

## Informal Utilization Characteristics of Underpass Public Spaces in Megacities from the Perspective of Co-Production Theory: A Case Study of Elevated Highway Underpasses in Guangzhou

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### Abstract

Under the guiding principle of “People-Oriented Urban Development,” public space has become a core focus of urban development in China. As major cities enter a stage of stock-based urban regeneration – emphasized repeatedly at the national level, notably in the 2025 State Council meeting – the potential of under-bridge spaces as public space assets in megacities has garnered significant attention. However, formal regeneration approaches often face prolonged implementation cycles due to complex land rights and the involvement of multiple management departments. In contrast, the informal use of under-bridge spaces (e.g., temporary markets, sports grounds) is widespread yet understudied in large Chinese cities. Based on co-production theory and adopting a socio-spatial perspective, this study investigates multiple cases of informal under-bridge space utilization in Guangzhou, a representative Chinese megacity. The research aims to systematically summarize the core characteristics of such informal use (such as spatial adaptability, actor diversity, and functional dynamics) and reveal the interaction mechanisms among diverse actors in the informal production of space. The findings offer theoretical insights and practical references for overcoming the challenges of formal regeneration and exploring more inclusive and adaptive governance models for under-bridge spaces in megacities within the context of urban renewal.

**Keywords:** Urban Regeneration; Under-bridge Space; Public Space; Co-production; Informal Use

### 1 Introduction

The Report of the 20th National Congress of the Communist Party of China emphasises the principle that “a people-centered city is built by and for the people.” This signals a paradigm shift in China’s urban development philosophy—from incremental, expansion-oriented growth to connotative, human-centered development (Shen, 2019). In this transition, the construction of urban public spaces increasingly responds to citizens’ diverse needs. However, central districts of major cities often suffer from inadequate public space supply, spatial mismatch between supply and demand, and significant challenges in spatial supplementation.

In this context, elevated expressways, as critical infrastructures in megacities, have drawn attention in recent urban regeneration initiatives, particularly for the potential reuse of space beneath the overpasses. For instance, the Shanghai Urban Regeneration Action Plan (2023–2025) identifies five major regeneration tasks. Under the third task—“Optimisation of Public Space Facilities”—it proposes upgrading the quality of under-elevated spaces to create high-quality urban public environments (Shanghai Municipal Government, 2023).

Existing domestic research primarily focuses on the formal uses and planning strategies of space beneath elevated roads (Huang, 2019). However, the share of under-elevated spaces that are suitable for formal redevelopment remains limited. Moreover, the formal transformation of such spaces is constrained by complex multi-agency governance, dynamic urban policy adjustments, ambiguous land tenure in certain areas, and potential interference with traffic systems. These challenges result in a rigid and narrowly applicable formal planning framework, with prolonged implementation cycles.

In contrast, the informal uses of under-elevated spaces in megacities can potentially compensate for the limitations of formal redevelopment. Yet, theoretical frameworks for understanding such informal utilisation remain underdeveloped in China. Little attention has been paid to the spatial characteristics, governance mechanisms, and user preferences associated with informal practices in these spaces.

This study seeks to address this gap by drawing on the theory of co-production to examine informal uses of multiple under-elevated spaces in Guangzhou. Adopting a social-spatial negotiation perspective, the paper aims to identify informal use characteristics, spatial structures, and user preferences, thereby contributing

strategic recommendations for revitalising these underutilised spaces within the broader context of urban stock regeneration.

## 2 Literature Review: Informal Use of Under-Elevated Spaces from the Perspective of Co-Production Theory

### 2.1 Current Research on the Informal Use of Space Beneath Elevated Roads

International scholarship on the informal use of under-elevated spaces emerged relatively early, with numerous studies affirming the positive effects of such practices under certain conditions. Some scholars argue that temporary uses of space represent innovative and experimental solutions, capable of breathing new life into abandoned facilities while preserving their historical, cultural, and environmental values (Galdini, 2020). These practices, by reassigning function and meaning to otherwise disused areas, contribute strategically to holistic urban regeneration processes (Galdini, 2020).

Research has also highlighted that informal uses of space beneath elevated highways can foster spatial integration between both sides of an overpass. Akinci (2016), for example, points out that while elevated highways fragment urban fabric, the spaces beneath them retain a certain urbanity. Informal everyday activities conducted by local residents under these structures can serve as symbolic and functional urban bridges.

International studies on urban informality primarily examine various forms of informal socio-economic activities, with a focus on their causes, governance models, and impacts. This body of literature also analyses the spatial characteristics of informality across different scales (Guo, 2023).

In contrast, domestic research has largely concentrated on **formal uses** of under-elevated spaces. Informal uses are typically discussed within typological analyses that highlight their **negative effects** and propose regulatory strategies (Liu, 2017). Research on urban informality in China has focused predominantly on the distribution and governance of informal economic activities—such as street vending—within urban villages, sidewalks, and streets. Recent studies have gradually begun to acknowledge the role of informal spatial practices in **complementing formal planning**, exploring governance models under different sociospatial structures (Guo, 2023).

