

SMART PLOT DIVISION

Research on the Morphological Evolution of Nanjing South
Historic Urban Area and its Plot Redivision since 1949



Peng Liu

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by
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Abstract

Chinese historic cities have experienced drastic transformations since the socialist revolution of 1949, in which an essential change is the reconstruction of the plot pattern. The historic plot pattern in a majority of Chinese cities was heavily damaged by constant urban renewals, while the renewed plot pattern lost its historically morphological identity. The transformation of plot pattern is directly influenced by plot division which serves as not only a planning apparatus but also a key link in the land development system. The damage of historic plot pattern has shown that the current plot division mechanism is not necessarily in favor of the conservation and continuation of historic cities. Under this background, this dissertation takes the first step to understand the special role of plot division in affecting the transformation of urban form in the historic urban area.

Based on the hypothesis that the plot serves as a mediator connecting urban morphology and land development system, this research establishes a plot-based morphological-institutional analytical framework, exploring the morphological evolution of Nanjing south historic urban area since 1949 and its plot redivision. The research is composed of four parts, including analysis of morphological evolution, institutional analysis of plot division, comparative research with Berlin and the strategy for the urban refurbishment.

Based on the typo-morphological theory, the analysis of morphological evolution is made at three different spatial levels including historic urban area, unit plot and plan-unit. The analysis shows that the elimination of traditional plot subdivision and the prevalence of megaplot schema is the prominent feature for the morphological evolution of Nanjing Old South area since 1949. The megaplot schema not only implies excessive plot scale but also represents excessive differences of building types and an increasingly alienated plot-building relationship. The renewed plot pattern in five typical plan-units has neither continued the historically morphological characteristics nor generated better urban space.

The institutional analysis of plot division focuses on three aspects including the conservation planning, the regulatory planning, and land development mode. The result shows that the plot pattern is for a long time neglected by the conservation planning system. The regulatory planning does not establish a mature standard of plot division and shows a deficiency in the morphological control on the unit plot. The historical institutionalist (HI) analysis of land development mode in Nanjing shows that the prevalence of megaplot is the result of the land development of growth supremacism.

The comparative research between Nanjing and Berlin shows that the development of Nanjing Old South area was for a long time in a fragmented way. Taking a reference on Berlin's Critical Reconstruction since the 1990s, a set of smart plot division strategy is finally proposed to promote the refurbishment of the historic urban area.

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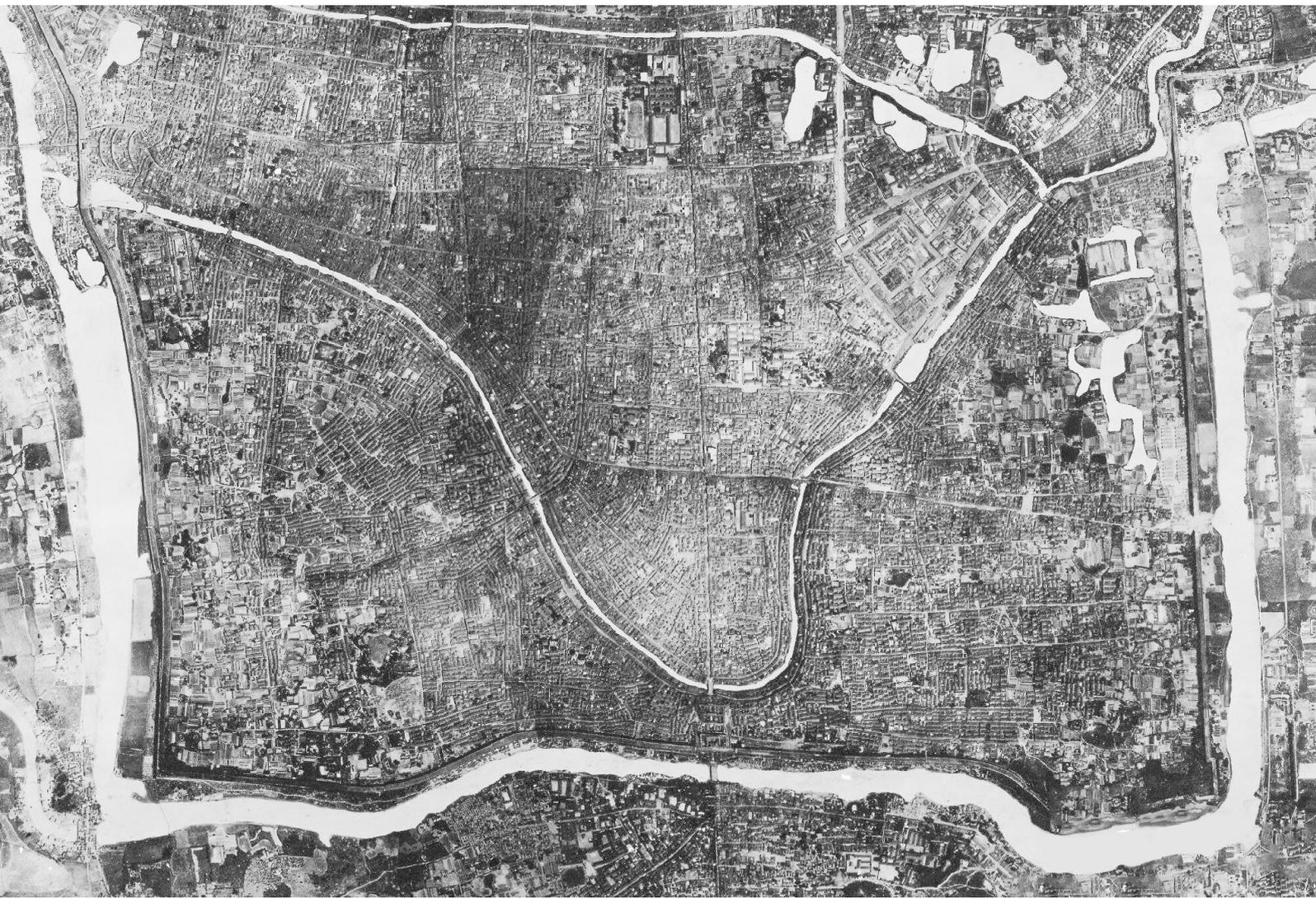


Fig. 1.1: Traditional urban fabric of Nanjing Old South area before 1949 [Source: weibo.com/jsmaps]



Fig. 1.2: Contemporary urban fabric of Nanjing Old South area in 2010 [Source: Google map]

1 Introduction

1.1 Research motivation and questions

1.1.1 The damage of historic plot pattern

This research stems from a constant observation of the damage of Chinese historic urban areas and an attempt of analyzing the transformation of Chinese cities with European planning theories. Chinese historic cities have experienced drastic transformation since the socialist revolution of 1949, leading to a fundamental change of urban form (Fig. 1.1, Fig. 1.2). There has been a large amount of research discussing the damage of traditional street pattern or building space¹, but few pay an attention to the transformation of the plot pattern.

Formed under the private land ownership, traditional Chinese cities were characterized by small plots and the plot subdivision they constitute. With the ever-changing urban development goals, planning system, and land development modes, the plot scale keeps increasing in constant urban renewals, consequently leading to the prevalence of megaplot in the historic urban area. This oversized plot as the basic parcellation of masterplans can vary between 5000m² and more than 10 hectares in historic urban areas. Its lack of architectural and spatial attributes makes it highly efficient for planning and land transaction².

However, the utilization of megaplot not only heavily damaged the historic plot pattern but also obstructed the continuation of historic characteristics in the renewed plot pattern. A series of cases show that the damage of the traditional plot pattern has been a common problem for Chinese histories cities:

Case 1: Luoyang started the urban renewal of the south part of its old city in 2011. The regulatory planning made a plot redivision on this 100ha area. The traditional plot pattern in Luoyang old city is based on small-scale plots. The plot shape is characterized by a small frontage and big depth. However, in the new plot pattern, traditional small plots were almost amalgamated into oversized plots (Fig. 1.3). In some cases, the whole block is designated as a single plot for land leasing.

Case 2: Beijing constructed the Financial Street area, a high-level business district in the western heartland of its old city since 2000. Through a complete demolition, the plot redivision was made on the 32ha central area, in which a majority of new plots are larger than 1ha (Fig. 1.4).

Case 3: The demolition of Nanjing Old South area reached the climax in 2008. Yanliao Fang area with an area of 8ha was totally demolished and amalgamated into a megaplot which would be redeveloped into a large-scale commercial complex. The new plot was the largest single plot leased in the historic urban area, about 133 times the area of a traditional plot which is only about 600m². Although the planning requirements

¹ Cf. Deng et al. (2016). 88-93.

² Cf. Lee. C. (2012).

claimed to make a strict control on the building form, the massive building volume finally forms a big contrast to the historic contexts (Fig. 1.5), which is largely an inevitable result of the construction based on the oversized plot. In fact, the land amalgamation of Yanliao Fang area is not a unique case. According to the statistics about plots leased from 2002 to 2015 in Nanjing Old South area, the average size of totally 15 plots achieved about 11500m², far beyond the acceptable range for a historic urban area³.



(1). Existing plot pattern of Luoyang old city in 2011



(2). Plot redivision of Luoyang old city by the regulatory planning

Fig. 1.3: Scheme for the plot redivision of Luoyang old city [Source: Planning Bureau, 2011]

³ Cf. Appendix.1.

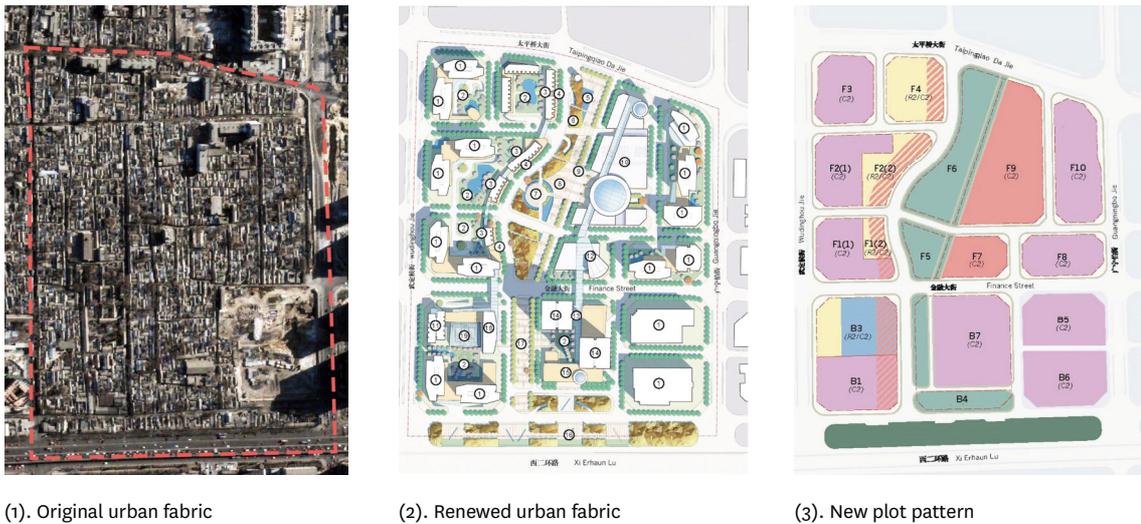


Fig. 1.4: Beijing Financial Street area created a totally new plot pattern [Source: SOM, 2002]



Traditional urban fabric

A megaplot formed after the demolition

Fig. 1.5: Great demolition of Yanliao Fang area in Nanjing old city [Source: Photos from Zhou, X and Zhang, W. (2010)]

The above three cases have shown that the conservation of plot pattern is largely neglected in current urban renewals of the old cities. Plot division is a significant tool in molding the urban form, but little research has discussed the relationship between plot division and the urban form. What are the standards of plot division in the old city? How could the megaplot like the case in Yanliao Fang area produced? What is the influence of oversized plots on the morphological transformation of the historic urban area?

The theoretical research and planning practices in Germany have brought my attention to the significant impact of plot division on the urban form. In China there is a common misunderstanding towards European cities that most European old cities are well preserved without large-scale renewal. In fact, some cities, especially German cities once heavily damaged by the Second World War experienced large-scale reconstruction. For example, a majority of Berlin inner city was reconstructed after the war, especially after the German reunification in 1990. However, most of these cities preserved the historic urban structure, through which new urban development could be integrated with historic urban form. Under this urban development

philosophy, plot pattern becomes a decisive morphological element. As long as the spatial framework composed of the street and the plot is preserved, the historic urban form could be essentially continued despite the renewal of buildings. Such kind of understanding towards the historic urban form is definitely a big contrast to the way of Chinese. Facing the contrast, I have deeper questions about the development of Chinese historic cities: How is the transformation of plot pattern in Chinese historic urban areas? Why is the morphological element plot pattern long neglected in the conservation and renewal of Chinese historic urban areas? Is it possible to introduce the German model of urban conservation into Chinese counterpart?

Urban renewal and urban heritage conservation have become my major research field since the master study. The long-term researches and practices make it clear to me that the research on Chinese urban form has to go deep into the plot level. Despite a quite different urban development history and urban planning system, I hold that the transformation of Chinese urban form is also greatly influenced by the plot division, though this influence is not yet clearly known to us. In this sense, I believe that the introduction of a plot based perspective will bring about a cognitive shift for both the research on Chinese urban form itself and the practical planning control.

1.1.2 Deficient planning control on the plot division

The transformation of plot pattern in historic cities is directly influenced by plot division. Plot division is not only the main element in constituting the urban space but also the foundation for establishing the Chinese regulatory planning. Through the plot based index system the regulatory planning takes control of the spatial form. The size and distribution of the plots indicate the typology of buildings that can reasonably participate in the build-out⁴. Thus, A rational and careful plot division, along with a set of regulatory guidelines is critical for the formation of good urban space.

Plot division is not only a tool of planning control on the urban form but also a key link in the land development. Chinese historic cities were formed under the private ownership, but the land nationalization since 1949 led to totally different land development modes. With the establishment of Land Use Right system in 1988 and the market economy in 1992, China reconstructed its land market. Facing the ever-changing land development system, plot division mechanism also experienced radical transformations.

However, current research pays little attention to plot division and its impact on the transformation of urban form. There are not any ordinance or standard of plot division specially made so far. The cases mentioned above are to a great extent the result of inappropriate plot division mechanism. The damage of historic urban form, especially the elimination of historic plot pattern has shown that the current plot division mechanism is not necessarily in favor of the conservation and continuation of historic cities.

Plot division is not left to chance, or determined by the particular market pressures of the moment, but is planned intelligently, deftly and judiciously as an integral part of the regulatory planning⁵. In this sense, it is necessary to detect the existing problems and mechanism of plot division. This dissertation takes the first step to understand the special role of plot division in affecting the transformation of urban form. Specifically,

⁴ Cf. Love and Crawford. (2011). 93.

⁵ Cf. Adams, D. et al. (2013).459-477.

the research aims to answer the question: How is the evolution of plot pattern in Chinese historic urban area since 1949 and what is the influence of plot division on the process?

1.1.3 Conservation and refurbishment of historic urban area

The concept of the historic urban area was first proposed by Washington Charter in 1987⁶, for the purpose of protecting areas embodying the value of traditional urban culture. Historic urban areas, large and small, include cities, towns and historic centers or quarters, together with their natural and man-made environments. It was officially accepted as an independent conservation level in Chinese urban conservation system in 2005⁷, which is regarded as a breakthrough that Chinese historic cities are stepping towards the overall conservation⁸.

In the Chinese context, most historic urban areas are designated based on the scope of the old cities formed before 1949⁹, ranging from 10km² to 20km² as a mesoscale conservation level between the historic city and the historic district (Tab. 1.1). Given the actual condition that most historic urban areas have been heavily damaged in the urban renewal in the last thirty years, urban refurbishment is considered increasingly urgent. Consequently, National Housing and Construction Department launched the Program of Ecological Rehabilitation and Urban Refurbishment in 2017¹⁰, in which historic urban area is the main focus for urban refurbishment.

The plot is long considered as the essential element in the conservation of European historic urban areas. The Washington Charter of 1987 proposed that the primary principle for the protection of historic urban area is to protect the urban pattern which is based on the plot and the street. In comparison, the plot is not an independent conservation element in Chinese conservation system. The distinctive plot subdivision is not taken as the basic morphological characteristics of the historic urban area worthy of conservation, revealing the deficiency of value recognition. Under this background, the research aims to discuss the plot-based development and control strategy for the historic urban areas. The dissertation tries to answer the question: How could a proper plot division strategy promote the conservation and refurbishment of historic urban areas?

⁶ ICOMOS. (1987). Charter for the conservation of historic towns and urban areas (Washington Charter).

⁷ Chinese Ministry of Construction. (2005). Code of conservation planning for historic cities.

⁸ Cf. Lin, L. (2016).94-101.

⁹ Cf. Zhang, S. (2012).5-11.

¹⁰ Chinese Ministry of Housing and Urban-Rural Development (MOHURD). Instruction on the Program of Ecological Rehabilitation and Urban Refurbishment. (2017). http://www.mohurd.gov.cn/wjfb/201703/t20170309_230930.html/ Accessed 2017-06-29.

Tab. 1.1: Major Chinese historic urban areas and the proportion of traditional cityscape

Historic Urban Area	Area	Year	Traditional cityscape	Proportion of traditional cityscape	Scope of historic urban area	Main contents of conservation
Nanjing" (Old South)	6.9	2010	100ha	15%	South part of the old city	Spatial scale, street pattern, and natural landscape
Guangzhou	20.39	2011	500ha	25%	Built area before 1949	City skyline, building height, historic axes and urban layout
Beijing	60	—	1800ha	30%	Old city	—
Suzhou	19.2	2013	610ha	33%	Old city, Shantang street and Shangtang street	Street and river pattern and scale, building height, landscape view corridor and building form
Jinan	16.03	2015	80ha	5%	Old city and commercial port	Historic cityscape and street pattern
Chengdu	13.44	2017	43ha	3%	Old city and moat	Urban layout, street pattern and landscape view corridor

Note: " The area of Nanjing old city is about 50km². The conservation plan of 2010 delimited three historic urban areas, in which the Old South is about 6.8km². [Source: Compiled by the author]

1.1.4 Summary of research questions

As a whole, four main research questions can be summarized as follow:

Question 1: Chinese historic cities have experienced drastic transformation since the socialist revolution of 1949. What is the morphological evolution of the plot pattern and its impact on the damage of the traditional urban form?

Question 2: What are the problems of the existing plot division mechanism and its impact on the transformation of the urban form?

Question 3: As Germany develops a quite different understanding and strategy of plot division, is it possible to introduce the German model of plot division into Chinese counterpart?

Question 4: As the morphological element plot pattern is long neglected in Chinese urban conservation system, how can a proper plot division strategy be established to promote the conservation and refurbishment of historic urban areas?

Based on these questions, this research takes the example of Nanjing south historic urban area and analyzes its morphological transformation since 1949 at two levels of the plot and the plot pattern. The concept of spatial modes is specifically established for the typological analysis of the plot, while the morphological analysis of the plot pattern is based on typical plan-units. On this basis, a reflection on the planning control of plot division is made, in which the effect of the conservation planning, regulatory planning, and the land development mode are given special attentions. Taking a reference on Berlin's Critical Reconstruction since

the 1990s, a set of Form-based Code is finally proposed, providing a standard of smart plot division in historic urban areas.

The research has four goals: (1). In terms of the conservation value, the research emphasizes the significance of the plot in the conservation of Chinese historic urban areas. (2). In terms of the methodology, the research proposes a plot-based morphological-institutional analytical framework to explain the morphological evolution of Chinese historic urban areas and its institutional root. (3). In terms of the comparative study, empirical researches between Nanjing (China) and Berlin (Germany) provides a new perspective for cross-cultural and cross-regional comparisons of urban morphology. (4). In terms of the practice, the research proposes a Form-based Code in order to promote the refurbishment of the damaged historic urban ground plan.

1.2 Research structure

This research contains 8 chapters (Fig. 1.6).

Chapter 1 is the research introduction, which consists of four parts. The first part proposes the research motivation and research questions. The second part introduces the research content and structure. The third parts introduces the key concepts and related literature. At last, the research methods are introduced, including the establishment of a morphological-institutional analytical framework.

Chapter 2 explores the overall transformation of Nanjing old city and Old South area. The first part discusses the formation of Nanjing old city before 1949; The second part analyzes the spatial transformation of Nanjing old city since 1949 based on the master plan; The third part zooms in on Old South area, focusing on the changing development orientations and the road system reconstruction. Consequently, a reflection on the effect of master plan on the renewal of Old South area is made.

Chapter 3 explores the types and transformation of spatial modes. Firstly the definition and classification of spatial modes is clarified. The following parts make a detailed introduction about the traditional spatial modes and all four contemporary types of spatial modes, including work-unit modes, residential modes, commercial modes and historic restoration modes. At last a summarization of the plot typology is made.

Chapter 4 explores the transformation of typical plan-units, including industrial plan-unit, residential plan-unit, modern commercial plan-unit, traditional plan-unit and historic conservation plan-unit. In addition, a morphological comparison of commercial centers is made between Nanjing, Berlin and Kyoto. At last a summarization is made that the transformation of plot pattern has led to the vanishing plot subdivision.

Chapter 5 makes an institutional analysis of the mechanism and problems of plot division. Firstly, analysis is made on the deficiency of conservation planning in protecting the historic plot pattern. Secondly, the effect of regulatory planning system on the plot division is discussed. On this basis, several typical Form-based Codes are introduced in order to reflect on the significance of form-based control. At last, the impact of land development modes on plot division is discussed. Above all, the prevalence of megaplot is a result of land development mode under growth supremacism.

Chapter 6 introduces the Critical Reconstruction of Berlin inner city since the 1990s in order to make a comparison with Nanjing case. The first part introduces the development orientation and the specific principle for urban refurbishment, "the Critical Reconstruction". Then three typical cases of urban refurbishment

are specially introduced, in which how plot redivision promotes the urban refurbishment is paid the special attention. At last, the institutional guarantee of the plot redivision is discussed.

Chapter 7 proposes the Form-based Code as the strategy for the refurbishment of the historic urban area. At first the new development mode and principles are proposed. Then the introduction about Form-based Code is made, which is composed of three levels including the refurbishment of street pattern, standard of smart plot division, and the control of building envelope. In addition, an improvement of plot division mechanism is also made.

Chapter 8 concludes the study, and reflects the significance of plot division on the research of urban morphology and the practice of urban refurbishment. The transferability of research method, contributions, limitations and future directions are also discussed.

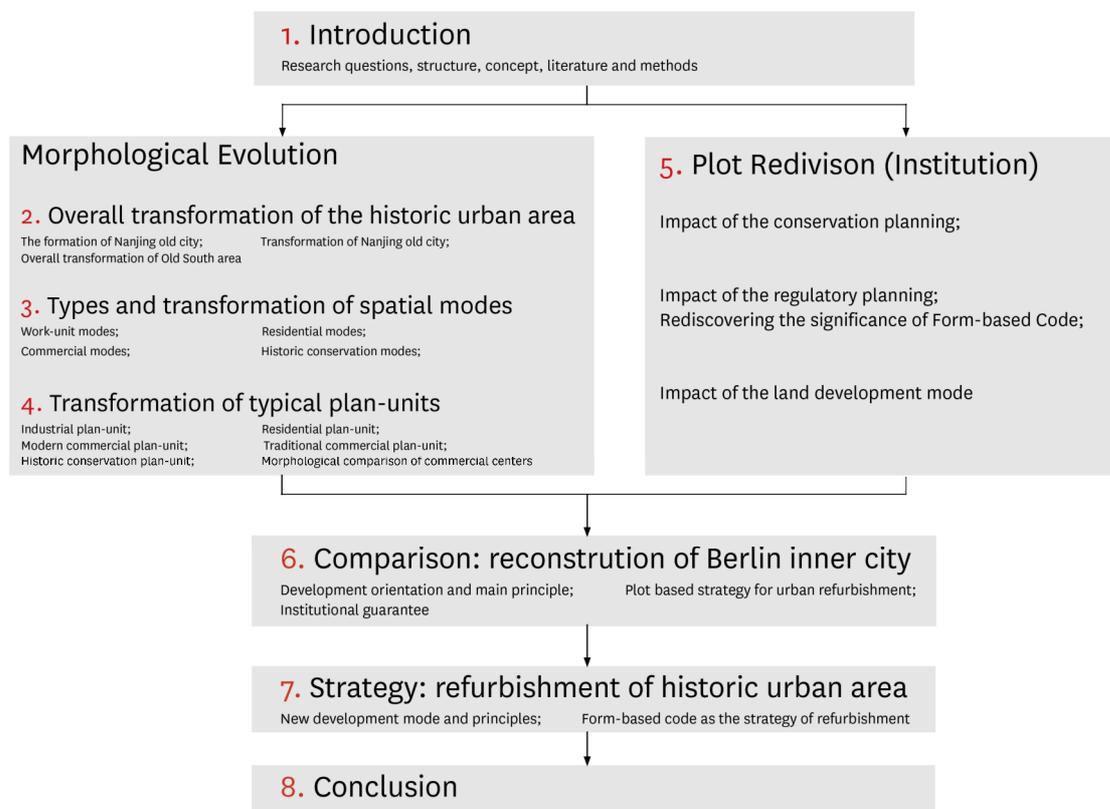


Fig. 1.6: Research structure

1.3 Research concepts and literature

1.3.1 Plot pattern and urban morphology

Urban morphology is the study of the form of human settlements and the process of their formation and transformation.¹¹ Form, resolution and time constitute the three fundamental components of urban morphological research. Above all, the smallest cell of the city is recognized as the combination of two elements: the individual plot of land, together with its buildings and open spaces. Attributes of the cell and its elements reflect not only a time period of history, but the socio-economic conditions present at the time of land development and building.

Originating from geographic studies in central Europe, urban morphology is a comprehensive products of several different perspectives. Above all, two schools have great influences, Conzenian school of urban morphology and Italian school of building typology. In 1996 the International Seminar on Urban Form (ISFU) was formalized by a group of urban morphologists from a variety of disciplines including architecture, geography, history and planning, which greatly promoted international exchanges and the construction of the field's theoretical basis¹².

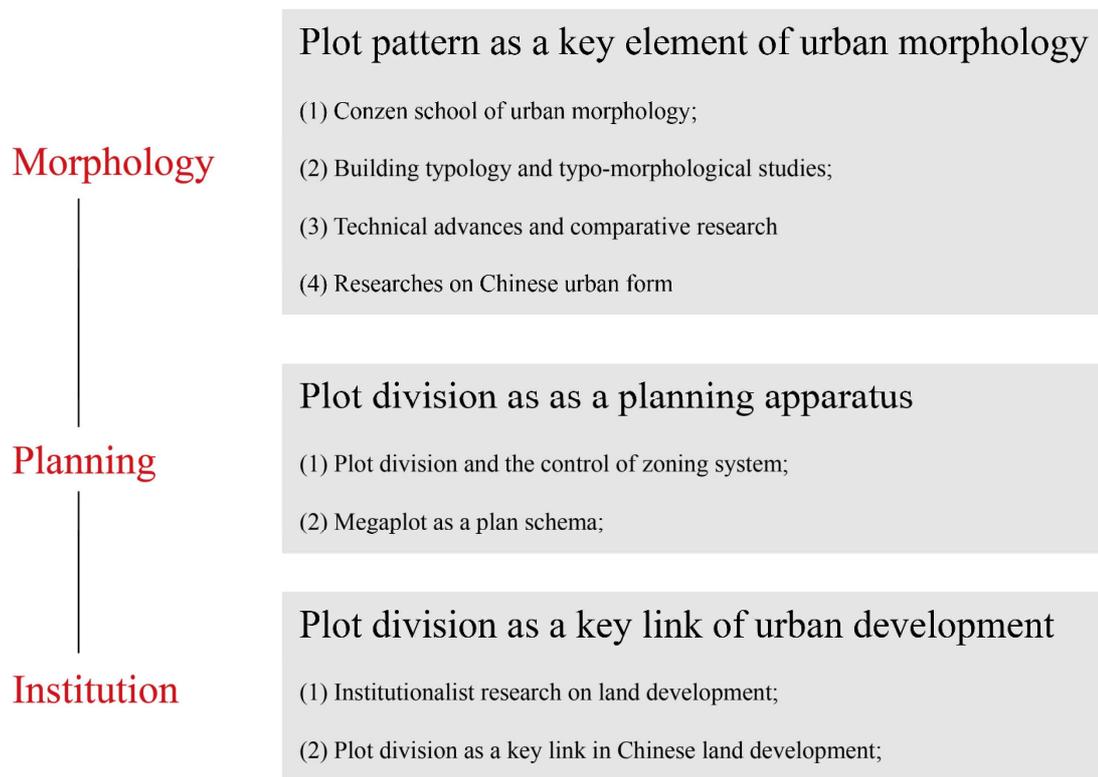


Fig. 1.7: Framework of literature research

¹¹ Wikipedia. Urban Morphology. (2017). https://en.wikipedia.org/wiki/Urban_morphology/Accessed 2017.02.25.

¹² Cf. Moudon, A. V. (1997).3-10.

(1). Conzen school of urban morphology

The Conzenian school of thought, founded by M.R.G. Conzen has attracted increased interest since the early 1980s. Based on the analysis of historic town plan, it focuses on the *process* of urban development at the medium-micro level. A *town plan* can be defined as the topographical arrangement of an urban built-up area in all its man-made features. It contains three distinct complexes of plan elements: street pattern, plot pattern and building footprints. The three element complexes enter into a *plan-unit*, individualized combinations in different areas of the town, which derives uniqueness from its site circumstances and establishes a measure of morphological homogeneity or unity in some or all respects over its area¹³.

Some most fruitful ideas of Cozenian school were developed in relation to the plot, which constituted a very detailed, micro-scale framework for analysis by the standards of British human geography (Fig. 1.8). Each plot is essentially a unity of land use. A row of plots, placed contiguously along the same street-line, each with its own frontage, forms a *plot series*. When considered separately from other elements of the town plan, the arrangement of contiguous plots may be called the *plot pattern*. The morphological characteristics of plot pattern include both the plot shape and the relationship between plots and the block plans of buildings¹⁴. Despite invisible, the plot pattern reflects the property of urban land, which is the important foundation in constituting the urban structure. In this sense, the evolution of property structure can be clarified through the analysis of the plot pattern transformation¹⁵.

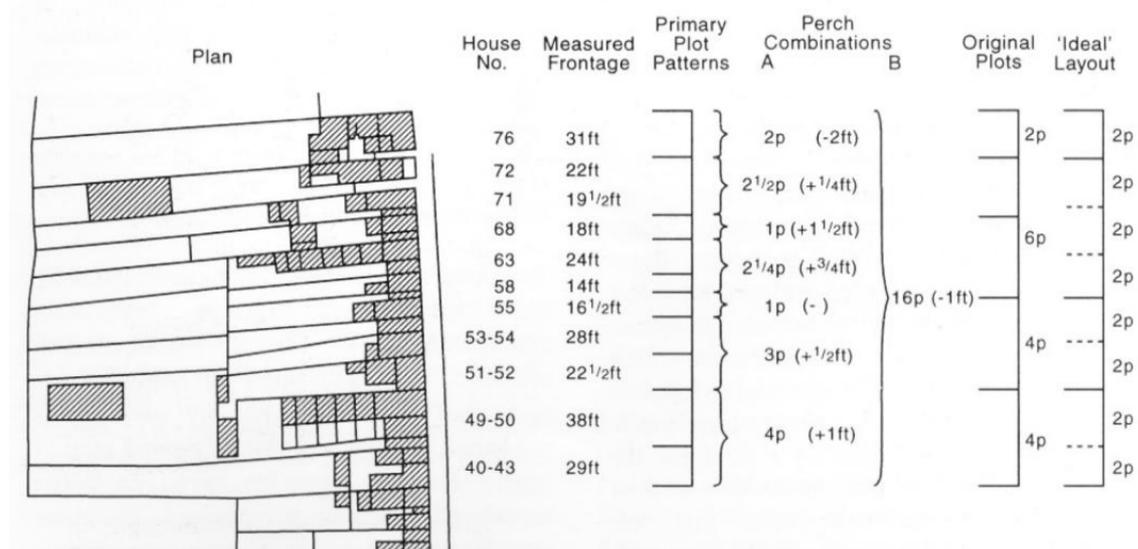


Fig. 1.8: Plot pattern is the core element in Cozenian school of urban morphology [Source: Adopted from Whitehand, J. W. R. (2001)]

(2). Building typology and typo-morphological studies

In Italy, the interpretation of urban form has mainly been pursued through an instrumental use of the concept of "type". The process typological approach to urban morphology is rooted principally in the work of the

¹³ Cf. Conzen, M. R. G. (1960).

¹⁴ Cf. Whitehand, J. W. R. (2001):103-109.

¹⁵ Cf. Stimmann, H. (2009).

Italian architect Saverio Muratori but is best represented by the work of the architect and urbanist Gianfranco Caniggia, who studied under Muratori¹⁶. The approach they developed seeks to inform their architectural and urban proposals with an understanding of the built environment by examining its detailed structure and the historical process of its formation. The forms found at the different levels are identified as types which are conceived as cultural entities rooted in, and specific to, the local process of cultural development¹⁷. However, Aldo Rossi (1982) firmly rejected the historical dimension of type, although his work largely promoted the diffusion of building typology.¹⁸ He held that type should be considered as a permanent, universal and static matter with the capacity to accommodate changing needs¹⁹.

Since the 1990s the typo-morphological studies has been established, seen as the integration of the two major schools of urban morphology and building typology. It describes urban form(morphology) based on detailed classifications of buildings and open spaces by type n(typology). The type here becomes a morphological model for the interpretation of the forms.²⁰ Above all, the element that links built spaces to open spaces is the plot, the basic cell of the urban fabric. What's more, the inclusion of land and its subdivisions as a constituent element of type makes land the link between the building scale and the city scale²¹. The researches of "plot typology" by Philippe Panerai further clarifies the mechanism how plot division molds the urban form²²(Fig. 1.9). Through empirical researches on the plot division in residential areas, the most common urban fabric in Europe cities, he explores different building densities and building types generated by various patterns of plot division²³.

¹⁶ Cf. Maretto, M. (2013).93-106.

¹⁷ Cf. Kropf, K. (2009).105-120.

¹⁸ Cf. Rossi, A. (1982).

¹⁹ Cf. Marzot, N. (2002).59-73.

²⁰ Cf. Gauthiez, B. (2004).71-89.

²¹ Cf. Moudon, A. V. (1994).289-311.

²² Cf. Wei, Y. (2009).115-118.

²³ Cf. Panerai, P. Mangin, D. (1999).

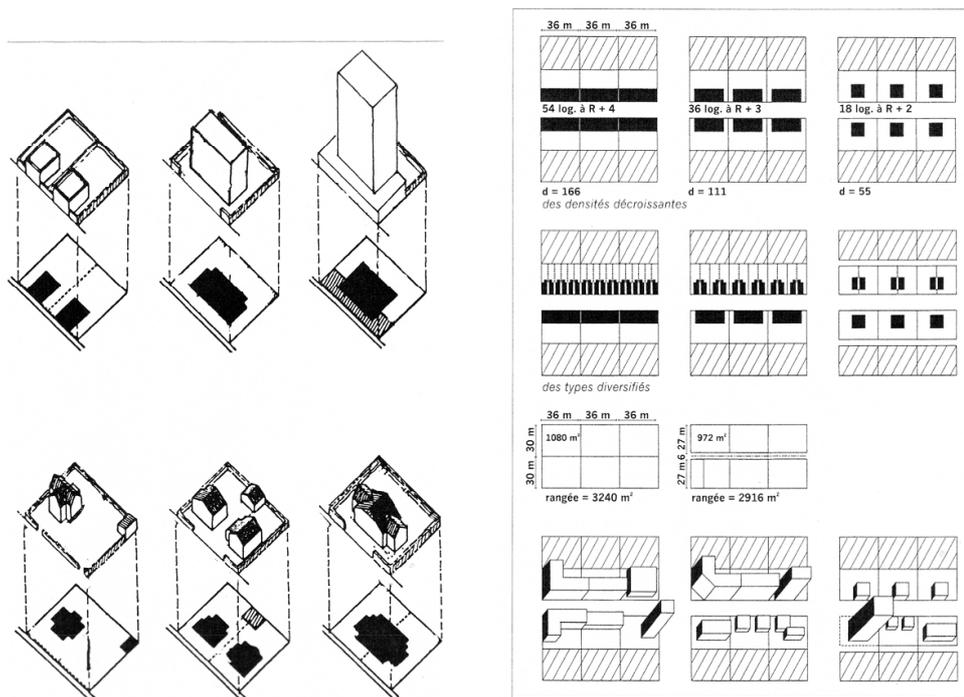


Fig. 1.9: The research of “plot typology” by Philippe Panerai [Source: Adopted from Panerai, P. and Mangin, D. (1999)]

(3). Technical advances and comparative research

In recent years, technical advances and comparative research have become the main trends concerning the development of urban morphology.

With the advances in GIS(Geographic Information System), the research focus of urban morphology transforms from the conventional studies of small historic towns to contemporary large urbanized regions, from urban conservation to plot-based urban management¹². Apart from the traditional advantages in incorporating new forms with old landscapes, urban morphology researches make more contributions to the creation of totally new urban landscapes²⁴. Many jurisdictions currently store their records at the level of the individual plot of land, thus allowing urban analysis at the very scale at which urban morphologists excel. As a result, these new “intelligent” maps enable regional analyses to be carried out with detailed data available at the plot level, or, conversely, plot-level analyses can be applied to an entire region.

Urban morphology faces the challenge of sharing boundaries of many kinds –disciplinary, linguistic and geographical; between the particular and the general; between West and East; and between research and practice. Nevertheless, some progresses are being made. Kropf(2014) tried to establish a common reference point for examination of the different aspects of urban form in a given case and comparative study of cases from different times and places²⁵. Gauthier and Gilliland(2006) proposes a straightforward scheme to identify, classify and interpret, or “map”, individual contributions to the study of urban form according to their respective theoretical or epistemological perspectives²⁶. In addition, a number of cross-cultural and cross-

²⁴ Cf. Whitehand, J. (2007).1-9.

²⁵ Cf. Kropf, K. (2014).41-57.

²⁶ Cf. Gauthier, P., Gilliland, J. (2006).41-50.

regional comparisons are being made, which include studies in parts of the world that have hitherto not featured prominently in urban morphological research, notably China, Latin America and Africa, using a conceptual framework and method largely developed in Europe and North America²⁷.

(4). Researches on Chinese urban form

For a long time narrative and other types of description are overwhelmingly predominant in researches on Chinese urban form. Despite some achievements made on researches at the regional and municipal level, the progress at the meso and micro level is very slow. Analytical and conceptual approaches, such as have been applied to good effect within parts of Europe, have been comparatively rare²⁸. Plot has become a basic analytical tool in researches of the urban morphology of European cities^[29], while quite few researches on Chinese urban form paid attention to it.

The concepts and methods of Conzenian school were gradually applied into Chinese morphological researches after 2000^{30,31,32}. In the early stage the focus was on the theoretical introduction, while empirical researches were limited. Only Liang and Sun (2007) made an empirical research on Chinese urban centers, exploring the morphological evolution of the block and the plot pattern for the first time³³. After 2010, a series of systematical and deep empirical researches of Chinese historic cities, mostly concentrating on Pingyao³⁴ and Guangzhou³⁵ were made, indicating the start of the plot-based morphological research in China.

The influence of distinctive Chinese institutional background, including the state land ownership, command economy, and work-unit system constitutes the most characteristic part in plot-based researches on Chinese urban form. Huang (2011) made an empirical research on the morphological transformation of Guangzhou old city under different land tenures, namely the private ownership, administrative land allocation and land marketization³⁶. Zhang and Ding (2018) examines the changing urban form of a commercial district of Nanjing in a planned economy³⁷. In addition, the prospect for the integration of urban morphology into urban conservation planning has been discussed, with the proposition of the strategy to establish urban landscape units in order to improve the conservation effect³⁸.

²⁷ Cf. Whitehand, J. (2012).55-65.

²⁸ Cf. Whitehand, J. W. R., Gu, K. (2006).337-355.

²⁹ Cf. Tian, Y., Gu, K., Tao, W. (2010).21-24.

³⁰ Cf. Duan, J., Qiu, G. (2008).34-42.

³¹ Cf. Zhang, L. (2010).90-95.

³² Cf. Duan, J., Qiu, G. (2010).24-28.

³³ Cf. Liang, J., Sun, H. (2007).

³⁴ Cf. Whitehand, J. W. R., Gu, K. (2007).91-109.

³⁵ Cf. Zhang, J. (2012).

³⁶ Cf. Huang, H., Lai, S. (2013).90-96.

³⁷ Cf. Zhang, L. Ding, W. (2018).15-34.

³⁸ Cf. Whitehand, J. W. R. et al. (2011).171-185.

1.3.2 Plot division as a planning apparatus

(1). Plot division and the control of zoning system

Plot division can be defined as the division of any improved or unimproved land for the purposes of sale, lease, or financing. In redevelopment area, the procedure of land redistribution is called plot redivision. The significance of plot subdivision is considered in four aspects: (1). to identify public versus private land; (2). to create portions of land (erven) which suit the purposes for which they are intended; (3). to establish a vehicle for implementation of policy or overall planning philosophy; and (4). to identify land which is unusable for settlement purposes either as a result of physical or topographic limitations³⁹. Adams, D (2013) holds that land subdivision should not left to chance, or determined by the particular market pressures of the moment, but should be planned intelligently, deftly and judiciously as an integral part of masterplanning and with the positive intent of generating place diversity. He further summarizes four common approaches to parcelization (Fig. 1.10), indicating how parcels can be defined by plots, streets, blocks or multi-blocks⁴⁰.

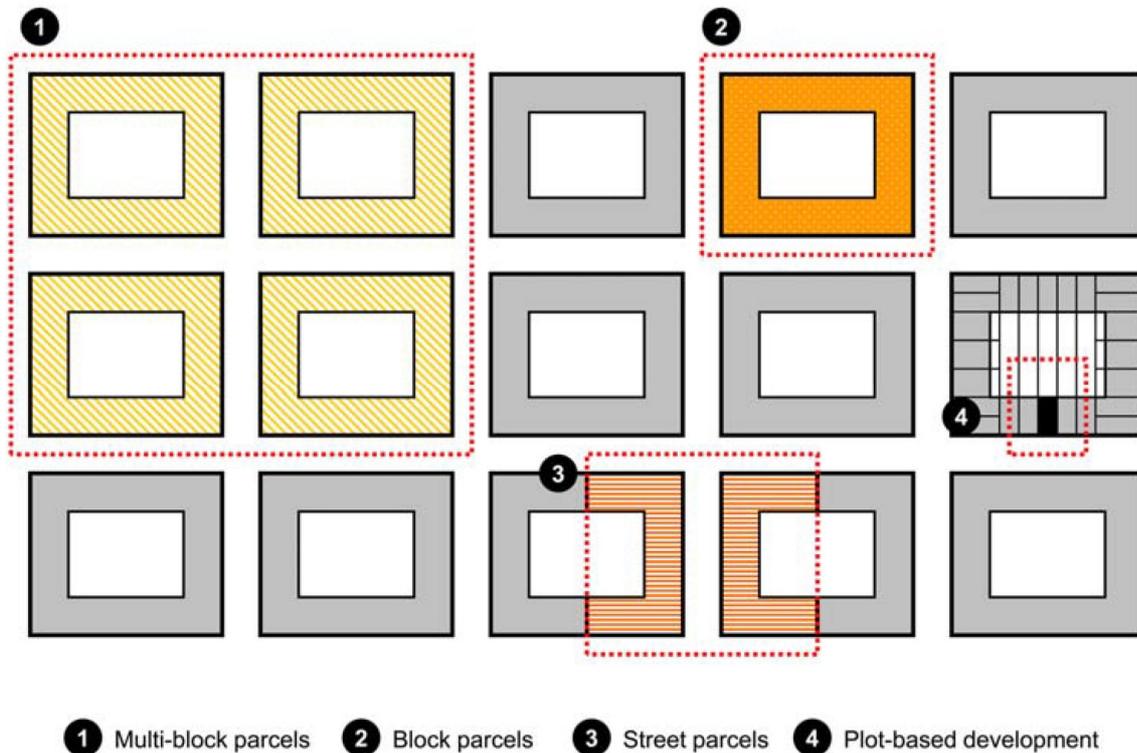


Fig. 1.10: Four approaches to land parcelization summarized by Adams, D. (2013) [Source: Adopted from Adams, D., Tiesdell, S. and White, J. (2013)]

In most countries, plot subdivision is strictly controlled by urban codings. In United States, plot subdivision is the core content of zoning system. The design of subdivisions is the responsibility of the local government of the community in which the land is situated. Standards for lot sizes, dimensions, and area to be found in the zoning ordinance, which differs in each zone. Taking the land type of “single family” as an example, the

³⁹ Cf. CSIR Building and Construction Technology. (2005).

⁴⁰ Cf. Adams, D. et al. (2013). 459-477.

ordinance establishes a minimum lot area permitted in these zones and frequently specifies the minimum lot measurements. The standards vary considerably; some cities still permit lot widths of 25 feet (7.6m) street frontage, but a width of 60 feet (18.2m) or more is accepted in most communities as the minimum, with a minimum lot area of 6000 square feet (557m²)⁴¹. There are many interests involved in the subdivision of land, including those of the original owner, the developer, the prospective buyer, and the city as a whole.

In Chinese context, plot subdivision is controlled by the regulatory planning system which is characterized by the hierarchical control and index system. Above all, the three-layer hierarchy of regulatory planning system is composed of *Plan and Management Unit* (at neighborhood level), block and plot⁴². At the planning level, current researches concerning the plot subdivision are almost from the perspective of urban design. Liang (2006) discussed the approaches how urban design can be integrated with the regulatory planning. The improvement principles of urban spatial structure are proposed, including reducing the plot area, improving road density, improving road accessibility, and centralized distribution of public space⁴³. Liu (2011) analyzed the misalignment between the plot subdivision and the planning scheme from the perspective of urban design⁴⁴. A majority of researches focus on the control indexes system and the institutional framework, while few researches have been made on issues like the proper plot scale for land development, the standardization of plot subdivision as well as its related control indexes, revealing a severe deficiency of regulatory planning in recognizing the significance of the plot.⁴⁵

(2). Megaplot as a plan schema

Historically, plots in urban areas tended to be small, which is seen in many of the early cities both in Asia and Europe. But there is a prolific use of megaplots and superblocks in modern East Asian cities, lending a coarseness of grain and insularity to urban area⁴⁶. Bucher (2016) focuses on the origins of large plots in Singapore as well as the building types generated from this development mode (Fig. 1.11). Megaplot based urban redevelopment produced internalized urban worlds, turning away from the surrounding urban context. This trend of introverted worlds became Singapore's urbanistic paradigm. Finally, it explores how "a policy of plots" could be deployed to contribute to a more diverse city while still accommodating contemporary needs⁴⁷.

As Koolhaas declared, the developmental model of Singapore is being implemented in cities across China⁴⁸. The developmental Chinese cities, relying on market speculation, require planning strategies and parameters with the least developmental restriction and political resistance to attract developers and financiers. At the heart of this strategy is the utilization of the megaplot. The urbanization of this megaplots result in the dissolution of the city as a legible artifact, bereft of its civic dimension and public sphere. In the hands

⁴¹ Cf. Eisner, S. et al. (1993).

⁴² Cf. Wei, D, Cheng, R (2009).45-50.

⁴³ Cf. Sun, H, Luan, B. (2006).93-97.

⁴⁴ Cf. Liu, D., Sun, X. (2012).144-148.

⁴⁵ Cf. Liang, J. (2000).40-42.

⁴⁶ Cf. Rowe, P. (2016).6-13.

⁴⁷ Cf. Bucher, L. (2016).

⁴⁸ Cf. Koolhaas, R. (1995).

of speculative developers, this sea of enclave urbanization does not constitute any idea of the city⁴⁹. In recent years, the neighborhood design guidelines in China have witnessed a change of moving away from superblock neighborhoods and creating a finer network of urban blocks and streets. Kan (2017) traces the circumstances that prompted this change and explores the opportunities and challenges for urban design. He claims that while modifications of the superblock are somewhat overdue, this current mode of organization should not be entirely abandoned.

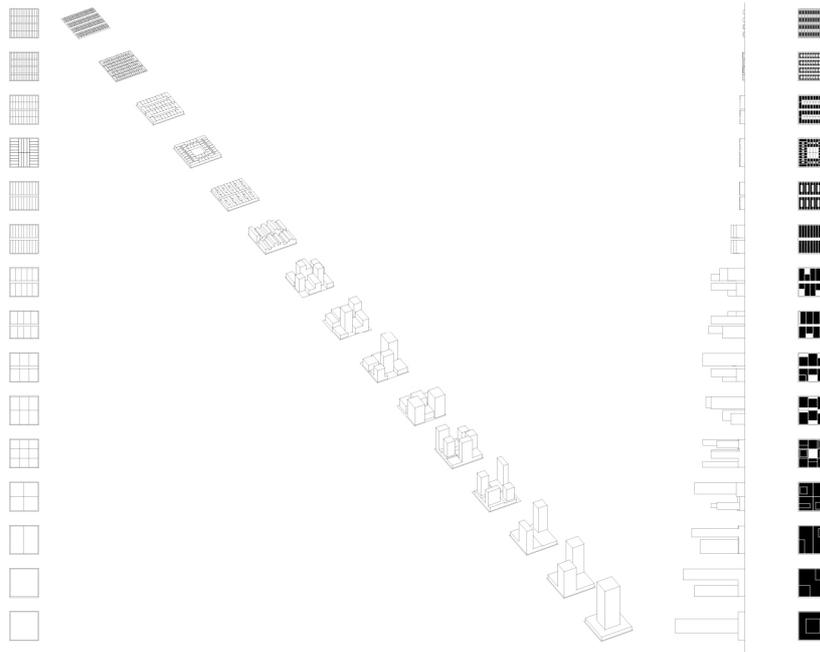


Fig. 1.11: Development of the building morphology by altering plot sizes [Source: Adopted from Bucher, L. (2016)]

1.3.3 Plot division, land development and institutionalism

(1). Institutional research on land development

Historical institutionalism (HI) is considered as a social science methodology focusing on the innovation, continuation and change of institution in different times. It includes two related but analytically distinct claims, the *critical junctures* and the developmental pathways (*path dependence and feedback mechanism*). The former involves arguments about crucial founding moments of institutional formation, while the latter suggests that institutions continue to evolve in response to changing environmental conditions and ongoing political maneuvering but in ways that are constrained by past trajectories. Recent work in planning studies has shown an increasing use and debate of HI concepts and methods. Sorensen (2015) outlines a historic institutionalist research agenda for planning history and proposes planning history relevant definitions including path dependence, critical junctures, and incremental change processes⁵⁰.

⁴⁹ Cf. Lee, C. (2012).

⁵⁰ Cf. Sorensen, A. (2015):17-38.

Institutional analysis is widely used in researches of land property and land development. Many researches have attempted to build conceptual models of the land development process. Ball .M (1998) holds that identifying institutional power and its consequences is the predominant approach to institutions within property research⁵¹. Guy, S, Henneberry, J. (2000) argues for the need to develop an understanding of property development processes which combines a sensitivity to the economic and social framing of development strategies with a fine-grain treatment of the locally contingent social responses of property actors.⁵²

Healey and Barrett (1990) proposed *Structure and Agency* institutional model to analyze the path dependence of how the state affects the land property and land development through policy making and resource distribution⁵³. The objective of this type of structure-agency analysis is to relate the agencies' roles, strategies and interests to the underlying structural resources, rules and ideas. Structure and agency approach is thought most successful when used in locally based studies⁵¹. Healey (1999) emphasizes its relevance to the practical task of responding to demands for a more place-conscious evolution in public policy⁵⁴.

Structure and agency model provides a new perspective and a useful tool for the analysis of the internal mechanism of Chinese urban space⁵⁵. Zhou (2009) for the first time introduces structure and agency model as the frontier theory, bringing new institutionalism into Chinese urban planning⁵⁶. Zhu (2007) proposed three theoretical points that this model particularly applicable to the study of Chinese urban land reforms. Firstly, it emphasizes the assessment on the effectiveness of the structure for urban land reform; Secondly, it indicates the importance of analyzing actors and their interactions in the land reform; Thirdly, the analysis of structure and agency should be conducted from a dynamic perspective⁵⁷.

(2). Plot division as a key link in Chinese land development

Plot division in Chinese cities is controlled by regulatory planning, but essentially it is a key link of the land development process. Thus plot division is remarkably affected by the land system. As existing researches that directly discuss the relationship between plot division and land development are limited, the institutional influence can be only extracted from relevant researches. Above all, researches in three aspects are given the most attention: land property system, land development modes and the planning control of land development.

Land property system is the core of land system. The reform of land property system which focuses on the separation of land ownership and the land use right is the key point of Chinese land system reform⁵⁸⁵⁹. Based

⁵¹ Cf. Ball, M. (1998).1501-1517.

⁵² Cf. Guy, S., Henneberry, J. (2000).2399-2416.

⁵³ Cf. Healey, P., Barrett, S. (1990).89-104.

⁵⁴ Cf. Healey, P (1999).111-121.

⁵⁵ Cf. Li, Q.(2008).13-19.

⁵⁶ Cf. Zhou, J., Liao, Y.(2009).56-62.

⁵⁷ Cf. Zhu, Q.(2007).219-233.

⁵⁸ Cf. Hong, S., Zhang,J.(2009).89-94.

⁵⁹ Zhang, J., Wu, F., Ma, C. (2008).Institutional transition and reconstruction of China's urban space: establishing a institutional analysis structure for spatial evolution. *City Planning Review*, 32 (6), 55-60.

on institutional economics, Xi (2003) analyzes the transformation of Chinese land property system and proposes the institutional immaturity in current transitional period⁶⁰. It has been suggested that an unambiguous definition of land property rights, guaranteed most effectively by private ownership, would provide efficient land use, rational investment behaviour, and sustainable economic growth. However, the Chinese experience has presented puzzling evidence that deviates significantly from the conventional theoretical expectation⁶¹. Empirical researches on the transformation of land property show that the government takes full advantage of the property ambiguity and the discretion in order to promote rapid urban growth⁶².

Chinese land development mode has experienced fundamental transformation since 1949 when China became a socialist state. Yeh, A and Wu, F (1996) examined how land developments have been organized in China since 1949 and summarized three main types according to their sequence of appearance: project-specific development (used since 1949), comprehensive development (used since 1978) and Land Use Right system (LURs) and real estate market (1987-present)⁶³. Under the LURs, land supply is a powerful tool for governmental intervention into land market, and proceeds from land supply greatly contribute to local revenue and financing of infrastructure construction. But some researches propose that land supply intervention is a two-edged sword in Chinese city development⁶⁴. As the current mode of land redevelopment pursues maximizing the land value, local residents lack the power of discourse in urban redevelopment and are almost excluded from the policy-making process⁶⁵.

The relationship between planning control and land development is another research hotspot. The establishment of regulatory planning system was a major institutional innovation for improving the control of land development. However, current planning system is notably characterized by path-dependent mechanisms which brings about difficulties in properly coping with land development⁶⁶. He (2009) explores the relationship between the regulatory planning and the planning conditions for land leasing, suggesting the introduction of planning consultation in connecting both aspects. Thus the regulatory planning and the planning conditions for land leasing can be bonded flexibly, better adapting to the ever-changing land market. Zhu (2011) emphasizes that the spatial structure of land is determined by the interest structure of land. Public participation will become a significant component for the making of regulatory planning, because the planning scheme is a product of interaction and readjustment between different interests. In recent years, some cities have gradually made reforms about the regulations of urban renewal⁶⁷. Above all, the Administrative Measures on Urban Renewal of Shenzhen enacted in 2009 for the first time established the concept “*Urban*

⁶⁰ Cf. Xi, D. (2003).

⁶¹ Cf. Lin, G. (2009).

⁶² Cf. Tian, L. (2008).

⁶³ Cf. Yeh, A., Wu, F. (1996).330-353.

⁶⁴ Cf. Tian, L. Ma, W. (2009).599-609.

⁶⁵ Cf. Huang, X. Cao, X. (2011).15-22.

⁶⁶ Cf. Sun, S., Xi, D. (2003).12-16.

⁶⁷ Cf. Tian, L. et al. (2015).22-28.

*Renewal Unit*⁶⁸, encouraging the self-led renewal of property owners. Shan (2012) holds that this reform indicates the partial transfer of land development right to property owners, through which the planning of *Urban Renewal Unit* can absorb more bottom-up decisions⁶⁸.

Consequently, several potential research issues concerning plot division are extracted from existing researches of above three aspects: (1). The ambiguity of land property system brings about a difficulty to the standardization of plot division; (2). Ever-changing land development modes inevitably brings about the transformation of plot division mechanism; (3). The lack of public participation in the planning control makes the government take an absolute control of the plot division. The plot division mechanism under this background may be less flexible in coping with the diversified conditions of land development.

It is clear through the review of literature that existing researches on the plot division in Chinese cities are still in the preliminary stage. Ambiguity remains in several issues, including the form and the mechanism of plot division and its influence on urban renewal. There still lacks a comprehensive research of plot division which combines perspectives from urban morphology, planning control and land development. Under this background, this research proposes the hypothesis that the plot functions as the mediator between the urban morphology and the land development system. The hypothesis is based on three main reasons: Firstly, the thorough change of urban form of Chinese cities since 1949 has obviously exceeded the intensity and dimension of that in European cities. Secondly, the combination of morphological analysis and the planning control can promote the research product of morphological evolution to be directly transformed into planning strategies. Thirdly, plot pattern is the core element of urban morphology; and plot division is both a significant apparatus of planning control and a key link of land development process. An analysis from above three aspects establishes a comprehensive theoretical framework for the research of plot division, also providing a new perspective for the research of Chinese urban morphology.

1.4 Research methods

1.4.1 Plot-based morphological-institutional analytical framework

Based on the hypothesis that the plot functions as the mediator between urban morphology and land development system, this research establishes a plot-based morphological-institutional analytical framework, aiming at providing a new perspective to interpret the transformation of Chinese historic urban area (Fig. 1.12).

Combining the morphological analysis and the institutional analysis, the backbone of the framework consists of three elements, including the plot pattern, unit plot and the plot division, which reflects the process how unit plots are redivided and controlled by a series of institutions and how they constitute a plot pattern under specific morphological rules. Plot division is the core of institutional analysis, which is notably influenced by regulatory planning, conservation planning and land development mode. Through the regulatory

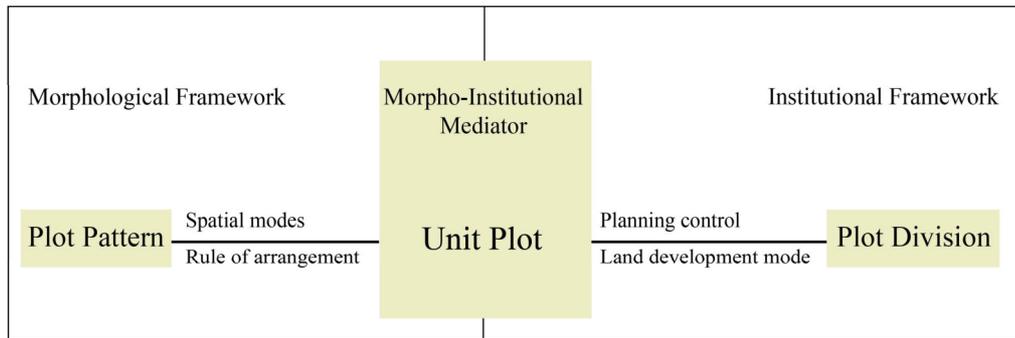
⁶⁸ Cf. Shan, H. (2013).79-84.

planning system, most requirements of land development and control are transformed into plot-based prescriptions. The morphological analysis contains two levels, including the unit plot and the plot pattern. Above all, different types of unit plots together with the buildings on them form a series of spatial modes. With specific arrangement rules, unit plots are combined into the plot pattern. The unit plot is on the one hand the basic control unit of regulatory planning, on the other hand the basic component of urban form. In this sense, it is through the unit plot that the morphological analysis and the institutional analysis is combined.

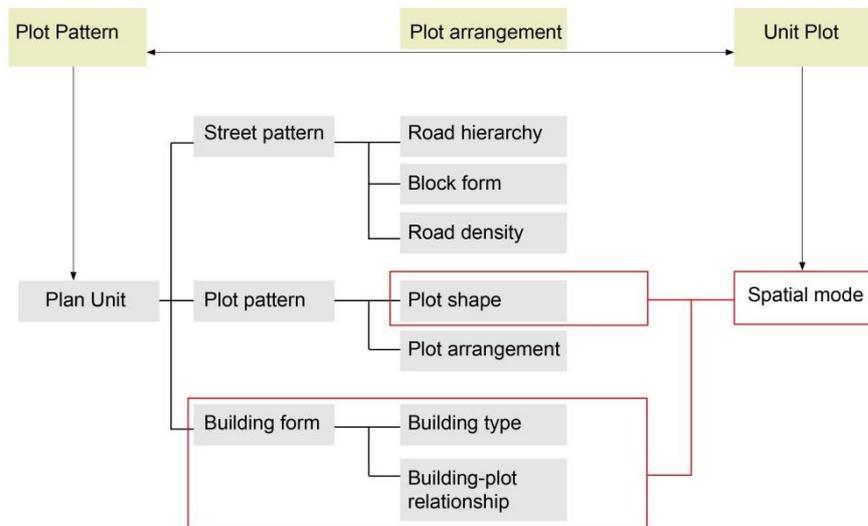
The morphological framework applying the typo-morphological theory, focuses on two major issues, the typology of plot shape and the morphological transformation of plot pattern (Tab.1.2). The analysis of plot shape is based on the concept spatial mode. It is the synthesis of a plot and buildings on it, which provides a morphological model based on unit plot. Obviously, the analysis of spatial mode has two major components, the plot shape and the building form. It is through the distribution and configuration of spatial modes that constitute the contemporary urban fabric of the historic urban area.

The morphological transformation of historic urban area is based on the theories of Conzen school. Primarily, the historic urban area is divided into several plan-units according to important boundaries (rivers and roads), morphological independence and integrity of each unit. As each plan-unit has major spatial modes, there are four types of plan-units including work-unit plan-unit, residential plan-unit, commercial plan-unit and historic conservation plan-unit.

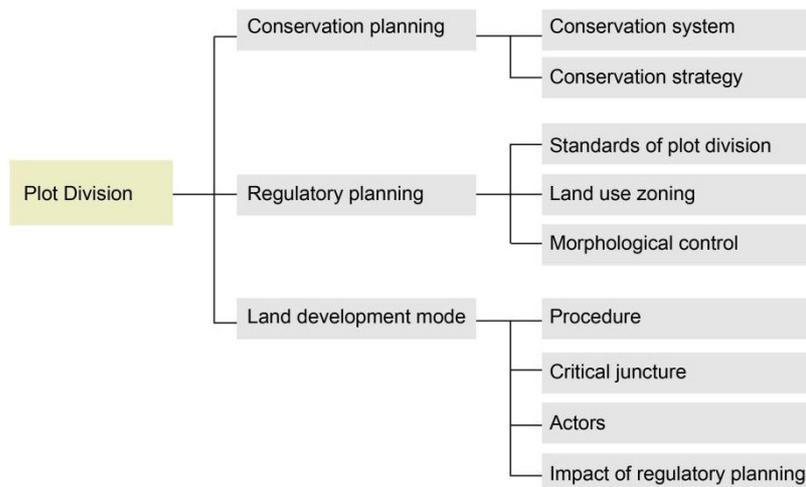
The morphological analysis of the plan-unit focuses on three major elements, street pattern, plot pattern and building form. Each element contains a series of subordinated elements and corresponding indexes. Above all, plot pattern is the most significant and distinctive element in this analytical framework. The analysis of plot pattern contains two subordinated elements, plot shape and plot arrangement. Plot shape is defined by three indexes, including plot type, proportion of different plot types and proportion of megaplot. The other key morphological element is the plot arrangement. Above all, an ordered plot arrangement is largely determined by the configuration of plot series.



(1) Plot-based morphological-institutional analytical framework



(2) Plot-based morphological analytical framework



(3) Plot-based institutional analytical framework

Fig. 1.12: Plot-based morphological-institutional analytical framework

Tab. 1.2: Morphological analytical framework

Primary elements	Secondary elements	Third elements	Indexes	
Plan-unit	Street pattern	Road hierarchy	<ul style="list-style-type: none"> ·Hierarchical structure/ Homogeneous structure ·Ways of road structure change: Continuation, Superimposition and Reconstruction ·Road width 	
		Block form	<ul style="list-style-type: none"> ·Average block size" ·Increase rate of average block size 	
		Road density	<ul style="list-style-type: none"> ·Road density" ·Decrease rate of road density 	
	Plot pattern	Plot shape	Plot shape	<ul style="list-style-type: none"> ·Plot type (plot size, plot frontage, ratio of plot depth to width ") ·Proportion of different plot types ·Proportion of Megaplot
			Plot arrangement	<ul style="list-style-type: none"> ·Plot series ·Plot division and public space ·Continuity of historic plot pattern ·Resilience of the plot pattern (mixed land use, flexibility of stage construction, and optimization of the land value)
		Building form	Building type	<ul style="list-style-type: none"> ·Building footprint ·Building height ·Building coverage rate ·FAR ·Continuity of historic spatial modes
			Building-plot relationship	<ul style="list-style-type: none"> ·Building setback, build-to line and (side) building interval ·Impact of regulatory planning and ancillary regulations

Note:

" Average block size can be calculated according the equation: $S_b = S_p / N_b$, where S_b is the average block size; S_p is the area of the plan-unit; N_b is the number of blocks in the plan-unit.

" Road density can be calculated according the equation: $D_R = L_R / S_p$, where D_R is the road density; L_R is the total road length of the plan-unit; S_p is the area of the plan-unit.

