Smart growth of historic district under the resilience and sustainability: A case study of Shuanglong Lane in Kaifeng

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Abstract. Historical blocks are rich in cultural relics and historic buildings, and their renewal and activation play an important role in improving the decline of the city center and enhancing the quality and taste of the city. Based on the concept of resilience and sustainability, combined with the regional characteristics, cultural background, and the actual situation in the renovation and renewal of Shuanglong Lane, this paper explores the smart growth strategy and practice of the historical district in the three-dimensional framework of the environment, business form, and society, through the integration of physical space, the reconstruction of commercial space and the harmony of social space. The purpose is to promote the same type of block in the process of protective renovation and characteristic rejuvenation, to resist disasters in the form of a complete community, and to improve resilience, adaptability, and sustainable development.

1. Introduction

The historic district with the active and dense population usually illustrates the origin, evolution, and collective memory of a city. Its revitalization and renewal are vital to the manifestation of the city feature, the improvement of its quality, and its economic development [1]. However, most of the historical districts have a poor quality of house appearance, aging structural, high density of living, outdated infrastructure, and chaotic management, etc., which cannot meet people’s high quality of life and are gradually falling into a dilemma. Therefore, it has become the only way for the renovation and renewal of the historic neighborhood to improve the original environment, enhance the vitality of the neighborhood, and match the development of the city.

In July 2020, the General Office of the State Council put forward guidance on comprehensively promoting the renovation of old communities in cities and towns. Subsequently, 13 ministries and commissions including the Ministry of Housing and Urban-Rural Development jointly issued the “Compensation for Shortcomings to Build a Complete Residential Community”. This provides policy guidance for solving the debilitating and hollowing of urban historical blocks, scenic areas, and old communities, improving the quality of the city, and improving the functions of the blocks. This article takes Kaifeng Shuanglong Lane as an example to explore the development model of the district by continuing the historical heritage gene, alleviating local land pressure, creating neighborhood vitality, and expanding influence while protecting and renewing.
2. Theoretical study

2.1. Resilience and sustainable development

*Silent Spring* (Rachel Carson, 1962), aroused wide attention to environmental protection all over the world, which to cope with the changes of the times, the deterioration of the natural environment, and the development of the social economy. And a new concept of sustainable development emerged in the 1980s. The application of the concept of “resilience” in urban planning and architecture provides a new perspective and means to achieve the goal of sustainable development [2]. Today, the city has become the future center to ensure sustainable development [3], and the resilient community, which is the first to perceive disasters and risks, is becoming an important part of the construction of resilient cities [4]. Therefore, as the core of a city, the historic district should be activated, moderately reformed, compactly renewed, and strive to achieve sustainable development under the principles of fairness, sustainability, and commonality.

2.2. Smart growth of historic districts

The smart growth theory was put forward in the 1970s, and then was supported and promoted by local government committees, the New Urbanism Conference, and the Environmental Protection Agency (EPA). This theory has gradually become a planning strategy for the revitalization and renewal of American cities, urban areas, and communities. To cope with the predicament of unlimited urban sprawl, disorderly expansion, and central decline, the General Office of the State Council proposed to comprehensively promote the renovation of old urban communities, indicating the era of peri-urbanization and shantytowns has ended. According to the triple bottom line or three dimensions of sustainable development and the definition of the U.S. Environmental Protection Agency (EPA) [5,6], the basic principle framework of resilient and sustainable historical district smart growth is shown in Figure 1.

![Figure 1. Basic principles of smart growth.](image1)

![Figure 2. Smart growth of block space.](image2)

3. Analysis of the value and present situation of the historic district

3.1. The value cognition of historic district

Historical blocks are physical examples of the evolution and development of urban history and culture, which are of non-renewable scarcity and of great significance to the individual development and revitalization of the city or region they located. In *Revitalizing Historic Urban Quarters*, Steven Thiesdell believes that historic districts have multiple levels of important value [7]. First of all, historical districts are an important carrier of historical background, regional customs and humanistic stories. Secondly, it shows the antique flavor of old buildings and the diversity of street textures, and evokes people's memory of history. Thirdly, the aborigines living in the historical districts have constructed a social network, and the historical districts just provide a place for residents’ cohesion and sense of belonging. Finally, the scarcity of historic districts provides them with direct and indirect
economic benefits and commercial value, as well as the driving force for their protection and maintenance.

3.2. **Analysis of the present situation of the Shuanglong Lane historic district**
Kaifeng, an ancient city with a history of more than 2,700 years, flourished in the Northern Song Dynasty and was the premier cosmopolitan city at that time. It has become the first batch of historical and cultural cities because of its “rich cultural relics, profound cultural heritage, ancient urban fabric, and unique northern water city”. The history and culture of Kaifeng Shuanglong Lane can be traced back to the Northern Song Dynasty. It is named after the legendary Song Emperor Zhao Kuangyin and Zhao Guangyi who lived here when they were young. Shuanglong Lane is only 850 meters away from the central axis of the ancient city of Kaifeng that has remained unchanged for thousands of years. It was designated as a historical and cultural district by the Henan Provincial Government in 2018. At present, the infrastructure renovation in the block has been completed, and most of the residential building of key point renovation areas have been demolished, such as reconstruction, expansion of properties, renovation, and some are under restoration construction. The Tangguo Factory and Bian Embroidery Factory have been refurbished, and schools and hospitals have also undergone partial renovation. The prototype of the core area has emerged, and subsequent operations are also being implemented steadily. It is increasingly important to continue district genes under the smart growth concept for inherit the cultural heritage of the neighborhood, remediate the surrounding environment, and promote the sustainable development of resilience.

