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Spatial Assets Value Extraction and Integrated Utilization of Old Communities: Case of Central Guangzhou, China

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Abstract: Extracting the economic value by the integrated utilization of space in old communities is crucial for encouraging independent participation from enterprises and residents, reducing reliance on government leadership and fiscal investment. This study starts from the active perspective of spatial assets and constructs a value activation framework for old communities by balancing "endogenous demand" and "exogenous opportunities". By enhancing the "economic value" through the "use value", five methods for value extraction and overall project utilization paths are proposed, guided by a dynamic "cost-revenue" balance. Using multi-source data, we identify the spatial assets of 1096 old communities in central Guangzhou and apply a market comparison method for an economic value assessment. Additionally, this study offers recommendations on the timing and project portfolios for regeneration efforts, along with strategies for establishing a coordinating implementation entity and fund account. This research provides strategic insights for advancing the regeneration of old communities by tapping into their macro-level economic potential.

Keywords: old communities; spatial assets; value extraction; integrated utilization; Guangzhou; China

Citation: Yin, X.; Tang, Y.; Yuan, L.; Ai, Y.; Tang, Y. Spatial Assets Value Extraction and Integrated Utilization of Old Communities: Case of Central Guangzhou, China. *Land* **2024**, *13*, 1781. https://doi.org/10.3390/land13111781

Academic Editor: Hossein Azadi

Received: 8 September 2024
Revised: 23 October 2024
Accepted: 28 October 2024
Published: 30 October 2024

1. Introduction

The regeneration of old communities has been a key element of China's national strategy for "implementing urban regeneration actions". From 2012 to 2022, a total of 163,000 old communities have been targeted for regeneration according to China's Ministry of Housing and Urban–Rural Development [1]. And, China aims to complete the regeneration of 3 billion square meters of old community buildings by 2025 [2]. However, the lack of economic returns from these projects has resulted in limited motivation among enterprises and residents to participate [3]. Consequently, the process has primarily relied on government-led financial expenditures and administrative operations [4,5]. Thus, exacting the economic value from regeneration projects is the core of attracting active participation and investment from enterprises and residents, which is essential to ensure the sustainable regeneration of old communities [6,7]. Since old communities often have small-scale, scattered spatial assets, their potential can only be fully realized through large-scale, integrated utilization and orderly planning. Therefore, it is essential to set up a framework of economic value extraction and the coordinated utilization of old community regeneration from a macro-scale perspective.

Globally, the development of neoliberalism has promoted the financialization of urban space and the corporatization of urban governance [8,9], which has also led to achieving a balance between revenue and cost [10] and fostering multi-stakeholder cooperation for core sustainable regeneration across economic [11], social [12], and environmental [13,14] dimensions. From the practice in Kewaunee, the United State [15], Letchworth, the United Kingdom [16], Lisbon, Portugal [17], Seoul, South Korea [18] and other places, it can be found that economic profits are the basic support for the orderly advancement of urban

regeneration projects and an important guarantee for the formation of cooperative relationships among developers, landlords and other stakeholders. At the same time, since urban regeneration investment is a high-risk and irreversible investment [19], an objective evaluation is a prerequisite for investment decisions. Judging from the economic multi-criteria analysis model [20], private entities' charge appraisal model [21], financial feasibility evaluation model [22] and other models proposed in existing studies, the fact that the revenue of regeneration projects are greater than their cost is always the simplest, clearest and most basic standard in various financial models [23]. However, in general, these studies focus on the financial model itself, pay less attention to the spatial transformation methods of regeneration projects and lack research on the combination of spatial regeneration methods and economic benefit measurements. In China, after the housing reform in the 1980s, housing began to serve both consumption and investment purposes. Thus, the regeneration of old communities now carries dual responsibilities of ensuring livelihood security and promoting economic development [24]. Historically, the focus of old community regeneration has been on meeting residents' needs [25], with little attention paid to the investment potential of these communities. In fact, many old communities possess inefficient or underutilized "spatial assets" due to issues such as poor quality, idle facilities, or inappropriate functions—examples include vacant spaces, dark corners, and underused buildings. Reusing these assets can unlock economic value, creating opportunities to reinvest in these communities [26]. Increasingly, Chinese scholars are introducing financial and public administration models to address critical issues like fund balancing [27] and multi-stakeholder collaboration [28] in old community regeneration [29]. For instance, Zhao et al. [30] proposed a "cost-revenue" financial model; Liu et al. [31] discussed a collaborative governance model based on Bayesian networks; and Shen et al. [32] developed a regeneration engine model involving both city governments and operators. However, most existing research focuses on micro-level case studies or theoretical frameworks, with less emphasis on the macro-scale urban or regional context [33].

By using central Guangzhou as a case study, the research quantitatively identifies the spatial assets of old communities and assesses their value potential. It also offers recommendations on work arrangements and mechanisms for the regeneration of old communities. This study aims to shift the focus of old community regeneration from a passive "demand-driven" approach to an active "value-driven" strategy, providing a reference for coordinated economic value exploration and strategic planning at the urban macro-scale.

2. Materials and Methods

2.1. Study Area

Guangzhou has gained extensive experience in urban regeneration [34,35]. In 2017, it was selected as one of the 15 pilot cities for old community regeneration in China. However, Guangzhou's regeneration efforts have predominantly relied on government initiatives and fiscal funding [36,37]. For instance, in 2019, over 87% of the funds for old community regeneration came from public finances [38]. Additionally, the current practice of implementing single projects by individual entities has hindered the comprehensive utilization of spatial resources within and around communities [39]. So, it is essential to adopt a municipal-level approach to regeneration, supported by systematic resource surveys and value assessments, to promote the coordinated use of spatial assets.

The list of old communities in this study was obtained from the Guangzhou Municipal Housing and Urban–Rural Development Bureau. Then we refined and identified 1096 old communities within central Guangzhou by comparing and correcting satellite imagery, data from the Third National Land Use Survey and building outline data. These old communities cover a land area of 26 square kilometers within the 933 square kilometers of the central city, with a total building area of 67.6 million square meters and a population of approximately 1.4 million residents (Figure 1).

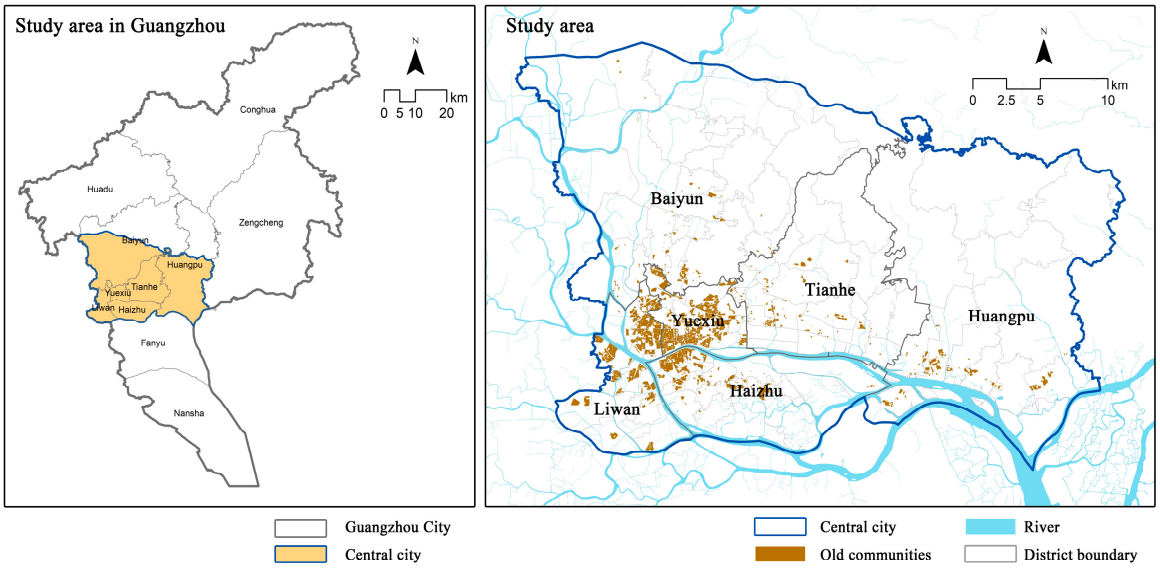

Figure 1. Location of the study area.