" Ratio of plot depth to width reflects the plot shape. For most traditional plots, the ratio is larger than 1, indicating that the plot is featured as small width and big depth.

" Plot shape element and building form element constitute the framework of spatial modes (areas in grey).

Source: compiled by the author

Tab. 1.3: Institutional analytical framework of plot division [Source: Compiled by the author]

Institutional design	Primary elements	Secondary elements
Conservation plan	Conservation system	<ul style="list-style-type: none"> ·Conservation elements and main focus ·The role of plot conservation
	Conservation strategy	<ul style="list-style-type: none"> ·Development stage of conservation system ·Conservation focus and the role of plot ·Conservation of plot pattern
Regulatory plan	Standards of plot division	<ul style="list-style-type: none"> ·Standards of plot division ·Practical way of plot division ·Effect of other regulations on plot division
	Land use zoning	<ul style="list-style-type: none"> ·Standard of land use classification ·Description of the form of plot pattern ·Encouragement of mixed land use
	Morphological control	<ul style="list-style-type: none"> ·Control system ·Control of building siting ·Control of building height ·Control of spatial modes
Land development mode	Procedure	<ul style="list-style-type: none"> ·Procedures and actors
	Critical juncture	<ul style="list-style-type: none"> ·Land tenure ·Mode of land allocation ·Mode of land development
	Actors	<ul style="list-style-type: none"> ·Initiators ·Participants ·Stakeholders
	Impact of regulatory planning	<ul style="list-style-type: none"> ·The level where regulatory planning can have impacts ·Principle of plot division ·Primary land development ·Contribution to the public welfare

Apart from the plot pattern, the analysis of other two elements, the street pattern and building form, are indispensable. The analysis of street pattern contains three key indexes, including the road hierarchy, block scale and road density. The analysis of building form contains the building type and the building-plot relationship. The key indexes of building form includes building footprint, building height, building coverage rate, FAR, and continuity of historic spatial modes. The analysis of building-plot relationship focuses on the building siting which is defined by three major indexes, including building setback, build-to line and building interval.

The institutional framework analyzes the influence of three relevant system including conservation planning, regulatory planning and land development mode on plot division (Tab. 1.3). Plot redivision refers to the procedure of land redistribution in redevelopment area, which is influenced by multiple institutions including given property system, land development mode as well as planning system.

The influence of conservation planning on plot division is mainly reflected on the statutory conservation system and the practical conservation strategy. Since the establishment in the 1980s, urban conservation system experienced frequent transformations and were characterized by stages with different conservation focuses. The analysis specially focuses on the role and transformation of plot conservation in the conservation system and the conservation strategy.

Regulatory planning is the planning tool directly controlling the plot division. Its institutional influence is mainly reflected on three aspects: standard-making of plot division, land use zoning and the plot-based morphological control. Above all, the main attention of analysis is put on the rationality of these control standards. It is through the regulatory planning that prescriptions and indexes are assigned to unit plots, which is understood as the process how the institution molds the urban morphology. In this sense, the influence of control standards on the urban morphology will also be discussed.

The transformation of land development modes and their different operation mechanisms have a remarkable influence on the plot division. Based on HI approaches, especially the Structure and Agency model, the analysis of land development mode mainly focuses on following factors: (1). *Critical junctures*, referring to those moments of major change when new institutions are established⁶⁹⁷⁰. In this research critical junctures includes the major reforms of land tenure, land allocation system and land development system, which directly promotes specific mechanisms of plot division. (2). *Actors*, including initiators, participants and stakeholders of plot division; A major theme in historical institutionalism is the way actors and their interests are constituted historically. (3). *Impact of planning*. The impact of planning differs greatly on different modes of plot division. Above all, the impact is evaluated by four indexes, including the links where regulatory planning has impacts, the standard-making of plot division, the impact on primary land development, and the contribution to the public welfare.

1.4.2 Empirical study: Nanjing South Historic Urban Area

Despite the different development trajectories and speciality of urban form, Chinese historic cities have considerable morphological and institutional similarities in terms of the plot division. In this circumstances, this research makes an empirical study of a typical Chinese historic city Nanjing.

The empirical research is made at three levels, the historic city, historic urban area and plan-unit. Nanjing historic city as the first level (Fig. 1.13) provides a macro spatial background for the evolution of the historic urban area. There are three reasons for the selection of Nanjing: (1). Nanjing is one of the most important Chinese historic cities. Known as one of the four famous Chinese ancient capitals, Nanjing owns a history of more than 2500 years and served as the capital city 10 times in Chinese history. The existing old city was built in 1366, as the capital of Ming dynasty. It covers an area of 43km², with currently more than 1.5 million population (data in 2010). (2). Nanjing old city has experienced radical urban renewals since the economic reform and boom in the 1990s. Its south part, known as Old South area, preserves quite proportion of traditional cityscape and was listed as the historic urban area in 2010. Meanwhile constant urban renewals have

⁶⁹ Cf. Collier, R., Collier, D. (2002).

⁷⁰ Cf. Capoccia et al. (2007).341-369.

also led to the change of urban form, which makes Old South area an appropriate object for morphological research. (3). Nanjing has developed relative matured land market and its land development system is typical among Chinese mega cities.

The second level is the historic urban area. South Historic Urban Area (Old South area) with an area of 6.8km², extends to Yundu River in the north, to Qinhuai River in the west and east and to Yingtian Road in the south. Relying on Qinhuai River, the Old South area was long in history the main civil life area and industrial and commercial center of Nanjing (Fig. 1.14). Since the end of 19th century, as the urban center moved to the north, Old South area became a traditional residential area. Since 1980s it faced increasingly large pressure of urban renewal, suffering demolition of traditional buildings, relocation of original residents and incompatible contemporary urban landscape. In 2010 it was listed as the historic urban area for the overall conservation.

The third level is the plan-unit. Considering both the historic urban form (based on the historic map of 1928) and the current situation, Old South area can be divided into 7 primary plan-units and 21 secondary plan-units (Fig. 1.15, Tab. 1.4). Above all, the research mainly focuses on four typical plan-units: work-unit plan-unit (e.g. Menxi industrial area), residential plan-unit (e.g. Chuanban alley), commercial plan-unit (e.g. Yanliao Fang) and historic conservation plan-unit (e.g. Confucius Temple and Mendong).



Fig. 1.13: Nanjing Old City (yellow) and the Old South area (red) [Source: Conservation Plan and Urban Design of Nanjing South Historic Urban Area (2012)]

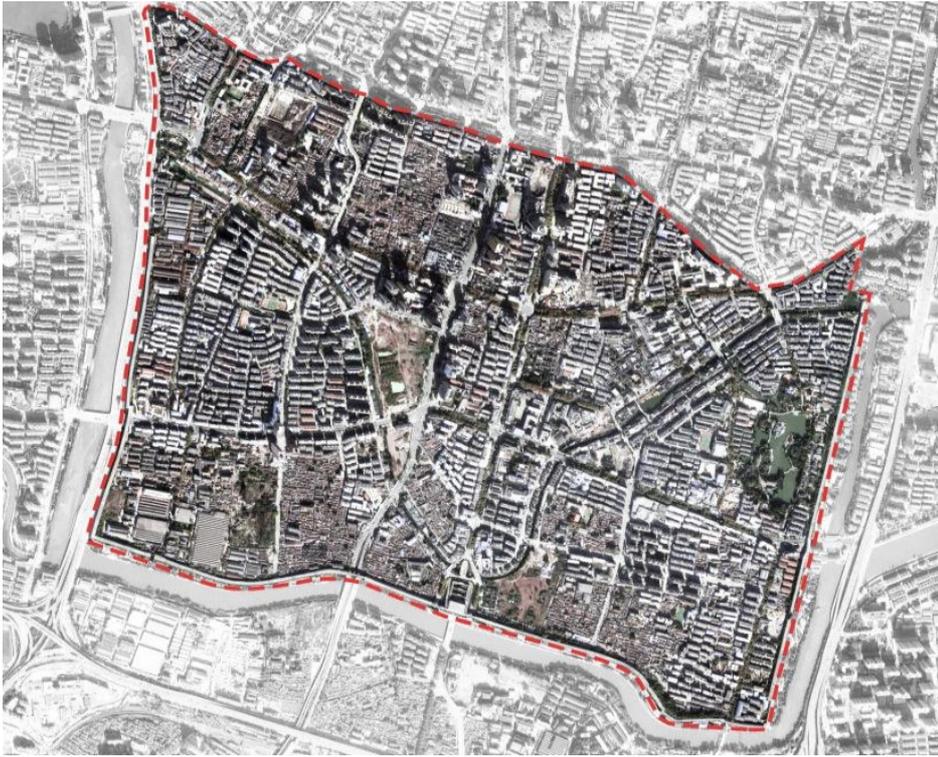


Fig. 1.14: Nanjing South Historic Urban Area (Situation in 2010) [Source: Google map]



Fig. 1.15: Plan-units of Nanjing South Historic Urban Area

Tab. 1.4: Classification of plan-units in Nanjing South Historic Urban Area [Source: Compiled by the author]

First level		Second level	
A	South-West Qinhuai River	A1	Menxi
		A2	Menxi vacant land
		A3	Chuanban Alley
		A4	Laifeng Street vacant land
B	South-East Qinhuai River	B1	Mendong
		B2	Mendong vacant land
		B3	Pipa Alley
		B4	Bailuzhou vacant land
C	South of Shengzhou Road	C1	Dabaihua Alley
		C2	Yanliao Fang
		C3	Xujia Alley
		D1	Changle Road
		D2	Confucius Temple
		D3	Diaoyu Alley
E	North of Jiankang Road	E1	Wangfu Yuan
		E2	Changbai Street
F	North of Shengzhou Road	F1	Nanbuting
		F2	Cang Alley
		F3	Zhimaying West

1.4.3 Comparative research

Based on the empirical research of Nanjing, a comparison with foreign cities is thought necessary. On the one hand, the specialty and universality of the morphological evolution of Chinese historic cities become more clearly through the comparison. On the other hand, as the development of Chinese land market is still in the preliminary stage, it is necessary to draw lessons from other paradigm cities both in theoretical and practical terms.

The comparison of planning strategy is made between Nanjing and Berlin. The Critical Reconstruction of Berlin inner city since the 1990s not only established the specific principle of urban development, but also conducted successful refurbishment of the damaged historic urban pattern. Above all, the plot played an essential role in the refurbishment strategy. In institutional terms, Berlin develops a relative mature mechanism, Land Reallocation to cope with the great challenges of land property readjustment since the land re-privatization in the 1990s.

In addition, a morphological comparison of commercial centers is made between Nanjing, Berlin and Kyoto. Kyoto as one of the most typical Asian ancient capital, has some similarities to Nanjing in terms of

the traditional urban form. In comparison, Berlin as a typical European city, has a quite different development track. But its urban refurbishment since the 1990s can provide lessons to Nanjing. Accordingly, the morphological comparison between three cities can be mutually complemented.

The comparison of urban coding is made between the function-based zoning system and the Form based Code. Chinese regulatory planning system is a typical function based zoning system, while German Bebauungsplan, American Form-based Code and French Plan Local d'Urbanisme emphasize the significance of the form in the planning control. The comparison shows the necessity of establishing Form based Code in the historic urban area.

It's important to note the difficulty of the cross-country comparison thanks to the cultural, institutional and social differences. There seems to be no direct comparability between China and European countries, as the former is characterized by state ownership and property ambiguity, while the latter develops mature land market under the private ownership. Nevertheless, strategical and morphological comparison can still promote the understanding about the renewal characteristics of Chinese historic cities.

1.4.4 Data collection and rectification

(1). Data collection

The research materials are collected at three levels, including the historic city, historic urban area and plan-unit. At the level of historic city, all previous Master Plan of Nanjing (1929,1983,1991,2001,and 2007), Conservation Plan of Nanjing (1984, 1992, 2002, 2009), yearbooks (1987-2014), local annals and national and local policies and regulations concerning land development and land management are collected. At the level of historic urban area, Conservation Plan and Urban Design of Nanjing South Historic Urban Area (2012), Master plan of Qinhuai District (2013), and Regulatory Planning of Qinhuai District (2012) are collected. At the level of plan-unit, main research materials include conservation plans of important historic districts, historic cadastral map (1933), and contemporary topographic maps and land use maps.

There exists great difficulty in collecting data concerning the current urban form of Chinese cities. On the one hand, town plans made before 1949 were severely insufficient. Due to the difference of cartography in ancient China, there lacks accurate and measurable historic town plans for most Chinese historic cities. In Europe, the scientific study of urban forms could not have developed without the elaboration and diffusion of reliable topographical maps and plans from the eighteenth century onward²⁰. In comparison, the accurate mapping of Chinese cities was not made until the 20th centuries.

On the other hand, data concerning land development and urban planning are treated as the state secret under Chinese administrative system since 1949 and could not be published. Moreover, these data often belong to different governmental sectors, especially the Land and Resource bureau and the Planning bureau, bringing about much difficulty for academic researches. In addition, some governmental data even lack reliability. For example, the plot pattern extracted from the land use map does not necessarily match the practical land property distribution, indicating that it is impossible to conduct the research just relying on single governmental data without any verification or rectification. Consequently, all these difficulties greatly restricts the choice of cities for research, limiting it in practice to a small minority²⁸.

As the lack of ready-made town plans, the basic data of urban morphology can be only extracted from other available maps:

- (1). Data of street pattern are extracted from city maps of 1928, 1990 and 2005.
- (2). Data of historic plot pattern are extracted from the cadastral map made in 1933⁷¹. Data of land development from 1949 to 1980 mainly come from yearbooks and local annals, as few graphical resources of that period are accessible. Data of plot pattern since 1990 are extracted from land use maps made in the regulatory plan⁷².
- (3). Data of building footprint are extracted from topographic map of 2005, google maps from 2005 to 2015, and some detailed plannings.

(2). Data rectification and re-mapping approach

One major object of data rectification is to unify the cartographic standard of historic town plans of different times so that a quantitative analysis of morphological evolution can be realized. This research adopts a re-mapping approach to translate traditional Chinese urban maps into modern measurable plans (Fig. 1.16). Dong (2009) discussed the traditional Chinese urban mapping theory, which is characterized by the extraction of key spatial elements, including mountain, river, street, landmark and topography from physical space and a reinterpretation of topological relation. It is quite different from the principle of European Cartography which emphasizes the accurate reproduction. In this sense, he considers the re-mapping approach as a necessity in obtaining the measurable Chinese historic maps which meet contemporary mapping standards⁷³.

The main task of re-mapping approach is to establish a corresponding relationship of spatial information of different times. Wang (2009) proposed main procedures of this approach, including the division of historical period, selection of historic data, extraction and classification of historic information, spatial orientation of historic information, overlapping analysis of historic information and the rectification of spatial orientation⁷⁴.

Spatial orientation, consisting of three operating steps, is thought as the most essential but difficult section of the re-mapping approach. First, the land use map made in 2012 is selected as the base map. Second, spatial anchor points are selected and located on the base map. Spatial anchor points refer to those entities which remain their spatial location unchanged through times and can be seen as dots in the map so that they can be taken as the reference for spatial rectification. Typical spatial anchor points include bridges, city gates, building monuments, and intersection of historic streets. Third, other historic information can be located according to their topological relationship with spatial anchor points. This procedure of operations can be realized with “Georeferencing” function in GIS platform.

⁷¹ The cadastral map is made in 1933 and was used to 1949, after China became a socialist state. It is an important graphical document depicting the traditional urban morphology under private land ownership. The source of electronic maps is from the website of Academia Sinica: http://webgis.sinica.edu.tw/map_moi/default.asp.

⁷² As the regulatory planning of Nanjing old city required that the land use map should be in accordance with the existing land property, the land use map can generally substitute the cadastral map which is impossible to be gotten from the Land and Resource bureau. Even so, collation and rectification of some plot boundaries are imperative.

⁷³ Cf. Dong, W. (2009).29-34.

⁷⁴ Cf. Wang, S. (2010).

Based on the re-produced historic maps, large amount of historic information related to the morphological evolution can be further transformed from text into graphical information and added into the GIS database of historic maps so that morphological information of different times can be constantly enriched.

It's important to note that the reproduced historic maps are only relatively accurate as most old Chinese maps inevitably remain errors because of the measurement accuracy, and some of the spatial orientation are based on experiential speculation. With the enrichment of archaeological and historic research achievements, the spatial orientation of historic information can be continually rectified and refined, which is definitely a long term work.

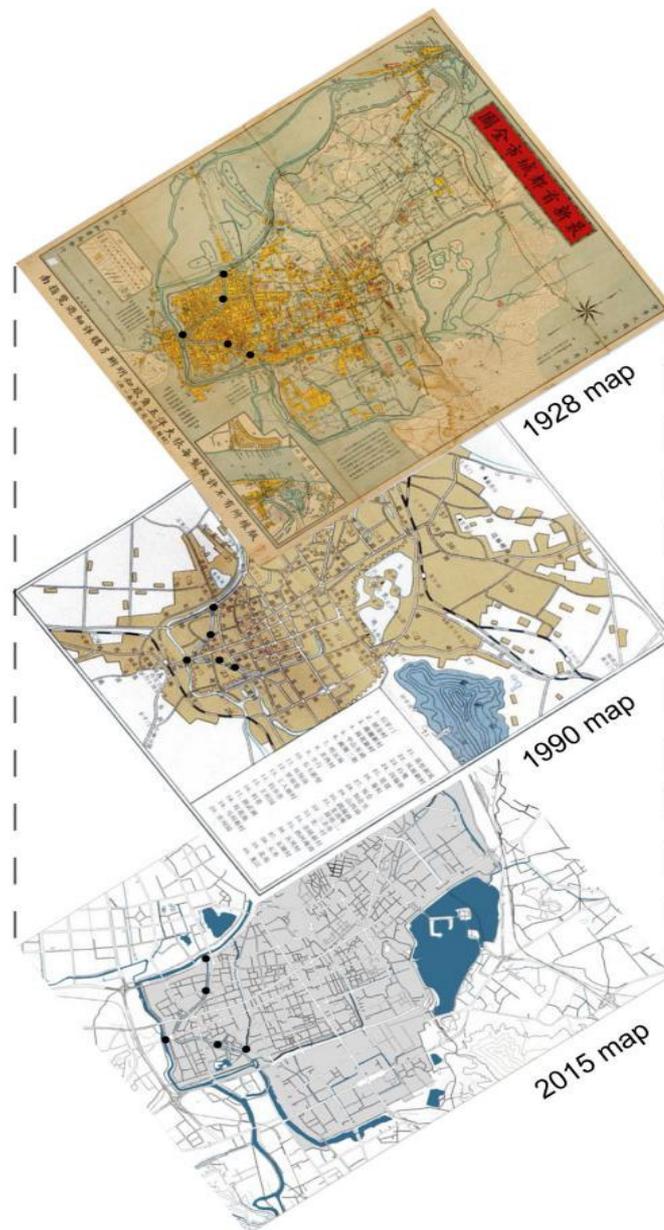


Fig. 1.16: Schematic diagram of re-mapping approach

2 Overall transformation of Nanjing old city and Old South area

2.1 The formation of Nanjing old city (-1949)

2.1.1 Urban development in early periods

The beginning of Nanjing's urban history dates back to 472BC, when a military fort called Yue City (*yue cheng*) was established in the south of Qinhuai river (outside the Zhonghua Gate today). General residents and businessmen settled along the river, forming the earliest residential and commercial area. In the following seven centuries, Nanjing gradually developed from a military fortress by Yangtze river to a regional political and economic center.

Nanjing first became the capital city in Six Dynasties period (220-589)¹. **Jiankang City** gradually developed into the political, economical and cultural center of southern China. Jiankang City was composed of the imperial city in the north and the civil life area in the south. Above all, the civil life area was distributed along Qinhuai river due to its importance as a water and land transportation hub (Fig. 2.1). With the toppling of Six Dynasties, Jiankang City was thoroughly destroyed.

By 937 the regional regime Southern Tang² made Nanjing its capital and constructed **Jinling City**. Instead of continuing to use the site of Jiankang City, the location of Jinling City moved southwards to present outer Qinhuai river (Fig. 2.1). It is worth mentioning that the present-day Old South area are all in the coverage of Jinling City, partially inheriting the urban structure and landmarks of Jinling City. For example, the present-day Zhonghua Road derives from the south-north imperial road. The present-day east-west arteries Shengzhou-Jiankang Road and Baixia-Jianye Road could also date back to the period of Jiangning City. By the 12th century the prefectural school (*fu xue*) was reconstructed by Qinhuai river, which later developed into the Confucius Temple, the landmark and of the Old South area as well as the commercial center of Nanjing.

¹ Wu state built the Jianye city (present day Nanjing) and made it the capital in 229. East Jin dynasty made its capital in Jianye in 420 and renamed it as Jiankang. Four subsequent dynasties, Song, Qi, Liang and Chen continued to make their capitals in Jiankang.

² Southern Tang was one of the Ten Kingdoms in Southern China created following the Tang Dynasty from 937-976. The capital was located in Jinling, located in present-day Nanjing. Southern Tang was conquered in 976 by the Song Dynasty.

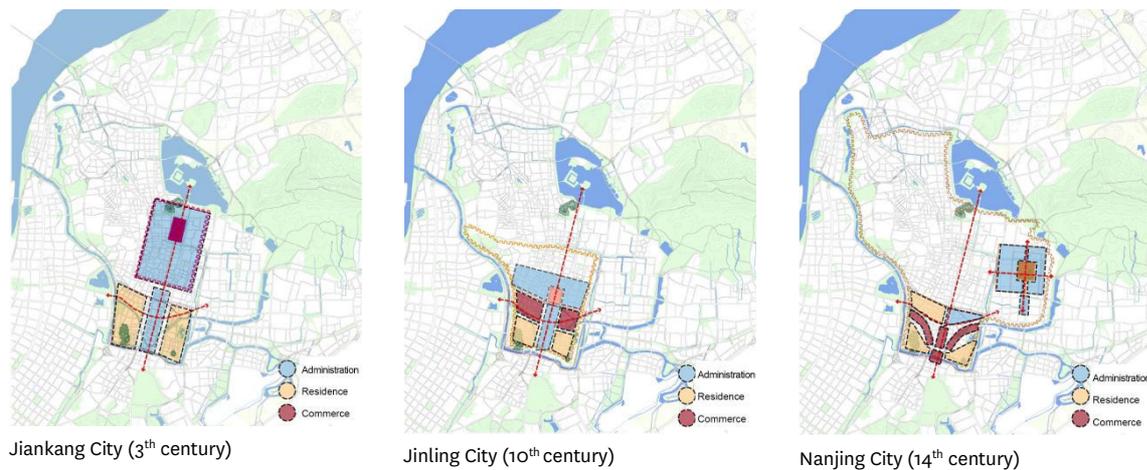


Fig. 2.1: Urban transformation of Nanjing in imperial period (-1911) [Source: Conservation Plan and Urban Design of Nanjing South Historic Urban Area (2012)]

2.1.2 Nanjing city of Ming dynasty

The present-day Nanjing old city was originally built in the middle of 14th century when Nanjing became the capital of Ming dynasty³. The first emperor of the Ming dynasty, the Hongwu Emperor, renamed the city Yingtian, rebuilt it, and made it the dynastic capital in 1368. A 48km long city wall around Yingtian, as well as a new Ming Palace complex, and government halls were constructed. It took 200,000 laborers 21 years to finish the project⁴. Inheriting the former Jinling City, Nanjing city had a substantial extension, reaching the area of 41km². With more than one million population it was the largest Chinese city at that time. The construction of Nanjing city in Ming dynasty was characterized by taking good advantage of the topography and the former built-up area, the Jinling City. The city wall was built along the periphery mountains in favor of the defense, while rivers, canals and the moat were connected into a dense river network.

Nanjing city of Ming dynasty was composed of three functional areas: the political area in the east, the civil life area in the south and the military area in the north. The eastern political area was the major new built-up area. It was mainly composed of the imperial palace and governmental institutions which were distributed along the imperial road, a north-south axis. The military area was located in the northwest part of Nanjing old city, where barracks, warehouses, fields and wastelands were distributed. Bordering Yangtze river, it had strategically terrains. However, urban development in this area was very slow. Until 1949 there were still a large area of farmland and vacant land.

The civil life area was almost in the scope of former Jinling City (Fig. 2.2). There existed further a subdivision of residential areas, handicraft areas and commercial areas. The commercial area was mainly distributed along Qinhuai river, as in imperial time the commercial and industrial development of Nanjing mainly

³ The Ming dynasty was the ruling dynasty of China, for 276 years (1368–1644) following the collapse of the Mongol-led Yuan dynasty. Nanjing served as its capital from 1368 to 1421, before the capital was relocated to Beijing by Yongle Emperor.

⁴ Wikipedia. Nanjing. (2017). <https://en.wikipedia.org/wiki/Nanjing>/Accessed 2017.11.21.

depended on the transportation of Qinhuai river. Above all, Sanshan street⁵ and Confucius Temple area were the major commercial centers.

In Nanjing city of Ming dynasty, most workshops with mid-small scale were combined with the living function, constituting a specially mixed development mode. The residential area was organized by a specific unit of neighborhood called Fang. Each Fang consisted of 110 households. The residential differentiation was based on the social class and professions, including the aristocrat, the official, the affluent and various groups of handicrafts men. Above all, handicrafts men took a large proportion in the population, accounting for about 200,000 people. They were settled in different Fang according to specific industries they worked in, for example bow and arrow production, brocade production and silverware production.

The street hierarchy of Nanjing old city contained three levels, the official street, the small street and the alley. The official street, generally with the width of more than 20m, was the artery connecting three different functional areas. The small street and the alley were much narrower, generally not beyond 10m. Inside the three functional areas, individual street patterns were developed. The political area was characterized by the axis and symmetry street pattern, while the military area was characterized by sparse street network and low accessibility. In terms of the civil life area, the street pattern of former Jiangning City was remained (Fig. 2.3).

The Old South area today was the south part of civil life area (Fig. 2.19). It is surrounded by the city wall on the east, west and south side, each side with one city gate. The V-shaped inner Qinhuai river flows across all this area, serving as the significant traffic and urban functional link. Yundu river marked the northern boundary. The artery system was characterized by a cross structure, with the old royal street in the north-south direction and another two arteries leading to city gates in the east-west direction⁶. Actually this cross structure was also an inheritance from Jiangning old City. In terms of the local street pattern, areas in the north of Qinhuai river was characterized by the orthogonal grid, while that in the south was characterized by winding and intricate pattern. Benefit from the location adjacent to Qinhuai river and the urban axis, Confucius Temple area and Sanshan street had gradually developed into the commercial center since 13th century. Although the Old South area was the most prosperous area of the Nanjing old city in imperial time, there was still quite amount of land along the city wall undeveloped by 1949.

⁵ Sanshan street was demolished in the urban reconstruction in the 1990s. Its location is at the present-day intersection of Shengzhou Road and Zhonghua Road.

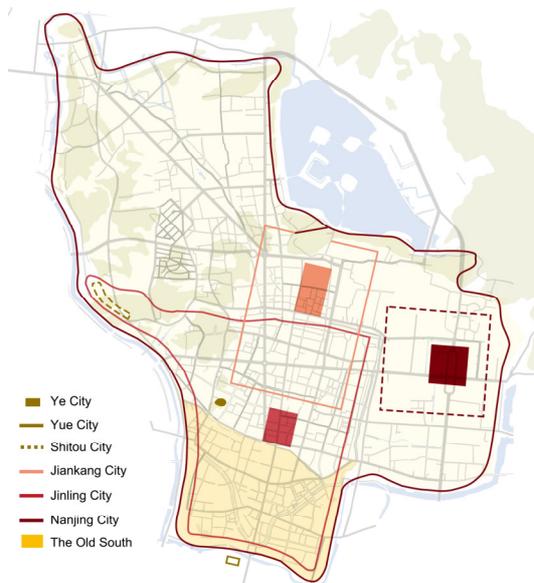


Fig. 2.2: Superimposition of several cities within the coverage of present-day Nanjing old city



Fig. 2.3: Street pattern of Nanjing City in Ming dynasty

2.1.3 Reconstruction plan in early 20th century

Nanjing became the capital city again since the foundation of Republic of China in 1912. But the old city without automobile traffic system, modern infrastructure and architecture could no longer meet the demand of a new national capital. After winning a political stability in the middle 1920s, the national government launched the plan of reconstructing Nanjing old city. In 1929 the City Plan of Nanking was made by then Capital Construction Committee, which was regarded as the first modern urban planning and the most complete urban planning during the Republic of China era before 1949.

The City Plan of Nanking contains 28 main issues including the classification of functional areas, road system planning, population prediction, infrastructure and coding and management system. The classification of functional areas mainly included administrative area, industrial area, residential area, commercial area, educational area and green space. Above all, a new central political area was schemed to be built in the east of Nanjing old city, while the built-up area including the Old South area mainly continued to be the commercial and residential areas.

The road system planning established a five-layer road hierarchy which was composed of the arterial road, the sub arterial road, the boulevard, the ring road and the alley. The planning of arterial road system took consideration of the dense street network in the south of old city. Thus in the built-up area arteries should take advantage of existing streets as much as possible, while in undeveloped areas an orthogonal and diagonal road system could be formed. As the focus of urban development had moved to the north city, the Plan established a new urban axis, Zhongshan Road, which connected the port area in the northwest and the urban center Xinjiekou (Fig. 2.4).

In the Old South area, the artery system was characterized by a grid pattern, which aimed at establishing a fast and efficient automobile system. But there were problems in terms of the integration with the historic street pattern. For example, some historic districts including Confucius Temple area, Mendong, and Menxi

area were all separated by arteries. By the end of Republic of China in 1949, few roads were reconstructed based on this concept. But this scheme had an important influence on the subsequent schemes for implementation in the 1990s. For example, the extension of Zhongshan Road South cutting through Menxi area, reorganization of road system in Chuanban alley area, and the broadening of Mingyang street were obviously the continuation of ideas from the City Plan of Nanking. However, the Plan also emphasized minor renovation of alleys so that the dense historic street pattern could be realized. Most existing alleys would be moderately broadened into six meters to accommodate automobile traffic. Unfortunately this concept were not realized.

The planning of Boulevard system was another uncompleted concept but worth mentioning. As the transportation importance of Qinhuai river reduced, it was considered to be open to the city as a landscape belt. Thus a 17m wide riverside boulevard was proposed to be built with demolition of riverside houses. Similarly, as the city wall lost the defense function, it could be reconstructed into a ring road in favor of automobile traffic and recreation.

Because of the war and the regime change⁷, most of the City Plan of Nanking was not implemented except the construction of new urban axis, Zhongshan Road (Fig. 2.5). But it has drawn great influences on the following urban development after 1949. In the Old South area, despite the ideas of the City Plan of Nanking and some renewals of buildings, the urban structure and overall urban form did not experience an essential change during the Republic of China era. Thus the traditional urban form continued to the foundation of the communist regime in 1949.

In summary, the historic urban form of the Old South area is characterized by the superimposition of urban development in different times, rather than a product of unified planning (Fig. 2.2). It is ten times that Nanjing serves as the national or regional capital city in Chinese history. Several cities were built in this region, some of which are overlapped with each other. Nanjing City of Ming dynasty largely continued the built-up area formed in previous Jinling City. Thus the street pattern in the Old South area is complex and winding, quite different from that in the north city. Although the reconstruction plan in the early 20th century was almost not realized, some new arteries are overlapped on the historic street pattern.

The prosperity of Old South area depended on the transportation importance of Qinhuai river in history. Since the 20th century, with the focus of urban development moved to the north, the significance of the Old South area gradually reduced. Thus the urban renewal of this area was relatively slow than the north part. Due to the political instability, the City Plan of Nanking failed to superimpose a grid pattern of arteries on exiting street pattern. A premodern city was preserved. The renewal of the Old South area needed new opportunities of both the development mode and develop orientation, which would come soon after 1949 when the communist regime was founded.

⁷ The reconstruction of Nanjing old city was mainly concentrated on the 1930s after the publication of the City Plan of Nanking (1929). The Sino-Japan war from 1937 to 1945 stopped the construction boom. Then the civil war followed from 1945 to 1949. By the end of 1949 the ROC government terminated its power in Mainland China. Few more constructions were made during this period of turmoil.

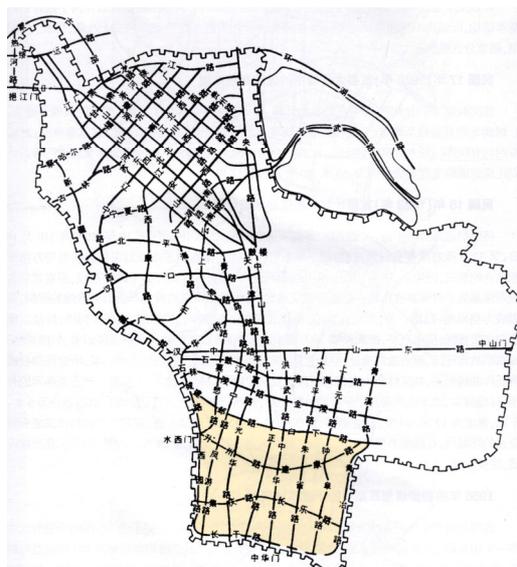


Fig. 2.4: Planning of road system in the City Plan of Nanking (1929) [Source: Modified from City Plan of Nanking (1929)]

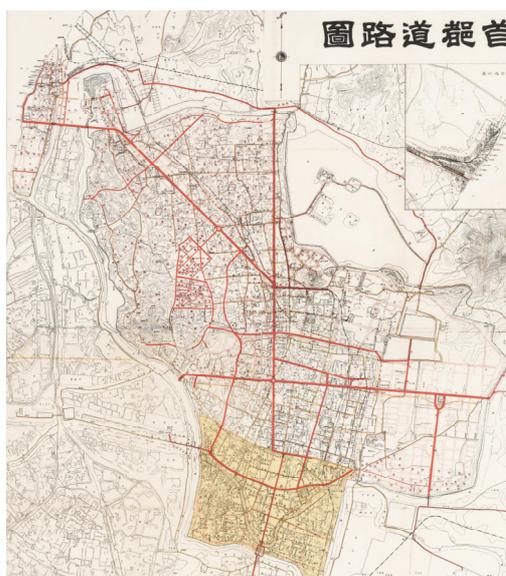


Fig. 2.5: Road system construction by the end of the Republic of China (1946) [Source: Modified from Nanjing road plan (1946)]

2.2 Transformation of master plans and the spatial structure of Nanjing

2.2.1 Industrialization of the old city (1949-1958)

Since the foundation of communist regime in 1949, urban development of China entered a new stage. China introduced the so called “Soviet model” into the planning system, holding that urban development should be subject to industrial production, the supreme function of socialist cities. The superiority of socialist cities is the plan for production and the state ownership of the land. Under this background, the central government proposed that “urban development should serve the industrial production and serve the livelihood of laboring people”, which then became the ideological foundation in guiding the subsequent urban development.⁸

As industrial production became the prime task of urban development in the 1950s, the city status and the development priority totally depended on the proportion of industrial construction designated by the central government. A hierarchy of industrial cities was put forward at the first national urban construction conference in 1954 when China began the planning and construction of its key industries (Tab. 2 .1). The construction of industrial cities was divided into four types: (1). Major industrial cities; (2). Cities with industry-led expansion; (3). Cities with infill industrial construction and (4). other General cities. Above all, Nanjing with a certain industrial base established before 1949 was listed into the third type.

By 1956 China basically completed the socialist transformation of private ownership and planned to speed up industrial development in coastal regions. As one of the key coastal cities, the development of Nanjing

⁸ Cf. Dong, J. (2011).

as well as its urban planning were paid more attention. Summarizing the lessons in the first Five-Year period⁹, the central government pointed out that “urban planning should not pursue big style and over extension, instead it is suggested to reduce the demolition and investment. Old cities like Nanjing should take good advantage of their current situations to realize a reasonable development. Central government further proposed that the mode of inside-out, infill and compact development was applicable to Nanjing’s practical situation.” Under this background, a draft plan was made in 1956 to function as the preliminary master plan.

The supreme task of this plan was the designation of functional areas, especially the distribution of major industrial areas. During that period Chinese urban planning was heavily influenced by the Soviet mode and designated specific urban functions to cities in a top-down way. Above all, Nanjing was oriented as the regional industrial and transportation center, mainly developing shipbuilding industry, electrical equipment, food industry and textile industry.

In terms of the spatial layout, infill and compact development was given the priority. The majority of existing plants in the old city should take advantage of their current situations and had in situ expansion, while new industries should be set in the industrial zones outside the old city. Housing construction was also combined with industrial development, with its distribution closely related to the corresponding work-units. With the urban development in east and north direction, Xinjiekou and Gulou were determined as commercial centers, while Confucius Temple area was still the traditional commercial and recreational center.

Tab. 2.1: The hierarchy of industrial cities [Source: Compiled by the author]

Type of Industrial Cities	Cities
Type 1 Major industrial cities (8)	<ul style="list-style-type: none"> ·Northwest: Baotou, Lanzhou, Xi’an ·North China: Taiyuan, Datong ·Central China: Wuhan, Luoyang ·Southwest: Chengdu
Type 2 Cities with industry-led expansion (21)	<ul style="list-style-type: none"> ·Northeast: Anshan, Shenyang, Jilin, Changchun, Harbin, Fushun, Fularji, Benxi, Dalian, Jiamusi, Hegang ·North China: Shijiazhuang, Tianjin, Handan, Qingdao ·East China: Shanghai ·Central China: Zhengzhou, Zhuzhou ·South China: Guangzhou, Zhanjiang ·Southwest: Chongqing
Type 3 Cities with infill industrial construction (14)	<ul style="list-style-type: none"> ·Northwest: Hohhot, Zhangjiakou, Xining, Yinchuan, Baoji ·North China: Jinan, Tangshan ·East China: Hangzhou, Nanjing ·Central China: Changsha, Nanchang ·South China: Nanning ·Southwest: Guiyang, Kunming
Type 4 General cities	

⁹ “Five-Year Plan” are a series of social and economic development initiatives established by the Communist Party of China, which made top-down strategies for economic development, set growth targets, and launched reforms. (Wikipedia, https://en.wikipedia.org/wiki/Five-year_plans_of_China).

2.2.2 Non-planning and random development (1958-1980)

Due to frequent political campaigns, the urban development of Nanjing after 1958 was actually kind of non-planning and random industrialization. The Great Leap Forward¹⁰ from 1958 to 1962 marked the peak of zealous industrialization. In order to transform the country from an agrarian economy into a socialist society through rapid industrialization and collectivization, the guidance of urban development was determined that “everything should serve the industrial production”. In Old South area industrial construction was also in a fever, with nearly 100 factories established. Particularly, neighborhood factories sprung up all over the historic urban area. Despite achieving a wider range of industry system, the unreasonable distribution brought about seriously safety and environmental problems on neighborhoods.

During the ten years of Cultural Revolution (1966-1976)¹¹, political struggles became the main content of daily life, while the normal social and economic order were seriously disturbed. Under such conditions the urban planning system completely broke off. The infill development became increasingly serious, leading to more confusing land-use structure. Encroachment of green space and rivers, illegal enclosure and buildings as well as damage of cultural relics were not uncommon.

It is obvious that after 1958 political intentions taking place of urban planning became the direct driving force for urban development. There were two draft plannings¹² made in the political turmoil, but with few practical effectiveness. In the practical urban development, the urban scale was strictly controlled. Comparing the land use structure in 1978 with that in master plan 1956, the most significant change was the increase of randomly infilled industrial land (Fig. 2.6).

¹⁰ The Great Leap Forward of the People's Republic of China (PRC) was an economic and social campaign by the Communist Party of China (CPC) from 1958 to 1962. The campaign was led by Chairman Mao Zedong and aimed to rapidly transform the country from an agrarian economy into a socialist society through rapid industrialization and collectivization.

¹¹ The Cultural Revolution was a sociopolitical movement that took place in China from 1966 until 1976. Set into motion by Chairman Mao Zedong, its stated goal was to preserve 'true' Communist ideology in the country by purging remnants of capitalist and traditional elements from Chinese society, and to re-impose Maoist thought as the dominant ideology within the Party. The movement paralyzed China politically and negatively affected the country's economy and society to a significant degree.

¹² The Nanjing Regional Plan (1960-1961) and the Planning Outline of Nanjing (1975).

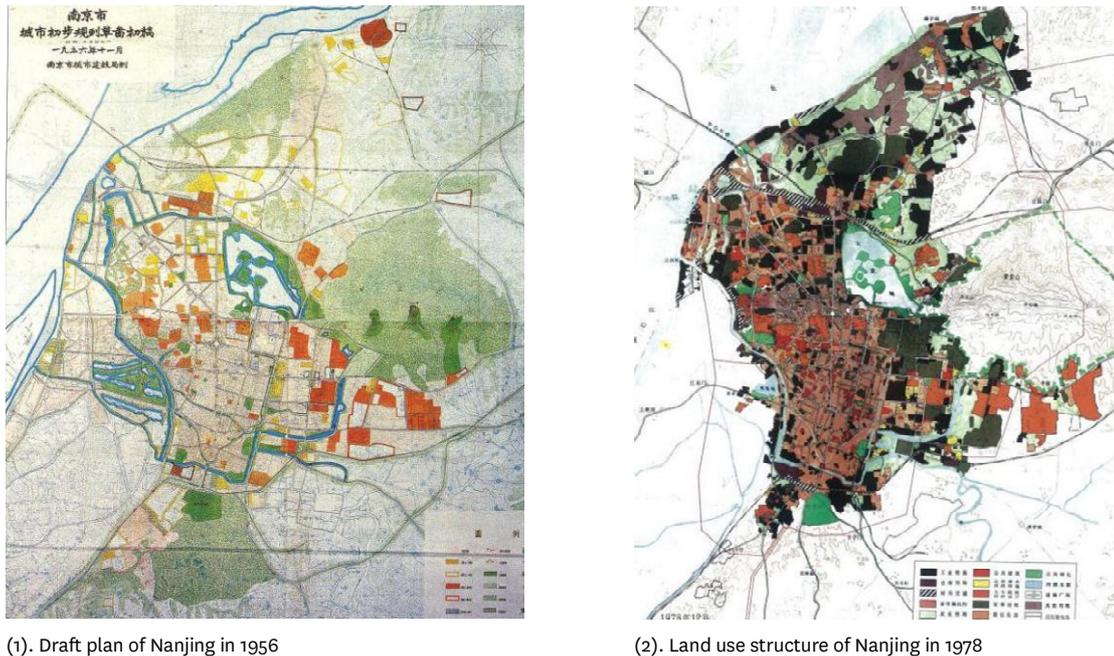


Fig. 2.6: Change of Land use structure of Nanjing between 1956 and 1978 [Source: *Annal of Nanjing Urban Planning* (2008)]

2.2.3 Urban development based on the old city (1980-1990)

After 1978 China started its political and economic reform. Urban planning regained the critical role in directing the urban development. In 1983 the master plan of Nanjing was approved by the central government, which became the first formal master plan of Nanjing since 1949. It was in this plan that the historic and cultural value of Nanjing was finally recognized and required for a protection.

In terms of the spatial layout, master plan of 1983 still endeavored to control the urban expansion. A circle structure of urban layout was established, with the main urban area encircled by a green belt composed of agricultural bases and scenic area (Fig. 2.7). As the increase of new construction land was very small¹³, urban development was still based on the old city. The plan claimed there should be a combination of reconstructing the old city and constructing the new city, but the former should be given the priority. The old city should have unified reconstructions in streets, blocks and districts, thus 40 neighborhoods were designated as areas in need of urban renewal.

In the 1980s the industrial development still occupied an important position in the development of the old city. By 1990, the main urban area contributed about 61% of the gross industrial output¹⁴. The Old South area was still designated as the specific industrial zone of textile and light industry, with the industrial land taking up 15% of the historic urban area¹⁵. However, the blind development mode which had lasted about thirty years within the old city ended up. The master plan proposed four requirements for the readjustment of industrial layout:

¹³ By 1978 the built-up area had been 116 km², the master plan of 1983 held that the urban expansion in the following decade would reach its limit of 122km² in terms of the resources, natural and geographic conditions.

¹⁴ The statistics is based on the Compilation of data for the master plan of Nanjing in 1992.

¹⁵ The statistics is calculated according to the land use plan of 1983.

- (1). Industrial development in the old city should be strictly controlled. New projects and large-scale expansions should be in principle set to the satellite towns;
- (2). Factories with serious pollution and potential security and transportation problems would be designedly and gradually moved to satellite towns or specific industrial zones outside the old city;
- (3). Small and medium scale factories which scattered in residential areas could be transformed to industrial neighborhoods;
- (4). The development of satellite towns generally depended on the location of large and medium scale industry.

Generally speaking, the urban renewal of Old South area in the 1980s was still slow, apart from the comprehensive redevelopment of the historic center, Confucius Temple area. As there were no fundamental changes on land and economic system, state invest as the major financial source could hardly meet the enormous demands of urban construction. But this situation would be totally changed in the 1990s.

2.2.4 Urban expansion from old city to metropolitan area (1990-)

With the reform of land system and economic system in the early 1990s, China established the Land Use Right system (LURs) and market economy system, which directly promoted the rapid development of real estate industry and third industry. Under this background, Chinese urban development went into a new stage. The change of Chinese urban space during the 1990s are summarized into two main features: the expansion of built-up area and the renewal of old city, which are inter-related¹⁶. In most Chinese cities, the power of municipal government outdistances other influential factors including the market and community. It indicates that the master plan as the tool of government's intervention plays a decisive role in molding the urban space.

The urban expansion since the 1990s has made Nanjing spring out of the old city and develop into a metropolitan area with a conglomeration structure. This spatial transformation is deeply influenced by three master plans made from 1990 to 2010.

The master plan of 1991 for the first time proposed the concept to develop Nanjing into a metropolitan area, providing the guidance for the urban expansion in the following two decades. The city was expected to develop along two development axes, Yangtze river in east-west direction and the airport expressway in north-south direction. Above all, Yangtze river served as the main development axis, connecting most of planned satellite towns. The metropolitan area was composed of the central urban area and twelve satellite towns which would be linked with efficient transportation and spaced by green space (Fig. 2.8). The central urban area, based on the old city, was the core of metropolitan area and mainly develop third industries including finance, trade and information service. In contrast, twelve satellite towns would mainly develop secondary industry according to their location and existing industrial bases.

However, the actual urban development did not go completely in accordance with the plan. As the orientations lacked speciality and differences, twelve satellite towns developed slowly, failing to evacuate population and industry from the old city as planned. Of the twelve planned satellite towns, Pukou, Xianlin and

¹⁶ Cf. Zhang, T. (2001).7-13.

Dongshan¹⁷ with their location advantage got better opportunity to develop into integrated new towns. Accordingly, the master plan of 2001 determined to nurture the three satellite towns into new districts (Fig. 2.9).

The urban expansion of Nanjing reached its peak in the 2000s, with an annual increase of construction land of about 40km². The area of construction land in new districts increased from 56km² in 2000 to 163km² in 2007. Under such a surprising development speed, the expansion of three new districts, Pukou, Xianlin and Dongshan led to the connection with the central urban area. Despite the rapid spatial expansion, the construction of auxiliary facility there was relatively slow. In order to further promote the upgrading of urban functions and population flow to the new districts, the master plan of 2007 proposed to merge the three new districts into the central urban area (Fig. 2.10). Thus the new districts would get more support to promote the transformation from industry-led districts to integrated urban districts. Through this adjustment the area of central urban area increased unprecedentedly to 920 km².

In any case, the urban expansion since the 1990s changed the location of old city, making the old city as a whole the center of Nanjing metropolitan area (Fig. 2.11). Above all, the master plan is the main guidance for the transformation of spatial structure. Faced with the unprecedented urban expansion, the status of the old city concerning the functional orientation, the land value, the demographic structure and the urban form keep changing, generating increasingly larger pressure for the upgrading of industrial structure and the urban renewal.

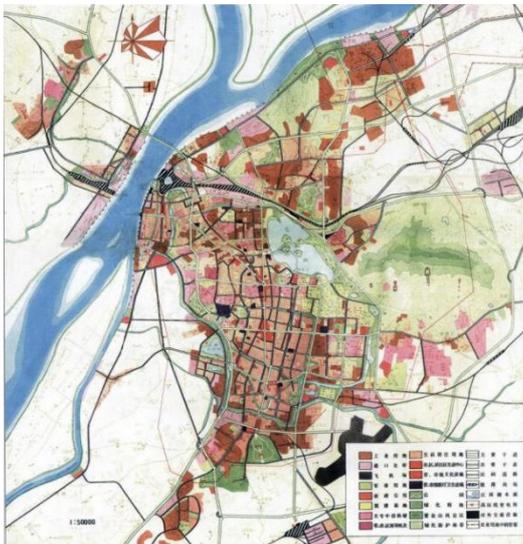


Fig. 2.7: Master Plan of Nanjing in 1983 [Source: Planning Bureau of Nanjing]



Fig. 2.8: Master plan of Nanjing in 1991 [Source: Annal of Nanjing Urban Planning (2008)]

¹⁷ According to the 2001 master plan, Pukou was oriented as the base of high and new technological industry and the center in the north of Yangtze River; Xianlin area would develop into a new urban district; Dongshan would develop into the center of southern Nanjing.

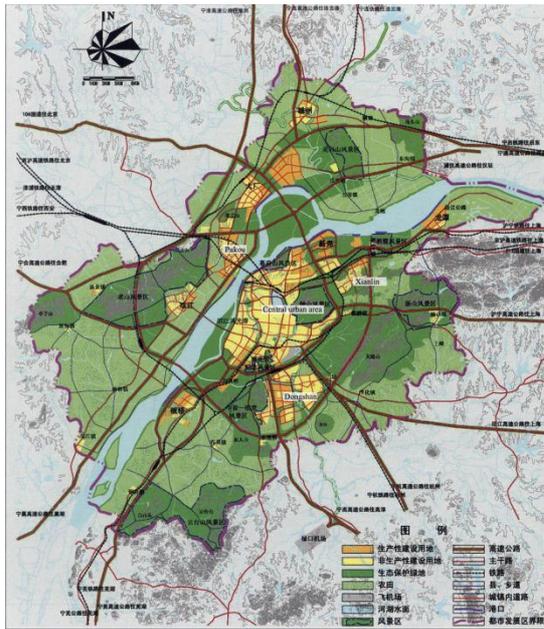


Fig. 2.9: Master plan of Nanjing in 2001 [Source: Annal of Nanjing Urban Planning (2008)]

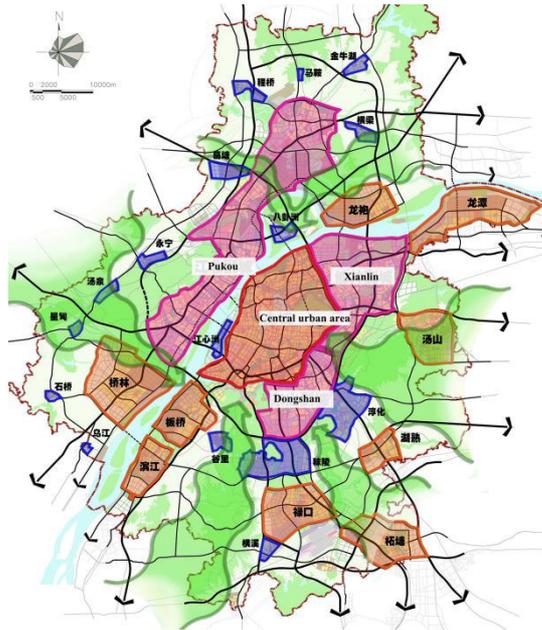


Fig. 2.10: Master plan of Nanjing in 2007 [Source: Planning Bureau of Nanjing]

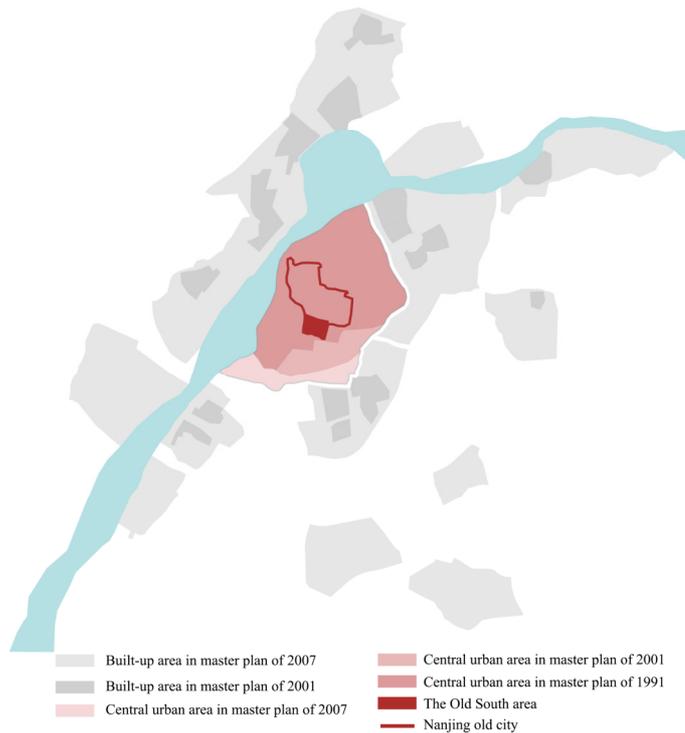


Fig. 2.11: Urban expansion of Nanjing since 1990

2.2.5 Urban renewal of the old city (1990-)

The large-scale renewal of the old city since the 1990s is a comprehensive result of development orientation, spatial structure and institutional transformation. The development of third industry since the economic reform depends on the old city where has better infrastructure and richer human resources. The urban expansion generated the necessity and possibility for the old city to upgrade the industrial structure and urban landscape. In addition, the recovery of the land market and the development of real estate industry made the land revenue an important governmental finance, largely evoking the enthusiasm of local government to launch urban redevelopment in the old city.

According to the master plan of 1991, the development of old city should on the one hand highlight the image of an ancient capital, but also undertake the increasing responsibility as a regional center.¹⁸ The plan further proposed three strategies for the renewal of old city: (1). Optimizing the land use structure to promote service industry like finance, trade and tourism; (2). Improving the infrastructure, especially the construction of arterial road system; (3). Improving environmental quality and protecting traditional urban characteristics. They can also be seen as the main characteristics of the renewal in the old city since the 1990s.

Reconstruction of road system

The master plan of 1983 established a three-layer road hierarchy, which is composed of the arterial road (approximately 40m wide), the sub arterial road (approximately 30m wide) and the local road (approximately 20m wide). The interval of arterial roads is about two kilometers, while the interval of sub arterial roads is about one kilometer.

The master plan of 1983 also proposed a road system for the central urban area. It was composed of three vertical arteries and eight horizontal arteries (Fig. 2.12). The master plan of 1995 further enriched the system by adding two vertical arteries, finally forming a “five vertical and eight horizontal” structure. About half of the arteries went through the old city, most of them deriving from the broadening of existing streets. This structure generated a ring of expressway around the core areas of the old city so that the disturbance of through traffic could be reduced.

Although the arterial road system was proposed early in the 1980s, its practical construction during the command economy was very slow. It was not until the middle 1990s when the market economy generated new financial modes that the road construction sped up. In 1995 the municipal government proposed the construction goal that “the urban construction should have preliminary improvement in one year and a revolutionary improvement in three years”, which eventually promoted the road construction in central urban area. By the end of 1990s the artery system was basically completed (Fig. 2.13).

The optimization of land use structure

The optimization of land use structure in the old city was notably manifested as the proportional increase of commercial land and the reduction of industrial land. Before the land system reform and establishment of the market economy, urban development was totally determined by unified governmental construction plan and the administrative land allocation. Thus the proportion of residential and industrial land in urban center were too high. As the master plan of 1991 claimed the industrial upgrading of the old city through

¹⁸ In masterplan 1983 Nanjing was defined as the famous ancient capital and political, economic and cultural center of Jiangsu Province. In master plan 1991 and 2001, the city status rose to the central city of the lower Yangtze River Area. And in master plan 2007 it was further enhanced to national regional center city.

developing third industry including the finance, trade, science, information and tourism, it was imperative to increase the proportion of commercial land. Therefore the master plan of 1991 proposed to increase the proportion of land for third industry from 4.6% to 59.1% and reduce the proportion of industrial land from 24% to 16%.

The growth of commercial land was realized through the development of commercial center system. The master plan of 1991 proposed a four-tiered commercial center system¹⁹ to accelerate the commercial development all over the old city. Above all, the urban center Xinjiekou area was schemed to develop into a central business district (CBD). With the guidance of high-strength exploitation, highrise building, commercial complex and underground development became preferred spatial forms. This development mode gradually became the general characteristics of commercial development and prevailed in the old city, remarkably changing the building height and building volume of the old city. By 2001, the number of buildings with more than 8 storeys was about 1000, taking up 80% of those all around the city.

Although the municipal government made efforts to promote the development of new centers outside the old city after 2007, the old city with the best condition of infrastructure, is still the hotspot of urban construction in the previous twenty years. Above all, the Old South area with its superior location in adjacent to Xinjiekou CBD²⁰ faced increasingly stronger pressure of urban renewal.

Early in 1982 Nanjing was selected as the Famous Historic and Cultural City. Since then the protection of the old city has been a significant component of the master plan. Four conservation plans were made respectively in 1984, 1992, 2002 and 2010, showing improvement in conservation framework and strategies. However, during the middle 1990s to early 2000s, urban conservation focused on single cultural relics, subsequently expanding to historic districts. Radical redevelopment was made outside conservation areas, failing to integrate with conservation areas. By 2003, the area of traditional cityscape within the 43 km² old city was only about 5 km². The overall conservation of the historic urban area was not proposed until 2010 when most of the old city had been renewed. It has to admit that the historic protection fell far behind the urban renewal in the old city.

¹⁹ The plan of 1991 proposed the commercial center system which was composed of one major center, six subordinate centers, nine district centers and several neighborhood centers. Above all, Confucius Temple area was designated as the subordinate commercial center.

²⁰ The master plan of 1991 defined the scope of urban center. With an area of 20 km², it directly bordered the Old South area.

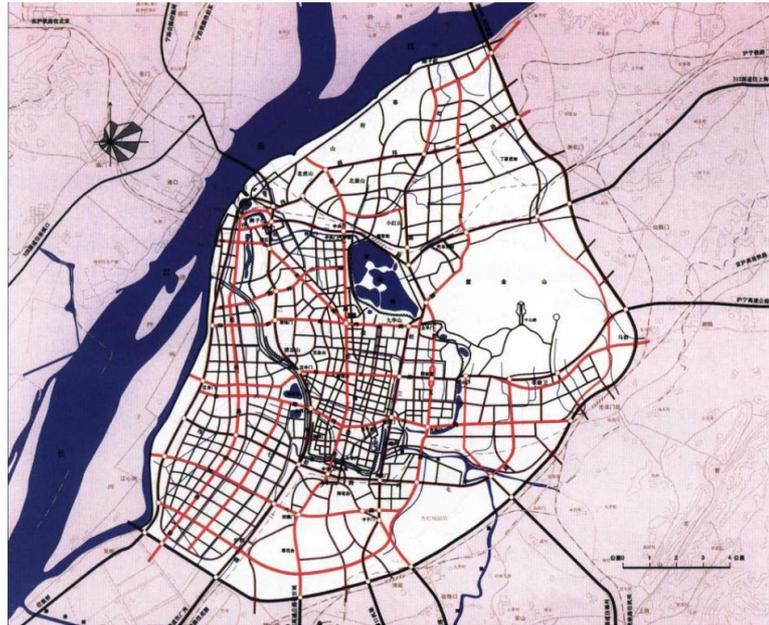


Fig. 2.12: Road system of the central urban area in the master plan of 1991 [Source: Annual of Nanjing Urban Planning (2008)]



(1). Traditional street pattern before 1927



(2). Road construction between 1927 and 1949



(3). Road construction between 1949 and 1990



(4). Road construction after 1990

Fig. 2.13: Evolution of road construction in Nanjing old city

2.3 Overall transformation of Old South area

2.3.1 Changing development orientations and fragmented urban renewals

Although the concept of Old South area as a vague spatial scope has come into being for a long time, a unified development orientation was never made there (Fig. 2.14). The early master plans mainly emphasized the conservation of key historic landscapes, like Confucius Temple area, Mendong and Menxi historic districts, while few principles and standards were made for the renewal of general traditional areas. The fickle institutional and social transformation led to that most urban renewal were made in a fragmented way. Especially during the period of rapid development from 1990 to 2010, the development of the Old South area was not under an unified framework. Instead, it was often passive when facing various local renewals, which inevitably resulted in the fragmentation of spatial structure and urban fabric (Fig. 2.15, Fig. 2.16).

Before the 1980s the supreme task of urban renewal in the Old South area was the industrial development. Land nationalization and administrative land allocation system provided the institutional guarantee for industrial development. There were two kinds of factories in the Old South area, the large factory and neighborhood factory. They were mainly established before the early 1960s, engaged in the production of textile, plastics, machine and clothing. Above all, large factories are mainly distributed in the west-end along the city wall, while small and medium sized neighborhood factories scattered all over the historic urban area. As the majority of limited finance was invested into the industrial construction, the infrastructure and housing construction was highly compressed.

In the 1980s the urban development of Nanjing got back on track after the long-term political turmoil. The major achievement of the Old South area was the reconstruction of Confucius Temple area, the most typical historic landscape of ancient capital Nanjing. Starting in 1983 the reconstruction aimed to recover the traditional cityscape and its status as the commercial and cultural center. Apart from the reconstruction of historic landscape and renovation of damaged cultural relics, the reconstruction program also included the construction of large-scale antique commercial pedestrian street as well as housing development in periphery areas.

Generally speaking, urban renewal in the 1980s was still slow as the urban construction totally depended on state investment in the period of command economy. With the establishment of Land Use Right system (LURs) and market economy in the early 1990s, the land market and real estate industry were evoked. The land finance became the major source of governmental revenue, that municipal government got great profit from the land leasing. Under these backgrounds, the urban renewal of the historic urban area entered into an unprecedentedly rapid stage.

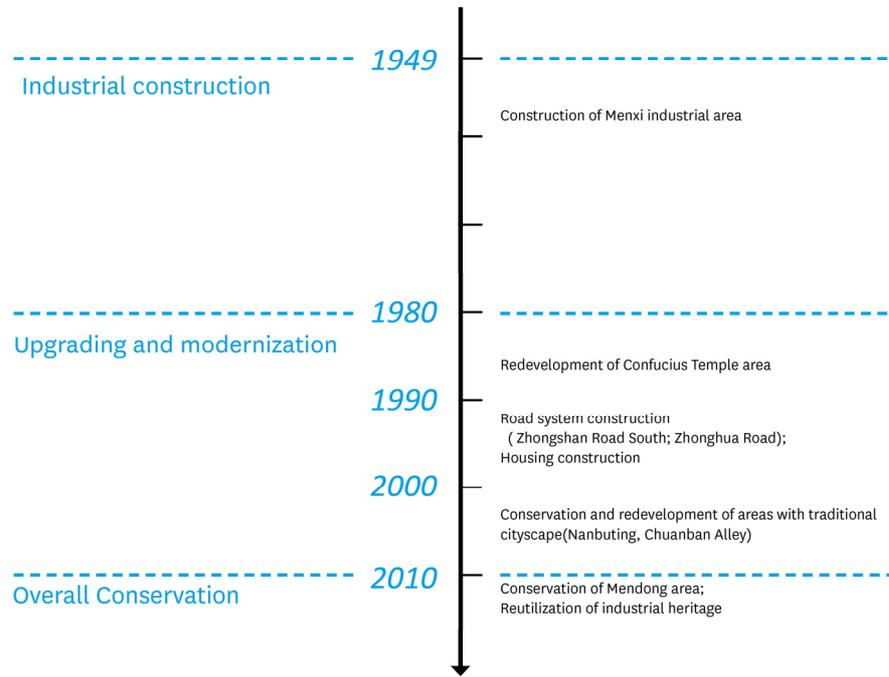


Fig. 2.14: Transformation of development orientation of the Old South area

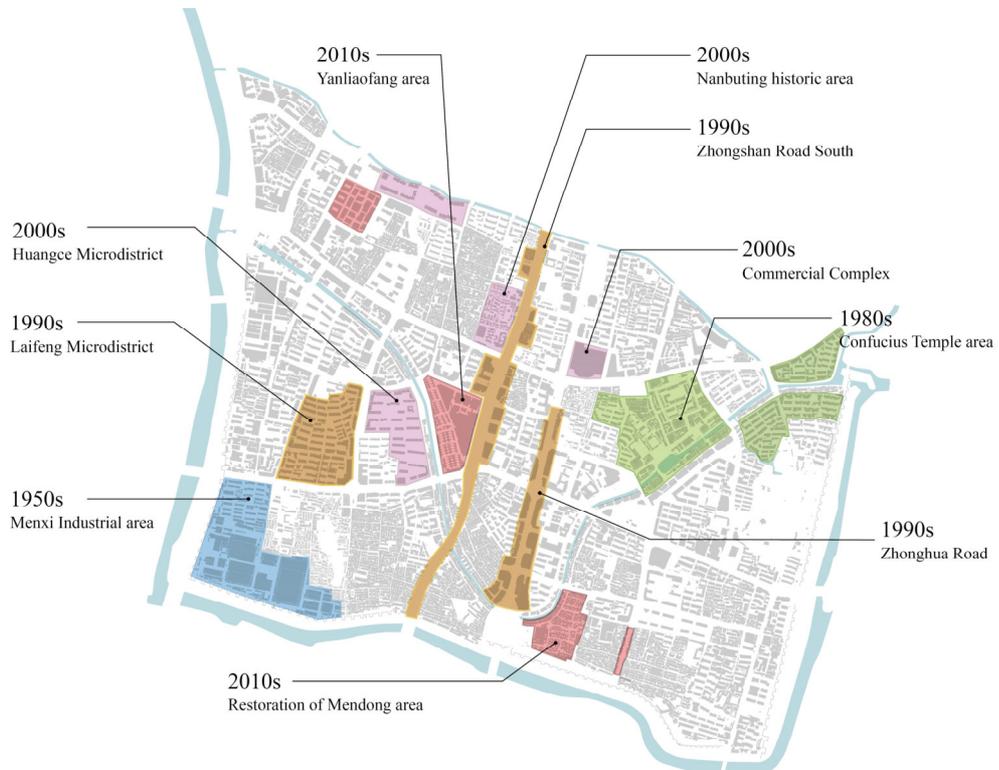


Fig. 2.15: Urban renewal in different periods and the fragmentation of urban form



1950s_Menxi industrial area



1980s_Confucius Temple area



1990s_Zhonghua Road



1990s_Zhongshan Road South



1990s_Laifeng Microdistrict



2000s_Huangce Microdistrict



2000s_Nanbuting historic area reconstruction



2000s_Commercial complex Shuiyou Cheng



2010s_Restoration of Mendong area



2010_Commercial complex in Yanliaofang area

Fig. 2.16: Typical renewals in the Old South area in different periods

In the 1990s the supreme task of urban renewal was upgrading and modernization of Old South area, which was characterized by the road construction and housing construction. The road construction was the major method to promote the urban renewal. The construction of two north-south axes Zhonghua Road and Zhongshan Road South, as well as the east-west axis Jiqing Road not only remolded the urban structure of the historic urban area, but also accelerated large-scale redevelopment along the roads. The reconstruction of historic axis Zhonghua Road in 1994 introduced the arcade into the ground floor to remain the traditional commercial space while broadening the road. In the late 1990s areas along Zhongshan Road South was oriented by Qinhuai District government as a subordinate commercial and business center to carry on the high-end service industry transferred from Xijiekou. Since then the large-scale construction of high-rise buildings started there, remarkably changing the historic landscape of Old South area.

