

Research on renewal strategy of old community under the concept of inside flow

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ORIGINAL RESEARCH PAPER



ABSTRACT

As China enters a phase of high-quality development, urban development is transitioning from extensive expansion to refined quality enhancement. During this phase, urban renewal must adapt to the new objectives and demands of urban development in the new era. The concept of “Inside Flow”, with its environmental and social friendly characteristics, provides a universally applicable and effective means for the sustainable renewal of old communities. Drawing on the practical case study of the renewal of the eastern section of Yaojiayuan Road in Beijing, a “small-scale, gradual, and recyclable” strategy based on the concept of “Inside Flow”, is operated for the renewal of public space in old communities that aligns with spatial form development and urban operational logic. This paper aims to offer insights for the sustainable renewal of public space in old communities in the future.

KEYWORDS

urban renewal, inside flow, old community, public space, sustainability

1. INTRODUCTION

1.1. Urban renewal in Beijing

According to statistics, there are more than 200,000 old residential communities in Chinese cities and towns built before the year of 2000, including nearly 4,000 in Beijing [1]. In response to the constraints of the limitations of old communities on high-quality urban development, Beijing has improved its urban renewal policy system, coordinated research and planning of supporting policies and standard specifications in land, finance, taxation, and business management, promoted urban renewal legislation, formed a series of documents related to urban renewal, and used the full process tracking of typical cases as the starting point to solve the difficulties and bottlenecks in project promotion through “micro reforms”. The policy system has been implemented and refined in a “small, fast, and flexible” form [2]. Since 2021, the Beijing Municipal Government has successively formulated and launched top-level design documents for instance the Beijing Urban Renewal Action Plan (2021–2025) [3], Guiding Opinions of the Beijing Municipal People’s Government on Implementing Urban Renewal Actions [4], Beijing Urban Renewal Special Plan (Beijing’s 14th Five Year Plan for Urban Renewal) [5], Beijing Urban Renewal Regulations [2], etc., which indicate the implementation path for urban renewal.

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1.2. Development of the concept of urban renewal

The concept of urban renewal first appeared in the 1954 US Housing Act [6], mainly targeting the renovation of residential areas in urban waste and depressed areas. In social practice, the objects of urban renewal are not fixed. Different countries have distinct objects of urban renewal at different stages. The concept of updating old communities in China began in the 1980s. Professor Wu Liangyong first proposed the theories of “protection and development” and “organic urban renewal” for the protection and renewal of old cities in China [7].

Urban renewal is a systematic project that involves comprehensive urban issues including spatial planning, living environment, historical and cultural protection, ecological restoration, disaster prevention, and reduction. It not only serves the current urban development, but also solves many problems left over by urban development [8]. With the continuous deepening of research in this field, Chinese scholars’ research on the renovation of old urban communities has shown a trend of transitioning from single material space research to applied policy research, and then to comprehensive mechanism research. Compared with previous models, urban renewal under the new development concept emphasizes on integrity, systematicity, and sustainability, highlighting people-oriented and high-quality development. Its constituent elements are more diverse and the levels are richer, emphasizing the collaborative governance of more open and diverse subjects such as government, market, and society [9].

2. RESEARCH METHODOLOGY

The concept of “Inside Flow” originated from the theoretical model of “Recycity” proposed by Superuse Studio in the Netherlands [9]. It aims to transform a linear and independent social system into a circular and comprehensive urban environment, establish “cyclizers” to redefine the direction of transformation, connect and mobilize existing materials and energy in the local area, and make the urban system adapt to the local environment [10].

“Inside Flow” is an analytical method that uses flow as an auxiliary design process, aiming to systematically understand the flow in living environment. “Flow” refers to the movement of energy, mass, or information over time. By analyzing the “flow” system, new design thinking approaches are stimulated, encouraging designers to adopt sustainable design methods for valuable urban resources and establish any possible connections within the system. At present, there are 3 groups and 14 subcategories of the “Inside Flow” method available for project analysis (Table 1).

The concept of “Inside Flow” advocates for the interaction of various groups in the cycle. In short, the output of one substance can become the source of another substance, and the output of this substance becomes the source of the next substance. In a similar fashion, forming a “circular chain”. In practice, by improving the original strategy,

Table 1. Classification of “Inside Flow”

Layers	Subcategory
Physical Layer	Users
	Nature
	Food and other organics
	Inorganic material
	Traffic
	Water and other liquids
	Air and other gases
Value Layer	Data/information and knowledge
	Identity and culture
Energy Layer	Money
	Electricity and other powers
	Heat
	Light
	Sound

Source: Superuse Studio, [10].

forming a new circular chain, redirecting, transforming, and connecting existing materials and energy in the local area, the urban circulation system can better adapt to the local environment, continuously promote urban metabolism, and promote urban renewal.

