

A Framework for Analysing Physical Form Outcomes of Value Capture Paths of Regeneration Projects in Residential Historic Areas

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Keywords

Value Capture, Physical Form, Residential Historic Area, Regeneration Project

Abstract

This study develops a framework to analyse the impact of value capture paths on physical form outcomes in residential historic area regeneration projects. The framework, using four independent variables: adjusting property rights, changing use, increasing intensity, and improving quality, and five dependent variables: plot form, building type, number of building floors, building density, and setback distance, is applied to the XIAOXIHU historic area in Nanjing, China. The findings reveal that the same planning control conditions can yield different spatial form outcomes, largely explained by value capture paths. The framework is informative for both planning and policy design.

1. Introduction

1.1 Regeneration Projects in Residential Historic Areas

The regeneration mode of residential historic areas can be broadly categorized into overall redevelopment and progressive regeneration (Ministry of Housing and Urban-Rural Development, 2021). The former is usually led by the government or developers, moving out all or most of the residents by means of expropriation, and carrying out shock-style overall demolition and construction; while the latter is implemented by a diversity of stakeholders, with property rights as the unit and the willing of the residents as the basis, and carrying out gradual regeneration. In recent years, with the increasing awareness of cultural conservation and property rights, "small-scale, progressive" has gradually become a positive guide for the regeneration of historic areas (WANG et al, 2023).

1.2 Regeneration Project as Systematic Social Practice

The conservation and regeneration of historic areas is a systematic social practice that involves regeneration policies, resource allocation, planning and design, construction, operation and maintenance, and community governance, etc (TANG, 2020). The "small-scale and progressive" regeneration model involves multiple interests and complex property relations. Literatures on this topic are scattered in the fields of planning, architecture, historic conservation, municipal government, economy, society, policy management and other disciplines, forming relatively independent knowledge accumulation from different perspectives. However, the working mechanism of spatial regeneration practice is not a simple combination of disciplinary knowledge, but rather a multi-sectoral, multi-actor game and collaborative behavior under the intervention of regulations and policies.

1.3 The Gap in Existing Literature

Most of the existing relevant results exist in the form of knowledge in various disciplines, explaining the mechanism of the interaction between non-physical factors and the physical environment from different academic perspectives. However, it is difficult to utilize the mechanism theory in the planning and designing practice of physical space by only revealing "the inner working mode of each element as well as the operation rules and principles of interconnection and interaction under certain conditions" (Tennekes et al, 2015). It has been pointed out that the role of complex social practices on space is centered on the issue of value capture paths. Therefore, it is necessary to follow the organizational path of practical work, integrate theoretical methods scattered in various disciplines, and establish the correlation between value capture paths and changes in the physical form.

1.4 Objective of This Study

This study intends to build a framework to analyze how the value capture path of residential historic area regeneration projects affects the physical form outcomes. Firstly, through the literature review, the analytical framework of Value Capture Paths and Physical Form of Regeneration Projects is established, and the hypothesis of correlation analysis is put forward; secondly, the research hypotheses are verified one by one through the study of 32 Regeneration Projects in the XIAOXIHU Block, Nanjing, the research hypotheses are verified one by one; thirdly, the roles of adjusting property rights, changing use, increasing intensity, and improving quality on the physical space are discussed; finally, the Implications for planning are discussed. Third, the role of adjusting property rights, changing use, increasing intensity, and improving quality on physical space are discussed; and finally, Implications for planning regulation and supporting policies are discussed.

2. Literature Review and Synthesis

2.1 Value Capture Paths of Regeneration Projects

Game theory, rent gap theory, and other theories have been trying to elucidate the financial equilibrium behind regeneration projects, and Zhao (2021) simplifies this financial equilibrium by summarising the value capture paths of urban regeneration into four categories: adjusting property rights, changing use, increasing intensity, and improving quality. (1) Adjusting property rights. For historical reasons, property in China is divided into two types: "property rights", which can be traded freely, and "limited property rights", which can only be used but cannot be traded freely. "Changing from "small property rights" to "large property rights" will bring additional premium. (2) Changing use, different uses of land bring different revenues and are priced differently in the market, and if the conversion is realised through planning, the corresponding progressive value can be derived from it; (3) Increasing intensity, through the increase in floor area ratio, from the additional floor area ratio to obtain the financing required for urban regeneration; (4) Enhancing quality, old properties often no longer reflect the appreciation of the land, if the quality is upgraded, the missing land value can be captured through property appreciation.