4. **Resilient and sustainable smart growth of the historic district**

4.1. **Integrating of physical spatial structure: the growth of the livable environment**

4.1.1. **Complete spatial form.** A historical block is an area of a certain scale with a concentration of ancient artifacts and a collection of historical buildings, which can more completely and truly reflect the traditional pattern, historical features and ethnic local characteristics of a certain historical period [8]. According to the location and characteristics of the Shuanglong Lane, the first phase of the project, the southern area, contains major historical and cultural sites protected at province level, historical buildings, and ancient and famous trees. The total area is 23.2hm², and the texture of traditional streets and alleys is clear, among them Ia is the core reserve covers an area of 12.08hm² and Ib is the construction control area covers an area of 11.12hm². Phase II, Shuanglong Lane of the north area, extends north to Yanshousi Street, which enables this plot is also included in the historic district. IIa has 4.76hm², and IIb area has 16.77hm². Not only the spatial structure of this area is increased, but its functions are also expanded, and a complete block and community are built (Figure 2). In the future, according to the needs of the overall urban planning pattern, it will be extended to Tieta Street based on spatial continuity, forming an area called Shuanglongfang about 45.38 hm². Due to space limitations, this article will not repeat it.

4.1.2. **Safety and accessibility of streets.** To protect the street texture of historic blocks, the core area can’t change and widen the roads at will, which restricts vehicles to access and makes slow traffic become the main mode of passage in the alley. And the commonly used design principles are added parking lots outside the block to strengthen the external traffic. Based on unblocked traffic, it should construct emergency, avoidance and evacuation channels and places to fully improve the openness, safety and accessibility of the block.

Although the space features of street and alley remains intact, while its width is relatively narrow. The width of Shuanglong Lane is 6-7m, the width of LiuFu Hutong, Nanjukui Lane and Houjia Hutong are 3-5m, and Qujia Hutong is only around 2 to 3 meters. There is a lack of public space in the block, and the road surface with poorer quality material has consisted of brick or soil. Some spatial nodes should be designed to connect the main and secondary roads of the city, such as the east and west
squares, the south square, and bridges to connect Shuiche Hutong and Yanshousi Street. The north side of Dongpengban Street is designated as the core protection area of the historic district, and the south side is designated as a construction control zone, which can be changed appropriately, so the street is widened to the south side to form a 12-meter-wide roadway (Figure 3). Shuiche Hutong, Lianhe Street, and Beifu Hutong should be joint and clear to access, forming a north-south branch road for motor vehicle traffic. A complete pedestrian system should be built in this area, such as stone arch bridges, landscape-covered bridges, and other pedestrian alleys.

It is a difficult problem for the reconstruction of all old blocks and old urban areas to design the parking space. The purpose of planning design is to design a mode to separate pedestrian and vehicular, which makes car parking along with the main street. And there are six parking areas allowing 1342 cars parking, including five underground parking lots that could be regarded as shelter. The playground of Kaifeng No. 8 Middle School, the Yishi primary school, the east-west entrance square, the Baiyige green courtyard and the Longyang river green park are identified as earthquake-proof and emergency evacuation sites (Figure 3).

**Figure 3. Safe access to streets and alleys.**  **Figure 4. Integrated community.**

### 4.1.3. Ecological livability of residents

The concept of urban planning design of livability and ecology is booming. The historic block that used to be neglected has gradually attracted attention [9], which not only related to people's quality of life but concerns the degree of cultural heritage conservation. Since the formation of historical blocks is relatively long, the infrastructure will inevitably be outdated. The method, completed in one go and buried underground, should be used to increase and improve infrastructures, such as water supply, power supply, gas supply, heating, and WIFI, minimize renovation works, and preserve the original state of the historic district. The core area of Shuanglong Lane is mainly protected, which is of great significance to protect the original inhabitants and their vivid living atmosphere. Therefore, a small amount of commercial and residential areas should be added to the design, such as the southwest side of the intersection of Dongpengban Street and Nanjukui Alley, the north side of Chaoyang Hutong, and Baiyi Temple. However, it is necessary to preserve and continue traditional residential areas, such as the north of Dongpengban Street, especially the northwestern of the area, which accounts for 22.21%. Due to the high residential density in the historic block and the lack of public space, small, decentralized pocket parks should be adopted in the design. In addition, both sides of the Longyang River, expected to be excavated, should be greened and planted to establish a continuous waterfront greening interface, forming a greening network of “points, lines, and areas” to improve the whole surroundings.

