Research on Protection and Renewal Strategies for Residential Historical and Cultural Districts from a Multidimensional Synergistic Perspective: A Case Study of the North Street Area in Pingwang Town, Suzhou

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Abstract: As the core carriers for the continuation of "liveliness", residential historical and cultural districts face critical challenges in terms of community cohesion, spatial vitality, and cultural inheritance. From a multidimensional synergistic perspective, this study deconstructs the social, environmental, and cultural dimensions of such districts. It proposes a protection-and-renewal framework of "collaborative social governance—optimized spatial environment—revitalized cultural memory". Taking the North Street area in Pingwang Town, Suzhou, as an example, we develop targeted strategies in three dimensions: socially, by establishing multi-stakeholder co-governance and property rights coordination mechanisms; environmentally, by repairing street-block morphology, supplementing public spaces, and reshaping district character; and culturally, by perpetuating folk traditions and crafting differentiated cultural-tourism carriers. Our findings indicate that a multidimensional synergistic approach can reconcile conservation with development, reinforce community cohesion, and—through spatial enhancements and cultural activation—inject contemporary vitality, thus ensuring the ongoing "liveliness" of residential historical and cultural districts.

1. Introduction

1.1. Research background

Residential functions have long been central to the evolution of China's historic districts, and "liveliness" has become a defining value of their cultural heritage[1]. A residential historical and cultural district authentically reflects a particular historical period or regional characteristic, retains abundant historic fabric, and features a concentrated and sizable residential building layout. Compared with other district types, residential districts have the characteristics of a larger scale, overall architectural integrity, singular use, and human-scale alleyways.[2]. However, decades of rapid urbanization, population shifts, and social restructuring have weakened community cohesion, accelerated aging, hollowed out neighborhoods, and broken local social networks. Thus, retaining the original residents and sustaining traditional life have become critical challenges in protecting these districts.

1.2. Literature review

Existing research on historic district conservation and renewal spans theoretical methodologies for designing guidelines, offering valuable insights for residential districts[3-5]. Because of their intrinsic "liveliness", residential districts require the simultaneous preservation of social stakeholders, physical spaces, and cultural genes.

– Social dimension: Studies emphasize resident-driven governance models and mechanisms for community identity, advocating multiparty collaboration for sustainable development[6-10].

– Physical dimension: Research combines qualitative and quantitative methods to develop environment-protection models, analyze spatial-form evolution, and control color palettes in district facades[11-16]. These studies are significant for the study of residential historical and cultural blocks.

– Cultural dimension: Work from a cultural tourism perspective has explored how spatial form affects visitor experience, offering guidance for integrating tourism with organic renewal[17].

Existing research lacks a comprehensive integration of social actors, spatial structures, and cultural elements, and fails to thoroughly explore the internal operational mechanisms of historic and cultural districts. The introduction of a multidimensional synergistic perspective provides a new analytical perspective for the preservation and regeneration of residential historic districts. Relevant studies, aligning with the systemic characteristics of history and districts, have established a multidimensional synergistic perspective planning

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framework, opening up a new research pathway for historic and district conservation[18].

Building on this foundation, the present study summarizes the challenges of preserving and regenerating residential historic districts and introduces a multidimensional synergistic perspective into this research domain. It constructs a preservation and strategic framework for residential historic districts based on systems theory and synergetics. Simultaneously, using the North Street Historic District in Pingwang Town, Suzhou as a case study, this research further explores practical strategies for multidimensional synergistic regeneration, aiming to provide valuable insights for the future preservation and renewal of residential historic districts.

2. Theory and methods

2.1. Foundational theories

Our multidimensional synergistic perspective combines system theory and synergetics. Systems theory offers a framework for understanding complex wholes, whereas synergetics focuses on cooperative mechanisms within and among subsystems. A historic district is a complex, dynamic system, and these theories guide the analysis of its internal dynamics and inter-element influences.