In reality, specific urban regeneration projects can be combinations of the above four paths. Planning and design is to maximise the difference in value of the assets before and after the

regeneration by choosing different combinations of schemes according to the specific conditions of the project, so as to create conditions for achieving financial balance of the regeneration project. Different choices will lead to completely different results after the regeneration.

2.2 Physical Form of Regeneration Projects

The classical urban morphology theory divides physical space into three hierarchies: streets, plots, and buildings (Conzen, 1960). Considering that the unit of this study is a regeneration project, the elements of the street level are not considered.

Indicators at the plot level are mainly referred to the study of Bobkova (2021), who suggest that plot form can be understood through three indicators: plot area, street frontage ratio, and compactness, of which the most crucial indicator is plot area. The geometric measure that captures the potential to host diverse strategies is simply plot area. Plots provide an essential link between the spatial and non-spatial parameters of cities, such as land-uses and property.

The indicators of the building hierarchy are mainly based on the study of Dong (2022), who, after analysing the building types in the XIAOXIHU Block over time, found five basic building types. Type A: courtyard houses from the Ming and Qing Dynasties (before 1912), Type B1: single-family house from the Republic of China era (1912-1949), Type B2: townhouses from the Republic of China era (1912-1949), Type C1: courtyard houses built in the 1950s-1960s (traditional layout), Type C2: courtyard houses built in the 1950s-1960s (modified layout).

In addition, three commonly used planning control indicators, namely number of floors, building density, and setback distance, are introduced in this study for the sake of interface with planning and design practice.

2.3 The Causal Relationship between Value Capture Paths and Physical Form Outcomes

According to above referenced studies, this study proposes a causal hypothesis between value capture paths and physical form outcomes. The hypothesis of association between independent and dependent variables is shown in Figure 1.

Dependent Independent	Plot form	Building type	Number of floors	Building density	Setback distance
Adjusting property rights					
Changing use					
Increasing intensity					
Improving quality					

Figure 1. The Framework for Analysing Physical Form Outcomes of Value Capture Paths

3. Case Study Location and Data

3.1 Case Study Location and Overview

The XIAOXIHU Block (DAYUFANG Lane Historic Area) is located in the southern historic district of Nanjing (Figure 1). In 2015, the Nanjing Municipal Bureau of Planning and Natural Resources, as the main body of planning and management, explored the conservation and regeneration strategy of the XIAOXIHU Block as a pilot project. In 2016, the People's Government of QINHUI District designated the district state-owned enterprise Nanjing Historic District Preservation and Construction Group Limited Liability Company (the "Historic Preservation Company") as the implementation body. In the same year, we undertook the planning and design work. The progressive regeneration changes in the XIAOXIHU Block are shown in Figures 3 and 4.



Figure 2. The XIAOXIHU Block in the southern historic district of Nanjing



Figure 3. The XIAOXIHU Block before Regeneration

Figure 4. The XIAOXIHU Block after Regeneration

The Detailed Construction Planning for Micro-Regeneration of XIAOXIHU Block (DAYUFANG Lane Historic Area), QINHUI District, Nanjing (hereinafter referred to as the Micro-Regeneration Plans) is the main planning basis for the progressive regeneration of the XIAOXIHU Block, and it has set up a two-level planning and control system for the different conservation and regeneration challenges of the streets, alleys, plots and buildings (Figure 5): the higher level is the 15 "Planning Control Units" surrounded by the red lines of the streets and alleys, specifying the basic control requirements; the lower level is the 127 "Micro-Regeneration Implementation Units" based on property plots, integrating the historic texture, property rights, and willingness to relocate., and the boundaries of the units and some of the control requirements can be dynamically adjusted during the process of implementation (Figure 6).

