

# Examining the Optimization of Urban Design -- Analysis of Urbanization-Related Tactics for Enhancing Livable Street Spaces

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**Abstract.** In the context of rapid urbanization, the detailed planning of urban design lacks an integrated consideration of old and new spaces and humanized design, revealing a number of aspects that need to be improved. The living street environment, which is most intimately connected to people's daily activities, typically lacks convenience and comfort, a humanized design, street dynamics, and a natural and humanistic appearance. In order to better understand the direction of improving the living street space in the context of urbanization, this paper discusses the research background, the concepts related to street space, analyzes the research methods, specific cases, and current problems, and through the literature research and quantitative research, puts forward ideas on the optimization strategies of living street space, and attempts to summarize the generally applicable direction of street space optimization.

## 1. Introduction

### 1.1. Study's background

Urbanization has continued to progress and grow in recent years. However, the economic-oriented and driving force of urbanization design inevitably produces problems like sloppy planning and rigid neighborhood articulation, while streets, as an important part of urban space, have experienced varying degrees of destruction of texture and dimension in several spatial types as a result of the development of motorized traffic, with the most serious impact on living streets. The quality of people's social lives is impacted, and the vitality of urban space is diminished, as greening rates and landscape settings typically fall short of pleasing criteria.

### 1.2. Study's content and goals

Street space, which consists of a network of streets and three-dimensional components like buildings, public amenities, and plants adjacent to the street perimeter, has been a significant component of the urban social and environmental space in development planning across all eras [1].

This paper focuses on social space issues such as the rationality of living street space and the lack of human-centered design in the context of urbanization, and the purpose is to give a more in-depth analysis of the basic issues with living street space in urbanization and to provide a more objective and thorough knowledge of the development of urban space and the street environment.

## 2. Overview of concepts related to street space

### 2.1. Urbanization

The accelerated pace of contemporary urban construction, the emergence of new metropolises, the rise of high-rise building projects, and the swift incremental development of motorized traffic can be summarized as contemporary rapid urbanization from the perspectives of architecture and urban and rural planning.

### 2.2. Street space

#### 2.2.1. Definition of street space.

Street space is the public open area that is bounded by the street's lower level and the buildings that line it on both sides [2]. The street and the road are distinct. Streets are the most significant component of a city's external public space, as opposed to roads, which place an emphasis on traffic functions. Streets are the foundation of the urban space and the lifeblood of the social environment because they serve as a place for people to carry out public activities, exchange information, and participate in social life.

#### 2.2.2. Classification of street space.

According to the traffic and landscape characteristics of the streets and their functional significance in urban life, the varieties of urban street space can be separated into

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traffic streets, lifestyle streets (including traditional regional and cultural streets and commercial pedestrian streets) and other pedestrian spaces.

The urban traffic street space consists mainly of expressways, main roads and secondary roads with high traffic volumes and high speeds in the urban traffic space, carrying the main traffic flows in the city. The remaining pedestrian areas are mostly for leisure reasons alone, such as park trails, and do not serve any commercial or profitable uses. Since these two types of street space are less relevant to residents' social interactions than living street space, they are not the focus of this essay.

### **2.3. Living street space**

#### *2.3.1. The variety of urban living spaces.*

Living street spaces can be categorized into four different categories based on factors including the neighborhood and the street's purpose.

(1) Secondary and feeder roads in metropolitan areas with amenities like buildings or facilities.

These routes frequently have serviced public buildings, commercial buildings, or public facilities on either side, and the nodes have ongoing public parking.

(2) A street space that is original, traditional, and cultural.

The majority of these streets are found in established neighborhoods with high historical value that represent the city's cultural legacy and character, and usually have a strong atmosphere of life and pleasant scale, undertaking urban life and a certain traffic function [3].

(3) Settlement and settlement-level roads.

With the expansion of residential areas and high-rise settlements, the settlement-level street space is gradually taking over the functions of feeder traffic, street-level commerce and the provision of public services, and is a type of space where residents are more likely to stay.

(4) Commercial walkways

The pedestrian street is a living space with comprehensive functions for leisure and entertainment, dining and shopping, with the main mode of access being walking, and is a street space that is relatively well equipped with public facilities, has a relatively high degree of human design consideration and is capable of carrying the main urban dynamics.

#### *2.3.2. The function of living street space.*

Living street spaces are used for a range of activities such as information exchange, public recreation, transport, and shopping and leisure, and include almost all the functions required for living and production. However, in summary, their functions can be broadly divided into two categories.

(1) Transport functions

Even though the living street serves as the primary conduit for all manner of activities related to the public realm, the traffic function is a crucial component of the street area.