2.1.1 Systems theory

Ludwig von Bertalanffy initially developed Systems Theory. Its core premise is to explain the common essence and intrinsic regularities of objective phenomena from a systemic perspective[19]. It posits that a system is an organic whole composed of several interconnected and interacting components that possess specific functions – the order and arrangement of these components within the system's scope form its structure. A specific structure corresponds to a particular function, making the system a unified entity of structure and function[20]. These components are not mechanically assembled or superimposed; instead, they are interconnected and mutually influential, collectively determining the operation of the system. The elements within a system can generally be categorized as internal or external factors[21]. Internal factors manifest the system's internal characteristics, whereas external factors represent the external environmental conditions influencing the system.

2.1.2 Synergetics

The German physicist Hermann Haken proposed Synergetics in 1976. After Haken introduced the concept of "synergy" into the philosophy of science, it sparked a research surge centered on "New Three Theories", with synergetics as a prominent representative[22]. Synergetics elucidates the mechanisms of synergy or coordination among elements and functions within a system. It is a discipline that studies the interactions between multiple systems and the laws governing their changes[23]. Specifically, it examines how subsystems within an open system achieve ordered development in time, space, or function through synergistic interactions. It posits that the competition and synergy among order parameters lead to different forms of complex organizational evolution[24]. The synergy degree, also known as the coordination or coupling synergy degree, describes the level at which systems or elements coordinate and harmonize with each other[25].

2.2. Applicability to residential historical and cultural districts

From the perspective of Systems Theory, a residential historic district can be conceptualized as a giant, complex, dynamic system integrating both artificial and natural elements. Generally, the more complex a system becomes, the more goals it tends to possess, and these multiple goals are often incompatible[26]. Within residential historic districts, this multi-objective incompatibility commonly manifests in the social, environmental, and cultural dimensions. It is not easy to simultaneously achieve optimal outcomes for all three objectives. However, synergetics demonstrates that effective synergistic interactions can enhance the overall functionality of a system. The nature of the interactions between different subsystems or components within a system determines the extent to which synergistic effects can be fully realized. When applied to the system of a residential historic district, this theory suggests that when elements within and between the social, environmental, and cultural dimensions coordinate and collaborate in pursuing shared objectives, a "1+1>2" effect is achieved. This synergy amplifies the overall benefits and facilitates the sustainable development of the district (Fig. 1)

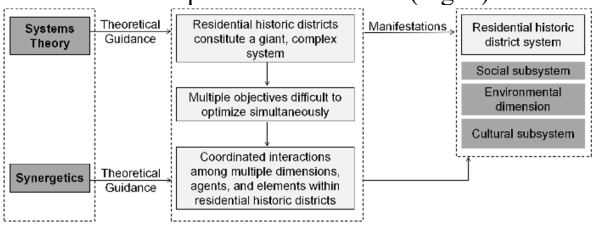

Fig. 1. Applying Systems Theory and Synergetics to Residential Historic Districts

2.2.1 The applicability of systems theory and synergetics to residential historic district

The core systemic characteristic of residential historic districts lies in their nature as complex systems where interconnected subsystems exhibit four key attributes: diversity of agents, complex functionality, unified values, and holistic dimensionality. Systems Theory and Synergetics align with the inherent properties and needs of such districts, providing a scientific theoretical framework for their preservation and regeneration.

Systems Theory transcends conventional isolated approaches to singular district elements. It guides a holistic comprehension of the interconnections among social, environmental, and cultural dimensions, preventing optimization in one dimension from

compromising overall equilibrium. The theory acknowledges the inherent incompatibility of multiple objectives within complex systems, a phenomenon directly corresponding to the conflicts between preservation and regeneration observed in these districts. This recognition establishes a theoretical foundation for introducing synergetics.

Synergetics, which emphasizes coordinated interactions among subsystems or elements, aligns with the operational requirements of historic residential districts. It offers solutions to conflicts between subsystems and elements by coordinating diverse demands, including resident livelihood improvements, cultural heritage conservation, and commercial development. By establishing dynamic equilibrium mechanisms, synergetics enables districts to preserve historical continuity while revitalizing contemporary vitality during regeneration processes.