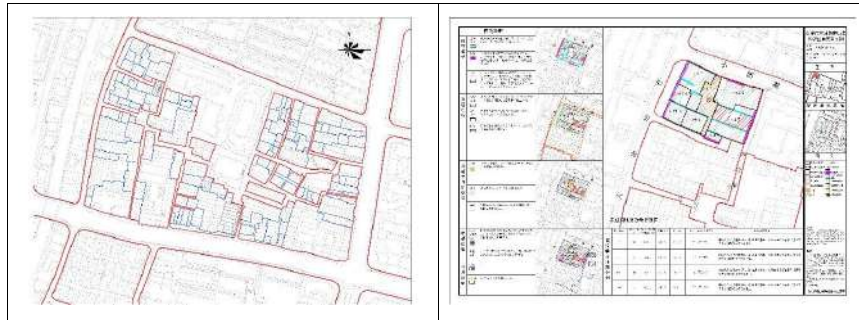


Figure 5. Two-level control unit

Figure 6. Micro-regeneration guidelines

The spatial distribution of the 32 regeneration projects in the XIAOXIHU Block is shown in Figure 7. By 2021, the first set of construction projects (P1-P17 in Figure 7) have been completed and put into use, and the main implementation contents include the regeneration of historic streets and infrastructure, the regeneration of courtyard buildings voluntarily vacated by the subject of property rights, and the regeneration of buildings to which the subject of property rights has moved back to their original locations. From 2021 to the present, led by the demonstration of the first phase of the regeneration, the subsequent projects (P18-P32 in Figure 7) will continue to be carried out.

The implementation of the regeneration projects follows the principle of "who finances, who benefits". The management agent coordinates the whole regeneration process, and according to the assessment of dangerous buildings, provides different proportions of subsidies to the owner of the property right who renews the building independently; the implementation agent acquires the building or participates in investing in part of the regeneration independently, provides public services, and obtains different degrees of balance through the sale and lease of space; the owner of the property right contributes to the regeneration of the real estate held by the owner and pays the land premium in accordance with the regulations, and obtains the benefits from the change of land price, the regeneration of the house, and the increase of the capacity of the building. capacity increase, etc.

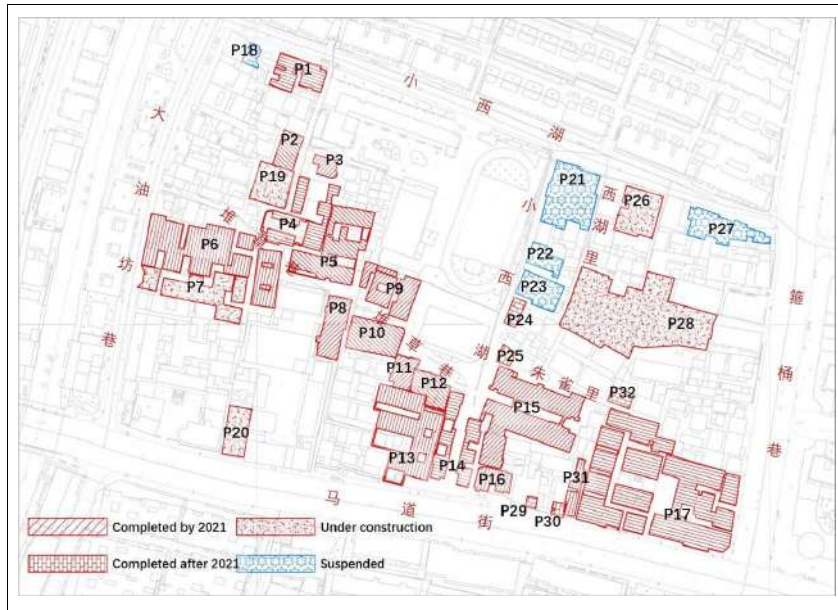


Figure 7. The 32 construction projects in the XIAOXIHU Block

3.2 Case Study Data

Through the interviews with the stakeholders and the analysis of the construction project drawings, the value capture paths and physical space changes of the 32 regeneration projects were obtained as shown in Table 1.