Another hotspot of urban renewal in the 1990s was the residential redevelopment. The land for residential redevelopment was mainly distributed along arteries or transferred from industrial land. The reform of urban housing system in 1998 marked the end of welfare-oriented public housing distribution system. The complete commercialization, marketization and monetization of urban housing led to remarkably morphological changes of residential area. The commodity residential area is characterized by high-rise slabs, bigger building interval and the disappearance of street frontage, which is hard to integrate with the historic context.

After 2000 the reconstruction of the old city came into the climax, in which the focus was on the conservation and renewal of areas with historic cityscape. Reconstruction of the traditional area was specially supported by local government. On the one hand, the local government could get land revenue from the land leasing. On the other hand, it was a preferred way to realize the modernization of the old city. Areas that were not designated as the conservation areas were reconstructed into high-rise residential areas or large commercial complex which could hardly integrate with the historic context. In comparison, legal historic districts were generally reconstructed into antique commercial street, with only limited protected historic buildings and original residents left. The great demolition and reconstruction of Nanbuting area and Mendong area caused a lot of controversies, directly leading to the change of development policy of Old South area after 2010.

The development of Old South came into a new stage after 2010, when the new conservation plan proposed the overall conservation of the historic urban area. The focus of urban development transformed from the renewal to the conservation. The restoration of Mendong area which had been damaged in previous great demolition became a symbolic achievements for the overall conservation. Above all, the major ways of restoration included recovering the traditional pedestrian street through narrowing the excessive width of the local road; reconstructing traditional residential blocks, transforming industrial heritage buildings into museums. With the development of cultural industry, the orientation of Old South changed from a tourism-based development into a cultural industry based development. Old South area as a whole was understood as a large-scale cultural industry quarter. Based on this idea, the Menxi industrial area was considered as the industrial heritage. Its renovation and reutilization has begun in recent years.

Comparing the land structure of 1990 and 2010, the increase of commercial land and the reduction of industrial land is a significant feature of the urban renewal in Old South area in the last thirty years (Fig. 2.17, Fig. 2.18). The commercial land was mainly distributed in Confucius Temple area and along arterial roads. As a large amount of industrial land were transformed into residential and commercial land since the end of 1990s, currently only Menxi area keeps large-scale industrial land. Being oriented as a cultural industry park, its renovation has started. Residential land still took up the largest proportion in the historic urban area, but

most of them have been renewed into contemporary residential microdistrict. The traditional area only accounts for 1.62 km².



Fig. 2.17: The change of land use structure in the Old South area

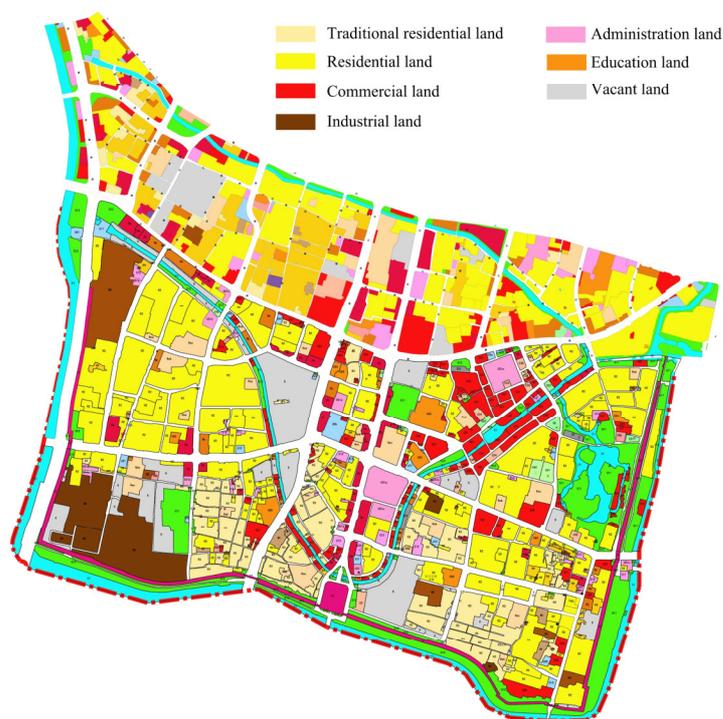


Fig. 2.18: Land use map of the Old South area in 2010 [Source: Planning Bureau of Nanjing]

2.3.2 Reconstruction of the road system

Before the 1990s, road construction in Old South area was very slow, mainly focusing on the improvement of existing arteries. In the 1990s the reconstruction of road system in Old South area came into the climax, leading to the great transformation of urban structure (Tab. 2.2, Fig. 2.19). The most significant change was the construction of Zhongshan Road South, which becomes a new north-south axis of the historic urban area. Taking place of Zhonghua Road, it together with the east-west axis Jiankang Road- Shengzhou Road constitutes a new cross-shaped arterial system. Despite the improvement of the traffic capacity, Zhongshan Road South has an exaggerate road width of 40-60m and the impassible traffic medians in the middle, which generates a surgical incision to the key historic conservation area Menxi area (Fig. 2.20).

Although Old South area was characterized by a dense traditional street pattern, the contemporary mode of traffic organization is based on the hierarchical arterial system rather than a micro-circulatory system. Under the current road hierarchy, all three level of roads, the artery, the sub artery and the local road have an overlarge scale which is hard to integrate with the historic street pattern. The sub arterial roads are almost broadened to about 30m wide, while local roads which derived from the broadening of alleys are about 10-20m.

As most significant historic districts concentrated on the east and south-end²¹, it was difficult for the arterial road system to develop into an ideal grid pattern in the historic urban area. Thus the discontinuous automobile system has to shoulder increasingly larger traffic pressure, which further promoted the road broadening. As the alley is not an independent level in the automobile traffic system, a large number of traditional alleys were broadened into local roads or eliminated in the urban renewal. By 2010 the number of local roads in the Old South area reached up to more than 100 while that of traditional alleys only about 40²², most of which were located in historic conservation areas.

It's necessary to argue the road scale appropriate to historic urban area. Comparing the current road system with that proposed in the City Plan of Nanking (1929), it is clear to see the difference how the alley is integrated into the automobile traffic system (Tab. 2.3). The road system of 1929 Plan encouraged the minor broadening of alleys and the improved alleys could be transformed into the one-way traffic. However, the current road system excludes the alley from the automobile traffic system. There is a big difference of the scale between the local road and the traditional alley. Moreover, the low-density local road network redefined the block scale and even the plot scale, further contributing to the formation of megaplot.

Tab. 2.2: The arterial roads in the Old South area [Source: Compiled according to Annal of Nanjing Urban Planning (2008)]

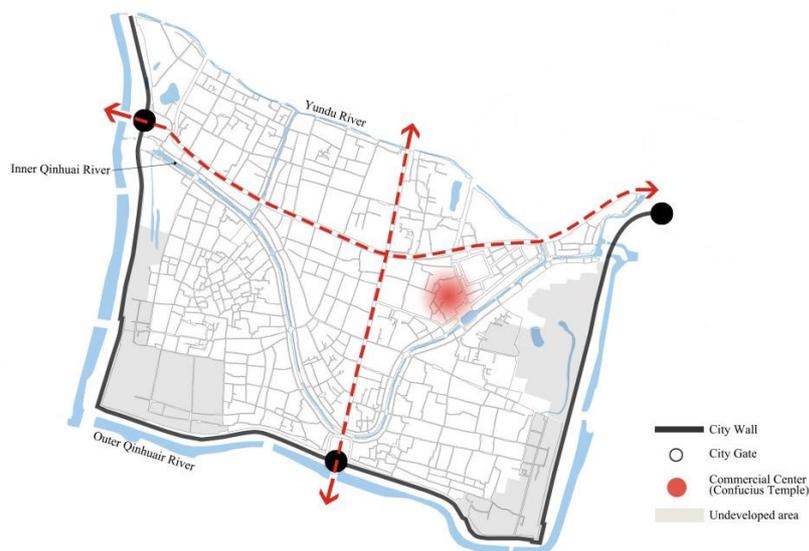
Road Name	Road Width(m)	Reconstruction Time
<i>Arterial road</i>		
Zhongshan Road South	40-59	1997
Shengzhou Road- Jiankang Road	28	1964
Zhonghua Road	36	1998
<i>Sub arterial road</i>		
Changle Road- Jiqing Road	28-40.5	1999
Baixia Road- Jianye Road	30	1993
Taiping Road South	25.6	1971
Xianhe Street- Dingxin Road	20-30	2004

²¹ According to the conservation plan of 2010, Confucius Temple historic district is located in the east part and seven historic districts are located in the south end.

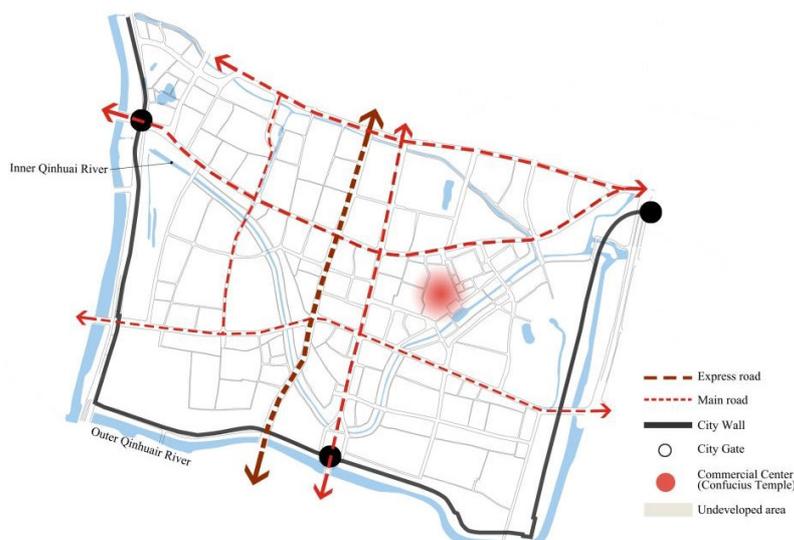
²² The statistics comes from the survey of former Qinhuai District government in 2010, when the north boundary of the administrative district was only by Jiankang Road and Shengzhou Road.

Tab. 2.3: Comparison of the current road system and that proposed in City Plan of Nanking in 1929 [Source: Compiled by the author according to Annal of Nanjing Urban Planning (2008) and City Plan of Nanking (1929)]

Road hierarchy	Contemporary road system	The City Plan of Nanking in 1929	Traditional Street System
Arterial road	40m	12-40m	10m
Boulevard	---	28m	---
Sub arterial road	30m	Commercial area, 22m New residential area, 18m Old residential area, 12m	3-5m
Local road	20m	6m	1-2m



(1). Traditional urban structure and street pattern of the Old South area



(2). Contemporary road system in the Old South area

Fig. 2.19: Transformation of the road system in the Old South area



Fig. 2.20: Zhongshan Road South with excessive scale cannot integrate with historic street pattern [Source: Baidu Map]

2.3.3 Reflection: the effect of master plan on the renewal of Old South area

The master plan draws its influences on Old South area mainly in two aspects. Firstly, the master plan determines the development orientation for the old city as well as Old South area; Secondly, the master plan proposes the overall spatial structure and the road system of the central urban area, remolding the structure of Old South area.

Reconstructing a modernized old city was for a long time the development orientation of Old South area, but the approach and the planning prospect differ greatly in different times. From the City Plan of Nanking (1929), introducing automobile traffic, functional zoning, and new architecture form had been the main contents for the reconstruction of old city. Since 1949 there are several stages of urban development according to significant changes of development orientation. Before the 1980s the industrialization was considered as an efficient approach to realize the modernization of the old city. For the thirty years between 1980 and 2010, upgrading of urban functions and modernization of urban landscape became the main goal of urban renewal. Although the master plan increasingly strengthened the requirement for the conservation of the old city, many spontaneous and random redevelopment emerged from the radical institutional transformation and rapid economic development, which could hardly be considered in accordance with the overall development orientation. Until 2010 the development theme of Old South area changed from urban renewal into urban conservation. In the following years, the historic urban area still experienced a change of orientation from the tourism-led development to the cultural industry-led development.

Due to the changing development orientations, a continuous development framework of the whole historic urban area was hard to be formed. Under this background the contradiction between local renewal and the overall control became increasingly sharp. One typical expression was the coexistence of two distinct urban fabrics of the conservation area and the renewed area (Fig. 2.21). The urban fabric in the conservation area is characterized by small plot pattern and traditional courtyard buildings. In comparison, the urban fabric in the renewed area is characterized by the coexistence of various building types, including the rows of residential slabs, high-rise business buildings and large commercial complexes. Above all, the most critical problem is that both areas are hard to be integrated with each other. In fact, the fragmented renewals are dispelling the historic urban structure instead of being integrated into it.

Another essential reason for the fragmentation of urban form is the lack of overall urban design. Although the master plan proposes the development orientation, spatial structure and road system, they need to be transformed into practical control of physical form through the design of urban ground plan. Composed of three major morphological elements, the street pattern, the plot pattern and the building footprint, it is an important tool in controlling the form of historic urban area at the medium level. However, overall urban design has not been paid enough attention in the master plan for a long time. Especially for the design of urban ground plan, even so far it is still in the preliminary stage.

Consequently there formed a paradox: the ambitious master plan aimed to reconstruct the old city, but there was no clear image foreshowing its physical form. The master plan has to answer a critical question that how the old and the new can be integrated with each other, which also establishes the principle for the renewal of the historic urban area. There is nothing wrong that the reconstruction of road system remolds the structure of historic urban area. What matters is how the new structural elements organically embedded in the historic urban structure. As the lack of control on overall urban form, the urban fabric of the Old South area was rapidly disrupted by fragmented renewals. Thus an integrated urban structure disappeared.

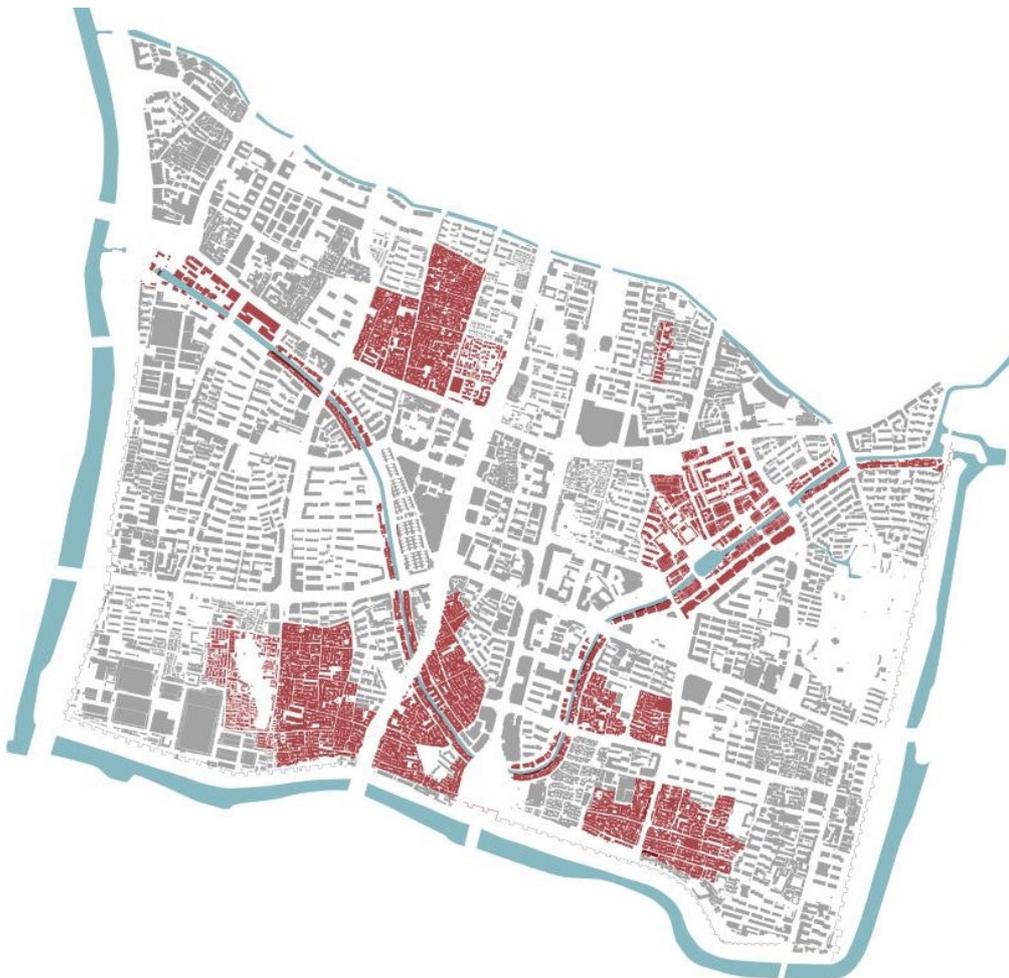


Fig. 2.21: Two distinct urban fabrics of the conservation area and the renewed area

2.4 Conclusion

This chapter discusses the overall transformation of Nanjing old city and Old South area.

The historic urban form of Nanjing old city is characterized by the superimposition of urban development in different times, rather than a product of unified planning. The present-day Nanjing old city was originally built in the middle of 14th century when Nanjing became the capital of Ming dynasty. The present-day Old South area was in the civil life area. Depending on the transportation importance of Qinhuai river, it developed into a prosperous commercial and residential area in the imperial period. As the focus of urban development moved to the north since the 20th century, the significance of Old South area gradually reduced.

As Nanjing became the national capital again in the period of Republic of China (1912-1949), the City Plan of Nanking was made in 1929, aiming at a reconstruction of the old city for the first time. Due to the war and the regime change, most of the plan was not implemented except the construction of new urban axis, Zhongshan Road. But it has drawn great influences on the subsequent urban development after 1949.

Since the foundation of communist regime in 1949, the urban development of Nanjing entered a new stage. With the land nationalization and command economy system, the master plan played a critical role in directing the urban development. Before the 1980s, industrialization was the supreme goal of urban development. As the central government pointed out that the mode of inside-out, infill and compact development was applicable to Nanjing's practical situation, many factories of various scale were inserted into the old city. With the political and economic reform in the 1980s, the first master plan of Nanjing was approved in 1983. But the urban expansion was strictly controlled and the urban development was still based on the old city.

In the early 1990s China established the Land Use Right system (LURs) and market economy system, which directly promoted the rapid expansion of built-up area and the renewal of the old city. The urban expansion made Nanjing spring out of the old city and develop into a metropolitan area with a conglomeration structure.

Meanwhile, the urban expansion also brought about increasing pressure for the old city to upgrade the industrial structure and modernize the urban landscape. The urban renewal during this period mainly focused on three points: (1). Optimizing the land use structure to promote service industry like finance, trade and tourism; (2). Improving the infrastructure, especially the reconstruction of arterial road system; (3). Improve environmental quality and protect the traditional urban characteristics.

For Old South area, its development was for a long time neither directed under a unified framework nor on-going development orientation. Reconstructing a modernized old city was for a long time the development orientation of Old South area, but the approach and the planning prospect differ greatly in different times. For the first thirty years of the communist regime between 1949 to 1980, the modernization of old city was expressed as the industrialization, while for the second thirty years between 1980 and 2010, upgrading of urban functions and modernization of urban landscape became the main goal of urban renewal. With the completion of a hierarchical arterial system in the 1990s, the structure of the historic urban area was remolded. Since 2010 the development theme of Old South area has totally changed from urban renewal into urban conservation. But affected by fickle institutional and planning transformations, most urban renewals were made in a fragmented way. In addition, as the lack of overall urban design, the fragmentation of urban form has been intensified. The contradiction between the local renewal and the overall control becomes increasingly sharp. Thus an integrated urban structure has disappeared.

3 The origin of megaplot: types and transformation of spatial modes

3.1 Definition of spatial modes and its classification

(1). Definition of the spatial mode

The morphological analysis on the transformation of Old South area is made at two levels, the unit plot and the plot pattern. The typological change of the unit plot exerts an essential impact on the evolution of the overall urban form. The concept of **spatial mode** is specifically established for the typological analysis on the unit plot. Spatial mode, defined as the synthesis of a plot and buildings on it, is the smallest morphological cell of the city. It contains three major components, plot shape, building types and plot-building relationship, each containing several subordinated indexes (Tab. 1.2, Fig. 1.12).

There exists a correspondence between spatial modes and the overall urban form. In spatial terms, the overall historic urban form can be classified into several types of spatial modes according to the morphological characteristics¹. For example, residential areas, commercial areas and historic conservation areas have quite different morphological characteristics and are defined as different types of spatial modes.

In chronological terms, a given spatial mode is generated under comprehensive influences including urban development policy, planning system and land development system. According to Aldo Rossi, ‘the city is in itself a repository of history’². History here shifts into the realm of memory, and the singular form was not only to signify its own distinct individuality; it became a sign of forms and events that were part of a collective- that is, urban- memory.³ For example, the prevalence of the multi-storey microdistrict, a subordinated residential spatial mode, was largely due to the welfare housing system, comprehensive development mode and the utilization of microdistrict schema. Thus, the transformation of urban form can be explained by the development of specific spatial modes.

(2). Types of spatial modes and their distribution

Compared with the urban form before 1949, the existing urban form shows a remarkable problem of fragmentation. Traditional urban form is characterized by the predominant building type courtyard houses and the ordered plot pattern which is mainly composed of a large number of small-scale and narrow plots. The existing urban fabric, however, accommodates various plot types and building types, which are in many cases arranged in a disordered way (Fig. 3.1).

¹ Cf. Tong, M. (2014).85-96.

² Cf. Rossi, A. (1982).

³ Cf. Lathouri, M. (2011).24.

Old South area experienced large-scale urban renewal since 1949, which can be further divided into three development periods: (1). Industrial construction of the old city in the period of the command economy (1949-1980); (2). Upgrading of urban function and renewal of urban landscape since the establishment of the market economy (1980-2010); (3). Overall conservation of historic urban area (2010-). The three development periods with quite different development goals and development modes generated diversified spatial modes in the historic urban area, including 4 primary spatial modes and 12 subordinated modes. Above all, the four primary modes include work-unit mode, residential mode, commercial mode and historic conservation mode (Fig. 3.2 and Fig. 3.3).

The four major spatial modes were generated in different times. Work-unit spatial mode, composed of three subordinate modes including *large factory*, *neighborhood factory* and *public service unit*, is the predominant spatial mode in the period of industrialization before the 1980s. From 1980 to 2010 when the urban renewal of the historic urban area reached the climax, residential space and commercial space experienced most remarkable changes. In chronological order, the residential mode contains four subordinate modes, *multistory microdistrict*, *highrise microdistrict*, *highrise apartment* and *lowrise residential area*. Similarly, the commercial mode is chronologically subdivided into *podium*, *slab/arcade*, *tower* and *complex*. Historic conservation mode includes two subordinate modes, *traditional courtyard buildings* and *historic restoration mode*. Above all, the historic restoration mode is the most typical spatial mode since 2010 when the overall conservation of the historic urban area started.

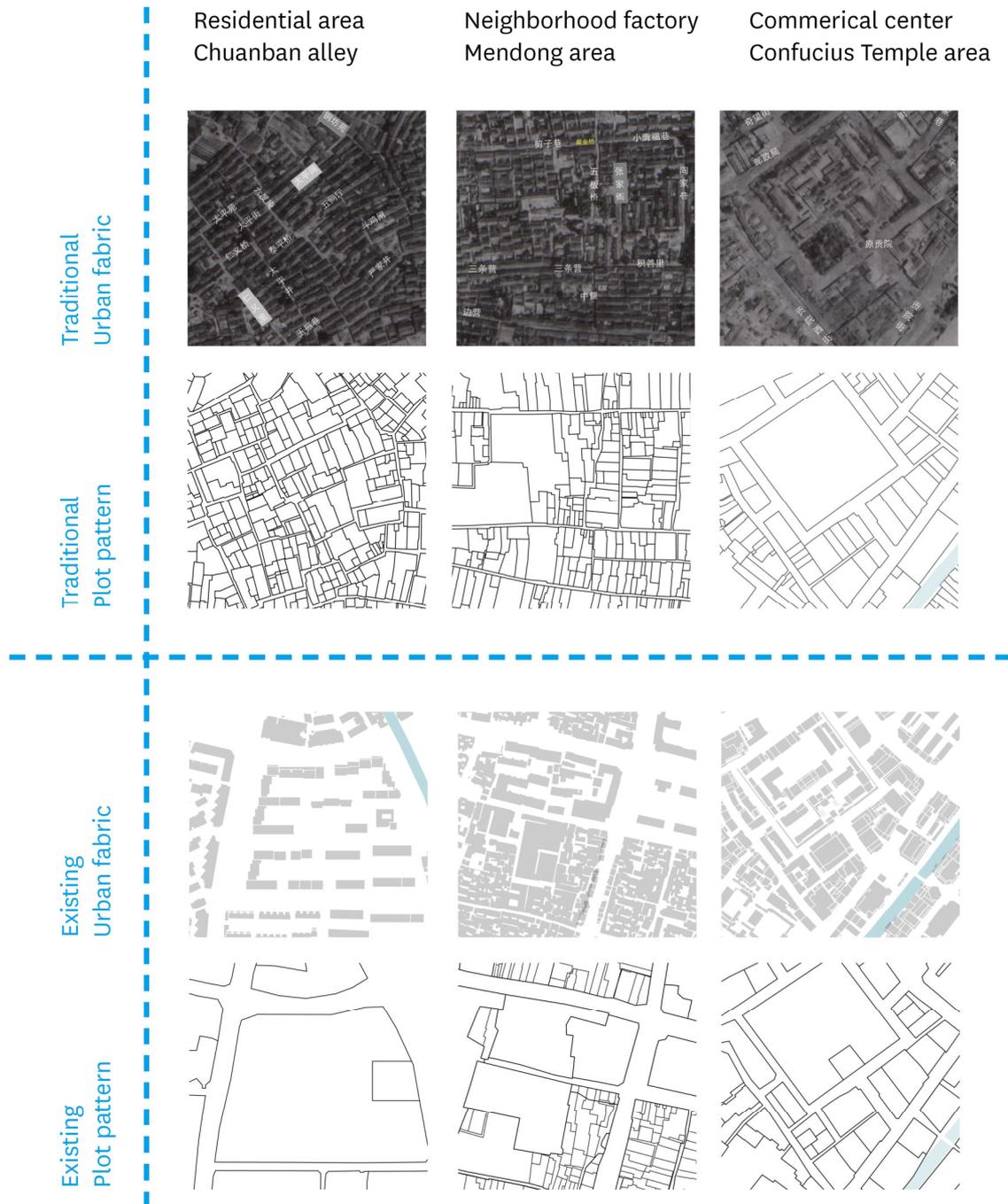


Fig. 3.1: Comparison of urban fabric and plot pattern between 1949 and 2010 Source: Made by the author; The Photo taken in 1929 is adopted from weibo.com/jsmaps

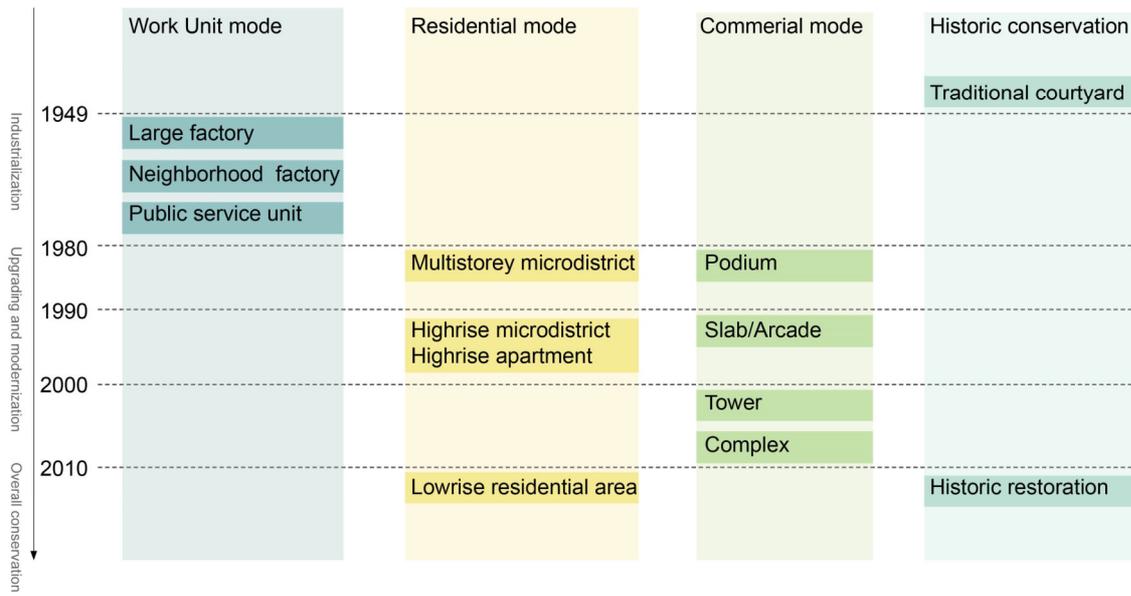


Fig. 3.2: Types and chronology of spatial modes [Source: Own figure]

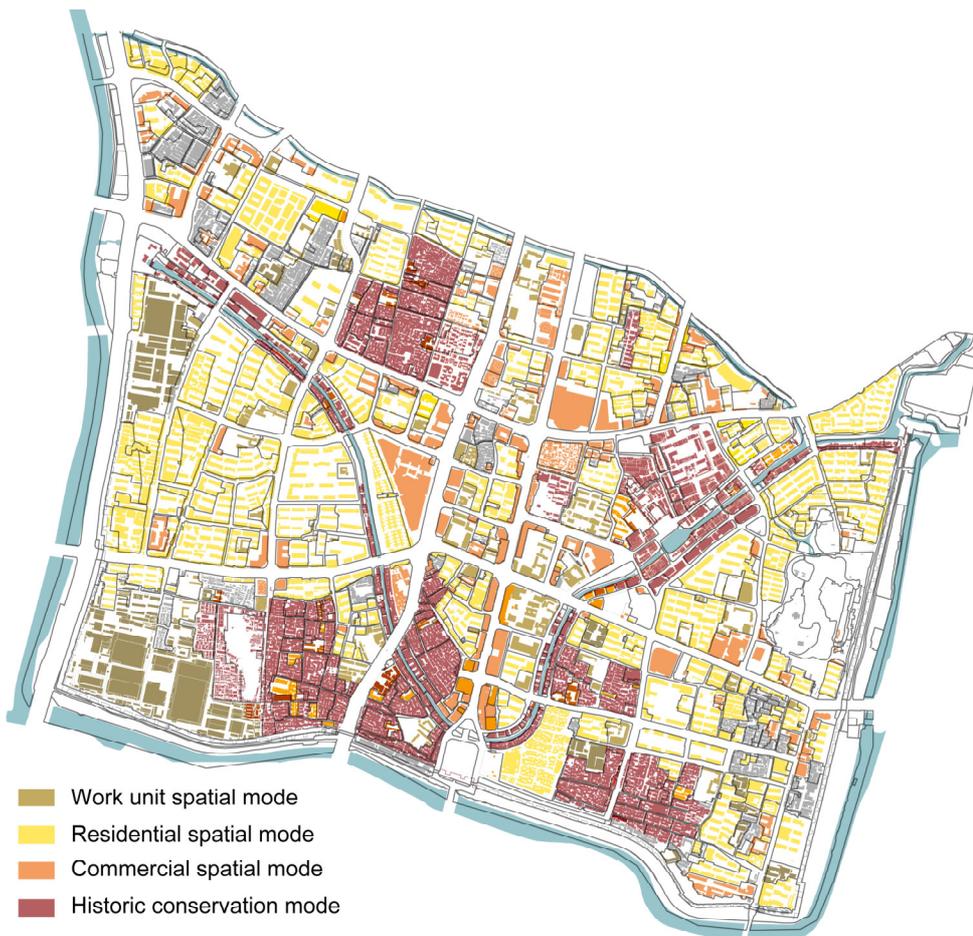


Fig. 3.3: Types and distribution of spatial modes [Source: Own figure]

3.2 Traditional spatial modes

3.2.1 Traditional courtyard buildings

The courtyard buildings is an important component for Nanjing's traditional urban form. Traditional Chinese architecture is generally based on the composition of various buildings around courtyards, and traditional Chinese cities are composed of such courtyard compounds⁴. Affected by the dense population and deficient construction land, Nanjing vernacular dwelling is so compact that rooms are closely linked with each other, forming a coherent roof and inner space. Thus the courtyard is relative small, only meeting the basic demands of lighting and ventilation.

The courtyard buildings serve as a good spatial carrier for the mixed use development of small-business and residence. With the commercial prosperity in Old South area, especially in Confucius Temple area and Nanbuting area, many courtyard buildings developed a typical functional distribution that shops or business are located in buildings facing the street, while the residence is set in the rear. Chaoku Street 38th is a typical commercial building situated on Qinhuai riverside (Fig. 3.13). It is a three-hall building with two open courtyards. Taking up an area of about 600m², the plot has a slender shape with the width of 16m and the depth of 40m. The buildings are two storeys high and reaches a FAR of 1.5.

Generally speaking, the plan and structure of traditional courtyard buildings prototype in Nanjing is highly modularized, which obviously draws an influence on its plot size. A courtyard, together with the joint hall and side rooms, constitute a basic building unit. In this sense, courtyard buildings develop relatively fixed scale and form. And the plot correspondingly develops a law of scale.

There exists a sophisticated correspondence between the plot shape and the building form. Fig. 3.4 shows a block located in Nanbuting area. The small-scale and narrow plots are arranged along the block boundary, forming a plot series facing the street. The frontage and side boundaries of plot are almost covered by buildings, leaving no front yard and side yard.

The plot depth depends on the number of courtyards in longitudinal direction. In Old South area, the plot depth of traditional courtyard house generally ranges from 20m to 60m, corresponding to a one-courtyard compound to a four-courtyard compound (Fig. 3.4). The plot depth increases by 11m to 14m from each additional courtyard (Tab. 3.1).

Relative to plot depth, traditional plot has small plot width. The plot frontage is generally between 10m and 16m. The plot width increases with the addition of courtyard series along the plot frontage. For example the dwelling containing two plot series has a plot width of 16m. For the block in Fig. 3.4, a majority of plot width is smaller than 16m, in other words, most of plot frontages accommodate one or two plot series.

The proportion of megaplot is very small in the traditional plot pattern which was formed under the private land ownership. For example, a typical two-courtyard compound only covers an area of about 600m², while the largest residential plot in Old South area, Ganxi's former residence, is not larger than 6000m². In addition, some public service organizations, including administrations, temples, guild halls also bared large plot size, but generally the number of plots larger than 5000m² is small.

⁴ Wu, L. (1999).



Fig. 3.4: The sophisticated correspondence between the plot shape and the building form

Tab. 3.1: The growth of plot scale [Source: compiled by the author]

Scale element	One-layer courtyard	Two-layer courtyards	Three-layer courtyards	Four-layer courtyards
Width(m)	9.21	16.33	7.9	15.81
Depth(m)	19.5	32.3	49.8	60
Area(m ²)	166	541	516	956
Morphology				

3.2.2 Modern architecture in the republic period

During the Republic of China, western architectural form was gradually introduced into Nanjing. Despite a developed civil area characterized by traditional courtyard buildings, Old South area still witnessed the emergence of some modern architecture, including public buildings like cinema, banks and office buildings, and general residential buildings. In this period there was no big changes of the general plot size as the private land ownership continued. Except the new building form, modern architecture brought about the growth of building height, with residential buildings generally two storeys high and commercial buildings three to five storeys high. Buildings were also required to be sited on the plot frontage leaving no side yards so that continuous street frontages could be remained.

The former site of SHCS Bank⁵ was originally built in the 1930s. With an area of 1100m², the triangle plot is located in the street corner. Two street frontages are respectively 60m and 27m wide. The building is originally three storeys high⁶, in part five storeys, reaching an total floor area of 3400m². The plot is totally covered by the building, leading to a relative high FAR of 3. The building footprint basically corresponds to the plot shape, with a small setback distance. A five storey tower is set in the corner, forming a continuous and rhythmed urban interface (Fig. 3.14).

⁵ SHCS Bank, Shanghai Commercial and Saving Bank.

⁶ An extra storey was added in the 1980s.

Constructions in the republic period had been controlled by zoning system. The City Plan of Nanking for the first time established the zoning system in 1929 which included regulations on the building height, plot area, building facade, building coverage and so on. For example, the building of SHCS Bank was located in the area where was classified as second-class commercial zone. It must follow specific morphological prescriptions for this zone: The building height should be no more than five storeys; In commercial area the side yard was not allowed and the rear yard was at least 7m in depth; The maximum building coverage rate was 60%. Obviously, all these regulations were reflected in the practical building form.

In fact the number of modern architecture in Old South was so limited. Despite a remarkable variation of building form, the plot shape and the relationship between the plot and the building had few changes. Generally speaking, these modern architecture did not significantly affect the overall urban form which was still dominated by traditional courtyard buildings before 1949.

3.3 Work-unit spatial modes

Work-unit spatial modes are the predominant spatial mode in the period of command economy(1949-1990). Work-unit (*Danwei*) refers to a place of employment during the period when the Chinese economy was still more heavily socialist. Prior to Chinese economic reforms in the 1980s, it acted as the first step of a multi-tiered hierarchy linking each individual with the central Communist Party infrastructure. Above all, work-units were the principal method of implementing party policy. Most factories, schools and government offices were organized under this system.

Work-unit has functioned not only as workplace but also the principle social institution in which the lives of most urban residents are organized. As each work-unit created its own housing, child care, schools, clinics, shops, services, post offices, etc, workers were bound to their work-unit for life⁷. By 1978 around 95% of urban workers belonged to a work-unit of one kind or another.

After 1990 when China started a series of economic and social reforms, the influence of work-unit system gradually reduced with great relocation of industrial space from the old city. A large amount of industrial land was redeveloped for residential or commercial use since the late 1990s. However, Old South area still keeps a quite proportion of work-unit space, which can be further subdivided into three subordinate modes, large factory, neighborhood factory and public service compounds.

⁷ Wikipedia. Work-unit. (2017). https://en.wikipedia.org/wiki/Work_unit/Accessed 2017.02.7.



Fig. 3.5: Distribution of industrial land in early 1980s [Source: Made by the author according to the statistics in *Annal of Nanjing Urban Planning* (2008)]

3.3.1 Large factory

Large factory is the most typical work-unit spatial mode. Old South area as a developed area has only limited land for large-scale industrial development. In the early 1950s the area along the city wall, especially in the southwest corner were almost farmland. Under the guideline of infill development, this area was expropriated for the development of large factories. There are two typical large factories in Old South area: Nanjing Second Machine Tool Plant and Nanjing Printing and Dyeing Mill. The former was an adaptation of Jiangnan Mint which was originally established in 1987, while the latter was constructed in the 1970s.

The common physical features of large factory can be summarized as: (1). a walled and gated enclosure; (2). a well-integrated internal circulation system; (3). close association of work and residence; (4). a high level of provision of social facilities; and (5). rationalist architectural layout and style⁸.

Both large factories in Old South area take up a large area: Nanjing second machine tool plant is about 12ha and Nanjing printing and dyeing mill is about 22ha. However these vast factories, enclosed by brick walls or the city wall, were separated from surroundings. People or vehicles can only enter the factories through several main gates.

Large factory establishes its own internal circulation system. Rather than following the regular gridiron street system, internal streets are laid out in a flexible pattern to fit the geography and particular needs of the unit. But the internal circulation system cannot be connected into the urban road system and is not accessible to urban traffic.

A typical large factory integrates workplace, residence, and social facilities in close proximity within one or several walled compounds. In the two factories in Old South area, residential areas are located next to production areas. In addition, a variety of service facilities are set inside the residential areas, including hospital, kindergartens, shops, primary schools, sport fields, restaurants and banks. As a result, many unit residents can carry out their daily business within the unit compound, although some do daily travel beyond the unit walls.

⁸ Cf. Lu, D. (2006).

Although inside the large factory there are various building types including residence, production and public service, most buildings generally follow the rationalist design doctrines and are characterized by modern brick and concrete structures. Production plants are almost large rectangular structures. With the largest building height of 6 storeys, they are arranged in an orthogonal grid. The unified north-south building orientation is basically for pragmatic concerns like ventilation and lighting.

The period of great industrialization ended for a long time, but the large factories were kept as a typical spatial mode in particular historic moment. With the relocation of industry from the old city after 2000, the production of both large factories has been halted. According to the Conservation Plan of Nanjing Industrial Heritage made in 2017, both factories are listed as protected industrial districts, in which the building layout and some old factory buildings should be protected. Their re-utilization has become an important issue concerning the overall conservation of Old South area. After 2011 Nanjing second machine tool plant was transformed into a creative industry park. The whole production area, even slogans of industrial production, is completely protected, and some plants are renovated into contemporary office space, aiming at attracting businesses in the field of industrial design, cultural creativity, and technology research and development⁹. Currently Nanjing printing and dyeing mill is also under a renovation, combining the protection of some plants and the addition of new buildings. It will also be transformed into a cultural industry park.

3.3.2 Neighborhood factory

Apart from two large factories, there was vast amount of small and medium sized neighborhood factories scattering in the built-up area. Most of them were established spontaneously by basic level administrations during the Great Leap Movement (1958-1962), then gradually expanded the production scale and developed into regular factories. By the end of 1970s there was almost 80 neighborhood factories, manufacturing various kinds of products including textile, plastics, machine and clothing. According to Fig. 3.5, most of neighborhood factories were distributed along the arterial roads.

The largest feature of neighborhood factory is that they inherited existing medium and large plots in the historic urban area. As most of these factories, organized by basic level administrations, could not get the land from legal government-led expropriation, they had to take best advantage of developed land and make readjustments of existing buildings. In other words, some temples, government offices and public institutions as well as houses of the rich, due to their large plot size, were most likely to be transformed into factories. In some cases, productions were made directly in existing buildings without much adaptations.

In Old South area, the average plot size of neighborhood factory mode is about 8300m², and the largest plot size is no more than 15000m². For industrial production it is a medium and small scale, but compared with residential or commercial plots, it still belongs to a megaplot. In addition, the average plot width reaches 80m. In some cases, say, Yarn-dyed fabric mill even has a plot width of 130m, indicating that big plot width is another feature in terms of the plot shape¹⁰.

The building layout of neighborhood factory shows an adaption to the plot shape. Wall is built along the plot boundary in order to generate an independent production compound. Generally only one entrance is set, leading to the central yard. Buildings are sited on the plot boundary, facing the central yard. As most

⁹ Nanjing Second Machine Tool Plant Historic Landscape area (<http://www.guihuayun.com/read/3685>).

¹⁰ The statistics of neighborhood factories is calculated according to the distribution of industrial land in 1980 (Fig.9).

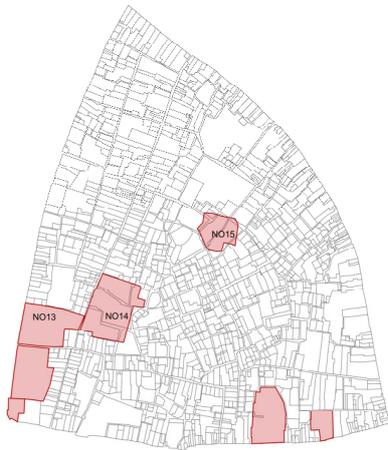
neighborhood factories were spontaneously constructed without any unified planning, buildings of different times often coexist.

Nanjing Yarn-dyed Fabric Mill is a typical neighborhood factory (Fig. 3.16). With the plot area of 12000 m², it was built on the site where had been originally a large nursing home before 1949. Original buildings had been teared down in the 1950s and replaced by new plants. With the highest building of five storeys, the factory reaches a FAR of 1.7. The factory is composed of three parts, the plants on the east, narrow middle yard connecting the main entrance, and the subsidiary rooms in the west.

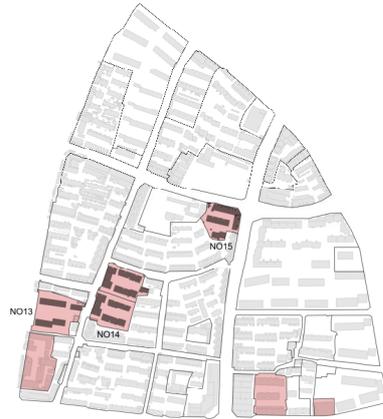
Promoted by the reform of state enterprises and readjustment of industrial structure in the urban center, the transformation of industrial land sped up in the late 1990s. A large number of neighborhood factories were the primary target of transformation. In that period, residential and commercial redevelopment were the predominant way of transformation. As the land development right in most cases was obtained in the form of private agreement between the developer and the factory, these industrial plots were not expropriated by government and put into the process of land banking system in which a plot redivision is required. Thus the form of industrial plots were almost kept. According to Fig. 3.6, the plots No. 13, No. 14 and No. 15 in Chuanban Alley area were examples that the land of neighborhood factories were redeveloped into residential areas. Even under the condition that the road structure was totally reconstructed, the form of industrial plots were basically kept. Fig. 3.7 shows cases of commercial redevelopment that plots No.35 and No.36 along Changle Road were transformed into the shopping mall and the covered market.

With the development of cultural industry and improvement of industrial heritage conservation in Nanjing, the reutilization of industrial buildings became an alternative for the transformation of industrial land by the late 2000s. At that time a majority of neighborhood factories have been redeveloped. Even so some surviving plants situated in adjacent to historic districts got the opportunity for the reutilization. For example, the main plant of Nanjing Yarn-dyed Fabric Mill has been converted to Jinling Art Museum, which is currently a tourist attraction in Mendong historic district (Fig. 3.8).

It can be seen that although neighborhood factories has withdrawn from the historic arena, through redevelopment or reutilization, this spatial mode has still left its mark on contemporary urban form, either in the form of plot shape or the protected buildings.



(1). Industrial plots in 1950s



(2). Residential redevelopment in the late 1990s

Fig. 3.6: Commercial redevelopment of industrial plots

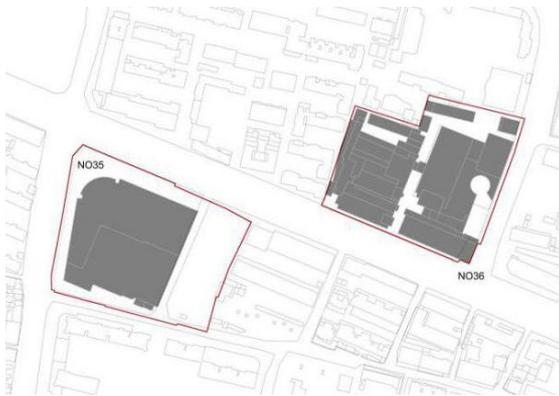


Fig. 3.7: Commercial redevelopment of industrial plots

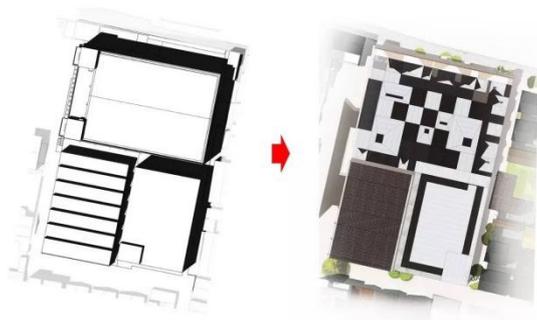


Fig. 3.8: Nanjing Yarn-dyed Fabric Mill [Source: Renovation of Jinling Gallery, <http://fmddd.com/article-1377-1.html>]

3.3.3 Public service unit

Apart from the factories, a large number of public service institutions constitute the third subordinated spatial mode of work-unit. Typical public service organizations include governmental and administrative organizations, schools, kindergartens and hospitals. In the period of command economy, they are distributed in

communities according to the quota of service population (except the governmental organizations). The scale of public service unit is generally smaller than neighborhood factory. But they have similar source of construction land, as many public service organizations were established based on the expropriation of existing temples, government offices, guild halls, and mansions.

Taking Yanliao Fang area as an example, several kinds of public service units are distributed in this commerce-led area, including kindergarten, primary school, middle school, hospital and telecom company, taking up nearly 10% of the whole area. Because of the differences concerning function and service hierarchy, the plot size of different units varies, ranging from 850m² to 11700m². But as the average size of all 6 plots within this area is close to 5000m², the plot scale of public service unit is still very large. The plot of Qinhuai Hospital, located on the side of a local road, bares the plot area of 4747 m² and the plot width of 57 m (Fig. 3.17). With the highest building of 5 storeys, the hospital reaches a FAR of 1.6. The yard takes up quite a large proportion of the plot, leaving a small building coverage rate of only 31.6%. The building layout of the hospital has typical characteristics of “work-unit compound”: enclosed by wall, the entrance leads to the central yard, through which the buildings of north-south orientation are organized together. The buildings are generally located inside the plot instead of sticking to the plot boundary (the setback distance serves as the green space and parking). On this condition, the relationship between the building and the street is weak, intensifying the closure of work-unit compound.

Work-unit spatial mode held the dominant position in the period of command economy before 1990. Although the proportion of industrial land has had a dramatic reduction in recent years with the changing urban development orientation, this mode is still a significant component of contemporary urban form.

The influence of work-unit spatial mode is mainly manifested in three aspects. Firstly, the protected factories and industrial buildings. Promoted by the improvement of industrial heritage conservation, reutilization of industrial buildings taking place of thorough redevelopment has become the major method for the transformation of industrial land since the late 2000s. For large factory mode, Nanjing Second Machine Tool Plant has been renovated into a creative industry park; for neighborhood factory mode, Nanjing Yarn-dyed Fabric Mill has been transformed to Jinling Art Museum.

Secondly, the preserved industrial plots. Although a large amount of neighborhood factories were redeveloped for residential and commercial use in the early 2000s, the industrial plots were preserved as most of them were directly transferred to developers in the form of private agreement instead of governmental expropriation which leads to a plot redivision.

Thirdly, the big influence of work-unit mode on other spatial modes. Work-unit spatial mode was the first spatial mode generated in the urban renewal of the historic urban area since 1949, completely overturning the traditional land development mode and spatial form. A series of characteristics generated in this mode, including self contained development, excessive plot scale, unified construction, pragmatic building layout and building form, were learned more or less by subsequent residential and commercial spatial modes. In this sense, the role of paradigm has even larger effect on the morphological evolution of the historic urban area than the work-unit spatial mode itself.

3.4 Residential spatial modes

3.4.1 Multistory microdistrict

The housing construction of Nanjing stagnated for a long time after 1949. As residential development was largely suppressed by industrial construction, many traditional dwellings were in a state of disrepair. The economic reform since the 1980s finally led to the revival of urban development. According to the statistics in the beginning of the 1980s¹¹, 69% of traditional dwellings needed a renovation or renewal. On this condition, housing construction became a very urgent task of urban development.

Under the planned economy, Nanjing government proposed the comprehensive development mode to take place of the previous project-based development mode¹², which was considered more efficient in promoting the large-scale overall reconstruction. Comprehensive development mode follows the principle of “six unification”, namely the unification of planning, design, investment, construction, distribution and management¹³. The reconstruction of Confucius Temple area is the most typical comprehensive development in the 1980s, which not only renovated the damaged historic landscape, but also accelerated the housing construction in this area. Following the principle of six unification, the local government was completely responsible for the planning and development, including the selection of project location, land allocation, as well as development intensity. Housing construction was not an independent development task. Instead its development should be combined with road construction and public service facilities construction.

The application and prevalence of microdistrict schema was one of the most prominent features of housing construction in the 1980s. Microdistrict schema was first introduced from Soviet Union in middle 1950s and applied in the masterplan of Beijing in 1957. But it was not widely accepted and spread in the period when the industrial construction completely dominated the urban development. Promoted by the new mode of land development and the revival of urban housing construction in the 1980s, microdistrict schema finally regained its vitality. As it met the governmental requirement of large-scale, efficient and unified construction, microdistrict soon became the predominant planning model for urban residential development all over the country.

Microdistrict is a self-contained residential complex, designated as a primary structural element of Chinese residential area system (Tab. 3.2)¹⁴. A typical microdistrict covers the area of 10ha and provides dwellings for a population of 10000-15000. Major motor roads, greenways or natural obstacles serve as boundaries of a microdistrict. But inside the microdistrict an independent internal traffic system should be established so that the through traffic can be excluded. A microdistrict is comprised of residential dwellings and public service buildings. Typical public service structures include secondary schools, pre-school establishments (usually combined kindergarten and nursery), grocery stores, personal service shops, playgrounds, and building maintenance offices, as well as a number of specialized shops¹⁵. The scale of service facilities

¹¹ The statistics is from the Master Plan of 1983.

¹² According to the Summary of National Urban Planning Conference in the end of 1980, comprehensive urban development was a reform for the management of urban construction, which was favorable to the realization of urban planning, land saving and making full use of investment.

¹³ Nanjing Urban Construction Annal (1994).

¹⁴ Chinese residential area system is mainly composed of three levels, the residential district, the microdistrict and the cluster.

¹⁵ Wikipedia. Microdistrict. (2017). <https://en.wikipedia.org/wiki/Microdistrict>/Accessed 2017.12.6.

depends on the population density and service distance requirement. Chinese microdistrict is often enclosed by a wall, with the entrance gate being guarded. It's compulsory to set aside a percentage of green space within the microdistrict. In many cases, the green space is connected with public service facilities, forming a public activity center.

According to the planning theory of microdistrict, block serves as the basic unit of land development. In the 1980s there are mainly four microdistricts constructed around Confucius Temple area, including Bailu, Diaoyu Alley, Sifu Alley and Pipa Alley (Tab. 3.3, Fig. 3.9). The practical plot size of microdistrict in the historic urban area was smaller than the ideal scale, as the area of most microdistricts ranges from 2ha to 4ha.

A majority of microdistricts constructed by local government or Work Unit during the 1980s and the 1990s are welfare housing aiming at relieving the problem of housing shortage. Coupled with the land scarcity for redevelopment, local government adopted the policy called "on-the-site placement" to cope with the dwelling distribution, which meant that microdistricts had to be constructed on the site to resettle the original residents, rather than being relocated out of the old city. It further led to the multistory and high-density development characteristics. Taking Diaoyu Alley microdistrict as an example (Fig. 3.18), with the average five-storey building height, its FAR reaches 2.63 and the building coverage rate is 43%. Its building density is remarkably higher than those microdistricts built after 2000.

The building layout of multistory microdistrict is characterized by rows of slab buildings in north-south orientation. As the average building height is five to six storeys, the front building interval generally reaches about 14m and the side building interval is about 8m, meeting the basic requirements of ventilation and light. But the pursuit of higher development intensity was at the expense of reducing the green space and public activity space. Located in the vicinity of historic core, most microdistricts make efforts to remain the continuous street wall. In addition, traditional architectural elements, like slopping roof, wharf wall, black brick and small tile were applied onto the facade so that they could be in line with the overall atmosphere of Qinhuai River Scenic Belt. In any case, the microdistrict schema molded during the 1980s became a standard and paradigm of residential redevelopment and rapidly transformed the urban form of the historic urban area since the 1990s.

Tab. 3.2: Chinese residential area system [Source: Adapted from Code of urban Residential Areas Planning and Design GB50180-93 (2002), Lu, D. (2006)]

Level of residential grouping		Cluster	Microdistrict	Residential district
Number of households		300-1000	3000-5000	10000-16000
Number of residents		1000-3000	10000-15000	30000-50000
Land-use composition	Residential(RO1)	70-80%	55-65%	50-60%
	Public facilities(RO2)	6-12%	12-22%	15-25%
	Transportation(RO3)	7-15%	9-17%	10-18%
	Parks and open spaces(RO4)	3-6%	5-15%	7.5-18%

Tab. 3.3: Development intensity of typical microdistrict in 1980s [Source: Annal of Nanjing Urban Construction]

Microdistrict	Site area(ha)	Relocation area(m ²)	Floor area(m ²)	FAR	Floors	Relocated House- hold	Plan Household
Bailu	9.87	62254	127100	2.04	3-5	1678	2169
Diaoyu Alley	3.42	27761	73026	2.63	5	785	1243
Sifu Alley	2.27	22891	55300	2.42	5-6	680	850
Pipa Alley	3.6	26426	72000	2.72	6	867	1100

The establishment of Land Use Right system (LURs) and market economy in the early 1990s promoted the emergence of real estate market in Nanjing. Housing construction no longer simply relied on the governmental investment. Instead, state enterprises, private developers and foreign developers were all allowed to engage in real estate development, which greatly accelerated the renewal of urban housing all over Old South area. The area of residential redevelopment during the 1990s amounted to about 76ha, far more than that in the 1980s.

The distribution of the residential redevelopment in this period had two features. Firstly, a large number of microdistricts are distributed along arterial roads because the large-scale road construction in the 1990s constituted the direct power of urban renewal¹⁶. For example, Chuanban Alley area, where the road structure was reconstructed, was thoroughly redeveloped into a modern residential area. Secondly, some scattering residential land were transformed from industrial land because of the industrial restructuring.

Although the real estate market had been established in 1992, the welfare housing system and the commercialized housing system constituted a dual system before the reform of housing system in 1998. In fact, a majority of microdistricts constructed in the 1990s belonged to the welfare housing. Above all, Laifeng microdistrict with the area of 8.5ha was an achievement of welfare housing construction in the 1990s and is also the largest residential area ever built in Old South area. Consequently, multistorey microdistricts occupied about 60% of urban fabric by the end of the 1990s, revealing an essential change of historic urban form.

¹⁶ Multistorey microdistricts are mainly distributed along Jiqing Road (reconstructed in 1991), Xianhe Street, Shuangtang Road (constructed in 1995), Zhonghua Road (reconstructed in 1995) and Madao Street (reconstructed in 1999).

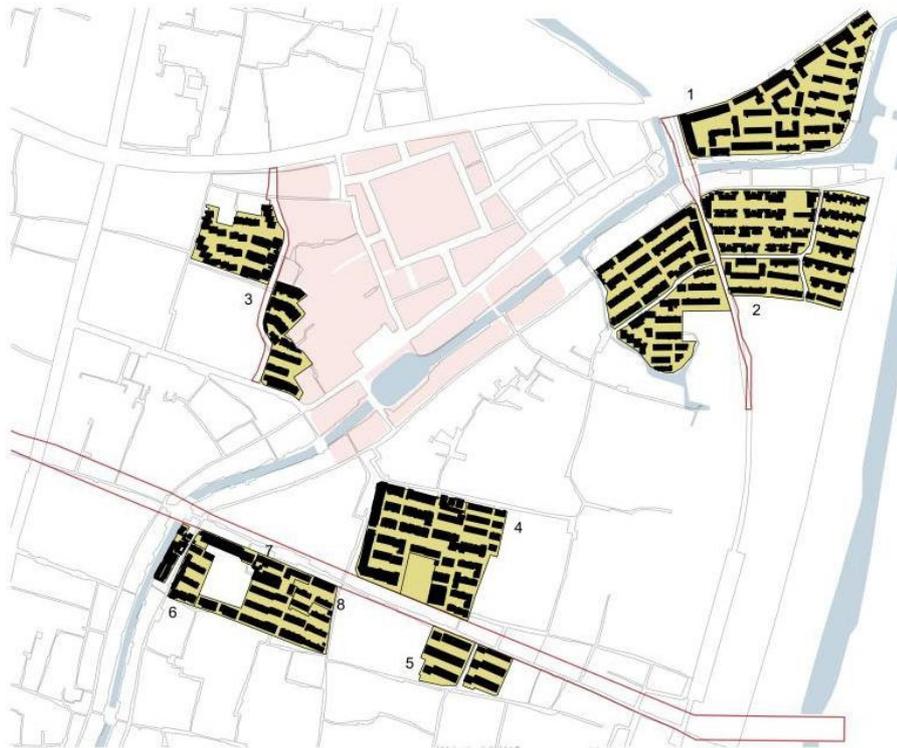


Fig. 3.9: Housing constructions in Confucius Temple area in the 1980s [Source: Made by the author according to Nanjing Yearbook in the 1980s]

3.4.2 Highrise microdistrict and highrise apartment

China launched the reform of urban housing system in 1998¹⁷, claiming the end of welfare-oriented public housing distribution system. Thus residential development realized the complete commercialization, marketization and monetization. Since then the commercial housing development in Nanjing went on the fast track. In 2003 the real estate industry was officially defined as a backbone industry of Nanjing.¹⁸ By 2009 the added value of real estate industry contributed to 18% of Nanjing's GDP growth¹⁹. On this condition, local government enthusiastically supported the residential redevelopment, including the redevelopment in the historic urban area.

The development of commercialized housing in Old South area reached the peak in the decade from 2000 to 2010. The redevelopment, mostly distributed along Qinhuai river, Yundu river and the city wall, was made in the name of modifying the old city, emphasizing large-scale renewal of traditional areas.

The scale of residential redevelopment in the 2000s increased remarkably. Although the total area of residential redevelopment was smaller than that in the 1990s, the average size of residential plot reached up to 1.2ha, double size of the 1990s. In addition, the maximum single plot increased spectacularly to 4.9ha, which is definitely beyond the acceptable range of the historic urban area. The land speculation during the

¹⁷ Circular of the State Council on Further Deepening the Urban Housing System Reform and Accelerating Housing Construction (No. 23 [1998] of the State Council).

¹⁸ Circular of the State Council on Promoting the Continuous and Healthy Development of the Real Estate Markets (2003) illustrated that "the real estate industry has a high degree of conjunction and strong driving force, which has become the backbone industry of the national economy."

¹⁹ Nanjing Annal (2010).

ten years was almost out of control, heavily damaging the historic plot pattern. This problem largely attributed to the essential difference between the commercialized housing construction and the welfare housing construction. Under the commercialized residential development, developers instinctively want to get larger plot in order to maximize the profit. The local government, which should have been responsible for the control of plot size, yet encouraged the leasing of megaplot in order to get more land revenue. Thus a vicious circle formed.

The highrise microdistrict and highrise apartment were the main spatial modes of residential redevelopment during this period (Fig. 3.10, Tab. 3.4). According to Nanjing's urban planning regulations, buildings higher than 24m (6F) is defined as the highrise building. There is a further subdivision: buildings with the height between 24m and 35m (7F-11F) are defined as small highrise residential buildings; and those higher than 35m (12F) are defined as highrise residential buildings. According to this standard, the small highrise residential areas are mainly distributed in the south of Shengzhou Road-Jiankang Road where the building height limit is very strict. Highrise microdistrict and highrise apartment are mainly distributed on the north of the two roads. Above all, the largest building height of two residential areas, Jin Ding Wan and Luo Ma Jia Ri reach up to 33 storeys, generating a significant contradiction to the historic urban form.

Huang Ce is a typical highrise microdistrict (Fig. 3.19). With the site area of 7ha, it is composed of three plots, in which the largest one is about 49000m². As a gated community, urban roads can not extend through the microdistrict and hardly integrate with the internal traffic system. As a result, the road density of this area had a large reduction.

Huang Ce highrise microdistrict basically follows the law of building layout formed since the 1980s which is characterized by north-south rows of slabs. The average building height is 11 storeys and the FAR reaches 2.8, indicating a larger development intensity. However, the building density has a remarkable reduction. Compared with the multistorey microdistrict in the 1990s, the building interval of Huang Ce is much wider, leading to the low building coverage rate of only 26%. This change is not only due to the improvement of building height, but also due to the requirement of commercialized residence on larger green space and living privacy.

If we say that multistory microdistricts in the 1980s and 1990s more or less took consideration of the continuation of street frontages, then highrise microdistricts almost show neglect of the historic context. Almost all highrise microdistricts no longer required buildings to be filled onto eastern and western plot frontages, while the southern and northern plot frontages are also damaged by excessive building interval and building setback distance. Obviously, the relationship between the microdistrict and the urban street is increasingly weaker, in other words, all these microdistricts seem to be self-contained entities.