In sum, both domestic and international literature have long recognised the relevance of informal space use in urban regeneration. However, in China, such research remains relatively nascent, particularly with respect to **theoretical understandings** and **spatial characterisation** of informal uses beneath elevated highways.

### 2.2 Informal Use of Under-Elevated Spaces from the Perspective of Co-Production Theory

The concept of **co-production** was first proposed by economist **Elinor Ostrom** in the 1970s to describe the active participation of citizens in the delivery of public goods and services (Albrechts, 2012). The theory emphasises the collaborative and direct involvement of both public administrators and citizens in managing public spaces, particularly under conditions where state capacity is limited. It proposes that such collaboration often constitutes **an optimal model for spatial regeneration**.

Some scholars argue that urban informality should be taken more seriously during spatial planning processes (Joshi, 2004). Others suggest that informal practices can facilitate co-production between governments and local communities, enhancing public engagement in space-making. The **spatial negotiation** among multiple actors over the informal use of urban spaces, in this view, constitutes a form of co-production in itself (Song, 2016).

Informal use may also serve to **rebalance unequal power relations** between space managers and users by enabling more equitable access to spatial resources (Song, 2016). In the domestic context, scholars have pointed out that informal uses foster **organic spatial growth**, promoting diversity in population structure, spatial morphology, and landscape form (Liu, 2017). Accordingly, how to institutionalise and regulate informal uses without stifling their vitality has become a central concern in contemporary urban planning.

In practice, many international cases of under-elevated space reuse exemplify co-production through **multi-stakeholder participation**. For example, New York City's *High Line Park*—initiated by the non-profit “Friends of the High Line”—transformed an abandoned elevated railway into a celebrated public space. Although the structure was initially slated for demolition due to complaints about unmanaged space below, planners and community members began experimenting with its use and negotiated with government agencies. Since opening in 2009, the park has become one of New York's major tourist attractions and a catalyst for the revitalisation of Manhattan's West Side.

In China, some scholars have also highlighted that the bottom-up adaptation and value redefinition of under-elevated spaces—through user-initiated modifications and cross-sector collaboration—can be viewed as a process of co-production (Li, 2023).

This study investigates **three long-established, functionally stable** cases of informal use beneath elevated highways in Guangzhou. Drawing on co-production theory and employing the **Actor-Network Theory (ANT)** as an analytical lens, it aims to identify the spatial characteristics, usage patterns, and governance logics that underpin the informal reuse of these spaces.

### 2.3 Informal Use of Under-Elevated Spaces from the Perspective of Co-Production Theory

The concept of **co-production**—also referred to as “collaborative production”—was first introduced in the 1970s by economist **Elinor Ostrom**. It emphasises the active involvement of citizens in the creation and delivery of public goods and services that directly affect their lives (Albrechts, 2012). Ostrom's formulation of co-production underscores the joint and direct participation of public administrators and ordinary citizens in service provision, particularly in the governance of public spaces. Co-production is widely recognised as a potentially optimal approach to spatial renewal, especially in contexts where public authority is weak or fragmented. Some scholars have further argued that informal spatial uses should be taken more seriously during spatial planning processes (Joshi, 2004).

In theoretical research, international studies suggest that informal uses of space can facilitate co-production between governments and communities, thereby activating public participation. The negotiation processes among various actors over informal spatial uses can themselves be understood as **forms of spatial co-production** (Song, 2016). Informal uses may also serve to moderate inequalities in **spatial agency** and **resource access** between space managers and users (Song, 2016). In the domestic context, researchers have observed that informal spatial practices can foster **organic spatial growth**, characterised by functional mix, contextual adaptation, and morphological diversity in population, spatial form, and landscape (Liu, 2017). As a result, the challenge of how to **institutionalise and guide** the orderly development of informal spatial practices has become a key issue in the field of urban planning.

In practice, many international examples of under-elevated space revitalisation have adopted co-production mechanisms involving **multiple stakeholders**. These collaborative efforts often aim to address the scarcity and misalignment of community public spaces. A prominent example is the **High Line Park** in New York City, initiated by the non-profit organisation *Friends of the High Line*. Originally an elevated railway decommissioned in 1980, the structure faced widespread complaints due to unmanaged and underutilised space beneath the tracks. Although there were calls for demolition, local planners began experimenting with new uses and engaged in sustained negotiations with government actors. This process eventually led to the preservation and transformation of the structure into a unique elevated urban park. Since its opening in 2009, the High Line has become one of New York's most popular tourist destinations and has played a pivotal role in revitalising the West Side of Manhattan.