2.3. Protection and Renewal Strategy Framework

2.3.1 Analysis of multidimensional synergy mechanisms

The multidimensional synergy mechanism in residential historic districts operates through a tripartite framework of social, cultural, and environmental dimensions, with internal synergistic relationships existing within each subsystem. The social subsystem, comprising agents including residents, tourists, communities, and governments, coordinates interests via social governance mechanisms: residents establish distinctive neighborhood ambiance, tourists generate visibility and vitality, communities mediate relationships, and governments provide policy, resources, and oversight. The environmental subsystem, incorporating elements such as district patterns and spatial textures, functions across two interconnected levels: spatial functionality (enhanced through rational zoning and traffic improvements) and district character (upgraded by synergizing livability enhancements with heritage conservation), collectively elevating environmental quality to foster livable, tourism-friendly environments. Within the cultural subsystem, intangible heritage (folk traditions) achieves innovation through historical-contemporary synergy, while cultural vehicles (physical carriers) mediate resident needs and display requirements to provide experiential spaces, jointly enabling cultural continuity. Crucially, inter-subsystem synergies manifest as follows: social optimization infuses humanistic attributes into environmental spaces while supplying localized cultural resources; environmental development provides material foundations for social advancement and spatial vessels for cultural expression; and cultural revitalization strengthens cohesion among resident-tourist communities, ultimately sustaining cultural memory through effective heritage transmission.

2.3.2 Constructing a conservation and regeneration framework through a multidimensional synergy perspective

Diverging from traditional regeneration paradigms centered on physical transformations, the multidimensional synergy approach to residential historic districts prioritizes a human-centric value orientation. It deeply considers the alignment between spatial interventions and diverse stakeholder needs, establishing a more vibrant and resilient regeneration system through the synergistic integration of social continuity, environmental conservation, and cultural revitalization. Building upon prior research[27], this study explores concrete pathways for district conservation and regeneration across three synergistic dimensions (Fig. 2):

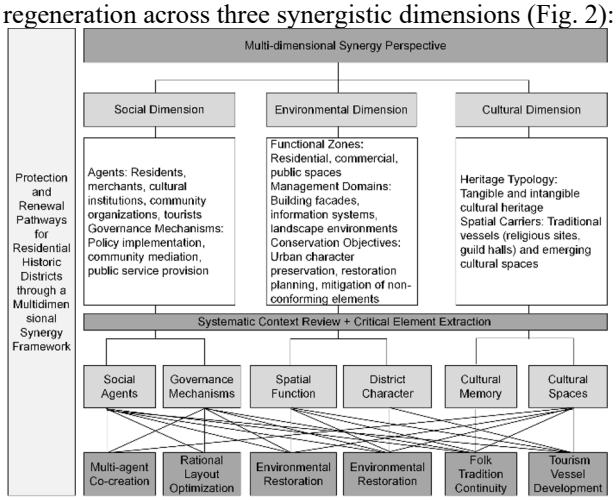

Fig. 2. The Multidimensional Synergy Framework for Residential Historic District Regeneration

Social Dimension Synergy. Focusing on the centrality of human agency, this dimension establishes a co-governance structure that engages multiple agents. Regeneration fundamentally prioritizes resident livelihood improvements while preserving traditional lifestyles and neighborhood networks, simultaneously fostering integration between the original and new communities. By creating multi-stakeholder participation platforms, comprehensive input is encouraged during the planning, implementation, and operation phases. These efforts cultivate spiritual belonging and emotional connections, collectively strengthening the social foundation for district conservation efforts.

Environmental Dimension Synergies. Focusing on rational spatial functionality, this dimension implements heritage conservation and environmental restoration. The physical space serves dual functions: supporting daily life and economic activities while embodying historical and cultural significance. Regeneration must preserve spatial morphology and street textures, maintain the authenticity and functionality of historic buildings, and concurrently upgrade the landscapes and public spaces. Through scientifically planned functional zoning (residential/commercial/public services) and the restoration of degraded structures, it provides a robust material foundation for social activities and distinctive

industries, enabling historic spaces to retain memory while accommodating contemporary needs.