2.2. *Analytical Framework*

2.2.1. Object Definition: Spatial Assets in Old Communities

An asset is an economic concept referring to valuable and scarce resources with specific ownership rights that can generate expected economic benefits [40]. The core idea behind "asset-based" community regeneration is to achieve profitability through the comprehensive exploration and effective utilization of various resources. This concept emerged in the 1960s when the U.S. federal government began to shift the leadership of community development to local governments and communities, while gradually reducing direct financial support [41]. In the 1990s, American scholars Kretzmann and McKnight recognized that relying excessively on external resources for community regeneration was unsustainable [42]. They proposed focusing on community assets to stimulate endogenous development [43]. This approach has since been widely adopted internationally, with strong support from the United Nations [44,45].

Scholars have proposed various classifications for community assets [46], including tangible assets such as spatial assets (land, buildings, etc.), vegetation, facilities and equipment [47], as well as intangible assets like human resources, culture and social capital [48]. Empirical studies by Huang [49], Kuang [50] and others in cities such as Chongqing and Shanghai have demonstrated that a comprehensive approach considering both tangible and intangible assets is effective for analyzing individual communities. However, intangible assets are significantly influenced by factors such as management practices, resident relationships and historical and social contexts, making them difficult to quantify and compare uniformly across different communities. This limitation affects their applicability on a macro scale. Recently, advancements in geographic information technology and the availability of multi-source data have enhanced the accuracy of spatial resource identification [51,52], allowing for a more precise and in-depth analysis of tangible assets, particularly spatial assets, at a macro scale [53].

Therefore, this study focuses on analyzing the tangible spatial assets of old communities from a macro-scale perspective. These assets include land and building spaces that can be repurposed to generate economic benefits through reconstruction, functional upgrades, and changes in property rights. Key examples of such assets are idle facilities, unused spaces, inefficient shops, public housing, low-density housing, and low-rent housing, etc.

2.2.2. Dynamic Logic: Leveraging "Endogenous Demand" and "Exogenous Opportunities" to Activate Spatial Asset Value

In China, old community regeneration projects fall into three categories [54]. "Basic" regeneration projects, such as building insulation, waterproofing and municipal pipeline replacement, are the most common and primarily funded by the government. In contrast, "improvement" and "upgrading" projects, which involve the transformation and utilization of inefficient spatial assets, are typically handled as individual initiatives, with large-scale coordinated efforts being notably lacking. Traditional regeneration often overlooks the unique conditions of different communities, including their location and urban environment, and lacks systematic, macro-level planning for the transformation and utilization of inefficient spatial assets. As a result, the economic value of communities remains underutilized.

The reuse of spatial assets in old communities can enhance their economic value by leveraging the potential of use value while addressing both endogenous needs and exogenous opportunities (Figure 2). Endogenously, transforming inefficient spatial assets can address facility shortfalls, catering to diverse needs within the community, such as convenience services, parking and leisure facilities. This transformation can generate economic benefits through facility operation, environmental maintenance and community services. For instance, public housing units can be sold to residents, transferring ownership to the private sector, or expanded to improve living conditions. Fees can be charged to residents during the regeneration process [55]. Externally, the urban environment surrounding old communities influences how spatial assets are utilized [56]. For example, communities near office areas often experience a higher rental demand from working individuals, while street shops near tourist attractions typically perform better [57]. Thus, regeneration efforts should capitalize on the influence of nearby facilities such as industrial zones, commercial centers and subway stations to address residents' needs for a work–life balance and commercial services [58].

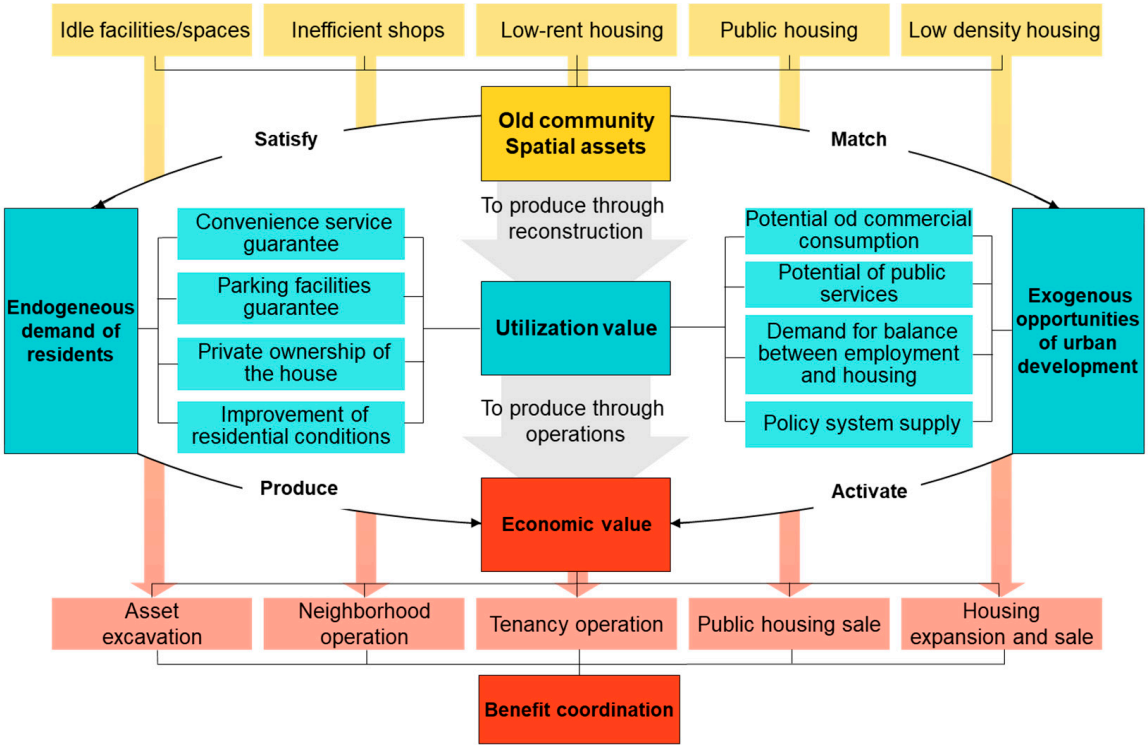

Figure 2. The driving force behind spatial asset value enhancement in old communities: synergizing "endogenous demand" and "exogenous opportunities".

2.2.3. Strategic Pathways: Five Approaches to Value Extraction and Coordinated Utilization of Spatial Assets in Old Communities

For individual communities, the focus of spatial asset utilization lies in maximizing both the continuous and one-time economic value through appropriate renovation strategies. Continuous economic value primarily refers to the income generated from operating spatial assets, such as rental income and service fees. In contrast, a one-time economic value is derived from the proceeds obtained through the sale or disposal of spatial assets.

