# Strategies and Practices of Renovating Old Buildings and Urban Renewal

Tianjiao Li *

College of Architecture and Urban Planning, Qingdao University of Technology, Shandong, China

* Corresponding Author Email: 1911431115@mail.sit.edu.cn

**Abstract.** This research aims to explore methods and strategies for the renovation of old buildings to meet the demands of urban renewal and cultural preservation. In the process of modern urbanization, the preservation and renovation of old buildings have become significant topics. However, constraints such as financial limitations, technological challenges, and societal obstacles to cultural awareness and understanding have hindered the renovation process. This study examines typical cases from both domestic and international contexts, delving into the technologies and methods employed in the renovation of old buildings. It investigates strategies related to policy regulations, social involvement, and environmentally friendly materials. Employing a methodology of literature review and case analysis, the study highlights key technologies including modern material application, green building concepts, and earthquake resistance. The research findings indicate that the renovation of old buildings while protecting cultural heritage, can enhance urban image and promote sustainable development. Through comprehensive analysis, this study concludes that policy support, social engagement, and technological innovation are pivotal factors in the renovation of old buildings. It emphasizes the need for collaborative efforts among governmental bodies, property owners, professional associations, and other stakeholders to achieve a virtuous cycle of urban renewal and cultural heritage preservation.

**Keywords:** Renovation of old buildings; urban renewal; sustainable development; technological innovation; social strategies.

## 1. Introduction

In the rapid process of urbanization, urban renewal and the renovation of old buildings have emerged as pivotal strategies to address various challenges encompassing urban development, environmental preservation, and cultural heritage. Urban renewal involves the redevelopment and transformation of old, dilapidated, or functionally obsolete urban areas, with the aim of enhancing urban quality, improving living environments, propelling economic growth, and augmenting social functions. Among these, old buildings, as essential components of urban architecture, should be given substantial attention for their renovation. This will not only address the living environment issues associated with old buildings but also promote the sustainable development of the construction industry through such renovations [1].

The objective of urban renewal is to meet the demand for a high-quality life. Given that current cities do not adequately fulfill the requirements of modern urban development, it becomes necessary to engage in the redesign and reconstruction of cities [2]. Its significance is profound: enhancing urban competitiveness, improving residents' lives, optimizing the efficient utilization of land resources, safeguarding historical and cultural heritage, achieving sustainable development, and promoting societal harmony.

Old buildings refer to structures that have been in existence for a certain period after construction and, to some extent, do not conform to contemporary functional or aesthetic standards but still retain usability. Old buildings can be broadly categorized into historical old buildings and general old buildings [3]. This research will explore various methods and strategies for the renovation of old buildings, with the goal of providing effective solutions for urban renewal and sustainable development. Through in-depth analysis of typical cases and the study of existing technologies and innovations, this research aims to uncover the potential and challenges of renovating old buildings, thereby offering valuable insights to ensure the successful implementation of urban renewal.

## 2. Techniques and Processes for Renovation of Old Buildings

The techniques and processes involved in the renovation of old buildings constitute a crucial aspect, encompassing various dimensions to ensure the feasibility, safety, and effectiveness of renovation projects.

### 2.1. Building Materials and Technological Innovations

Utilizing modern high-performance and eco-friendly innovative building materials, such as high-strength concrete and composite materials, is pivotal in enhancing the structural strength and durability of buildings. Simultaneously, restoration and preservation of traditional materials inherent to old structures, such as reinforcing wooden components and cleaning and restoring stonework, are carried out to prolong the lifespan of these materials.

#### 2.1.1. Application of modern materials in renovating old buildings

The building envelope serves as the interface regulating the exchange of substances and energy between the interior and exterior of a structure, with crucial functions in insulation, thermal insulation, daylighting, and ventilation, significantly enhancing the overall performance of residences [4]. The following are common applications of modern materials in renovating old buildings:

High-performance insulation materials: Old buildings often suffer from poor insulation; employing high-performance insulation materials like polystyrene boards and polyurethane foam improves insulation capabilities, reduces energy consumption, and enhances indoor comfort.

Eco-friendly decorative materials: Opting for environmentally friendly decoration materials, such as low-volatile organic compound (VOC) solvent paints and eco-friendly wallpapers, minimizes indoor air pollution and improves indoor environmental quality.

