Discussion on the Comprehensive Utilization and Improvement Design Mechanism of High Plot Ratio Stock Land Resources

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Abstract: Against the backdrop of accelerated urban stock renewal, the development of high plot ratio land faces a deep contradiction between "quantity" and "quality": rigid constraints on plot ratio lead to physical barriers such as insufficient lighting, chaotic flow lines, and lack of public space, while the demand for quality living places higher demands on spatial openness, ecology, and social inclusiveness. This article focuses on this core game relationship, by analyzing design strategies such as underground space composite utilization, ecological compensation for rooftop gardens, and cross plot three-dimensional corridors, combined with ownership division coordination, full process cost control, and policy tool innovation, to construct a comprehensive improvement mechanism of "physical optimization ownership coordination economic balance", providing replicable design paradigms and decision-making references for improving the quality and efficiency of existing land in high-density urban development scenarios.
***Keywords*:** high plot ratio; existing land; urban renewal

1. Introduction

In the current context of sustained and deepening urbanization, the contradiction between supply and demand of urban land resources has become increasingly prominent, and the renewal of existing land has become the key to breaking through spatial development bottlenecks[1]. As the core support for high-density urban development, high plot ratio plots have significant implications for the synergistic improvement of land use efficiency and urban spatial quality through their development model. However, there is a deep contradiction between "quantity" and "quality" in current high plot ratio development, which includes physical problems such as lighting, transportation, and public spaces caused by plot ratio constraints, as well as new requirements from residents for upgrading their ecological, social, and other quality living needs. Therefore, how to solve the problems of physical limitations and interest coordination through innovative design strategies and full process coordination mechanisms, and achieve dual improvement of land value and spatial quality, has become a core issue in the field of urban stock renewal. This article will conduct a systematic exploration of this.

2. Breakthrough in the physical dimension of design strategy for high plot ratio land parcels

Breakthroughs can be achieved in the vertical and horizontal dimensions, as well as in the ecological innovation of building technology, for the existing high plot ratio plots in urban villages in Shenzhen. In terms of vertical dimension, underground space development can draw on the model of Shenzhen Qianhai Comprehensive Transportation Hub, integrating "commercial transportation municipal" functions, such as setting up subway transfers, commercial retail, parking facilities, and municipal pipe corridors, and introducing natural light through sunken plazas to improve enclosure; The collaborative utilization of rooftop gardens can refer to Beijing Qiaofufang Grassland, which reduces the heat island effect through large-scale rooftop greening, permeable paving, and vertical green walls, providing residents with a resting place. At the same time, the roof load-bearing design is optimized, and lightweight planting substrates and automated irrigation systems are used to reduce maintenance costs. In terms of horizontal dimension, the cross main road three-dimensional corridor system can solve the problem of traffic separation, such as building aerial or underground passages to connect scattered plots, forming a continuous pedestrian network, coordinating the interests of multiple parties, balancing interests through the "government led+owner co construction" model, and using BIM technology to achieve vertical connection between corridors and transportation hubs. In terms of lighting and ventilation optimization, the building form can adopt a setback layout to reduce shadow projection, and the facade design can be combined with parametric technology and ecological materials. The lighting coefficient can be quantitatively verified using relevant standards, and the ventilation path can be optimized through CFD simulation. The integration of facade greening and photovoltaic technology can be applied to enhance ecological benefits and achieve a dynamic balance between "high density" and "high quality".

3. Overall planning of the entire process design under complex ownership and approval conditions

3.1 Ownership division and interest coordination mechanism

The development of high plot ratio land involves multiple ownership entities such as the government, developers, owners, and public facility managers, and differences in interest demands have led to prominent contradictions in ownership division[3]. If cross plot corridor construction requires coordination of property rights boundaries among owners, underground space development involves municipal pipeline relocation and commercial operation rights allocation. To solve the problem, it is necessary to establish a collaborative mechanism of "government led+market participation+public supervision". The government has formulated regulations to clarify the ownership and profit distribution rules of shared facilities. For example, Guangzhou Tianhe CBD adopts the model of "public corridor ownership belongs to the government, and owners are rewarded with a plot ratio to share maintenance costs", achieving equal rights and responsibilities. The market introduces third-party operating agencies to coordinate mixed functions, using rental income to support the maintenance of public spaces. For example, the Qianhai Comprehensive Transportation Hub in Shenzhen is managed by a professional team for underground commerce, with 30% of the revenue used for corridor maintenance. Public supervision guarantees residents' right to know and participation through the community planner system. For example, the Xintiandi project in Shanghai organizes owner representatives to participate in the scheme review, transforming residents' needs into design constraints. Technically, using BIM technology to establish a three-dimensional model of ownership provides a visual basis for coordinating interests.

3.2 Optimization of approval process and innovation of policy tools

The traditional approval process is inefficient due to departmental division, and high plot ratio projects often experience delays in project completion due to delayed special reviews. The establishment of a "joint approval+capacity acceptance" mechanism can break the deadlock. The Beijing Urban Sub Center integrates 12 departments through a "multi regulation integration" collaborative platform, achieving synchronous review of plans and one-time feedback of opinions. The approval cycle has been compressed from 12 months to 4 months; Shanghai has implemented a "tolerance acceptance" system, allowing developers to submit construction drawings for review after the core requirements are complete, shortening the preparation time for construction. Policy tool innovation focuses on the dynamic regulation of plot ratio rewards and development intensity. The "white space" policy in Singapore allows developers to independently adjust land use functions and plot ratios while meeting the requirements of public space allocation; Shenzhen implements the policy of "rewarding plot ratio for underground space development" to promote the composite utilization of underground commercial and municipal facilities. In addition, establish a negative list system for approval, clarify prohibitive clauses for high plot ratio development, and reduce discretionary space.

4. Comprehensive improvement path from the perspective of design driving force

The development of high-density land plots requires comprehensive multidimensional improvements. First, transitioning from single-function layouts to mixed-use formats breaks through traditional zoning by integrating functions such as "commerce, office, residential, and public services", thereby enhancing land utilization efficiency and spatial vitality. Second, extending from physical spaces to social spaces strengthens a sense of belonging through public space configurations and embedded community services. Third, technological optimization and policy innovation must be coordinated to establish a full-cycle support system encompassing "design, approval, and operation." Technologically, parametric design tools simulate environmental factors; policy-wise, innovative tools like transferable floor area ratios are introduced, alongside cross-departmental platforms that consolidate data for synchronized scheme reviews and policy stacking applications. By validating policy feasibility through technology and feeding back policy insights to technological iterations, a virtuous cycle of "technology-policy" bidirectional drivers is formed, jointly advancing the high-quality development of high-density land plots.

5. Conclusion

This article focuses on the development of high plot ratio land and systematically explores the comprehensive improvement path of complex ownership, approval process, and design driving force. Research has shown that through ownership division and interest coordination mechanisms, optimization of approval processes, and innovation of policy tools, conflicts among multiple parties and administrative efficiency bottlenecks can be effectively resolved; The design strategy of transforming from a single function to a composite format, extending physical space to social space, and linking technological

optimization to policy innovation provides a practical framework for improving the comprehensive benefits of land parcels. Future research can further focus on the application of digital tools in dynamic ownership management, as well as the collaborative mechanism between policy innovation and market mechanisms, providing more adaptive theoretical support and practical guidance for high-density urban development.

References

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