Comparing typical cases from the eight batches of "Replicable Policy Mechanisms for Urban Old Community Renovation" published by China's Ministry of Housing and Urban–Rural Development since 2020, alongside renowned renovation examples such as Beijing's Jinsong Community [59], Guangzhou's Liuyun Community [60] and Shanghai's Caoyang New Village [61,62], reveals that the current approaches to renovating and utilizing spatial assets in old communities in China generally fall into five main strategies (Table 1 and Figure 3) in which, asset extraction involves reusing idle facilities and spaces, such as boiler rooms and vacant lots, to meet resident service needs while generating an economic value from operations and rental income. For example, in Beijing's Jinsong community, the company can achieve an annual profit of CNY 6.27 million by renovating and operating 1670 square meters of existing buildings and 1000 square meters of idle land in the community and it is expected to break even in 10 years. The neighborhood operation aims to enhance the commercial potential of old communities located near major commercial and cultural areas by upgrading the types and quality of operational assets. For example, relying on its good location and transportation advantages, the Guangzhou Liuyun Community has gradually gathered a large number of specialty shops such as coffee and cultural and creative businesses on the ground floors of residential buildings, bringing good economic benefits to the neighborhood. The tenancy operation involves professional agencies managing rental properties to better match the supply with the demand and maximize rental income through market-based methods. For example, in the regeneration of the Zhenwumiao community in Beijing, the operation company leases existing houses, renovates them and then rents them out to high-income white-collar workers in the surrounding area, earning a premium of CNY 4000 per house per month. A public housing sale refers to selling designated public housing to meet housing needs and reduce maintenance pressures while generating revenue. For example, after the regeneration of Beijing's Guangminglou 17, the public property was sold to the original residents, attracting CNY 4.6 million in investment from the residents. Finally, housing expansion and sale entails adding new construction where feasible to optimize residential layouts and improve living conditions, with the added space sold to offset the renovation costs. For example, residents of Zhegong New Village in Hangzhou jointly invested CNY 470 million to demolish and rebuild the community. While the residents' housing area was expanded, they could also obtain a 1.5-fold increase in the unit price of their houses.

2.3. Data Acquisition and Processing

This study introduces an integrated analysis framework for multi-source data concerning the regeneration of old communities in central Guangzhou (Figure 4). The framework begins by classifying and identifying spatial assets using data from land use, Points of Interest (POI), building outlines, and relevant urban planning standards. Next, the value potential of inefficient spatial assets is assessed using a market comparison method, which involves determining the asset value by comparing similar cases and referencing comprehensive data such as rent and property prices. Finally, the "cost-revenue" analysis of regeneration funds for each community is performed to propose a coordinated regeneration plan, including the prioritization of projects.

Table 1. Five approaches to tap the economic value of spatial assets.

Approaches	Spatial Assets	Endogenous Demand of Residents	Exogenous Opportunities for Urban Development	Economic Benefits
Asset excavation	Idle facilities and Idle space	Requirements for service facilities, parking space, etc.		Continuous rental and operating income
Neighborhood operation	Inefficient shops	Demand for upgrading of business forms	Guaranteed demand for facilities around scenic spots in the business district	
Tenancy operation	Low rent housing	Demand for rent increase and dwellings upgrading	Demand for employment and housing balance in employment agglomeration areas	
Public housing sale	Public housing	Residents' demand for obtaining property rights	Simplified management needs of the government	One-time asset sale funds
Housing expansion and sale	Low density housing	Demand for expanding the area and adding kitchen and bathroom facilities	Demand for people's livelihood and housing conditions	

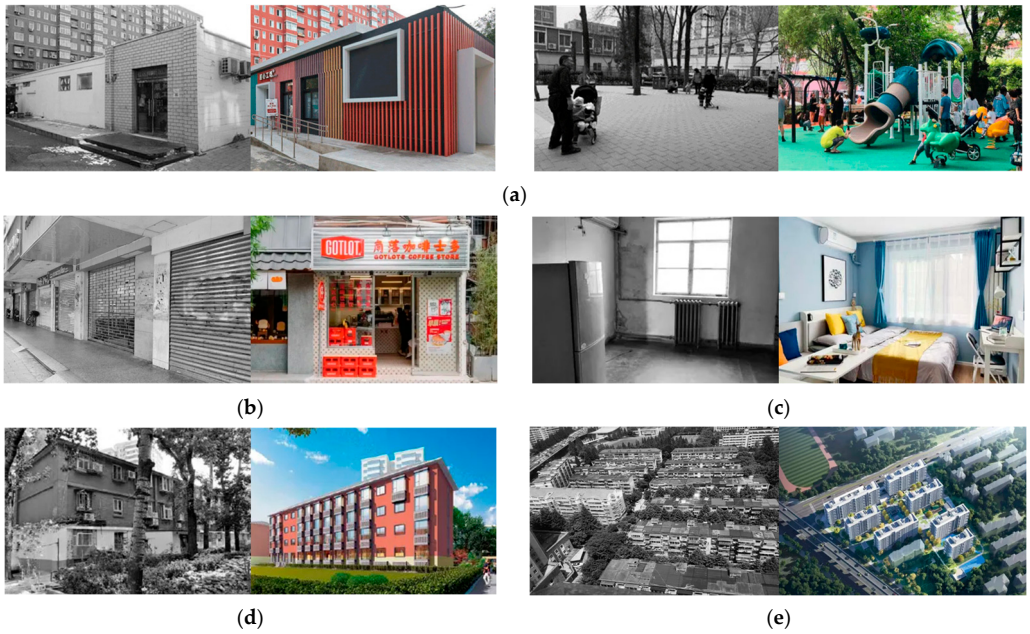

Figure 3. Cases before and after regeneration of five approaches to tap the economic value of spatial assets in China. (**a**) asset excavation—Beijing's Jinsong Community; (**b**) neighborhood operation—Guangzhou's Liuyun Community; (**c**) tenancy operation—Beijing's Zhenwumiao Community; (**d**) public housing sale—Beijing's Guangminglou 17; (**e**) housing expansion and sale—Hangzhou's Zhegong New Village [63–67].

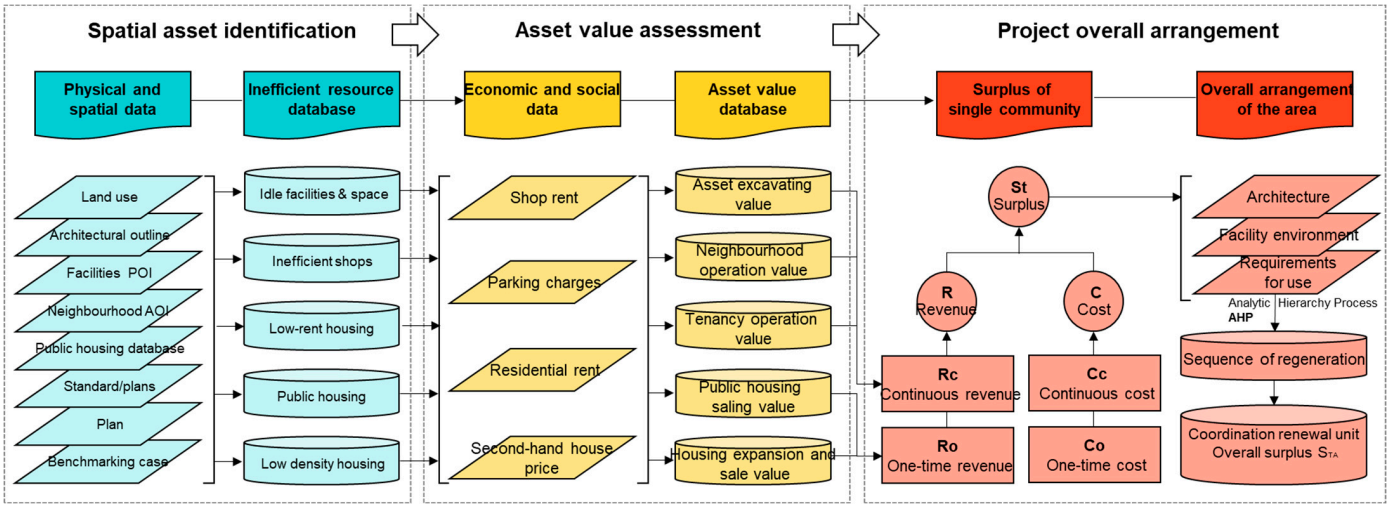

Figure 4. Multi-source data analysis framework for the regeneration of old communities in central Guangzhou.

