		
GSP5	<---	GSP	0.060	17.779	***	0.826		
RRV1	<---	RRV				0.796		
RRV2	<---	RRV	0.064	16.960	***	0.808		
RRV3	<---	RRV	0.060	16.526	***	0.790	0.599	0.882
RRV4	<---	RRV	0.064	14.828	***	0.723		
RRV5	<---	RRV	0.060	15.500	***	0.750		
INT1	<---	INT				0.780		
INT2	<---	INT	0.064	17.817	***	0.858	0.670	0.890
INT3	<---	INT	0.066	16.832	***	0.815		
INT4	<---	INT	0.065	16.912	***	0.819		
ACH1	<---	ACH				0.799	0.627	0.870

Table 3 (Continued)

Path Relationship			S.E.	C.R.	P	Standardized Factor Loading	AVE	CR
ACH2	<---	ACH	0.06	15.683	***	0.778		
ACH3	<---	ACH	0.061	15.892	***	0.788		
ACH4	<---	ACH	0.06	16.181	***	0.802		
ARH1	<---	ARH				0.796		
ARH2	<---	ARH	0.067	15.261	***	0.796	0.624	0.833
ARH3	<---	ARH	0.066	14.971	***	0.778		

Note. This table demonstrates the structural equation model path coefficients and reliability tests of the study. Where: *P < 0.05; **P < 0.01; ***P < 0.001.

Structural Equation Model Fit Test

The present study employed structural equation modeling (SEM) using IBM SPSS Amos 27.0 to assess the model's estimation biases, as depicted in Figure 9. The overall test results are summarized in Table 4. The chi-square to degrees of freedom ratio (CMIN/DF) of 1.231 falls within the acceptable range of 1 to 3, indicating a good model fit. Furthermore, the root mean square error of approximation (RMSEA) value of 0.024 is well below the favorable threshold of 0.05, further supporting the model's satisfactory fit. Additionally, most other fit indices performed well, collectively suggesting that the constructed structural equation model exhibits a satisfactory overall fit.

SEM Path Relationship Hypothesis Test Results

The standardized path coefficients and corresponding hypothesis testing results of the structural model are presented in Table 5. Of the four exogenous variables, the path coefficient from ACH to ARH is -0.002, indicating a negative correlation and suggesting that preserving the authenticity of traditional dwellings has a detrimental impact on their adaptive reuse. Conversely, the remaining three exogenous variables exhibit positive correlations, implying beneficial effects.

Specifically, the path coefficients for adaptive reuse influenced by GSP and RRV are 0.329 and 0.361, respectively, both statistically significant at $p < 0.05$. This indicates a significantly positive effect of these dimensions on the ARH. Additionally, the path coefficient for the CSD is 0.185; although small, it is significant at $p < 0.05$, indicating a positive impact on the ARH. Consequently, hypotheses H1, H2, and H3 are supported, but hypothesis H4 is not.