Innovative soundproofing materials: Old structures might exhibit inadequate soundproofing; adopting novel soundproofing materials like acoustic insulation panels and noise-reducing materials enhances acoustic performance and elevates living quality.

#### 2.1.2. Green building materials and considerations for sustainability

Renovation of old buildings must thoroughly consider the utilization of eco-friendly, energy-efficient, and sustainable building materials to mitigate environmental impact, enhance energy efficiency, and realize sustainability objectives. Employing renewable materials, recycled resources, high-performance insulation materials, low-VOC materials, and similar strategies minimizes environmental pollution. Embracing high-efficiency energy windows, intelligent building systems, green roofs, and walls further advances the sustainable utilization of buildings.

### 2.2. Structural Strengthening and Safety Measures

Comprehensive assessment of the structure of old buildings is vital, identifying weak points and implementing reinforcement measures to ensure building safety.

#### 2.2.1. Structural assessment and strengthening methods

Structural assessment and strengthening are pivotal stages in the renovation of old buildings. Through structural assessment, understanding the structural condition and safety of the building is achieved, pinpointing areas and methods requiring reinforcement. Based on establishing a reasonable model and setting some rational evaluation indicators, these buildings are evaluated [5].

Structural assessment involves thorough inspection and analysis of the old building's structure to comprehend its load-bearing capacity and existing issues. The evaluation comprises methods such as visual inspection, structural material testing, structural calculations, and numerical simulations, yielding safety assessment results. Non-destructive testing techniques, including ultrasonic testing and radar detection, can also be employed to examine the structural materials for potential problems like cracks, corrosion, and rust.

Based on structural assessment results, corresponding reinforcement design schemes are developed. Reinforcement designs may encompass various techniques, such as reinforced concrete

augmentation, steel structural support addition, external reinforcement, etc. to enhance the seismic resistance and structural stability of the building.

#### 2.2.2. Earthquake and natural disaster mitigation

Strengthening the seismic and disaster resilience of old buildings based on regional seismic and climatic characteristics is imperative, enhancing their ability to withstand adverse conditions.

Earthquakes and natural disaster mitigation are of paramount consideration, especially for old buildings. Due to their age and structural deterioration, these buildings might be at higher risk of seismic and natural disaster threats, necessitating corresponding measures for reinforcement and renovation to enhance their earthquake and disaster resistance.

Common earthquake and natural disaster mitigation measures in old building renovation encompass seismic reinforcement, seismic support, foundation strengthening, disaster prevention facility construction, secure evacuation routes, post-disaster emergency facilities, etc. These measures enhance the seismic and disaster resistance of old buildings, minimizing the impact of earthquakes and natural disasters on buildings and residents, and safeguarding their lives and properties.

## 3. Renovation of Space and Functional Optimization in Old Buildings

Optimizing space and functionality is a crucial aspect of renovating old buildings. Through the optimization of interior space and functionality, these buildings can adapt to the demands of modern urban life and the preferences of residents, ultimately enhancing their efficiency and comfort.

### 3.1. Space Planning and Design

During the renovation process, consideration is given to the versatility and adaptability of the building, ensuring it meets diverse usage needs and future development. Optimizing the interior layout of the building improves efficiency while providing a comfortable indoor environment.

#### 3.1.1. Flexibility and adaptive design

The internal spaces of old buildings are reconfigured and laid out in a more rational and flexible manner. Room locations and sizes are optimized based on functional requirements and foot traffic, with corridors and passageways set up reasonably to enhance space utilization and flow.

Multi-functional space design is employed to transform single-purpose spaces into versatile and adaptable areas. For instance, merging the original kitchen and dining room into an open-plan kitchen increases interaction and dynamism within the space.

Facilities that connect indoor and outdoor spaces, such as terraces, balconies, and courtyards, are introduced to enhance lighting and ventilation indoors while offering outdoor leisure areas.

#### 3.1.2. Space optimization and improved living experience

The exterior of a building is like the shell of an egg, providing protection; the interior is the yolk, the most crucial part. Both aspects complement each other [6]. In the renovation of old buildings, creating public spaces like multi-functional halls, lounges, and reading rooms satisfies residents' social and cultural needs. Environmental-friendly and energy-saving features, such as photovoltaic power generators and solar water heaters, are integrated into functional optimization to enhance the building's energy efficiency.