2.3.1. Spatial Assets Identification and Economic Value Assessment

This study outlines methods for identifying and evaluating the economic value potential of five types of spatial assets in old communities.

(1) Asset excavation of idle facilities and space

This study identifies vacant facilities using building outlines and points of interest (POIs) and calculates restricted building areas (Equation (1)). The criteria for selecting idle facilities include buildings with fewer than two floors, structures rated C or D on a four-level scale (from A to D, with A being the best) and buildings lacking POIs within their outlines. Additionally, spaces within the community that are not occupied by necessary buildings or public areas are considered idle spaces. The estimation of these spaces uses the community area, building base area and standard greening ratio (Equation (2)).

$$A_{ib} = A_{ba} \times F \quad (1)$$

where A_{ib} represents the area of idle facilities, A_{ba} denotes the base area of the building and F indicates the number of floors.

$$A_{is} = A_c \times (1 - S_{gr}) - A_{ba} \quad (2)$$

where A_{is} is the area of idle space, A_c is the area of the community, S_{gr} is the standard green space rate from the 2019 "Guangzhou Urban and Rural Planning Technical Regulations" (25% for the old city and 30% for other urban areas) and A_{ba} is the base area of the building.

Then, idle facilities are converted into commercial and service facilities to generate rental income, while idle spaces are repurposed as parking lots to collect parking fees. Consequently, we use data on shop rents and parking fees to assess their economic value potential (Equation (3)).

$$R_{ae} = A_{ib} \times R_r + A_{is} \times R_p \quad (3)$$

where R_{ae} represents the revenue from asset excavation during a specific period, R_r is the shop rent from 58 Tongcheng (https://gz.58.com/), a widely used commercial rental information website in China, and R_p denotes the parking fee based on standards issued by the Guangzhou Municipal People's Government.

(2) Neighborhood operation of operational facilities

This study utilizes POI data within the community to classify and calculate the total scale of various operational facilities. The average scale for each type of facility is determined through field surveys (Equation (4)).

$$A_{of} = \sum_{i=1}^{n} A_{ai} \times N_i \quad (4)$$

where A_{of} represents the total area of operating facilities in communities, n denotes the number of types of operating facilities, A_{ai} is the average area of each type, and N_i is the number of facilities of each type. Field surveys reveal that business facilities in Guangzhou's old communities fall into three categories, including living and catering services (average area of about 30 m^2), convenience and retail stores (average area of about 50 m^2) and accommodation services and offices (average area of about 100 m^2).

By considering development opportunities around the community to enhance business facility rents through the introduction of suitable functions and improved environmental quality, we calculated the economic potential. This was carried out using city-, district- and cluster-level centers identified in urban planning to determine the scope of impact, with rent increases assessed based on interview data (Equation (5)).

$$R_{no} = A_{of} \times R_r \times (1 + R_{ai}) \quad (5)$$

where R_{no} represents the revenue from the neighborhood operation mode during a specific period, R_r is the shop rent and R_{ai} is the annual growth rate of shop rents. The annual growth rates are based on the Guangzhou Territorial Spatial Master Plan (2018–2035), including 8% within 1500 m of city-level centers, 7% within 1000 m of district-level centers and 6% within 500 m of cluster-level centers.

(3) Tenancy operation of low-rent housing

This study identified old communities with rents below the average within a 150 m radius using housing rent data. Subsequently, occupancy rates and building area data were used to calculate the rentable building area (Equation (6)).

$$A_{lr} = A_{ah} \times R_r \quad (6)$$

where A_{lr} is the area of the low-rent housing available for rental, A_{ah} is the total building area of the low-rent community and R_r is the rental ratio of the community. This ratio, derived from the seventh census data for each district, is 0.46 for Liwan, 0.45 for Baiyun and Tianhe, 0.43 for Haizhu, 0.40 for Huangpu and 0.38 for Yuexiu.

We further assessed the rental disparity between old communities and surrounding residential areas, focusing primarily on those old communities with rents lower than those in nearby areas (Equation (7)).

$$R_{to} = A_{lr} \times (R_{sa} - R_{ag}) \quad (7)$$

where R_{to} represents the revenue from the tenancy operation mode during a specific period, R_{sa} is the average rent within 150 m of the old communities and R_{ag} is the rent within the old communities.

(4) Public housing sale

This study utilized the public housing database from the Guangzhou Municipal Housing and Urban–Rural Development Bureau to measure the area of public housing in each community (Equation (8)).

$$A_{ph} = \sum_{i=1}^{m} A_{phi} \quad (8)$$

where A_{ph} represents the total area of public housing in the old communities, A_{phi} is the area of public housing i and m denotes the number of public housing units.

According to Guangzhou regulations, public housing can be sold to residents at second-hand housing prices. Therefore, we use these prices to assess the economic potential (Equation (9)).

$$R_{ps} = A_{ph} \times P_{sh} \quad (9)$$

where R_{ps} represents the revenue from the sale of public housing and P_{sh} is the second-hand house price, sourced from Beike (https://gz.ke.com/), a widely used housing transaction information website in China.

(5) Expansion and sale of low-density housing

According to the "Guidelines for the Design of Micro-regeneration of Old Communities in Guangzhou 2019", Guangzhou's old residential areas are classified into three types: courtyard-type, street-type, and commercial housing-type. Street-type areas are low-rise urban villages and commercial housing-type areas are modern communities with full kitchen and bathroom facilities. These two types generally do not have potential or demand for increased density. In contrast, most courtyard-type communities, which consist of 4-to-6-story buildings with limited household space and lacking kitchen and bathroom facilities, do have the potential for reconstruction and an increased building area. We first classified the communities based on their building height, architectural form, and age. Then, we identified those with a floor area ratio (FAR) below the upper limit set by the "Technical Regulations on Urban and Rural Planning in Guangzhou 2019" and assessed the potential for increasing the density in old courtyard-type communities (Equation (10)).

$$A_{di} = A_{ah} \times N_h \quad (10)$$

where A_{di} represents the density-increasing potential of the old communities, A_{ah} is the expansion area potential per household and N_h is the number of households in the communities. In practice, some communities are significantly below the planned floor area ratio (FAR), making it challenging to achieve the planned FAR due to the extensive reconstruction required. Therefore, we adopted an increase of 7 m^2 per household to accommodate the addition of kitchen and bathroom facilities, based on the approach used in Caoyang New Village in Shanghai.

The additional buildings can be sold to residents at second-hand house prices. Therefore, we use these prices to estimate the economic potential (Equation (11)).

$$R_{es} = A_{ph} \times P_{sh} \quad (11)$$

where R_{es} is the revenue of expansion and sale and P_{sh} is the second-hand house price.

2.3.2. Project Regeneration Sequencing and Overall Coordination

(1) Sequence of regeneration

This study used expert questionnaires and the Analytic Hierarchy Process (AHP) to determine the regeneration sequence. First, we selected five indicators across three categories—building characteristics, the facility environment and usage needs: building age, structure, density, facility completeness and population density. We then distributed questionnaires to experts and scholars experienced in the planning, design and research of old community regeneration in Guangzhou, asking them to compare the importance of these indicators in pairs. After conducting a consistency test, we used the AHP method to assign weights to each indicator. These weights were then used to calculate the urgency of regeneration for each community. Finally, we divided the regeneration tasks into a 5-year plan according to the overall goals set by the Guangzhou Municipal Government.

(2) Surplus of regeneration

This study used a "cost-revenue" balance approach to propose a coordinated path for regenerating old communities across various scales and timelines. It is important to

note that in actual financial calculations, factors such as exchange rates, taxes and discount rates need to be considered. However, this study focused on a macro-level estimation of economic value and did not account for these factors, aiming for a clearer and more intuitive demonstration of the results [68].