Moderating Effect Analysis

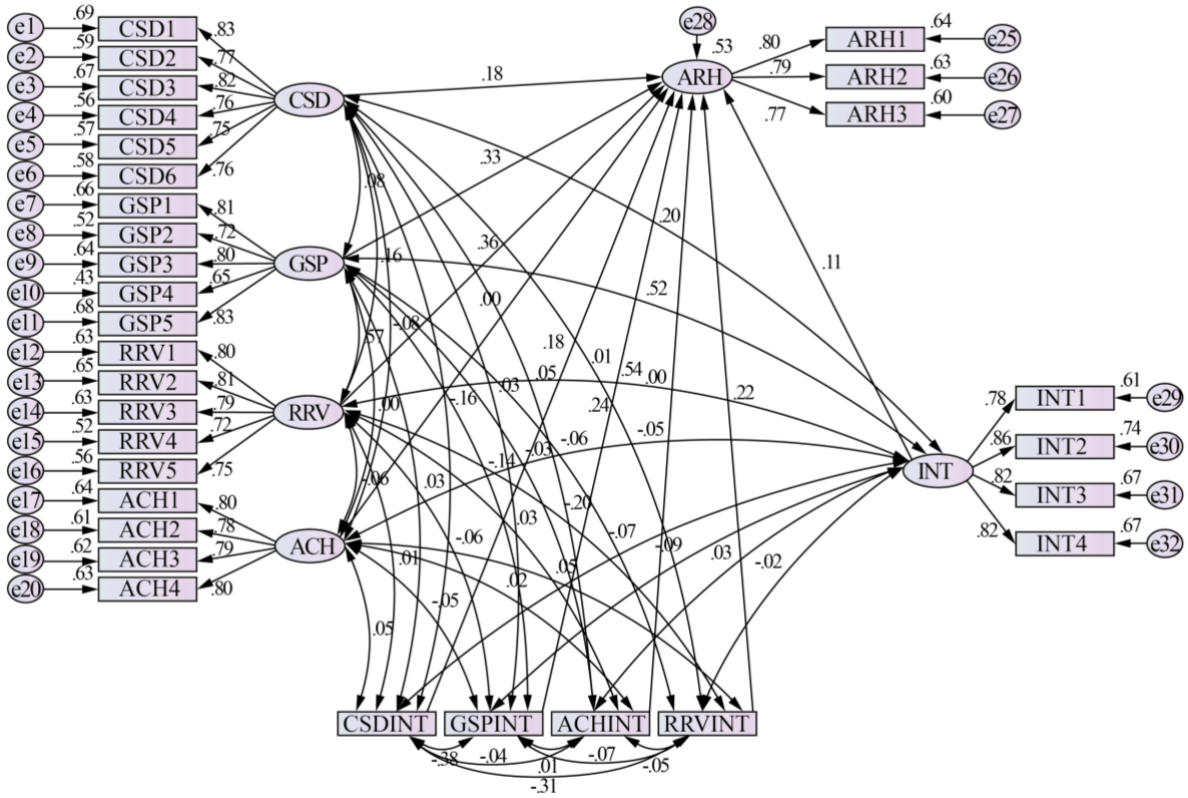
This study examined the moderating influence of innovative technologies (INT) on the adaptive reuse of Huizhou traditional dwellings (ARH) and its associated factors (CSD, GSP, RRV, ACH) using interaction term analysis with AMOS software. The results, presented in Table 5, show the path coefficients and their significance levels (p-values) for each interaction term. Specifically, the interaction between the conservation authenticity of Huizhou traditional dwellings (ACH) and INT regarding their adaptive reuse (ARH) had a path coefficient of 0.003 and a p-value of 0.937, which does not meet the significance threshold of 0.05. Therefore, hypothesis H8 was not supported, indicating that in this sample, INT did not significantly moderate the impact of conservation authenticity on adaptive reuse. However, the other moderating hypotheses were supported.

The results provided support for several moderating hypotheses. Specifically, the path coefficients for the interactions of CSD*INT → ARH, GSP*INT → ARH, and RRV*INT → ARH were 0.181, 0.24, and 0.225, respectively, all statistically significant at $p < 0.01$, thereby

supporting hypotheses H5, H6, and H7. These findings suggest that further research into these moderating effects could inform the development and implementation of more effective, targeted conservation and reuse strategies, ultimately promoting the sustainable development and protection of cultural heritage in traditional dwellings.

Figure 9

The Final Structural Equation Model



Note. This figure demonstrates the final model constructed in the study. Created by the author using SPSS AMOS 27.0.

Table 4

Structural Equation Model Fit Test

Test Statistics	CMIN/ DF	RMSEA	GFI	TLI	NFI	CFI	IFI	PCFI	PNFI
Fitted Values	1.231	0.024	0.926	0.982	0.923	0.984	0.985	0.832	0.780
Standard	<3.00	<0.05	>0.90	>0.90	>0.90	>0.90	>0.90	>0.50	>0.50
Results	Ideal	Ideal	Ideal	Ideal	Ideal	Ideal	Ideal	Ideal	Ideal

Note. This table demonstrates the structural equation model fit indices of the study. Created by the author.