Cultural Dimension Synergy. This dimension sustains the district's Cultural Traits through folk tradition and cultural tourism vessels. Characteristic spaces serve as physical vessels of collective memory and function as critical conduits for cultural transmission. Regeneration requires the systematic documentation of folk traditions, historical narratives, and artisanal practices. Conservation methods include safeguarding time-honored businesses, perpetuating traditional crafts, and reconstructing iconic scenes to preserve cultural memories. Concurrently, it develops modern vessels, such as cultural exhibition halls, Intangible Cultural Heritage (ICH) experience spaces, and creative industry quarters, transforming local heritage into experiential and communicable cultural landscapes.

3. Study area

3.1. Location and scope

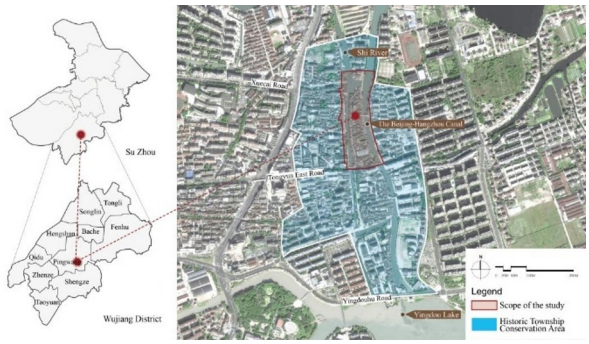

Fig. 3. North Street Historic District Study Area and District Location

The North Street Area lies in the old town of Pingwang, Wujiang District, Suzhou City. It is bounded on the east and west by the North River and the Old Canal, and on the north and south by Tongyun East Road and the Elderly Bridge, forming an island where the two rivers meet. (Fig. 3). Pingwang Town is a "Famous Historical and Cultural Town of Jiangsu Province", with a history of nearly 700 years of town establishment, with a post set up in the Tang Dynasty and a town formally established in the Ming Dynasty, relying on the canal to form the pattern of a significant trade town. The North Street area is not only an important carrier of Suzhou's traditional culture, canal culture, and other urban memories, but also a residential neighborhood with distinctive Suzhou-style characteristics, a strong sense of life, and relatively complete preservation of authenticity.

3.2. Current characteristics

3.2.1 Social dimension: close-knit and diversified social relations

The North Street Historic District, with the aborigines as its core, has formed a close social relationship with the neighbors and has the characteristics of a "familiar society", which still maintains a relatively real way of daily life of the residents in the neighborhood, and the neighborly relationship is relatively harmonious. However, due to institutional changes and the development of production practices in the neighborhood, the property rights of the houses in the neighborhood are now diversified and mixed, with the coexistence of public housing, private housing, and common property rights. In addition, with the development of society and the cultural and tourism industry in the ancient town area, the social crowd has evolved from indigenous people to a mixed crowd structure, comprising mainly residents, renters, operators, and tourists. Diversified and fragmented property rights intertwine residents' interests, and to carry out community conservation and renewal, it is necessary to consider the clarification of property rights to avoid causing neighborhood disputes in the community. The diversity of subjects poses challenges to community cohesion. To achieve community conservation and renewal, it is essential to clarify the community governance system's mode and foster effective interaction and communication among various groups of people.

3.2.2 Environmental dimension: rich but lacks linked historical resources and relatively scarce public space

In terms of the overall pattern, the North Street Historic District flourished due to the convergence of four rivers, including the Beijing-Hangzhou Canal. With the development of the city, it presents an overall pattern of small-scale and high-density. The street and alley texture of the ancient city of Suzhou remains unchanged. The North Street Historic District is primarily characterized by North Street and South Street, with the river street adjacent to it. Still, due to the influence of the construction era, the street and alley transportation system is not well connected (Fig. 4). In terms of the neighborhood style, the traditional whitewashed residential houses of Suzhou are dominated, interspersed with modern multi-storey buildings constructed after reform and opening up. In terms of neighborhood style, the traditional white-walled and gray-tiled houses of Suzhou are the main features, mixed with modern multi-story buildings constructed after the reform and opening up, with high building density and lack of public space; there are a large number of historical elements in the area (Fig. 5), such as the Anmin Bridge, Liaotangwan Fan Residence, and 14 other historical buildings. The North Street Historic District presents an environmental pattern that combines historical heritage and realistic development. Protection and renewal should focus on preserving historical features, improving the living environment for residents, and enhancing public spaces.