Similar reflections have emerged in Chinese scholarship. For example, Li Zhigang (2023) argues that the spontaneous use, modification, and subsequent renegotiation of space beneath elevated roads represent a **process of multi-actor co-production**. In this study, we examine three long-established and functionally stable cases of informal use beneath elevated highways in Guangzhou. Through the lens of **co-production theory** and

employing **Actor-Network Theory (ANT)** as a methodological framework, we analyse patterns of spatial utilisation and extract key characteristics of informal practices under elevated infrastructure.

### 3 Empirical Study on Informal Uses of Under-Elevated Spaces in Guangzhou

#### 3.1 Research Scope and Methodology

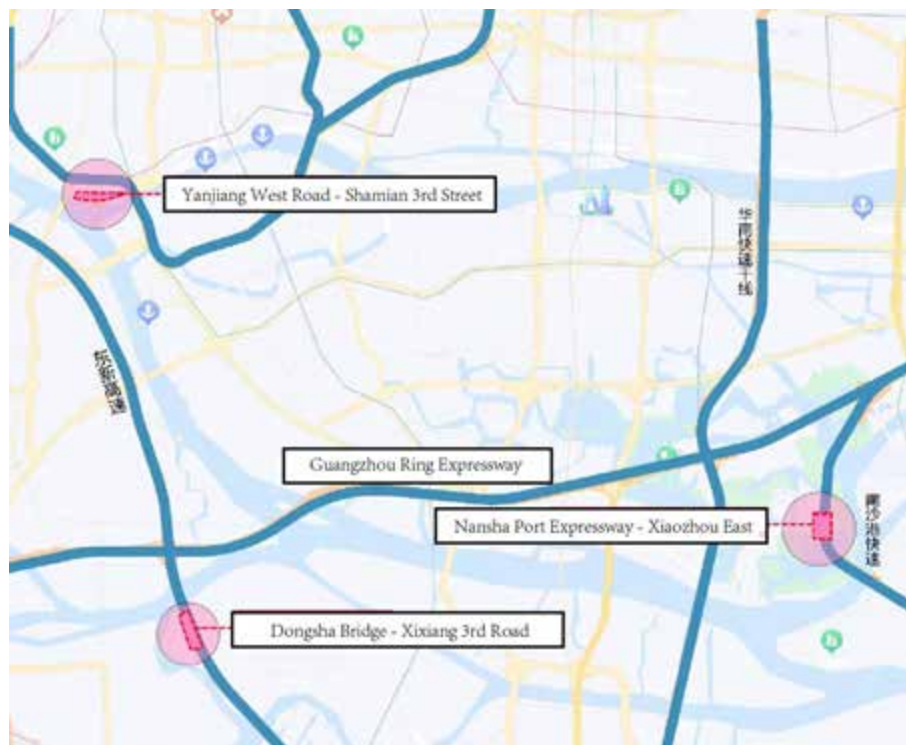
This study investigates three cases of informal use beneath elevated roads in Guangzhou:

- (1) the space beneath the Dongsha Bridge at the intersection with Xixiang Third Road, located at the urban-rural fringe;
- (2) the underpass space of the Nansha Port Expressway intersecting Xiaozhou East Road; and
- (3) the ramp space between Yanjiang West Road and Shamei Third Street (Figure 1).

The study adopts a two-scale spatial analysis framework:

- ① At the neighbourhood scale, we analyse the five-minute pedestrian catchment surrounding each site, focusing on pedestrian flow patterns, land use types, and associated socio-spatial characteristics.
- ② At the micro-scale, we examine the under-elevated spaces themselves, identifying their physical configurations, patterns of informal use, and associated user groups.

Findings are further interpreted through the lens of **co-production theory**, summarising the typology of informal spatial practices and governance logics involved.



**Figure 1** Location map of case study sites: under-elevated spaces in Guangzhou.  
Base map source: Baidu Maps; diagram created by the author.

#### 3.2 Nansha Port Expressway – Xiaozhou East Road

##### 3.2.1 Spatial Context and Use Characteristics

The under-elevated space at the intersection of the Nansha Port Expressway and Xiaozhou East Road lies within the Xiaozhou Village Art District. The road bisects the space beneath the overpass into two distinct functional zones (Figure 3):

To the north: a self-organised fruit market initiated by village residents;