Through these space and functional optimization measures, old buildings can be revitalized, aligning with modern urban development and residents' requirements, ultimately boosting their functionality and value. Moreover, by emphasizing environmental protection and energy efficiency, optimizing the interior environment enhances residential comfort, thereby significantly enhancing the appeal of old building renovation.

### 3.2. Preservation and Heritage of Historical and Cultural Values

For buildings of historical significance, specialized heritage preservation measures are adopted to ensure that their historical and cultural value is not compromised during the renovation process. In the renovation design, modern elements are integrated to complement the traditional architectural style, achieving a balance between the preservation of historical and cultural heritage and the fulfillment of modern functional requirements.

## 4. Policies and Social Strategies for Renovation of Old Buildings

The techniques and craftsmanship involved in renovating old buildings require a foundation of scientific research and accumulated practical experience. At times, the construction site chosen for municipal engineering projects can significantly influence the future development of the city. Optimizing and improving urban design solutions can effectively avoid a series of severe issues, thereby aligning the trend of urban renewal more closely with the development of modern society, satisfying citizens' aspirations for a better life [7]. Additionally, rational financial investment and government support are key factors in promoting the renovation of old buildings, revitalizing the city's historical heritage, and making it a splendid calling card of modern urbanity. Throughout the process of urban renewal, the public will voice their opinions. Therefore, relevant government departments must take citizens' individual viewpoints seriously; otherwise, the distribution of interests may become complicated [8].

### 4.1. Policy Regulations and Support Measures

Countries and regions worldwide establish corresponding policies, regulations, and support measures to encourage and facilitate the renovation of old buildings, thereby realizing the goals of urban renewal and sustainable development. Formulating building regulations and standards related to the renovation of old buildings clarifies the technical requirements, procedures, and standards of renovation to ensure the safety and quality of renovation projects. The government can also provide financial subsidies and incentives for building renovation, encouraging property owners and developers to engage in the renovation of old buildings. Subsidies and incentives may include financial support and tax incentives.

### 4.2. Social Engagement and Stakeholder Cooperation

The construction of future communities closely aligns with the current focus of societal transformation and development. It promotes the integration of societal communities, the construction and governance of community entities, and the governance of highly integrated technological systems [9]. The primary stakeholders in the renovation of old buildings are residents and community members. Living within the immediate scope of renovation projects, they should actively participate in the planning and decision-making process of renovation.

Developers and property owners are the main implementers of old building renovation. They should collaborate closely to formulate renovation plans, ensuring project feasibility and economic benefits. Additionally, establishing appropriate regulatory mechanisms or inviting third-party quality inspection agencies ensures long-term and effective control over building safety and personal security [10].

## 5. Successful Case Analysis and Evaluation

### 5.1. Typical Cases of Renovation of Old Buildings in China

The Shikumen area of Shanghai Xintiandi was once seen by the people of Shanghai as a 'burden' of urban modernization in the late 20th century. However, through constructing new blocks while preserving old buildings, the Shikumen area transformed into a fashionable landmark and a new

calling card for Shanghai. After the renovation, it became a place that integrates culture, creativity, leisure, and commerce, attracting tourists and residents alike [11]. This transformation highlights the integration of cultural preservation and urban development.

In Chengdu, old factories have been transformed into cultural and artistic creative parks. These parks not only retain the original architectural appearances but also attract many cultural and artistic practitioners, promoting the development of the cultural industry. Through renovation, these old buildings have regained vitality, becoming important components of urban development and cultural heritage. The protection of historical and cultural heritage and active social engagement played a pivotal role in these transformations. Additionally, the introduction of creative industries and modern facilities allowed these renovated buildings to better serve the needs of the modern city.

### 5.2. Typical Cases of Renovation of Old Buildings Internationally

#### 5.2.1. Centre Pompidou in Paris

Originally an old industrial building located in the heart of Paris, Centre Pompidou was transformed into a world-renowned modern art center in 1977. It is often referred to as the 'pipe art'. While preserving the original industrial exterior, Centre Pompidou underwent comprehensive interior space and functionality optimization, providing artists and visitors with a multifunctional space for exhibitions, performances, learning, and communication.

#### 5.2.2. Tate Modern in London

Initially an electric power plant in London, Tate Modern underwent a renovation to become a modern art museum. While retaining the industrial characteristics of the original building, Tate Modern created spacious open areas suitable for art exhibitions, establishing itself as one of the most significant modern art museums globally.