(2) Social functions

Living streets emphasize the shared aspect of the area, whether it be the structures, amenities, or public areas that line the street and serve as the primary venue for social interaction. These activities include information sharing, organizing events, shopping, eating, resting, and being alone. Additionally, everyone has different degrees of emotional identification with the street spaces they are familiar with or have lived in[4], and the living street space frequently serves as the repository for people's collective place memories due to its open design and integrated function.

### **2.4. Humanized design**

In order to suit people's physiological and psychological demands, humanistic design takes a human-centered approach to the design of urban environments, particularly near-human spaces, in terms of scale, form, appearance, and amenities. People are the primary players in cities, only by embracing human scale and standards in urban design planning can we provide the most comfortable locations for citizens to live and promote the actual vitality of urban space.

## **3. Research methodology and current thinking**

### **3.1. Research theory and methodology**

#### *3.1.1. Literature analysis method.*

This paper's primary objective was to review the literature on urban design, street space, living streets, and the publications and specifications on design theories, planning methodologies, and the current environment in China and abroad, extract the parts that were pertinent to the paper's direction, and construct a theoretical framework for the analysis of current issues and solutions that would follow.

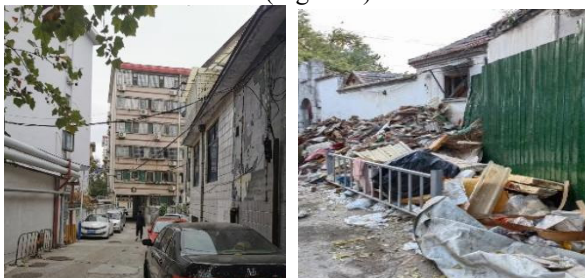
#### *3.1.2. Case Study Approach.*

Several examples of the transformation and impending transformation of living street spaces are chosen: typical living streets with many aspects that could be improved are used as examples of the impending transformation, and their current issues are examined in relation to the physical and psychological needs of the residents; the more successful cases of the transformation of living street spaces are summed up to make it easier to extract general issues and generalize the solutions to them.

(1) Cases to be converted

① Shangxin District of Jinan City: Shangxin District belongs to the original traditional regional cultural street space in the living street space. However, after conducting field photography, measurements, interviews and research, it was found that there are many aspects of its living streets to be improved: the roads are too narrow, there are blind spots at the corners and there is less space

for parking (Figure 1); the original buildings and living environment are of low quality, and the public infrastructure is outdated (Figure 2).



**Fig. 1.** Status of the road **Fig. 2.** Status of the residential environment

②The Qinglongxiang neighborhood in Wuhan: The Qinglongxiang is located in the Chucai community of Wuhan, is a typical example of a living street space to be renovated. Through data collection and online research, the following existing problems were identified: the traditional streets are narrow, resulting in greater fire hazards; the public space is occupied and residents lack activity space ; and the poor quality of the buildings results in a poor landscape environment within the visual field .

(2) Retrofit cases

① Shunde Jinbang-Xincun Street: Located in the center of the old city of Foshan, Xincun Street originally suffered from a lack of greenery, insufficient public space and inadequate infrastructure (Figure 3), but after the transformation of the landscape and cultural coupling, public service facilities and functional businesses were introduced into the street; public space was embedded at local nodes, which improves the environmental quality of the living street space in response to the needs of residents (Figure 4).

② Singapore's Chinatown: Located in the heart of Singapore, Chinatown has been gradually occupied during the modernization process. Through the restoration and redevelopment of traditional buildings along the street, the inclusion of public space in the high-rise complex, and the landscaping of the street interface to meet the needs of the residents, the unique style of the street has been recreated and the overall quality of the social environment of the street space has been improved.



**Fig. 3.** Original view of Xincun Street **Fig. 4.** Current view of Xincun Street

3.1.3. *Quantitative analysis method.*

The range of desirability of living streets in various dimensions such as sense of dimension, rhythm,

continuity, and enclosure is derived through the quantitative analysis of various factors affecting the form and scale of street space combined with the influence of different visual perceptions on the psychology of the crowd, and the direction of reasonable improvement of living street space is further examined.

3.2. *Reflections on the current state of urban space and focus on issues*

It is clear that cities are becoming more modernized nowadays, and the pace of urbanization, which is centered on economic development, keeps picking up. While it advances technology and offers convenience to inhabitants, it also results in a number of urban spatial issues. In combination with the previous theoretical and case study analysis, the current situation of urban space and living streets is considered and problems are summarized as follows.

3.2.1. *Texture damage.*

(1) Urban texture

Urban shape, road network form, plan form, neighborhood scale, architectural style, and other elements make up the urban texture. The process of urbanization has inevitably given rise to numerous new neighborhoods and structures are built, but the integration of the new street space with the existing conventional street space is typically subpar, leading to an uneven development of urban space.