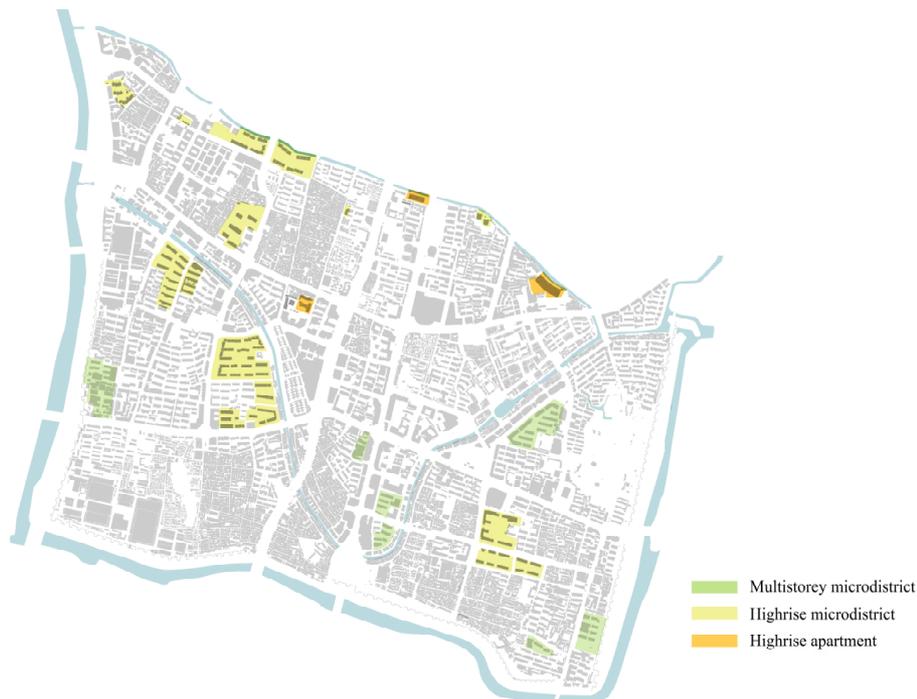


Fig. 3.10: Residential development in Old South area (2000-2010)

Tab. 3.4: Highrise microdistricts and highrise apartments developed in the 2000s [Source: Compiled by the author]

Residential area		Building height	FAR	Site area(m ²)	Floor areas(m ²)	Year
Highrise apartment	Luo Ma Jia Ri	33F	4.9	7346	36000	2005
	Jing Long	26F	4.2	8000	33568	2010
	Yin Da	16F	5.6	4300	24157	2000
Highrise microdistrict	Jin Ding Wan	33F	2.51	45000	115000	2009
	Tong Yu	16F	2.8	60000	168000	2000
	Heng Long	17F	2.89	25840	74692	2007
	Tao Yuan	14F	2.53	40000	100000	2005
	Huang Ce	11F	2.85	70000	200000	2005
	Hua Jing	11F	2.1	10875	22837	2005
	Hong Tu	11F	1.39	50000	69500	2005

Highrise apartment is the other typical spatial mode of residential redevelopment in the 2000s, which is mainly distributed in the north part of Old South area. Compared with the highrise microdistrict, the plot size of highrise apartment is smaller, though basically larger than 5000m². Taking Luo Ma Jia Ri as an example (Fig. 20), this typical highrise apartment takes up the area of 7346m². With the maximum building height of 33 storeys, it reaches a FAR of 4.9, revealing a much higher development intensity than highrise microdistricts. The building form of highrise apartment is generally characterized by the combination of podium and tower. The podium is generally for commercial use, while the upper tower is for residential use. But this form still conflicts with the historic urban form. Though the podium could mold the street frontage better than microdistrict, the increasing tower damages the three dimensional spatial relationship of the historic urban area.

The development of highrise microdistrict and highrise apartment were made in the period lacking rational thinking of development orientation and effective ways of urban planning management. The self-centered spatial modes constantly aggravated the fragmentation of historic urban area. In fact, the selection of residential spatial modes should be based on whether a given mode can be organically integrated into the historic urban structure, rather than a random application of any prevailing spatial modes to renew the historic urban area.

3.4.3 Lowrise residential area

The residential redevelopment went into a new stage after 2010 when Old South area conducted the policy of overall conservation. As the regulation on building height limit was very strict that new buildings must be controlled lower than 24m (about 7 storeys), the possibility of developing highrise microdistrict was eliminated. In fact, even the development of multistorey microdistrict became difficult, because most of the residential redevelopment were located in areas in the periphery of historic districts where the building height is required to be lower than 12m. Under this background, the residential development in Old South area for the first time since the 1980s returned to the lowrise building based mode.

There are mainly three lowrise residential areas developed since 2010, including Changledu district, Niushi residential area and Cang Alley residential area (Fig. 3.21, Tab. 3.5). Their plot sizes range from 2ha to 6ha, all belonging to megaplot. What's more, the plot size seems to keep increasing compared with that of the multistorey microdistrict and highrise microdistrict. Automobile traffic is almost set around the plot boundaries, while the internal traffic system is mainly composed of pedestrians, through which the megaplot is subdivided into several medium scale blocks. Compared with previous multistorey and highrise microdistricts, the internal traffic system of lowrise residential area takes more consideration of the integration with the overall urban structure, revealing a progress of conservation concepts. For example, some historic alleys have been protected and renovated into pedestrians.

With the reduction of building height, the development intensity of residential area also fell remarkably. The average building height of all three lowrise residential areas was two storeys (at most three storeys in some parts). Although their building coverage rate rose to 40%-50%, the FAR is only 0.8-1, dropping remarkably. The townhouse is widely applied in the lowrise residential area, as two townhouses can generally splice into a similar plan of a traditional courtyard dwelling. In addition, this building type creates continuous street walls and small building setback distance. Thus the building footprint of lowrise residential area can be better integrated into the historic urban form, which is a large progress compared with previous multistorey and highrise microdistricts.

Tab. 3.5: Morphological and development indexes of three typical lowrise residential areas [Source: Compiled by the author]

Lowrise residential area	Plot size	Floor area	Building height	FAR	Building Coverage
Changledu district	59900	58900	2F	0.98	49%
Niushi	41700	33300	2F	0.80	40%
Cang Alley	27300	23480	2F	0.86	43%

Tab. 3.6: Transformation of residential plot scale [Source: Compiled by the author]

Year	Development background	Total renewed area(m ²)	Average plot size(m ²)	Max single plot size(m ²)
1980s	Reconstruction of Confucius Temple area	285,298	6958	38,594
1990s	Road construction; Transformation of industrial land	764,922	5464	34,788
2000s	Commercial housing development; Modification of the old city	390,029	12188	46,058



(1). Residential development in the 1980s



(2). Residential development in the 1990s



(3). Residential development in the 2000s



(4). Residential land in 2010

Fig. 3.11: Transformation of residential land distribution in Old South area

The residential renewal in Old South area since the 1980s experienced several stages from welfare housing construction to commercialized residential redevelopment, from the pursuit of multiple and highrise micro-district to the return of lowrise residential area (Tab. 3 .6). The introduction of microdistrict schema essentially redefined the predominant residential spatial mode in the historic urban area. In the subsequent thirty years the evolution of residential spatial modes are almost based on the readjustment of microdistrict schema. In this sense, microdistrict schema plays a significant role in the transformation of historic urban form.

Microdistrict schema also led to great changes of the plot size. In last three decades, the scale of residential plot keeps increasing, while the development intensity reached the peak during 2000s. However, during the period of rapid residential renewal, there existed a deficiency of urban planning control on both the plot shape and the building form, leading to difficulties for renewed microdistricts to integrate with the historic context. In morphological terms, residential areas seem to be self-contained entities, aggravating the fragmentation of historic urban area.

3.5 Commercial spatial modes

3.5.1 Podium

In the period of command economy from 1949 to 1992 the commercial development was largely suppressed. Instead of an independent land use type, commercial land was only a subtype of public service land. The location and scale of commercial space were based on the government-led plan which emphasized the service population and service radius. Under this background, the commercial space in Old South area was quite limited, mainly distributed in Confucius Temple area and Sanshan street. According to the commercial center system established in the master plan of 1983, Confucius Temple area was categorized as the sub commercial center, and Sanshan street was the district level commercial center.

The redevelopment of Confucius Temple area was the major commercial development in the historic urban area in the 1980s. Sitting on Qinhuai river, this area had long been the commercial, cultural and recreational center of Nanjing before 20th century. As the focus of urban development moved northwards, the significance of Confucius Temple gradually declined. As the urban development of Nanjing got back on track from political turmoil and the significance of Nanjing as a famous historic city was confirmed by the master plan in the early 1980s, the municipal government started the reconstruction of Confucius Temple area, the most typical cultural landscape of Nanjing, which greatly promoted the local development of commerce and tourism.

The principle of redevelopment aimed at recovering the traditional commercial, cultural and recreation center with the core area of 6 ha. Centering on the renovated Confucius Temple, the T-shape commercial streets with antique style were reconstructed. The traditional street pattern and vernacular architectural elements were specially remained. As the business type must be in accordance with the historic context, traditional commerce and tourism took the predominant position. Along the commercial pedestrians a series of special markets (souvenir market, birds and flower market), restaurants, snack bars, hotels and clothing stores are distributed.

The reconstruction of traditional commercial street adopted the spatial mode of podium. As the reconstruction was under a comprehensive development which prevailed in the 1980s and emphasized the unified construction according to the detailed plan, the plot pattern was redivided and a batch of medium sized plots were generated. The medium scale spatial mode tried to continue the characteristics of historic space while create larger commercial space. Plot Food Market (abb. Plot FM), located on the entrance of the T-shape commercial street and back to Qinhuai river, is a typical case of podium mode built in the middle

1980s (Fig. 3.22). The plot size is approximately 3000m² and the plot width 60m, equivalently five-fold the width of a traditional plot frontage²⁰.

The podium mode is characterized by a large building coverage rate. In the case of Plot FM, it is more than 70%. As the building height reaches two-to-three storeys, the FAR is about 1.8. In order to continue the historic urban form, adjacent buildings along commercial pedestrian are usually connected with each other by a common sidewall, and the front building setback is very small. But in periphery areas, both the building setback and the building interval are relatively larger. This variation is also reflected on Plot FM that it has different building setback distances in the north (facing commercial pedestrian) and west (facing local road). In the reconstruction of Confucius Temple, most buildings adopted the archaized building form, which are not always strictly in accordance with the form and scale of traditional courtyard building. For example, the courtyard layout is often used on the top floor or roof floor, slope roof and vernacular building facade are also required.

In the 1990s the traditional commerce and tourism in Confucius Temple area continued to develop. Above all, the podium mode was used in most redevelopment projects. Although there was a growth of building height into maximum seven storeys in periphery area, Confucius Temple area still remains continuous street frontage and relative moderate urban scale. By the end of 1990s, the commercial pedestrian area reached into 20ha. And the commercial land took up 28% of the whole area, stimulating the transformation of residential land and industrial land there. Obviously, it is a significant reason for the success of urban redevelopment in Confucius Temple area that the podium constantly serves as the predominant spatial mode in this area.

3.5.2 Slab/Arcade

Apart from the continuous expansion of Confucius Temple area, the other commercial development in Old South area in the 1990s was the reconstruction of Zhonghua Road. Once the imperial street of Jinling City during Southern Tang dynasty (937-976), it is the historic axis of Old South area. Based on the transportation advantage that it long serves as a major city-out road in the south, traditional commerce was prosperous along the road. As it was categorized as an arterial road by the master plan of 1991, the road reconstruction became necessary.

After a pilot project conducted in the south end section in the early 1990s, the detailed planning for the reconstruction of Zhonghua Road was made in 1995. In order to improve the traffic capacity, the road was broadened from 23m to 37m. Thanks to the protection of historic road section and reduction of the demolition, the special building element, the arcade, was applied to both sides of Zhonghua Road, which not only provided the pedestrian space without further extension of road width, but also continued the small and medium scale business.

Slab/Arcade is a typical commercial spatial mode of Old South area in the 1990s. This mode is characterized by the arcade which is generally set on the ground floor of slab buildings. The land along Zhonghua Road was almost redivided based on the detailed plan of reconstruction, generating a batch of plots with large frontage and small depth. Above all, some block sides along the road are occupied by only one flat plot. For example, Plot of Zhan Yuan Emporium (abb. Plot Z) has a large plot frontage of 120m, while the plot depth is

²⁰ The average width of traditional plot frontage is about 8m-16m.

only 20m. With an area of about 3000m², it has similar plot size to that of the podium mode, both belonging to medium sized plots (Fig. 3.23).

Naturally the flat plot shape generates the form of slab building. The slab building, generally three to four storeys high, stands facing the road. The continuous arcade is set on the ground floor where is filled with small and medium scale commerce, while the upper floors are for mixed use of residence and commerce. The slab building has relatively high development intensity. In Plot Z the building coverage reaches 80% and FAR is about 2.8. Due to the application of the arcade, buildings can be sited on the plot frontage. As the block sides along the road almost have only one or two plot subdivisions, coupled with relative small building interval, a continuous street wall is formed along Zhonghua Road. In addition, the building facade encourages a combination of the modern and the tradition instead of an entire antique style. Thus facade design emphasizes the vertical partition so that “*Jian*”, the spatial division unit of traditional Chinese architecture is associated.

The greatest significance of slab/arcade mode is that it was generated under the guidance of the urban design which aimed to protect the historic urban structure. It met the requirements of contemporary transportation and urban development (including the building siting regulations of urban coding), but also remolded the historic urban form organically. If the reconstruction simply followed the contemporary regulations of building setback and building interval without any readjustment, it would be hard to create a continuous street wall, which was proven to be true in the subsequent construction of another artery, Zhongshan Road South. In fact, arcade mode was widely used in the post-war reconstruction of many European cities (especially in some German cities like Munich and Berlin), as it was thought as a proper way to keep the balance between the increasing traffic capacity and the continuation of historic urban structure. Unfortunately, arcade mode was not widely used in subsequent reconstructions in Old South area. As the orientation of urban development transformed, new commercial spatial modes would rapidly changed the traditional cityscape.

3.5.3 Tower

By the late 1990s the status of Nanjing old city as the urban business and commercial center was increasingly strengthened by the transformation of industrial structure, the direct result of economic globalization. “Transformation, upgrading and optimization” became the primary principle of economic development even for the historic urban area. Under this background, the scale of commercial land in the 2000s had a great increase, nearly threefold that in the 1990s. Above all, most of the newly increased commercial land was distributed along Zhongshan Road South and Qinhuai landscape belt.

With the completion of Zhongshan Road South in the end of 1990s, the local district government planned to construct a business district there which would be an aggregation of headquarters and research bases in communication industry²¹. It was one practical measure in realizing the tourism and commerce-led development strategy. With the rapid development of real estate, the development and leasing of office buildings made great contribution to the tax source and finance of local government. Thus the local government even proposed the urban development goal that each subdistricts, one of the smallest Chinese political divisions,

²¹ Qinhuai District Government Work Report in 2004.

should nurture one office building and one urban industry park²². With Zhongshan Road South business district opening in 2003, more and more office towers were built along the urban artery.

Tower is the most typical commercial spatial mode in the early 2000s. Compared with the spacial modes in previous period, the plot size of tower mode kept increasing, with the area ranging from 27000m² to 100000m². The plot frontage is between 50m and 140m. With this scale, one block side generally have no more than three plot subdivisions. Above all, Plot ICBC²³ located on the crossing of Zhongshan Road South and Shengzhou Road was a typical case of office tower development (Fig. 3.24). With the area of 100000m² and the plot frontage of 140m, it is the largest plot of tower mode.

A typical tower mode is characterized by a tower standing on a podium. Generally the tower is more than twenty storeys, while the podium is about five to six storeys. For the case of Plot ICBC, it is totally 28 storeys, including the five storey podium. Despite a low building coverage rate of 38%, this plot has a very high development intensity, with the FAR reaching 4.4.

The other feature of tower mode is the self-centered building siting. According to the Implementing Regulation of Nanjing Town Planning Ordinance, buildings higher than 100m along an urban artery (wider than 30m) has the minimum setback of 25m and minimum side building interval of 18m. As the setback distance is directly related to the building height, the application of podium brings about smaller setback distance and is also in favor of creating continuous street wall. In Plot ICBC, the podium has at least 12m setback distances from the plot boundary, with the tower above further stepping back. It indicates an essential change in regards to the standard of building siting that the building is just placed in the center of the plot rather than based on the relationship to the plot frontage. Furthermore, the self-centered building siting leads to the interruption of street wall. What's worse, some office buildings in later period discarded the podium, having the tower directly standing on the ground with much larger setback distance. These towers, in terms of both the building height and the building footprint, are difficult to be integrated with the historic urban structure.

3.5.4 Complex

With the reinforcement of urban conservation and the change of development orientation, the boom of high-rise buildings in Old South area ended by the middle 2000s. On the one hand, the increasingly stricter control of building height eliminates the possibility of the high-rise building development. According to the Conservation Plan of South Historic Urban Area in 2010, new buildings must be controlled lower than 24m (about 7 storeys). Especially those located in the south of Shengzhou Road and Jiankang Road must be lower than 18m for the sake of keeping traditional spatial scale. On the other hand, the development of business district was considered in contradiction to the conservation of historic urban area. A series of great demolitions of important historic districts since 2006 evoked strong criticism and deep reflection on local development policy. Thus the development priority was gradually turned to culture-based tourism and commerce.

Under this condition, large-scale shopping mall as a new business form began to prevail in Old South area since the middle 2000s. The Aqua City, located in adjacent to Confucius Temple was the first commercial complex in Old South area opening in 2008. Once regarded as a paradigm of redevelopment in the old city,

²² This illustration was the goal of economic and social development proposed by Qinhuai district government in 2003.

²³ ICBC, Industrial and Commercial Bank of China.

it combines diversified functions of shopping, recreation, catering and tourism together, successfully introducing high-end businesses and large-scale indoor commercial space into the historic urban area. In addition, the commercial complex is preferred by local government because it fulfills the governmental desire of launching large scale, intensive and unified redevelopment so that a modern cityscape can be created rapidly. As a result, commercial complex became the preferred commercial spatial mode after 2010 when Old South area started the overall conservation.

One prominent feature of complex mode is the super-large plot scale which generally occupies one block or even several blocks. Plot G3 on the west side of Zhongshan Road South is a typical case of complex mode (Fig. 3.25). Deriving from the amalgamation of three original blocks, this megaplot is about 38000m², the largest single plot for redevelopment in Old South area so far. The main plot frontage facing Zhongshan Road South is as long as 320m without any plot subdivision.

Because of the strict building height limit, the commercial complex of Plot G3 is confined to three storeys with the height lower than 21m. The building height further confined the development intensity. With the FAR of 1.9, it was reduced to the intensity of podium mode in the 1980s, much lower than slab mode and tower mode. On this condition, two spatial operation was made in order to create more business area. In the vertical direction, two underground floors were extended, while in the horizontal direction, the complex covers a majority of the plot, with the building coverage rate reaching 77%. Compared with the tower mode, the building setback distance of complex mode is smaller due to the reduction of building height. In Plot G3, the building setback on the side of Zhongshan Road South is about 7m, while that on the side of western local road is about 2m.

However, it seems still difficult for the integration between the complex and the historic urban form. As the complex stretches across three original blocks, the route of three former alleys were required to be kept as pedestrian ways, but both the scale and the form were totally reset. Only one historic building, Yunzhang Association originally built in 1895, was protected in the large-scale commercial redevelopment. According to the detailed site plan, it will be embedded into the center of the modern complex. The so-called consideration of historic conservation seems to be mainly focused on the application of vernacular architectural elements, like the slope roof and Ma Tau wall, onto building facade.

In fact, the destruction of complex mode on the historic urban form is not only the disharmony in regards to the building volume. More importantly, it promotes the fragmentation of historic urban structure. The mega commercial complex emerges as an urban island that inverts attention, captures all street activity into an air-conditioned interior, and effectively sucks the life from surrounding streets²⁴. As it is like a self-contained entity in which every business demand can be met, it does not need to take care of the relationship with periphery urban space any more.

The commercial development orientation of Old South experienced the great transformation from a traditional commercial center, to a modern business district and finally to a cultural-based tourism and commercial area (Tab. 3.7, Fig. 3.12). Viewing the evolution of commercial spatial modes, it is obvious to see the significant influence of ever-changing development orientations and the upgrading of industrial structure.

Generally speaking, the scale of commercial plot keeps increasing during the last three decades. The average plot size has increased from 2098m² in the 1980s to 3070m² in the 2000s, while the maximum single plot size has increased from 12048m² in the 1980s to 44349m² in the 2000s. The prevalence of complex mode

²⁴ Cf. Shelton, B., Karakiewicz, J. (2011).

indicates that the commercial development in the historic urban area is also based on the megaplot. In other words, the block becomes the basic unit of commercial development.

The transformation of commercial spatial modes manifests that the relationship between the plot and the building is increasingly weaker, which is especially shown in the building siting. The increasing building set-back distance and the building interval tend to make buildings located in the center of the plot rather than stuck to the plot frontage. Thus the building seems to become a self-contained entity without any consideration of the periphery environment although it should be an organic component of the overall urban form. In addition, two major spatial modes since the 2000s, the tower and the complex, with inappropriate building height and building volume, have aggravated the fragmentation of urban form. Above all, this problem is closely related to corresponding regulations in the urban coding.

Tab. 3.7: Transformation of commercial plot scale [Source: Compiled by the author]

Year	Development background	Total renewed area(m ²)	Average plot size(m ²)	Max single plot size(m ²)
1980s	Reconstruction of Confucius Temple area	58,749	2098	12048
1990s	Reconstruction of Confucius Temple area; Reconstruction of Zhonghua Road	187,907	2574	12915
2000s	Zhongshan Road South business district; Reconstruction of Qinhuai River landscape belt	577220	3070	44349



Fig. 3.12: Transformation of commercial land distribution in Old South area

3.6 Historic restoration spatial mode

Historic conservation spatial mode mainly contains two subordinated modes, the traditional courtyard mode and the historic restoration mode. Currently traditional courtyard buildings are mainly distributed in historic conservation areas and some general traditional areas where have not been renewed. Historic restoration mode refers to the new constructions with characteristics of traditional scale and form. Nanjing started its reconstruction of historic landscape as early as the 1980s. A typical example was the antique commercial pedestrian streets in Confucius Temple area. But it only emphasized the antique facade instead of reconstructing buildings with traditional scale and form. By the 2000s, a successful case of historic restoration emerged in the conservation of Nanbuting historic area. As its second phase project, Xi Nan Li, an antique commercial street was built around the national cultural relics, Ganxi former house. New commercial buildings adopted the form of traditional courtyard with a minor expansion of building scale. It was not until 2010 when the development orientation of Old South area turned into overall conservation that the urban restorations that are strictly based on the historic urban ground plan were widely carried out. Under the guidance

of overall conservation, areas that were falsely demolished or renewed before were required to be reconstructed with traditional scale and form so that they could be integrated with the historic districts in the periphery. Currently the historic restoration spatial mode are mainly distributed in Mendong area. Above all, the renovation of Gutong Alley and the reconstruction of Changledu district are two typical cases.

The largest difference between historic restoration mode and the traditional courtyard mode lies in the plot shape. According to the previous analysis, traditional courtyard mode is characterized by a sophisticated correspondence between the plot shape and the building form. Basically, the traditional plot scale is in medium and small size. In comparison, historic restoration mode is based on the reconstruction on the megaplot. For example, the reconstruction of Changledu district was actually a residential redevelopment on the megaplot of 6ha (Fig. 3.26). The megaplot is subdivided into several blocks by the internal circulation system. Each block is subdivided into several renewal units of traditional scale. Under this situation, the restoration must pay attention to the reconstruction of the internal circulation system and the pattern of renewal units except the building form. In the case of Changledu district, there are remarkable differences between the historic pattern and the restored one in terms of the two issues. In order to meet the contemporary standard of building orientation, a majority of renewal units are aligned in north-south direction. The pattern of renewal units is under a standardized subdivision instead of continuing the organic historic pattern. In addition, the reconstruction of internal circulation system took more consideration on contemporary traffic requirements, only in part recovering the original street pattern.

In terms of the building form, the historic restoration emphasized on the restoration of building footprint, including respecting the historic building line, creating continuous street frontages and recovering courtyard based urban fabric. But changes are made in the building height and building floor plan. The buildings in Changledu district are generally in two storeys, with a higher floor height than traditional buildings. Due to the minor growth of road width and courtyard scale, the FAR of Changledu district is about 0.98, revealing a lower development intensity than that of traditional courtyard building mode.

Essentially, the historic restoration mode is a simulation of traditional form on the megaplot. It shows that the transformation of urban form can be better clarified through the analysis of spatial mode, a combination of plot shape and building form, than a simple research of building typology.

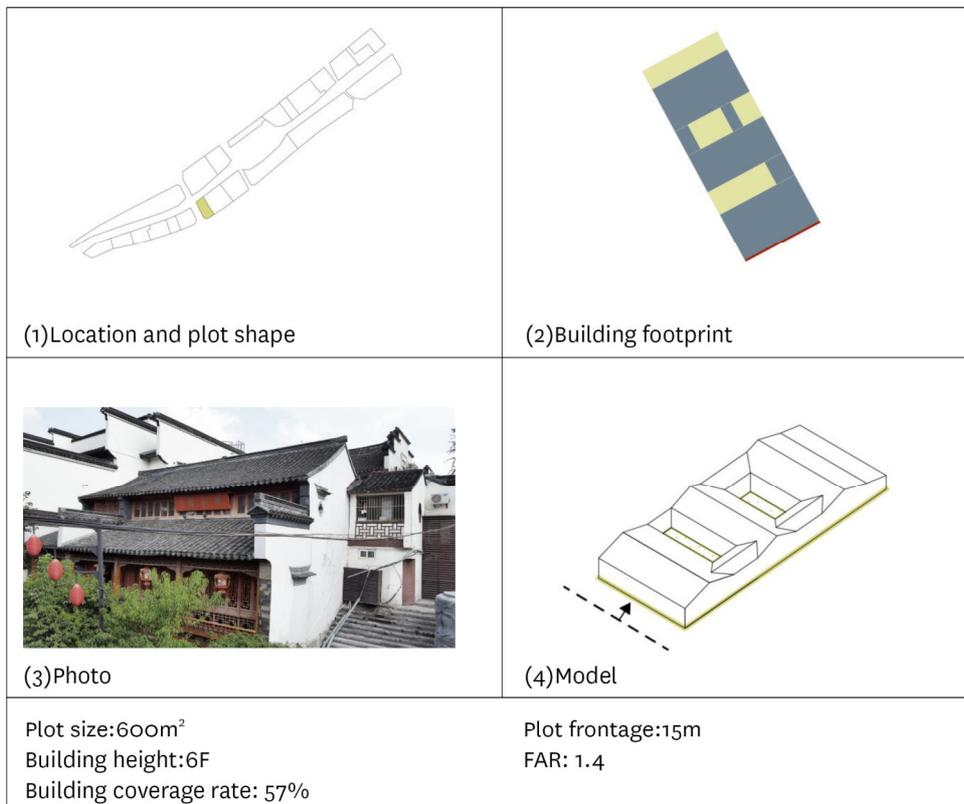


Fig. 3.13: Traditional courtyard building spatial mode (Chaoku Street 38th)

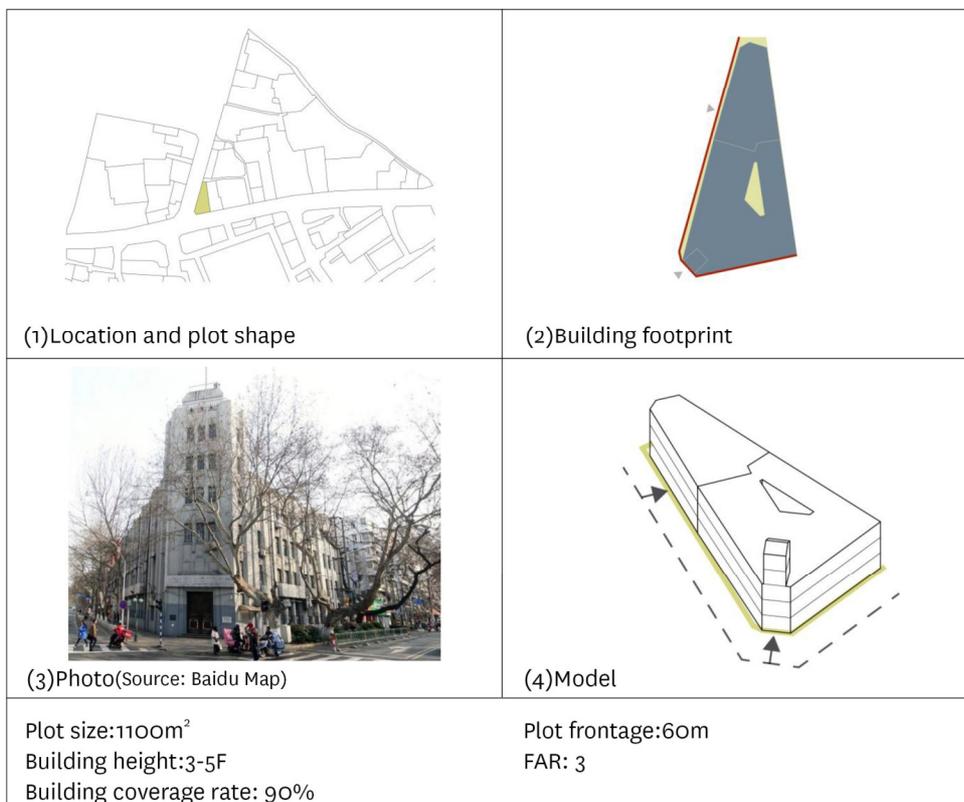


Fig. 3.14: The former site of SHCS Ban

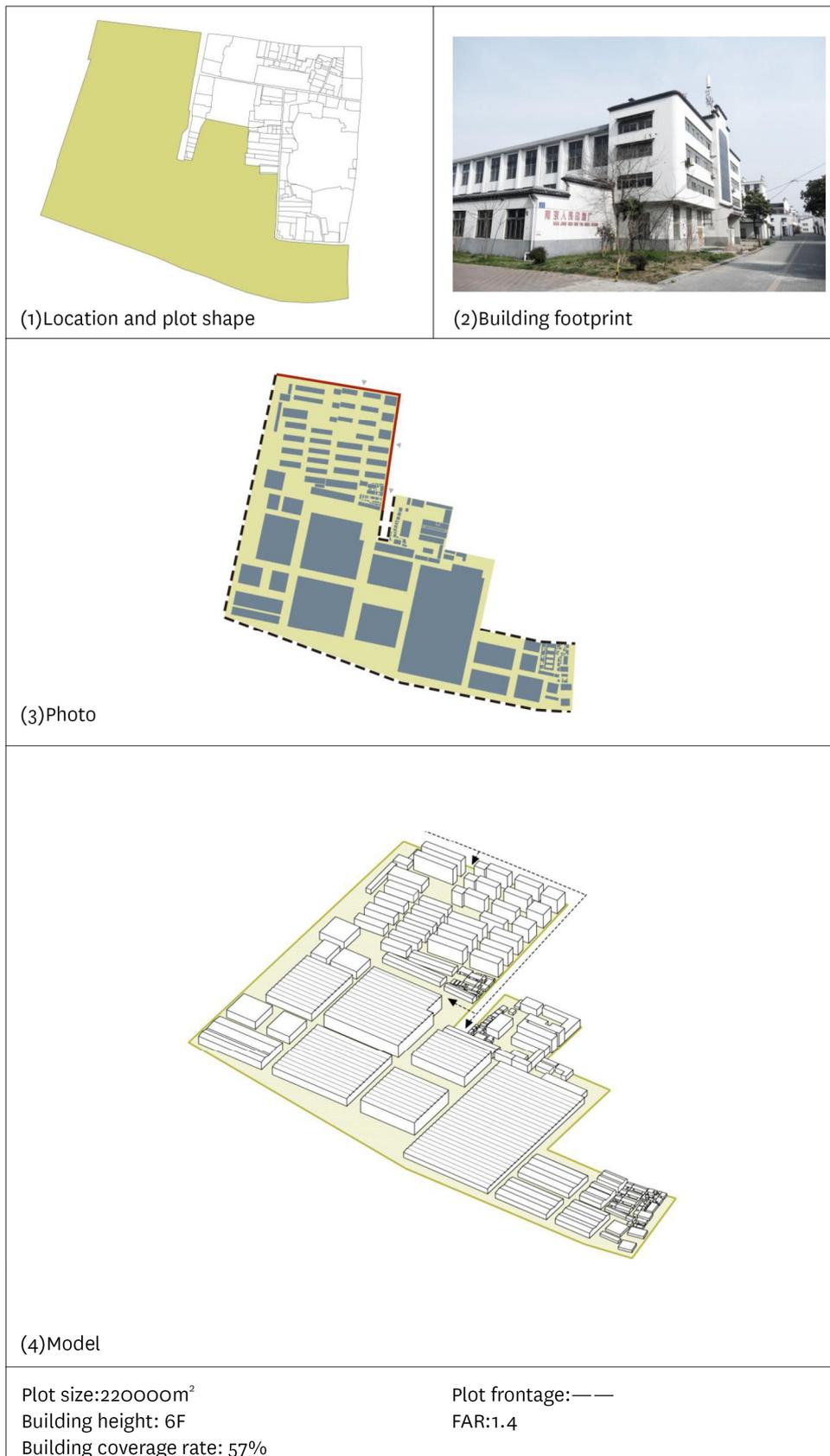


Fig.3.15: Large factory spatial mode (Nanjing Printing and Dyeing Mill)

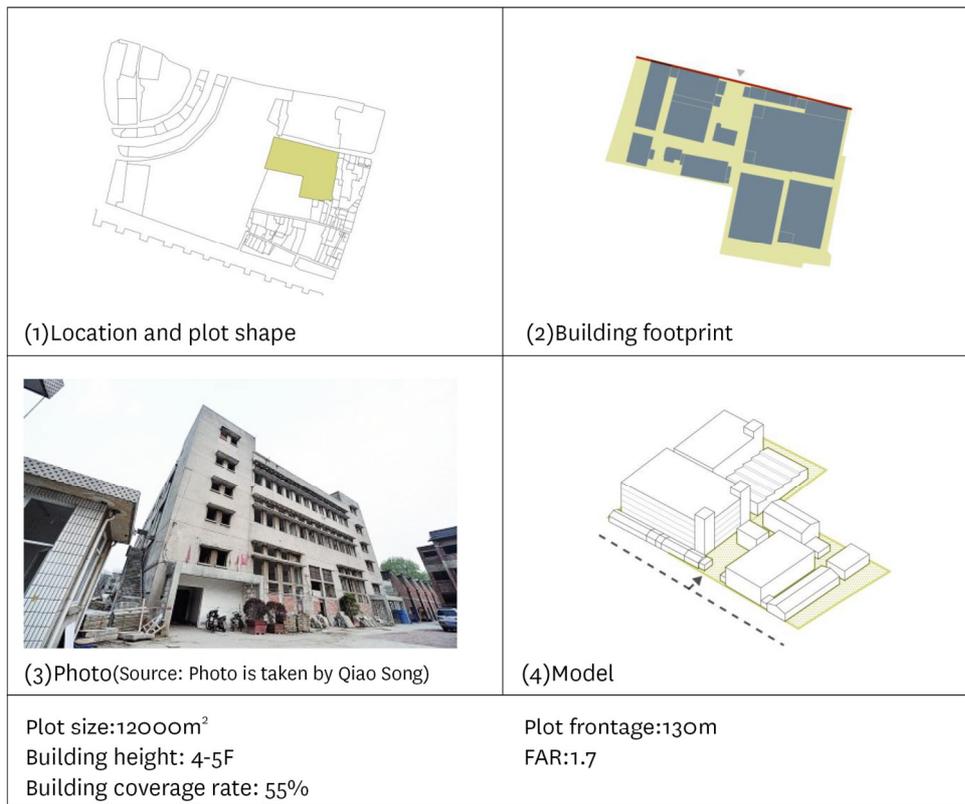


Fig. 3.16: Traditional courtyard building spatial mode (Chaoku Street 38th)

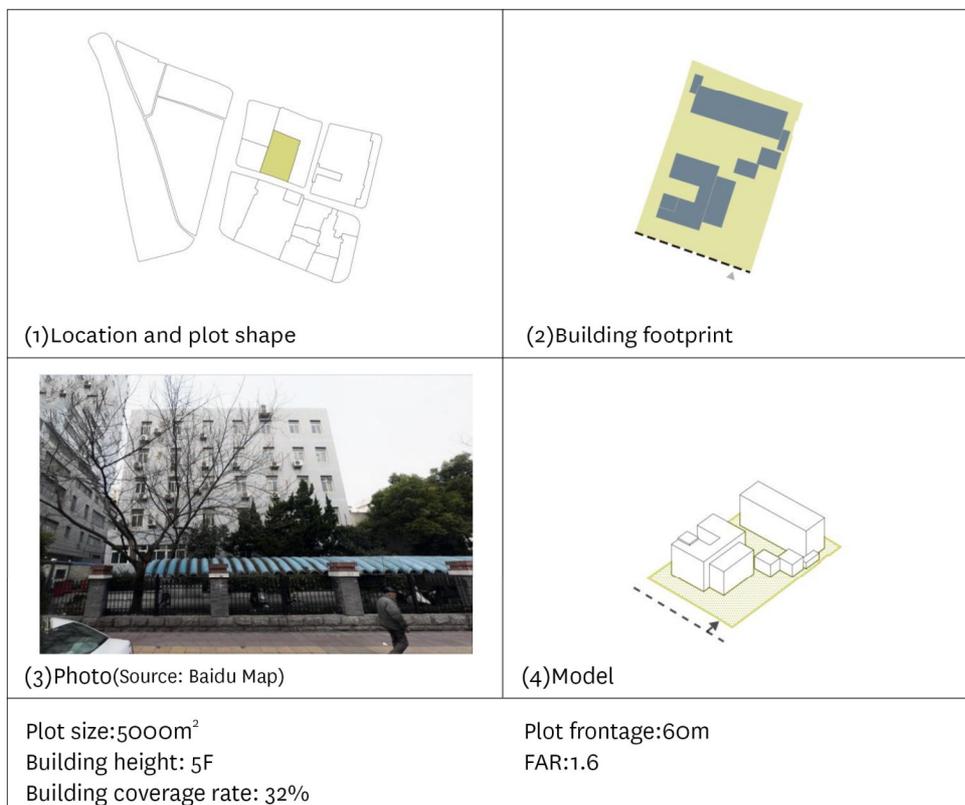


Fig.3.17: Public service unit mode (Qinhuai Hospital)

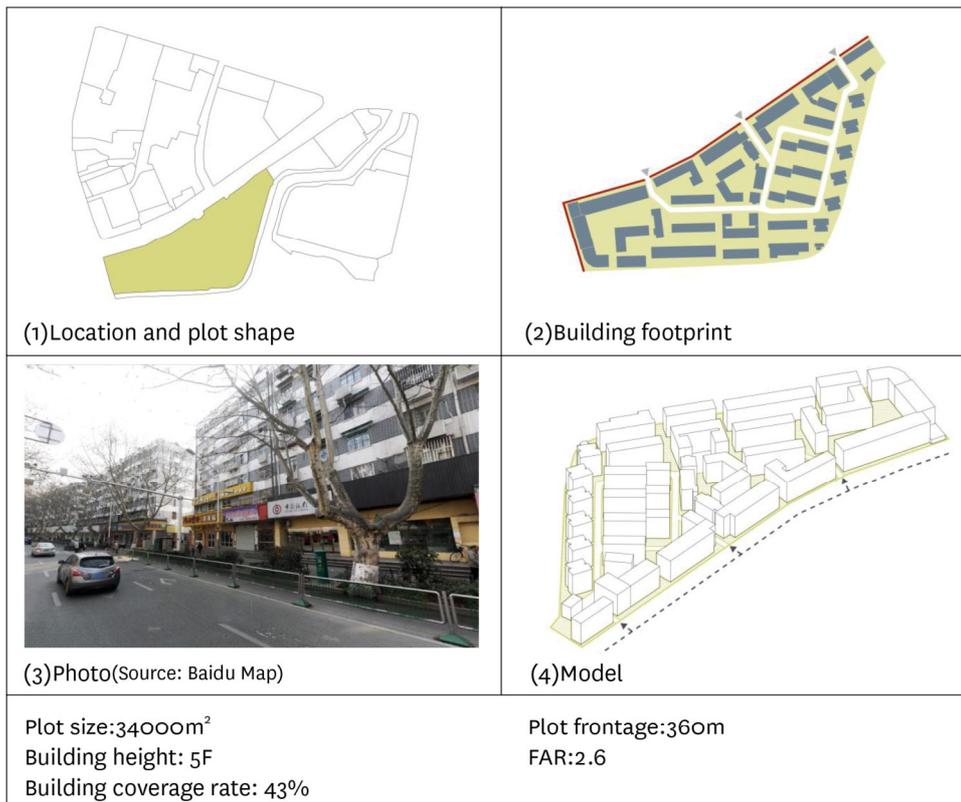


Fig. 3.18: Multiple microdistrict spatial mode (Diaoyu Alley microdistrict)

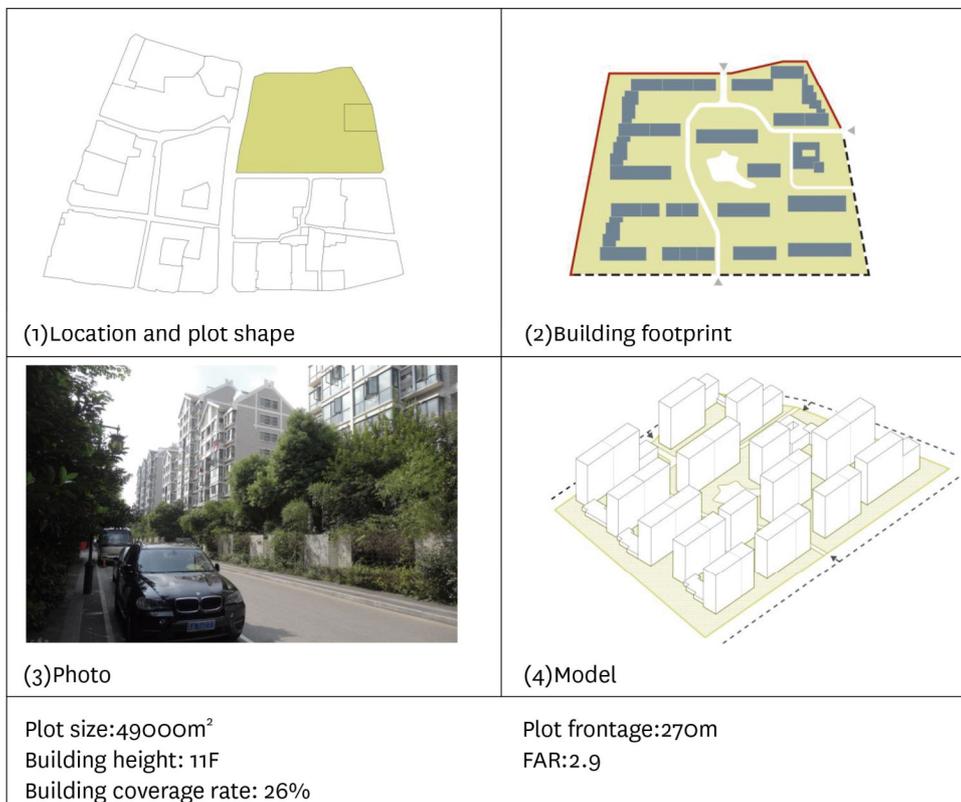


Fig. 3.19: Highrise microdistrict spatial mode (Huang Ce microdistrict)

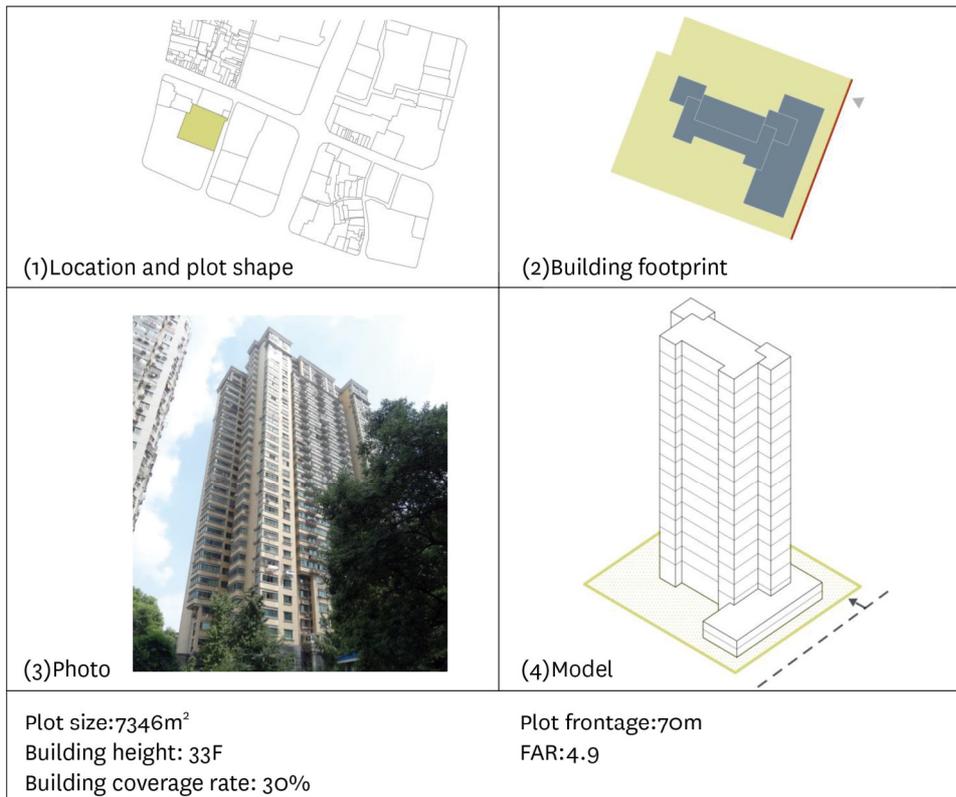


Fig. 3.20: Highrise apartment spatial mode (Luo Ma Jia Ri)



Fig. 3.21: Lowrise microdistrict spatial mode (Niushi residential area)

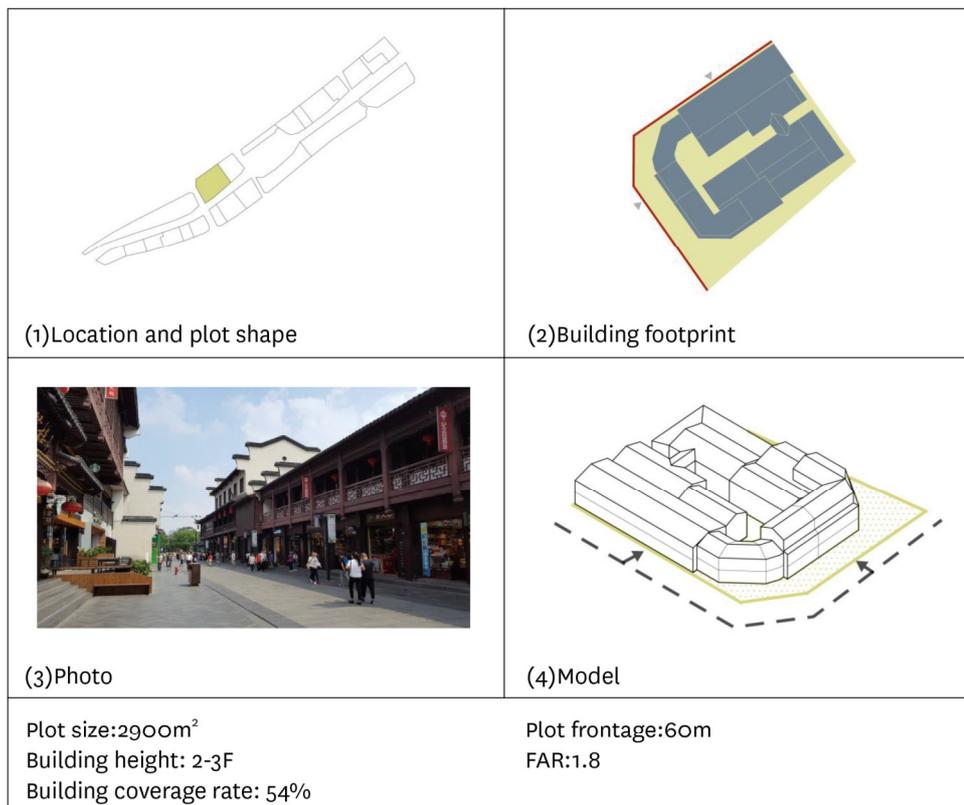


Fig. 3.22: Podium spatial mode (Plot FM in Confucius Temple area)

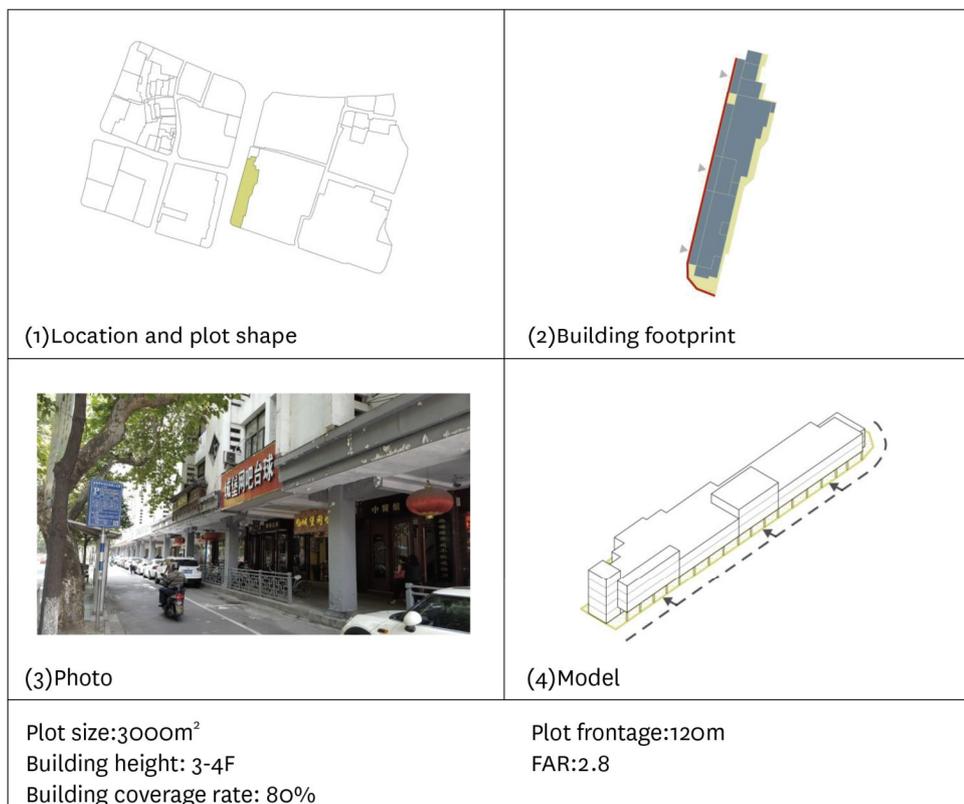


Fig. 3.23: Slab/ Arcade spatial mode (Plot Z along Zhonghua Road)

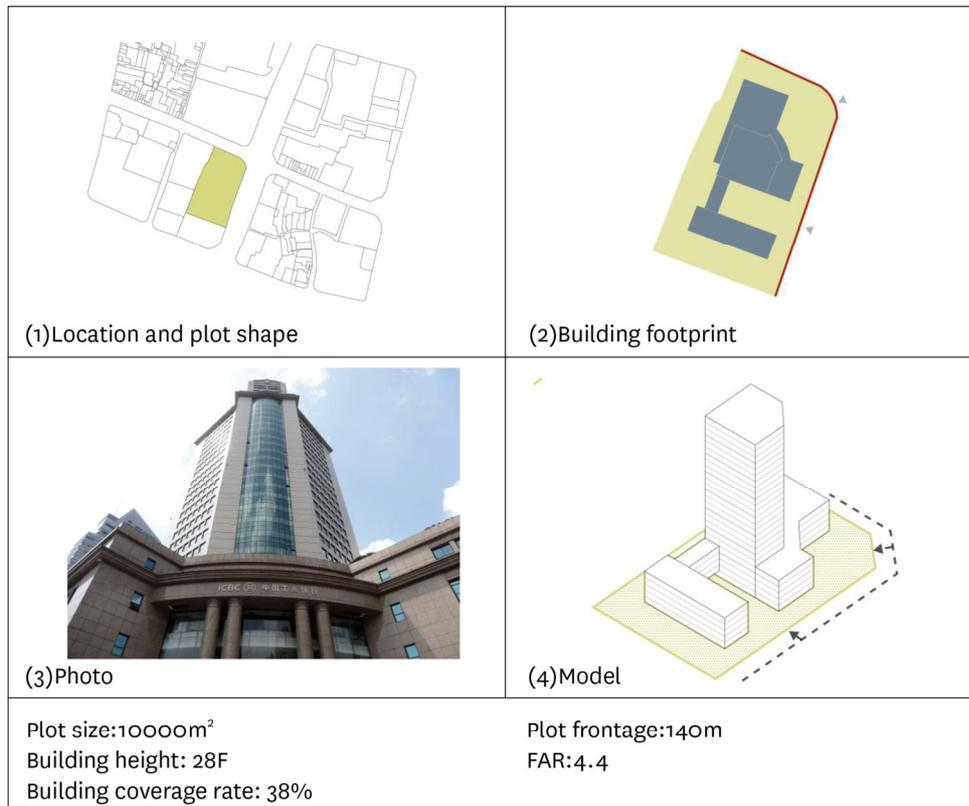


Fig. 3.24: Tower spatial mode (Plot ICBC along Zhongshan Road South)

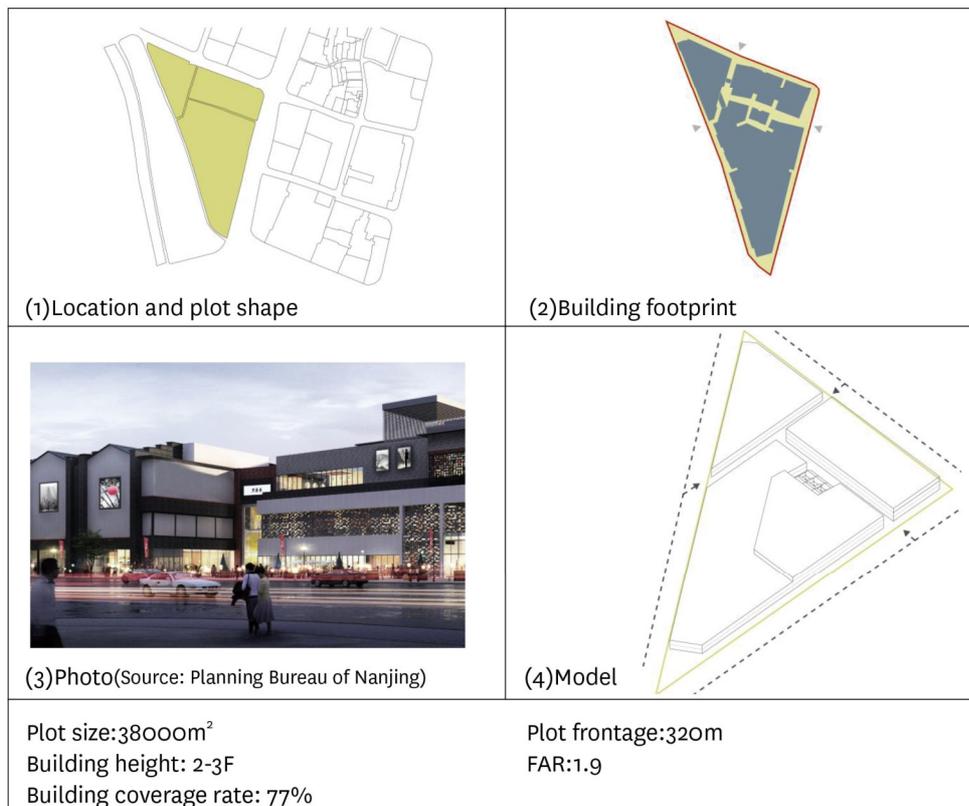


Fig. 3.25: Complex spatial mode (Plot G3 along Zhongshan Road South)



Fig. 3.26: Historic restoration mode (Changledu district reconstruction)

3.7 Plot typology: the origin of megaplot

The transformation of spatial modes showed that the megaplot has prevailed in all four spatial modes. Megaplot mode has become a basic feature of Chinese historic urban area (Tab. 3.8, Fig. 3.27, Fig. 3.28). In fact, it is the result of multiple influential elements such as urban development orientation, land property system, land development mode and regulations of urban codings. The megaplot mode not only implies the growth of plot size but also represents characteristics in aspects of building form and plot-building relationship.

(1). The growth of plot size

The most prominent change of unit plot is the growth of plot size. The transformation of spatial modes showed that the megaplot has prevailed in all four spatial modes. According to the statistics of existing plots, the research defines the scale of megaplot in the historic urban area as 5000m². The plot pattern of traditional urban form is mainly composed of a large number of small plots. As mentioned before, the plot size of a traditional two-courtyards compound is only about 600m², the plot area of 5000m² means an eight-fold expansion, which is definitely harmful for the continuation of historic urban form.

The expansion of plot size in four spatial modes take different paths (Fig. 3.27). Firstly, the application of work-unit schema and microdistrict schema into the historic urban area made the plot shape of industrial

space and residential space completely different from the tradition. The vast plot area is the primary characteristics of Work unit. For example, Nanjing Printing and Dyeing Mill constructed in early 1950s in Menxi area had an area of 22ha. The neighborhood factory mode, despite smaller than large state owned factory, still bared the average plot size of about 8300m². In addition, the megaplot-based microdistrict became the major residential form, essentially changing the basic plot scale of historic urban area. The average size of residential plot rose from about 7000m² in the 1980s to 12000m² in the 2000s.

Secondly, the plot size of four commercial spatial modes varies a lot. Above all, the plot size had a remarkable growth since the prevalence of tower mode after 2000. For example, Plot of ICBC along Zhongshan Road South has an area of more than 1ha and the plot width more than 140m, revealing that the trend of megaplot also emerged in commercial spacial modes. By the emergence of complex mode in the late 2000s, commercial development was completely based on the megaplot. The Plot G4 along Zhongshan Road South reached an area of 38000m². Due to the strict regulation on the building height limit, the construction of complex had to extend plot area as much as possible in order to achieve sufficient business area.

Thirdly, historic restoration became the predominant spatial mode after 2010 when Old South area started the overall conservation. Although the restoration aimed to recover the traditional building scale, the reconstruction was still based on the megaplot. For example, the reconstruction of Changledu district in Mendong area reaches an area of 6ha. The design strategy has more emphasized the role of plot in molding given urban form, as the concept of renewal unit was introduced into this project in order to promote the small-scale and gradual renovations. However, the renewal unit did not realized the subdivision of land property. In other words, the plot subdivision, a basic morphological characteristic of historic urban form, could not be recovered through the restoration.

Apart from the growth of plot size, the plot shape in Old South area becomes increasingly flat. Contemporary spatial modes have totally abandoned the morphological features of the traditional plot with small frontage and big depth, turning to pursue a larger plot width. Taking commercial spatial modes as an example, the plot width of four subordinated modes has increased from 60m to 320m and the ratio of plot width to plot depth has increased from 1.24 to 2.69 (Tab. 3), revealing the trend that the plot shape has become increasingly flatter.

(2). Building types with big differences

In the analytical framework, building type includes two elements: the building footprint and the building height. There are big differences between 12 subordinated spatial modes. Taking the commercial spatial modes as an example, podium mode is characterized by 2- to 3-storey buildings and a high building coverage rate. In order to continue the historic urban interface, adjacent buildings are usually connected with each other by a common sidewall. The subsequent slab/arcade mode showed a growth both in terms of building height and building volume. In addition, the commercial arcade is set on the ground floor of slab buildings. After 2000, the prevalent tower mode is characterized by a tower standing on a podium. Generally, the tower is more than 20 storeys, while the podium is about 5 to 6 storeys. The subsequent commercial complex mode, due to the regulation on building height limit, is confined under 24m. In order to create more business area, the complex covers a majority of the plot and develops a huge building volume.

It is clear that some spatial modes, deriving from different development stages, show a difficulty in integrating with historical contexts. In this sense, the analysis on the transformation of the spatial modes can help sort out the types that are in favor of the sustainable development in the historic urban area.

(3). Increasingly alienated plot-building relationship

Before 2010 when the overall conservation started, the transformation of the plot-building relationship generally showed an inclination of closure and self-sufficiency (Fig. 5). For example, the early multi-storey microdistrict mode still paid an attention to the building layout along the street in order to continue the urban interface. However, the subsequent high-rise microdistrict mode no longer required buildings to be filled onto eastern and western plot frontages. Instead, buildings are sited inside of the plot. Another example is the commercial spatial modes. The early commercial modes including podium and slab/arcade emphasized buildings to be sited on the plot frontage and to be connected by a common wall, while the subsequent tower mode and complex mode require larger building setback distance and building interval. These characteristics reflect an increasingly alienated plot-building relationship. Essentially, it indicates that building siting no longer follows the primary principle that buildings should face the street and integrate with the city.

In fact, the “morphological gene” of closure and self-sufficiency largely originated in work-unit spatial mode, manifesting in four aspects (Zhang and Ding, 2018; Zhang and Chai, 2009): (1). developing an independent circulation system which cannot be connected with urban road system; (2). building form inside the work unit compound taking few considerations of the historic contexts; (3). a weak relationship between the buildings and the plot frontage. (4). a pursuit of functional self-sufficiency in order to reduce the dependence on the urban service facilities outside the work unit. In this sense, historic restoration mode prevailed after 2010 aimed to integrate these separated morphological fragments and to make the building siting face the street again.

(4). Origin: Work Unit spatial mode

Megaplot originated in the construction of work unit. Work Unit schema was considered as a preferable mode of spatial and social organization for urban development during the period of command economy before 1990. Aiming to organize social life through industrialization, Work Unit schema is based on a huge plot scale and develops independent circulation system. Equipped with a series of production and living facilities, work unit developed a self contained and closed social unit. The land nationalization in the 1950s provided the prerequisite for the large-scale government-led land expropriation. It is worth mentioning that Work Unit mode has drawn its influences on other spatial modes in three aspects of plot scale, development mode and building form, which is very clear to see from the transformation of spatial modes.

Over forty years before 1990, the communist party made efforts to reconstruct the old city based on work unit schema. But this system slowly drained away after the establishment of market economy in the 1990s. In any case, it played a critical role in the development of plot shape and plot pattern. Until now the megaplot-based redevelopment still dominates the old city, revealing that the influence of work unit continues.

3.8 Conclusion

This chapter analyzes the types and transformation of spatial modes. It is defined as the synthesis of a plot and the buildings on it, providing a morphological model based on unit plot. Before 1949, traditional courtyard buildings serve as the predominant spatial mode in Old South area, molding a unified and ordered urban fabric. With the frequent transformation of development orientation, social and economic systems, diversified spatial modes have been generated since 1949. Currently the historic urban area contains four major types of spatial modes: work-unit spatial mode, residential spatial mode, commercial spatial mode and historic conservation mode. The transformation of urban form then can be explained by the development of specific spatial modes. Work Unit spatial modes are the predominant spatial mode in the period of command economy (1949-1990). It has three subdivided modes including large factory, neighborhood factory and public service unit. Aiming to organize social life through industrialization, work-unit schema is based on a huge plot scale and develops independent circulation system. Equipped with a series of production and living facilities, work-unit developed a self contained and closed social unit. What's more, these characteristics drew influences on other subsequent spatial modes.

From 1980 to 2010 when the urban renewal of the historic urban area reached the climax, residential space and commercial space experienced the most significant changes. The residential renewal in Old South area since the 1980s experienced several stages from welfare housing construction to commercialized residential redevelopment, from the pursuit of multiple and highrise microdistrict to the return of lowrise residential area. The introduction of microdistrict schema essentially redefined the residential form in the historic urban area. However, during the period of rapid residential renewal, there existed a deficiency of planning control on both the plot shape and the building form. The increasingly larger plot size and building volume, as well as the self-centered building layout all led to a difficulty for the microdistrict to integrate well with the historic context.

The commercial development orientation of Old South area experienced a great transformation from a traditional commercial center, to a modern business district and finally to a cultural-based tourism and commercial area. Influenced by ever-changing development orientations and the upgrading of industrial structure, commercial space is chronologically subdivided into podium mode, slab/arcade mode, tower mode and complex mode. Although there are remarkable morphological differences between these modes, the plot size kept increasing. Especially by the late 2000s the prevalence of complex mode indicated that the commercial development was also completely based on the megaplot.