These international case studies demonstrate the potential of transforming old buildings into vibrant cultural and artistic centers through thoughtful renovation. The success of these renovations lies in their ability to blend historical preservation with modern functionality, thereby contributing to the enrichment of urban life and cultural experiences.

## 6. Challenges and Solutions

### 6.1. Financial and Technical Limitations

Renovating old buildings often requires substantial financial investments, including structural reinforcement, interior refurbishment, and equipment updates. Many old buildings are located in historical and cultural districts, which can increase the cost of renovation and potentially exceed the financial capacity of property owners or governments. Some old buildings have complex structures and demanding technical requirements, involving unique engineering challenges. The lack of suitable technology and skilled professionals can lead to delays or failures in renovation projects.

### 6.2. Social Awareness and Cultural Perception

Society may lack awareness of the importance of preserving old buildings and might perceive demolition and reconstruction as more convenient options. Therefore, the protection and renovation of historical and cultural buildings could face skepticism and resistance. In the process of urban development and modernization, some old buildings might be overlooked or even demolished. The significance and value of renovating old buildings may require a deeper understanding and awareness within society. During the renovation process, conflicts between cultural value preservation and modern functional requirements may arise. Balancing the preservation of historical and cultural values with meeting the needs of modern society necessitates comprehensive consideration.

## 7. Conclusion

As urbanization accelerates and people's emphasis on historical and cultural preservation grows, the renovation of old buildings will continue to be a crucial topic in urban renewal. With technological advancements, new techniques and methods will continually emerge for renovating old buildings. In the future, increased application of smart and sustainable technologies will offer more possibilities for the renovation of old buildings. Moreover, the trend in old building renovation is moving toward greater environmental-friendliness, energy efficiency, and resource recycling to reduce environmental impact while creating healthier and more comfortable living environments.

This subject is a complex and interdisciplinary one, requiring more collaborative efforts across fields and the involvement of professionals from various domains to share experiences and resources in renovation projects. Balancing historical and cultural heritage protection with giving old buildings new functions is crucial in their renovation. Further research and exploration are necessary to achieve the inheritance of historical and cultural aspects along with the demands of modern society through scientific methods and concepts.

Old building renovation demands significant financial investment and has longer renovation cycles, necessitating the involvement of more skilled professionals. Thus, enhancing education and training efforts will attract more talent to engage in the old building renovation industry. Looking ahead and addressing challenges, only through joint efforts of governments, various sectors of society, professional organizations, and the public can the renovation of old buildings become a successful model for urban renewal and cultural heritage preservation, contributing significantly to the sustainable development of cities.

## References

[1] Xia R., Guo D. Analysis of Old Building Renovation in Urban Renewal under the Background of Urbanization. New Urbanization, 2023, 6: 108-111.

[2] Yu H. Discussion on Urban Design Strategies in Urban Renewal. China Housing Facilities, 2023, 2: 70-72.

[3] Qin Y. Research on Theme Hotel Design Based on Adaptive Renovation of Old Buildings. Chengdu University, 2023.

[4] Shu C., Zhuang Z., Gu, W. Analysis of Suitable Technologies for Residential Building Envelope Renovation in Shanghai's Old Residential Communities. Building Science and Technology, 2023, 43(5): 17-23, 50.

[5] Fei H. Discussion on Evaluation and Protection Scheme of Urban Old Buildings. Modern Communication, 2016, 13: 253.

[6] Li J. Research on Activation and Reuse of Old Building Space. Master's thesis, Dalian University of Technology, 2017.

[7] Luo Y. F. Reflection on Urban Design Strategies in Urban Renewal. Urban Construction Theory Research, 2019, 27: 55.

[8] Wang S. F., Shen, S. T., Mo, Z. J. Reflection on Urban Design Strategies in Urban Renewal. Shanghai Urban Planning, 2017, 5: 7-11.

[9] Liu Y. H., Zhou, X., & Zhang, J. Reflection on the Improvement of Future Community Construction. China Municipal Engineering, 2023, 1: 1-3.

[10] Jiang X. A. Transformation of Old Residential Communities Needs to Be "Age-Friendly". Beijing Observation, 2018, 7: 56-57.

[11] Chen, X. Study on the Brand Image of Tourism and Leisure Blocks—A Case Study of Shanghai Xintiandi. Knowledge Economy, 2022, 613(14): 26-28.