Under the Veil of Density: A Study of Urban Fragmentation in China

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Abstract

Against the backdrop of China's rapid economic growth and accelerated urbanization, Chinese cities present a spatial condition characterized by dense development on the surface yet fragmented internal structures. This study proposes the concept of "urban fragmentation" to distinguish it from Western "urban sprawl," encompassing multi-dimensional disintegration in urban functions, spatial structures, and visual morphology. By selecting Luohu District and Futian District in Shenzhen, Yanjiao Town in Hebei Province, and Brooklyn in New York City, USA as case studies, a combination of comparative visual analysis and spatial analysis is adopted to conduct research from aspects such as block structure, street connectivity, and functional composition. The results show that urban fragmentation in Chinese cities is not manifested as low-density expansion, but as symptoms including the rupture of urban texture, sparse street networks, unbalanced spatial scales, single functional zoning, and poor walkability. Its formation is the result of the combined effects of institutional, economic, planning, and cultural factors. This study aims to reveal the imbalance of spatial order beneath the appearance of high density, providing theoretical references for urban governance and spatial policies in China, and promoting the development of cities towards a more livable and cohesive direction.

Keywords

Urban Fragmentation, High-Density Cities, Spatial Structure, Comparative Case Study.

1. Introduction

Amid China's rapid economic growth and accelerated urbanization, Chinese cities are increasingly exhibiting a spatial condition that appears densely developed on the surface, yet structurally fractured beneath [1]. In terms of physical density alone, large-scale high-rise buildings and expansive residential complexes have come to dominate the urban landscape. However, this density has failed to deliver the continuity, accessibility, and public vitality that it ostensibly implies. Instead, a troubling urban condition has emerged: cities that are "dense but unwalkable," where towering buildings line empty, disconnected streets. Urban blocks lack integration, functional areas are fragmented, transportation systems prioritize automobiles over pedestrians, cyclists, and other modes of mobility, and public spaces are either scarce or unfriendly [2]. This urban form—visibly compact but spatially disjointed—has become a defining feature of contemporary urban expansion in China.

Historically, the term "urban sprawl" has been widely used in academic discourse to describe unregulated urban expansion, often characterized in the Western context by low-density, single-use, automobile-dependent suburban development [3]. However, directly applying this term to the Chinese context proves inadequate for capturing the complexity of China's urban spatial evolution [4]. Urban growth in China is not driven by low-density development; on the

contrary, high-density construction is overwhelmingly dominant. The problem lies not in the absence of density, but in the fragmented nature of urbanization itself—marked by disintegrated land parcels, unbalanced functional zoning, ill-proportioned streetscapes, and ruptured urban fabrics [5]. This study refers to such a condition as urban fragmentation. Unlike the more narrowly defined "spatial fragmentation" used to describe functional disconnection, the concept proposed here encompasses multi-dimensional disintegration across urban functions, spatial structures, and visual morphology.

This paper seeks to answer a central question: How can one uncover the broken spatial order and systemic distortions behind the seemingly "compact" and "high-density" appearance of Chinese cities? To approach this question, the study first reviews the origins and theoretical underpinnings of "urban sprawl" in the North American context, before assessing its limitations when applied to China. It then adopts a comparative case study method, analyzing four representative areas: Futian and Luohu Districts in Shenzhen, Yanjiao Town in Hebei Province, and Brooklyn in New York City. Through visual interpretation and spatial analysis, the study highlights differences and commonalities in block structure, street connectivity, and functional composition. The symptoms of urban fragmentation are embedded into each case, and are examined both visually and quantitatively. Finally, the study explores the underlying institutional, planning, and cultural mechanisms that drive fragmentation, with the aim of proposing a spatial concept more grounded in China's urban reality—one that can inform future urban governance and spatial policy.

2. Research Design

2.1. Selection of Research Objects

This study selects four representative regions as research objects, namely Luohu District and Futian District in Shenzhen, Yanjiao Town in Sanhe City, Hebei Province, and Brooklyn in New York City, USA. The reasons for choosing these regions are as follows: Luohu District, as one of the earliest urbanized areas in Shenzhen, presents the spatial characteristics of spontaneous growth in the early stage of urbanization and can be used as a comparative case; Futian District is one of the earlier modern urban areas in Shenzhen, which is deeply influenced by modernist planning ideas and can reflect the urban fragmentation characteristics of newly developed urban areas; Yanjiao Town is located near the eastern boundary of Beijing and is a typical case of real estate-driven urban edge expansion; Brooklyn, as an international case, its development process and spatial structure form a sharp contrast with the research areas in China, which helps to more clearly highlight the characteristics of urban fragmentation in Chinese cities [6].