Tab. 3.8: Typical spatial modes of the historic town - Source: Compiled by the author

Primary level	Secondary level	Major development period	Institutional background	Planning orientation	Case	Plot size	Plot frontage	Building Height	FAR	Building coverage rate
Work unit mode	Large factory	1950s-1980s	Land nationalization	Industrialization; Key projects	Nanjing printing and dyeing mill	220000m ²	——	6F	1.4	57%
	Neighborhood factory	1950s-1980s	Land nationalization	Industrialization; Non-plan development	Yarn-dyed Fabric Mill	12000m ²	130m	5F	1.7	55%
	Public service Unit	——	Land nationalization	——	Qinhuai Hospital	5000m ²	60m	5F	1.6	32%
Residential mode	Multistorey microdistrict	1980s-1990s	Land nationalization; Land marketization	Welfare housing; Commercial housing	Daoyu alley residential area	34000m ²	360m	5F	2.6	43%
	Highrise microdistrict	1990s-2000s	Land marketization	Commercial housing;	Huang Ce residential area	49000m ²	270m	11F	2.9	26%
	Highrise apartment	1990s-2000s	Land marketization	Commercial housing;	Luo Ma Jia Ri	7340m ²	70m	33F	4.9	30%
Commercial mode	Podium	1980s	Land nationalization; Land marketization	Reconstruction of traditional commercial center	Confucius Temple	2900m ²	60m	2-3F	1.8	54%
	Slab/ Arcade	1990s	Land marketization	Reconstruction of Zhonghua Road; Conservation of historic axis	Zhonghua Road	3000m ²	120m	3-4F	2.8	80%
	Tower	2000s	Land marketization	Business district construction; Reconstruction of Zhongshan Road South	ICBC	100000m ²	140m	28F	4.4	38%
Historic conservation area	Complex	2000s-	Land marketization	Overall conservation of Old South area	G3 on Zhongshan Road South	38000m ²	320m	2-3F	1.9	77%
	Traditional courtyard	——	——	Conservation of historic buildings and historic districts	Li Xingqun former residence	600m ²	15m	1-2F	1.5	75%
Historic conservation area	Historic restoration	2010-	Land marketization	Overall conservation of Old South area	Changfudu district in Mendong area	60000m ²	10m	1-2F	1	49%

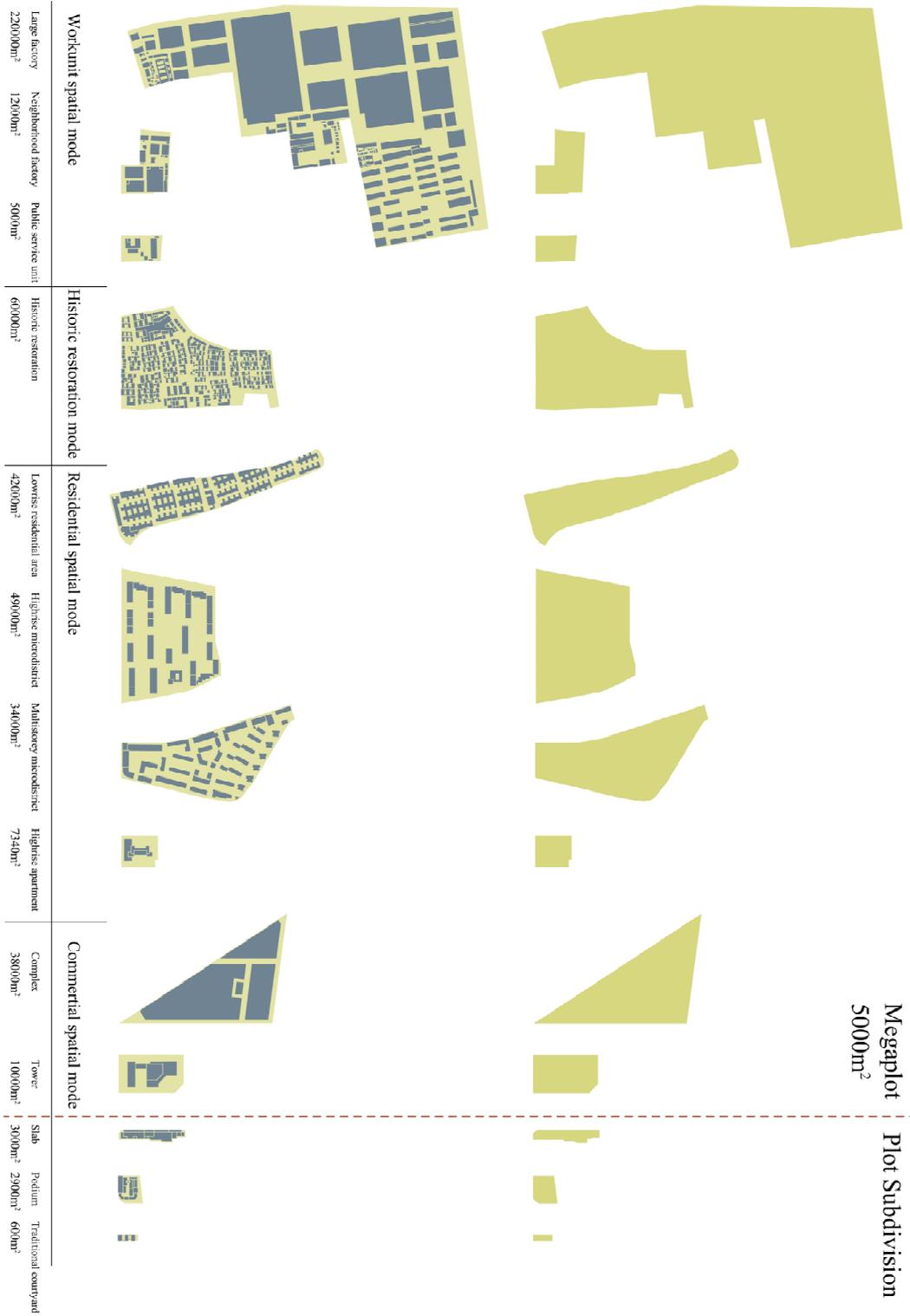


Fig. 3-27: Plot shape of typical spatial modes

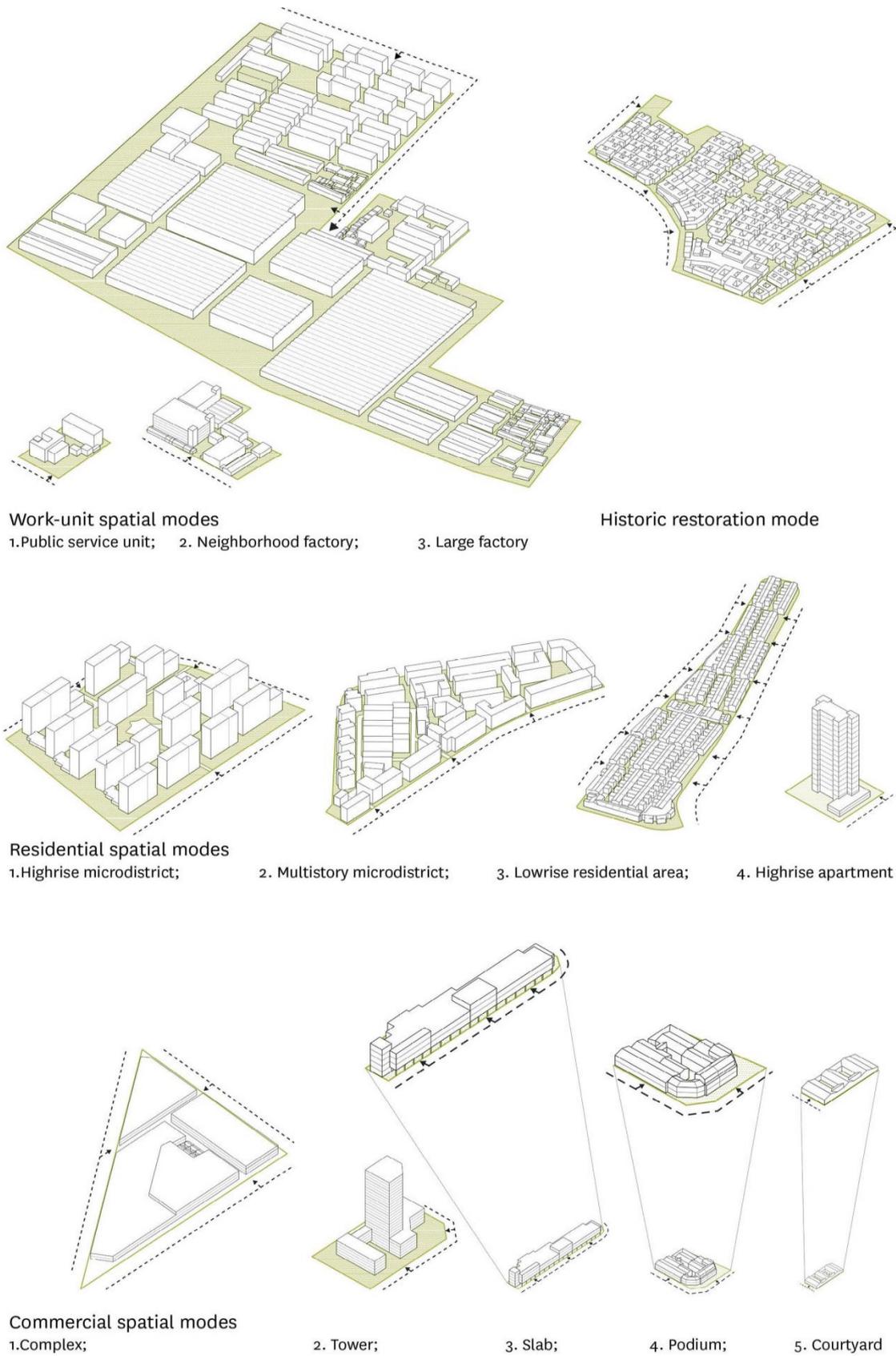


Fig. 3.28: 3D models of typical spatial modes

As an ensemble scale conservation of Old South area was proposed after 2010, historic restoration became the predominant spatial mode. Mainly distributed in Mendong area, historic restoration mode is characterized by the simulation of traditional form. Despite emphasizing restoration of building footprint and recovering of traditional street scale, the historic restoration was based on the megaplot rather than an organic renewal in traditional plot scale.

The transformation of spatial modes showed that megaplot prevailed in all four spatial modes and reached its climax by 2010, which attributed to several elements, such as urban development orientation, land property system, land development mode and urban codings. Originating from the Work Unit spatial mode, the basic scale of megaplot in the historic urban area is defined as 5000m². Megaplot-based development generally followed the principle of Six Unification, namely unified investment, planning, design, construction, rent and management. In addition, the building form of megaplot-based development shows an inclination of closure and self-sufficiency, further leading to clash with historic contexts, suppression of mixed land use and reduction of road density.

4 The vanishing plot subdivision: transformation of typical plan-units

4.1 Transformation of industrial plan-unit

4.1.1 Transformation of Menxi industrial Unit

Menxi industrial Unit, located in the southwest corner of Old South area, is the plan-unit baring the largest proportion of industrial land in the historic urban area. Early in Ming dynasty (1368-1644) its east part, Huang Lu Gang area developed into a tourist attraction for high officials and noble lords, with the prosperity of villas, gardens as well as temples. Above all, Wa Gong Temple originally built in 364AD was one of the oldest temples in Nanjing. Yu Garden, taking up a whole block with an area of 3.36 ha, is originally built in the late 19th century and is a famous private garden. But generally speaking, this Unit, surrounded by the city wall in the west and south, is situated in the fringe belt of the Nanjing old city. As a dense residential area had not been developed, the urban landscape there was characterized by scattering settlements and farmland.

The large-scale renewal of Menxi industrial Unit started from the 1950s when Nanjing was oriented as a regional industrial and transportation center by the central government (Fig. 4.1). The vacant land in the west of Hua Lu Gang was designated to develop a medium sized textile industrial zone which specially included the construction of two municipal factories. In 1958 Nanjing Cotton Mill was settled in the south end of the plan-unit. It was composed of a production area and a living area. The former with an area of 11.4ha was located in the south, containing seven plants built during the 1960s and 1970s; the latter mainly built during the 1980s and 1990s was located in the northwest corner of the plan-unit, containing residential area, schools and hospital. In 1977 Nanjing Printing and Dyeing Mill was constructed in the southwest corner. With an area of 8.5ha, it was composed of the northern printing and dyeing mill and the southern affiliated thermal power plant. Most of the plants were built in the 1980s. Both the large factories, with excessive plot size and closed compound space, had typical characteristics of work unit, which was totally different with the historical urban form.

Apart from the construction of large factory, the construction of neighborhood factory also reached the climax during the Great Leap Forward from 1958 to 1962. In Menxi industrial Unit, the most typical case was that Wa Gong Temple was reconstructed into a neighborhood factory, Nanjing Insulating Material Plan. Through an amalgamation of several adjacent plots, the factory plot size reached 5260m².

Affected by the readjustment of urban industrial structure since the 1990s, the operation of state enterprises and neighborhood factories faced great difficulty and the industrial productions were gradually stopped. By 2006 the two large factories were required by the municipal government to relocate outside the

old city. Subsequently, a majority of the production area of Nanjing Cotton Mill was demolished, while Nanjing Printing and Dyeing Mill was well preserved. As Nanjing launched the overall conservation after 2010, the preferred way for the transformation of industrial area was conservation and re-utilization instead of great demolition. The production area of printing and dyeing mill was selected as an industrial conservation area which was required to be renovated into a cultural industrial park. In addition, some historic landscapes, including Wa Gong Temple and Yu Garden, have been renovated or reconstructed. Subsequently, Menxi industrial plan-unit is transforming into a diversified cultural industry area.

4.1.2 Street pattern

(1). Fractured urban road system

As Menxi industrial Unit is located in the remote corner of Nanjing old city, a dense residential area had not been developed before 1949. The historic urban form was characterized by staggering settlements and farmland. Under this circumstances, the original road system was not mature. Based on several streets like Feng You Si and Hua Lu Gang, only a rough grid pattern was formed, generating three super large blocks. The original road density is only 113m/ha, while that in other plan-units is at least above 200m/ha.

As the construction of industrial area adopted the Work Unit schema, the excessive plot size and self contained building layout further simplified the road system, finally leading to the fracture of urban road system there. According to Fig. 4.2, as the south section was all taken up by work unit compounds, both the north-south Feng You Si and east-west Hua Lu Gang was reconstructed into cul-de-sacs in connecting work unit compounds and the city. Thus the only circulation in the original street pattern was destroyed.

The fractured road system facilitated the growth of block scale. There is only three blocks under the new street pattern, with the astonishing average size of 12.43ha. Correspondingly, the road density reduced to 69m/ha, making Menxi industrial Unit where has the smallest road density in Old South area.

(2). Independent internal circulation system

Relying on the urban local road Feng You Si, two large factories develop their own internal circulation systems. The printing and dyeing mill set its two entrances on Feng You Si road, and the internal loop goes along the plot boundary. The cotton mill has two entrances respectively on eastern Hua Lu Gang road and western Feng You Si road, based on which a internal grid pattern is formed. In addition, the living area of cotton mill in the northwestern corner develops a tree structure of internal traffic. Generally speaking, the internal circulation systems of three work unit compounds are separated with each other, and they can also hardly be connected with the urban road system. The fractured road system has aggravated the separation between the work unit compounds and the historic context.

4.1.3 Plot pattern

With a total area of 26.6ha, work-unit spatial mode takes up about 71% area of Menxi industrial Unit, serving as the predominant mode (Fig. 4.2). Above all, the area of large factory subordinated mode is about 22ha,

including the 8.5ha Nanjing Printing and Dyeing Mill, the 11.4ha production area of Nanjing Cotton Mill and its 4.2ha living area. In addition, two plots of public service unit subordinated mode (a primary school and a middle school) are also larger than 5000m². Consequently, led by the aggregation of work unit compounds, the plot pattern in Menxi industrial Unit has transformed into a megaplot-based pattern.

As the plot boundary is surrounded by the wall, leaving few street frontages, the plot of work unit compound is closed and introverted. The plot pattern of Menxi industrial Unit shows a strong inclination of “enclosure”. Most of the work unit compounds were generated in the period of command economy when the construction of large factory was constructed through specific government-led project. From the site selection, planning and design, to the land allocation, these projects got special approval from the government, taking less consideration of the cooperation with historic context and the restriction of urban codings¹. The land expropriation and enclosure were in many cases made based on their practical demands. Under this background, it is meaningless to discuss the plot arrangement and plot redivision.

4.1.4 Building form

The building fabric in Menxi industrial area, divided by the boundary of work unit, shows great differences inside the work unit compound and the outside (Fig. 4.2)². Outside the work unit compounds is the traditional urban area where is characterized by the traditional courtyard buildings. Lacking a maintenance for a long time, the building quality there is poor, and some plots have experienced self-led renewals (including the plot of neighborhood factory and commercial plots along arterial road in the north). Inside the work unit compound there are two major kinds of urban fabric, the residential area in the northwest corner and the factories in the south. Despite the street frontage facing the city developed in the northern living area, the southern production areas are almost surrounded by the wall or buildings on adjacent plots. They develop the only connection with the city through two cul-de-sacs, Feng You Si and Hua Lu Gang. Thus the coexistence of the three different kinds of building fabrics have formed a sharp contrast.

The production area in the south is composed of large rectangular plants. Several major plants of the printing and dyeing mill and cotton mill are all larger than 10000m², in which the largest one reaches 27540m². Most of the plants are 12m to 20m high, being distributed in an orthogonal grid pattern. The plants were built in different times from the 1960s to 1980s, most of them are in a rationalist style. The plant area is very compact, with the building coverage rate reaching 63%. Thus only a small proportion of green space and public space are set in the entrance area.

The living area of the cotton mill, located in the north in adjacent to urban arterial road, is composed of residential area and educational area. The residential area is characterized by rows of north-south multistory slabs. It contains several clusters built in different times, with the building height ranging from 3 storeys to 7 storeys.

The basic social amenities are distributed along the main internal road, including the hospital and kindergarten. Across the street is located the educational area where a primary, a middle school and a textile

¹ Before the 1980s there were few normative urban codings established.

² The analysis of contemporary urban form is based on the condition in 2010. After 2010 a majority of the cotton mill was demolished. Meanwhile renovations were made on Yu Garten and Wa Gong Temple in northern traditional area. These changes after 2010 are not included in the morphological analysis.

vocational school are set. Thus the basic living requirements of workers can be met within the work unit compound and they don't have much requirement for the urban public services. In turn, these public service facilities in the work unit are only accessible to its works, other periphery residents cannot take use of them. Work unit has created a self contained unit in both spatial and social terms.

Menxi industrial Unit is the most typical area where the urban renewal was made in the period of command economy. Promoted by industrial construction, Work Unit spatial mode thoroughly reconstructed the urban form. As the government-led development of textile industry cluster, two large factories, Nanjing Cotton Mill and Nanjing Printing and Dyeing Mill were constructed in the form of special project, which could enjoy the priority in the planning management and land allocation and took less consideration of the confinement of urban coding and practical historic contexts. The transformation of this plan-unit with Work Unit spatial mode taking up 70% of the area has shown the following morphological characteristics: (1). the fractured urban road system and the self contained internal circulation forms a sharp contrast; (2). Three megaplot based work unit compounds in this plan-unit shows a strong inclination of "enclosure". (3). The urban fabric inside the work unit compound and outside it has great difference. Inside the work unit compound, the building form and layout of the production area and the living area differ a lot. (4). Through the setting of living area, the daily life of most workers can carry their basic life in the work unit compound. But the service amenities inside the work unit are not accessible to other residents in the neighborhood. Thus the closure and self sufficiency of work unit compound are presented both in spatial and social terms.

Transformation of Menxi industrial plan-unit

Before 1949	The fringe belt with scattering settlements and farmland
1950s-1980s	Medium sized textile industrial zone Neighborhood factories construction
2006-	Relocation and demolition
2010-	Renovation into cultural industrial park



Plants of Nanjing Cotton Mill built in 1960s



Plants of Nanjing Printing and Dyeing Mill built in 1980s



Gongjian FanLiving area in the work unit compound (Nanjing Cotton Mill)



Renovation of industrial heritage after 2010 (Nanjing Printing and Dyeing Mill)



The main access to the industrial area

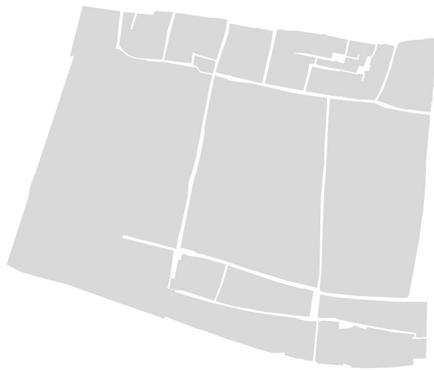


Renovation of the pedestrian along the city wall

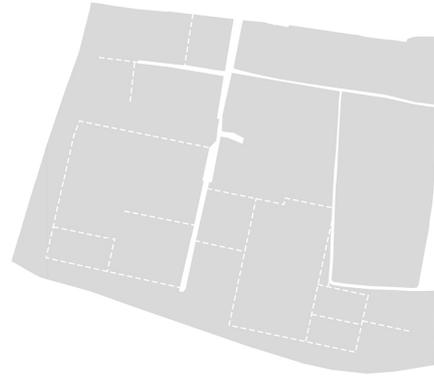
Source: Compiled by the author

Fig. 4.1 Transformation of Menxi industrial plan-unit

Morphological analysis of Menxi industrial plan-unit



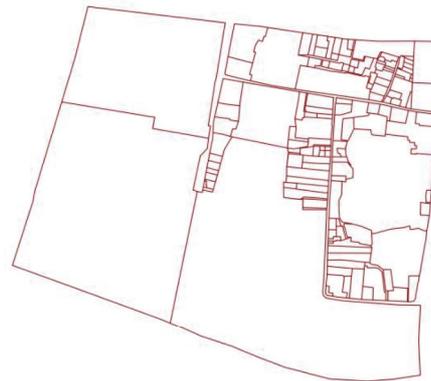
Traditional street pattern



Renewed street pattern



Traditional plot pattern



Renewed plot pattern



Zoning of spatial modes



Building form

Fig. 4.2: Morphological analysis of Menxi industrial plan-unit

4.2 Transformation of residential plan-unit

4.2.1 Transformation of Chuanban Alley Unit

Located in the west of Old South area, Chuanban Alley Unit with the area of 51ha is a typical renewed residential area. In Ming and Qingdynasty (14th-19th century) this area was a center of handicrafts workshops, especially the production of Yunjin, a upscale brocade for royal family. Based on the prosperity of handicraft industry and trade, this area also developed into a rich area in Old South area.

The large-scale renewal of Chuanban Alley Unit started in the 1990s (Fig. 4.3). The road reconstruction and development of microdistrict totally remolded the urban form there. Based on the master plan of 1991, a grid pattern of arterial roads was introduced into this area. The new structure contains two sub-arterial roads: Xianhe Street of 22-32m wide and Shuangtang Road³ of 20m wide. Local roads including Wufu street, Huangce road and Cuoji road are generally 7-8m wide. Of all the roads in the new road system, only Wufu streets has inherited the original route.

Road reconstruction brought about the large-scale residential redevelopment. Chuanban Alley Unit became a focusing area of welfare housing construction in the early 1990s. Several multistorey microdistricts including Lai Feng, Lai Feng Li, Shuang Le Yuan and Tongfang Yuan were built, with the area ranging from 1.6ha to 8.4ha. Most of them are distributed along Shuangtang road in the north and Wufu street road in the west. Above all, Lai Feng microdistrict, located between Shuangtang road and Jiqing road, was constructed from 1990 to 1999. Baring an area of 8.4ha, it is the largest microdistrict in Old South area.

As the readjustment of industrial structure sped up and reform of housing system was made in the late 1990s, a large amount of industrial land was transformed into residential land for the redevelopment of commercialized housing. Jinli, Wu Fu, Xian He microdistricts were examples that the land of neighborhood factories were redeveloped into residential areas. With the plot area ranging from 5000m² to 10000m², most of them adopted the multistorey microdistrict spatial mode. As the land use right was transferred through the agreement between the developers and the factory, the industrial land was not expropriated by the government for a redivision. Thus the form of industrial plots were well preserved. By the end of the 1990s, the area of multistorey microdistrict reached more than 25ha, taking up half the area of Chuanban Alley Unit. With the similar building layout, they have formed a new urban fabric which is characterized by rows of north-south slabs in the historic urban area.

The commercialized housing construction came to a climax in the early 2000s when the local government launched large-scale residential redevelopment in the name of old city renovation. The last two plots with traditional cityscape were demolished and renewed into highrise microdistricts (Huang Ce and Tao Yuan). Covering the area of 7ha and 3ha respectively, the plot size of the two microdistricts further increased compared with those in the 1990s. Despite a building layout, highrise microdistrict is quite different from the multistorey microdistricts in the 1990s in terms of the building interval, street frontage, and closure. In summary, the closure and fragmentation presented in the megaplot based redevelopment became more remarkable.

³ Shangtang road has been currently classified as a local road.

4.2.2 Street pattern

(1). The thorough elimination of the historic street pattern

Chuanban Alley is the plan-unit where experienced the most radical changes of street pattern in Old South area. Instead of broadening the original streets, the new road system was made through a total reconstruction, which resulted in the elimination of the historic zigzag street pattern (Fig. 4.4). Early in the city plan of Nanking (1929) a north-south grid road system had been conceived to be superimposed on the original structure. Although the zigzag, dense and narrow historic street pattern brought about a difficulty for the introduction of arterial road system, most of the original streets were to be renovated into local roads, indicating a possibility of preserving the historic street pattern. However, in the current road system a large number of traditional streets and alleys were wiped out because of the megaplot-based residential redevelopment. For example, only the construction of Lai Feng microdistrict led to the disappearance or reconstruction of about 10 original streets.⁴

(2). The severe shortage of local roads

As the welfare housing construction in the 1990s advocated the unified and large-scale development mode, the blocks were redivided in an excessive scale. In the historic street pattern the average block scale is about 6000m², while in the new street pattern it increases to 27000m², with an astonishing growth rate of 354%. Apart from the elimination of historic streets, the number of new local roads is heavily deficient. As the result, the road density declines sharply from 286m/ha to 54m/ha. Particularly, the current road density of Chuanban Alley Unit is the lowest one in Old South area, even lower than that of Menxi industrial Unit. Obviously, this kind of road structure is inappropriate for a traditional residential area. What's worse, a majority of microdistricts are gated community and exclude the through traffic, further deteriorating the traffic pressure. Taking Lai Feng microdistrict as an example, the megaplot leads to huge road intervals reaching up to about 500m in north-south direction and 370m in east-west direction.

4.2.3 Plot pattern

The transformation of plot pattern in Chuanban Alley Unit shows the following characteristics:

(1). Promoted by the dominance of multistorey and highrise microdistrict spatial modes, the plot pattern thoroughly transformed into a megaplot based structure (Fig. 4.4). There are four spatial modes distributed in Chuanban Alley area, including multistory microdistrict mode, highrise microdistrict mode, public service unit mode and tower mode. Above all, multistorey microdistrict mode and highrise microdistrict mode take up 50% and 19% of the area respectively. Both modes are characterized by megaplot. The average plot size of multistory microdistricts in the 1990s is 13333m². Of all 19 plots, 63% belong to megaplot. The average plot size of highrise microdistricts after 2000 further increased to 24000m². Viewing the whole plot pattern, few blocks have a plot subdivision into more than 4 plots, revealing that the block has become the basic unit for land development.

⁴ The demolished streets included Shuangleyuan, Dizang nunnery, Yuzhen alley, Yanzhi alley, Jixiang street, Cuoji ally, Jingjia alley, Taiping Yuan, Taiping Well as well as Jinsu nunnery.

(2). Disordered and pragmatic plot arrangement It is clear through the overlapping analysis of the new street pattern with the historic one that the historic plot pattern in Chuanban Alley Unit has been completely wiped out. As the new residential mode is based on the megaplot, plot series can not exist anymore. There lacks the standard of plot division, as most of the plots were generated from administrative land allocation (like the welfare housing construction and public service units etc.). In many cases, the practical construction and functional requirement are taken as the starting point of plot division, indicating a pragmatic inclination.

(3). The plot redivision does not lead to a better urban space. Firstly, microdistricts establish the internal green space to meet the demands of their residents, but they are not open to the city. Due to a lack of overall urban design, the public space and green space in Chuanban Alley Unit are still in a heavy shortage after renewal. Secondly, the plot redivision has not improved the traffic capacity. The road density has a sharp reduction after renewal and the number of local roads is heavily deficient. These problems largely attribute to the megaplot based development mode.

4.2.4 Building form

The transformation of building form in Chuanban Alley Unit shows the following characteristics:

(1). The dominance of microdistrict remolded the urban fabric. Despite a difference of building height, multistory microdistrict mode and highrise microdistrict mode, together taking up 70% of the unit area, have similar building layout, which promote the emergence of new urban fabric (Tab. 4.1, Fig. 4.4).

Lai Feng is a typical large-scale multistory microdistrict. Covering an area of 7ha, it is divided into five blocks by three internal roads. The main internal roads, with the width of 12m, is open to the city as pedestrian connections but excludes the through automobile traffic. Community commerce and public service facilities are distributed along them, indicating an introverted inclination in regards to the distribution of public service facilities. The building height is 7 storeys and the layout is characterized by rows of north-south slabs. As a large-scale welfare microdistrict, the building layout in Lai Feng is very compact that the building interval is about 16m and side interval is about 6-10m. In order to accommodate as many as 8000 households, Lai Feng has a high development intensity, with the FAR reaching 4.5. As a result, there is a remarkable deficiency of public space and green space and the internal road equipped with commerce and slight green become the main communication space for local residents.

Huang Ce microdistrict is a most typical highrise microdistrict in the 2000s. With an area of 7ha, it stretches across three blocks. Huang Ce has a similar building layout to multistory microdistrict. But as the building height rises to 11 storeys and wider green belt is set, the building interval increases remarkably to 30m. In addition, as the commercialized residential area focuses more on the quality of living environment, central green space with well-designed landscape has become a necessary component in the microdistrict. The community commerce, no longer set internal the microdistrict, is moved out to the street frontage. What's more, commercial function is settled in independent buildings that are separated from the residential slabs, leading to a reduced mixed use in the microdistrict.

Transformation of Chuanban alley residential plan-unit

Before 1949	A traditional handicraft and residential area
1990S-	Reconstruction of road system Large-scale welfare housing construction
2010-	Residential redevelopment of industrial land Commercialized housing construction



Street frontage of welfare housing in the 1990s (Laifeng Microdistrict)



Multistorey microdistrict in the 1990s (Laifeng Microdistrict)



Street frontage of commercialized housing in the 2000s (Taoyuan Microdistrict)



Highrise microdistrict in the 2000s (Huangce Microdistrict)



Big building setback distance from the plot frontage



Big contrast between the highrise microdistrict and the traditional river front buildings

Source: Compiled by the author

Fig. 4.3: Transformation of Chuanban alley residential plan-unit

Morphological analysis of Chuanban alley residential plan-unit



Fig. 4.4: Morphological analysis of Chuanban residential plan-unit

Tab. 4.1: Comparison of multistorey microdistrict and highrise microdistrict [Source: Compiled by the author]

Microdistrict	Year	Floors	Site area(ha)	FAR	Green rate	Number of households
Laifeng	1990s	7	8.4	4.5	33%	8000
Huangce Garden	2000s	6-11	7.0	2.8	40%	1291

(2). The residential redevelopment in the 2000s damaged the street frontage. The welfare housing construction in the 1990s, under the comprehensive development mode, relatively paid attention to preserve the continuity of street frontages. For example, Lai Feng microdistrict adopted the form that zigzag residential slabs stand on two-storey commercial podium to preserve the east and west street frontages. In comparison, two highrise microdistricts built after 2000 appear to be more self contained. For example, Huang Ce microdistrict is a typical gated community, stretching across three blocks. Each component block is marked off with fences or hedges, making the residential area separated from the city. Above all, the east and west plot frontage no longer required the filling of buildings. In addition, the excessive side building interval and building setback distance further weakened the relationship between the microdistrict and the urban street.

Generally speaking, the renewal of Chuanban Alley since the 1990s experienced a large transformation from the welfare housing construction to commercialized housing construction. During this process, the large-scale road construction in the 1990s and the reconstruction of the traditional area in the 2000s are two significant factors in promoting the residential redevelopment. The morphological transformation of the residential plan-unit has following characteristics: (1). The thorough road reconstruction and the elimination of historic street pattern; (2). The megaplot based residential development leads to the deficiency of local roads, elimination of plot subdivision, and pragmatic way of plot redivision; (3). Due to the prevalence of microdistrict schema, the residential mode in the historic urban area had such a radical transformation that the traditional form can hardly be preserved; (4). A new urban fabric characterized by rows of slabs were generated by the dominant spatial modes, the multistorey microdistrict and the highrise microdistrict. However, there are still problems in terms of its integration into the historic urban form, especially in terms of the damage of street frontage.

4.3 Transformation of modern commercial plan-unit

4.3.1 Transformation of Yanliao Fang Unit

Located in the middle of the Old South area, bordering Qinhuai river in the south, Yanliao Fang plan-unit is a typical modern commercial plan-unit. With an area of 33ha, this area was a major handicraft workshop area in history, including the production of pigment, bows and arrows, copper wares and iron wares. Workshops and dwellings are mixed together, forming the special social and spatial structure Fang, a industry-based neighborhood.

Yanliao Fang is not a planned commercial area. Instead, its development experienced several stages with the ever-changing development orientations (Fig. 4.5). According to the dominant spatial modes in different times, the transformation of Yanliao Fang can be divided into three stages: (1). Residential renewal in early

period (1990-1997); (2). Construction of business district(1997-2010); and (3). Commercial redevelopment under the overall conservation (2010-).

(1). Residential renewal in early period (1990-1997)

The renewal of Yanliao Fang Unit start in the early 1990s. Residential redevelopment played a predominant role before 1997 when the urban arterial road Zhongshan Road South was completed. The construction of two microdistricts, Gongjian Fang and Yudai Yuan in the northwest corner were the earliest practices of highrise microdistricts in Old South area. The residential towers reaching a maximum height of 30 floors are among the highest buildings during the 1990s. In addition, some multistorey microdistricts, including Qin Zhuang Yuan Li and San Shan are distributed along Zhonghua Road in the east of the plan-unit, characterized by north south slabs. The area of these residential plots ranges from 7000m² to 25000m² and the average plot area is about 9000m². All of them are megaplot based redevelopment.

The commercial development during this period was relatively slow. Apart from the small-scale spontaneous renewals of plots along arterial roads, the main development was the reconstruction of commercial space along Zhonghua Road with the introduction of slab/ arcade spatial mode. But this mode did not develop into a predominant commercial spatial mode in Yanliao Fang Unit.

(2). Construction of business district (1997-2010)

The large-scale road construction in the late 1990s remolded the spatial structure of Yanliao Fang Unit, also led the commercial development there stepping into a new stage. Above all, the arterial road Zhongshan Road South completed in 1997 played a decisive role. As the business and commercial functions of urban center Xijiekou extended southward along Zhongshan Road South, Yanliao Fang area based on the superior location advantage was considered as a ideal location to develop a subordinated business area in the historic urban area.

After 2000 the local district government proposed the goal of developing a subordinated business area, thus business towers sprang up along Zhongshan Road South, constituting a new prominent commercial spatial mode. There are totally seven towers developed during this period, in which six are intensively distributed along Zhongshan Road South⁵. They have high development intensity, with the FAR above 10 and building height ranging from 20 to 33 floors. The average plot area is more than 5000m².

(3). Commercial development under the overall conservation (2010-)

After 2010 Old South area started the overall conservation and the cultural tourism became the new orientation of industrial development. Under the strict regulation on building height limit, the development of tower mode could not continue. Thus commercial complex mode was introduced into the historic urban area. The triangular megaplot G3 along Zhongshan Road South is to be developed into a commercial complex. With an area of 38000m², this plot derives from the amalgamation of three original blocks. As the building height is required to be lower than 21m, the complex has to occupy the site area as much as possible and the building coverage rate reaches up to 70% so that more business area can be created.

The residential redevelopment in Yanliao Fang Unit after 2000 is so limited due to the changing development orientation. In 2008 Niu Shi district with an area of 3ha was totally demolished and merged into the Plot G4 for redevelopment⁶. According the regulation of building height limit, this area could only develop

⁵ There are six business towers built along Zhongshan Road South: Commercial and Industrial Bank (25F, 1997), Touzi Mansion (33F, 1998), Changle Mansion (31F, 1998), Qiaoning Apartment (20F, 2004), Yingjia Mansion (22F, 2005), and Tongfu Mansion (22F, 2008). Two towers are distributed along Zhonghua Road: Xihua Mansion (12, 1997) and Shengzhou Road No.3rd.

⁶ Plot G3 and Plot G4 were generated from the division of one megaplot with area of about 7ha for the sake of land leasing.

lowrise residential area. The form of courtyard dwelling was adopted, aiming at the restoration of the urban ground plan.

4.3.2 Street pattern

The most significant change of the street pattern in Yanliao Fang Unit is the establishment of road hierarchy (Fig. 4.6). The 40m wide Zhongshan Road South extends southward across the whole plan-unit, serving as the new axis of the historic urban area. The main east-western local roads including Yangzhu Alley, Jinshajing and Xujia Alley are 10m to 20m wide. The hierarchical road system is almost based on the broadening of existing streets, thus the main frame of traditional street pattern is preserved.

Compared with industrial plan-unit and residential plan-unit, commercial plan-unit bares the smallest growth of block size and reduction of road density. The average block size after renewal increases from 12375m² to 20190m², which is largely due to the construction of Zhongshan Road South and the large-scale residential development in the north. Original alleys were demolished to create more construction land. However the elimination of alleys would definitely reduce the street density. Compared with the former street pattern, the road density drops from 240m/ha to 215m/ha. Actually many alleys through a slight broadening could be turned into one-way road in favor of traffic circulation or pedestrian.

4.3.3 Plot pattern

(1). A most remarkable feature of current plot pattern in Yanliao Fang Unit is the diversified plot types. The plan-unit contains four primary types and eleven subordinated types (Tab. 4.2, Fig. 4.6). The commercial spatial mode and the residential spatial mode are main types, taking up 50% and 37% of the area respectively. Above all, tower mode and complex mode take up the largest proportion (38% of the commercial space respectively) of all four commercial types. There exists big difference of plot size and form between these subordinated spatial modes. Taking the plot size as an example, the average plot size of podium mode and slab/arcade mode is about 2500m², tower mode close to 5000m² and complex mode approximately 38000m².

(2). As a commercial plan-unit, Yanliao Fang Unit has preserved the minimal plot subdivision, but the plot series has been eliminated. The proportion of megaplot in Yanliao Fang is much smaller than in residential plan-unit and industrial plan-unit. Except the excessive commercial complex, only two plots of tower mode are larger than 5000m². Plots of slab mode and podium mode are all smaller than 5000m². However, the new plot pattern did not form any regular plot series.

In fact, the order of plot pattern lies in the existence of plot series. Under a mature land market, the regular plot subdivision based on similar morphological standard could minimize the variations of land value and generate more benefits from land leasing. The renewal of Yanliao Fang Unit has experienced a remarkable transformation with the ever-changing development orientations. A large amount of plots were redivided in a pragmatic way, lacking the base of a regular plot subdivision. The most typical case is the plot redivision along Zhongshan Road South. Six plots of tower mode, one plot of complex mode and one plot of podium mode coexist on both sides of the arterial road, leading to sharp contrasts and differences of both the plot

shape and the building form. What's more, the six plots of tower mode themselves differ a lot in plot shape and are randomly arranged.

Tab. 4.2: Spatial modes in Yanliao Fang Unit [Source: Compiled by the author]

Spatial modes		Total area(m ²)	Proportion	Plot number	Plot area(m ²)	Distribution
Commercial modes	Tower	36868	14.0%	8	4609	Zhongshan Road South; Zhonghua Road
	Complex	38927	14.8%	1	38927	Zhongshan Road South
	Slab/Arcade	4916	1.9%	2	2458	Zhonghua Road
	Podium	15252	5.8%	7	2179	Scattering along arterial roads
			36.5%			
Residential modes	Highrise microdistrict	23551	8.9%	3	7850	Gongjian Fang, Yudai Yuan in the north
	Multistorey microdistrict	63155	24.0%	7	9022	Yudai Yuan in the north; Sanshan, QZY in the east
	Lowrise residential area	30390	11.5%	1	30390	Niushi in the west end
			44.4%			
Historic conservation modes	Traditional courtyard	14933	5.7%	26	574	Jin Sha Jing in the north
Work unit modes	Public service unit	25497	9.7%	7	4894	Hospital, school and kindergarten scattering in the Unit
	Neighborhood factory	8715	3.3%	6	1452	Along Shengzhou Road
			13%			

4.3.4 Building form

Affected by the disordered arrangement of multiple spatial modes, a typical fragmented urban fabric was formed in Yanliao Fang Unit, with totally 11 subordinated spatial modes coexisting in the 33ha plan-unit.

(1). Traditional courtyard buildings

The only traditional courtyard buildings left in Yanliao Fang Unit, covering an area of 1.5ha, are mainly distributed between Shengzhou Road and Jinshajing in the north.

(2). Work-unit space

Work-unit space in Yanliao Fang Unit, taking up 13% of the area, mainly contains two subordinated modes, the public service unit mode and neighborhood factory mode. Above all, typical public service units in this plan-unit include a hospital, two schools, a kindergarten and other administrations⁷. And most neighborhood factories had already conducted the second round renewals. Surrounded by the “compound wall”, both the modes have the features of loose building layout, mixed building types and the lack of street frontages.

(3). Residential space

Residential space takes up the largest proportion of area in Yanliao Fang Unit, but presents a complex urban fabric. According to Fig. 4.6, the difference between three subordinated spatial modes is remarkable. The welfare housing construction in the 1990s created a compact building layout, characterized by rows of north-south multistory slabs. The highrise microdistrict Gongjian Fang had a more distinctive building form: the zonal podium of two to three floors is set along the block perimeter, while residential towers rising up to thirty floors stand on it. In adjacent to Gongjian Fang, Lou Ma Jia Ri, the highrise apartment built in the 2000s, achieves a high development intensity, with the building height of 33 storeys and the FAR of 4.9. The form of highrise apartment is characterized by the combination of residential tower and commercial podium. By 2010 the construction of Niushi residential area under the requirement of overall conservation returned to the lowrise courtyard building form.

⁷ The administration refers to Jiangsu Telecom (State owned enterprise), the hospital refers to Qinhuai Hospital, the primary school refers to Nanjing Kaopeng primary school and the kindergarten refers to Zhonghua Road kindergarten.

Transformation of modern commercial plan-unit, Yanliao Fang

Before 1949	A traditional handicraft and residential area
1990-1997	Residential renewal in early period
1997	Construction of Zhongshan Road South
1997-2010	Construction of business district
2010-	Commercial redevelopment under the overall conservation



Few surviving traditional streets



Residential area built in the early 1990s



Gongjian Fang highrise microdistrict in the 1990s



Zhongshan Road South constructed in 1997



Prevalence of business towers in the early 2000s



Planned commercial complex after 2010

Source: Compiled by the author

Fig. 4.5: Transformation of modern commercial plan-unit

Morphological analysis of modern commercial plan-unit, Yanliao Fang



Fig. 4.6: Morphological analysis of modern commercial plan-unit

(4). Commercial space

Similar to residential space, commercial space also presents remarkable differences of building form. Although slab mode serves as the predominant spatial mode along Zhonghua Road, the spatial rhythm is broken off by two commercial towers standing on the street corner. Along Zhongshan Road South, the three storey commercial complex is located next to six commercial towers with the building height ranging from 20 storeys to 33 storeys, but the site area of the complex is larger than the total area of six towers. Thus the disharmony is obvious both in terms of the building footprint and the building height. What's worse, the coexistence of four spatial modes further aggravated the disorder of urban form, which constitutes a typical image of collage city.

The other problem is that the commercial spatial modes failed to mold the street frontages. Taking the commercial plots along Zhongshan Road South as an example again, the towers bare large setback distance and building interval. Above all, the large setback at the street corner heavily damages the identity of urban structure. It seems justified that the large setback distance of towers attributes to the growth of building height, but the only three storey commercial complex also set the setback distance of 16m, indicating the neglect of building siting on preserving the plot frontage.

Generally speaking, the transformation of Yanliao Fang plan-unit experienced three development stages: (1). Residential renewal in early period (1990-1997); (2). Construction of business district (1997-2010); and (3). Commercial development under the overall conservation (2010-). During this process, the construction of Zhongshan Road South in 1997 and the overall conservation since 2010 played the decisive role in promoting the change of development orientation in this area. The renewal of the modern commercial plan-unit presents following morphological characteristics: (1). A hierarchical road system was established based on the broadening of original street framework so that the historic street pattern could be better preserved than residential plan-unit; (2). Compared with residential plan-unit and industrial plan-unit, Yanliao Fang Unit preserved the minimum plot subdivision, but the plot series has been eliminated; (3). The disordered arrangement of multiple spatial modes generated by the ever-changing development orientations led to the fragmentation of urban form and the discontinuity of street frontages.

4.4 Morphological comparison of commercial centers: Nanjing, Berlin and Kyoto

In order to further clarify the characteristics and problems of Nanjing south historic urban area, a morphological comparison of commercial centers is made between Nanjing, Kyoto and Berlin. Kyoto is one of the most typical Japanese ancient capital. Its original urban layout was deeply influenced by the planning schema of Chinese city Chang'an. Both as oriental ancient cities, Kyoto and Nanjing bare some similarities in the traditional plot pattern. In comparison, Berlin as the typical European city, had quite a different development track. Since the German reunification since the 1990s, Berlin faced with a radical transformation of land system and launched a large-scale urban refurbishment, in which the intervention on the plot redi- vision can give some lessons to Nanjing. Accordingly, the morphological comparison between three cities can be mutually complemented.

4.4.1 Shijo-Karasuma area in Kyoto

Kyoto city formulated the Guideline on the Business-Residential Districts in 1998. In the guideline, the business-residential districts are regarded as the leading area for the revitalization of the city center. In this area business offices and residences coexist and play central role in supporting the vitality of the city for a long period. In this research, six blocks in the heart of this area, namely the intersection of Shijo street and Karasuma Street was selected for analysis.

(1). Preservation of historic street pattern

Instead of establishing a hierarchical road system like Nanjing, Kyoto develops a micro circulation system based on the dense local roads. The original street pattern was characterized by a regular grid pattern, in which a majority of blocks are squares about 120m on a side. In the period of Edo, some north-south streets were constructed in the middle of the square blocks, cutting a square block into two rectangular blocks with the east-west side 60m wide⁸. But in Shijo-Karasuma area, the square block structure was still preserved.

The road hierarchy in this street pattern contains two levels: the arterial road with the width about 25m and the local road with width of about 6m. The only two arterial roads within this area constitute a cross structure, while the dense local road network is renovated into a one-way traffic system. In addition, some denser alleys are developed inside the blocks. Generally speaking, the traditional street pattern and scale has been well preserved, which also provides a good foundation for the conservation of historic plot pattern.

(2). Small High-rise building: the predominant spatial mode continuing the historic form

The commercial center of Kyoto contains much less number of spatial modes than Yanliao Fang Unit in Nanjing. Apart from the traditional plots, Shijo-Karasuma area bares three typical renewed spatial modes, including complex mode (including a hotel), small high-rise building (7-11F), and public service unit (including schools). Above all, the plot scale of complex mode and public service unit are larger than 5000m², belonging to the megaplot. Small high-rise building is the predominant spatial mode in the commercial center of Kyoto. Its plot scale ranges from 1000m² to 3500m² and the plot width ranges from 25m to 59m, belonging to a medium size plot. According to this scale, a block side of 120m long can accommodate 3 to 4 plot frontages.

One remarkable feature of the renewed plots in Kyoto is that they preserve the morphological tradition of small frontage and large depth. According to renewed plots in Block K1, K3 and K4, their ratio of plot frontage to plot depth is almost between 60% and 70%, smaller than 1. Thus the new plots have similar shape to the traditional ones, but the scale is magnified. In this sense, the integration of traditional plots and renewed plots are based on a morphological similarity.

It is clear to see a continuation of historic form when we compare the renewed Small High-rise mode with Machiya, kind of traditional Japanese town house. Apart from the similarity of plot shape, the principles of building siting also show a respect to history. The small highrise buildings are 7 to 11 storeys high, with a very large building coverage rate, generally more than 80%. Neighboring buildings are required to be connected with the common wall, leaving no building interval. Buildings on the plot frontage must be sited on the uni-

⁸ In 1590 the "Shichu-machiwari" project was implemented by constructing narrow streets called "Tsukinuke" which extended into the center of square blocks and divided them into two rectangular blocks.

fied building line of the given block. What's more, the building line spares only small building setback distance from the plot boundary, generally less than 3.5m. In some streets, the setback space is covered by roof, serving as a continuous pedestrian way. In terms of the building siting, it is defined by the relationship to the plot frontage. The development of buildings extend from the plot frontage inwards, which is quite different from the self-centered building siting in Nanjing.

(3). The continuation of plot series and diversified plot patterns

There are obviously four types of plot pattern developed in Shijo-Karasuma area:

Historic pattern (K5)

Traditional residential plots, with the plot width of 5 to 10m, are distributed along the block boundaries and form dense plot series. A megaplot of 5200m² in the south of the block is embedded into the historic plot pattern. But as it has a relative small plot frontage, the enclosure of historic plot series around the block is not damaged.

Hybridization (K1, K4, K6)

Hybridization pattern refers to the block in which traditional residential plots and medium scale commercial plots coexist. Commercial plots mainly face the arterial road. One block side can accommodate 2 to 3 commercial plots with area ranging from 1000m² to 3500m². Traditional plots with commercial and residential mix, mainly face the local roads.

Redivision (K3)

Block K3 experienced a thorough plot redivision, through which new plot pattern is composed of 7 plots, mostly in medium size. Although the plot number is limited, three plot series are formed, leading to an ordered pattern.

Megaplot based pattern (K2)

The largest plot in the commercial center area is the hotel plot located in Block K2. With an area of 10000m², it takes up 60% of the block area. Some medium and small plots are preserved in the block corners, which makes the plot subdivision survives on some block boundaries.

Generally speaking, the mix of traditional plots and new plots is the most remarkable characteristics of the plot arrangement in Kyoto's commercial center (Fig. 4.7). Firstly, hybridization type has the largest proportion; Secondly, even the megaplot-based block still preserves some traditional plots. Most importantly, most of the preserved plots still constitute remarkable plot series. Thus the primary principle for the insertion of new plots is to maintain the morphological characteristics of plot series, which is a key reason for molding an ordered plot pattern in Kyoto.

(4). The dense and ordered urban fabric

The commercial development in Shijo-Karasuma area based on multistorey and small high-rise buildings, has achieved a high development intensity. For example, the FAR of Block K3 is about 6. Even in many traditional plots the renewed buildings are 3 to 4 storeys high. In addition, a majority of buildings almost occupy the whole plot except the compulsory setback distance from the plot boundary, leading to a high building coverage rate. In the redeveloped Block K3, it is above 85%.

The ordered urban fabric largely attributes to the plot frontage-based building siting principle (Fig. 4.8). Above all, the building line plays a critical role in molding the continuous street wall. The historic building line is preserved on block side where traditional plot series exists; while the building setback distance is

smaller than 3.5m on those renewed boundaries. Most notably, the building layout of megaplot is also confined by the building line. Taking the school in Block K5 as an example, the building is sited on the building line, while the playground is placed inside the plot. Thus the coordination between the megaplot and the continuous street frontages is achieved. In comparison, most school buildings in Nanjing, as functional requirements are given priority, are sited inside the plot, leading to the damage of street frontages.

The reutilization of traditional plots is another noteworthy issue. Quite a proportion of traditional plots are preserved in the commercial center of Kyoto, which can be understood as a result of long-term private land ownership. Many traditional plots have been renewed, on which stand the residential or commercial buildings of threestorey or fourstorey high. Other plots are expropriated and transformed into parking space or public space. Under the private land ownership, the plot pattern shows a specific confinement to the urban spatial development that new architecture and new urban space should be generated from a historic framework (Fig. 4.9).



Fig. 4.7: Plot pattern of Shijo-Karasuma area in Kyoto

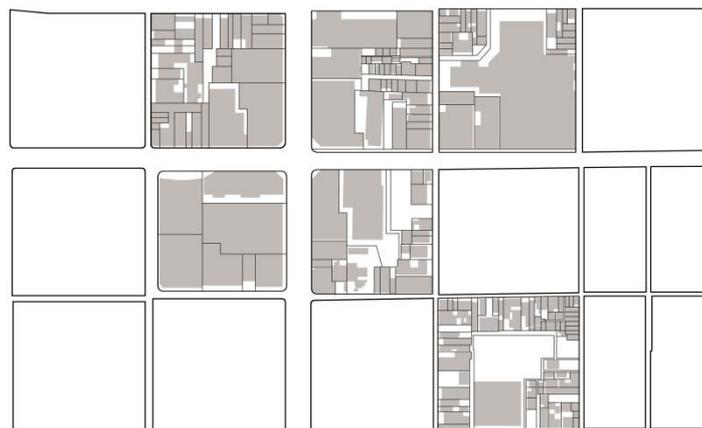


Fig. 4.8: Building form of Shijo-Karasuma area in Kyoto



Traditional Machiya building

Source: <https://www.homeaway.ca/cottage-rental/p514790vb>



Renewed building "Tower machiya" [Source: <https://www.pinterest.de/pin/290622982185976588/>]

Fig. 4.9: Continuation of historic form in Kyoto's spatial mode

4.4.2 Friedrichstadt in Berlin

Constructed in the early 18th century, Friedrichstadt is the westwards extension of Berlin old city. It was designed with an austere geometric style for the time, with broad streets which intersected at right angles to each other. This area was a prosperous commercial area for a long time before the Second World War, but was heavily damaged during the war and the post-war period. Since the German reunification in the early 1990s, a large-scale reconstruction was made in this area. Many new and luxurious buildings were built with attention to historic styles. New businesses, including several high-end department stores and shops opened in the neighborhood⁹.

(1). Street pattern: a homogeneous grid pattern

The street pattern in Berlin Friedrichstadt is characterized by a homogeneous grid pattern. A majority of streets are about 20m wide, a width between the sub arterial road and local road according to Nanjing's standard of road hierarchy. Blocks under this street pattern are small-scale. For the five blocks in the research, they are about 8200m², with the east-west boundary 106m long and the north-south boundary 77m. This block scale is smaller than that in all five typical plan-units of Nanjing, including Confucius Temple Unit. In addition, the homogeneous road network leads to a relative high road density of 188m/ha.

(2). Plot pattern: medium plot based subdivision

There are two typical spatial modes developed in Friedrichstadt, the complex mode and the Mid-block Courtyards. Complex mode prevailed in the early 1990s, including three commercial redevelopment. With the plot area of 8345m, 4482m and 4840m respectively, they roughly belong to the megaplot, but the scale

⁹ Wikipedia. Friedrichstadt, Berlin. (2017). [https://en.wikipedia.org/wiki/Friedrichstadt_\(Berlin\)](https://en.wikipedia.org/wiki/Friedrichstadt_(Berlin))/Accessed 2018.01.09.

is much smaller than the complex in Nanjing (38000m²). Except that the largest plot occupies the whole block, the other two only take up half blocks. Thus the plot subdivision still survives in the two blocks.

Taking up 75% of the research area, Mid-block Courtyards is the predominant spatial mode in Friedrichstadt. There are totally 18 plots of this mode in five blocks, with the area ranging from 200m² to 3500m². Some of them are traditional plots, some have experienced minor amalgamation. Traditional plots are characterized by small frontage and big depth. The traditional plot frontage is generally smaller than 20m, while the amalgamated one rises to 30m to 40m. The three plots of complex mode developed in the early 1990s were considered too large to meet the requirements of critical reconstruction. In the subsequent redevelopments, medium sized Mid-block Courtyards was given the priority, which is the key reason why Berlin commercial center can still the plot subdivision (Fig. 4.10).

(3). Building form: Mid-block courtyards mode based urban fabric

The urban fabric of Friedrichstadt is largely molded by the predominant spatial mode Mid-block Courtyards (Fig. 4.11). Above all, inner courtyards are the most remarkable morphological feature. Buildings of this mode is 5 storeys (22m) high, face the street and are located on the plot frontages. Buildings are connected with each other by the common wall, generating the corridor street. In order to solve the problems of lighting and ventilation, courtyards are set inside the plots. This spatial mode is characterized by a functional mix, with the ground floor for commercial use and upper floors for residential or business uses. In fact, even the three commercial complex also adopted the layout of Mid-block courtyards. In addition, Mid-block courtyards mode emphasizes the preservation of the continuous street frontages. All buildings are required to follow the historic building line. Thus the typical European perimeter blocks can be remained.



Fig. 4.10: Plot pattern of Friedrichstadt in Berlin

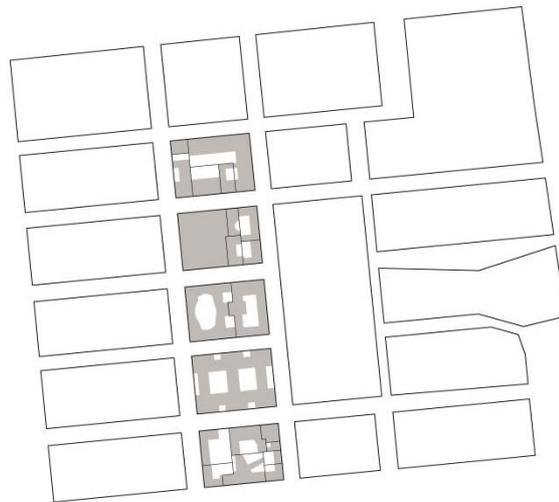
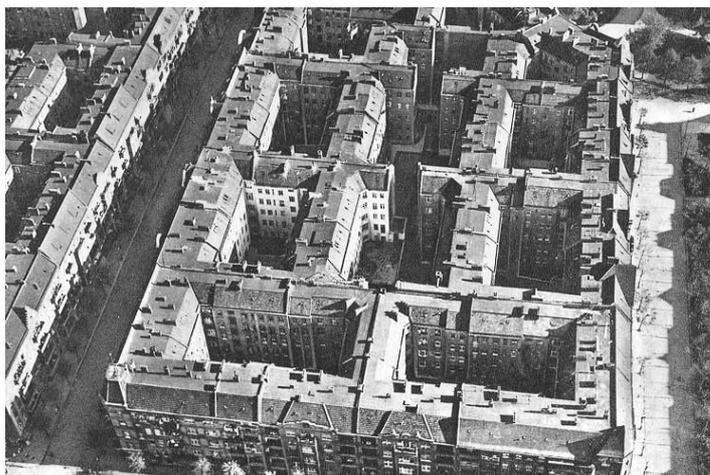


Fig. 4.11: Building form of Friedrichstadt in Berlin

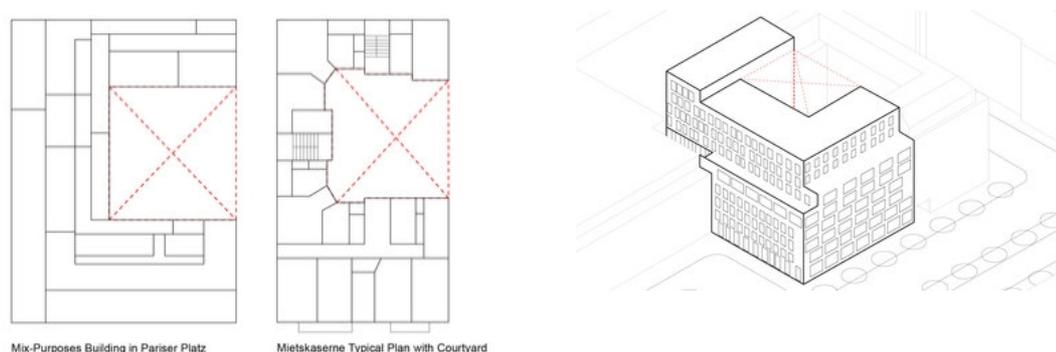
More importantly, Mid-block Courtyards mode reflects an inheritance of the historic morphological elements (Fig. 4.12). The prevalence of this mode was due to that the redevelopment of Berlin inner city in the early 1990s required the new buildings to incorporate the building typology of pre-war period. Mietskasernen, the “rental barracks” was the dominate urban housing type since the late 19th century when Berlin experienced rapid growth both of the urban scale and population. Derived from the police regulations of 1851, they constituted one of the most integral forms of exploitation of the urban land.¹⁰ Typically they were five stories high and arranged in a series of blocks surrounding a central courtyard with minimum dimensions of 5.3 by 5.3 meters as specified by police regulations. Though large when seen from the exterior, Mietskasernen could be subdivided internally into almost any combination of individual rental dwellings depending on the number and size of rooms installed.¹¹ New commercial development inherited the typological characteristics of Mietskasernen and made functional improvement. In this sense, the urban renewal of Berlin is based on the continuation of historic morphological elements.



(1). Typical Berlin Mietskasernen [Source: Verlag Dr. Hans Epstein/Wien & Leipzig 1929]

¹⁰ Cf. Rossi, A. (1982).

¹¹ Cf. Kuck, R. (2010).4.



(2). A typical mid-block courtyards mode [Source: Paul Phaisinchaiaree, <https://archinect.com/thanomphol/project/pariser-platz-germany>]

Fig. 4.12: Continuation of historic element in new buildings

4.4.3 Reflection: the problem of Nanjing Old South area

Through the comparison of three commercial centers in Nanjing, Kyoto and Berlin, a reflection on the morphological problem of Nanjing is made (Tab. 4.3, Fig. 4.13).

(1). Small-scale block structure

The small-scale block structure developed in Berlin and Kyoto not only promotes the establishment of the microcirculation system, but also set an upper limit for the scale of megaplot. In comparison, Nanjing adopts the hierarchical road system, leading to the elimination of many traditional local streets and alleys. Consequently, the growth of blocks promote the generation of megaplot.

(2). Nanjing lacks a predominant spatial mode taking root in the history

The historic morphological elements have been inherited in contemporary renewals both in Kyoto and Berlin. The Small High-rise mode in Kyoto bares similar plot shape to traditional plots but magnifies the scale. Berlin Mid-block Courtyards mode incorporates the pre-war building type, Mietskasernen. However, the commercial spatial modes developed in Nanjing do not show a historic continuation, hardly incorporating the traditional morphological elements. The ratio of plot depth to plot width in Yanliao Fang Unit is smaller than 1, indicating that the traditional plot shape characterized by small frontage and large depth has lost. In addition, Nanjing has diversified spatial modes but lack a predominant one. Comparatively, Small High-rise mode and Mid-block Courtyards mode are absolutely take up the largest proportion of the commercial center respectively in Kyoto and Berlin.

(3). Rough plot redivision leads to a megaplot based pattern in Nanjing

Through the comparison, Yanliao Fang Unit of Nanjing has much larger block scale, plot size and plot frontage than the commercial centers of Kyoto and Berlin. The average plot area of Nanjing achieved 8900m², while that in Kyoto and Berlin is 770m² and 3300m² respectively. Obviously, the plot pattern in Nanjing's commercial center has transformed into a megaplot based pattern, while that in Kyoto and Berlin still preserves the plot subdivision. Plot redivision was also made in Kyoto and Berlin, and some readjustments were made on the traditional plot pattern. In fact, it is necessary for historic cities to generate new plot scale in order to adapt to contemporary urban development. But the definition of a proper plot scale and plot shape require

a careful thinking. In this respect, the plot redivision in Nanjing is much rougher than that in Kyoto and Berlin. Especially, plot redivision in Nanjing neglected the preservation of plot series which is critical in maintaining the plot pattern.

(4).Weak control on the building envelop

It is seen that the building coverage rate and the proportion that buildings siting on the building line in Nanjing are far lower than those in Kyoto and Berlin. On the one hand, the commercial center of Nanjing has larger development intensity. It is the prevalence of highrise buildings that generate larger building interval and setback distance. In Yanliao Fang Unit, as the highest building reaching 33 storeys, the difference in building height is very big. Comparatively, the building height in Kyoto is limited in 11 storeys and in Berlin 5 storeys. On the other hand, the standard of building siting in Nanjing is too rigid and overemphasizes functional requirements, leading to the damage of historic urban form. But Kyoto and Berlin show respect on the historic building line, which results in smaller building setback distance and continuous street frontages.