For a single community, the surplus is calculated as the revenue minus the cost. Revenue includes income generated from the five types of spatial assets, while the cost encompasses the investment required for the regeneration of various old residential areas (Equation (12)).

$$S_t = (R_{ps} + R_{es} - C_o) + (R_{ae} + R_{no} + R_{to} - C_c) \times T \quad (12)$$

where S_t is the surplus from the regeneration of a single community over a specified period and R_{ps}, R_{es}, R_{ae}, R_{no} and R_{to} represent the revenues from the different regeneration modes outlined in Section 2.3.1. C_o denotes one-time costs and C_c represents continuous costs. This study estimated these costs using the 2018 "General Rules for Construction Project Pricing in Guangdong Province" and the 2021 "Cost Accounting Method for Comprehensive Regeneration of Old Urban Villages in Guangzhou". One-time costs include data surveys, plan preparation, overall reconstruction and unforeseen expenses, while continuous costs cover commercial and residential property management service fees, as well as the cost of renting houses from original owners in the unified rental operation model.

In practice, varying resource endowments often make it challenging to achieve financial balance within a single community's regeneration project. Therefore, it is essential to integrate different communities and achieve financial balance by combining various project types with different time sequences, including recent and future projects, as well as projects with both positive and negative profits, at the area level (Equation (13)).

$$S_{ta} = \sum_1^j \sum_1^t \left(R_{psj} + R_{esj} – C_{oj}\right) + \left(R_{aej} + R_{noj} + R_{toj} - C_{cj}\right) \times T_{tj} \quad (13)$$

where S_{ta} is the surplus from regenerating old communities at the area level, j represents the number of communities in the area and t denotes the time since regeneration. R_{psj}, R_{esj}, R_{aej}, R_{noj} and R_{toj} are the revenues from different regeneration modes for community j, C_{oj} and C_{cj} represent the one-time and continuous costs for community j, respectively, and T_{tj} indicates the time elapsed since the regeneration of community j.

3. Results

3.1. Economic Potential of Spatial Assets in Old Communities

The estimates reveal that spatial assets are widely distributed across old communities in central Guangzhou. Specifically, approximately 80% of these communities have idle facilities, averaging around 185 m^2 per community, which are evenly distributed in the central urban area. About 90% of the old communities contain idle space, with an average area of about 5000 m^2 per community. In the Liwan District, the core area of the old city where space resources are scarce, there is almost no idle space. And the overall distribution characteristic of idle space is that the farther away from the core of the old city, the larger the scale. Additionally, around 90% have business facilities, averaging about 1850 m^2 per community, which are also evenly distributed in the central urban area. Approximately 30% of the old communities include public housing, with an average area of 750 m^2 per community, which are less common in the old city of the Liwan District, and are mainly distributed in the Yuexiu District, which was rapidly developed after the founding of New China. Around 50% have low-rent housing, totaling 32 million m^2, which are evenly distributed in the central urban area. Furthermore, about 10% of the old communities have potential for increased density, with an estimated potential of around 350,000 m^2, which are mainly distributed in the old city of the Liwan District with low building heights (Figure 5).

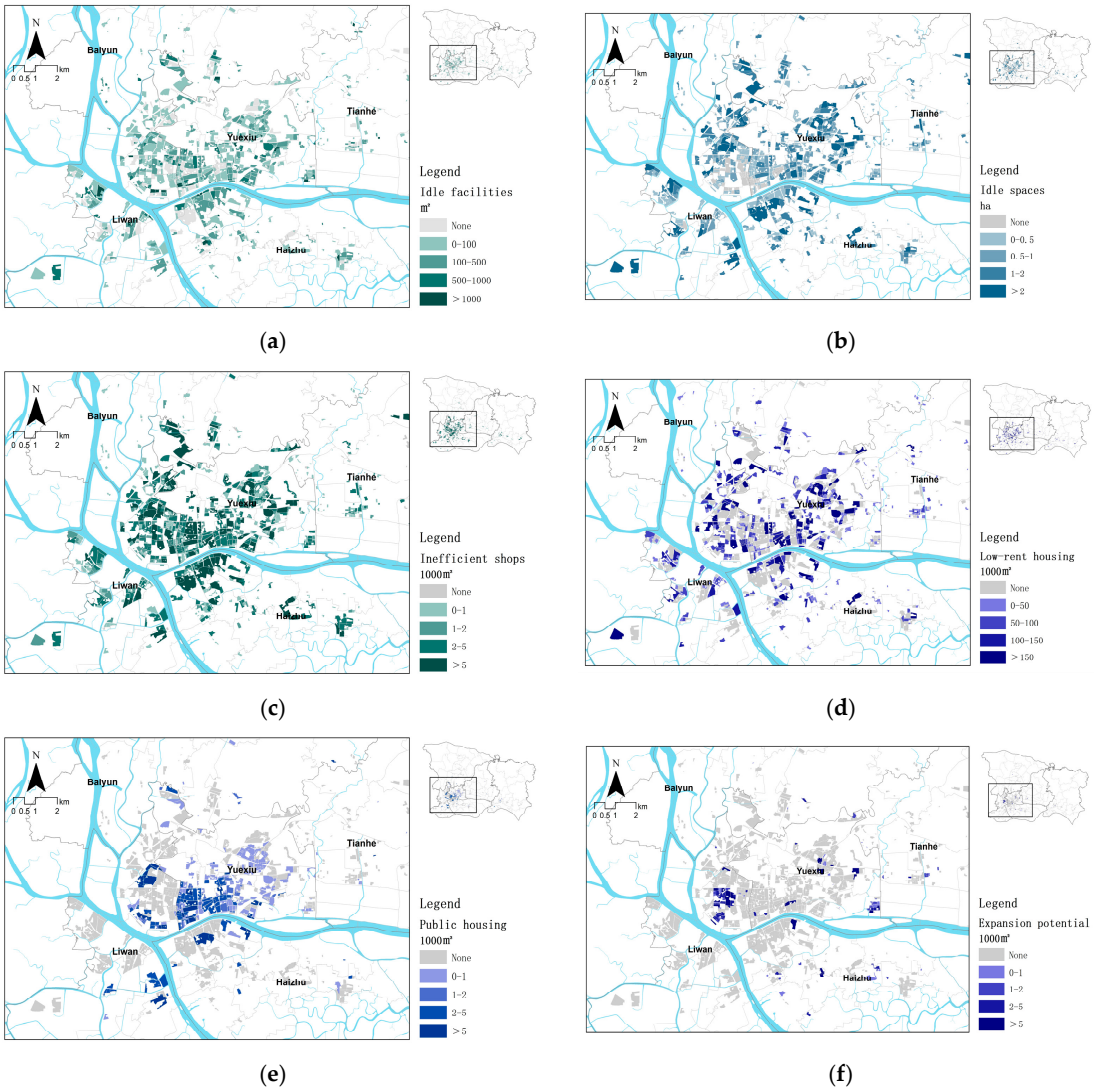

Figure 5. Spatial assets in old communities of central Guangzhou. (**a**) Idle facilities; (**b**) idle spaces; (**c**) inefficient shops; (**d**) low-rent housing; (**e**) public housing; (**f**) housing expansion potential.

If all these spatial assets are utilized, the old communities in central Guangzhou could generate a one-time revenue of approximately CNY 16 billion. This includes around CNY 2.5 billion from the sale of public housing and about CNY 13 billion from the sale of expanded residential buildings. Additionally, sustainable annual revenue could reach about CNY 17.5 billion, with approximately CNY 5.5 billion from asset excavation, CNY 3 billion from neighborhood operations and CNY 6.5 billion from tenancy operations. Furthermore, providing property services to the regenerated communities could yield an additional CNY 2.5 billion annually. The distribution characteristics of the economic value potential are highly correlated with the distribution characteristics of spatial assets. Overall, the sustainable economic benefits of different areas in the central city, including asset excavation, neighborhood operation, tenancy operation models and property services fees, are distributed relatively evenly. However, the one-time public housing sale and housing expansion and sale models, due to the uneven distribution of spatial assets, show the characteristics of agglomeration in the peripheral areas and core areas of the central city, respectively (Figure 6).