Table 5

SEM Path Relationship Test Results

Hypothesis	Path	Estimate	S.E.	C.R.	P	Results
H1	CSD→ARH	0.185	0.043	3.875	***	Supported
H2	GSP→ARH	0.329	0.061	5.088	***	Supported
H3	RRV→ARH	0.361	0.065	5.321	***	Supported
H4	ACH→ARH	-0.002	0.049	-0.035	0.972	Not Supported
H5	CSD*INT→ARH	0.181	0.055	3.538	***	Supported
H6	GSP*INT→ARH	0.240	0.063	4.918	***	Supported
H7	RRV*INT→ARH	0.225	0.066	4.632	***	Supported
H8	ACH*INT→ARH	0.003	0.045	0.080	0.937	Not Supported

Note. This table demonstrates the structural equation model path coefficients and other related information of the study. Where*:* *P < 0.05; **P < 0.01; ***P < 0.001*.*

DISCUSSION

The adaptive reuse of traditional Chinese dwellings has garnered significant attention in recent years. This study examines the key factors influencing the effectiveness of repurposing Huizhou traditional dwellings from the residents' perspective. The findings indicate that residents place high value on traditional dwellings, and with supportive governmental policies and regulations, these structures maintain their relevance and conservation worth within contemporary traditional villages. Amidst ongoing urbanization, residents confront crises of personal identity and belonging. As vessels of memory and historical culture, the authentic preservation and adaptive reuse of traditional dwellings reinforce residents' cultural identity and community attachment.

Theoretical Significance and Implications

This study developed and tested a conceptual model to examine the factors influencing the adaptive reuse of historic (ARH) dwellings from the residents' perspective. The findings emphasize the pivotal role of preserving the authenticity of traditional structures during adaptive reuse, balancing conservation with functional adaptation. Key strategies to safeguard the authenticity and integrity of these historic dwellings include: 1) attending to the conservation status and distinctiveness (CSD) of the structures, 2) implementing clear and reversible changes to protect authenticity, 3) enhancing residents' understanding of architectural conservation, 4) strengthening government support, and 5) effective management of the dwellings.

The adaptive reuse of traditional dwellings can foster a sense of place identity and preserve irreplaceable cultural resources. When properly conserved, these dwellings can serve contemporary and future generations. Despite some modifications for modern use, the architectural character of traditional dwellings often remains preserved. In contemporary Chinese society, the tension between rapid modernization and a deep attachment to traditional rural culture explains residents' valuation of these structures, enabling their adaptive reuse and the perpetuation of local culture.

Recommendations and Implications for Policy Making

This study presents a preliminary analysis of the factors shaping the adaptive reuse of traditional dwellings, emphasizing the necessity for enhanced resident collaboration to refine strategies that promote sustainable development. These strategies will inform decision-making processes aimed at protecting and adaptively reusing traditional dwellings, which necessitate appropriate measures to mitigate damage risks during adaptation (Shi et al., 2023). Experience indicates that incorporating new functions or replacing existing ones in traditional dwellings is viable without compromising their architectural, cultural, and heritage value, provided governments and communities offer adequate financial support for maintenance.

Although intelligent technologies (INT) do not directly impact the physical or cultural authenticity of traditional dwellings, they can support conservation efforts. When integrated with active participation from residents and local governments, digital documentation, structural monitoring, and virtual modeling can help protect key elements of authenticity, such as spatial layout, decorative details, and traditional materials, while fostering more efficient and collaborative conservation practices (Li et al., 2023). In adaptive reuse, this approach promotes conservative protection strategies over purely architectural conservation policies. These strategies safeguard the traditional architectural heritage of village settings and yield various ancillary advantages, encompassing community growth, inhabitants' sense of place, cultural identity, and financial benefits. The adaptive reuse of traditional dwellings considers both the pros and cons involved and the risks associated with stakeholder participation. From the residents' perspective, protecting and adaptively reusing traditional dwellings requires balancing all advantages and disadvantages to optimally address these issues with innovative and effective solutions.

Research Limitations

This study has several limitations. Primarily, it emphasizes RRV concerning objective authenticity. Future research should more precisely categorize residents' perceptions of authenticity to examine its relationship with place attachment, cultural identity, local identity, and subjective well-being. Furthermore, the results indicate that certain variables in the SEM (RRV, GSP) are closely linked to the effectiveness of adaptive reuse. This suggests that stakeholders and managers of traditional dwellings may influence adaptive reuse, a factor not considered in this study. Future research should incorporate this variable into the structural equation model to better analyze stakeholders' roles in the adaptive reuse of traditional dwellings, thereby enhancing their protection and reuse effectiveness.

This study has several limitations. First, it primarily focuses on the objective authenticity of RRV, neglecting residents' perceptions of authenticity and its relationship with place attachment, cultural identity, local identity, and subjective well-being. Additionally, the results suggest that variables such as RRV and GSP are closely linked to the effectiveness of adaptive reuse, indicating that stakeholders and traditional dwelling managers may influence this process, although their impact was not considered in the current study. Future research should incorporate stakeholders' roles into the structural equation model to more accurately analyze their influence on the adaptive reuse of traditional dwellings, thereby enhancing the protection and reuse effectiveness of these cultural assets.