Tab. 4.3: Comparison of morphological elements between Nanjing, Kyoto and Berlin [Source: Compiled by the author]

Morphological elements	Nanjing(Yanliao Fang)	Kyoto(Shijo-Karasuma)	Berlin(Friedrichstadt)
Average block size	20190m ²	14400m ²	8200m ²
Average plot size	8900m ²	770m ²	3300m ²
Average plot frontage	100m	30m	60m
Plot depth/ plot width	0.94	1.63	1.03
Building coverage rate	55.3%	72.6%	76%
Proportion that buildings siting on the building line	34%	76%	93%

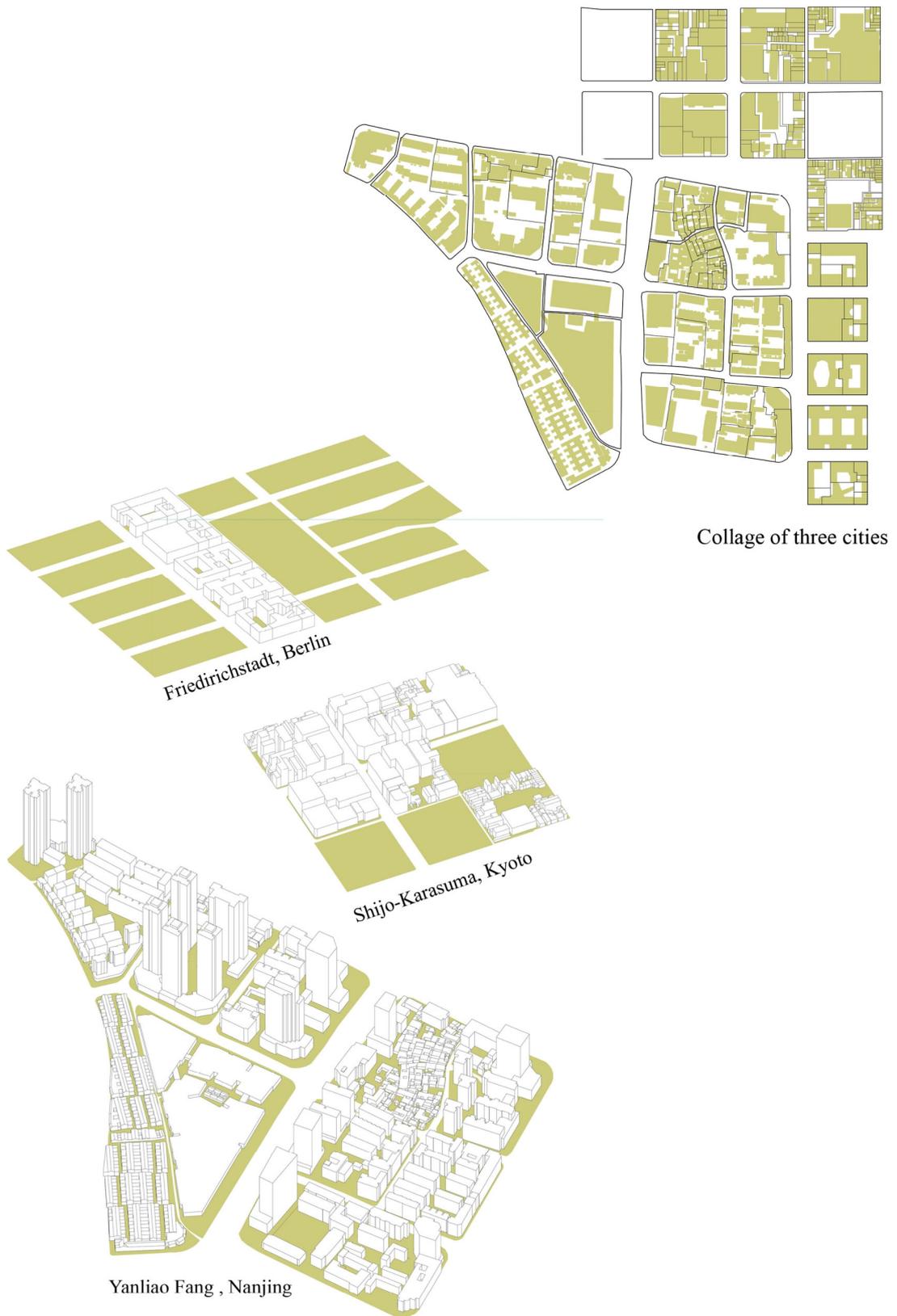


Fig. 4.13: Comparison of three-dimensional urban form between three cities

4.5 Transformation of traditional commercial plan-unit

4.5.1 Transformation of Confucius Temple Unit

(1). Formation of historic landscape (-1949)

Located in the east of Old South area along Qinhuai river, Confucius Temple area is long in history the cultural and commercial center of Nanjing. In East Jin Dynasty (late 4th century) when Nanjing first served as the capital city of the national regime, this area became a main residential area of the nobility and prosperous urban area full of temples and shops. The Confucius Temple, together with the Governmental School (*xuegong*) and the Examination Compound (*gongyuan*) were initially built in Song Dynasty (1034). Because of the lofty status of traditional Chinese examination system (*Keju System*)¹² in the ancient society, the building complex of Confucius Temple kept being renovated or reconstructed after several wars and turmoils. By Ming and Qing Dynasty (14th-19th), it had been the cultural and educational center of eastern China. Meanwhile, the commercial and recreational development in the periphery area, especially along Qinhuai river, reached the climax (Fig. 4.14).

As the Chinese imperial examination system was abolished in 1905, Confucius temple, Governmental School and Examination Compound lost their original functions. The Examination Compound was demolished and reconstructed into the market. Confucius Temple area basically turned into a recreational and commercial area. In the Second Sino-Japanese War (1937-1945), the building complex of Confucius Temple and abundant riverside shops and residences were heavily destroyed. After the war, this area was still a major commercial area of Nanjing, with the ruins of Confucius Temple rebuilt into a playground. However, the iconic historic landscape of ancient Nanjing was gone.



Fig. 4.14: The prosperity of Confucius Temple area in Ming and Qing dynasty (Kangxi Emperor's Southern Inspection Tour (1619)
[Source: The Palace Museum]

(2). Reconstruction of the historic core (1980s-1990s)

As Nanjing was selected as the national Famous Historic and Cultural city in early 1980s, the municipal government decided to reconstruct the historic landscape and meanwhile revitalize the traditional commercial

¹² The Chinese imperial examinations (*Keju System*) were a civil service examination system in Imperial China to select candidates for the state bureaucracy. It became widely utilized as the major path to office only in the mid-Tang dynasty, and remained so until its abolition in 1905. Based on knowledge of the classics and literary style, the examination helped to shape China's intellectual, cultural, political, shopping, arts and crafts, and religious life. Meanwhile it results in a systemic lack of technical and practical expertise. (from wikipedia).

center. Started in 1984, the reconstruction program included not only the restoration of cultural relics and historic building complex, but also the large-scale commercial and residential redevelopment (Fig. 4.15). In 1986 the municipal planning bureau made the detailed planning of Confucius Temple Commercial Center, which proposed five key points of reconstruction:

- (1). *Recovering the landmark building complex;*
- (2). *Recovering the iconic historic landscape of Confucius Temple square;*
- (3). *Constructing the commercial pedestrian street;*
- (4). *Establishing museums and more recreational facilities;*
- and (5). *Improving the environment by adding green space.*

In addition, several multistorey microdistrict including Da Si Fu Alley, Bai Lu, and Taoye were constructed in periphery area. The reconstruction of historic core was basically completed by the end of 1980s and the reconstruction of whole planning area was completed in the middle 1990s. Since then Confucius Temple area became one of the most important commercial and cultural destination of Nanjing.

4.5.2 Street pattern

The reconstruction of Confucius Temple area successfully remained the historic street pattern (Fig. 4.16). Above all, different strategies were applied in the core area and the periphery area. The traditional street pattern in the core area contains two distinctive parts, the T-shape major commercial streets¹³ and the orthogonal structure of Examination Compound which had been turned into a market in the early 20th century. Built as the official streets (*guan dao*) in imperial period, they had the original width of more than 10m, prominently wider than ordinary streets with an average width of 4m. In the reconstruction, the street structure was completely protected and was transformed into commercial pedestrian streets, remaining the original street width. Improvement was mainly made on the connection between the T-structure and the orthogonal structure. In comparison, streets in periphery area had a minor broadening in order to accommodate the automobile traffic. Pingjiangfu Road, the sub arterial road in the east was broadened into 20m. Dasifu alley, the local road directly adjacent to Confucius Temple complex in the east was reconstructed into 10m wide.

The historic street pattern in Confucius Temple area generated a distinctive small-scale block structure, under which the average block size is about 7200m² and the road density reaches 287m/ha. As the reconstruction remained a majority of historic streets and alleys¹⁴, the small-scale block structure was able to continue. The average block size after renewal increased modestly into 9900m² and the road density correspondingly reduced to 235m/ha, which is nevertheless still much finer and denser compared with other plan-units.

¹³ The T-shape major commercial streets are composed of east-western Gongyuan street and north-southern Gongyuan street.

¹⁴ The exception was the residential redevelopment of two blocks. Sifu alley microdistrict on the west side of Confucius Temple and Yaojia alley microdistrict in the east end. Both constructions led to minor simplification of street pattern and expansion of block size.

Transformation of traditional commercial plan-unit, Confucius Temple

Before 1949 Cultural and commercial center of Nanjing
1980s- Reconstruction of historic landmarks and redevelopment in periphery area
1990s- Continuation and completion of the redevelopment



Kuixing Pavilion, Pan-chi and screen wall in front of Confucius Temple in the 1930s



Reconstruction of historic landscape in the 1980s



Reconstruction of Confucius Temple



Reconstruction of commercial pedestrian street



Commercial redevelopment in periphery area



Da Si Fu alley microdistrict built in the 1980s

Source: Compiled by the author; The photo taken in the 1930 is downloaded from http://www.360doc.com/content/15/1012/19/5936285_505177505.shtml

Fig. 4.15: Transformation of traditional commercial plan-unit

Morphological analysis of traditional commercial plan-unit, Confucius Temple



Fig. 4.16: Morphological analysis of traditional commercial plan-unit

4.5.3 Plot pattern

There are five spatial modes include traditional courtyards, podium, tower, multistorey microdistrict and public service unit distributed in Confucius Temple plan-unit¹⁵. Above all, podium mode is the predominant spatial mode, taking up 31.4% of the whole area (Fig. 4.16). Compared with other contemporary spatial modes whose average area are all larger than 5000m²(Tab. 4.4), the plot size of podium mode is relative smaller. Most of them are in medium scale, with the average size of 1520m². The largest plot of podium mode is located on the south side of Qinhuai river. Built as a hotel, it reaches the area of 4800m²¹⁶. Due to the small-scale block structure, the plot amalgamation could be confined in an acceptable range. Taking the blocks of podium mode as an example, each block is generally divided into 2 to 4 plots. Thus a minimum plot subdivision is preserved in Confucius Temple Unit.

Apart from remaining a high road density, the plot redivision improved the environmental quality, as some amalgamated plots, mostly distributed along Qinhuai river and Jiankang Road, the northern boundary of the plan-unit, were set as green space or public space.

The generation of the medium scale plot pattern attributed largely to the specific development mode and economic system in the 1980s. In the period of command economy, the reconstruction largely relied on limited governmental investment. Despite guided by a comprehensive development, the reconstruction program had to be divided into several sub-projects which were generally based on single block or single plot and completed in stages. According to the statistics of Nanjing Urban Construction Annals, by 1990 there were totally 104 projects with the total area of 176000m² conducted around Confucius Temple area. In this sense, the generation of medium sized plots is a result of realistic option.

However, Confucius Temple Unit as a historic core has only preserved few historic plots¹⁷ and the distinctive lineal plot series has been eliminated after renewal, which was especially shown in striped-shaped blocks in the south of Qinhuai river. There new plots have excessive frontage width of more than 100m. As the reconstruction was made in the 1980s when the conservation of vernacular dwelling had not been fully emphasized, the majority of traditional dwellings were demolished for commercial redevelopment. In addition, the traditional plot scale was too small to conduct the unified commercial redevelopment. On these conditions, historic plots could hardly be preserved.

¹⁵ The zoning is based on the site plan of 2010. In the following years some plots like the Examination Compound and Block in the northeast corner have been renewed, bringing about the change of site plan.

¹⁶ Qinhuai Renjia Hotel, located on the south of screen wall, is composed of six building units. The hotel plot occupies an entire block of 4800m². In order to remain the traditional urban tissue, the courtyard archetype was adopted and the floor building height was slightly raised to two-three storeys.

¹⁷ There are only five historic buildings protected in Confucius Temple area.

Tab. 4.4: Spatial modes in Confucius Temple Unit [Source: Compiled by the author]

Spatial modes	Total area(m ²)	Proportion	Plot number	Plot area(m ²)	Distribution
Traditional courtyard	35849	12,99%	—	—	Only five protected buildings; Reconstruction of three landmark building complex; T-shape commercial streets;
Podium	86660	31.4%	57	1520	Jiakang Road; Bailuzhou Road
Tower	5750	2%	1	5720	The hotel in the north of Confucius Temple
Unit Compound	47345	17,15%	3	15781	Hospital in the Examination Compound and schools
Multiple-storey microdistrict	45589	16,51%	6	7600	Sifu alley and Yaojia alley microdistrict

4.5.4 Building form

(1). Reconstruction of historic landmarks and landscape

The main achievement for the reconstruction of Confucius Temple area was the discreet reconstruction of the historic landmarks and landscape. The landmark building complex is mainly composed of Confucius Temple, Governmental School (*xuegong*) and Examination Compound (*gongyuan*). Above all, Confucius Temple and Governmental School were reconstructed according to the historic form. The accesses on both sides of the temple were reconstructed into east and west markets. As the site of Examination Compound had been occupied by a hospital, the only surviving historic building there was preserved as a museum.

The renovation of historic landscape mainly included the square in front of Confucius Temple and the Qinhuai riverside landscape. Except the Ming dynasty relics of stone balustrade and screen wall, the majority of buildings and structures on the square were reconstructed according to historic form, including Lingxing Gate, Dacheng Gate and memorial archway¹⁸ on the axis; Kuixing Pavilion on the east and Deyue Terrace¹⁹, Wende Bridge and Juxing Pavilion²⁰ on the west.

(2). Podium-based urban fabric and the molding of continuous street frontages

Despite the success of landmark reconstruction, most of historic buildings have been demolished in the reconstruction. Currently there are only five buildings listed as protected cultural relics. Instead, commercial redevelopment promoted the prevalence of podium spatial mode. Compared with the hotchpotch of spatial modes in Yanliao Fang Unit, the predominance of podium mode and its concentrated distribution generated a more ordered urban form (Fig. 4.16).

The podium spatial mode is characterized by the large building coverage rate. In order to continue the historic street frontages, buildings are required to be connected with each other by a common sidewall, and the front building setback is very small. As most buildings do not set the courtyard, the podium-based urban fabric is quite different from the traditional one that is based on the courtyard building. Thus the archaized

¹⁸ The memorial archway, Tianxiawenshu, originally built in 1586 was reconstructed in 1988. It serves as the start point of the axis of the complex.

¹⁹ Deyue Terrace was originally a tea shop which was welcomed by men of letters. In 1987 it was reconstructed as one scenic spot, featuring as a combination of pavilion, terrace and open halls.

²⁰ Juxing Pavilion originally built in 1586 on the west part of the square, was reconstructed in 1988. Together with Kuixing Pavilion on the west, they symbolized the prosperity of culture and education.

building facade, in other words, the application of traditional architectural elements like sloping roof, Ma Tau wall (*ma tou qiang*) and lattice window, becomes necessary in maintaining the traditional characteristics of the streets. The building height and building form differs in core area and periphery area. In core area the building height is generally limited within three storeys, while in periphery area it can extend to five or six storeys.

The periphery area also faces the challenge of integrating various spatial modes which are imperative to be applied in order to accommodate diversified contemporary urban functions. There are remarkable differences between public service unit mode, multistory microdistrict mode and podium mode in terms of the building volume and building layout. The primary principle to solve this problem is to keep the continuous street frontages and historic building line through the detailed urban design. It is clear that the building siting of microdistricts and unit compounds in this Unit are discreetly controlled so that their street frontages are successfully preserved.

4.6 Transformation of historic conservation plan-unit

4.6.1 Transformation of Mendong Unit

(1). Traditional residential area and early renewals (-2000)

Mendong area, located in the southmost of Nanjing old city, is the core historic conservation area in Old South area. Bordering Zhonghua Gate, the main entrance of Nanjing city and Qinhuai River, the commercial and landscape belt, it developed into a prosperous residential area in imperial time.

After 1949 Mendong area in a long time served as a traditional residential area with limited urban renewals (Fig. 4.18). In the late 1950s when the industrial construction went to the climax in the old city, Nanjing Yarn-dyed Fabric Mill was built on Jianzi Alley. As a typical neighborhood factory, it covered an area of 120000m², with the highest plant building reaching five storeys. In the early 1990s, some welfare housing were constructed along Changle Road and Madao street, most of which adopted the typical multistory microdistrict schema.

As the urban center transferred north, the location advantage of Mendong area has gradually disappeared. As a traditional residential area, the infrastructure renewal in Mendong fell behind seriously, further leading to the deterioration of the living conditions. Although in the early 1990s this area has been included in the historical conservation area, there has been neither specific conservation plan nor overall urban design made to guide the organic renewal.

(2). Road reconstruction and large-scale renewal (2000s)

In the end of 1990s the fever of road construction in the historic urban area spread to Mendong area. In order to improve the automobile traffic capacity, east-west Madao street and north-south Gutong alley were upgraded into local roads and broadened into 25m. Thus a cross road structure with excessive scale was formed, cutting the entire historic area into four sections. Inevitably, urban renewals were made along these roads that several large-scale blocks were redeveloped into multistorey and highrise microdistricts. Especially the

two located in the intersection of Madao street and Jianzi alley posed a sharp contrast to the historic cityscape both in terms of the building layout and building height.

Faced with increasing pressure of urban renewal, several rounds of conservation plannings have been made since 2000, which nevertheless failed to stop the demolition and damage of the historic conservation area. In 2006 the southwest section, the 6ha Changledu district was totally removed, indicating the elimination of the oldest street pattern of Nanjing. By 2010, the last fragments where traditional cityscape survived in Mendong area are totally 16.5ha, mainly distributed in historic districts²¹. But the overall historic pattern has been damaged.

(3). Overall conservation and urban refurbishment (2010-)

The turning point for the conservation of Mendong area was 2010 when the conservation plan of South Historic Urban Area (2010-2020) was made. The plan for the first time proposed the overall conservation of Old South area and readjusted its development orientation as a cultural, tourist and recreational center. Above all, the refurbishment of Mendong area was emphasized by the conservation plan and the pilot projects were made there. The refurbishment strategy can be summarized into three points:

- *Refurbishment of the historic urban pattern and the traditional scale;*
- *Renewal unit strategy is applied to promote the protection of plot and*
- *Establishing the design guidance for building reconstruction.*

In the refurbishment of Gutong alley, the excessive road width generated from the renewal in the late 1990s was successfully recovered to the traditional scale. Recognizing the heritage value of industrial buildings, the neighborhood factory on the side of the street was renovated into an art gallery. In the reconstruction of Changledu district where had been falsely demolished in 2006, the urban ground plan with traditional scale and characteristics was established, integrating well with historic urban pattern.

4.6.2 Street pattern

(1). Reconstructed roads in the 1990s cutting off historic district

The traditional street pattern of Mendong Unit is based on several east-west main streets, which stretched towards the Qinhuai riverside. In comparison, the north-south subsidiary streets bare less density and continuity. Thus this plan-unit did not develop a grid street pattern, bringing about some difficulties in the introduction of automobile road system. What's more, the original block size in Mendong, with an average area of 10554m², was remarkably larger than most other plan-units.

The road reconstruction was made in the late 1990s, with the establishment of a cross automobile traffic structure. The east-west Madao street and the north-south Gutong alley were broadened into 25m. As most original streets in the historic districts are only 5m wide, the new roads with the excessive scale cut off the historic districts into four sections (Fig. 4.19). The subsequent residential and commercial redevelopment along the new roads further led to the increase of block scale and elimination of some traditional alleys. Consequently, the average block size increased from 10554m² to 15423m². This figure is much smaller than three typical redevelopment plan-unit and a little bit larger than Confucius Temple Unit. In addition, the road

²¹ Mendong area contains three historic districts, including Santiaoying historic district (4.84ha) and Shuangtangyuan historic cityscape district (6.98ha) in the south of Jianzi alley as well as Dayoufang alley historic cityscape district (4.69) on the western river side.

density decreased from 219 m/ha to 178 m/ha. Despite the broadening of Madao street and Gutong alley, the road network with its low road density was not improved.

(2). Refurbishment of the historic urban pattern and the traditional scale

The refurbishment of Mendong Unit after 2010 emphasized on the integration of urban pattern and the return of traditional scale. In the two pilot projects, the excessive road scale of Gutong alley which separates the historic district was required to be reduced, and the reconstruction of Changledu district should develop a street pattern that could be well integrated into the historic urban structure.

The section of Gutong alley for refurbishment is about 240m long, stretching from Jianzi Alley in the north to the city wall in the south. The major measure was to reduce the street width from 25m to 15m through adding new buildings on both sides. Coupled with the addition of landscape water system and green space into the street section, the traditional pedestrian scale could be regained. Through the renovation Gutong alley was turned into a pedestrian way, serving as a buffer area for entering Santiaoying historic district. As the separation of automobile traffic and pedestrian was the prerequisite of the road scale reduction, a new circulation road was built on the west side and two parking places were built on eastern and western sides.

The refurbishment of street pattern in Changledu district took reference of the cadastral map of 1951 when the traditional urban form still remained intact. In order to meet the requirements of automobile traffic and contemporary living standard, the refurbishment could not be a mere replication of the historic pattern. Instead, only several main streets were recovered to their original patterns, while others streets developed a new pattern. The restored street system can be divided into two levels, the automobile way of 5m-9m wide, and the pedestrian way of no more than 5m.

4.6.3 Plot pattern

The traditional plot pattern in Mendong can be divided into three morphologically distinct sub-areas. The area in the north of Santiaoying is composed of large-scale blocks. Despite north-south oriented plots taking up a majority, the blocks developed street frontages in all four directions. Plots in this area were very slender, with the average frontage width of 10m and the depth of more than 60m, speculating that they accommodated at least four-layer courtyards²². The area in the south of Santiaoying developed smaller blocks in which all plots were oriented in north-south direction and arranged into east-west plot series. Comparatively, the area in the southwest, namely Changledu district, had a zigzag and irregular street pattern and densest and smallest plot pattern.

After about twenty years' urban renewal, the spatial modes and plot shape in Mendong area by 2010 presented a sharp contrast between the north and the south (Fig. 4.19). A majority of the northern section has been renewed, which are especially distributed along Madao street and Changle road. The renewals along Changle road mainly include multistorey microdistricts constructed in the early 1990s and a commercial complex built on the plot transformed from a neighborhood factory in the late 1990s. Comparatively, the renewal along Madao street mainly include two highrise microdistricts. Most of these plots are larger than 10000m², belonging to megaplots. In the south part, historic districts still take up quite a large proportion,

²² Some extremely long plot like the former residence of Jiangbaiwan, reached the depth of more than 80m, constituting six layers of courtyards.

about 30% of the plan-unit by 2010. Thus plot subdivision is preserved in this area except the megaplot of Changledu district which was demolished in 2006 and amalgamated into a single plot for redevelopment. Consequently, the plot pattern of the whole plan-unit manifests a sharp contrast of the megaplot based pattern and the subdivision based pattern.

Plot pattern is the key point of urban refurbishment practice in Mendong area. Taking Changledu district as an example, the application of *Renewal Unit* strategy helped to recover a plot subdivision within the megaplot. The definition of the *Renewal Unit* should take reference on the property boundaries of the existing buildings. The minimum scale of individual renewal could be the renovation of a single building. But the maximum scale is confined by the scope of the Renewal Unit. In this way large-scale renewal is likely to be prevented and the traditional urban fabric is able to be preserved. In the case of Changledu district, most of renewal units adopted the traditional scale with the average plot width remaining about 10m. In order to meet the requirements of contemporary building code, a majority of renewal units are in north-south orientation. They are arranged along the reconstructed street pattern, constituting regular plot series. There are about 10 historic plots preserved in the district, which are well integrated into the new plot pattern. Renewal Units strategy also played an important role in the refurbishment of Gutong alley. In order to reduce the road scale, new plots simulating the traditional scale were filled into both sides of Gutong alley. In addition, several medium scale plots were set inside the block in order to meet the requirement of museums.

4.6.4 Building form

(1). The fragmentation in the north part and the spatial fracture in the south part

Apart from the historic conservation spatial mode, Mendong Unit still accommodates five spatial modes, including multistorey microdistrict mode, highrise microdistrict mode, commercial complex mode, neighborhood factory mode and public service unit mode, which are almost concentrated on the north of Jianzi alley. Their building footprints have large differences, leading to a fragmented urban fabric (Fig. 4.19). Above all, the two highrise microdistricts along Madao street bring about the heaviest damage. The rows of 11 storeys slabs pose a sharp morphological contrast to the adjacent historic districts. In addition, the microdistricts abandoned the historic building line and created large setback distance. Giving priority to the functional requirement, the east and west street frontage are totally eliminated without the filling of buildings.

The main problem in the south part is the spatial fracture that the excessive scale of Gutong alley made on Santiaoying historic district, and the elimination of historic urban fabric in Changledu district due to the great demolition in 2006. These problems show that compared with the early urban renewals those after 2000 had heavier damage to the historic conservation plan-unit.

(2). Recovering of traditional streetscape and building footprint

In the refurbishment of south part, both the reconstruction of Changledu district and Gutong alley paid much attention to recovery of the traditional streetscape and the building footprint (Fig. 4.20, Fig. 4.21). The planning establishes a set of design guidance, which focuses on the control of architectural form, in a way showing less flexibility. Above all, the key element is to simulate the layout of vernacular courtyards, although inside the building the reinforced concrete structure was used. In Changledu district, the width of each courtyard arranges from 5m to 12m and the building height is strictly controlled no more than two stories.

Three facade types including the commercial mode, the riverside mode and the residential mode were divided in remolding the streetscape. In addition, distinctive traditional facade elements like sloping roof, black brick and lattice window were also a necessity in recovering the traditional atmosphere.

(3). Recognizing the value of diversified cityscape

The conservation plan had a significant progress in recognizing the value of diversified cityscape. The diversified building types coexisting in the historic urban area is not only a significant morphological characteristic, but also the result of consecutive urban transformation. Therefore, some general buildings including modern buildings, industrial buildings and old dwellings should be protected and reunitized. A typical case in Mendong Unit was that the neighborhood factory near Gutong alley was renovated into an art gallery, and some multistorey microdistricts were preserved.



Fig. 4.17: Conservation hierarchy of Mendong plan-unit

Transformation of historic conservation plan-unit, Mendong area

Before 1949	Traditional residential area
1950s	Neighborhood factory construction
1990s	Welfare housing construction
2000s	Road reconstruction and commercialized housing renewal
2010-	Urban refurbishment



Welfare housing construction in the 1990s



Redevelopment of highrise microdistrict in the 2000s



Refurbishment of Gutong alley after 2010



Reconstruction of Changledu district after 2010



Historic conservation area, San Tiao Ying district



Renovation of industrial buildings into a gallery after 2010

Source: Compiled by the author

Fig. 4.18: Transformation of historic conservation plan-unit

Morphological analysis of historic conservation plan-unit, Mendong area



Fig. 4.19: Morphological analysis of historic conservation plan-unit

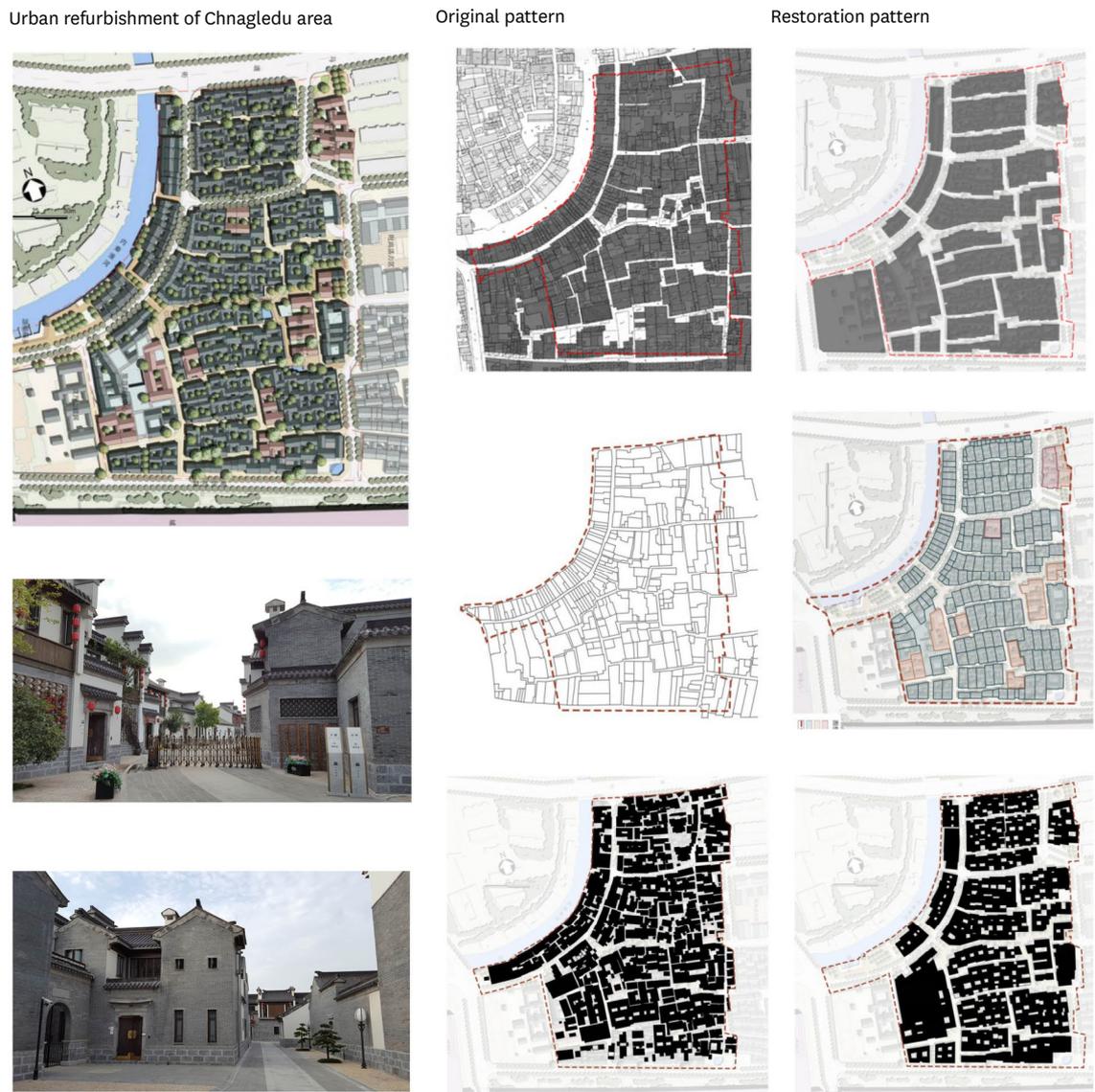


Fig. 4.20: Reconstruction of Changledu district [Source: Planning Bureau of Nanjing, 2011]

Transformation of urban form



Restoration pattern

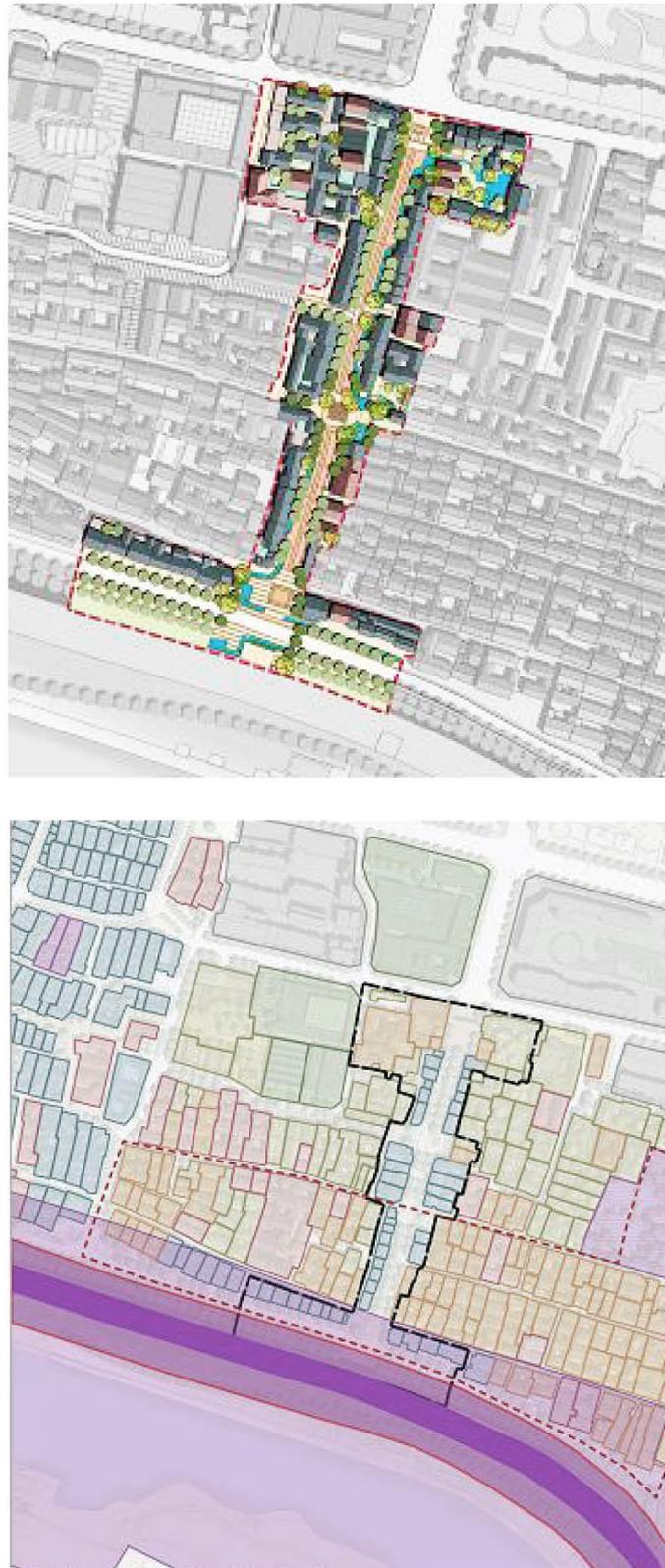


Fig. 4.21: Reconstruction of Gutong alley [Source: Planning Bureau of Nanjing, 2011]

4.7 Plot pattern: the vanishing plot subdivision

4.7.1 Street pattern: establishment of the hierarchical road system

The most remarkable change of the street pattern is that the hierarchical road system in favor of auto-mobile traffic has been established in the historic urban area since the 1990s, which has been shown in most typical plan-units (Fig. 4.22). The road system is composed of three levels: arterial road (40m wide), sub arterial road (30m wide) and local road (20m wide). Most of the arteries derived from the broadening of traditional streets, but in areas like Chuanban alley Unit a completely new arterial road system was established. However, the development of the hierarchical road system is hindered by Work-unit compounds. In Menxi industrial Unit, the urban road system is fractured and independent internal circulation was established by large factories.

Obviously, the hierarchical arterial system was considered by the master plan as more preferable than the micro-circulatory system in resolving the traffic problem. As traditional alleys could not be involved in the hierarchical road system, most of them were eliminated in the renewals. In addition, some were broadened into local roads with excessive width. For example, Madao street and Gutong alley in Mendong Unit were broadened into 20m, which are hardly integrate with the historic street pattern.

The elimination of alleys further leads to the shortage of local roads, which is manifested as the reduction road density. According to Tab. 4.5, all five typical plan-units show the reduction of road density. Above all, the industrial plan-unit and the residential plan-unit have a dramatic reduction by 39% and 81% respectively, while the commercial plan-unit and the historic conservation Unit drop less than 20%. Most notably, the residential plan-unit is faced with the largest reduction of road density. In Chuanban alley Unit, as the original dense homogeneous street network was totally erased and replaced by a rough grid pattern in favor of the megaplot-based microdistrict, the road density decreased by 89%.

The reduction of road density indicates the growth of block scale. In Yanliao Fang Unit and Chuanban Alley Unit, the average block size after renewal is larger than 2ha, while a traditional block is generally 0.5 to 1ha. In industrial plan-unit and residential plan-unit, the average block size has even increased radically by 272% and 354% respectively. Though the comparative research in Kyoto and Berlin, it has been seen that the small-scale block structure has advantages in confining the scale of megaplot and preserving plot subdivision. But in Old South area only Confucius Temple Unit has preserved the traditional street pattern characterized by dense streets and small blocks. Fortunately, this problem has been recognized in recent years and the refurbishment of street pattern and the recover of traditional street scale were primarily made in Mendong plan-unit.

Tab. 4.5: The transformation of street pattern [Source: Compiled by the author]

Spatial modes	Danwei space		Residential area		Commercial area		Traditional commercial area		Historic district	
Plan Unit	Menxi Industry		Chuanban alley		Yanliao fang		Confucius Temple		Mendong	
Year of reconstruction	-1990s		1990s		1990s		1980s		1990s	
Characteristics of road system	Isolated internal traffic		Hierarchical system; Reconstruction		Hierarchical system; Continuation		Homogeneous system; Continuation		Hierarchical system; Continuation	
Road Hierarchy	—		Sub arteries: 20-30m; Local roads: 7-8m;		Arteries: 40m; Local roads: 10-20m; Alleys: less than 5m		Local roads: 10-20m; Alleys: less than 5m		Local roads: 25m; Alleys: less than 5m	
Average block size(m)	Old	New	Old	New	Old	New	Old	New	Old	New
	33444	124304	5946	26997	12375	20190	7200	9900	10554	15423
Increasing rate	272%		354%		63%		38%		46%	
Density of street network(m/ha)	Old	New	Old	New	Old	New	Old	New	Old	New
	113	69	286	54	240	215	287	235	219	178
Decreasing rate	39%		81%		10%		18%		19%	

4.7.2 lot pattern: extinction of the plot subdivision

Plot pattern is the fundamental morphological element of urban form. The most prominent change of plot pattern in Old South area since 1949 is the extinction of plot subdivision and the prevalence of megaplots (Tab. 4.6, Fig. 4.23). The prevalence of megaplot based spatial modes is a key reason for the elimination of plot subdivision. Industrial plan-unit and residential plan-unit generally develop their predominant spatial modes, as the work-unit spatial mode and the microdistrict mode both take up about 70% the area of corresponding plan-unit. Through large-scale land amalgamation, their plot patterns have transformed into typical megaplot based pattern.

Comparatively, commercial plan-units have preserved minimal plot subdivision. In Yanliao Fang Unit, one block side can generally accommodate 2 to 3 plots with the frontage width more than 60m. In Confucius Temple Unit, most of the commercial plots (podium mode) are in medium scale, with the average size of 1520m²; the small-scale block structure confined the plot amalgamation in an acceptable range.

However, as plot redvision in many cases were made in a pragmatic way, it is difficult to form plot series which is key to mold an ordered plot subdivision. For example, Yanliao Fang Unit has experienced a remarkable transformation with ever-changing development orientations, resulting in the coexistence of multiple spatial modes. Lacking standards of plot division, plots of the same spatial mode are arranged irregularly and different spatial modes can not be coordinated. Currently the plot series are only preserved in historic conservation plan-units (Mendong area), where the plot pattern nevertheless shows a sharp contrast between the renewed plots in the north and traditional plots in the south.

Faced with this dilemma, we have to think about whether plot subdivision is still a necessity for contemporary development in the historic urban area. If necessary, what is the proper way of plot subdivision and what is the proper plot shape and scale in order to generate the contemporary plot series. Unfortunately, before getting any satisfactory answers, the subdivided plot pattern has been almost replaced by megaplots.

The evaluation of renewed plot pattern can be made from three aspects, the continuation of historic morphological elements, the publicity and the resilience:

(1). The plot redivision is not in accordance with the development law of historic urban area, which is fully manifested in the random determination of plot shape and plot arrangement. The majority of spatial modes in Nanjing have not inherited any historic morphological elements both in terms of the plot shape and the building form, which forms a strong contrast to Kyoto and Berlin. The prevalence of the megaplots leads to the extinction of plot subdivision, having obviously damaged the continuity of historic plot pattern.

(2). The plot redivision in most plan-units neither provided more public space and green space nor improved the road density for the historic urban area. Thus Old South area has lost a unique opportunity to improve its environmental quality. In Chuanban alley Unit, the public space and green space are still insufficient after a series of large-scale redevelopments. Although some microdistricts established quite amount of internal green space for their residents, they are not open to the city.

(3). The renewed plot pattern shows a weakness in regards to the resilience. Obviously plot subdivision is more friendly to land mixed use than the megaplot based pattern. Meanwhile subdivided plot pattern is more flexible for staged constructions. In addition, from the experiences of typical European cities such as Paris and Amsterdam, a regular plot subdivision can maximize the land value through reducing the differences in plot shape.

4.7.3 Building form: fragmentation of urban fabric

Due to the coexistence of multiple spatial modes and the deficient control of building envelope, most plan-units in Old South area show the fragmentation of building fabric (Fig. 4.24). In Yanliao Fang Unit, as much as 10 spatial modes coexist and no one has developed into the predominant mode. Coupled with the weak morphological control, the urban fabric in this area is very disordered. In industrial plan-unit, despite Large Factory serving as the predominant mode, the building fabric shows great differences inside the work unit compound and the outside. Comparatively, multistorey and highrise microdistricts account for approximately 70% of the land area and most of them have similar building layout. Thus a new urban fabric has been formed, characterized by rows of multistory slabs after a series of renewals.

The coexistence of excessive spatial modes also leads to the big differences in building height. In Yanliao Fang Unit, four commercial spatial modes have quite different building height. Along Zhongshan Road South, the 3-storey commercial complex stands next to a group of towers of about 30-storeys high.

The disorder of building height further leads to the disorder of building siting. Building siting control as a significant tool of regulatory planning in coordinating the spatial modes, particularly contains three key parameters, the setback distance, the building interval and the building line. According to current regulations in Nanjing, building setback distance and building interval are determined by the building height and road width. The higher a building is, the farther it is set back from the plot frontage. In Yanliao Fang Unit, the building setback distance of tower mode and complex mode is more than 10m and the building interval more than 20m, disintegrating the continuous street interface. Comparatively, Confucius Temple Unit successfully developed a unified and continuous street interface through a strong control of building siting, despite the major spatial mode podium only accounting for 31% of the land area.

4.8 Conclusion

This chapter analyzes the transformation of five typical plan-units in Old South area, including industrial plan-unit, residential plan-unit, modern commercial plan-unit, traditional commercial plan-unit and historic conservation plan-unit. The focus is especially put on the change of three morphological elements, the street pattern, the plot pattern and the building form.

The government-led development of textile industry cluster, including two large factories in Menxi industrial Unit was the most typical urban renewal made in the period of command economy. The predominance of work unit compounds led to a megaplot based plot pattern. The large-scale work unit compounds not only fractured urban road system, but also generated quite different urban fabrics on both side of the compound wall.

The residential renewal of Chuanban Alley since the 1990s experienced a large transformation from the welfare housing construction to commercialized housing construction. During this process the road system was thoroughly reconstructed and the historic street pattern and plot pattern were eliminated. The prevalence of megaplot based microdistricts remolded the urban fabric characterized by rows of slabs.

The commercial renewal in Yanliao Fang plan-unit experienced several developmental stages. During this process, the construction of Zhongshan Road South in 1997 and the overall conservation since 2010 played the decisive role in promoting the change of development orientations. The disordered arrangement of multiple spatial modes led to the fragmentation of urban form. Compared with residential plan-unit and industrial plan-unit, Yanliao Fang Unit preserved the minimum plot subdivision, but the plot series has been eliminated.

The morphological comparison of commercial centers with Kyoto and Berlin further shows following problems of Nanjing: (1). Nanjing didn't remain the small-scale block structure; (2). Nanjing lacks a predominant spatial mode taking root in the history; (3). The rough plot redivision in Nanjing leads to a megaplot based pattern; and (4). Weak control on the building envelop.

Reconstruction of the traditional commercial center, Confucius Temple area since the 1980s successfully remained the historic small-scale block structure. The plot redivision has preserved the minimum plot subdivision and improved the environmental quality. Apart from the discrete reconstruction of historic landmarks and landscape, the podium spatial mode was widely applied in the construction of commercial pedestrian street. On the one hand it remains the continuous street frontages, on the other hand podium mode is quite different from the traditional building form.

Mendong historic conservation area is a traditional residential area damaged by road reconstruction and large-scale renewals since the late 1990s. Under the guidance of overall conservation, the urban refurbishment was made since 2010, focusing on the integration of urban pattern and a return of traditional scale. A new strategy called Renewal Unit was applied to promote the small-scale and gradual renovations. In addition, a strict set of design guidance was made to recover the traditional streetscape and the building footprint.

Consequently, an overall summarization for the morphological transformation of typical plan-units is made:

(1). As the hierarchical road system was established in the historic urban area since the 1990s, a majority of traditional alleys were eliminated, further leading to the reduction of road density and the growth of block scale.

(2). The extinction of plot subdivision and the prevalence of megaplots are seen in most plan-units. The evaluation of the renewed plot redivision shows three main problems: Firstly, it is not in accordance with the development law of historic urban area. Secondly, it made few contributions to the growth of public space and green space and the improvement of the road density. Thirdly, it shows a weak resilience in regards to mixed land use and stage construction.

(3). Due to the coexistence of multiple spatial modes and the deficient control of building envelope, most plan-units in Old South area show the fragmentation of building fabric.

The transformation of typical plan-units in Old South area reflects the ever-changing development orientations, fragmented ways of urban renewal and immature urban planning system. In this sense, an institutional analysis of plot division is further required, which will be discussed in next chapter.

Tab. 4.6: The transformation of plot pattern (Source: compiled by the author)

Plan Unit	Number of spatial modes	Predominant spatial modes	Total area(m ²)	Proportion of land area		Plot number	Average plot area	Proportion of megaplots
Danwei space	7	Large factory	220000	58%	1	22ha	100%	
		Neighborhood factory	3700	1%	1	3700	100%	
		Public service compound	14000	3.7%	2	7000	100%	
Residential area	6	Multistorey microdistrict	253338	50%	19	13333	63%	
		Highrise microdistrict	95762	19%	4	24000	100%	
New commercial area	10	Tower	36868	14.0%	8	4608	25%	
		Complex	38927	14.8%	1	38927	100%	
		Slab(Arcade)	4916	1.9%	2	2458	0	
Traditional commercial area	6	Block	15252	5.8%	7	2179	0	
		Historic restoration/Block	91572	26%	57	1600	2%	
Historic district	7	Traditional Courtyard	172096	32%	—	600	0	
		Historic restoration	60000	11%	—	200-300	100%	

Transformation of Street Pattern

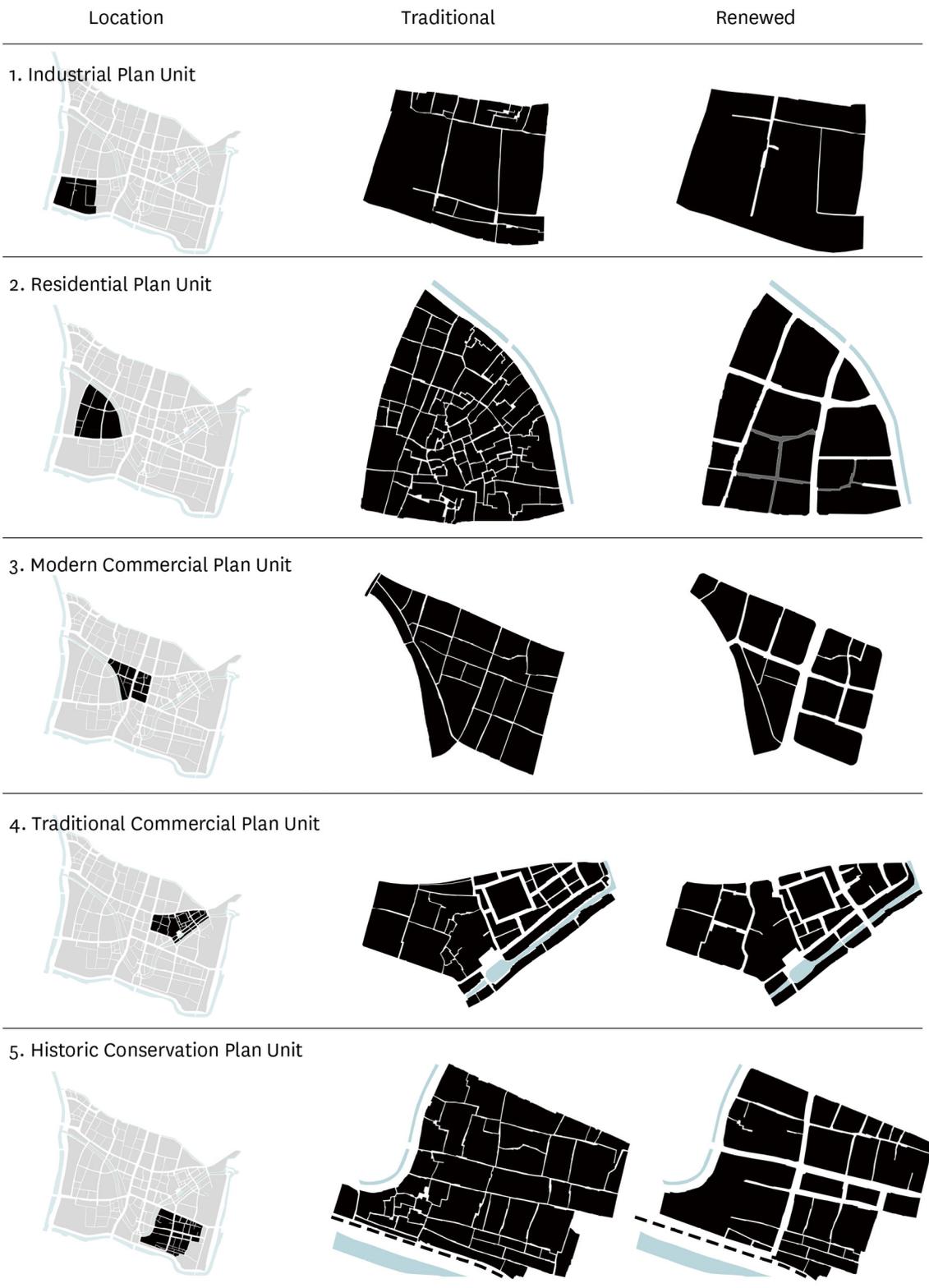


Fig. 4.22: Transformation of street pattern

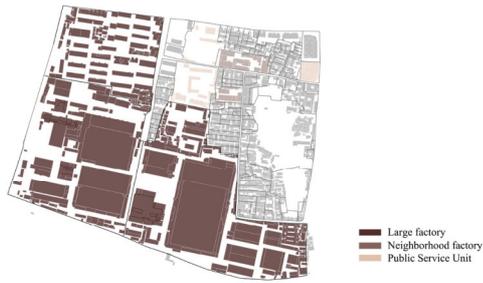
Transformation of Plot Pattern



Fig. 4.23: Transformation of the plot pattern

Transformation of Building Form

1. Industrial Plan Unit



2. Residential Plan Unit



3. Modern Commercial Plan Unit



4. Traditional Commercial Plan Unit



5. Historic Conservation Plan Unit



Fig. 4.24: Transformation of the building form

5 Institutional analysis: the mechanism and problems of plot division

The prevalence of megaplot mode in Old South area is a comprehensive result under the influence of a series of subjective and objective factors. Firstly, the growth of plot size is inevitably influenced by objective factors like the development capability and the general urban development trend. The improvement of development capability which contains both the construction technology and the development capital, leads to a remarkable growth of the plot scale and the building volume. The development of commercial buildings in Old South area is a typical case. The restriction of the finance and the technology in the period of command economy made the plot size increase slowly. For example, the typical plot size is around 3000m² in the reconstruction of Confucius Temple area in the 1980s. But after 2000 with the establishment of land use right system (LURs) and the prevalence of land finance, it is already not a difficult task for a commercial development with the land area reaching 8ha.

On the other hand, the integration of urban function as a development trend is the common characteristics for both Chinese and foreign cities. The comprehensive development mode which pursues the mixed use based on a relative big plot, typically based on the block is prevalent in Europe, North America and east Asian cities. Some hold that the plot size becomes larger as the mixed used is improved. Though debatable, it indicates an inevitable impact of the urban development trend on the plot scale.

However, the transformation of plot pattern is more affected by plot division as an result of planning control and urban design. This chapter will make an institutional analysis on the mechanism and problems of plot division. The impact of urban planning and land development system contains is manifested in three aspects. Firstly, the conservation planning, providing the direct guidance for the conservation and development of historic cities, determines how the historic plot pattern is protected. Secondly, the regulatory planning establishes the standard for plot division and regulations on the plot based control of the spatial form. Thirdly, the land development mode provides the essential development orientation and systematical support for the practical plot division.

5.1 Deficiency of conservation plans on protecting historic plot pattern

5.1.1 Plot pattern is not an independent element in the conservation system

In Chinese planning system, conservation plan as a significant component of the master plan provides a legal basis for historic city conservation and management.¹ Nanjing made its first conservation plan in 1984 when it was selected as the firstly ratified National Historical and Cultural Cities. Subsequently three rounds of rectifications were made in 1992, 2002 and 2010, promoting the establishment of a four-layer conservation system which is composed of the historic city, historic urban areas, historic conservation areas and officially protected monuments and sites.

The development of the historic city conservation in Nanjing experienced an evolution from the conservation of single monuments and sites to the overall conservation. Highlighting the historic spatial characteristics that Nanjing is a perfect combination of mountains, rivers, city wall and avenues, Conservation Plan of 1984 proposed four major conservation elements, including the environment and landscape, urban pattern, architectural style and protected monuments and sites. Above all, the Plan emphasized delimiting the range of protected monuments and sites.

The Conservation Plan of 1992 made a remarkable progress in establishing the historic conservation area. It is defined as a section of a city which contains protected monuments and sites, and old buildings considered valuable for historical or architectural reasons. Compared with single protected monuments and sites, historic conservation areas with its considerable scale, generally larger than 1ha in China, is a main conservation hierarchy reflecting the traditional urban pattern and cityscape. Except the historic landmarks like Confucius Temple area and Chao Tian Gong area, several vernacular residential areas were also designated as historic conservation areas, revealing an expansion of the conservation scope². However, historic conservation area was still a subordinated type of protected monuments and sites in Conservation Plan of 1992 and few concrete conservation strategies were made except the delimitation of conservation scope.

The Conservation Plan of 2002 further perfected the conservation system by supplementing the section of intangible cultural heritage. In addition, historic conservation area was finally separated from protected monuments and sites and became an independent conservation level.

The Conservation Plan of 2010 was made under the background that Nanjing old city had been heavily damaged by large-scale urban reconstructions during the 2000s. The shrinking historic cityscape had shown that the protection of an overall historic urban form could not only rely on designating historic conservation areas in a fragmented way. Rather, an overall conservation of the historic urban area is indispensable. On this condition, the Plan for the first time established the historic urban area as a new conservation level between historic city and historic conservation area (Tab. 5.1). Historic urban area refers to the section of a city which well preserves the historic urban pattern, traditional cityscape, and represents the specific history

¹ Cf. Guo, W. (2005).50-53.

² Most of the vernacular residential areas were located in Old South area. According to practical conditions and the renovation potential, five key conservation areas were designated, including Mendong, Menxi, Nanbuting, Dabaihua Alley and Jinshajing.

of urban development. In Chinese context, its scope equivalents to the old city formed before 1949. Three historic urban areas were designated in Nanjing old city, including south historic urban area (Old South area), Ming Palace historic urban area and Drum Tower-Qingliang Mountain historic urban area³. In Old South area, the Conservation Plan aimed to recover the distinctive historic landscape which combines elements like the city wall, rivers, mountains, towers, temples and vernacular residences. Obviously, the conservation focus was no longer confined within historic conservation areas but expanded on the integration of overall urban form.

Plot pattern is a mesoscale morphological element corresponding to the conservation levels of historic urban area and historic conservation area. For a long time it was not an independent conservation element in the conservation system. Before 2010 when the historic urban area was established, the mesoscale conservation mainly focused on the overall urban pattern and historic conservation areas. In previous conservation plans, the conservation of overall pattern included elements like the landscape and environment characteristics, layout of previous ancient cities, historic axes, city wall and the river network, most of which are special morphological elements or the “figure” according to the Figure and Ground theory. However, the general morphological elements, precisely the plot pattern or building fabric which constitute the “ground” of the historic urban area were not paid enough attention.

Historic conservation area established in 1992 is the most important component in the conservation system. Its designation is based on four conditions⁴: (1). A well preserved historic cityscape; (2). Buildings and environmental elements constituting the historic cityscape must be original; (3). The core conservation scope should be larger than 1ha; and (4). The proportion of officially protected monuments and historic buildings should take up at least 60% of the whole area. It indicates that plot pattern is not a decisive factor in defining the historic conservation area. In addition, the main control elements required in the historic conservation areas include historic buildings and structures, historic street pattern and environmental elements. Unfortunately, the conservation of historic plot pattern was so far not a compulsory conservation element.

The more essential problem is that plot pattern has yet been understood as a foundation in generating the building form. In other words, it is the spatial modes consisting of the plot and the buildings on it, instead of the buildings themselves, that is the key point for the conservation of urban form. The conservation of historic conservation area often overemphasizes the traditional cityscape but takes few consideration of the plot pattern and its related land property structure, which led to inappropriate conservation strategies which prefer unified reconstructions to organic renewals. These problems have been shown in cases like the reconstruction of Confucius Temple area in the 1980s and the conservation of Nanbuting area in the 2000s.

As the historic urban area was established very late, the old city in a long time is completely divided into two kinds of spaces, a small number of conservation areas and a majority of general areas. In the opinion of urban administrations, general areas with few conservation value are supposed to be redeveloped. As lack of control and integration, many general areas, even located in adjacent to conservation areas, were totally demolished and reconstructed into a modern landscape which forms a big contrast to the historic urban form. By 2002, 90% of Nanjing old city had been renewed. In 2006 a round of large-scale urban renewal

³ There are three historic towns established including the South historic urban area, Ming Palace historic urban area and Drum Tower-Qingliang Mountain historic urban area.

⁴ Code of Conservation Planning for Historic Cities (2005).

was launched in the name of constructing a new Old South area and improving the livelihood of local residents. Several areas including Yanliao Fang, Anpin street, Chuanban alley and Changledu district were demolished.⁵ All of them preserved distinctive traditional cityscape but were not designated as conservation areas.

Although the establishment of historic urban area as an independent conservation level in 2010 was a remarkable breakthrough for the conservation system, the plot pattern was still not paid enough attention. For the overall conservation of Old South area, several control points were proposed: the traditional spatial scale, street pattern and cityscape should be protected; the height, volume and style of new buildings must be in accordance with the historic contexts; green space and pedestrian ways should be constructed into a network; and large-scale infrastructure like the expressway and viaduct are not allowed to be constructed in historic urban areas. But none is directly linked to the conservation of plot pattern. Ironically, the Washington Charter of 1987 proposed that the primary principle for the protection of historic urban area is to protect the urban pattern which is based on the plot and the street. In this sense, the theoretic framework for the historic urban area is far from maturity.

Tab. 5.1: Framework of conservation elements in Conservation Plan of 2010 [Source: Compiled by the author according to Conservation Plan of Nanjing (2010)]

Primary classification	Second classification	Third classification
1.Tangible heritage	Overall pattern	Landscape and environment
		Layout of all previous ancient cities
	Historic conservation area	Overall conservation of the old city (Historic urban areas)
		Historic district
		Historical cityscape district
		General cityscape district
	Historic village and town	Historic village and town
		Important village and town
		General village and town
	Officially protected monuments and sites	Officially protected monuments and sites
Historic buildings		
General monuments and sites		
Others (underground relics, archaeological sites, old trees)		
2.Intangible heritage		
3.Representation of history and culture		
4.Guarantee of policy and system		

⁵ Cf. Zhou, X., Zhang, W. (2010).80-85.

5.1.2 Transformation of conservation strategy

The neglect of the plot pattern is reflected not only in the conservation system, but also in practical conservation strategies. As mentioned above, the historic city conservation in Nanjing experienced three stages since the 1980s, from the protection of single monuments, to historic conservation areas and finally to historic urban areas. Some typical conservation practices were made in each stages, including the reconstruction of landmark buildings and landscape in Confucius Temple area in the 1980s, conservation and renewal of Nanbuting area in the 2000s and the urban refurbishment of Mendong area since 2010. The section will analyze the conservation strategies of the three typical practices, in which special attention will be put on the role of the plot pattern played in the strategies.

(1). Stage one: reconstruction of historic landscape and antique commercial street

Confucius Temple is the traditional commercial and cultural center of Nanjing. Its conservation and reconstruction started in the middle 1980s, among the earliest conservation practices in Nanjing⁶. In 1986 the detailed plan of Confucius Temple Commercial Center was made by the municipal planning bureau, proposing five key points of reconstruction:

- (1). *Recovering the landmark building complex;*
- (2). *Recovering the iconic historic landscape of Confucius Temple square;*
- (3). *Constructing the commercial pedestrian street;*
- (4). *Establishing museums and more recreational facilities;*
- and (5). *Improving the environment by adding green space.*

The reconstruction of landmark buildings and landscape is the major achievement. Confucius Temple, Governmental School (*xuegong*) and Examination Compound (*gongyuan*), coupled with the neighboring Qinhuai river, and periphery commercial streets and vernacular residences, constitutes the most typical cultural landscape in Old South area. The reconstruction of landmark buildings and landscape strictly followed the historic form, while the conservation of vernacular residence and the historic plot pattern showed backward conservation ideas. A majority of traditional residential buildings were not designated as protected monuments and demolished. Currently there are only five buildings designated as protected monuments, in which two buildings were actually reconstructed in the 1980s.⁷ Apart from the demolition of historic buildings, their corresponding plot pattern was also eliminated and redivided. Generally a renewed block contains at most 4 plots, in some extreme cases only a single plot. Consequently, some historic plot series worthy of protection, e.g. the riverfront plot series could not be preserved.

⁶ This historic landscape was heavily damaged in the Sino-Japan war and was not restored until the 1980s.

⁷ Statistics comes from the Conservation Plan of Confucius Temple district (2012).

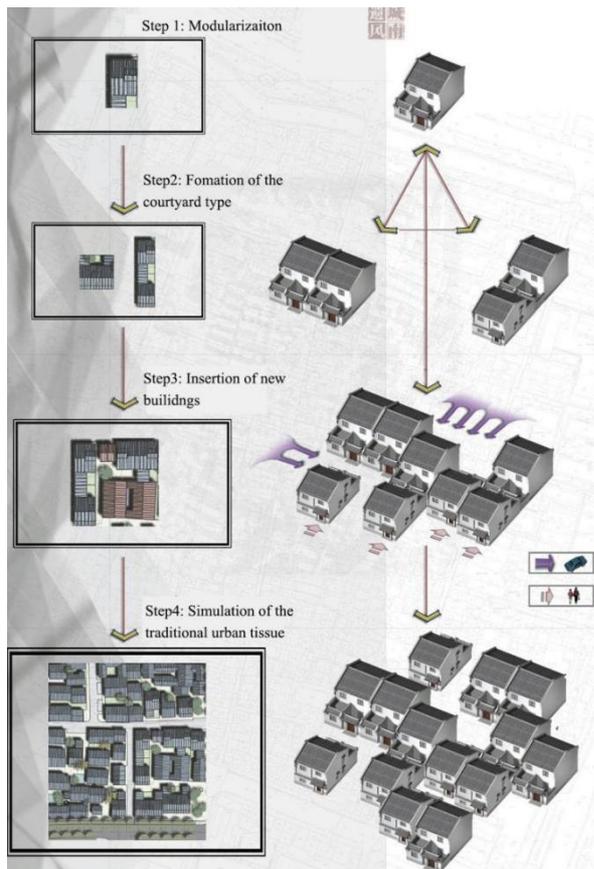


Fig.5.1: Plug-in type renewal [Source: Nanjing Planning Bureau]



Fig.5.2: Conservation planning of Nanbuting Historic District
Source: Nanjing Planning Bureau



Fig.5.3: Bird view of the 1st and 2nd phase conservation
(From east side)
[Source: http://www.njcjt.com.cn/pic/?97_555.html]

Another achievement of the reconstruction was the antique commercial street. The construction was based on a redivided plot pattern. The scale and form of new buildings are quite different from the traditional ones. For example, the plot width is extended to 60m, equivalently five-fold the width of a traditional one; some new buildings abandoned the inner courtyards in order to improve the development intensity. To mold the traditional streetscape, the antique building facade was emphasized and the traditional proportion of street section was required to be remained.

(2). Stage two: Plug-in mode

The conservation of Nanbuting area was regarded as the second stage of historic conservation in Old South area. In imperial period this area was a major civil life area where rich people settled their residence. Ganxi's former residence is a typical case. Originally built in early 19th, it covers an area of 12000m², and is the largest existing traditional residential building complex in Chinese cities. As it is only 1.5km far from the urban center Xin Jie Kou in the north, Nanjingting are faced increasingly larger pressure of urban renewal since the late 1990s⁸. Its conservation and renewal started from 2001 and was divided into four stages. The first stage was

⁸ Bordering urban arterial road Zhongshan Road South in the east, the periphery area of Nanbuting was renewed into groups of high-rise buildings and multistorey residential areas after 1997 when the construction of the arterial road was completed.

the conservation of the national protected monument, Ganxi's former residence. The second and third stages were the renovation and commercial redevelopment of the periphery area under the Plug-in mode which became the typical conservation strategy of historic districts in the 2000s.



Fig. 5.4: Morphological transformation of three stages' conservation work in Nanbuting area

Under the Plug-in mode only officially protected buildings are preserved, while a majority of buildings regarded as bad conditioned are required to be renewed. Through the readjustment of street pattern and building layout, new antique buildings can be well integrated with the preserved historic buildings, finally leading to the restoration of the urban pattern⁹ (Fig. 5.1). Plug-in mode is mainly applied in the periphery

⁹ The Conservation Planning of Nanbuting Historic District in 2003.

area of the core conservation area. In the case of Nanbuting area, Ganxi's former residence is the core conservation area, while the peripheral area was planned to be renovated into a commercial street under the Plug-in mode (Fig. 5.2, Fig. 5.3).

Located in the south of Ganxi's former residence, Xi Nan Li (the second stage project) was a L-shape antique commercial street. Instead of preserving the original plot pattern, the existing plots were amalgamated into a megaplot with an area of about 8000m² for unified renovation. According to the detailed plan, the commercial street consists of eleven single buildings, in which three historic buildings were protected and the others would be reconstructed. The antique buildings adopted the layout and footprint features of traditional courtyard buildings, but enlarged the building scale in adapt to the contemporary commercial needs. The building height is increased to 2 and 3 storeys, and the average building width is extended from the traditionally 10m to 15m. In addition, new courtyard buildings set side building intervals ranging from 1.6m to 7.6m, which mainly serve as accesses to the main commercial street. The width of commercial street was controlled within 5m. Coupled with continuous street frontages on both sides, traditional street frontages and spatial characteristics could be basically remained.

The plan of third stage project experienced three sizable adjustments. It was also based on a megaplot with an area of 13000m², and the existing plot pattern was eliminated. As few historic buildings were preserved in the site, the plan made a big change of the historic urban form. What's more, three plan schemes themselves were quite different, and the final scheme was characterized by the loose building layout, excessive building volume, and various building types, which was more like an industrial park than a traditional commercial district.

Objectively, Plug-in mode failed to protect the urban form of historic conservation areas (Fig. 5.4). On the contrary, it facilitated the large-scale demolition of historic districts. Generally speaking, the problems of this mode are mainly reflected in three aspects:

Firstly, Plug-in mode in essence shows no respect for the historic plot pattern and its related land property. Under Plug-in mode, the subdivided plot pattern could not be preserved and was amalgamated into megaplots for reconstruction. Neglecting the value of general vernacular buildings, only a few officially protected monuments are preserved. In this sense, the so called renovation is nothing else but a redesign on the blank piece of paper.