### 4.2. Reconstruction of commercial space and format: business scale growth

#### 4.2.1. Construction of cultural leading business field

Culture is the spiritual activity and product of human society relative to economy and politics and has been used as a way to rejuvenate communities and create brands to promote urban development [10]. It will become an important way to change the
urban development model by combining smart growth concepts and guiding the renewal and activation of historical blocks to protect historical heritage. Protection is only a measure, not a final goal. Ancient monuments and former residences of celebrities have certain historical value and commemorative significance. They cannot be well protected if they are left unused. Through functional replacement and implantation of characteristic cultural and creative industries, they can be further sublimated on the basis of their original functions.

The ideal planning for Shuanglong Lane should consider its plentifully historical and cultural heritage resources then focus on cultural creativity and creates a display and experience space to promote cultural inheritance. At present, there are complex types of land use, such as residential, commercial, and industrial. Therefore, it is planned to reduce 55.2% of residential land to 10.12% and increase the 1.29% commercial land to 31.16%, and add 0.73 hectares of green land and square land, accounting for 3.15% of construction land. Additionally, it is predicted to establish Longyang River waterfront commercial, and add street commercial from the east of Jiefang Road to Liufu Hutong, and creates leisure and entertainment and catering service facilities to enhance the commercial vitality of the neighbourhood.

4.2.2. Expansion of commercial formats with prominent regional characteristics. In Shuanglong Lane, there are historical and cultural sites protected at the province level, 21 immovable cultural relics, 11 historical buildings, and 32 characteristic door heads, 49 pillar foundations, 6 bearing stones, and 1 door stone that can represent the historical environment. And 36 ancient and famous trees, especially the Pagoda tree at No. 20, Shuangjing Lane, has been 300 years old and is growing well. These houses, objects or trees all tell history and stories, which are the evidence of material culture. Famous houses of celebrities, are used as places to display the architectural art and cultural connotation, such as Zhang Fang’s old house memorial, and typical houses are used as residential museums, such as Chen Weiru’s former residence, etc. The courtyards and houses along the street serve as carriers to form experience platforms that represent local cultural characteristics such as traditional art, folk culture, and hand-crafted workshops. Specific examples are the Henan Opera Quyi Cultural Center, Bian Embroidery and Guan Kiln Museum, Zhuxian Town Woodblock New Year Painting Museum, and vacation rental living experience. In reminiscing the historical memory of Kaifeng, street signs should be displayed, relics should be excavated, and local intangible culture should be implanted. The old buildings at the east and west entrances should be equipped with tourist reception and promotion halls to influence the surrounding areas while showing the characteristics of the block.

4.3. Social space resilience and harmony: social network growth

4.3.1. Social ecological stability. People-oriented voluntary principles should be adopted to moderately retain no less than 20% of the original residents, reduce the population of the area from about 550 people/hm² to 325 people/hm², and control the population of the core area to 720. The combination of gentrification and localization should be strengthened to make the neighborhood a residential community with life traces, folk culture, market culture, and religious culture. The design should emphasize people-oriented and use dynamic and static separation, not only to avoid the nuisance of tourists to residents, but to facilitate their visits to the scenic spot. The area of squares and green areas should be increased to account for 5.46% of the urban construction land area, such as the block square, the Shuanglong Lane Square and the Longyang River Waterfront. The use of public space in historic districts should be strengthen to promote communication between people in the community, avoid the disconnection of social network relations, and achieve community stability.

4.3.2. Integrated community building. Wu Liangyong first believe that the concept of integrated community, emphasizing that the city is the people, and planning cities should based on communities from a micro perspective to improve the quality of life and social cohesion [11]. At present, in the "post-unit" era, the block not only includes housing and life, but also includes many elements such as
health, education, elderly care, transportation, public security, culture and entertainment. In the new urban development concepts such as resilient cities, sustainable development, and smart growth, a 5-minute living circle should also be built in historic districts to showcase local culture and provide tourism, residence, commerce, etc. The Shuanglong Lane Historical and Cultural District Protection Management Office, as a regulatory agency, is responsible for management and operation, regular inspections, regular maintenance, timely repairs, etc., to reduce the hidden dangers of damage to ancient wooden buildings. The land used for the original Dongpengban community service center should be expanded, and add its service functions. To achieve the ultimate harmonious society, the block should build a multi-functional and integrated community to improve its safety, vitality, accessibility, livability, and harmony (Figure 4).

5. Conclusion
The historic district should pay attention to their resilience, adaptability and sustainable development, when improving the quality and creating vitality. Historical blocks are rich in multilateral value in people’s cognition, therefore, protective micro-renewal and small-scale development and utilization are often carried out in practice. However, the ultimate goal of its development is still mainly based on economic benefits, lacking of overall consideration of people and community. This article takes the renovation project of the Shuanglong Lane Historic District in Kaifeng as an example, based on the smart growth concept in urban development in the United States, to explore strategies and measures for the growth of livable environment, commercial scale and social networks. This effectively responds to various incentives that make it vulnerable, achieving resilient and sustainable development.

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