Fig. 4. Existing Street Texture and Appearance of North Street Historic District

Fig. 5. North Street Historic District Properties Element

3.2.3 Cultural dimension: diversified and rich folk culture and cultural tourism scenes are differentiated

Cultural heritage is the soul of the protection and renewal of historical and cultural districts. The North Street Historic District is located in the center of Pingwang Ancient Town and has a profound cultural heritage. Traditional folk activities such as dragon boat races, lantern festivals, bridge walks, and canal temple fairs, as well as cultural and artistic forms such as Pingwang lantern riddles and Pingwang Yangge, are preserved in the area. The community's historical folk culture is deep and lively, reflecting its unique charm and value as the core of Pingwang Ancient Township District in both its yearly customs and daily lifestyle. With the promotion of Pingwang's "Canal Culture Belt" construction and the development of tourism resources in the ancient town, North Street has attracted tourists from all over the world. Consequently, North Street and North Front Street have become the core excursion routes for showcasing the ancient town's style. However, the area has not yet formed a complete cultural tourism system integrating display, experience, and consumption, and the revitalization effect on the local culture needs to be further enhanced.

4. Results and analysis: protection and renewal strategies

Based on the current characteristics of the North Street Historic District, such as diversified and mixed social relations, the urgent need for revitalization of material space, and the urgent need for cultural inheritance, we propose a targeted renewal strategy from the perspective of synergy among three dimensions: social, environmental, and cultural, to guide the design practice and realize the continuation of "liveability" and residential historical and cultural districts.

4.1. Stakeholder diversification and multiparty co-construction

Addressing challenges, including heterogeneous social agents, complex property rights, and fragile neighborhood networks in the North Street District, this initiative coordinates multi-agent engagement to establish a co-governance framework.

4.1.1 Property rights coordination and interest balancing

To address the coexistence of four resident typologies—indigenous inhabitants, tenants, business operators, and tourists—we implement a typology-based regeneration strategy. This involves conducting in-situ restoration and age-friendly retrofitting for elderly indigenous residents to preserve core communities, as well as repurposing underutilized public housing through rental schemes to attract young entrepreneurial communities. Neighborhood network preservation remains paramount, with public space revitalization encouraging communal sharing to sustain the close-knit community fabric.

4.1.2 Multi-agent collaborative governance

We establish a tripartite consultation mechanism ("Government-Residents-Professional Team"). A District Regeneration Council, which includes indigenous representatives, merchants, and planners, develops consensus on property rights conflicts and benefit distribution. The On-site Community Planner Program uses semi-structured interviews and workshops to prioritize infrastructure upgrades and public service gaps, thereby enhancing resident participation.

4.2. Rational spatial layout and conservation repair

Focusing on the characteristics of the North Street Historic District, the project will address the fragmentation of historical resources and the lack of public space through the protective renewal of the physical space, achieved by dredging the street texture, upgrading the public space, and restoring the landscape system.

4.2.1 Sorting out street textures and transportation systems

Building on the current street pattern of the North Street Historic District, we establish an accessible street and alley road system. We vertically sort the street space of North Street and North Front Street, retain the original scale of the streets and alleys, and widen them locally to form small stopover spaces. We also horizontally open the

alleys connecting North Front Street and North Street; based on the current condition, we strengthen these connections and form a pedestrian network with a continuous main street and interconnecting branch alleys (Fig. 6). We connect residents with the open space at the water's mouth and the waterfront space designed for leisure and cultural display. Leisure and cultural display places. Unclogging the street space on the north side of Xiaoan lane, building spatial connections between North Street, North Front Street, Xiaoan lane, and Xinqiao, creating public activity nodes, and putting in infrastructure such as cultural displays, landscaping, and recreational seating, to take into account the needs of residents' daily interactions and visitors' recreation.