Secondly, there exists controversy in terms of the identification standard of historic buildings. Although an evaluation criteria of historic buildings is enacted in Nanjing, its practical implement by planners and urban administrators in many cases is subjective, leaving a hidden peril of "black-box operation".

Thirdly, in the practical operation it is very difficult to protect the scattering historic buildings. Developers regard them as obstructions of the unified and regular reconstruction, because it definitely brings about the rise of development cost if the adjustment of building layout is made for the sake of protecting historic buildings¹⁰. In most cases, the government tends to compromise with developers in order to speed up the reconstruction of old city.

¹⁰ Cf. Wang, L. (2011).23.

(3). Stage three: Renewal Unit

The conservation and refurbishment of Mendong was the first practice since 2010 when the overall conservation of Old South area was determined. The conservation adopted a new strategy called Renewal Unit to promote the small-scale and gradual renovations, indicating that the plot was for the first time treated as a conservation element.

Renewal Unit set up the maximum scale of a single renewal which should be confined within its scope. Its delimitation is generally based on the property boundaries of existing buildings. Renewal Unit contains six types according to the ways of intervention and building types: conservation unit of protected buildings, conservation unit of historic buildings, renovation unit of traditional buildings, renovation unit of general buildings, renovation unit of multi-storey buildings and recovery unit of demolished buildings. In this way large-scale renewal is considered to be prevented and the urban fabric deriving from plot subdivision can be continued. Renewal Unit also provides a small flexibility for plot amalgamation that only neighboring renovation units and recovery units are allowed an amalgamation in an appropriately range for renovation and utilization on the premise of maintaining the courtyard-based urban fabric.

Renewal Unit strategy played a critical role in the reconstruction of Changledu district. As an important component of Mendong historic conservation area, it was demolished in 2006 and was reconstructed into a high-class residential area in 2010. The reconstruction simultaneously aimed at a refurbishment of the damaged urban pattern, promoting this district to be integrated into the historic contexts. The refurbishment consisted of three aspects: (1). Recovering the traditional street pattern based on the historic map; (2). Recovering the morphological characteristics of plot subdivision through Renewal Unit strategy; (3). Recovering the traditional streetscape and building form through establishing a set of design guidance. Although the reconstruction was also based on a 6ha megaplot, the Renewal Unit strategy largely promoted its internal subdivision at design level. The subdivided Renewal Units are arranged along streets, representing the morphological characteristics of traditional plot pattern¹¹. Despite a complete reconstruction, a majority of Renewal Units remained the traditional frontage width of about 10m. Considering the requirements of contemporary building codes and usage habits, most of the Renewal Units have relative small depth and the north-south orientation. The refurbishment emphasized the imitation of traditional building footprint, but the scale and form of new buildings are not necessarily same with the traditional courtyard buildings.

Compared with the previous conservation practices, Renewal Unit strategy is a significant progress, revealing that plot pattern as an essential morphological element has been paid more attention in the conservation. However, Renewal Unit is only a subdivision at the design level, it can not necessarily bring about the subdivision of land property. The unified and megaplot-based development mode continues, forming a contradiction to the goal of Renewal Units.

¹¹ See Fig. 4.38 and Fig. 4.40.

Tab. 5.2: Transformation of conservation strategies [Source: Compiled by the author]

Historic districts	Confucius Temple	Nanbuting	Changledu
Year	1980s	2000s	2010s
Conservation Strategy	Reconstruction of historic landscape and antique commercial street	Plug-in mode	Renewal Unit
Development stage of conservation system	Single protected monuments and sites	Historic conservation area	Historic urban area
Conservation focus	Officially protected monuments and sites;	Protected monuments; Historic buildings	Protected monuments; Historic buildings; Historic street pattern and plot pattern
Conservation of plot pattern	Few consideration	Few consideration	Protection existing plot pattern; Megaplot based refurbishment and internal subdivision at design level

(4). Reflections on the evolution of conservation strategies

The typical conservation practices of three different stages show remarkable progress of historic city conservation in Nanjing, in which the conservation of plot pattern is paid more attention (Tab. 5.2). The focus of the conservation has transformed from single protected buildings to the overall conservation historic urban area. The reconstruction of Confucius Temple area in the 1980s succeeded in recovering the landmark buildings and historic landscape. However, as historic conservation area system had not been established at that period, a large number of vernacular buildings were demolished and replaced by antique ones.

When the conservation of Nanbuting area started after 2000, the historic conservation area had become a significant conservation level. But guided by the Plug-in strategy, the street pattern and building layout were totally reconstructed despite the preservation of some historic buildings. This is actually the continuation of early conservation ideas that except the limited historic buildings and historic streets, other buildings and streets have less value of protection and can be demolished for reconstruction.

The essential change happened in 2010 when Old South area started its overall conservation. The conservation of Mendong area not only aimed at protecting key historic districts, but also restoring the damaged historic urban pattern and recovering the traditional cityscape. Above all, Renewal Unit strategy is a main tool in promoting the refurbishment. It can be applied in both historic conservation area and refurbishment area. The value of plot pattern as a significant element in promoting the integration of overall urban form was finally recognized. But Renewal Unit is essentially an morphological imitation of the plot subdivision at design level, it can not lead to the subdivision of land property. In addition, the refurbishment was still made in the way of unified construction, which is in contradiction to the goal of Renewal Unit. In summary, the conservation of plot pattern is still in the preliminary stage and the conservation strategy should be further improved.

5.1.3 Protecting plot pattern: the essence for the conservation of historic urban area

The transformation of conservation system and conservation strategy shows that the plot pattern is a fundamental element for the conservation and refurbishment of historic urban area. But its conservation is for

a long time paid little attention. In this sense, the framework of conservation elements is far from a maturity despite the establishment of the historic urban area.

Firstly, the urban pattern of the historic urban area is essentially the framework composed of the plot and the street. Thus the conservation of plot pattern is critical for the continuation of historic urban pattern, because the plot is the general morphological elements constituting the ground of the historic urban pattern. However, the current conservation elements of urban pattern are too macro and overemphasizes the protection of special morphological elements. The significance of plot is largely neglected.

Secondly, the control of plot pattern can promote the integration of conservation area and redevelopment area, finally realizing the overall protection. Currently, the urban design of Old South area is almost limited in areas with traditional cityscape, while few overall considerations have been taken on redevelopment areas. By the year of 2010, there was only 1.6km² areas with traditional cityscape left in the 5.6 km² historic urban area, indicating that the urban refurbishment of redevelopment areas should be paid the same attention with historic conservation areas in the future. What's more, both sections should be well integrated: the historic plot pattern in conservation areas requires a strict protection; the plot division in redevelopment areas must take full consideration of integrating and continuing the historic urban pattern.

Thirdly, the key to the continuation of historic urban form in redevelopment areas is to introduce proper spatial modes. Currently the morphological control in conservation plan mainly focuses on the building form. In fact, the fundamental element affecting the urban form is not the buildings themselves, but the spatial modes which is composed of plot and buildings on it. New spatial modes should fully consider to continue the historic building form and plot shape. Thus the selection and distribution of various spatial modes should become a significant morphological control point.

The last but not the least, the conservation of plot pattern is in fact a conservation of the land property structure which is crucial in molding the historic urban form. For a long time, one major problem for the conservation is the vague land property and building property caused by the ever-changing land system and housing system since 1949. In the period of private land ownership, the maintenance of traditional residence depends on the self-led renewal and renovation of property owners. But the land nationalization in the 1950s led to the separation of land property and building property. Thus local residents have to passively accept the urban renewals launched by the government. In addition, a large number of private residence was expropriated by local government and turned into welfare housing for redistribution before 1980. Consequently the property relationship becomes very complex, bringing about much difficulties to the plot-based self-led renewal. Obviously, the current building form-based conservation mode can not solve the fundamental problem. In comparison, the plot-based conservation mode faces directly the property problem and integrates the conservation appeals both in morphological and institutional terms.

5.2 The effect of regulatory planning system on plot division

Codes are part of the “hidden language of place-making”. They have a direct influence on “the structure of the ordinary” - where ordinary connotes something not insignificant, but rather something representing the vast majority of the urban fabric. Urban codes are therefore important because they significantly shape the

character of our urban areas-for better or worse¹². In the era of command economy, land development were directly controlled by detailed plan of specific projects. But it was less efficient and flexible in coping with the booming land development since the establishment of LURs (Land Use Right system) in the early 1990s. Under this background, Nanjing established the regulatory planning system in the middle 1990s¹³.

Regulatory plan is the statutory planning in China, equivalent to the zoning system in US or Bebauungsplan in Germany. It is the major planning tool in controlling the land development. The main control elements of regulatory planning include land use, plot division, development intensity as well as physical form. Above all, the effect of regulatory planning on the plot division is manifested in three aspects: land use based zoning, principles of plot division and the morphological control of land development.

5.2.1 Rough standards of plot division

Plot division is the central task of regulatory planning system. In order to analyze the effect of regulatory planning on the morphological transformation of plot pattern, it is a primary task to survey the rationality of the plot division principles and standards. The Technical Regulation of Nanjing Regulatory Planning (TRNRP, 2005) proposed the two-level principles of land zoning and plot subdivision, including the division of *Plan and Management Unit* and the division of plot. *Plan and Management Unit* is the basic control unit of the regulatory planning. Its division should follow five principles:

- (1). *Clear enclosures and boundaries (e.g. Arteries, rivers and railways);*
- (2). *The scope of administrative division(e.g. In the old city the Subdistrict¹⁴ is considered as the unit of division);*
- (3). *Unity and relevance of land use;*
- (4). *Proper service radius of infrastructure and public facilities;*
- and (5). *Proper land scale (The proper scale arranges from 20ha to 30 ha in the old city, while from 80ha to 100 ha in new towns).*

The *Plan and Management Unit* can be further subdivided into plots. The division of plots should consider the following factors:

- (1). *Integrity and coordination of land use;*
- (2). *Clear land property;*
- and (3). *Convenience of land leasing.*

Obviously the standard of plot division is very rough. Firstly, it lacks detailed control attributes of plot shape like the plot width, ratio of plot width to depth, and plot area. Secondly, it lacks classification of plot types. Current standard only roughly distinguishes the scale of Plan and Management Unit in new urban districts and old city. But a classification of plot types is not formed. Not to mention any specific instructions about the plot shape in the old city or historic urban area. Thirdly, it lacks a consideration of the plot ar-

¹² Cf. Marshall, S. (2011).1.

¹³ The Nanjing Town Planning Ordinance, NTPO (1990, 1997) and the Implementing Regulation of Nanjing Town Planning Ordinance, IRNTPO (1995, 1998, 2003).

¹⁴ The Subdistrict (jie dao) is one of the smallest political divisions of China. It is a form of township-level division which is typically part of a larger urban area. In general, urban areas are divided into subdistricts, and a subdistrict is sub-divided into several neighbourhoods. (Wikipedia.https://en.wikipedia.org/wiki/Subdistricts_of_the_People%27s_Republic_of_China).

regulation. For example, the regulation of the plot arrangement along the river or in a block, or the regulation of forming a plot series. In the zoning system of United State, the control of plot division is as important as the control of land use, with detailed regulations on the plot size and plot width¹⁵. Comparatively, Chinese regulatory planning system with the rough control standard of plot shape is hard to achieve the standardization of plot division.

A more serious problem is that the practical way of plot division does not necessarily follow the standard set by the regulatory planning. The division of the plan-unit in Old South area is actually based on the scope of administrative division. On the one hand, it brings about convenience to practical urban management; on the other hand, as the administrative division is quite different from the distribution of morphological plan-units, the mismatching inevitably leads to difficulties for the protection of morphological integrity of plan-units (Fig .5.5).

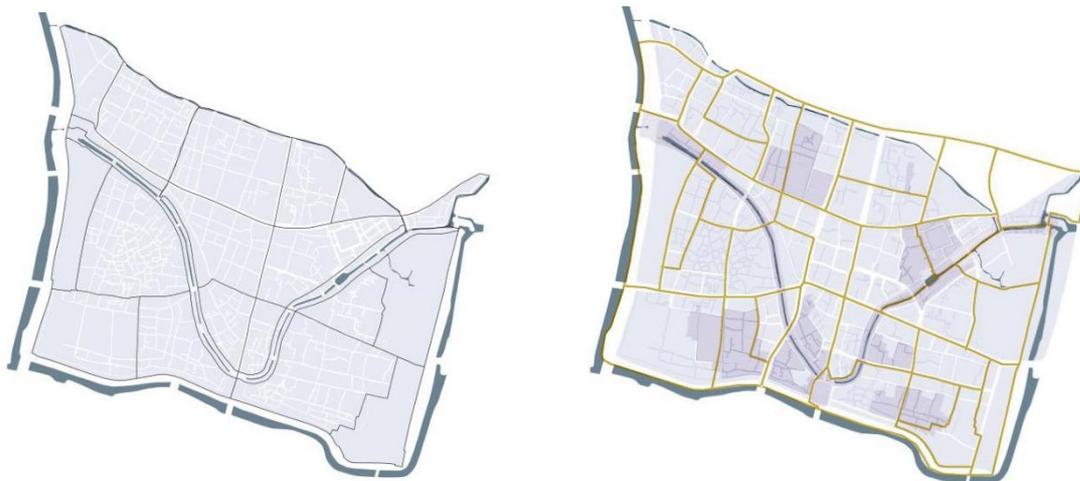
The practical plot division is made in a pragmatic way. Since the economic boom in the 1990s, the land sale has become the main goal of making regulatory planning. Under this background, the convenience of land sale and the integrity of land use are the most important consideration factors of plot division. In fact, the convenience of land sale implies the generation of megaplot, as it reduces the difficulty of land management, improve the efficiency of land leasing and brings about more land revenue to local government. In many cases, a whole block is leased as a single plot. It is such overlarge plot scale that enables the regulatory planning not to consider about the problems of plot subdivision as mentioned before.

The pragmatic way of plot division generated the following problems: (1). As the main goal of plot division is for the land sale, few considerations are taken on the improvement of public space and environment. (2). The pragmatic plot division is often made for specific land development projects rather than a rational re-adjustment and optimization of an overall area. This is a main reason why plot series disappear in the renewed plot pattern, which reflects a strong tendency of non-market economy. (3). Pragmatic plot division hardly considers the conservation and continuation of historic plot pattern, as well as the interest appeal of original property owners. New plot cannot integrate well with the historic plot pattern, forming a vicious circle and aggravating the damage of historic plot pattern.

Another problem worthy of attention is that some other regulations in the regulatory planning system have indirectly suppressed the plot subdivision. A typical example is the regulation on the layout of the vehicle access. The regulatory planning regulates the minimum distance of between the road intersection and the vehicle access (Tab. 5.3)¹⁶, according to which one block side with the length of 100m can supposedly be subdivided into at most 2 to 3 plots (Fig. 5.6). Consequently, plot division as a major control task of the regulatory planning, for a long time lacks the support of a systematic standard and is practically made in a pragmatic way, which becomes an important reason for the damage of traditional plot subdivision.

¹⁵ Cf. Liang, J, Sun. H. (2000).40-42.

¹⁶ Implementing Regulation of Nanjing Town Planning Ordinance (IRNTPO, 2007) regulates on the minimum distance between the road intersection and the vehicle access.



(1). Plan-units division based on the urban morphology

(2). Plan-units division based on the scope of the administrative division

Fig. 5.5: Comparison of two different ways of plan-unit division

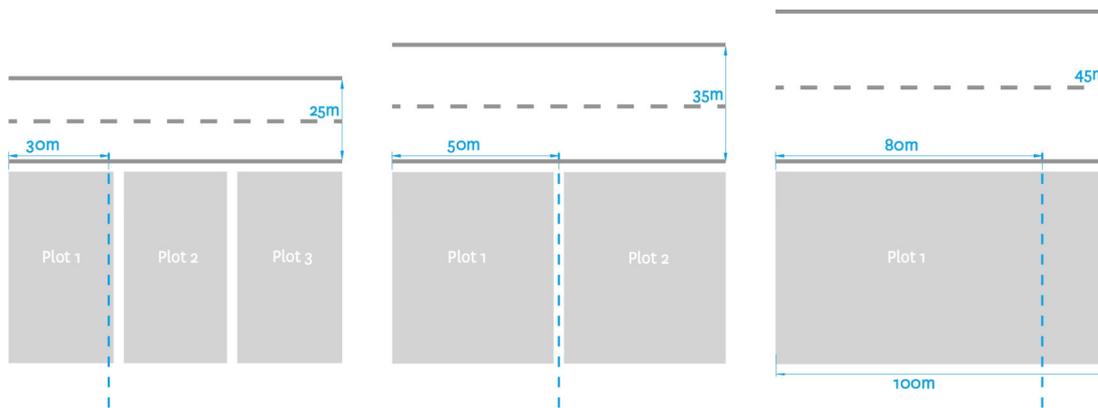


Fig. 5.6: Regulation on the layout of the vehicle access and its effect on the plot subdivision

Tab. 5.3: The minimum distance between the vehicle access and the road intersection [Source: Implementing Regulation of Nanjing Town Planning Ordinance (IRNTPO, 2007)]

Road width	$W < 30m$	$30m < W < 40m$	$W > 40m$
Road hierarchy	Local road	Sub arterial road	Arterial road
Minimum distance	30	50	80
Maximum plot subdivision	3	2	1

5.2.2 Form is neglected in the land use zoning

Although there has been many discussions about the standard of land use classification, few attentions have been paid on the relationship between the standard and the morphology of plot pattern. In fact, land use classification also represent the classification of plot types which is directly related to the morphological regulations on unit plot. In this sense, this section will mainly discuss the relationship between the standard of land use and the plot based morphological control.

Firstly, Chinese standard of land use classification is based on functional separation. The Code for Classification of Urban Land Use and Planning Standards of Development Land (*abb. Classification Code*) issued in 1990 was the major regulation guiding land use zoning in the 1990s and 2000s¹⁷ when the urban renewal reached the climax in the historic urban area. It established an excessively meticulous land use classification which contains 10 primary level types, 46 secondary level types and 73 third level types. It can be clearly seen from the residential land and public facilities land that this classification standard heavily depends on functional separation. As a product of the command economy, the classification was based on the premise that the land use of each plot could be totally controlled by government-led commands and urban planning¹⁸. In comparison, the function-oriented commands and plans are easier and more pragmatic ones to be implemented.

Consequently, the land use classification placed too much emphasis on the functional segmentation to depict the form of plot pattern. Taking Yanliao Fang plan-unit as an example (Tab. 5.4, Fig. 5.7), the function-based zoning and the form-based zoning have great differences. It is obvious that the function-based zoning can hardly reflect morphological features of spatial modes. Another example is that the classification of residential land is mainly based on the integrity of ancillary facilities, environmental quality as well as building height, while the building types is not taken as a critical influencing factor. Both designated as the land use type of R2, multistory microdistrict and the highrise microdistrict have quite different forms¹⁹. In addition, one key reason for the spatial fragmentation problem in the historic urban area as has analyzed in Chapter 3 is the weak control of spatial modes (including plot types and building types), which is largely due to the neglect of form in the land use classification.

The overemphasize of functional separation and the neglect of form further lead to the suppression of mixed land use. Taking the commercial land as an example, in the period of command economy, commercial land was not taken as an independent land use type, but a subordinated type of public facilities land. It contains meticulous subtypes, including commerce, finance and insurance, business, service, hotel and market, which were totally based on the functional segregation and notably suppressed the mixed land use. In fact, the relationship between mixed land use and the form can be thought in other way. Under a form based standard of land use classification, the mixed land use was inevitably generated as the functions had to adapt to specific form. A relative rough land use classification tends to encourage the functional mix, which also benefits the integration of urban form. For Old South area, a classification standard of land use is specially needed which takes full consideration of the form and encourages the mixed land use.

¹⁷ The Classification Code was revised in 2012 when the majority of the historic urban area has been renewed.

¹⁸ Cf. Xu, M. Tang, J. (2008).109-113.

¹⁹ Chapter 3 (3.4.1 and 3.4.2) clearly analyzes the characteristics of both spatial modes.

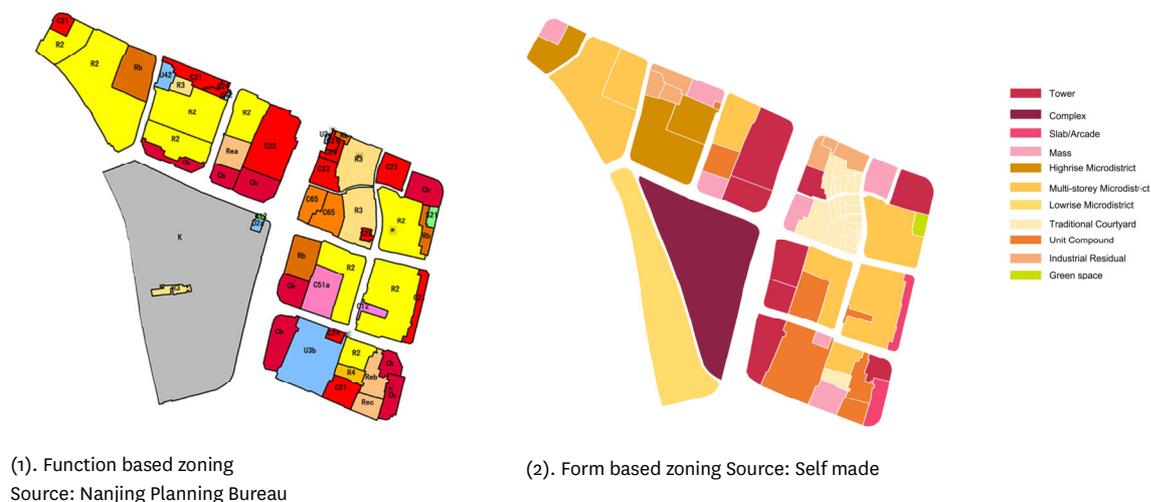


Fig. 5.7: The comparison of two kinds of zoning in Yanliaofang area

Tab. 5.4: Comparison of the land use-based zoning and the form-based zoning in Yanliaofang area [Source: Compiled according to Code for classification of urban land use and planning standards of development land (GBJ 137-90)]

Land use-based zoning	Form-based zoning
Residential land	Residential space
R2 Multistorey and high-rise based residential land with complete ancillary facilities, rational layout and good environmental quality	High-rise microdistrict
R3 Multistorey and high-rise based residential land with relatively complete ancillary facilities, incomplete layout and general environmental quality	Multi-storey microdistrict
R4 Residential land dominated by barracks	Low-rise microdistrict
Rb Residential and commercial mixed land	Traditional Courtyard
Re Kindergarten, primary school and secondary school within the residential land	Commercial space
Public facilities land	Tower
C1 Administrative land (C11municipal administrative land; C12 non-municipal administrative land)	Complex
C2 Commercial and financial land (C21,commerce; C22, finance and insurance; C23, trade and consulting; C24, service industry; C25, hotel)	Slab(Arcade)
C5 Medical and sanitary land (C51, hospital)	Block
C6 Educational and scientific land (C65, scientific and research land)	
Cb Commercial and office land	
Others	Work unit space
U Municipal public facilities land	Public service unit
S21 Parking area	Neighborhood industry
K Reserved land use	

5.2.3 Lack of morphological control on land development

The control indexes in the regulatory planning are divided into two categories, the mandatory indexes and the directory indexes (Tab. 5.5). The mandatory indexes are mainly set at plan-unit level, including “Six lines”²⁰, land area, floor space, green area and public facilities. The directory indexes, almost set at the plot level, mainly include land use, development intensity and greening rate. Obviously, the largest share of indexes are related to the control of development intensity²¹, while those related to the control of physical form are so limited. This problem is largely related to the background that regulatory planning was established. One main aim of its establishment was to cope with the large-scale land development in new urban districts. Thus it is preferable to strengthen the indexes of development intensity and weaken those of physical form to improve the flexibility and efficiency of land development. However, this kind of control system is not fit for the historic urban area where requires a strict control on physical form.

Practically a large number of renewals in the old city in lack of morphological control have caused damage to the historic urban form. The deficiency of the morphological control is manifested in three aspects: (1). Ambiguity of the building siting; (2). The control of the building height is not based on the plot; and (3). Unselected spatial modes (building types).

Tab. 5.5: Main indexes in the regulatory planning system [Source: Regulations on the making of regulatory planning of Nanjing (NJGBBB 01-2005)]

Index Type	Control Contents	Planning Level
Mandatory Index	“Six Lines” Plan	Plan-unit Level
	Land Area	
	Floor Space	
	Green Area	
	Public Facilities (Area and Number)	
Directory Index	Public Facilities(Siting)	Plot Level
	Leading Function	
	Population	
	Land Use	
	Plot Area	
	FAR (Floor Area ratio)	
	Building Density	
	Greening Rate	
	Building Height	
	Public Facilities	
Traffic Organization		

²⁰ “Six Lines” refers to the red line of road boundary, the green line of green space, the purple line of cultural relics, the blue line of river boundary, the black line of high tension corridor as well as the orange line of rail transit.

²¹ Indexes of development intensity include land area and floor space at the plan-unit level, and land use, plot area, FAR (floor area ratio), building density and building height at the plot level.

(1). Ambiguity of the building siting

The ambiguity of building siting is one of the most prominent problem in regards to the morphological control. Building siting determines the building position in the plot, which further reflects its relationship towards the urban street. Current regulatory planning delimits the buildable area in the plot by multiple regulations on building setback and building interval. As there is no additional build-to line set in the plot, there are various possibilities of building location within the buildable area, revealing that the building siting regulation is flexible but vague.

The building setback distance

Building setback distance is determined by multiple influencing factors, including the road, the river, the green space, the plot boundary as well as the building interval. The final building setback distance should meet all setback regulations of the above factors. As the building setback distance from the road is usually larger than that of others, it usually becomes the major influencing factor of the building setback (Tab. 5.6, Fig. 5.8).

According to IRNTPO²², the building setback from the road is directly determined by the building height and the road width. Comparing IRNTPO of 1998 with its rectified edition of 2007, the minimum building setback distance from the road has increased. Given that multistorey buildings takes up the largest share in Old South area, the corresponding minimum setback distance from road is prescribed as no less than 6m. But practically the building setback distances are evidently larger.

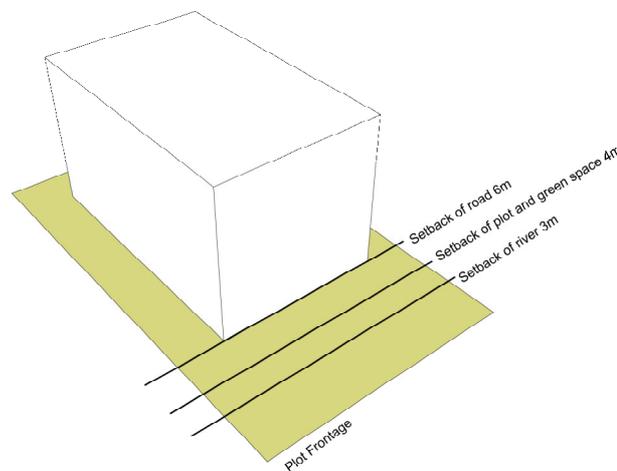


Fig. 5.8: Multiple setback requirements of a plot with the building height less than 24m, IRNTPO 2007

The building interval

The side building interval (abb. building interval) is another critical parameter affecting the building siting. In the early stages the standard of building interval was mainly aimed at multistorey buildings, varying in

²² The stipulations of the building setback are formulated by Implementing Regulation of Nanjing Town Planning Ordinance (IRNTPO), which was made in 1998 and had two revisions in 2004 and in 2007.

building types²³. With the prevalence of highrise buildings, building height became the major influencing factor in regulating the building interval. The IRNTPO of 2004 set up the minimum building interval according to four categories of building height, including the multistorey building ($H < 24$), small high-rise building ($24 < H < 35$), high-rise building ($35 < H < 100$) and super high-rise building ($H > 100$).

Comparing three editions of IRNTPO (Tab. 5.7), the minimum building interval keeps increasing. For example, the minimum building interval of two multistorey buildings has increased from 6m to 8m. IRNTPO 2007 has shown a progress by taking a consideration of morphologically special areas like downtown areas and commercial centers, claiming that buildings in these areas are allowed to be connected by common wall on the premise of meeting the fire safety requirement. However, the majority of practical redevelopment in the historic urban area didn't implement this special regulation, indicating the strong institutional path dependence and the lack of supporting measures for the implement of new regulation. Consequently, the regulation of side building interval implemented in recent three decades has led to the dominance of detached buildings in the historic urban area, which is one of the most identified feature of contemporary urban form. However, the historic form of street frontage and the continuity of street wall have been inevitably damaged.

Tab. 5.6: Stipulations of the building setback distance in IRNTPO 1998 and 2007 [Source: Compiled according to Implementing Regulation of Nanjing Town Planning Ordinance (IRNTPO 1998 and 2007)]

Year	Regulation of 1998			Regulation of 2007		
Elements	Building height	Minimum Setback(m)		Building height	Minimum Setback(m)	
Road		Road Width > 26	Road Width < 26		Road Width > 30	Road Width < 30
	H < 12	4	3	H < 24	6	4
	12 < H < 24	6	4			
	24 < H < 50	10	8			
	50 < H < 80	15	12	24 < H < 100	15	12
	80 < H < 100	20	15			
	H > 100	25	18	H > 100	25	18
River	---	3		H < 24	3	
				24 < H	6	
Green area	---	---		H < 24	4	
				24 < H	6	
Plot					Building Width < 15	Building Width > 15
				H < 24	4	6
	---	4			Building Width < 20	Building Width > 20
				24 < H < 35	8	10
					Building Width < 25	Building Width > 25
			H > 35	10	15	

²³ Due to the relatively smaller number of highrise buildings, building height was not the most critical parameter in the 990s. IRNTPO of 1998 only formulated stipulations for multistorey building in which the distance of building interval is based on building types.

Tab. 5.7: Regulations on the minimum building interval in IRNTPO [Source: Compiled according to Implementing Regulation of Nanjing Town Planning Ordinance (IRNTPO 1998, 2004 and 2007)]

Regulation 1998		Regulation 2004			Regulation 2007			
Building type	Minimum building interval(m)	Building height	Height of sheltered building	Minimum building interval(m)	Building height	Height of sheltered building	Minimum building interval(m)	
Slab	6	H<24	H<24	7	H<24	H<24	8	
			24<H<30	10		24<H<35		15
			H>30	14		H>35		
Point	10	24<H<30	24<H<30	10	24<H<35	24<H<35	15	
			30<H<35	14				
		30<H<35	30<H<35	14		H>35		
Slab and Point	8	H>35	24<H<35	18	35<H<100	24<H<35	15	
						H>35	18	
			H>35	30	H>100	24<H<35	18	
						H>35	20	

The deficiency of build-to line

The deficiency of build-to line is the largest problem of regulatory planning system concerning the control of building siting. In the zoning systems of other countries²⁴, there are three key parameters for the control of building siting, including the building setback, the building interval and the build-to line. Compared with the building setback line, the build-to line requires buildings compulsorily to be located on it. Thus building siting is no long a flexible buildable scope, but a precise location relative to the plot frontage. In addition, the building line regulates the minimum proportion that it must be occupied by the building, which is of great importance in keeping the continuous street frontages. Thirdly, the established blocks generate the historic building line. Its continuation is a key point for the protection of historic urban form.

Due to the deficiency of build-to line, the building siting based on regulations on the building setback and building interval can only designate a buildable area in the plot instead of a precise location. The current way of building siting is obviously a kind of control method in favor of land development in new urban districts. However, the excessive freedom of building siting appears to be inappropriate for the historic urban area. The problem is especially prominent in residential and commercial plots. For example, most of residential microdistricts built after 2000 abandoned the molding of eastern and western street frontages in order to create the south-oriented apartments as much as possible. In addition, for some commercial plots located in the block corner, the buildings are located far from the plot boundary, leading to the reduction of the morphological identity of the historic urban structure.

²⁴ As introduced in chapter 5.3. German Bebauungsplan creates the tool of build-to line (Baulinie), and American Form-based Code develops the Required Building Line (RBL).

(2). The control of building height is not based on the plot

The zoning of building height limit in the old city were first proposed in the Renewal Plan of Nanjing Old City in 2003, and were further improved in the Conservation Plan of Nanjing South Historic Urban Area in 2010. Nevertheless, the control unit of building height is based on the block instead of the plot²⁵. In the regulatory planning system, the building height of unit plot is only a directory index, and is usually assigned with an upper limit²⁶. But in practical development this upper limit figure is often considered as the “required” height, obviously violating the original control intention. In addition, the reliability of the height control is questionable, because in many cases height limit indexes are produced without any specific urban design or researches. Accordingly, the unreasonable building height not only damages the historic urban form itself, but also causes the problems of building sitting as it is the essential factor in determining the building setback distance and building interval.

(3). Unselected spatial modes

Apart from the problems of building siting and building height, current regulatory planning system also lacks the control of plot types and building types. The analysis in Chapter 3 has shown that the four major types and twelve subordinated types of spatial modes are not necessarily all fit for the historic urban area. A majority of them actually lacks the inheritance of historic urban form. Some modes even cause remarkable damages to the historic urban form.

The selection of spatial modes in the regulatory planning can be understood as the process of matching proper building types with given plot types. The control of spatial modes is completed through several links, in which the classification of plot types should be made in the process of plot division and the control of building types should be completed through land use zoning. Under the current circumstances, the plot division mechanism does not establish a classification standard of plot types, and the land use zoning, totally depending on the functional separation, takes few consideration on the “building types”. In this sense, the control of spatial modes becomes very difficult.

In conclusion, current regulatory planning system shows a deficiency in the control of plot division and its related physical form, which is remarkably manifested in following aspects:

- (1). The significance of “form” is largely neglected in the regulatory planning. Firstly, the land use zoning is completely based on functional separation, which can not depict the morphological features of urban space. Secondly, the plot division is actually made in a pragmatic way in favor of land leasing or land development, but few consideration is taken on the continuation of historic urban form. Thirdly, the control of regulatory planning mainly focuses on land use and development intensity, while the control on physical form is deficient.
- (2). The standard of plot division and some morphological regulations in the regulatory planning are not fit for the historic urban area. It is questionable when regulations benefiting the new town construction are used in the renewal of old city without any readjustments. In terms of the plot division in the historic urban area, special plot scale and form with historically morphological inheritance should be taken full

²⁵ According to the Technical Regulation of Nanjing Regulatory Planning (TRNRP,2005),the zoning of building height should be based on the block.

²⁶ The height zoning contains 6 categories: below 12m, 12-24m, 24-35m, 35-50m, 50-100m and above 100m.

consideration, but so far few researches have been made on this issue and the current standard of plot division can not benefit the continuation of historic plot pattern.

(3). The plot has not developed into the basic unit of morphological control in the regulatory planning. Firstly, the control of building siting currently is very rough and the control is not based on the relative position to the plot boundaries, especially the plot frontage. Thus the morphological control actually manifests a self-centered tendency rather than the integration of urban structure. Furthermore, the compulsory and dramatic building setback distance and the building interval have deteriorated the disintegration of street interface. In addition, the control of building height is not based on unit plot, but the building height is a decisive factor in determining the building setback distance and building interval of unit plot, which inevitably leads to the disordered urban form. Thirdly, the selection of spatial modes (or building types) in the historic urban area is lack of control. As a result, some inappropriate spatial modes have brought about damage to the integrity of historic urban form.

5.3 Rediscovering the significance of Form-based code

To solve the adaptive problem of the regulatory planning in the historic urban area, it is necessary to reconsider the role of “form” played in the zoning system. In some countries, form is still a significant basis in their zoning systems. Analyzing the characteristics of these zoning systems will provide good references to the rectification of Chinese regulatory planning system which treats “function” as the supreme principle. This section selects three typical form based codes, including Bebauungsplan of German, Form based Code of United States and Plan Local d’ Urbanisme of France for analysis. The main focus is how the form based zoning systems control urban development and promote the generation of an ordered urban form. Corresponding to the regulatory planning system, three aspects are particularly discussed, the standard of zoning, plot shape control, and building form control.

5.3.1 Bebauungsplan, Germany

Bebauungsplan (B-Plan) contains the legally-binding designations for urban development, including aspects of land use, development intensity, physical form, traffic organization, environmental protection and climate adaption²⁷ (Tab xx). The planning system contains four major sections:

- (1). Category of built use (*Die Art der baulichen Nutzung*) determines the zoning of land use based on the Baunutzungsverordnung (*BauNVO*).
- (2). Intensity of built use (*Das Maß der baulichen Nutzung*) determines the development intensity through assignment of key indexes including Site occupancy index (*die Grundflächenzahl, GRZ*), Plot ratio (*die Geschossflächenzahl, GFZ*)²⁸, and building height/floors.

²⁷ Cf. Weber, E. Henckel, D. (2008).

²⁸ The Site Occupancy Index (GRZ) indicates what portion of the plot area is permissible for building development. The Plot Ratio (GFZ) indicates the square meter of floor area that is permissible per square meter plot area.

(3). Buildable plot area (*Die überbaubaren Grundstücksflächen*) refers to the permissible plot coverage designated by build-to line, setback line and coverage depths.

and (4). Local traffic area (*Die örtlichen "Verkehrsflächen"*) determines the use, scope and location of traffic area, which constitutes the spatial framework of the planning area²⁹.

Land use zoning

The land use zoning in B-plan, characterized by mixed use, takes full consideration of the form. The land use is classified into four broad primary types and eleven secondary types. The four primary types include residential land, mixed land, business land and special land (Tab. 5.8). The land use types are not mutually exclusive or presumed as a hierarchy in which the residential use is at the top, isolated from other uses. Instead, the classification encourages mixed use both in horizontal and vertical terms. Almost all secondary types allow certain degree of functional coexistence, which would be only possible in specialized mixed zones in Chinese or America counterparts.

Taking the residential land as an example. In General Residential Area (*Allgemeine Wohngebiete*), residence is the main function but shops, restaurants and adaptive handicrafts workshops and firms are also allowed. The vertical mixed use is typically manifested in Special Residential Area (*Besonderes Wohngebiet*), a land use type specially designated for urban renewal. Besides residential buildings, other existing buildings with compatible uses are also preserved and developed. Under this condition, B-Plan regulates that above a particular storey only residential function is permitted, or a specific proportion of residence must be ensured.

One most remarkable feature of German zoning is the designation of Mixed area (*Gemischte Bauflächen*) as an independent land use type. The areas with special urban form like villages and old cities should not mechanically implement the function-based standard of land use classification. In most German cities, the inner city or city center are designated as the Core Areas (*Kerngebiet*). It is a secondary type of Mixed Land which mainly accommodate commercial enterprises, gastronomy and central institutions of economy, administration and culture as well as apartments. It is notable to distinguish that the land use classification emphasizes on the morphological significance of the inner city area and makes efforts to continue the established urban form rather than a compelling functional segregation. In this sense, the land use classification in German zoning system is based on both urban form and land function.

Control of building form

German B-Plan creates an effective but flexible tool, Building Window (*Baufenster*) in controlling the building form, especially the building siting (Fig. 5.9). It sets up a permissible buildable area in the plot where any development has to be located. Building window is defined by two different boundary conditions: build-to line (*Baulinie*) and setback line (*Baugrenze*). Setback line (*Baugrenze*) delimits the scope that buildings and their parts can not extend beyond. In contrast, the front facades of buildings must be directly positioned on the build-to line instead of staying behind.

²⁹ Cf. Yin, C. (2008).

Setback line and build-to line regulations are intended to control the relative position of buildings to the plot frontage. They regulate the distance between a building and the plot frontage line. If a Building Window is only defined by setback lines without build-to lines, buildings can be freely positioned within the Building Window while meeting other legal guidelines. Reversely, the aim of Build-to line is to mold a continuous row of houses along the street, which is of great significance for preserving traditional cityscape.

It is worth mentioning that Building Window is a particularly effective tool to control the form of megaplot. One key point for large-scale redevelopment in historical environment is to control the non-construction area, including existing alleys, preserved buildings or public space. Through setting up Building Windows within a megaplot, non-construction area can be specially separated out. In addition, Building Window can refine the height control within a megaplot through establishing subordinate areas of different building height. In the case of Potsdamer Platz in Berlin, it is prominent to see the critical role of Building Window in promoting the refurbishment of traditional urban form³⁰.

Apart from Building Window, Building Method (*Bauweise*) is another tool in controlling building types and building position (Fig. 5.10). It has three specific categories: (1). Open method (*offene Bauweise*), (2). Closed method (*geschlossene Bauweise*) or (3). Divergent method (*abweichende Bauweise*). Open method requires the construction of freestanding buildings (e.g. detached houses, semi-detached houses or house groups) which leave setbacks from the plot boundary. Close method requires buildings to leave no side setbacks from plot boundaries so that a continuous street frontage could be formed. Divergent method is a mixture of the above methods, requiring buildings to leave no side setback on either plot boundary.

³⁰ See Chapter 6.2.3.

Tab. 5.8: Classification of land use in German BauNVO [Source: Compiled by the author according to German BauNVO]

Primary classification	Secondary classification		Uses permitted by right
Residential (<i>Wohnbauflächen, W</i>)	Small holdings (<i>Kleinsiedlungsgebiete</i>)	WS	Small-scale residential (one- and two-family); retail and restaurants which serve the daily needs of the residents; and workshops
	Exclusively residential (<i>Reine Wohngebiete</i>)	WR	Residential buildings
	General residential (<i>Allgemeine Wohngebiete</i>)	WA	Residential buildings; retail and restaurants which serve the daily needs of the residents; workshops; and religious, cultural, social, public, health, and sports facilities
	Special residential (<i>Besondere Wohngebiete</i>)	WB	Residential buildings; retail, hotels, restaurants and other related commercial; business and administrative facilities; religious, cultural, social, public, health, and sports facilities; workshops and non-disturbing industry
Mixed (<i>Gemischte Bauflächen, M</i>)	Village areas (<i>Dorfgebiete</i>)	MD	Agriculture and forestry enterprises; small-scale residential associated with the agriculture and forestry enterprises; other residential buildings; retail; hotels; workshops and non-disturbing industry"; religious, cultural, social, public, health, and sports facilities; horticulture enterprises; and gas stations
	Mixed areas (<i>Mischgebiete</i>)	MI	Residential buildings; office buildings; retail, restaurants and hotels; workshops and non-disturbing industry; religious, cultural, social, public, health, and sports facilities; horticulture enterprises; and gas stations
	Core areas (<i>Kerngebiete</i>)	MK	Office facilities (including large ones); retail, hotels, restaurants and other related commercial; religious, cultural, social, public, health, and sports facilities; non-disturbing industry; parking garages; housing for owners, managers, workers in all above-listed facilities; gas stations
Industrial and commercial (<i>Gewerblichegebiete, G</i>)	Commercial (<i>Gewerbegebiete</i>)	GE	Commercial and office of all types; offices, warehouses and industrial enterprises; gas stations; sports facilities
	Industrial (<i>Industriegebiete</i>)	GI	Industry; retail and offices; gas stations
Special (<i>Sonderbauflächen, S</i>)	Special Recreational (<i>Sondergebiete, die der Erholung dienen</i>)	SO	Weekend and vacation housing; related services; camping grounds
	Other Special (<i>Sonstige Sondergebiete</i>)	SO	Tourist complexes; large retail complexes; convention centers; college campuses; hospital complexes; energy facilities

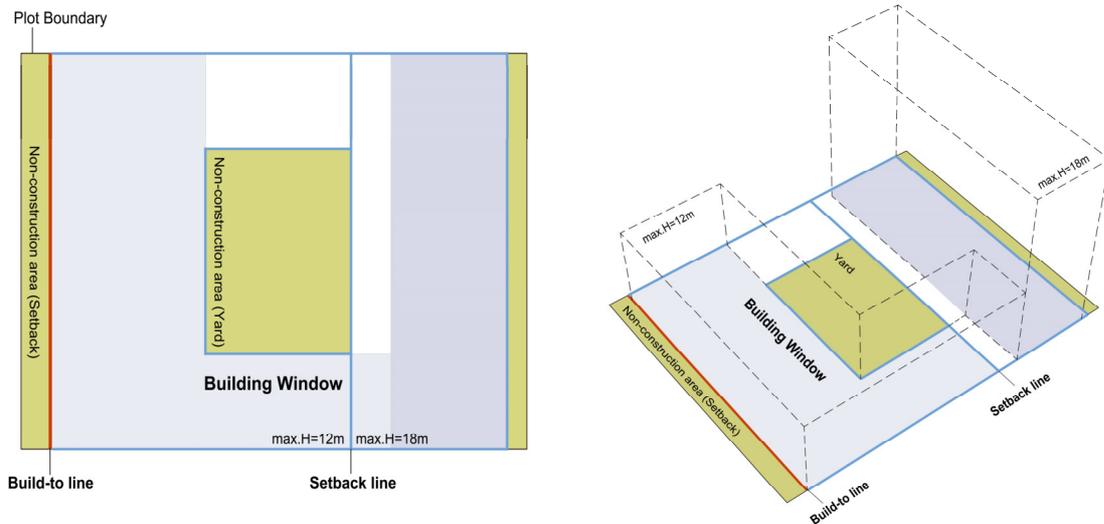


Fig. 5.9: Building Window

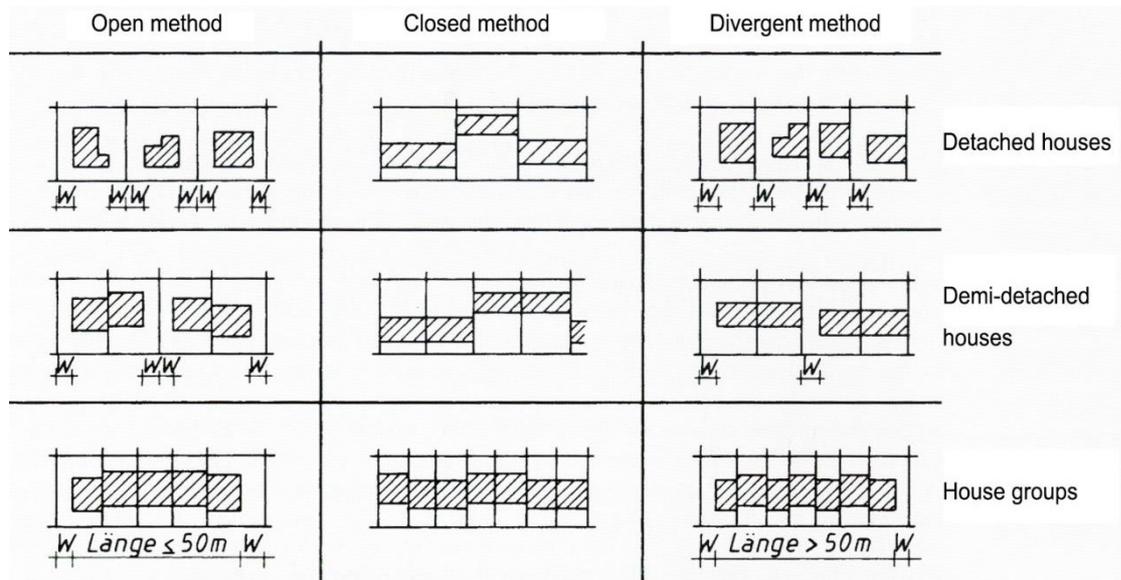


Fig. 5.10: Illustration of Building method (*Bauweise*) [Source: Yin, C. (2008)]

5.3.2 From conventional zoning to Form-based Code, US

In recent years, United States has witnessed the trend that an increasing number of cities adopt the Form-Based Codes (*FBCs*) as the alternative for the conventional zoning which has long been criticized for the deficiency in the control of physical form (Fig. 5.11).

The conventional zoning was devised to prevent undesirable juxtapositions, like factories next to homes, and incompatible scales of development. Although separating incompatible land use is sensible, the unnatural and forced separation of compatible land uses could do harm to communities. Functional segregation leads to a low efficiency of land utilization, which is notably manifested as the urban sprawl and the separation of social classes. What's more, regulations of conventional zoning mainly focus on the control of land

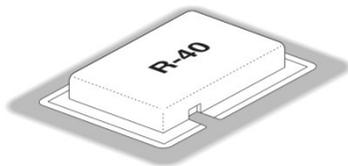
use and development intensity through a set of abstract and uncoordinated indexes, like FAR, setbacks, parking ratios and dwellings per acre. As a result, the physical form of urban development becomes no longer predictable and is likely to break with established urban patterns. In addition, conventional zoning fails in the protection of historic buildings and promotes the disassembling of old cities.

Recognizing these problems, many efforts have been made to establish the form based code to replace or supplement the conventional zoning since the 1980s. Especially since 2000 the number of communities adopting Form-Based Codes in North America is rapidly accelerating, including major cities like Miami, El Paso, and Cincinnati.

The Form-based Code is defined as a land development regulation that fosters predictable built results and a high-quality public realm by using physical form (rather than separation of uses) as the organizing principle for the code. It is not mere design guidelines, but a regulation adopted into city, town, or county law, which makes it a powerful alternative to conventional zoning regulation³¹. Form-based codes aims to restore time-tested forms of urbanism. The desired urban form they pursue should promote unified and efficient urban organization, social vitality, walkability, preservation of community history and protection of environment in cities, towns, and neighborhoods. The main morphological issues they concern include the scale and types of streets, blocks and plots, the form and mass of buildings, as well as the relationship between building facades and the public realm.

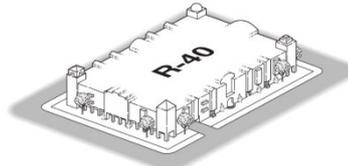
Conventional Zoning

Density use, FAR, setbacks, parking requirements, maximum building heights specified



Zoning Design Guidelines

Conventional zoning requirements, plus frequency of openings and surface articulation specified



Form-based Codes

Street and building types (or mix of types), build-to lines, number of floors, and percentage of street frontage filled by buildings specified

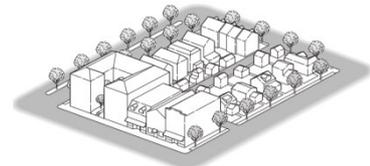


Fig. 5.11: Transformation of zoning plan in USA [Source: <https://formbasedcodes.org/definition/>]

The SmartCode

The Smart Code, originally developed by Duany and Plater-Zyberk, incorporating Smart Growth and New Urbanism, is a most representative Form-Based Code. It is a unified land development ordinance template designed to create walkable neighborhoods across the full spectrum of human settlement, from the most rural to the most urban, incorporating a transect of character and intensity within each. As a unified ordinance, it effectively spans and coordinates the regional, city, neighborhood, and building scales of development. It folds zoning, subdivision regulations, urban design, and basic architectural standards into one compact document. Because the SmartCode enables community vision by coding specific outcomes that are

³¹ Form-based Codes Institute. Form-Based Codes Defined. <https://formbasedcodes.org/definition/>

desired in particular places, it is meant to be locally calibrated by professional planners, architects, and attorneys³²³³.

The essence of Smart Code is the Transect Zone. Based on ecological theory, it segments the rural-to-urban continuum into discrete categories that fit within the language of current approach to land regulation. This continuum is composed of six different zones, including T-1 Natural zone, T-2 Rural zone, T-3 Sub-urban zone, T-4 General-urban zone, T-5 Urban center zone, and T-6 Urban core zone³⁴. The standards of categories ensure that a community offers a full diversity of building types, thoroughfare types, and civic space types, and that each has appropriate characteristics for its location (Fig. 5.12, Fig. 5.13). For example, at the rural end of the continuum, standards would call for less density; smaller, detached buildings; deep setbacks; paths, trails, and open swales; and irregular plantings. At the most urban end of the continuum, standards would call for higher density; larger, attached buildings; shallow setbacks; street and alley sections; and formal plantings. From rural to urban, the density and complexity of human elements are increased, while the density and complexity of natural elements are decreased³⁵.

SmartCode regulates land development with the most emphasis on controlling urban form³⁶. Control elements are mainly classified into three levels, street pattern, plot pattern and building form (Tab. 5.9). Above all, detailed regulations are made on the control of plot shape and building form. There are three major control elements, including plot occupation, building disposition, and setbacks, each further containing several subordinated attributes. Thus the form control is also made based on a set of attributes and figures, which incorporates well with the language of existing zoning system. Some most prominent characteristics of this code include: plot width is the key attribute in defining the plot shape; building siting is determined by explicit build-to lines in relation to all plot boundaries; the percentage of street frontage filled by buildings should be clearly regulated.

SmartCode proposes the basic control system and principles, but the calibration is necessary to make the code suit for local conditions and contexts. Fig. 5.14 shows how the principles of building siting set in the SmartCode are transformed into practical regulations with assignment by the Land Development Code of Peoria. Building siting is determined by given prescriptions of front setback, side setback and rear setback. Buildings are required to take up at least 80% of the build-to line in order to mold a completed street frontage. In addition, the location of parking is also regulated that it must be set in the rear of buildings to ensure the continuation of street frontage.

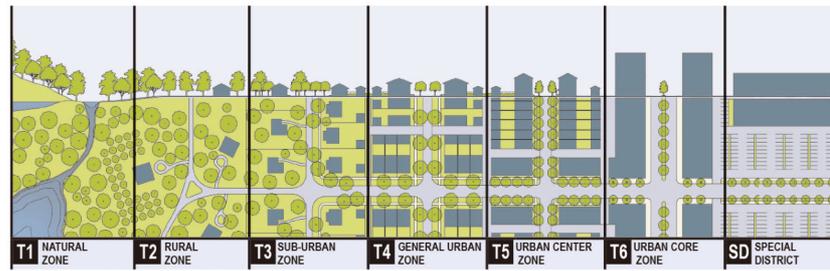
³² Wikipedia. Smart Code. (2015). <https://en.wikipedia.org/wiki/SmartCode>/Accessed 2015.2.20.

³³ DPZ. The SmartCode. (2017). <http://www.dpz.com/Initiatives/SmartCode/>Accessed 2017.09.

³⁴ Smart Code 9.0.

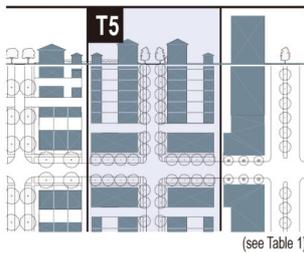
³⁵ Cf. Duany, A., Talen, E. (2002).3.

³⁶ Land use is also taken into consideration. For example, functions with negative impacts, such as heavy industry, adult businesses, etc. are still regulated.



	<p>T-1 Natural zone</p> <p>Building Placement Frontage Types Typical Building Height Type of Civic Space</p>	<p>Natural landscape with some agricultural use</p> <p>Not applicable Not applicable Not applicable Parks, Greenways</p>
	<p>T-2 Rural zone</p> <p>Building Placement Frontage Types Typical Building Height Type of Civic Space</p>	<p>Primarily agricultural with woodland&wetland and scattered buildings</p> <p>Variable Setbacks Not applicable 1-to 2-Story Parks, Greenways</p>
	<p>T-3 Sub-urban zone</p> <p>Building Placement Frontage Types Typical Building Height Type of Civic Space</p>	<p>Lawns, and landscaped yards surrounding detached single-family houses; pedestrians occasionally</p> <p>Large and variable front and side yard Setbacks Porches, fences, naturalistic tree planting 1-to 2-Story with some 3-Story Parks, Greenways</p>
	<p>T-4 General-urban zone</p> <p>Building Placement Frontage Types Typical Building Height Type of Civic Space</p>	<p>Mix of Houses, Townhouses&small Apartment buildings, with scattered Commercial activity; balance between landscape and buildings; presence of pedestrians</p> <p>Shallow to medium front and side yard Setbacks Porches, fences, Dooryards 2-to 3-Story with a few taller Mixed Use buildings Squares, Greens</p>
	<p>T-5 Urban center zone</p> <p>Building Placement Frontage Types Typical Building Height Type of Civic Space</p>	<p>Shops mixed with Townhouses, larger Apartment houses, Offices, workplace, and Civic buildings; predominantly attached buildings; trees within the public right-of-way; substantial pedestrian activity</p> <p>Shallow Setbacks or none; buildings oriented to street defining a street wall Stoops, Shopfronts, Galleries 3- to 5-Story with some variation Parks, Plazas and Squares, median landscaping</p>
	<p>T-6 Urban core zone</p> <p>Building Placement Frontage Types Typical Building Height Type of Civic Space</p>	<p>Medium to high-Density Mixed Use buildings, entertainment, Civic and cultural uses. Attached buildings forming a continuous street wall; trees within the public right-of-way; highest pedestrian and transit activity</p> <p>Shallow Setbacks or none; buildings oriented to street, defining a street wall Stoops, Dooryards, Forecourts, Shopfronts, Galleries, and Arcades 4-plus Story with a few shorter buildings Parks, Plazas and Squares; median landscaping</p>

Fig. 5.12: Transect zones of SmartCode [Source: SmartCode version9.2]



(see Table 1)

BUILDING FUNCTION (see Table 10 & Table 12)	
Residential	open use
Lodging	open use
Office	open use
Retail	open use

BUILDING CONFIGURATION (see Table 8)	
Principal Building	5 stories max. 2 min.
Outbuilding	2 stories max.

LOT OCCUPATION	
Lot Width	18 ft min 180 ft max
Lot Coverage	80% max

BUILDING DISPOSITION (see Table 9)	
Edgeyard	not permitted
Sideyard	permitted
Rearyard	permitted
Courtyard	permitted

SETBACKS - PRINCIPAL BUILDING	
Front Setback (P)	0 ft. min. 12 ft. max.
Front Setback (S)	0 ft. min. 12 ft. max.
Side Setback	0 ft. min. 24 ft. max.
Rear Setback	3 ft. min.*
Frontage Buildout	80% min at setback

SETBACKS - OUTBUILDING	
Front Setback	40 ft. max. from rear prop.
Side Setback	0 ft. min.
Rear Setback	3 ft. max.

PRIVATE FRONTAGES (see Table 7)	
Common Lawn	not permitted
Porch & Fence	not permitted
Terrace or L.C.	permitted
Forecourt	permitted
Stoop	permitted
Shopfront & Awning	permitted
Gallery	permitted
Arcade	permitted

Refer to Summary Table 14

PARKING PROVISIONS	
See Table 10 & Table 11	

* or 15 ft. from center line of alley

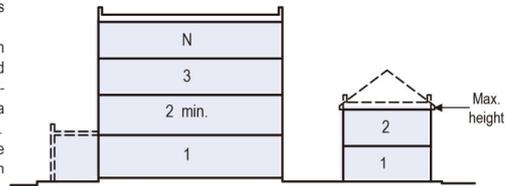
Graphics are illustrative only. Refer to metrics for Setback and height information.

"N" stands for any Stories above those shown, up to the maximum. Refer to metrics for exact minimums and maximums.

SMARTCODE VERSION 9.0

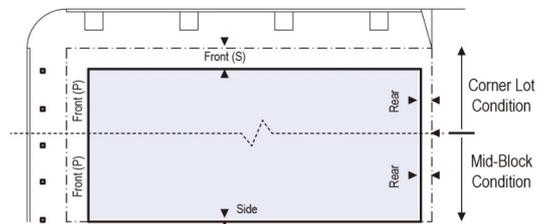
BUILDING CONFIGURATION

1. Building height shall be measured in number of Stories, excluding Attics and raised basements.
2. Stories may not exceed 14 feet in height from finished floor to finished ceiling, except for a first floor Commercial function which must be a minimum of 11 ft with no maximum.
3. Height shall be measured to the eave or roof deck as specified on Table 8.
4. Expression Lines shall be as shown on Table 8.



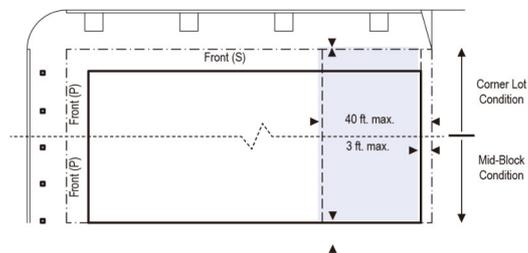
SETBACKS - PRINCIPAL BLDG.

1. The Facades and Elevations of Principal Buildings shall be distanced from the Lot lines as shown.
2. Facades shall be built along the Principal Frontage to the minimum specified width in the table.



SETBACKS - OUTBUILDING

1. The Elevations of the Outbuilding shall be distanced from the Lot lines as shown.



PARKING PLACEMENT

1. Uncovered parking spaces may be provided within the 3rd Layer as shown in the diagram (see Table 17d).
2. Covered parking shall be provided within the 3rd Layer as shown in the diagram (see Table 17d).
3. Trash containers shall be stored within the 3rd Layer.

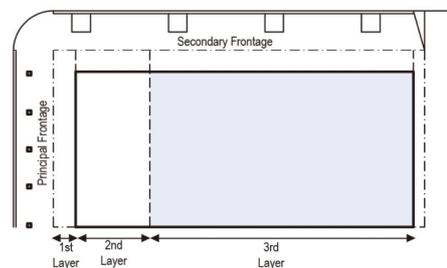


Fig. 5.13: Form-Based Code graphics [Source: SmartCode version9.2]

Tab. 5.9: Morphological control elements of the SmartCode [Source: Compiled by the author according to SmartCode version9.2]

Morphological level	Control elements	Subordinate indexes
Street pattern	Development modes	(1) CLD, (2)TND, (3) RCD
	Base residential density	---
	Block size	Block Perimeter
	Thoroughfare types	Highway, Boulevard, Avenue, Commercial Street, Drive, Street, Road, Rear Lane, Rear Alley, Path, Passage, Bicycle Trail, Bicycle Lane, Bicycle Route
	Civic space types	Park, Green, Square, Plaza, and Playground
Plot pattern	Lot occupation	Lot Width, Lot Coverage
	Setbacks	Front setback, Side setback, Rear setback, Frontage Buildout
	Building disposition	Edgeyard, Sideyard, Rearyard, Courtyard
Building form	Building configuration	Common Yard, Porch&Fence, Terrace or Dooryard, Forecourt, Stoop, Shopfront&Awning, Gallery, Arcade
	Private frontages	Principal Building, Outbuilding
	Building function	Residential, Lodging, Office, Retail

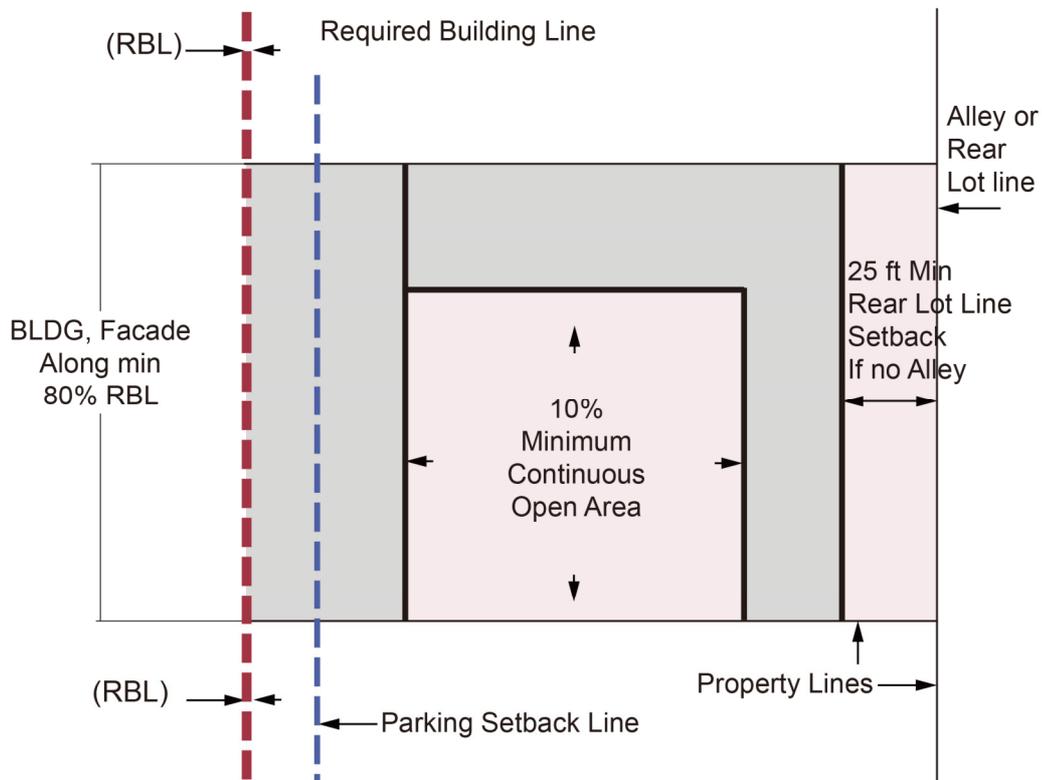


Fig. 5.14: Building siting control in Peoria-form-districts [Source: Reproduced according to Land Development Code of Peoria]

5.3.3 Plan Local d'Urbanisme (PLU), France

In France each municipal council, or intercommunal group, is obliged to prepare a Plan Local d'Urbanisme (PLU). The purpose of PLU is to determine a development plan for the commune and the general planning rules that will be applied to the locality and to specific sites³⁷. The key components of PLU include (1). Analysis and rationale; (2). Planning and sustainable development objectives; (3). Specific planning aims; (4). Graphic documents; (5). The règlement; and (6). Annexes. Above all, the zoning plan and the règlement are two major tools of PLU to make detailed morphological controls on specific circumstances.

In essence, PLU is a zoning plan. Rather than emphasizing the functional separation, the classification of land use only broadly contains four types: Urban areas (U), Future urban areas (AU), Agricultural areas (A), Natural and woodland areas (N), much fewer than that in Chinese regulatory planning system. The four primary types are further subdivided into sub-zones or even secondary sub-zones according to morphological characteristics. For example, there are eight sub-zones within U zone, including central urban tissue (UC), urban tissue of moderate continuity (UM), varied urban tissue (UD), detached housing (UP), hamlets (UH), employment (UE), industrial (UI) and public facilities and institutions (UGES). Within UC zone there are six secondary sub-zones (Fig. 5.15).