Table 1. Value Capture Paths and Physical Form Outcomes of 32 Regeneration Projects in the XIAOXIHU Block (Be=Before, Af=After, CU=Changing Use, II=Increasing Intensity, IQ=Improving Quality)

Projects and Value Capture Path		Plot Area/m ²		Building Type		Floors		Setback distance/m		Building density	
		Be	Af	Be	Af	Be	Af	Be	Af	Be	Af
P01	CU	3910	4090	D	D	3	3	1.3	1.9	0.65	0.67
P02	CU	191	197	A	A	1	1	0.0	0.0	0.79	0.96
P03	CU	151	151	B1	B1	1	1	0.0	0.0	0.92	0.92
P04	CU	787	787	C1&C2	C1&C2	1	1	0.0	0.0	0.54	0.28
P05	CU	881	875	C1&C2	C1&C2	2	1	0.0	0.0	0.84	0.64
P06	CU	1448	1557	A	A	2	2	0.0	0.0	0.88	0.73
P07	CU	734	865	E	E	1	2	2.2	2.7	0.91	0.93
P08	II+IQ	328	328	D	D	3	4	2.0	2.0	0.89	0.89

P09	CU+IQ	450	450	A	A	2	2	0.0	0.0	0.65	0.85
P10	IQ	389	389	A	A	1	1	0.0	0.0	0.60	0.60
P11	CU	171	171	C1&C2	C1&C2	2	2	0.0	0.0	0.70	0.64
P12	CU+IQ	238	252	C1&C2	C1&C2	2	2	0.0	0.0	0.72	0.75
P13	CU	696	781	A	A	1	1	3.4	3.4	0.67	0.68
P14	II+CU	1295	1295	C1&C2	C1&C2	1	2	6.8	8.3	0.37	0.54
P15	CU	1886	1886	D, C1&C2	D, C1&C2	5	4	0.0	0.0	0.50	0.50
P16	CU	185	175	C1&C2	C1&C2	2	2	6.7	7.1	0.81	0.48
P17	CU	3451	3451	A, E	A, E	3	3	2.6	2.6	0.60	0.60
P18	IQ	86	62	A	A	1	2	2.3	2.1	0.60	0.82
P19	II+IQ	345.6	345.6	C1&C2	C1&C2	1	2	0.0	0.0	0.80	0.88
P20	II+IQ	267	70.4	A	A	1	2	3.3	3.3	0.74	0.98
P21	IQ	673	673	A	A	2	2	0.0	0.5	0.79	0.73
P22	IQ	152	153	C1&C2	C1&C2	2	2	0.0	0.7	1.00	0.98
P23	IQ	316	270.5	A	A	2	2	0.0	0.2	0.93	0.82
P24	CU	83	83	C1&C2	C1&C2	1	1	0.0	0.0	0.84	0.85
P25	IQ	26.5	59	C1&C2	C1&C2	2	2	0.0	5.6	0.92	0.44
P26	CU	425	417	A	A	1	1	0.0	0.0	0.99	0.83
P27	IQ	596	400	C1&C2	C1&C2	2	3	0.0	0.0	0.81	0.77
P28	CU	1558	1680	C1&C2	C1&C2	1	2	0.0	0.0	0.82	0.30
P29	CU	39.7	39.7	C1&C2	C1&C2	2	2	4.3	4.3	0.92	0.92
P30	CU	32	35	C1&C2	C1&C2	2	2	2.7	1.7	1.00	1.00
P31	II+CU+IQ	192	186	A	A	1	2	2.7	3.5	0.72	0.73
P32	II+IQ	84.1	84.1	C1&C2	C1&C2	1	1	0.0	0.0	1.00	1.00

4. Results

4.1 How Adjusting Property Rights Affect Physical Form Outcomes

The impact of adjusting property rights on the physical space is mainly reflected in a significant increase in plot area. There are deeper reasons behind this phenomenon:

One is the loss of the rules and order of traditional urban tissues, which is strongly adjusted by planning control. As shown in Figure 8, the XIAOXIHU Block had 117 plots in 1936, and after the founding of the People's Republic of China (PRC), as the speed of urban housing construction could not meet the needs of the surging population, an original plot or even a building was sub-leased to a few to a dozen households. By 2016, 216 plots existed in The XIAOXIHU Block (Figure 9). Planning control (Figure 5) delineated 15 planning control units and 127 micro-regeneration implementation units, which directly led to an increase in plot area.