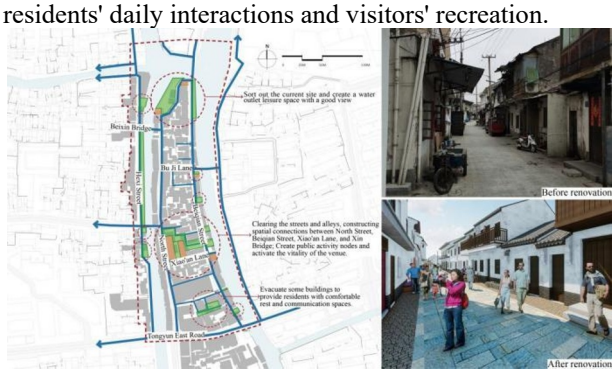

Fig. 6. Illustration of street space grooming

4.2.2 Public space should be added, and landscape quality should be improved

Given the North Street Historic District's small scale and the current situation's high scale, the available public space is relatively scarce. Therefore, the use of green and acupuncture enhancement strategies is necessary. Utilizing the unused plots of land and building gaps, such as the waterfront and riverfront, to create pocket parks and street corner green spaces, configure seating areas and landscape sketches, retain the original barge form, and install additional waterfront platforms and viewing pavilions to enhance the experience of water accessibility. Sorting out the cluttered hard space in the neighborhood, replenishing the green in the waterfront, alleys, nodes, and building facade space, linking the green components, forming a good ecological environment, and creating a natural and livable environment by way of green micro-renewal (Fig. 7). The greening of the waterfront space combines ecological floating islands in the river channel to link the river channel and alley space, creating a continuous greening link. We moderately increase greening in the lanes and alleys, and enhance the neighborhood's overall green volume through vertical greening, courtyard greening, and greening of activity areas.

Fig. 7. Illustration of ecological value enhancement of public space

4.2.3 Systematic restoration of the overall landscape is necessary

Reorganization and integration of old and new era buildings, so that the historical structure of the city participates in the present and future urban development (Fig. 8). The renewal of traditional Suzhou-style buildings is based on protection and restoration, without changing the traditional pattern, scale, and style, and maintaining the original building structure; removing undesirable structures and attachments; reinforcing and painting the exterior walls; and restoring the original style of roofing materials and door and window styles. In the 1970s-1990s, buildings selectively retained the unique parts of their styles. For buildings with no distinctive qualities in their style elements, painting the exterior walls and replacing the facade components, without changing the structure of the building, will lead the way towards the Suzhou-style architectural style. We should replace the building facade components and orient the building in the Suzhou style. It is recommended that we unify the ground pavement, establish orderly guide rules for the plane and facade materials of the blocks, and guide them towards a traditional style. Through the systematic restoration of the landscape, the original humanistic elements of Pingwang, such as cinema, teahouses, and opera, are integrated into the context of modern society, so that the peaceful living environment and the bustling commercial atmosphere, the experience of humanistic travel, and the enjoyment of the natural scenery can be incorporated.

Fig. 8. Building Facade Style Improvement Effect

4.3. Folk tradition continuity and cultural-tourism carrier creation

We should integrate the profound canal cultural heritage of the North Street Historic District with the homogenization of cultural and tourism scenes, thereby realizing the sustainable inheritance of cultural values through the preservation of folk genes, revitalization of cultural spaces, and the development of a cultural and tourism integration system.

4.3.1 Systematic excavation and living transmission of folk cultures

By combining residents and cultural scholars, we can sort out the historical origins and inheritance status of folklore, such as dragon boat races, Yangge praying for blessings, and bridge-walking customs. Restoring the "Canal Temple Fair" during traditional festivals, set up a non-legacy display area, display Pingwang lantern riddles, Yangge performances and other cultural folklore, guide residents and tourists to participate in handicraft experiences such as Su embroidery and wood carving, with indigenous residents acting as "folklore inheritors" to drive tourists' participation; integrating poetic culture into landscape signs and sketches, quoting poems and extracting imagery, showing visitors and residents the rich cultural heritage of the North Street Historic District, and strengthening the immersion of cultural scenes (Fig. 9).