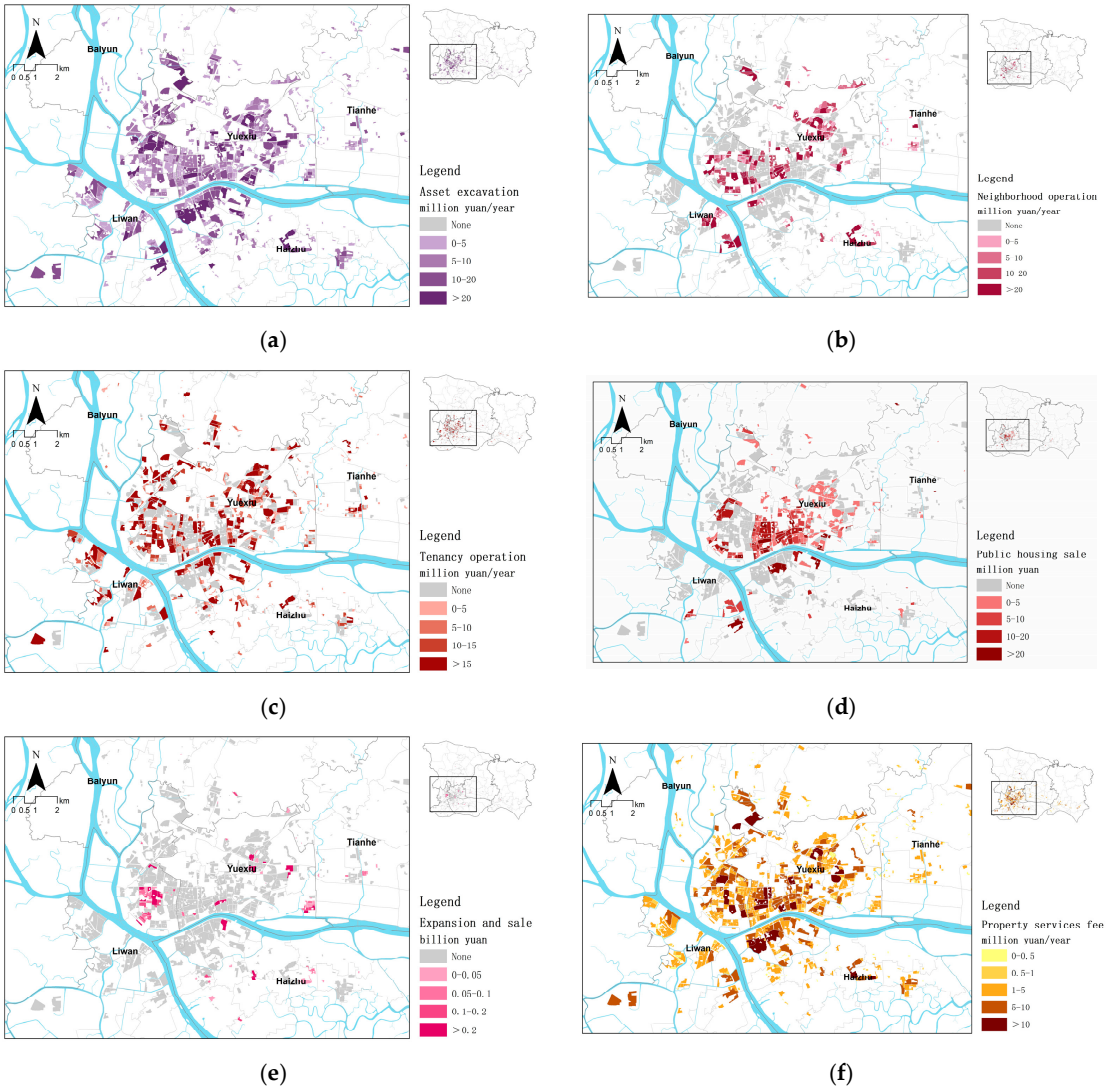

Figure 6. Economic value of spatial assets in old communities of central Guangzhou. (**a**) Asset excavation; (**b**) neighborhood operation; (**c**) tenancy operation; (**d**) public housing sale; (**e**) housing expansion and sale; (**f**) property services fee.

3.2. Overall Arrangement of the Regeneration of Old Communities

In determining the regeneration sequence, this study distributed 35 questionnaires and collected 34 valid responses. Using the AHP method, the weights of the various indicators were as follows: building structure (0.248) and building age (0.122) under the building category; building density (0.102) and facility perfection (0.184) under the facility environment; and the population density (0.344) under usage needs. Based on these weights, the regeneration sequence for the old communities was established (Figure 7).

In estimating the costs for old communities in central Guangzhou, the one-time expenses amount to approximately CNY 23 billion, with continuous costs around CNY 16 billion per year. Factoring in both the costs and the revenue generated from spatial asset utilization, the one-time deficit is around CNY 7 billion, while the annual continuous surplus is about CNY 1.8 billion. As a result, the overall balance of profit and income at the central urban level is projected to be achieved by the sixth year (Figure 8).

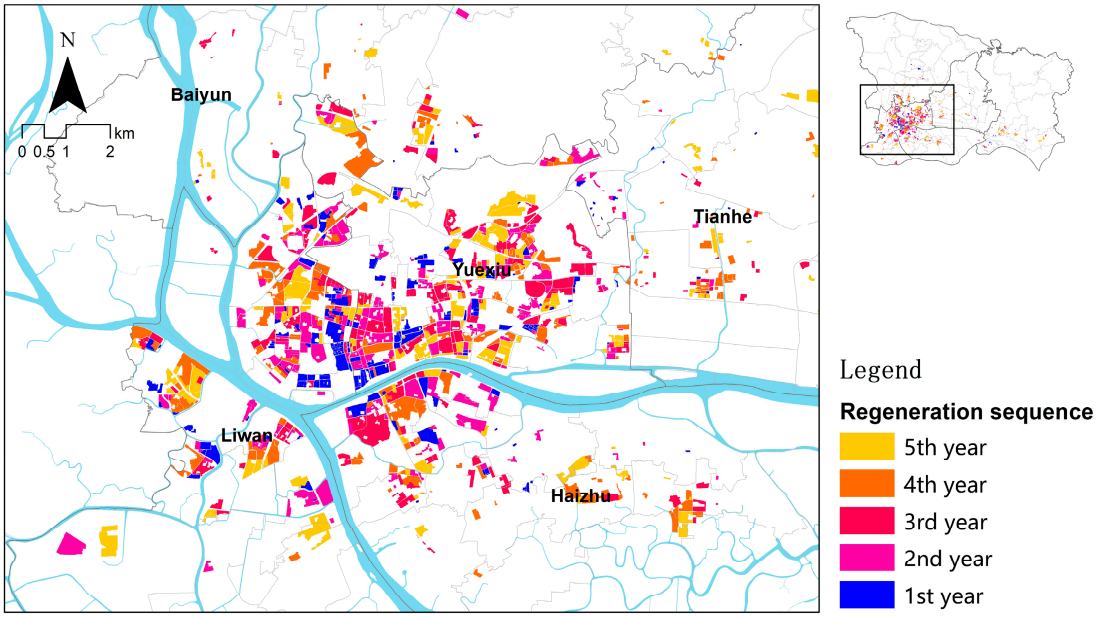

Figure 7. Sequence arrangement for old community regeneration in central Guangzhou.