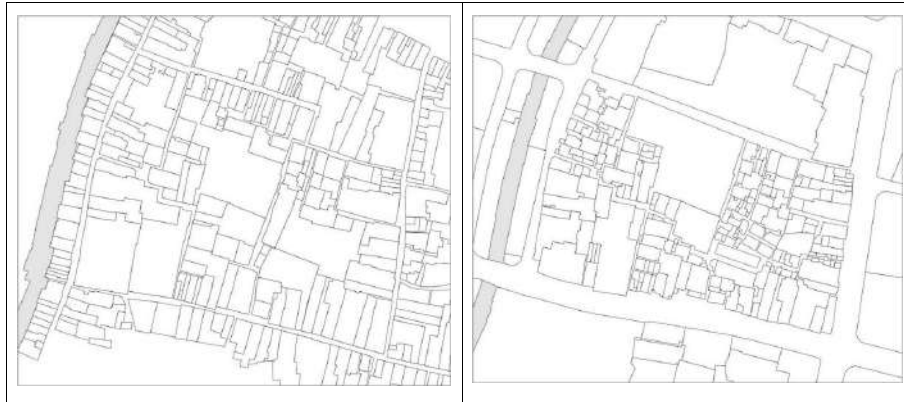


Figure 8. The 117 plots in the XIAOXIHU Block in 1936

Figure 9. The 216 plots in the XIAOXIHU Block in 2016

This trend is also exacerbated by the acquisition of houses by implementation agent with a background in state-owned enterprises, which are then converted and reused as a whole. A large number of projects in the XIAOXIHU Block have been undertaken by state-owned enterprises that acquire residential housing and lease it out for rent after overall regeneration. The need for market operation leads to the fact that the scattered and fragmented plots cannot be directly used by hotels, restaurants and other businesses, so the increase in plot area is an inevitable result of this implementation path. Typical projects such as P17, which originally had a number of plots (Figure 10), were later acquired and built as a hotel (Figure 11).



Figure 10. The several plots before regeneration

Figure 11. The HUAJIANTANG hotel after regeneration

4.2 How Changing Use Affect Physical Form Outcomes

Changing Use within the XIAOXIHU Block is mainly reflected in the change of residential use to commercial use or public use, and apart from the increase in plot area mentioned in section 4.1, another notable result in terms of physical form is the increase in the building setback distance. This result occurs in P01, P07, P14, P16, and P31, and the reasons behind it are equally twofold:

One lies in the fact that change of use projects is mainly implemented by state-owned enterprise, which are subject to stricter government regulation. With a dense residential population and high building density within the historic area, buildings are often connected to each other or have very little space between them, and as traditional buildings are mostly wooden structures, it is easy for fires to spread in patches in the event of a fire. For the XIAOXIHU Lot, which is over 300 meters wide in the east-west direction and about 200 meters wide in the north-south direction, the twisting and narrow internal alleyways must assume the function of fire escapes. These projects implemented by state-owned enterprise therefore need to give priority to setting back a sufficient distance to meet firefighting needs.

The second lies in the need for larger outdoor spaces for change of use for commercial purposes. These outdoor spaces are uniformly designed as green spaces (e.g., Project P11, Figure 12), shop fronts (e.g., Project P14, Figure 13), etc. to increase the popularity of retail and catering, thus indirectly bringing about an increase in the setback distance.

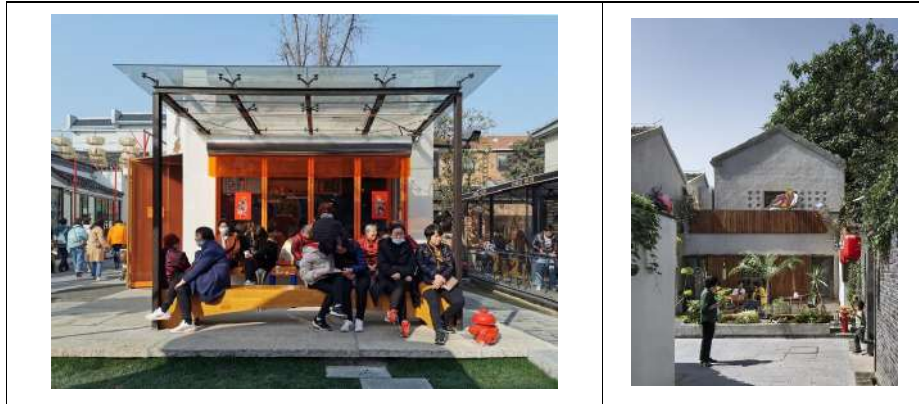


Figure 12. Green space outside the shops of the P14 in the XIAOXIHU Block

Figure 13. Seating outside the shops of the P11 project in the XIAOXIHU Block

4.3 How Increasing Intensity Affect Physical Form Outcomes

The morphological outcome of increased intensity is either increased height or increased density, but these two outcomes occur in two separate implementation scenarios.