4.3.2 Creating differentiated cultural and tourism carriers and forms is essential

Relying on historical relics to build a cultural and tourism space system combining "points, lines, and surfaces". Revitalizing unused public buildings and transforming them into new consumer businesses, such as canal culture exhibition halls and teahouses, to enhance economic value while protecting the neighborhood's appearance; taking North Street and North Front Street as the axis, retaining traditional stores such as barber stores and pastry stores, and introducing new businesses such as cultural and creative bookstores and specialty lodgings (Fig. 10); linking up with the scenic area of "Pingwang · Four Rivers Convergence" and developing the "Canal Culture Walking Route", linking Anmin Bridge and the "Four Rivers Convergence" scenic area, and developing the "Canal Culture Walking Route". In line with the scenic area of "Pingwang and Four Rivers Convergence", the "Canal Culture Hiking Route" has been developed, linking nodes such as Anmin Bridge and Shuikou Green Area. This integrated network forms a special tourism product that allows visitors to "observe ancient bridges, stroll along ancient streets, and experience folk customs".

4.3.3 Promoting community-based sharing of cultural spaces

The cultural space considers the daily needs of residents, and the exhibition hall is used as a community activity center during non-tourism hours for residents to carry out exchanges of calligraphy and painting and gatherings at festivals; the waterfront green space and pocket parks between buildings also take on the functions of residents' morning exercise and evening coolness; priority is given to absorbing residents' entrepreneurship and encouraging the mode of "store in front and house at the back", to make the cultural inheritance and residents' life mutually integrated. These measures integrate cultural inheritance with residents' daily lives, thereby avoiding the decline in vitality caused by static protection.

Through the synergistic strategy of the three dimensions of society, environment and culture, the North Street Area of Pingwang Town can realize the linkage effect of "restoration of material space - continuation of social network - inheritance of cultural genes", which not only retains the original inhabitants and traditional life, but also endows the historic district with vitality to adapt to modern needs, providing a practical example for the living conservation of residential historic and cultural districts. It not only retains the original residents and traditional life, but also gives the historic district the vitality to adapt to modern needs, providing a practical example for the living conservation of Residential historical and cultural districts.

Fig. 9. Integration of cultural symbols into neighborhood scenes

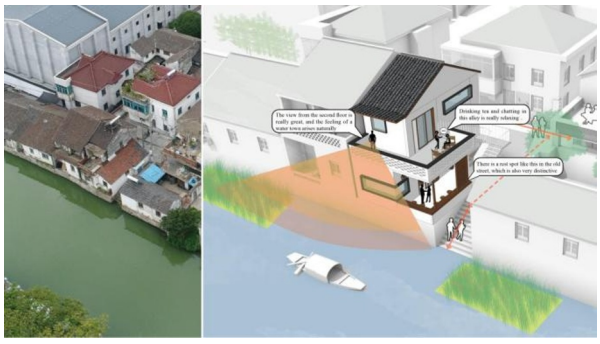

Fig. 10. Introducing new forms of cultural tourism

5. Conclusions and discussion

5.1. Conclusions

This study takes Suzhou's Pingwang Town North Street Historic District as the object, exploring protection and renewal strategies for residential historical and cultural districts from the multidimensional synergy of society, environment, and culture.

Socially, it balances interests and strengthens community identity through property rights coordination and a "government-residents-professionals" co-governance system, laying a sustainable foundation.

Environmentally, spatial optimization—restoring street texture, adding public space, and unifying architectural styles—achieves historical space's "authenticity preservation" and "modernity adaptation," meeting composite needs.

Culturally, it revitalizes traditions like dragon boat racing through excavation, living inheritance, and a "point-line-surface" cultural-tourism carrier, thereby avoiding the decline of vitality from over-commercialization or pure protection.

In conclusion, the protection of such districts should focus on multidimensional synergy, as Pingwang's practice verifies this strategy and offers references for similar areas.

5.2. Discussion

Theoretically, this study integrates social, spatial, and cultural dimensions, breaking down isolated analyses and enriching conservation theory. Practically, the targeted strategies developed for Pingwang Town provide operational guidance for similar areas, balancing authenticity and modernization.

Limitations include the singularity of the case—its canal heritage and Suzhou-specific characteristics may restrict generalizability—and the need for long-term tracking of property negotiations, community integration, and tourism development dynamics. Future research should compare diverse residential areas to refine both universal and context-sensitive strategies, and explore digital tools to coordinate stakeholders and deepen resident participation.

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