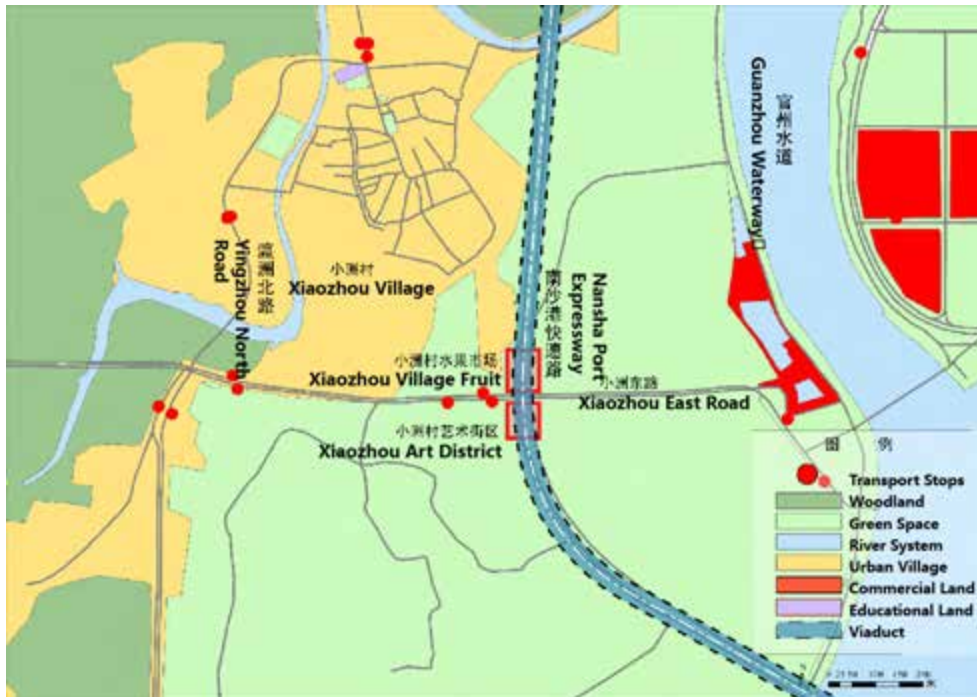
To the south: informal artist studios.

These functions are closely linked to the surrounding spatial structure, especially Xiaozhou Village and the nearby Guangzhou Academy of Fine Arts (Figure 2).



**Figure 2** Contextual spatial analysis of selected case site.  
Base map source: Baidu Maps; diagram created by the author.

Land use analysis within the five-minute pedestrian catchment (Figure 3) reveals a mix of village housing, woodland, and urban green space. Xiaozhou East Road, a minor road, provides the primary access. On-site observations indicate low vehicular traffic and a pedestrian-friendly environment.



**Figure 3** Five-minute walking catchment and land use analysis around the Nansha Port Expressway-Xiaozhou East Road underpass.

*Diagram created by the author*

The space accommodates two primary types of informal use: fruit vending, which functions as a **consumption-oriented activity**, and artistic production, which constitutes a **culturally embedded use** (Figure 4). These uses have emerged in a self-organised manner and coexist within the same under-elevated zone, creating a unique spatial synergy between everyday livelihood needs and creative practices. The primary user groups include local village residents, fruit vendors, art students preparing for university entrance exams, and young artists affiliated with the nearby Guangzhou Academy of Fine Arts.

Field investigations and interviews revealed that both the fruit market and the artist studios have existed continuously for more than one year and have become routinised components of the local spatial ecology. The site operates on a **full-day temporal cycle**, with peak activity periods observed during early morning (around 6:00 a.m., when vendors set up stalls) and again from late afternoon to early morning, when both vending and artistic activities intensify.

The fruit market is composed of **lightweight, collapsible stalls and mobile furnishings**, allowing vendors to adapt to changing space conditions and respond flexibly to demand and weather. Most of the infrastructure is semi-permanent but easily removable, which reflects the provisional nature of informal commercial activity. On the other hand, the artist studios take the form of **prefabricated panel structures or temporary cabins**, often built with plywood, plastic sheets, or reused materials. These units provide enclosed working environments for sketching, painting, and storage.

Together, these uses reflect a **multi-functional, informally co-produced urban microspace**. The spatial configuration not only satisfies practical needs such as daily food provision and low-cost workspace but also activates the underutilised overpass area with a blend of social and cultural vibrancy. This case illustrates how informality can serve as a tool for spatial optimisation in the context of megacity regeneration and space scarcity.



**Figure 4** Top: Xiaozhou Village fruit market; Bottom: Xiaozhou Village art district.  
*Photographs taken by the author.*

### 3.2.2 Informal Use as Co-Produced Space

This site exemplifies a relatively complex and dynamic process of spatial production, resulting in a **functionally stable and socially embedded informal configuration**. Located adjacent to Guangzhou University Town but lying outside its formal administrative boundaries, Xiaozhou Village benefits from a unique **regulatory grey zone**. This peripheral positioning allows for greater spatial flexibility and tolerance of informality, as local administrative authorities tend to adopt a more lenient or non-interventionist approach. Such an environment enables organic spatial appropriation and adaptive reuse, indirectly facilitating long-term spatial stability beneath the overpass.

Several key conditions converge to support this stability. First, the area's **relatively low land rent** and **proximity to public transportation nodes** make it an attractive location for young artists, art students, and migrant vendors alike. The village lies only three kilometers from the Guangzhou Academy of Fine Arts, and its accessibility by bus and bike further strengthens its functional ties with the art school. As a result, a **local creative ecosystem** has gradually taken shape. According to field interviews, there are currently **dozens of intensive art training centers** (commonly known as ) operating within the village, offering short-term residency, portfolio coaching, and art tutoring services.