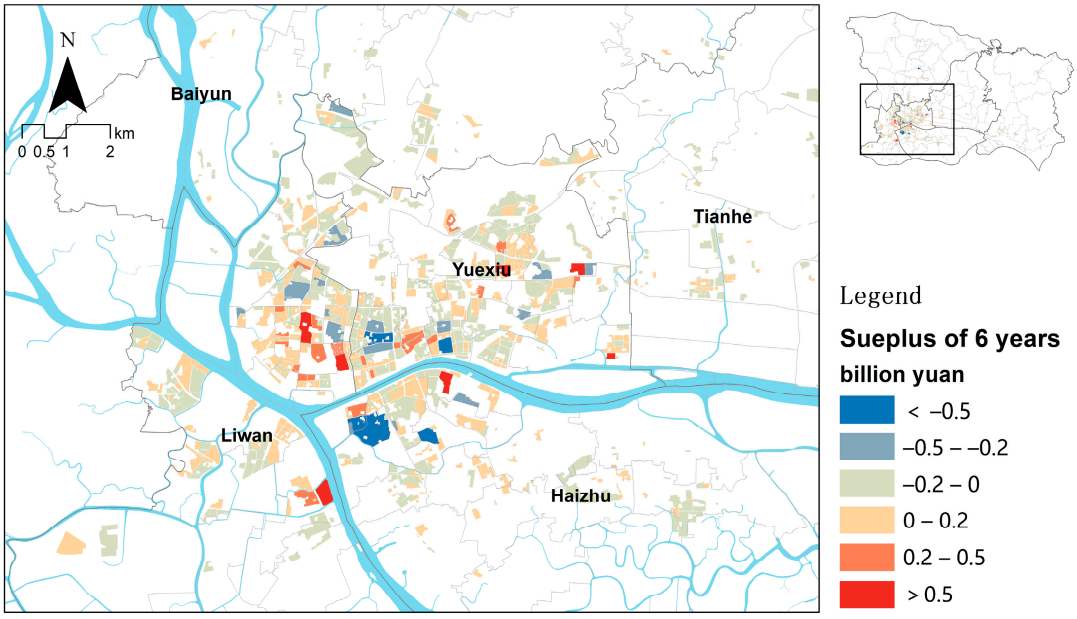

Figure 8. Overall surplus for old community regeneration in central Guangzhou.

The sub-district serves as both the basic administrative unit of the city and the fundamental governance entity for the regeneration of old communities in China. Therefore, this study uses sub-districts as the area unit to calculate the cost–revenue balance for community regeneration. The analysis shows that in the sixth year post-regeneration, when the central city achieves an overall positive surplus, 32 sub-districts will have positive surpluses, while 62 will still have negative surpluses. To address this, this study suggests combining sub-districts with positive and negative surpluses, as illustrated in Figure 9, to promote the overall economic balance. Specifically, Yuexiu and Liwan districts can achieve a positive surplus by internal combination, whereas Tianhe, Haizhu, Baiyun and Huangpu districts, which have negative surpluses, can balance their finances by combining with Yuexiu and Liwan.

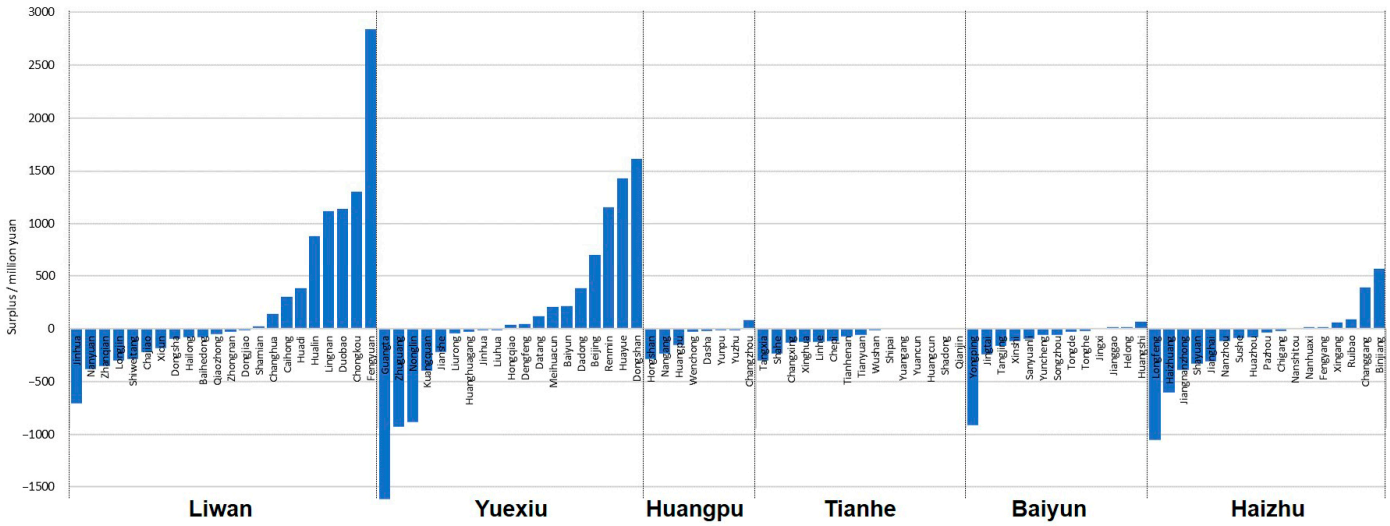

Figure 9. Surplus of old communities in sub-districts of central Guangzhou.

4. Discussion

4.1. Research Reflection

This study addresses the core challenge of an insufficient economic value in the regeneration of old communities. Building upon existing research methods that focus on individual communities or projects [46–48], we extend the analysis to the macro scale of the city and district, integrating financial potential exploration with a traditional spatial reconstruction design. Five methods for identifying and assessing the value potential of spatial assets are proposed. Furthermore, we refine the urban regeneration financial model put forth by scholars like Zhao [30], You [69], Lin [70] and Tang [71], applying it to the regeneration planning of old communities in Guangzhou's central city. Overall, the rationality of the spatial asset identification and value potential analysis framework proposed in this study is supported by three aspects. First, the "cost-revenue" framework adopted by the research is a mature and concise financial standard in the research and practice of urban regeneration. Second, the five regeneration models of the old community sorted out in this study have been successfully applied and gradually expanded in other cities in China. In addition, this study fully considers the actual conditions of the old communities in Guangzhou, such as the building quality, volume ratio, community type, location conditions, and planning guidelines. At the same time, this study can be well applied to the research of other cities. This is because Guangzhou's old communities include various types such as urban villages, commercial housing and public housing, covering all types of old communities in other cities in China, and the basic data such as rents, housing prices and planning involved in this study can be obtained through public channels. For the study of foreign cities, the "cost revenue" balance approach proposed in this study is still applicable. However, for the identification of spatial assets, it is necessary to select an appropriate method based on the definition of old residential areas in foreign countries, data accuracy and type, etc.

However, the macro-scale measurements in this study require further validation and refinement at the micro scale to enhance the accuracy. In future research, expanding data sources and optimizing calculation methods will be essential. Improving the database structure for macro-scale spatial asset identification and value assessment, alongside conducting regeneration planning and funding estimates for individual communities at the micro level, can help create mutual validation between macro guidance and micro application.