2.2. Data Collection Methods

By collecting spatial data such as building footprint maps, satellite images, and street view images of the research areas, as well as relevant planning documents, statistical data, and other materials, a rich empirical basis is provided for the research. Among them, building footprint maps and satellite images are used to analyze the block structure, spatial layout, and land use of the city; street view images help to intuitively understand the street landscape, the degree of functional mixing, and the walking environment; planning documents and statistical data can assist in analyzing the policy background and economic driving factors of urban development.

2.3. Analytical Methods

A combination of comparative visual analysis and spatial analysis is adopted. Comparative visual analysis mainly conducts intuitive comparison of building footprint maps, satellite images, and street view images of different research areas to identify their differences in block scale, street connectivity, spatial texture, and functional integration. Spatial analysis uses relevant spatial metrics to quantitatively analyze block structure, street network density, etc.,

to more accurately reveal the characteristics of urban fragmentation. The combination of these two methods can comprehensively and deeply analyze the phenomenon of urban fragmentation in Chinese cities.

3. Comparative Image Analysis of Case Studies

3.1. Luohu District, Shenzhen

As one of the earliest urbanized areas in Shenzhen, the urban form of Luohu District retains the spatial characteristics of spontaneous growth in the early stage of urbanization to a large extent. The block structure is relatively scattered and unorganized, with high street density, forming a unique urban texture different from Futian District discussed later. Although there are also wide roads in Luohu, the continuity between buildings remains relatively intact. This area has a coherent street network and a good mixed functional layout, so it does not show the spatial fragmentation and functional imbalance in new urban areas.

Figure 1: Building footprint map of Luohu Central District (1:6000)

From the building footprint map (Figure 1), it can be observed that although there are some wide roads in Luohu, due to the relatively narrow building setbacks, the integration between the building texture and the street network is strong. Although this may reduce the distance and openness between individual buildings, it enhances the overall continuity of the urban landscape and improves walkability. Compared with newly developed areas such as Futian, the more compact layout of Luohu promotes diversity and accessibility at the urban level.

Figure 2: Street view 2 of Dongmen Middle Road, Luohu

The street view (Figure 2) further shows a coherent street scene, with a high degree of land use mixing between residential and commercial functions, forming a visually continuous and functionally compact urban texture. In general, the spatial structure of Luohu has a high degree of coherence and does not have the characteristics of urban fragmentation.

3.2. Brooklyn, New York City

Located in the eastern part of New York City, Brooklyn originally began as a Dutch colonial village before becoming an independent city, and was later incorporated into New York City under the Greater New York Charter of 1898. Prior to the mid-19th century, its development lacked strict centralized planning, resulting in a semi-grid layout that organically followed terrain and transportation access. During the late 19th century, large-scale immigration driven by industrialization led to the development of dense row houses and a compact urban fabric. Although post-WWII deindustrialization caused some urban decay and led to government-led urban renewal projects that disrupted some of the original street networks, much of Brooklyn's street grid and architectural form remained intact. The district continues to exhibit high levels of functional mixing and pedestrian-oriented block structures, making it a representative example of unplanned yet highly integrated urbanism.

Figure 3: Building footprint map of Brooklyn (1:12000)

From the building footprint map (Figure 3), we can see that the blocks are relatively small and streets are closely spaced, with narrow cross-sections. This ensures strong pedestrian accessibility. Moreover, the building setbacks are minimal and uniform, fostering tight building-street integration and consistent streetscapes. The high degree of functional mixing—residential and commercial—is also visible in the street view (Figure 4), further enhancing walkability. In summary, Brooklyn features a cohesive spatial structure and a connected street network, and does not display characteristics of urban fragmentation.

Figure 4: Street view of Smith Street, Brooklyn

3.3. Futian District, Shenzhen

Unlike Brooklyn, which evolved gradually over a long historical timeline, Futian District was rapidly developed within only two decades. As one of the earliest modern urban districts in Shenzhen—a city designated as China's first Special Economic Zone—Futian's urbanization was driven by substantial investments and guided heavily by modernist planning ideology. This resulted in a spatial pattern characterized by wide arterial roads, superblocks, gated residential

compounds, and large-scale high-rise buildings. Although it serves as a central district with high population and built density, and contains a mix of office and residential uses, its large building setbacks, fragmented street networks, and overly wide roads contribute to reduced pedestrian accessibility and discontinuous urban fabric—especially when compared to Luohu District.

As shown in Figure 5, Large gated residential compounds, oversized plots of high-rise buildings, and excessively wide roads combine to fragment the street network. Most residential buildings face inward within gated communities and thus contribute little to the surrounding streetscape. Physical barriers such as fences create visual and functional breaks in the urban fabric. Moreover, large podium setbacks in commercial buildings diminish continuity, making it difficult for adjacent plots to maintain visual cohesion and connectivity.