(2) Street texture

Street scale, building dimension, interface morphology, landscape appearance, etc. are all included in street texture. The original form and function of living streets, which make up a crucial component of the urban skeleton, have typically not been respected in recent urban development: The form tends to be patterned, and some traditional neighborhoods have unplanned, disorganized forms; the original rational function is not valued; and the comprehensive living service function is gradually convergent towards a single traffic function.

3.2.2. *Patterned design of street space.*

The modern living street space typically places less emphasis on the value of the overall spatial sense of togetherness and more emphasis on the connection with other spaces in the city in terms of traffic. At the same time, living streets generally adopt a monotonous style of paving and greenery, while the style and form between buildings and buildings and between buildings and streets are not consistent, thus failing to create a logical sequence of street space.

3.2.3. *Street public services to be improved.*

(1) Lack of public space

The red line of the road is continually extending to accommodate the traffic demand brought on by the rapid spread and surge of motor vehicles, which is squeezing out

other locations. For instance, the amount of pedestrian space is reduced, and the inadequate pavement width results in tree ponds blocking blind alleys and destroying barrier-free facilities; the number and scale of public car parks cannot meet the demand.

#### (2) Lack of public facilities

Bus stops, road signals, park benches, and trash cans are examples of public amenities. Combining prior theoretical research and case studies, it is evident that there is a general absence of well-organized design and location of amenities, and that the amount and kind of public facilities in living streets are generally incomplete, and the quality varies.

#### 3.2.4. *Lack of humanized street design.*

Living streets, a type of street space directly associated with people's living and moving about, typically lack humanistic design, which makes it challenging to further improve the quality of people's life.

For instance, there is a lack of human scale of appropriateness; most street spaces lack accessible facilities for the elderly, children and the disabled, and it is not uncommon for blind corridors to be blocked; there is a general lack of continuity and rhythm in the streets; and the landscaping generally fails to compensate for the greenery expected by the residents of high-rise settlements.

## 4. Exploring strategies for optimizing living street space

### 4.1. Rationalization of the spatial form of living streets

An essential component of optimizing urban architecture is the sensible planning of roadway geometry. The following will measure and analyze the rational scope of improving street spatial form in three dimensions using preliminary theoretical and case studies.

#### 4.1.1. *Reasonableness of street length.*

It can be inferred that a walking distance of 300–500m for roadway segments, 50–100m for residential street spacing, and 500–1000m for pedestrian streets best meets the needs of the human body for street dimension. This walking distance was recommended by Yoshinobu Ashihara in *Designing External Spaces*. Rest areas should be placed along the street when the distance is longer.

#### 4.1.2. *Reasonableness of openness.*

The degree of confinement of the interface and space, which is controlled by the width of the street profile and the height of the building, defines the openness of the street space.

In order to investigate a reasonable range of street openness with regard to the human visual field, Yoshinobu

Ashihara proposed the D (street width)/H (building height) index, which is introduced in this essay.

The height and distance of the street interface are more appropriate and the sky is fairly exposed when D/H is near 1. Modern neighborhoods typically have D/H levels that fluctuate between 0.5 to 2, which is a reasonable range; however, many traditional streets and residential streets to be renovated have D/H values of less than 0.3, causing inconvenience to traffic and giving people a sense of oppression.

#### 4.1.3. *Reasonableness of continuity.*

The degree of continuity of street space is one of the key factors in how people perceive the living street interface, and this paper selects two quantitative indicators that have a significant impact on street continuity, focusing on a reasonable range of interface density and sticker rate.

##### (1) Interface density

The projected face width of the building at the road's red line setback line and the distance of the building control line along the street are what determine interface density. According to *The Great Streets*, the street interface has a strong sense of enclosure and continuity when the interface density is between 60% and 80%, but it is still reasonably open in terms of spatial perception, and it falls within a generally acceptable range of street interface density. However, there are some differences in suitability for different types of street space

##### (2) Posting rate

With the former emphasizing the continuity and regularity of the street interface as opposed to the density of the interface and the latter on the degree of enclosure of the street space, the sticker ratio directly reflects the degree of continuity of the building interface. Planning for designs should take into account both indicators.

For instance, traditional streets that need to be renovated typically have a high interface density and a low sticker ratio, which causes jagged spaces to emerge in a cluttered manner. Conversely, streets with a high sticker ratio and a low interface density have a good degree of regularity, but the sense of continuity between buildings is weak, and a high degree of continuity is also not achieved.

### 4.2. Exploring the human needs of living streets

In the urban design process, the usefulness, safety, and comfort of streets should be guaranteed based on humanistic principles, with full consideration of the spatial peculiarities and user needs of living streets. Based on data gathering, study findings, and the level of psychological assessment of various street environments, the humanistic demands of living street spaces are explored in the following in four areas.