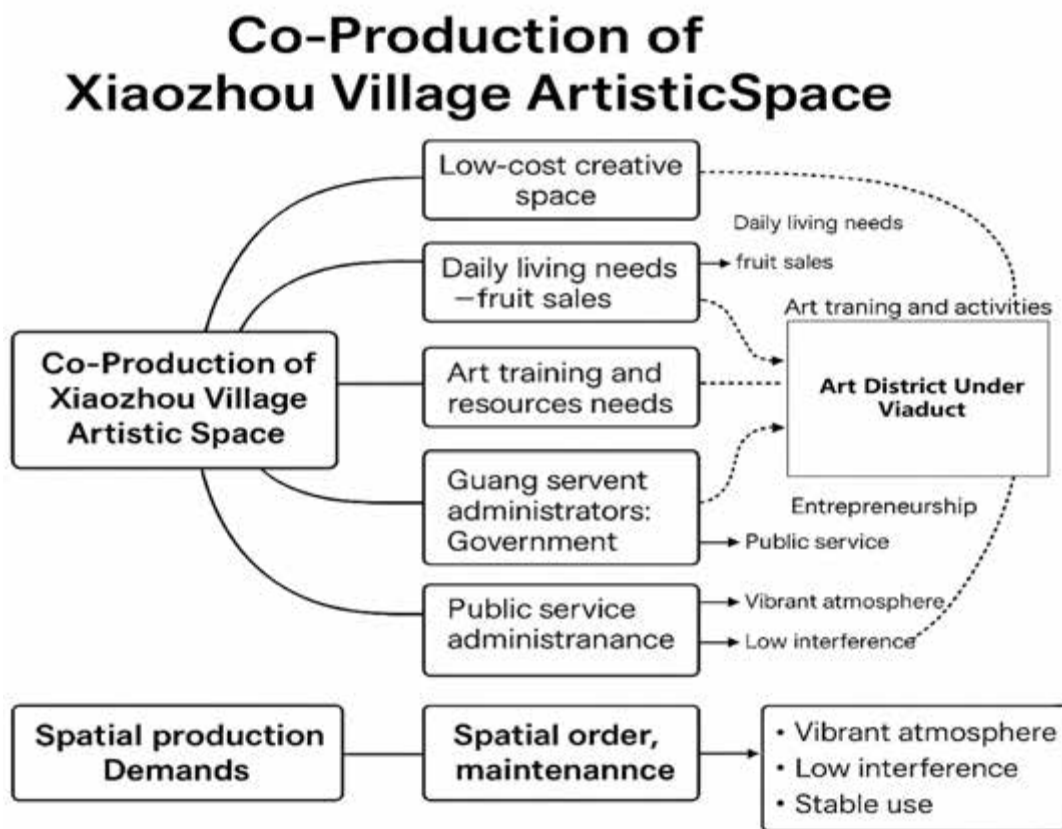
The under-elevated fruit market on the north side of the road responds not only to the **everyday consumption needs** of village residents and art students but also plays a **supplementary role in the local art economy**. Fruit

is a recurring subject in foundational art education—particularly in sketching and still-life drawing exercises—which transforms the market into both a consumption space and a symbolic component of the **productive artistic environment**. This co-functionality of consumption and education creates **layered meaning and utility** within the space.

Meanwhile, on the south side of the overpass, the presence of self-built studios, temporary structures, and creative clusters illustrates a bottom-up formation of an **informal cultural district**. These spaces are typically constructed using prefabricated materials, reclaimed wood, or modular panels, and are highly adaptable to changing user needs. Artists, art students, and even part-time instructors from the Academy make use of these spaces for drawing, teaching, exhibiting, and even small-scale commercial work.

Crucially, this spatial arrangement is **not the result of a formal plan** but rather a **co-produced urban microenvironment** formed through the alignment of diverse actor needs—residents, artists, vendors, students, and local governance actors. Each party contributes to the spatial logic through their ongoing use, maintenance, and negotiation. The elevated infrastructure itself—often regarded as residual or dead space—is thus transformed into a **productive, multifunctional, and socially cohesive zone**.

In summary, the Xiaozhou Village case demonstrates how **spatial informality, artistic economies, and everyday consumption can intersect through co-production**, producing a hybrid and resilient public space that challenges the binaries of formal/informal and planned/spontaneous in contemporary urban theory (Figure 5).



**Figure 5** Characteristics of informal use under the Nansha Port Expressway–Xiaozhou East Road overpass.  
*Diagram created by the author.*

### 3.3 Dongsha Bridge – Xixiang Third Road

#### 3.3.1 Spatial Context and Use Characteristics

This case involves the under-elevated space beneath Dongsha Bridge at its junction with Xixiang Third Road. A self-organised farmer's market has emerged beneath the structure (Figure 6).

- The eastern side is dominated by rural homesteads ();
- The western side consists of second-class residential land (R2 zoning).