3. “INSIDE FLOW” FOR THE RENEWAL OF OLD RESIDENTIAL COMMUNITIES

3.1. General situation of old residential communities

As a complete system, the residential community forms a complex organic unit among its various elements, constantly self-regulating and dynamically updating, experiencing a cycle of emergence, development, maturity, and decline, constantly adapting to environmental changes, maintaining relative stability, and promoting community development [11]. At present, there is barely connection between the various elements of updating in most old communities, and the elements rarely benefit from each other’s existence.

3.2. Renewal strategy under the concept of “Inside Flow”

The concept of “Inside Flow” provides a new perspective for community renewal. By constructing a circulation chain related to various materials in the community and adopting an intensive development approach for sustainable renewal and transformation, it creates feasibility for realizing a new sustainable community circulation system, thereby promoting effective utilization of community resources and environmental protection [12]. Focusing on the coupling relationship between the renewal of old communities and “Inside Flow”, this research proposes the following strategies.

Firstly, activate diverse scenarios and empower harmonious communities. The renewal of old communities requires identifying their own advantages and opportunities in the development of urban regions. Based on defusing shortcomings and improving the quality of space, the

renewal should focus on developing a high-quality commercial system for life services, creating a distinctive image, attracting high-quality external audiences to participate in internal communication and interaction within the community, and thereby enhancing community vitality [13]. Realize personnel and capital circulation within and outside the community.

Secondly, improve urban service functions and enhance living experiences. As an important component of the urban renewal system, the renewal of old communities should be based on improving the quality of living environment and residents' quality of life, exploring the inefficient spaces in the existing environment, supplementing the shortcomings of the current supporting facilities in the community, and carrying out comprehensive renewal in a targeted manner according to the characteristics of the community.

Thirdly, build heartwarming living streets and create livable living atmosphere. A safe and comfortable travel environment is the base of a high-quality community [14]. In the process of organizing public spaces, especially pedestrian spaces, in old communities, the first step is to ensure the continuity and smoothness of routes, and then consider the different travel needs of different age groups to build an age friendly pedestrian system. The purpose is to promote interaction between residents and the environment, facilities in the community, becoming a place for residents to communicate, engage in activities, and gather vitality, bringing multi-level circular experiences to residents.

Fourthly, optimize the vertical interface and innovate urban landmarks. The vertical interface of a community is an important component of a city's image, which has a direct impact on residents' life experience. Taking urban renewal as an opportunity, updating the facades of old communities can not only improve the quality of residents' life, but also embellish the city to achieve a win-win situation between the community and the city, meanwhile, forming a cycle of interests between individuals and subjects.

The renewal of old communities under the concept of "Inside Flow" focuses on creating new lifestyles, scenarios, and consumption patterns in the context of modern society, reconstructing the centripetal force of old communities, shaping new values for communities, and constructing a glorious prospect of future life.

4. CASE STUDY OF THE RENEWAL DESIGN UNDER THE CONCEPT OF "INSIDE FLOW"

4.1. Site investigation

Yaojiayuan Road is located in the western part of Chaoyang District, Beijing, and belongs to Tuanjiehu Street. The street starts from Pingfang Road in the east and ends at eastern 3rd ring North Road in the west, adjacent to Tuanjiehu Park and Chaoyang Park. It has a spatial planning with a dense network of small blocks. The stations of subway lines 6, 10, and 14 are distributed around the street, with convenient transportation, making it one of the most livable streets in

Chaoyang District. This section of the road has abundant public resources, including schools, hospitals, parks, sports centers, etc., providing residents with comprehensive and convenient daily services (Fig. 1).

With the continuous development of the surrounding environment, the current situation of Yaojiayuan Road no longer able to adapt to the development trend of the surrounding area, there is a lack of public service facilities, and the image of the street is less prominent (Table 2).