#### 4.2.1. *Humanized street space dimension.*

Good street space should be designed according to human size. Based on the previous examination of the logic of spatial form, it should be taken into full consideration

when optimizing urban design whether a living street dimension is desirable.

#### 4.2.2. Streetscape needs.

##### (1) Rhythm

The regular undulations of the street interface's component parts make up a rhythmic street. People's sense of the city and the street is improved when they can feel the rise and fall of the space and the changes in the nodes as they go along it. The life of the city can be increased and the space's richness can be increased by the pace and rhythm of the city's main living streets.

##### (2) Sense of Place and Belonging

Humanized street environment must have a sense of place and a sense of belonging. A good sense of place is created by boosting the spatial hierarchy and making space accessible for people, whilst a good sense of belonging is produced by improving the realm's design and organizing sensible spatial and social flows.

##### (3) Cultural needs of the landscape

People's need for interaction with local cultures and natural landscapes is growing along with the population and architecture density in cities. The psychological depression brought on by long-term urbanization can be successfully treated with adequate green space with proper planning and cultural streets with design aspects.

#### 4.2.3. Public space and facility needs.

##### (1) Public spaces

Public space has been severely constrained as a result of the expansion of roads, the existing quantity and quality of public spaces such as community squares, city parks and public car parks differ significantly from people's psychological expectations.

##### (2) Public facilities

The sufficiency of public facilities is somewhat a reflection of the citizens' quality of life. The existing public facilities in the living streets are generally in need of improvement in terms of abundance and regularity, and there is currently a high demand from citizens for the provision of resting seats and bus stop facilities in the streets.

##### (3) Infrastructure

The absence of infrastructure for the residents, particularly in the internal streets of the settlements, is one of the typical characteristics of the neighborhoods that need to be upgraded according to the literature and case studies. Infrastructure needs to be improved to meet residents' other wants as well as to provide for their fundamental needs.

#### 4.2.4. Accessible design requirements.

One of the more glaringly absent components of urban spatial planning is accessibility. In terms of quantity, the streets' accessibility largely complies with standards, but there is a major lack of quality and attention.

For instance, in practice, blind passageways are frequently blocked and do not suit the needs of those with

impairments. There aren't many more low-level amenities for the elderly, kids, and persons with disabilities in street spaces, aside from the obligatory multiple rows of safety railings and handrails along the waterfront and other nearby sites. It is essential to increase the accessibility of human care design when optimizing urban environments.

#### 4.3. Summary of spatial optimization strategies for living streets

The following spatial optimization solutions for living streets are outlined in light of the preliminary research, existing issues, spatial rationality, and the demands of the population.

(1) The various dimension indicators, such as street openness, interface density, and building veneer rate, are controlled within a reasonable range based on human reference standards by controlling the distance between the red line of roads and the red line of buildings, adjusting building forms, and reasonably planning the distribution of high-rise buildings. Small-scale demolition and renovation are then carried out for necessary spaces of unreasonable Dimensions to repair the damaged urban fabric.

(2) Enhancing the overall continuity and rhythm of the living street, combining the density of vehicular and foot traffic in various areas, carrying out various detailed plannings about lengths and widths of street sections to improve the recognition of each street space and people's sense of the experience of the social environment.

(3) According to the architectural and cultural landscape needs, it is necessary to think in an integrated way about the buildings and street sections, but also to plan and design the style and spatial sequence of the different sections in a novel and individual way; to consider street views and to pay attention to the opening of the visual field, and to pay full attention to all places where good corresponding views are possible in the composition and arrangement of the street space [5].

(4) Creating integrated and shared spatial nodes by incorporating public spaces into building clusters, and combine and arrange the land with public facilities and commercial facilities.

(5) Improve the installation of basic living facilities, public facilities and barrier-free facilities. Addressing current issues, including those involving steep slopes at entrances and exits, blocked blind alleys, a lack of infrastructure and low-level service facilities in communities, and developing humane areas with equal care.

#### 5. Conclusion

Living streets are a significant component of urban space in terms of quantity, importance, and frequency of usage, and are also one of the most severely affected types of space in the urbanization process.

Background research - purpose formulation - conceptualization and data collection - methodology study and a description of the existing situation - needs analysis - strategy discussion provided the framework for this

report. It is hoped that the study will use the living street as a starting point and, in response to the existing problems of urban space in general, provide a rough view on the improvement of the living street space in the context of urbanization in the new era. However, there are limitations in terms of the completeness of data collection and the scope of application of the strategy. The study is intended to give a general notion of the direction in which the living street space will be improved in the new era of urbanization.

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