Land use in the five-minute walking radius includes a mix of rural and urban housing, as well as cultivated farmland.

The bridge's clearance reaches approximately 20 metres, providing a rare, sheltered public space. The space's openness and shading qualities are especially valued in the local village context.

Additionally, moderate commuter flows from nearby roads and surrounding residents create a consistent demand for agricultural produce. Informal vending activities have emerged spontaneously over time. Restaurants along the roadside also occasionally encroach into the under-elevated area.



**Figure 6** Land use analysis within a five-minute walking radius around the Dongsha Bridge-Xixiang Third Road underpass.

*Diagram created by the author,*



**Figure 7** Informal use of space beneath the Dongsha Bridge–Xixiang Third Road overpass.  
*Diagram created by the author.*

### 3.3.2 Informal Farmers' Market as Co-Produced Space

In this case, the rural residents of Xisan Village act as the primary initiators of informal spatial use beneath the Dongsha Bridge. Their need to sell surplus agricultural products—often grown in nearby peri-urban plots—naturally intersects with the everyday consumption patterns of passing commuters, local shopkeepers, and nearby residents. This **spatial and economic intersection** has facilitated the spontaneous emergence of an informal farmers' market beneath the elevated infrastructure.

Over time, through repeated transactions and habitual occupation, a **stable, trust-based relationship** has formed between vendors and consumers. The spatial regularity of the market—its specific time windows and physical configuration—has become part of the local socio-spatial rhythm. The elevated bridge structure provides critical environmental affordances: shade from sunlight, shelter from rainfall, and a relatively noise-buffered, open-air environment that does not impede vehicle circulation.

Importantly, the site is characterised by **low vehicular traffic flow and high pedestrian accessibility**, which supports the safe coexistence of informal economic activities and surrounding circulation systems. This case demonstrates how informal markets are not merely the result of economic necessity but are **co-produced through spatial affordances, social routines, and adaptive use of urban residue**. It underscores the planning potential of recognising informal practices as integral components of everyday urban systems.

## 3.4 Yanjiang West Road – Shamei Third Street

### 3.4.1 Spatial Context and Use Characteristics

Located on Shamian Island, a protected historical district and renowned tourist destination in Guangzhou, this site consists of a strip of under-elevated leisure space with informal seating and a bar (Figure 9).

The local street network is composed of narrow pedestrian-friendly roads, with walking as the primary mode of transport.

The elevated road above is currently decommissioned, allowing the space below to be fully appropriated for public use.

Visitors to Shamian often complete a loop around the island and stop at the riverside for rest. The underpass area provides essential shade and shelter from intense sunlight. It also hosts performances by local bar musicians, and a bar operates beneath the structure during evening hours.

The government has since incorporated this vibrant underpass space into its planning framework, designating it as a “**high-decibel vitality park**” within the Shamian Park system.



**Figure 8** Indicative land use diagram of the ramp underpass at Yanjiang West Road, Shamian Island.} *Diagram created by the author.*



Figure 9 Informal activities beneath the Yanjiang West Road–Shamei Third Street overpass.  
*Photograph taken by the author.*

### 3.4.2 Informal Recreation as Co-Produced Space

This case illustrates a **multi-actor co-production process** that has gradually stabilised into a vibrant leisure-oriented informal public space beneath the elevated ramp at Shamian Island. The key stakeholders involved can be categorised into three functional groups:

- (1) **Space users**, including local elderly residents and domestic or international tourists, who regularly occupy the area for rest and socialisation;
- (2) **Space beneficiaries**, particularly bar owners and informal performance groups (e.g., musicians and small bands), who generate cultural and commercial value through spatial use; and
- (3) **Space managers**, namely local government departments and park authorities, who adopt a facilitative yet non-intrusive regulatory stance.

The **primary spatial functions** observed in this setting include passive recreation, live music performance, and outdoor food and beverage services. Informal usage patterns typically manifest during evenings and weekends, with actors deploying **movable furniture**, such as tables, chairs, sound equipment, and improvised stages. These temporary spatial interventions occur in response to fluctuating user demand and weather conditions, showcasing a high degree of **spatial adaptability**.

Notably, the local government's regulatory approach is **permissive but observant**. Rather than dismantling or formalising the space, officials have recognised the social and economic vitality generated by informal use. In some instances, they have gone further by incorporating the area into local spatial plans—designating it as a **"high-decibel vitality zone"** that tolerates noise, foot traffic, and spontaneous gatherings.

This governance flexibility has allowed informal space production to **move beyond precarity**, achieving temporal consistency and social acceptance. It also reflects a broader shift in urban governance paradigms—from formal control to **collaborative stewardship of public space**. By enabling spontaneous, low-cost cultural activity to thrive, this case offers a model for how informality and leisure can **coexist within heritage-sensitive, high-value urban environments**, enriching both local identity and the everyday public realm (see Figure 10).