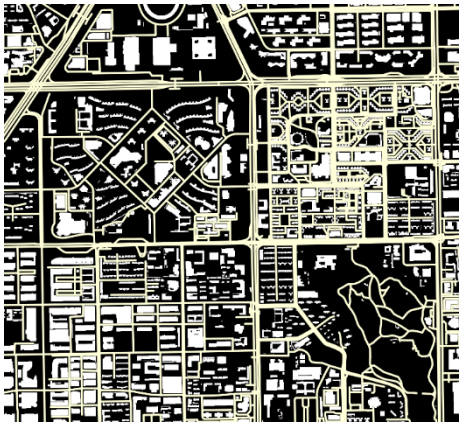

Figure 5: Building footprint map of residential areas in Futian

Unlike the coherent and integrated pattern seen in Luohu, Futian's large-scale plots and isolated developments lack coordinated connectivity. This results in visible breaks in the built environment, weakening pedestrian mobility and fragmenting the urban structure, as shown in the following street views (Figure 6). Even when ground-floor retail space is incorporated into these developments, wide roads diminish accessibility and prevent streets from becoming vibrant, multifunctional public spaces.

Figure 6: Street view of Shangbu Road, outside a residential compound

In summary, Futian District exhibits key traits of urban fragmentation, including superblocks, deep setbacks, wide roads, disrupted continuity of the urban fabric, disconnected street networks, and poor walkability. This fragmentation is not a result of uncontrolled sprawl, but rather a structural flaw embedded in modernist planning principles, which overlook the importance of fine-grained street networks and fractal building scales.

3.4. Yanjiao Town, Sanhe City, Hebei Province

Unlike Futian, the fragmentation observed in Yanjiao Town stems not from planning ideology but from institutionally driven urban fringe expansion—an extreme manifestation of spatial

fragmentation. Although it also displays spatial isolation and low connectivity, its deeper causes lie in growth-oriented development strategies.

Since the 1980s, under the dual influences of market reforms and opening-up policies, local governments began to prioritize economic growth as their primary performance metric. Urban planning, alongside the booming real estate sector, became a key vehicle for growth, leading to a dominant expansion model based on repetitive high-rise residential developments. Stimulated by surging housing demand and local governments' incentive to lease land for revenue, developers favored standardized, high-density tower typologies combined with green spaces—maximizing efficiency and minimizing costs. This has resulted in a homogenized landscape of replicated residential compounds across Chinese cities, accompanied by uncontrolled and coarse urban sprawl.

Yanjiao, located in Sanhe City just outside Beijing's eastern municipal boundary, represents a typical case of such expansion. Due to Beijing's rapidly rising living costs and Yanjiao's lower housing prices, the town has attracted a large influx of migrant laborers working in the capital, fueling real estate-driven urban growth.

Over the 30-year period from 1990 to 2020, Yanjiao's built-up area expanded rapidly. The land-use map below (Figure 7) shows that residential land overwhelmingly dominates the landscape, leading to a lack of functional diversity and reinforcing its "bedroom community" character.

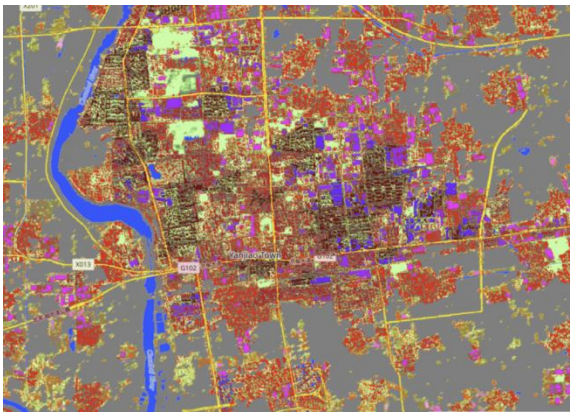

Figure 7: Land-use map of Yanjiao in 2020. Red: residential; light green: green space

Figure 8: Building footprint map of Yanjiao (1:24000)

Beyond functional homogeneity, Yanjiao suffers from spatial discontinuity and a lack of coherent urban texture. As seen in the footprint map (Figure 8), its growth has not produced a contiguous street structure. Instead, isolated plots dominate, creating ruptured urban fabric and visual fragmentation. There is no clear integrative planning logic, and the overall pattern reflects a form of "local density clustering" rather than coherent urbanism. Yanjiao thus

represents an extreme version of China's fragmented urbanization—where urban space is rapidly filled, but remains disconnected, functionally segregated, and structurally incoherent.

In addition to spatial and functional fragmentation, Yanjiao exhibits an imbalance of urban scale, a problem shared with Futian and many newly built Chinese urban districts. As shown in the aerial view (Figure 9), the town lacks small- to mid-scale buildings or podiums, resulting in a distorted urban scale at the pedestrian level. The absence of narrower roads and side streets, coupled with direct adjacency between high-rises and wide arterial roads, undermines pedestrian connectivity and reduces perceived walkability.