CONCLUSION

This study integrates an SEM with factors influencing the adaptive reuse of traditional dwellings (CSD, GSP, RRV, ACH, INT) to assess residents' evaluations of reuse outcomes. Conducting empirical research in Xidi and Hongcun villages in the Huizhou region, the study yields several key conclusions. The CSD, along with GSP and RRV, significantly impacts their reuse process. This emphasizes how traditional dwellings embody collective historical memory and place-specific architectural and

cultural elements, receiving substantial protection under the combined influence of residents and the government, thereby facilitating the reuse of architectural heritage. Moreover, the reuse of traditional dwellings is a continuous and dynamic process that demands a balance between reuse and authenticity preservation, especially crucial for those parts of world heritage sites requiring stringent protection.

SEM analysis in this study indicates that INT's moderating role in the reuse of traditional dwellings is insignificant, reflecting residents' acceptance levels. Given the residents' generally low education levels, a gradual adoption of new technologies is necessary. Future conservation and reuse strategies should include recommendations for optimized improvements, focusing on educational initiatives to aid residents in adopting new technologies and concepts. Applying INT in the protection, management, and reuse of traditional dwellings will offer a foundation for scientifically informed project management.

DISCLOSURES AND ACKNOWLEDGEMENTS

This research was supported by the Ministry of Higher Education Malaysia for the Fundamental Research Grant Scheme with Project Code: FRGS/1/2023/SSI02/USM/02/5. The authors express their sincere gratitude to all individuals and institutions who contributed to this research. We appreciate the research participants for their data support throughout the study and are grateful for the constructive comments from peer reviewers that helped improve our work. Finally, we thank our families and friends for their encouragement and support throughout this research.

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APPENDIX

Table A1

Legal Regulations Related to the Protection of Huizhou Dwellings

Issuance Department	Name of Regulations and Policies	Time
Central Office of the Communist Party of China General Office of the State Council	Opinions on Strengthening the Protection and Inheritance of Historical and Cultural Heritage in Urban and Rural Construction	2021.09.03
Ministry of Housing and Urban-Rural Development of the People's Republic of China	Notice on the Implementation of Traditional Village Designation Protection Work	2020.05.14
Ministry of Housing and Urban-Rural Development of the People's Republic of China, Ministry of Natural Resources, Ministry of Public Security	Ministry of Urgent Notice on Resolutely Stopping the Relocation of Traditional Buildings to Other Places and Legally Cracking Down on the Illegal Sale of Components	2015.06.19
Standing Committee of the Anhui Provincial People's Congress	Regulations on the Protection of Huizhou Ancient Buildings in Huangshan City	2018.01.18
	Regulations on the Protection of Ancient Residential Buildings in Southern Anhui	2004.07.01
Standing Committee of Huangshan Municipal People's Congress	Regulations on the Protection of Huizhou Ancient City in She County	2016.09.30
Huangshan Municipal People's Government	Measures for the Protection of Ancient Villages in Huangshan City	2014.09.28
	Measures for the Recognition, Protection, and Utilization of Huizhou Ancient Buildings in Huangshan City	2014.09.28
	Measures for the Relocation, Protection, and Utilization of Huizhou Ancient Buildings in Huangshan City	2014.09.28
	Measures for the Emergency Repair, Protection, and Utilization of Huizhou Ancient Buildings in Huangshan City	2014.09.28
	Interim Measures for the Management of Special Funds for the Protection and Utilization of Huizhou Ancient Buildings in Huangshan City	2014.09.28
Huangshan Municipal People's Government	Fire Protection Technical Specifications for Wooden Structures in Hui-style Architecture	2023.12.18
Office of the People's Government of Yixian County Office of the People's Government of Yixian County	Regulations on the Protection and Management of Historical and Cultural Famous Cities in Yixian County	2022.06.21
	Measures for the Protection and Management of Historical and Cultural Blocks in Yixian County	2022.06.21
	Measures for the Protection and Utilization Management of Historical Buildings in Yixian County	2022.06.21

Table A1 (Continued)