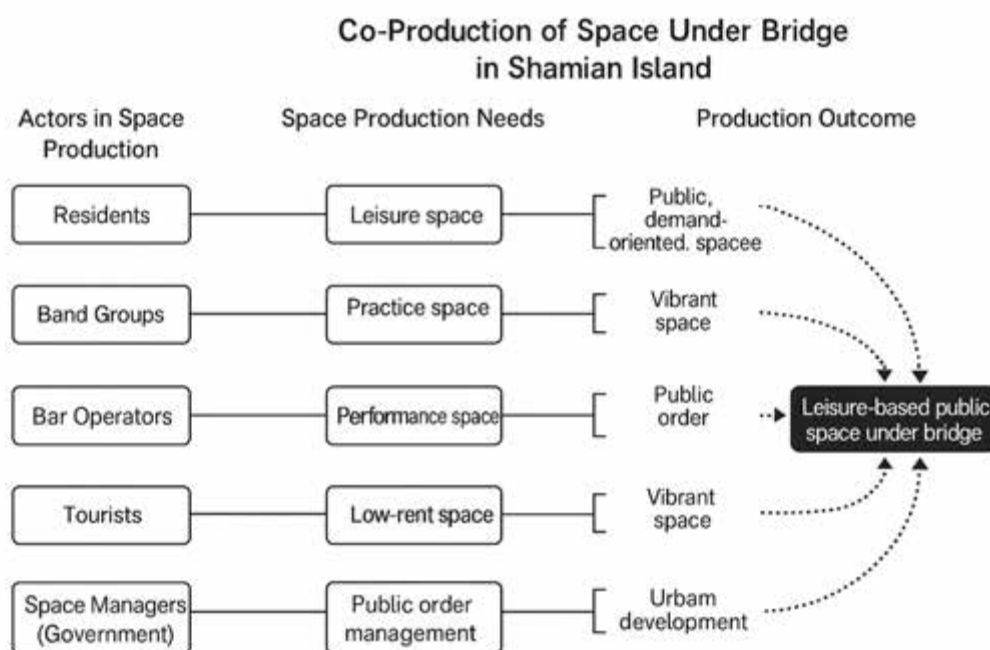


Figure 10 Characteristics of informal use beneath the ramp underpass on Shamian Island.  
*Diagram created by the author.*

#### 4 Insights into Informal Uses of Under-Elevated Spaces in Megacities under Stock-Oriented Urban Regeneration

##### 4.1 Spatial Conditions that Support Overflow Functions from Adjacent Land Uses

Beyond the aforementioned three cases, this study extends the spatial analysis to several other sites across Guangzhou. Findings suggest that relatively stable, long-term informal public spaces beneath elevated highways generally exhibit the following spatial characteristics:

First, land uses on both sides of the overpass typically include **public activity-oriented functions**, with the under-elevated space absorbing overflow public uses. For example, in the Xiaozhou Village case, the art-related land uses west of the overpass—comprising art education industries and proximity to the Guangzhou Academy of

Fine Arts (within 2 km)—feed directly into the underpass art district.

Second, all cases are located within five-minute walking distances from **residential land**, whether in urban core areas or peripheral zones. This implies that continuous residential activity and strong public demand form the social basis for informal space activation, indicating the **necessity of community presence** to sustain use.

Third, suitable under-elevated spaces are generally **safe, calm, and pedestrian-friendly**. In all analysed cases, the relevant spaces are either beneath minor roads or entirely disconnected from vehicular traffic, forming semi-enclosed and stable environments. In the subtropical Lingnan climate, such covered yet ventilated spaces function similarly to traditional **arcades (骑楼)**—offering shade, rain protection, and fulfilling basic outdoor rest and gathering needs.

#### 4.2 Formation of Stable Informal Uses Requires Multi-Stakeholder Spatial Production and Negotiation

The establishment of stable informal public spaces beneath elevated roads inevitably requires **multi-actor coordination**. Therefore, a communicable planning context becomes a prerequisite. The development process often involves four progressive stages:

##### Problematisation Stage:

Citizens or grassroots users must articulate spatial use needs from the bottom up, or managers must identify latent public functions of the space, initiating informal space formation.

##### Proposal and Resource Allocation:

Stakeholders collaboratively define the spatial product, identify beneficiaries, and clarify the nature of participation and resource inputs. Interests are negotiated, and actors are empowered to proceed.

##### Policy Formation Stage:

Based on site surveys and user engagement, public managers coordinate with other actors to formulate directional policies or decisions to support space production.

##### Maintenance Stage:

Long-term effectiveness of spatial governance must be ensured. Sustained support for spatial producers and responsiveness to evolving needs are essential to preserving stakeholder motivation and action continuity.

A relatively stable informal space emerges only when these stages are successfully completed. The formation mechanism can be summarised by four critical factors:

**Top-down institutional design**, where enabling policy environments are crafted by the government;

Active participation of community residents as spatial producers;

**Supportive spatial production factors**, such as nearby universities (e.g., the Guangzhou Academy of Fine Arts), artist communities, and vocational training demands;

**Grassroots leadership and collaboration**, including resident support and participation by students, artists, and vendors.