Figure 9: Aerial view of Yanjiao

To a certain extent, Yanjiao's pathological spatial traits originate from the same mechanisms as those in Futian. It exemplifies the characteristics of urban fragmentation, marked by large-scale, single-use residential enclaves that tear the urban fabric, lack integrated planning, fail to form connected street networks, and suffer from functional voids. This spatial fragmentation is largely a product of growth-oriented urbanism, where speed of development overrides considerations of structural coherence and coordinated planning, leaving urban space dominated by disjointed megablocks.

4. Discussion and Conclusions

4.1. Discussion

Urban fragmentation is a unique spatial phenomenon in the development of contemporary Chinese cities. It has both similarities and essential differences with urban sprawl in the West. The similarity is that both may lead to problems such as traffic congestion, environmental pollution, and poor walkability; the essential difference is that Western urban sprawl is characterized by low-density, single-functional suburban development, while China's urban fragmentation occurs in the context of high-density development, which is caused by the lack of overall planning and morphological integration.

From the perspective of driving mechanisms, the formation of urban fragmentation in Chinese cities is the result of the joint action of multiple factors. At the institutional level, the tax-sharing reform in 1994 led to increased financial pressure on local governments. In order to make up for budget gaps, local governments relied on land finance and obtained income by selling land use rights and promoting real estate development. This growth-oriented governance model made urban development ignore people-oriented indicators such as spatial continuity, infrastructure efficiency, and environmental quality. At the economic level, the soaring housing prices have prompted residents to move to the surrounding areas of the city, accelerating the spatial expansion of the city. At the same time, developers excessively pursue the floor area ratio under cost pressure, ignoring spatial integration. At the planning level, the influence of modernist planning ideas has led to phenomena such as super blocks and functional zoning, which have destroyed the coherence and walkability of the city. At the cultural level, the

traditional preference for introverted space makes enclosed residential communities widely exist, which cuts off the urban texture.

4.2. Conclusions

Through spatial comparison of Chinese and international urban cases, this study identifies and analyzes the spatial fragmentation phenomenon in contemporary Chinese cities. The research shows that urban fragmentation in China is not manifested as low-density sprawl, but as the loss of urban texture, sparse street networks, unbalanced spatial scales, single functional zoning, and poor walkability. Although it is superficially similar to the concept of urban sprawl in Western planning discourse, urban fragmentation in China differs in spatial performance and potential driving factors. Unlike sprawl characterized by low-density expansion, fragmentation in China even occurs in high-density developments that lack overall planning coherence or structural integration with the surrounding urban environment.

Urban fragmentation is not only the result of physical form, but also the product of the interaction of institutional, economic, and cultural forces. Traditional urban sprawl usually stems from weak growth management policies, while China's fragmented urban form comes from more complex reasons, including misplaced policy incentives, rising real estate prices, path-dependent planning concepts, and culturally embedded preferences for enclosed and introverted living spaces. These driving factors operate in China's unique land system and governance structure, forming a pathologically divided urban space - a fracture under the veil of density, in which seemingly compact development often covers up potential spatial inefficiency and the weakening of urban cohesion.

Understanding the dynamics of urban fragmentation is crucial to the future governance and spatial planning of Chinese cities. This study advocates shifting from taking density as the only indicator of urban quality to a more comprehensive evaluation system, emphasizing the continuity of urban texture, the integration of land use, and the readability of urban space at the pedestrian scale. Only by reconstructing multi-scale urban structures, restoring neighborhood-level connectivity and coherence, and re-establishing the integrity of the city as a whole, can Chinese cities get rid of the fragmented legacy of rapid urbanization and move towards a more livable and cohesive urban future.

References

[1] Zhou L, Wei L, López-Carr D, et al. Identification of irregular extension features and fragmented spatial governance within urban fringe areas [J]. Applied Geography, 2024, 162: 103172.

[2] Zhu J, Guo Y. Fragmented peri-urbanisation led by autonomous village development under informal institution in high-density regions: The case of Nanhai, China [J]. Urban Studies, 2014, 51(6): 1120-1145.

[3] Yue L, Zhao H, Xu X, et al. Quantifying the Spatial Fragmentation Pattern and Its Influencing Factors of Urban Land Use: A Case Study of Pingdingshan City, China [J]. Land, 2022, 11(5): 686.

[4] Ekers M, Hamel P, Keil R. Governing suburbia: Modalities and mechanisms of suburban governance [J]. Regional studies, 2012, 46(3): 405-422.

[5] Bourne L S. Reinventing the suburbs: Old myths and new realities [J]. Progress in planning, 1996, 46(3): 163-184.

[6] Phelps N A, Wood A M. The new post-suburban politics? [J]. Urban Studies, 2011, 48(12): 2591-2610.