4.2. Innovation proposal

This research takes the renovation of the public space in the eastern section of Yaojiayuan Road as an example. New connections are proposed to be established to enhance the vitality and functionality of the space through the analysis of the "flow" patterns of various elements in the entire public space. Based on the analysis of the current "flow" mode, the

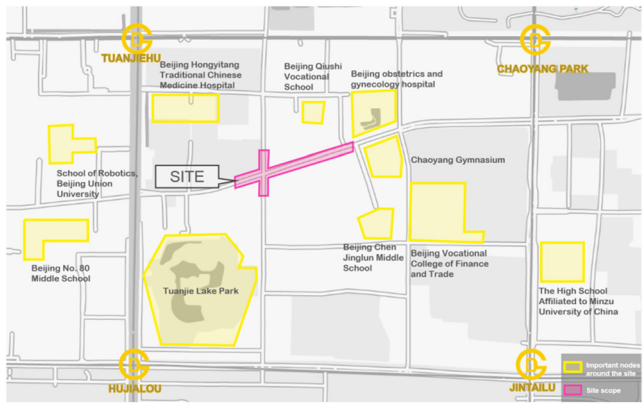


Fig. 1. Analysis of surrounding resources of Yaojiayuan Road (Source: Authors)

Table 2. Research on the current situation of Yaojiayuan Road

Current Situation of Yaojiayuan Road	Concrete problems
Service facility configuration	Lack of centralized charging equipment for a large number of electric bicycles Lack of suitable rest facilities on both sides of the road Lack of convenient service facilities, resulting in inconvenience for vulnerable groups to travel
Image of the street	Unordered Vehicles parking in public space along the street, causing obstruction to pedestrian traffic Lack of distinctive scenes, and an absence of obvious iconic structures or attractions Limited types of customers, and less attractive for residents from other areas

Source: Authors.

research team will give strategies to better answer the needs of community residents and visitors (Fig. 2). This study aims to inject new vitality into the public space of the eastern section of Yaojiayuan Road, promote interaction and communication among community residents while creating a more livable and tourist friendly public space, and achieving sustainable development of the space (Fig. 3).

4.3. Practice of innovation

4.3.1. Establish a physical layer: a traffic - user circulation promotion. The consumers of Yaojiayuan Road are mainly community residents, and the types of commercial passengers are limited. Meanwhile, this area lacks basic public service facilities with featureless appearance, which barely attract the customers of surrounding commercial areas.

Under the concept of “Inside Flow”, the renewal strategy aims to solve the problem of random parking of vehicles in the street and broaden the pedestrian space by innovating important nodes along the street. The addition of urban sculptures and nighttime lighting systems drives the overall atmosphere of the street [15, 16]. The addition of age friendly and accessible facilities meets the needs of special populations [17]. The enhancement of fun, interactivity, and accessibility of pedestrian space optimizes the quality of the street (Fig. 4). The research team started from improving the flow of different forms of transportation, to facilitate the travel of residents, while attracting new customers in the surrounding area through high-quality and comfortable walking space, thus driving the commercial development of the street (Table 3).



Fig. 4. Innovated street corner with well-structured multi-functional pavilion, comparison before and after renewal (Source: Authors)

4.3.2. Form a value layer: a culture - economy circulation promotion. Based on the history and culture of the street and the will of the residents, a unique cultural system with the characteristics of Tuanjiehu Street was created, and the façade of the retailers along the street was innovated, respecting the historical continuity while accommodating the emergence of different commercial modules with sufficient space for commercial expression (Fig. 5). Through this method, different types of merchants can be attracted to settle in, new production environment can be created, and the circulation and renewal of the street's economic environment can be promoted (Table 4).

4.3.3. Build an energy layer: a solar - electricity circulation promotion. In street renewal, available energy is categorized into conventional and new energy sources. Streets can be innovated to improve the energy circulation system, obtaining energy directly from the environment, so that street buildings are in dialogue with their sites, climatic conditions, and their own environments. In harmony with



Fig. 2. Schematic diagram of the innovated street circulation system (Source: Authors)