#### 4.3 Long-Term Informal Use Relies on Stable Actor Networks

Whether initiated by institutional design, policy incentives, production conditions, or economic interests, **the formation of stable under-elevated informal public spaces requires a robust actor-network**. Key characteristics of such networks are:

**Recurring spatial needs** from producers, leading to the articulation of spatial use issues. For example, in the Shamian Island case, a senior citizens' band rehearses daily at a fixed time, and the audience that gathers around them further reinforces public demand for informal use.

**Consistent and communicative relationships** between public managers and spatial users. Effective governance depends on iterative dialogue and responsiveness across different production stages.

These factors help foster **networked co-production**, where the government, community organisations, social groups, and active users form a collaborative ecosystem for public space use.

## 5 Conclusion

In the context of China's rapid urbanisation, elevated highways have served as a key spatial instrument to support the functional expansion of megacities. However, the majority of under-elevated spaces remain **inactive and underutilised**. With increasing pressure for spatial intensification and rising public expectations for high-quality urban spaces, the potential of underpass spaces for adaptive reuse is becoming more evident.

Nevertheless, current informal uses are largely **sporadic and uncoordinated**, occurring in isolated pockets. There is still a pressing need to construct **scalable and replicable models of flexible spatial governance**. Such models should allow for formal recognition, support, and guidance of grassroots-driven informal practices within the broader framework of **People-Oriented Urbanism** (人民城市).

## 6. Discussion

This study explored the informal utilisation of under-elevated spaces in Guangzhou through the lens of co-production theory, using three representative cases—Xiaozhou Village, Dongsha Bridge, and Shamian Island. The findings provide critical insights into how spontaneous, actor-driven uses can evolve into functionally stable public spaces. Here, we reflect on the broader theoretical and practical implications of the research.

### 6.1 Rethinking Informality as a Strategic Layer of Urban Public Space

Conventional urban planning tends to regard informality as a disorderly or transitional phenomenon. However, our findings suggest that in the context of spatial scarcity and rigid institutional frameworks, informal uses can fill important spatial, social, and economic gaps. The analysed cases demonstrate that informal uses under elevated infrastructure are not merely adaptive; they are co-constructed by overlapping needs, negotiations, and routines across multiple stakeholders. Such bottom-up practices can be viewed as **strategic layers** of urban functionality rather than marginal exceptions.

### 6.2 Co-production as a Mediating Mechanism for Space Governance

Through Actor-Network Theory (ANT), we identified that the co-production of under-elevated informal spaces involves iterative interactions among residents, artists, vendors, tourists, and public managers. This reveals that governance of urban space need not be exclusively top-down; rather, it can emerge through negotiation, adaptation, and shared responsibility. In particular, the local government's flexible management style—by tolerating or even facilitating such uses—can stabilise informal activities without formalising them entirely. This suggests an **institutional space for negotiated informality** that may be more resilient than rigid spatial interventions.

### 6.3 From Fragmented Practice to Typological Recognition

Despite their ad hoc origins, the three case studies exhibit recurring spatial typologies:

**Creative-cultural spaces** (e.g., Xiaozhou Village),  
**Informal vending and micro-economies** (e.g., Dongsha Bridge),  
**Leisure-based activation** (e.g., Shamian Island).

Each typology reflects not only spatial conditions (e.g., shade, access, enclosure) but also **relational configurations** among actors. Recognising these patterns offers a potential pathway to shift from fragmented interventions to **typological recognition and planning integration**. Future urban design frameworks could include under-elevated zones as experimental zones for semi-formal co-production, especially in high-density contexts.

## 6.4 Limitations and Further Research

This study is limited to three qualitative case studies within one metropolitan context. Although the co-production framework proved effective in interpreting spatial and social dynamics, further research could:

Extend comparative analysis to other Chinese megacities or global south contexts;  
Incorporate quantitative assessments of spatial performance and user behaviour;

Explore legal and planning instruments for formal-informal hybrid governance models.

### Note

#### [1] Informal Use:

In this paper, “informal use” refers to urban spatial activities that arise spontaneously and contingently, without explicit official planning control or formal authority intervention.

#### [2] Urban Residual Space :

In *The Death and Life of Great American Cities* (1961), Jane Jacobs questioned conventional urban renewal models and introduced the concept of urban residual spaces, such as “urban dead zones” and “dead corners.” In this study, residual space primarily refers to linear spatial remnants generated during urban development processes that remain underutilised.

#### [3] Co-production:

Co-production (also referred to as “collaborative production”) is a key concept proposed by economist Elinor Ostrom in the 1970s. It emphasises that citizens can play an active role in the production of public goods and services that significantly affect their lives (Albrechts, 2012). This concept is extended in this study to frame the informal use of space.

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