Most of the projects with relatively simple property rights relationship and not affecting the sunlight conditions of other residents have adopted the way of increasing building height. Among P08, P18, P19, P20, P27, P28 and P31, the P27 is most typical. The project is adjacent to the street on the north side, which will not have any impact on the sunlight, ventilation and other conditions of the rear side, and therefore the way of increasing the height of the storey has been adopted directly. In addition, the ownership of the site is relatively simple, and there is no problem of not being able to increase the height due to divergent views of residents within the same plot.

On the other hand, projects with complex property rights, or with sensitive sunlight conditions in the surrounding plots, tend to adopt the approach of increasing density. Typical projects such as P20, the south brick house in the east-west courtyard is partly owned by government, in the north, an originally timber-framed three-bay old house housing three separate families (Figure 14). The original construction plan was to increase the capacity by adding more floors, but later, due to the objection of the residents on the north side of the site, the only way to increase the capacity was to slightly raise the ridge height and add mezzanine floors (Figure 15).



Figure 14. The several plots before regeneration

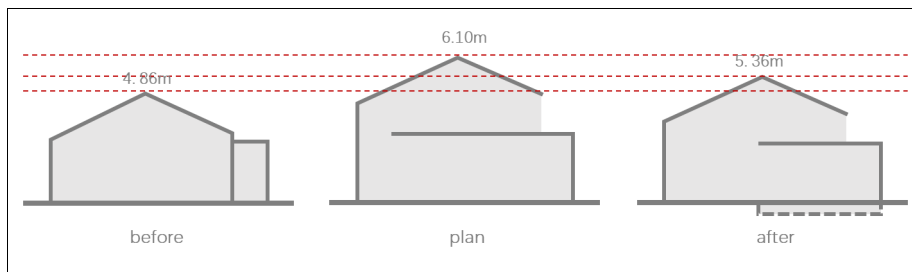


Figure 15. The HUAJIANTANG hotel after regeneration

4.4 How Improving Quality Affect Physical Form Outcomes

The effect of improving quality on the physical form is relatively indirect, with two outcomes: increased setback distances and reduced building density. Typical projects such as P21, P22, and P23, where state-owned enterprises plan to obtain funds through loans and vacate the property rights subject to be converted into high-end housing for sale, have a high demand for the quality of living environment. The project has changed from a mix of multi-family residents (Figure 16) to a mix of commercial and residential upscale housing (Figure 17), which is still in progress, and the setback spacing and building density of the upscale housing is significantly lower than before the update.



Figure 16. Mixed multi-family living before regeneration

Figure 17. Mixed commercial/residential high-end residences after regeneration (rendering)

5. Discussion and Conclusion

Despite the fact that the physical form of residential historic areas is strongly controlled by planning, significant effects of spatial value-added pathways on material forms can still be seen. Specifically, adjusting property rights will lead to an increase in the plot area, the change of use will lead to an increase in plot area and setback distance, increasing intensity will lead to an increase in the number of floors or building density, and increasing quality will lead to an increase in the setback distance and a decrease in the building density.

The value capture path does not determine the final physical form, but it does lead to certain morphological outcomes being more likely than others, which sheds new light on planning and design efforts and the design of regeneration policies. For planning design, it is important to carefully evaluate the morphological outcomes of planning control conditions (height, density, and floor area ratio) in order to protect the historic value of the historic area; for policy design, it is important to interact positively with planning design, which on the one hand enables the planning design objectives to be realized, and on the other hand avoids excessive policy dividends that lead to the upheaval of the historic form.

The value capture path - physical form outcome study in this research complements the single causal explanation of planning control - built form, which does not fully explain the particular direction of variation in physical form. This paper complements the institutional literature in planning and urban studies as it does not only focus on the interaction between stakeholders, but also examines the link between this interaction with physical form.

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