Issuance Department	Name of Regulations and Policies	Time
	Process for Maintenance and Repair of Historical Urban Housing in Yixian County	2022.06.21
	Technical Standards for the Protection and Repair of Historical Buildings in She County	2022.06.21
	Process for Maintenance and Repair of Historical Urban Housing in Yixian County	2022.06.21

Table A2

Questionnaire and Variables

Latent variables	Observation Variables	Variable Valuations
Individual and Family Situations of Residents (INR)	INR1: Gender	Male = 1; Female = 2
	INR2: Age	(21, 30)=1; (31, 40)=2; (41, 50)=3; (51, 60)=4; more than 60=5
	INR3: Educational Level	Elementary school and below = 1; Junior high school = 2; High school/Technical secondary school = 3; Bachelor's degree = 4; Master's degree and above = 5
	INR4: Occupation	Government/Public servant = 1; Public institution = 2; Self-employed = 3; Employee = 4; Tourism services and others = 5
Conservation Status of Traditional Dwellings (CSD)	CSD1: Residential Function of Traditional Dwellings	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5
	CSD2: Materials of Traditional Dwellings	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5
	CSD3: Craftsmanship of Traditional Dwellings	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5
	CSD4: Quality of Traditional Dwellings	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5
	CSD5: Living comfort of Traditional Dwellings	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5
	CSD6: Harmony of traditional dwellings with their surrounding environment	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5

Table A2 (Continued)

Latent variables	Observation Variables	Variable Valuations
Innovative Technologies (INT)	INT1: Monitoring and Recording of Improved Conservation Interventions	Very weak = 1; Slightly weak = 2; General = 3; Somewhat strong = 4; Very strong = 5
	INT2: Intelligent Conservation and Restoration to Enhance the Quality of Protection	Very weak = 1; Slightly weak = 2; General = 3; Somewhat strong = 4; Very strong = 5
	INT3: Management of Traditional Dwelling Conservation	Very weak = 1; Slightly weak = 2; General = 3; Somewhat strong = 4; Very strong = 5
	INT4: Education, Training, and Information Dissemination	Very weak = 1; Slightly weak = 2; General = 3; Somewhat strong = 4; Very strong = 5
Government Support and Policies (GSP)	GSP1: Obtaining Government Subsidies	None = 1; A little = 2; General = 3; Strong = 4; Very strong = 5
	GSP2: Financial Support	None = 1; A little = 2; General = 3; Strong = 4; Very strong = 5
	GSP3: Policy Regulations	Very weak = 1; Slightly weak = 2; General = 3; Somewhat strong = 4; Very strong = 5
	GSP4: Increased Revenue from Tourism	None = 1; A little = 2; General = 3; Strong = 4; Very strong = 5
	GSP5: Level of Policy Enforcement	Very weak = 1; Slightly weak = 2; General = 3; Somewhat strong = 4; Very strong = 5
Residents' Recognition of the Value of Traditional Dwellings (RRV)	RRV1: Local Identity	Very weak = 1; Slightly weak = 2; General = 3; Somewhat strong = 4; Very strong = 5
	RRV2: Social Identity Recognition	Very weak = 1; Slightly weak = 2; General = 3; Somewhat strong = 4; Very strong = 5
	RRV3: Estimated Value of Traditional Dwellings	Very weak = 1; Slightly weak = 2; General = 3; Somewhat strong = 4; Very strong = 5
	RRV4: Cultural Heritage Transmission	Very weak = 1; Slightly weak = 2; General = 3; Somewhat strong = 4; Very strong = 5
	RRV5: Cultural Belonging and Cohesion	Very weak = 1; Slightly weak = 2; General = 3; Somewhat strong = 4; Very strong = 5
Adaptive Reuse of Huizhou Traditional Dwellings (ARH)	ARH1: Building Renovation	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5
	ARH2: Regulation Management	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5

Table A2 (Continued)

Latent variables	Observation Variables	Variable Valuations
	ARH3: Energy Retrofitting and Modernization	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5
Authenticity in the Conservation of Huizhou Traditional Dwellings (ACH)	ACH1: Well-preserved structure, façade, and architectural decoration	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5
	ACH2: Reflect the local ancient living environment	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5
	ACH3: Represent the local past culture	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5
	ACH4:The spatial environment is intact, the layout and furnishings remain intact	Very bad = 1; Slightly bad = 2; General = 3; Somewhat good = 4; Excellent = 5