In addition, economic interest-oriented urban regeneration will inevitably lead to gentrification and the displacement of low-income groups, which is also a trap that should be avoided in old communities. Therefore, even though the renovation methods proposed in this study have successful experience, in the practice of Guangzhou and other cities,

enterprises and governments should still fully consider the actual situation and immediate needs of community residents and carefully choose the renovation method. First, the renewal willingness of community residents should be fully respected. For example, in the tenancy operation model, residents should voluntarily choose whether to rent their homes to enterprises and choose the lease terms on the basis of equal negotiation to avoid high-premium housing being monopolized by enterprises, resulting in skyrocketing rents and losses of interests of original homeowners and tenants. Second, the payment ability of community residents should be fully considered. For example, in the asset excavation model and the neighborhood operation model, the use charges of the renovated facilities and services should be within the acceptable range of residents to avoid them moving away because they cannot afford the use fees. Furthermore, the government should carry out appropriate planning intervention and policy guidance. For example, public housing plays a large role in protecting the housing rights of low-income groups. Therefore, in the public housing sale model, some public housing should be retained based on comprehensive location conditions and the needs of residents in different communities, rather than all of them being renovated and sold.

4.2. Implementation Recommendations

This study highlights that a coordinated arrangement at the area level is key to the sustainable regeneration of old communities. However, challenges remain in managing scattered spatial assets and complex revenue relationships, which hinder the effective use of various assets and the coordination of project benefits. The Community Land Trust system, used in the U.S. and U.K. [72,73], offers a useful reference by entrusting third-party enterprises to oversee the reconstruction, operation and management of community assets. For Guangzhou, it is recommended to establish "coordinating implementation entities" and "coordinating fund accounts" at the sub-district level to enhance the asset value and balance costs and revenues through better asset management and capital flow (Figure 10).

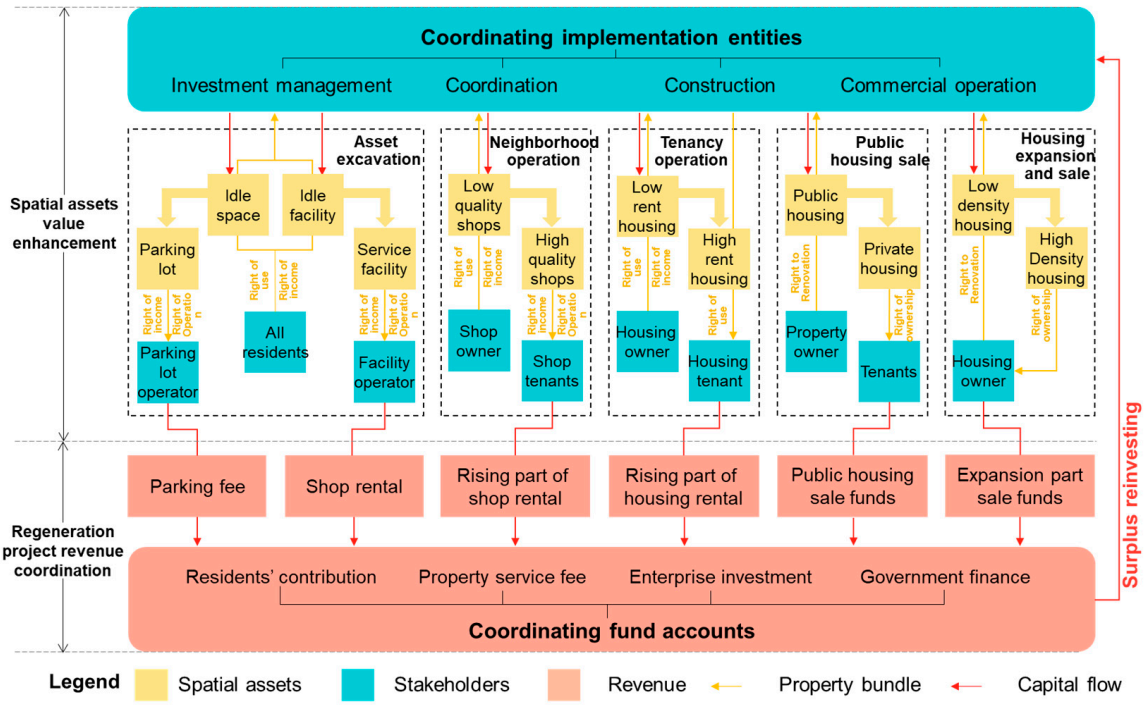

Figure 10. Recommendations for enhancing the value of spatial assets and coordinating benefits in the regeneration of old communities.

4.2.1. Coordinating Implementation Entities

We recommend improving the value of spatial assets by systematically allocating property rights bundles through coordinating implementation entities [74]. Currently, idle facilities and spaces in old communities are owned collectively by all residents, while shops and housing are privately owned and public housing belongs to the government or enterprises. This fragmented ownership complicates the coordinated use of these assets [75]. A professional implementation entity could integrate and manage these diverse property rights. These entities, which can cover one or more sub-districts, would involve companies with expertise in construction, management and commercial operations. They would be granted the rights to use, profit from and manage various spatial assets, leveraging their expertise to ensure the effective regeneration and sustainable operation of the communities.

4.2.2. Coordinating Fund Accounts

We recommend establishing coordinated fund accounts to streamline the capital flow of regeneration projects and achieve a surplus balance. Currently, various incomes—such as rents from commercial and residential properties, sales of public housing and revenue from property services—are managed by different entities, making it hard to reinvest these funds into regeneration efforts. To address this, the coordinating fund accounts, managed by the implementation entity and overseen by the government, would centralize the income from spatial assets, government funds and resident contributions. This ensures the necessary funding for regeneration projects and covers ongoing operational costs like facility maintenance, safety and community activities.

5. Conclusions

Roger Trancik, in his book *Finding Lost Space*, argues that lost spaces represent both challenges and opportunities [76]. Urban regeneration involves rediscovering these lost spaces and revitalizing them. The case of Guangzhou illustrates that many old communities contain such spaces. By aligning residents' needs with urban development opportunities, these spaces can significantly increase in economic value through enhanced property use.

This study treats passive and inefficient spaces in old residential areas as active spatial assets. It introduces specific methods for identifying, valuing and arranging these assets, applies them empirically in central Guangzhou and offers practical recommendations. These approaches can shift old community regeneration from relying solely on government investment to a market-driven model that attracts private participation. Practically, this study provides a reference for old community regeneration worldwide, transitioning from investment- and demand-oriented approaches to value-added, proactive and systematic strategies. Theoretically, it advances the field by integrating asset identification and value assessments into urban planning and design, moving from a focus on physical reconstruction to sustainable urban governance and operation.

Author Contributions: Conceptualization, X.Y. and Y.T. (Yan Tang); methodology, Y.T. (Yiming Tang) and L.Y.; software, X.Y. and Y.T. (Yiming Tang); validation, Y.T. (Yan Tang) and L.Y.; formal analysis, X.Y.; investigation, Y.T. (Yiming Tang) and Y.A.; resources, L.Y.; data curation, X.Y. and Y.T. (Yiming Tang); writing—original draft preparation, X.Y.; writing—review and editing, Y.T. (Yiming Tang) and Y.T. (Yan Tang); visualization, X.Y.; supervision, Y.T. (Yan Tang); project administration, Y.A.; funding acquisition, Y.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by China's National Key Research and Development Program by the Ministry of Science and Technology of the People's Republic of China, grant number 2022YFC3800301, "Research on the Micro-profit Sustainable Regeneration Model of Old Communities in Guangzhou" by the Guangzhou Urban Planning and Design Survey Research Institute Co., Ltd., grant number 2022 Research (Institute) 103, the School of Architecture, Tsinghua University—the China Construction Jiuhe Joint Research Center Fund, grant number 2024-A1, and the 2024–2025 Dissertation Scholarship from Peking University—the Lincoln Institute Center for Urban Development and Land Policy.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: Special thanks to the experts from the Urban Regeneration Project Construction Management Office of the Guangzhou Municipal Housing and Urban–Rural Development Bureau for careful guidance on the project.

Conflicts of Interest: Author Yiming Tang, Lei Yuan, Yongjun Ai were employed by the company Guangzhou Urban Planning and Design Survey Research Institute Co., Ltd. The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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