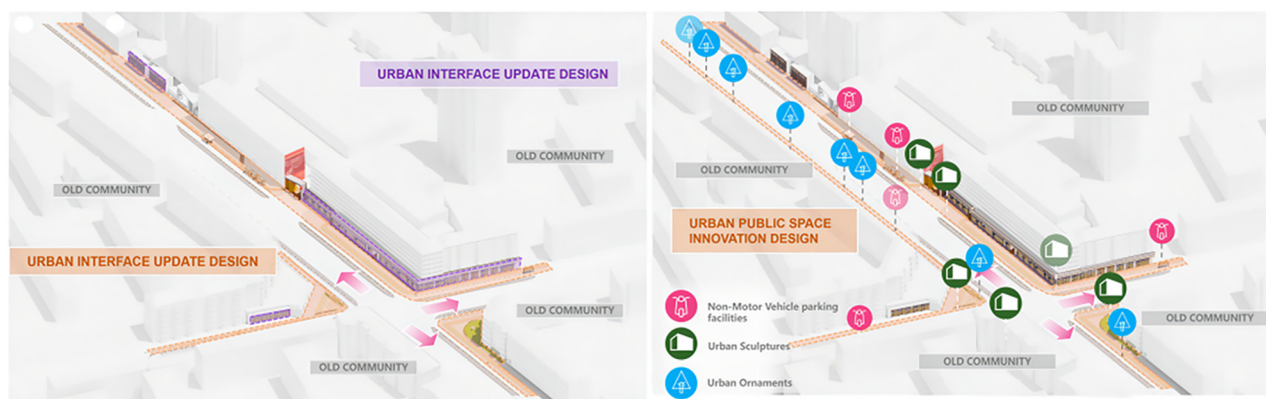


Fig. 3. Scope and types of public space renewal in the eastern section of Yaojiayuan Road (Source: Authors)

Table 3. Physical layer: implementation plan for transportation and user cycle

Layers	Subcategory	Purpose	Specific measures
Physical Layer	Transportation Cycle	Optimize pedestrian space	Reduce the number of street parking and move some vehicles to the parking lot belongs to the market Add electric bicycles, bicycle parking spots, with charging equipment for electric bicycle to improve the current parking situation for both non-motorized and motorized vehicles
	User Cycle	Attract potential customers from the surrounding areas for shopping	Redesign the paving system and add urban sculptures derived from street culture Add recreational facilities; Redesign street signage; Enhance accessibility design such as age friendly seats Redesign the roadside isolation piles with lighting function Improve the night lighting system of the street, add different types of lighting facilities to enrich the level of night lighting in the street

Source: Authors.

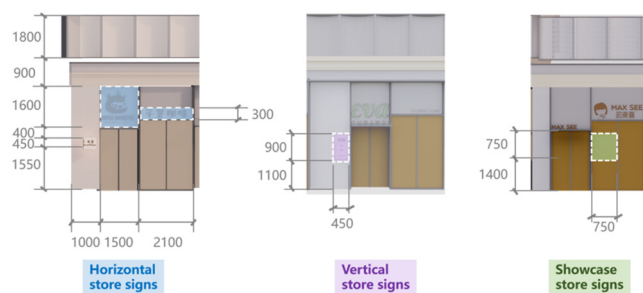


Fig. 5. Schematic diagram of technical control for the street interface of commercial stores (Source: Authors)

the ecological environment, the balance between buildings and environment promotes the self-sufficiency of the street's internal energy system (Table 5).

In the small-scale urban construction of street renewal, it is important to seize the opportunity of the times and take advantage of the favorable market environment of China's photovoltaic industry. In this research, solar panels are applied to provide electricity for street facilities, then, to achieve partial self-sufficiency of energy in the streets and to reduce the waste of energy (Fig. 6). The simple utilization of solar energy is an attempt to improve the energy cycle of the street and promote the continuous improvement of the subsequent energy cycle system of the street to realize the sustainable development of the street.

Table 4. Value layer: implementation plan for cultural and economic cycle

Layers	Subcategory	Subcategory	Specific measures
Value layer	Identity and Culture	Create a unique street cultural atmosphere	Based on the historical and cultural elements of the street, the street image is generated with elements of "unity, water flow, and Inside Flow". Unify the street's image by orange main color tone. Set up urban furniture to promote street culture in the greens of the street.
	Economy	Enhance the quality of commerce, and drive community renewal through economic cycle	Design wall paintings with street cultural characteristics. Innovate the street market entrance for convenient identification. Apply external punched pressed aluminum panels to form a double-layer facade. Transform the commercial facade along the street. Standardize the size and color of bottom commercial signs

Source: Authors.

Table 5. Energy layer: implementation plan for solar energy and electric energy cycle

Layers	Subcategory	Subcategory	Specific measures
Energy layer	Solar Energy and Electric Energy	Improve the application of street energy and achieve sustainable development	Apply solar panels to provide power for electric bicycle charging equipment, as well as some urban features and other facilities with lighting functions on the streets

Source: Authors.



Fig. 6. Electric bicycle charging cabinet generated by solar power
(Source: Authors)

5. CONCLUSION

Community renewal is not a short-term design project, but a long-term sustainable project that relies on the living needs and collective will of residents to promote the reproduction of community space. The renovation of old communities should turn from a disposable high-cost renovation to a gradual socialized renovation. Renewal strategy guided by the concept of “Inside Flow” helps communities discover problems in their own systems and make targeted adjustments to related issues within the community. Different types of cycles under different groups within the street intertwine and promote each other, which helps to achieve self-renewal of the community. With the cooperation of multiple parties, a complete community renewal system is formed, promoting sustainable and circular development of the community.

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