The written regulations are included in a separate section of the PLU known as the règlement. It has a fixed structure composed of three parts, totally fourteen articles (Tab. 5.10)³⁸. *Nature of the Occupation and Use of Land* regulates the land use, while *Maximum Occupation of Land* prescribes the development intensity. *Conditions on the Occupation of Land* is the main section regulating the physical form of development. Specific urban form is fostered by the combination of given articles. For example, the combination of articles 6, 7, 8, 9 and 10 determines the position of buildings relative to the street, neighboring buildings as well as the building height. Article 7 and 8 together determine three types of residential buildings, including detached type, semi-detached type or terraced type. Article 6, 9 and 10 effectively determine the street section.

As the morphological control of PLU is based on the plot, the most basic but significant task is to distinguish the road/ public space and the private property. The building siting is determined by the relative position to the frontage line, side plot boundaries and neighboring buildings. Above all, the frontage line is the most important reference point in defining the buildable area and building height (Fig. 5.16).

In addition, focusing on the relative position can also benefit formulating relative simple rules that could lead to good urban space, such as continuous building lines, well defined street sections and perimeter blocks (Fig. 5.17). A perimeter block, for example, can be generated by a simple code at the level of the plot: the building should sit at the front of the plot with the front facade on the frontage line and the building extending along the frontage with each side wall of the building forming a party wall on the boundary of adjacent plots³⁹.

³⁷ Local Plans in France. (2018). French Planning System. <https://www.french-property.com/guides/france/building/planning/local-plans/plan-local-urbanisme/> Accessed 2018.03.

³⁸ All règlements must set out each article but it is possible to have the equivalent of an "empty set", with the contents of the article being "no particular provision is imposed".

³⁹ Cf. Kropf. K. (2011).158-179.

Obviously, a typomorphological approach is deeply integrated in PLU. Street pattern, plot pattern and building form are taken as major control contents. What's more, there is a correspondence between the attribute system of the règlement and the hierarchy of morphological elements (Tab. 5.11). It is the typological and structural correspondence that avoids an over-strict control on specific building form. In other words, PLU still provides freedom and flexibility for individual architectural design.

Tab. 5.10: Main contents of règlement [Source: Kropf. K. (2011)]

Nature of the Occupation and Use of Land	1. Proscribed types of occupation or use 2.Types of occupation or use subject to specific conditions
Conditions on the Occupation of Land	3.Access and public highways 4.Services 5.Ground conditions 6.Position of buildings relative to public roads 7.Position of buildings relative to side boundaries 8.Position of buildings relative to each other within a plot 9.Building coverage 10.Maximum height of buildings 11.External appearance 12. Parking 13. Open space and planting
Maximum Occupation of Land	14. Maximum occupation of the land by buildings

Tab. 5.11: Morphological elements or levels of scale and attributes included in the règlement [Source: Kropf. K. (2011)]

Morphological elements	Coding attributes
Complex/polycentric settlements	Main zones: U, AU, A, N
Simple settlements	
Streets/tissues	Sub-zones/voirie
Plots series-routes/public highway	Frontage line/ position of buildings relative to public highway;
Plot	Position of buildings relative to side boundaries and to each other within a plot, buildable area
Buildings	Building type, coverage and height
Rooms	
Structures	Appearance
Materials	



Fig. 5.15: Zoning plan of Morangis is based on morphological characteristics [Source: Kropf. K. (2011)]

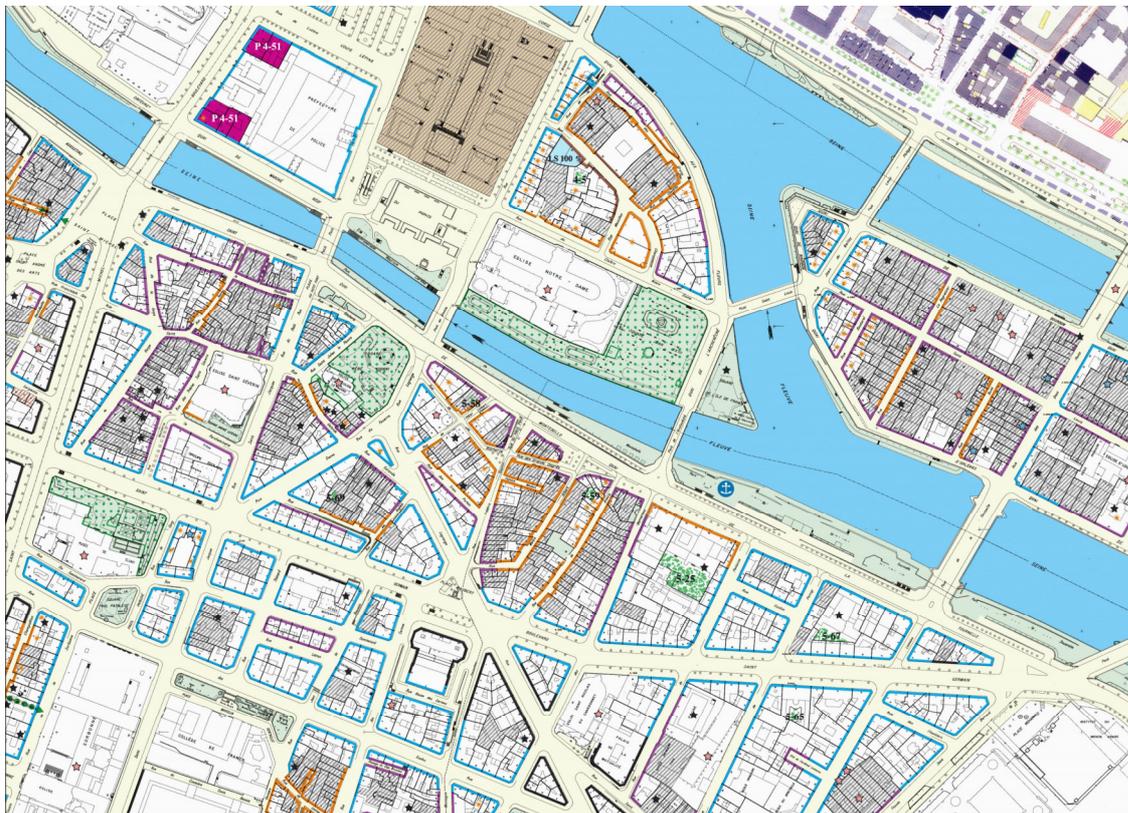


Fig. 5.16: Zoning plan of Paris [Source: Kropf. K. (2011)]

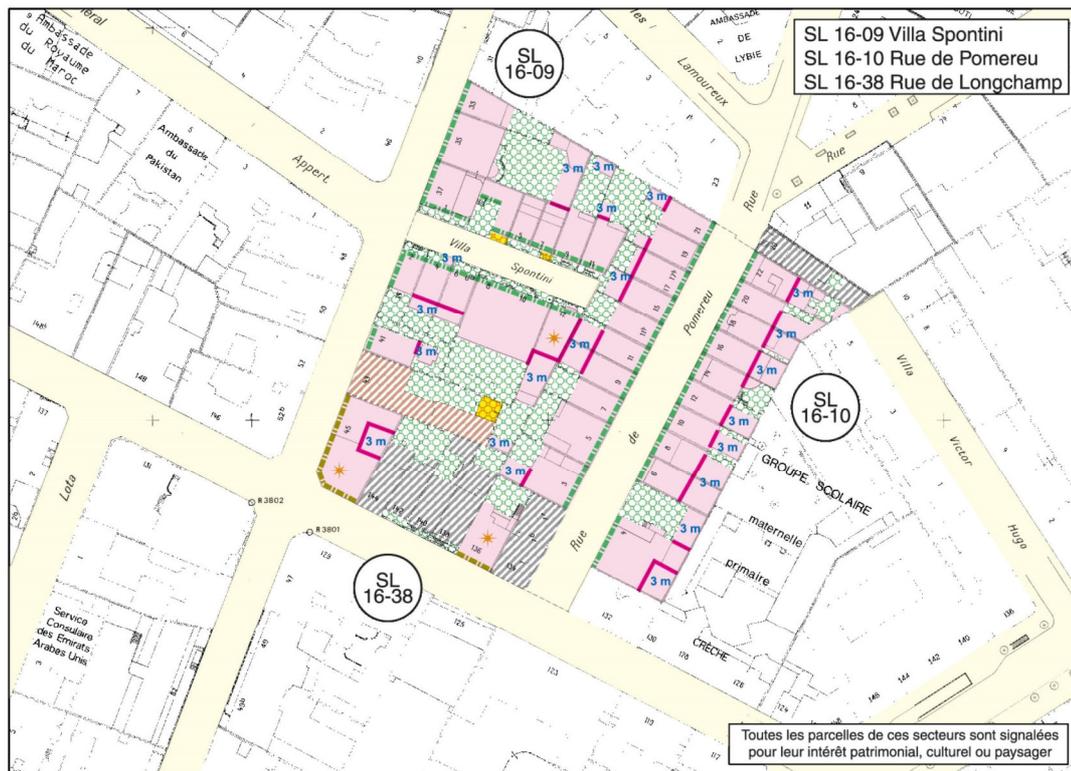


Fig. 5.17: Frontage line control in a detailed plan of PLU [Source: Kropf, K. (2011)]

5.3.4 Reflection: establishing Form-based Code in the historic urban area

In all three zoning systems of German, US and France, form serves as a crucial principle in establishing control measures and prescriptions. Firstly, form is regarded as one important criteria of land use zoning in all three zoning systems, which is quite different from the Chinese counterpart which almost depends on land function. Secondly, plot as the essential morphological element plays a significant role in three zoning systems. German Bebauungsplan establishes a detailed standard of plot subdivision and land reallocation; American Form based Code formulates a set of attributes in control of plot shape; In France, street pattern, plot pattern and building form constitute three core control levels of PLU. Thirdly, all three zoning system establish strict morphological control framework. Above all, building siting he building height are two critical control points. The control of building siting is based on its relative position to the plot frontage. In comparison, Chinese regulatory planning system shows obvious deficiency in controlling the two points.

It must be stressed that form and function are complementary instead of mutually exclusive. But special urban space like the old city where the urban form is special and worthy of protection should give the priority to the form based code. According to the Transect zones of SmartCode, different kinds of urban spaces correspond to different development intensity, urban form and control measures. In this sense, it is necessary to establish a set of Form based Code in the historic urban area to supplement the deficiency of current regulatory planning system.

5.4 The impact of land development mode: plot division for growth

The impact of land development mode on the plot division is mainly manifested in two aspects. Firstly, plot division is a comprehensive result of land development mode and regulatory planning. As regulatory planning was generated and developed late in China, a large number of plot redivision since 1949 was not made under its guidance. On the contrary, land development mode directly provides a systematic framework for plot division. Secondly, land development mode itself experienced big transformation since 1949. The development orientation reflected in the land development modes has a significant influence on determining the principles of plot division.

Institutional analytical framework contains three important issues including the critical juncture, actors and the impact of planning. Critical juncture depends on the changes of Chinese land system, economic system and urban development policy. Above all, land development system plays a decisive role. Chinese historic urban form was formed under the private land ownership. Since 1949 the land system has experienced radical and frequent transformations. The communist regime established the command economy and strove for industrial development. Land regarded as one of the most significant means of production was nationalized in the middle 1950s⁴⁰. Under the state ownership, land use system experienced three major reforms: (1). Administrative land allocation (1949-1988); (2). Early stage of Land Use Right system (LURs) (1988-2002); (3). Land Banking system (2002-) (Tab. 5.12). The land development differs a lot under different land use systems. Coupled with the major impact of Chinese economic open and reform policy since 1980, the land development in Nanjing since 1949 can be classified into four modes: project-based mode and comprehensive development mode in the period of command economy; negotiation mode and land banking mode in the period of market economy⁴¹.

The analysis of the four land development modes mainly focuses on three points: (1). procedure of plot division; (2). actors of plot division; and (3). influence of regulatory planning on plot division (Fig. 5.19, Tab. 5.13). The actors involved in land development include governments at all levels, developers and land users. The research aims to clarify their relationship and the dominant power. As it was mentioned before, the establishment and development of regulatory planning is very late. And the impact of regulatory planning on plot division differs a lot under different development modes. Thus, it is debatable whether the regulatory planning is a decisive factor determining the practical way of plot division.

Tab. 5.12: Three stages of land use right system [Source: Compiled by the author]

⁴⁰ The socialist transformation of private property began in 1956. However, until 1982 had the amendments of Chinese Constitution proclaimed that all urban land are owned by the state.

⁴¹ The research discusses only four typical modes of plot division instead of enumerating all the modes.

Characteristics	Administrative land allocation	Early stage of LURs	Land Banking system
Time of establishment	Since the 1950s	Since 1988	Since 2002
Land ownership	State owned	State owned	State owned
Land use right	No separation	Separation from land ownership	
Usage term	No limit	Residential land for 70 years, industrial land for 50 years and commercial land for 40 years	
Land use	Governmental and military uses, infrastructure land and other non-profit making land	Residential, commercial and industrial uses	
Right of land re-transfer	No	Allowable	
Background of formation	Communist system Command economy Industrial development	Economic and social reform since the 1980s; Urban construction fever	Land finance; Maximization of land value; Normalization of land development
Ways of allocation	Administrative allocation	Negotiation, tenders and auction	Negotiation, tenders and listing
Land transferring fee	No	Low(mainly through negotiation)	High
Land management	Project based	Often compromise with developers	Unified planning and management by Land Banking Center

5.4.1 Transformation of Chinese land development system

(1). Land nationalization and administrative allocation

The land nationalization brought about the reform of land use right system. From middle 1950s the administrative land allocation, taking place of the traditional market-based land transaction, became the only form of land supply. There are two characteristics of this system: (1). the project based land allocation and (2). the complete deprivation of the land market value.

In the period of command economy, the administrative land allocation was totally linked with the specific “quota projects”. Urban development usually started with the plan of quota projects made by superior government(the central government). Then the quota projects were distributed into governments at lower levels which made their own urban development plans according to them. As most of these quota projects were directly managed by the superior government, the municipal government had limited power of discourse in the land development. Thus it became a key problem that how different projects led by various sectoral departments could be coordinated. To solve this problem, the superior government, the local government and the work units constituted a special committee for joint site selection. If the city was designated with more than two projects, it was suggested to set an industrial zone for the given sectoral departments⁴². The textile industrial zone in Menxi area was established based on this procedure. Above all, the main task of urban planning was to help locate key industrial projects.

The other characteristics of administrative land allocation is the deprivation of market value. Land users were not required to pay granting fee as well as land rent to the government. The allocation didn't definite the term of land use but the land user was not allowed to transfer its land use right, thus the normal mobility of the significant means of production was cut off. The function of market in distributing land resources was totally extincted and replaced by the planning system. In addition, administrative land allocation brought about several negative effects. Firstly, this system showed a very low efficiency in land management, leading to tremendous waste of the land resource. Many factories took all measures to acquire land which was surplus compared with their practical demands. Secondly, the free use of land caused a financial shortage of

⁴² Cf. Yeh, A., Wu, F. (1996).330-353.

urban construction. Couple with that the most finance was flowed to the industrial development, the development of urban infrastructure and housing fell far behind.⁴³ Thirdly, as the land use right could not be transferred, some land could not be mobilized timely. Especially after 1980 when some state owned factories had bad business performances, they failed to conduct the redevelopment through land use transfer and the land was left fallow for a long time.

(2). Land Use Right system

With the development of the Chinese economy and increasing economic reforms, the need for both residential and commercial space has grown rapidly. This emerging real estate demand led to an amendment to the Constitution of the People's Republic of China in 1988⁴⁴. The amendment of Constitution added the clause that the land use right can be transferred in accordance with the law, marking the reconstruction of Chinese land market. In the following years a series of laws and regulations were further enacted,⁴⁵ which enriched the institutional framework of the Land Use Right system (LRUs).

Although private ownership of land is not possible in China, LRUs separated the land use right from land ownership, thus making it is possible for the land use rights to be privatized. Under this system, land is leased to private users through three ways, negotiation, tenders and auction, mainly for residential, commercial and industrial uses. The land user should pay land transferring fees to the municipality. The length of land usage term differs according to land use. For example, the usage term of residential land is 70 years, industrial land 50 years and commercial land only 40 years. Apart from conducting land development, the holder can retransfer these land use rights to a third party subject to certain conditions.

LRUs neither changes the basic principle of communist system that the urban land is owned by the state nor abolishes the administrative land allocation system. The result was that a dual land use system operates until now (Fig. 5.18). Land for governmental and military institutions, infrastructure and other non-profit making institutions (such as public health, sports facilities, science, education and public utilities) are still allocated through the administrative allocation mechanism. As the administrative land allocation charges no land transferring fee and does not set time limit for the usage term, it is legally difficult to be transferred, leased or pledged by the land user.

Together with the land system reform, Chinese economic system also experienced radical reforms in the early 1990s. In 1992 the market economy system was officially established⁴⁶, becoming the direct momentum for the rapid development of real estate industry and third industry. The taxation system reform in 1994⁴⁷ restructured the revenue distribution between the central government and the local government. Under the new distribution regulations, the most share of production and business revenue is flown to the central government, while the benefit of land transfer is distributed to the local government. Facing the revenue short-

⁴³ Cf. Li, J., Dai, S. (2009).2-10.

⁴⁴ Cf. Yuan, Z. (2004).73-78.

⁴⁵ These important laws and regulations include: Land Management Law (1988), Provisional Regulation on the Granting and Transfer of Land Use Right over the State-owned Land in Cities and Towns (1990), Provisional Measures for the Administration of Foreign Investors to Develop and Operate Land (1990) and Urban Real Estate Management Law (1994).

⁴⁶ The socialist market economy was officially established in the 14th Congress of the Communist Party of China in 1992.

⁴⁷ The fiscal and tax system reform in 1994 introduced the tax sharing system and a multiple budget system, through which the central government increased its share in tax revenue. Local government get smaller share of tax revenues but had more obligations. Local government, especially the governments at bottom, do not have any direct sources of tax revenue, making them wholly dependent on either land transfer payments or finding alternative sources of revenue.

age, the local government kept increasing the scale of land transfer in order to balance the enormous financial pressure of urban development. Consequently, the benefits of land transfer has become the paramount source of revenue for local government and the so-called “land finance” was formed.

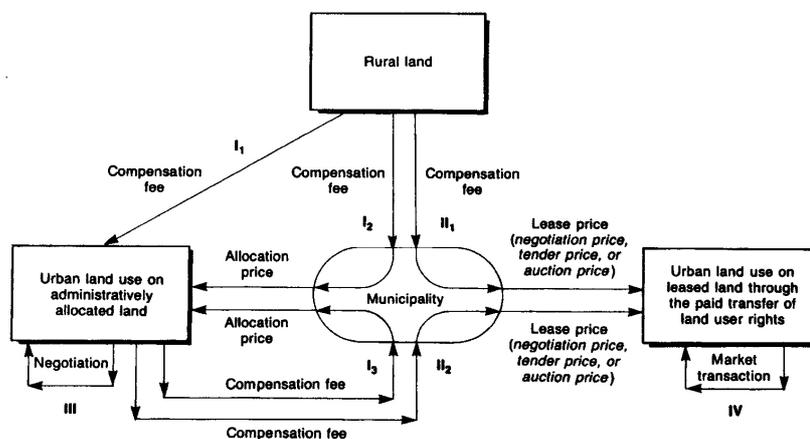


Figure 1 Model of dual land market and land transactions in Chinese cities

Fig. 5.18: Model of dual land market and land transaction in Chinese cities [Source: Yeh, A., Wu, F. (1996)]

(3). Land Banking system

The institutional framework of LURs in the early stage was not mature enough, leading to that the practical land leasing operated not as expected. Of the three ways of land leasing, the negotiation mode practically dominated in the 1990s. Taking Nanjing as an example, In 1992 when the LURs started there were 23 plots leased in the way of negotiation, accounting for 67% of all 34 plots with paid transfer⁴⁸. By 2002 when the negotiation mode was finally abandoned in Nanjing the total land area leased through negotiation reached up to 1549.66ha, while the other three ways, tender, auction and listing together only amounted to 768.34ha⁴⁹. In most cases, the land transfer fee determined by the negotiation was much cheaper than that determined by other ways, which despite a promotion of investment and development efficiency, nevertheless brings about the corruption in land management and a great loss of land revenue.

In order to tighten the control on the land market, land banking system gradually developed after 2000⁵⁰. Above all, Nanjing established the Land Banking Center in 2002 and enacted the Procedure of Land Banking in 2006. Land banking refers to the process in which local government purchase land from previous users, convert it to productive use, or hold it until it is profitable to sell. It is composed of four main stages: land expropriation, land arrangement, land reserve and land supply, in which the land expropriation is generally thought as a key and difficult stage⁵¹. The municipal government makes the annual plan of land banking and the Land Banking Center is authorized to cope with the land expropriation, land value assessment, primary land development and land leasing. Through this system the municipal government strengthened the control on the land development, changing the previous situation that the government had to compromise with

⁴⁸ Nanjing Yearbook 1993.

⁴⁹ Nanjing Yearbook 2003.

⁵⁰ Notice of Improving the Management of State Owned Land Assets, 2001.

⁵¹ Kang, C. (2006). A Study on the Operation Mechanism of Urban Land Banking System in China [dissertation]. Wuhan: Huazhong University of Science and Technology.

developers in the negotiation. Thus the land development can be carried on under unified planning and management, greatly promoting the urban construction, especially the implement of urban planning.

In order to solve the problem of land leasing, Nanjing readjusted the ways of land leasing in 2004, requiring all the profit-oriented land can only be leased in three ways, including the tenders, auction and listing. Negotiation mode as the main institutional loopholes causing the illegal land transfer in the early stage of LURs was finally abandoned.

5.4.2 Project-based mode (1949-1980)

Project-based mode was the predominant mode of plot division in the early stage of command economy from 1950s to 1980s. The procedure of this mode consists of five steps: (1). Superior government makes the plan of quota projects and distributes them to specific cities. (2). Site selection is made through the negotiation between superior government, local government and work units. (3). Work units obtained the land through administrative allocation, and was fully responsible for (4). the making of detailed plan and (5). the practical construction.

The actors of project-based mode mainly include the superior government, the local government and the work units, which constitutes a complex game relationship. Generally speaking, local government had limited influences on the key projects since they were initiated by superior government and independent from the urban master plan. Local government could also benefit little from these work units in regards to the tax revenue which flowed directly to the superior government.

Under this background, the plot division of project-based mode was in fact made through the negotiation of multiple administrative sectors instead of regulatory planning system. Actually Chinese statutory planning system has not been established until 1980s. Although efforts were made in the site selection in order to fulfill the spatial layout designated in the master plan, disaccords were often inevitable. For instance, the location of Nanjing Cotton Mill in the vacant land in Menxi area in the 1950s was a result of pragmatic fill-in development.

Under the project-based mode, work units were authorized by superior government to be independently responsible for the practical land development. Most constructions took few consideration of the integration with historic contexts, revealing the self-sufficient tendency. The large factory spatial mode with its fragmented urban form is a typical product of under the project-based mode.

5.4.3 Comprehensive development mode (1980s)

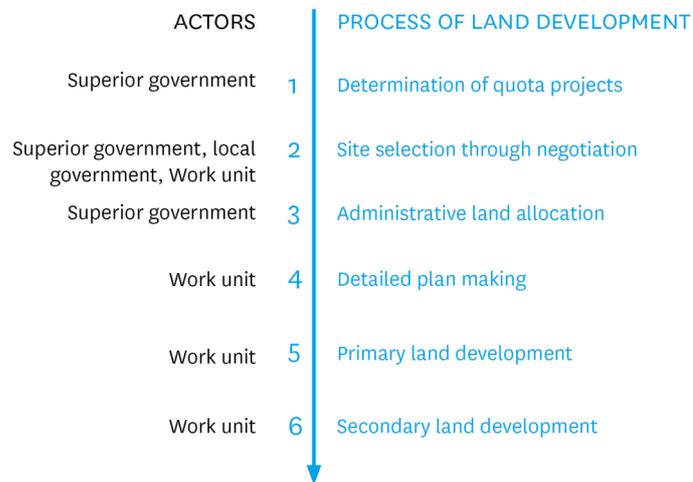
Comprehensive development mode, prevailing from the 1980s to the early 1990s, was established under the urban construction principle, “unified planning, rational layout, comprehensive development and auxiliary construction”. Taking full advantages of the state ownership and the command economy, this mode combined housing construction and infrastructure construction together, effectively promoting the implementation of master plan. This mode was particularly applied in the welfare housing program and large-scale urban redevelopment program. The most typical case is the redevelopment of Confucius Temple area in the

1980s, which not only recovered the traditional commercial street and the historic landscape, but also re-constructed the road network and several periphery residential areas.

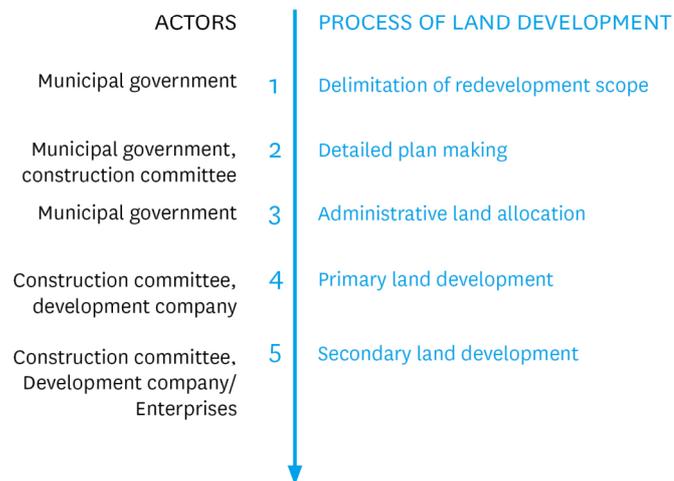
The procedure of comprehensive development mode contains five steps: Firstly, the municipal government delimited the scope for redevelopment and made the detailed plan. Then a special construction committee was established which was in responsible for the implement of the comprehensive development. Based on the detailed plan, the committee divided the whole redevelopment area into several sub-projects and entrusted them to development companies founded by municipal or district governments.

Under comprehensive development mode, the municipal government takes absolute control of the land development. Above all, the primary land development is directly made by the government, significantly contributing to the improvement of the infrastructure and the public space.

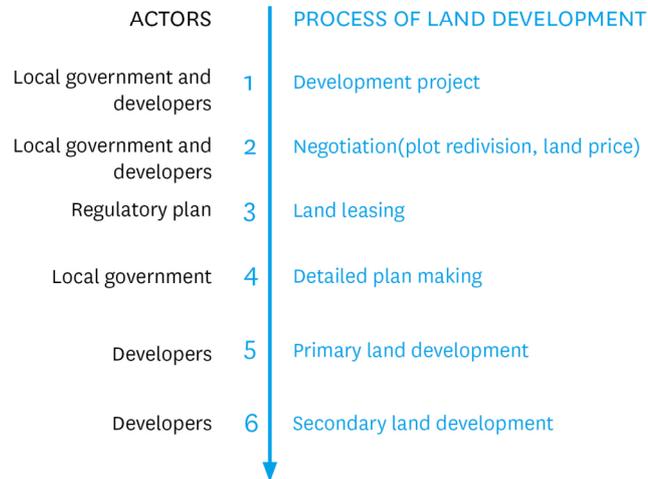
Project-based mode



Comprehensive development mode



Negotiation-based mode



Land banking mode

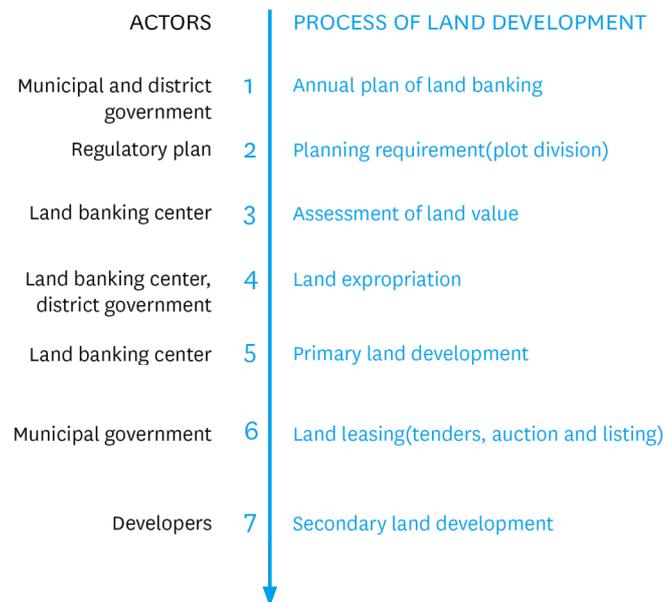


Fig. 5.19: The procedure of four typical plot division mechanisms

Tab. 5.13: Comparison of the four typical mechanisms of the plot division [Source: Compiled by the author]

Analytic elements	Project-based mode	Comprehensive development	Negotiation-based mode	Land Banking mode
Period	1949-1980	1980s	1990s	2002-
Land Ownership	State owned	State owned	Land Use Right system	Land Use Right system
Land allocation	Administrative allocation	Administrative allocation	Negotiation	Tenders, Auction and Listing
Development mode	Project-based	Comprehensive development	Project-based	Government-led development plan
Critical juncture	Land nationalization (1956)	Economic reform (1978)	Land Use Right system (1988) ; Market economy (1992) ; Reform of tax system (1994)	Land banking center (2002) The end of negotiation mode (2004)
Initiator of the plot division	Superior Government	Municipal/District Government	Developer/ Municipal/District Government	Municipal/District Government
Participants of the plot division	Governments at all levels, Danwei	Government, Danwei, Administrative Committee, Development Company	Government, Developers	Municipal/ District government, Land banking center, Developers
The effect of Planning/ Zoning	No	Detailed plan	Weak control	Zoning
Principle of plot division	Enclosure	Enclosure	Enclosure	Plot division
Plot subdivision/ Megaplot	Megaplot	Megaplot major	Megaplot major	Megaplot
Primary land development	Work Unit	Development Company	Developers	Land banking center
Publicity of the plot division	weak	relative good	weak	relative good
Typical case	Cotton mill in Menxi industrial area	Renewal of Confucius Temple; Laifeng Microdistrict	Extension of Zhongshan Road South; Redevelopment of industrial land	Yanliao Fang (commercial redevelopment); Huang Ce (residential area) Changledu district (historic restoration)

The plot division under the comprehensive development mode was remarkably controlled by the detailed plan which with its certainty and accuracy has advantages in the control of urban form. In the reconstruction of Confucius Temple area, the traditional street pattern was well preserved by the discrete detailed plan.

However, detailed plan did not develop an independent procedure of plot division which was almost made through the enclosure of given projects. In addition, comprehensive development mode showed the tendency of encouraging the megaplot. According to the statistics, the largest single plots⁵² generated in the 1980s and 1990s were actually the products of this mode.

5.4.4 Negotiation-based mode (1990s)

Negotiation mode was popular since the establishment of Land Use Right system in the 1990s. Its main flow path is as follows: the development project is proposed by either the government or the developers, and both sides proceed negotiations so that the agreement of key issues such as the land price and the plot division can be reached. Then planning requirements of plots should be designated and the plots are allocated to developers. Having acquired the land, developers are responsible for both the primary land development and the secondary land development. Although three major ways of land leasing, including the negotiation, the tenders and the auction were established in the early 1990s, in a long time the negotiation was the predominant way of land leasing. Negotiation based mode is a product of the institutional transformation. Both the government and the developers benefit from the institutional immaturity: the government can accelerate the urban renewal, while developers can buy the land use right with lower price and get bigger autonomy in land development requirements.

Under the negotiation mode, plot division is made through negotiation and can be hardly controlled by the regulatory planning. In this sense, it is difficult to make overall urban design. Several key elements, such as the site selection, the plot shape as well as the development intensity are not necessarily controlled in an effective way. In addition, as the primary land development, including the house demolition and relocation as well as the infrastructure construction, is conducted by the developers, property disputes and social contradictions became unavoidable.

In terms of the actors, both the interests of the government and developers are maximized through the negotiation mode. But generally speaking, developers hold larger power of discourse in the negotiation, since the government is more anxious for land transfer-fees to relieve the financing shortage in the large-scale urban construction. For example, the policy “Financing the road construction with the land revenue” was established in the 1990s when Nanjing launched large-scale infrastructure construction. A large amount of land along the roads to be reconstructed were allocated to developers who would like to finance the road construction. As a result, it became impossible to make an overall urban design along the roads and developers through negotiation got larger autonomy in land development.

There was a particular case of negotiation mode called the “black market”. It refers to the private transfer of administrative allocated land into the land market without the governmental permission. The most typical case of black market is the redevelopment of industrial land in the late 1990s when local government strongly advocated the removal of industries from the old city. Through the illegal negotiations, the land was redeveloped either by practical land users themselves or developers bought it. Despite a change of land use,

⁵² The largest plot in the 1980s, with an area of 38584m², was generated in the construction of Diaoyu alley microdistrict, while that in the 1990s, with an area of 34788m², was generated in the construction of Laifeng Li microdistrict.

no land compensates were paid to the government, and the land development was not necessarily under an effective control by the regulatory planning. On the one hand, the black market has deteriorated the problem of the vague property; on the other hand, some industrial land could not be properly redivided in the second round of renewal so that an opportunity for the refurbishment of historic plot pattern was lost.

5.4.5 Land banking mode (2002-)

The Land Banking refers to the practice of aggregating parcels of land for future sale or development. Land banking system was established in Nanjing in 2002, and is the main mode of urban land development at present. It is directed by a special institution, the Land Banking Center, through which the municipal government takes full control of the land development.

The procedure of land banking system consists of seven steps. (1). The municipal government makes the annual plan for land banking based on the master plan and the development plan, in which the requirements of district governments are also taken into consideration. (2). The land to be redeveloped should have the plot division according to regulatory planning. In addition, corresponding development requirements determined by regulatory planning should be designated to each plot. (3). A special land value assessment should be made by Land Banking Center before the land leasing. (4). The district governments are paid relocation compensation by Land Banking Center and entrusted with the land expropriation. (5). After the land acquisition, Land Banking Center is responsible for the primary land development (or it entrusts the work to other development companies). (6). The land is leased to developers in three ways, namely the tenders, the auction and the listing. (7). Developers conduct the (secondary) land development based on the planning requirements on their own plots.

It is under this mode that the plot division has become an independent and specialized procedure in the regulatory planning. It is a necessity only under this mode to discuss the rationality of plot division principle in the regulatory planning. Unfortunately, a majority of historic urban area had been renewed before the establishment of land banking mode. According to statistics, the total area of plots redivided and leased in Old South area since 2002 reached up to 28ha, only accounting for 5% of the whole historic urban area.

Land Banking mode reflects the strong intention of municipal government to take full control of the land development. Firstly, the annual plan of land banking mainly reflects the governmental development goals. Secondly, the government directly engages in the primary land development including the house demolition and relocation, the reallocation of land property and the construction of public space and infrastructure, largely reducing the possibility that public interest is encroached by developers. Thirdly, the government gains the initiative in the land leasing as the previous negotiation mode has been replaced by tenders, auction and listing. The competition mechanism is introduced into the demand side (developers), while the supply side (government) keeps a monopoly, which leaves developers little space of bargaining with the government. As the land price is constantly pushed up under this mechanism, the government can benefit greatly from the increasing land revenue.

Land banking mode has consolidated the tendency of megaplot. According to the statistics, more than 90% of plots redivided in the historic urban area since 2002 are larger than 5000m², especially 9 plots are

larger than 10000m². Even the urban refurbishment after 2010 was also made based on the megaplot. In fact, the tendency of megaplot attributes to several reasons. First, megaplot is regarded by the government as improving the efficiency of land development and brings about larger amount of land revenue. Second, as the land price is pushed up, the balance between the benefit and the cost can be only achieved through large-scale land development.

5.4.6 Megaplot mode: a land development mode of growth supremacism

(1). Path dependence under growth supremacism

The rapid economic growth of China started from the 1990s, when growth itself has become an imperative for governance. The growth largely depended on the land development. Under the Land Use Rights System, land supply is a powerful tool for local government to intervene into land markets, and proceeds from land supply greatly contribute to local revenue and financing of infrastructure construction⁵³. As urban planning was also regarded as a tool for promoting the growth^{54,55}, land leasing has become the major goal of making regulatory planning. The Technical Regulation of Nanjing Regulatory Planning in 2005 proposed three principles for plot division, including (1). Integrity and coordination of land use; (2). Clear land property and (3). Convenience of land leasing. These principles reflects a typical trend of growth supremacism.

Megaplot mode is the core of the growth supremacist land development, which has three aspects of connotations: (1). the generation of the megaplot; (2). setting less control indexes on urban form; and (3). project based plot division (Tab. 5.14). In order to attract investment, regulatory planning exerts minimum control on limiting the spatial (re)development. Compared with the zoning of United States, Chinese regulatory planning does not establish a developed standard for plot division. For example, there lack regulations on key indexes like plot size, plot width as well as the rules of plot arrangement.

Tab. 5.14: Comparison of two modes of plot division [Source: Compiled by the author]

Main characteristics	Plot division for growth	Smart plot division
Background	Redevelopment of historic urban area	Refurbishment of historic urban area
Plot scale	Megaplot based(50000m ²)	Medium and small plots based
Control of urban form	Minimum control on urban form	Conservation of historic urban form
Principle	Project based	Balance between the historic conservation and the diversified development

Despite the big differences in the procedure of plot division, the transformation of the four land development modes in the last 60 years manifests a typical path dependence of “enclosure”, through which the megaplot mode is constantly strengthened (Fig. 5.20). The enclosure started from the Project-based mode in the period of command economy. The construction of key work units (e.g. large factories) obtained abundant land

⁵³ Cf. Tian, L. Ma, W. (2009).599-609.

⁵⁴ Cf. Wu. (2015).

⁵⁵ Cf. Zhang, J. Chen, H. (2016).16-20.

through the administrative land allocation. The self-centered land development got only limited control of urban planning, causing some negative effects on the overall historic urban form. For the subsequent comprehensive development mode, the land allocation are also based on given projects with the encouragement of generating megaplot (e.g. the construction of welfare housing).

In the 1990s, Land Use Right system (LURs) regulates four ways of land leasing including negotiation, auction, bidding and listing. However, in a majority of cases the government tends to lease the land to developers in the way of negotiation which is characterized by much less land transferring fee than the other ways. On this condition, plot division was actually a compromise between the government and the developers. Developers sometimes can get large-scale land through the negotiation with the government.

It is since 2002 when Nanjing established the Land Banking system that plot division truly became a specific institutional procedure in the regulatory planning. The municipal government makes the annual plan for land expropriation. In cooperation with regulatory planning, the expropriated land is redivided and released to the land market. Despite the improvement of the governmental control on land market, Land Banking system has further promoted the megaplot mode. According to the statistics, more than 90% of plots redivided in the historic urban area since 2002 are larger than 5000m², in which 9 plots are larger than 10000m²⁵⁶.

(2). Plot division based on projects

Considering the initiators and negotiators of the four land development modes, it is clear that plot division under growth supremacism is generally made in a top-down way. In the period of command economy, the government has an absolute control on the urban development and plot division. Under the project-based mode, the government exerted its control through given projects instead of planning. Under the comprehensive development mode, the government made an overall plan for the redevelopment area, based on which the plot redivision and subprojects followed. The the establishment of LURs, land allocation gradually took more consideration of the market influence (the developers). The Negotiation mode formed in the early stage of the institutional transformation, endowed developers with more power of discourse with the government. The establishment of the Land Banking system has made the municipal government regain absolute control on land development, and further normalized the way of plot division and land leasing. But under this mode, the original property owners and practical land users are still difficult to be involved in the process of plot redivision, which is not beneficial to the conservation and continuation of plot subdivision in the historic urban area. Lots of practices at home and abroad have shown that the continuation of plot subdivision depends on the establishment of a mechanism that encourage the self-led renewal of property owners. Once the expropriated land is put into the process of Land Banking, it tends to be consolidated into a megaplot in favor of the overall and unified development.

⁵⁶ The statistics come from the record of land leasing since 2002 listed on the website of Nanjing Land and Resource Bureau (<http://www.landnj.cn/LandBargainInfo.aspx>).

Although the plot division is generally made in a top-down way, but for a long time it has not been effectively controlled by the regulatory planning. Plot division is made based on specific projects. The everchanging relationship between plot division and the regulatory planning can be divided into three stages: (1). Before the establishment of regulatory planning (1949-1990); (2). The establishment of regulatory planning system (1990-2002); and (3). The establishment of land banking system .(2002-). In the first stage, land development is managed directly in the way of the project. In the second stage, regulatory planning system was established. It regulated the land development through setting up the plot based index system. But the binding was so limited in the 1990s that abundant plots derived from the project based negotiation between the government and the developers.

It is since 2002 when Nanjing established the Land Banking system that plot division truly became a specific institutional procedure in the regulatory planning. But the plot division mechanism is far from a maturity. The procedure of plot division lacks the public participation and transparency. Consequently, the plot division in some cases is still made in a pragmatic way, favoring the projects that the government would like to bring in.

(3) The change of land development orientation: from growth to place-making

Generally speaking, the plot division under growth supremacism damages the historic urban area in three aspects: (1). The prevalence of megaplot leads to the elimination of the plot subdivision, the essential morphological characteristics of the historic urban area; (2). the project based plot division and land allocation fail to improve the land structure and the quality of urban space; (3). the rough control on spatial form aggravates the fragmentation of urban form.

By growth supremacism, it means to make everything center around economic growth, which serves as the foremost task overriding everything else. China remains a developing country; thus pursuit of economic growth is a must. However, the land development mode of growth supremacism is realized at the cost of the identity and diversity of the historic urban area. Growth should not be the only value orientation of plot division in the historic urban area. We should understand, adapt to and guide the new normal, break off as soon as possible from purely focusing the development goal on growth supremacism, and put more emphasis on the place-making. One hypothesis here is a given development requirement corresponds to a given urban form. For example, the historic urban area, the old city and the new city should develop different standard of plot division according to their morphological characteristics. The renewal area and conservation area within the historic urban area should also have different standards of plot division.

Plot division and land leasing strategies affect the scale of developer willing to participate and produce different outcomes. Smaller developers often prefer small parcels. Owing to their larger operation, larger developers may need larger parcels to gain sufficient economies of scale⁵⁷. Place-making oriented plot division means that the renewal of the historic urban area should preserve medium and small plots and depends on a large number of small developers, through which the diversity of urban space can be preserved. In some European cases, even new built neighborhoods create an atmosphere as pleasant and diversified as that in

⁵⁷ Cf. The Scottish Government. (2010).

the inner city through the strategy of creating plot subdivision⁵⁸. It is urgent for Chinese cities to change the current value orientation of land development. In this sense, the refurbishment of historic urban area aims to solve the above problems. Above all, it is critical to establish a new land development mode in favor of place-making (Tab. 5.14).

5.5 Conclusion

Plot redivision refers to the procedure of land redistribution in redevelopment area, which is influenced by multiple institutions including given property system, land development mode as well as planning system. This chapter mainly analyzes the impact of the conservation planning, the regulatory planning and the land development mode on the plot division in the historic urban area.

Historic conservation of Nanjing experienced three stages since the 1980s, from the protection of single monuments, to historic conservation areas and finally to historic urban areas. Typical conservation practices were made in each stages, including the reconstruction of landmark buildings and landscape in Confucius Temple area in the 1980s, conservation and renewal of Nanbuting area in the 2000s and the urban refurbishment of Mendong area since 2010. The transformation of conservation system and conservation strategy show that despite critical for the conservation and refurbishment of historic urban area, plot pattern is for a long time not an independent conservation element. The current conservation elements mainly emphasize the protection of special morphological elements, but largely neglected the significance of the “ground” composed of plots. In this sense, the conservation framework is far from maturity.

⁵⁸ Cf. Abrahamse, J., Buurman, M. (2006).

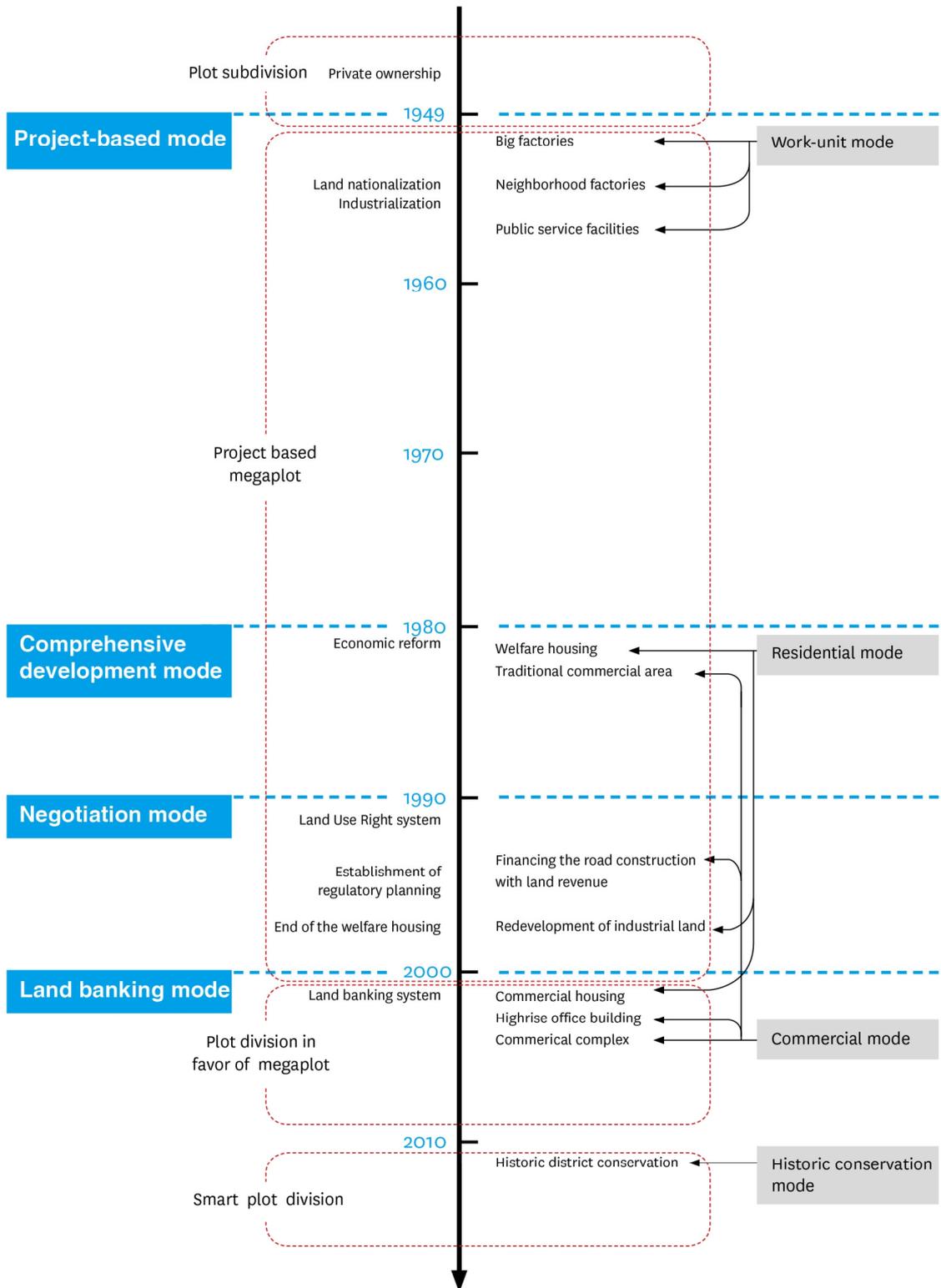


Fig. 5.20: The transformation of four land development modes and their impact on plot division and urban form

Regulatory planning is the major planning tool in controlling the land development. It draws the influences on the plot division in three aspects: principles of plot division, land use zoning and the morphological control of land development. Firstly, plot division as a major control task of the regulatory planning, for a long time lacks the support of a systematic standard and is practically made in a pragmatic way, which becomes an important reason for the damage of traditional plot subdivision. Secondly, the current land use classification places too much emphasis on the functional segmentation to depict the form of urban space, which also leads to the suppression of mixed land use. Thirdly, regulatory planning system shows a deficiency of the morphological control on land development, which is manifested in three aspects: (1). Ambiguity of the building siting; (2). The control of the building height is not based on the plot; and (3). Unselected spatial modes (building types).

To solve the adaptive problem of the regulatory planning in the historic urban area, it is necessary to reconsider the role of “form” played in the zoning system. A comparative research is made on three typical Form-based Codes, including *Bebauungsplan* of Germany, Form-based Code of United States and *Plan Local d’Urbanisme* of France, showing that Form-based Code should be given the priority in the old city where the urban form is special and worthy of protection.

The radical transformations of land tenure, economic reforms as well as planning system since 1949 have generated four typical land development modes, including project-based mode and comprehensive development mode in the period of command economy; negotiation mode and land banking mode in the period of market economy. The prevalence of megaplot is the result of the land development mode under the growth supremacism. In addition, the transformation of the four land development modes manifests a typical path dependence of “enclosure”. Although land banking system has established a relative formal procedure of plot division, it still encourages the megaplot.

Obviously, the current plot division mechanism does not conform to the morphological development requirements in the historic urban area. In terms of the actors, plot division is generally made in a top-down way and lacks a mechanism that encourages the self-led renewal of property owners. In addition, for a long time plot division has not been effectively controlled by the regulatory planning. Even the current land banking mode is far from a maturity. It is urgent for Chinese cities to change the current value orientation of land development. In this sense, it is critical to establish a new land development mode in favor of place-making.

6 Comparison: Critical Reconstruction of Berlin inner city and its plot redivision

6.1 Development orientation and main principle

6.1.1 Critical Reconstruction

(1). Modernist reconstruction of Berlin inner city after 1945

Unlike those European cities whose historic urban areas remain largely intact throughout the 20th century, Berlin was heavily destroyed in the 2nd World War and its urban form was vigorously remolded in the post-war period. The air raids from 1943 to 1945 destroyed 80% of the city center. After 1945, social changes and new political aims demanded a different urban space which could break with history. Architects and planners tried to reconstruct Berlin into a traffic-friendly and functional city as defined in the Athens Charter of 1933. In the following period of political division, the democratic West and the socialist East held ambitious competitions in the architecture and urban planning.

However, the two politically competing systems had things in common. The freely articulated network of roads was laid over the historic ground plan, leading to the destruction of corridor-like streets and geometrical squares. Abundant historical buildings were demolished to make way for avant-garde new buildings. The historic ground plan of both East and West were largely renewed. Especially the founding nuclei, the Berlin old city (*Alt-Berlin*) dating from the 13th century was totally erased in order to create a brand new urban image, accompanied by the large-scale land nationalization. Guided by the Collective Plan of Hans Scharoun, this area was finally reconstructed into the political center of GDR characterized by the modernist style (Fig. 6.1, Fig. 6.2)¹.

At the time of reunification in 1990, Berlin inner city had lost a large part of its memory. However, neither the West nor the East had fully completed their urban development modes. The practical urban pattern was characterized by a collection of fragments based on different planning and political goals.

(2). IBA Berlin 1987

In the 1970s West-Berlin witnessed plenty of social conflicts in neighborhoods in protesting the radical urban renewals and discussions about the orientation of urban development, which consequently leading to the

¹ Cf. Stimmann, H. (2009).

divergence from modernist urban development. Above all, the International Building Exhibition Berlin (*Internationale Bauausstellung Berlin, IBA Berlin*) from 1979 to 1987 marked a new stage of urban development (Fig. 6.3).

IBA Berlin 1987 was an urban renewal project launched by Berlin Senat, aiming at promoting the return of West Berlin inner city to a livable urban area. The project contained two sections: IBA Altbau, namely the conservation of old buildings, aimed to explore methods of “careful urban renewal”, while IBA Neubau, namely the construction of new buildings, proposed the strategy called Critical Reconstruction². Above all, Josef Paul Kleihues was appointed the director of IBA Neubau section in 1979. Under the framework of Critical Reconstruction, many international architects including Peter Eisenman, Vittorio Gregotti, Herman Hertzberger, Hans Hollein, Arata Isozaki, Rob Krier, Aldo Rossi and James Stirling were invited for the design of some renewal projects.

With the promotion of IBA, the new idea of urban development was finally formed by the end of 1980s, that the korridor-streets, blocks, squares and the long discriminated “tenement-city” (*Mietskasernenstadt*) were considered worthy of conservation. The damaged urban structure need to be restored, while contemporary architecture should also be created. These experiences became ideological roots for the reconstruction of Berlin inner city after the German reunification in the 1990s.

(3). The principle of Critical Reconstruction

Berlin’s urban development went into a new stage after the German reunification in 1990. As the capital of a reunited nation, the reconstruction of inner city became an urgent task, in which one of the biggest challenge was how to sew up the fissures caused by great demolition and modernist reconstruction in the post-war period.

After many discussions the agreement was finally reached that the principle of Critical Reconstruction should continue to guide the coming reconstruction of Berlin inner city. The city should no longer pursue the goal of re-inventing Berlin, but use its built history as a resource. Different from the period of IBA when the principle was mainly applied to public housing projects in Southern Friedrichstadt, it should be applied to completely different types of urban redevelopment after the reunification, including office buildings, hotels, department stores, ministries and university buildings.

The essence of Critical Reconstruction is a return to traditional urbanism, which is predominantly represented as a refurbishment of historic urban ground plan. A new Berlin should gradually emerge from dialogue between the restored urban ground plan and new architecture with a contemporary interpretation of the European city model. Above all, the “contemporary interpretation” is illustrated in three aspects. (1). The Critical Reconstruction aims at creating a differentiated and contemporary urban plan rather than a rough recovery of a nostalgic one. (2). The focus of urban reconstruction is not the lost buildings, but the damaged urban structure. What is expected is architectural experimentation addressing contemporary use within the preexisting frame. (3). The land use structure, despite differences between commercial areas, government

² Cf. Bodenschatz, H. (2010).

areas, university areas and the central cultural area, generally promotes mixed use within individual urban quarter, especially the mix of inner city housing.

These principles were transformed into a set of executive rules; some major prescriptions are listed below:

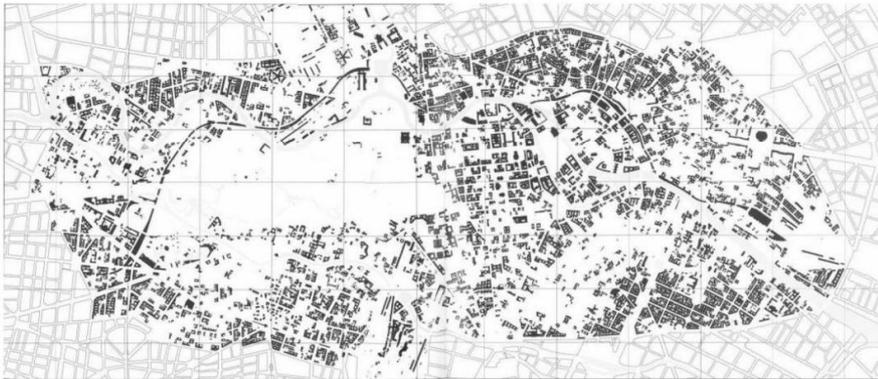
- (1). The historic street network and associated historic frontage lines should be respected or restored.
- (2). The maximum admissible building height for redevelopment should be 22 meters to eaves and 30 meters to ridges.
- (3). Certification of a share of approximately 20% of the gross floor area for housing use is required as the condition for approval.
- (4). The development intensity(FAR) is not prescribed. It is yielded by the parameters mentioned above, the building function and other specifications of building code.
- (5). The typological preference of new development is the town house(*Stadthaus*) built on individual plot; the maximum admissible plot size is the block³.

Actually these rules took a full consideration of pre-war building codes. For example, the Building Code of 1897, specified a maximum eaves height of 22 meters with 5 storeys and required buildings on the side of public street must be positioned on the frontage line, which contributed to the formation of historic Berlin urban cityscape. Also, the Building Code of 1929 for the first time allowed stepped-back storeys in place of the traditional roof.

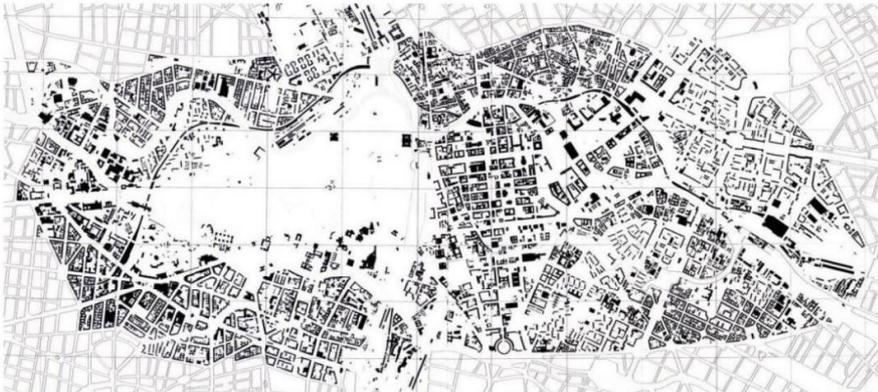
³ Cf. Stimmann, H. (1995).



Urban fabric in 1940



Urban fabric in 1953



Urban fabric in 1989



Urban fabric in 2010

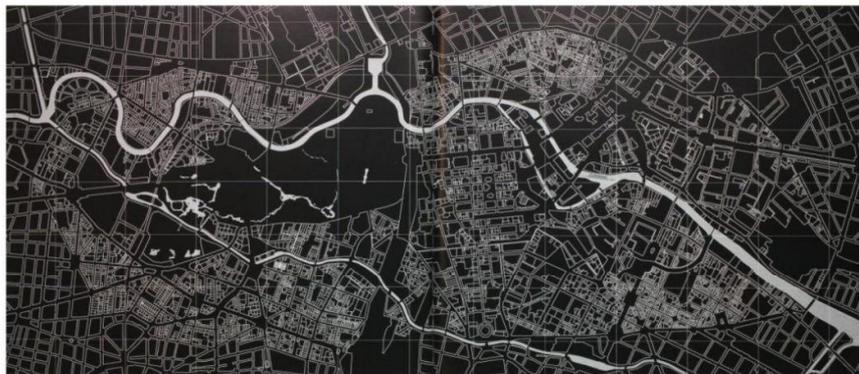
Fig. 6.1: Transformation of the urban fabric in Berlin inner city from 1940 to 2010 [Source: Stimman, H. (2000)]



Plot pattern in 1940



Plot pattern in 1953



Plot pattern in 1989



Plot pattern in 2010

Fig. 6.2: Transformation of the plot pattern in Berlin inner city from 1940 to 2010 [Source: Stimman, H. (2000)]



Fig. 6.3: IBA Berlin1987 [Source: Adopted from Bodenschatz, H.(2010)]



Fig. 6.4: Planwerk Innenstadt Berlin 1999 [Source:http://www.stadtentwicklung.berlin.de/planen/planwerke/de/planwerk_innere_stadt/download/index.shtml]

6.1.2 Planwerk Innenstadt Berlin of 1999

The Planwerk Innenstadt Berlin (*abb. PIB 1999*), approved by Berlin Senate in 1999, was a summarization and legislation of the urban development mode adopted in Berlin inner city since the reunification. With the Critical Reconstruction still considered as the major development principle, PIB 1999 aimed at the integration of fragmented urban areas into a whole. The planning area was about 30km², including central areas of both City West and City East. The main areas of intervention were not the great central locations, but the linking points that are essential to the integration. Eight areas, including Breitscheidplatz, Kulturforum, Molkenmarkt, Karl-Marx-Allee, Lietzenburger, Spittelmarkt, Fischerinsel and Luisenstadt, were chosen as key nodes of restoration (Fig. 6.4).

PIB 1999 proposed several important goals, involving demography, traffic, land use, open space, urban form, land property and realization:

The sustainable urban development requires the densification of inner city and the activation of development potential.

The inappropriate through traffic should be replaced by efficient urban streets with developed public transportation.

Improvement of open space and mixed land use in order to realize the re-urbanism of the European city.

The quality of open space and green space should be improved through the optimization in usage, function and form, and the systematization of them in inner city.

Strengthening the orientation of Berlin inner city as a living place through the modernization of existing housing and the supplement of new housing. Above all, building typology based on private land property is given the priority.

Taking a critical consideration of all historical stages of urban development, the overall identity of Berlin inner city should be improved through the integration and new representation of the urban form.

Individual plannings are integrated through establishing the cross-regional relationship of urban planning.

Foremost the urban redevelopment should be based on the activation of nationalized land for private development.

The PIB is realized through self-sufficient urban economic and executive strategy.

PIB 1999 respected all historical layers of urban development in Berlin and held the aesthetic view that the old and the new should coexist with each other. The City East developed by GDR would not be pulled down and replaced with new buildings. But what was already in place must be prepared to put up with criticism and necessary reconstruction.

The traffic strategy bade farewell to the automobile-oriented development mode. Instead, the priority should be given to the public transportation. It was planned that the proportion of public transport should be improved to 80%, while the use of private cars reduced to 20%. In addition, excessively wide roads across the inner city should be re-narrowed to the historic street scale. The street frontage was treated as one important component for the restoration of urban space.

In the early 1990s the housing ratio within Berlin inner city was only 6%, far lower than that in other boroughs. In this sense, Berlin inner city was oriented again as a living place for all social groups. Densification of population and housing was considered as an approach to slow down urban sprawl as well as to raise the utilization rate of technical, social and cultural infrastructure. Above all, the preference of housing typology was given to the town house, which is built on the small plot and offers flexible and mixed use. In addition, the housing redevelopment must promote the transformation of nationalized land and attract private investors.

The PIB 1999 would have not succeeded without a meticulous urban management. Despite Berlin's complicated administrative structure⁴, some consensus was achieved between various camps and levels of administration through efforts of discussions. Each project should have the assessment on the feasibility for private development. In addition, the PIB 1999 had to be well integrated with the legal planning, Bebauungsplan, so that the spatial strategies could be transformed into practical prescriptions of individual areas.

6.2 Plot based urban refurbishment

Under the guidance of critical reconstruction, the plot is considered as the key factor in the refurbishment of historic urban ground plan. It serves as the mediator between the overall urban pattern and individual building. In addition, some planning goals including the mixed land use, townhouse construction and reprivatization of nationalized land have to depend on the reconstruction of a subdivided plot pattern.

Rather than a hasty reconstruction of small-scale and subdivided plot pattern, the plot based refurbishment took full considerations on the differences of development goals and historic background in individual districts. Thus three typical modes of refurbishment are summarized, including the refurbishment of historic center, the residential redevelopment and large-scale commercial redevelopment.

The typological analysis of refurbishment modes are based on case studies. First, the history and evolution of each case are introduced in order to clarify specific development background. Based on the differences of background and development demand, each case establish its specific goal and principle for the refurbishment. Above all, the strategy of morphological restoration is the most important section, which should be assessed under the morphological framework consisting of the street pattern, the plot pattern and the building form. At last, key lessons of each type are summarized.

6.2.1 Refurbishment of historic district: Pariser Platz

(1). History and evolution

Pariser Platz is located in the center of Berlin. Built from 1732 to 1734, it was a product of the second baroque urban expansion. The neo-classical Brandenburg Gate, as the landmark of the square, was completed in the early 1790s by Carl Gotthard Langhans. In 1814, the square was renamed as Pariser Platz to mark the conquest of Paris by Prussian troops.

⁴ A Land government that is also a peak of local government, and 23 markedly powerful districts, each of which sees itself as an independent city, offered conditions that were just as suitable for this as the political stalemate.

Before World War II, Pariser Platz was the grandest square in Berlin, surrounded by American and French embassies, the luxury Adlon Hotel, the Academy of Arts and several blocks of apartments and offices. It suffered severe destruction in World War II. All the buildings, except the Brandenburger Gate, were destroyed or demolished in the post-war period for the construction of Berlin Wall. The square was then laid derelict and became the death zone dividing the city⁵.

Since the German reunification, the reconstruction of Pariser Platz with its symbolic significance of state unification drew more attentions than any other places in Berlin inner city. After a series of discussions, the consensus was achieved that the square should be reconstructed into a fine urban space again under the principle of Critical Reconstruction (Fig. 6.5, Fig. 6.9).

(2). Main principle of the reconstruction

The principle of the reconstruction of Pariser Platz was to restore the square space (public space) instead of to reconstruct lost buildings. What's more, what is encouraged is a contemporary square instead of a return to the status before the war.⁶ The reconstruction concept came from four historic epochs which include the period of desolation after 1945, but the morphological restoration was mainly based on the pre-war town plan in which the a closed urban square was molded by surrounding plots. As all buildings had been demolished except the Brandenburger Gate, some plots should be filled with contemporary architecture and functions. But Brandenburger Gate. In terms of the functional orientation, representative embassies, official and commercial uses were once again located into the square. Meanwhile residential use should take up at least 20% of the floor area in order to promote the mixed use of the civil square. These goals could only be realized through formulating an unified but detailed morphological framework which was also well integrated with the zoning plan. The reconstruction was completed in 2008, making Pariser Platz once again the center of both Berlin city and the whole country (Fig. 6.8).



1930



1989

⁵ Wikipedia. Pariser Platz. (2017). https://en.wikipedia.org/wiki/Pariser_Platz. Accessed 2017.05.03.

⁶ Cf. Bodenschatz, H. (1995).



2010

Fig. 6.5: Transformation of Pariser Platz [Source: Photo 1 and2: <https://www.pinterest.de>; Photo 3: Google map]



Fig. 6.6: Bebauungsplan of Pariser Platz,1995 [Source: <http://www.stadtentwicklung.berlin.de/>]



Fig. 6.7: Urban design of Pariser Platz, 1995 [Source: <http://www.stadtentwicklung.berlin.de/>]

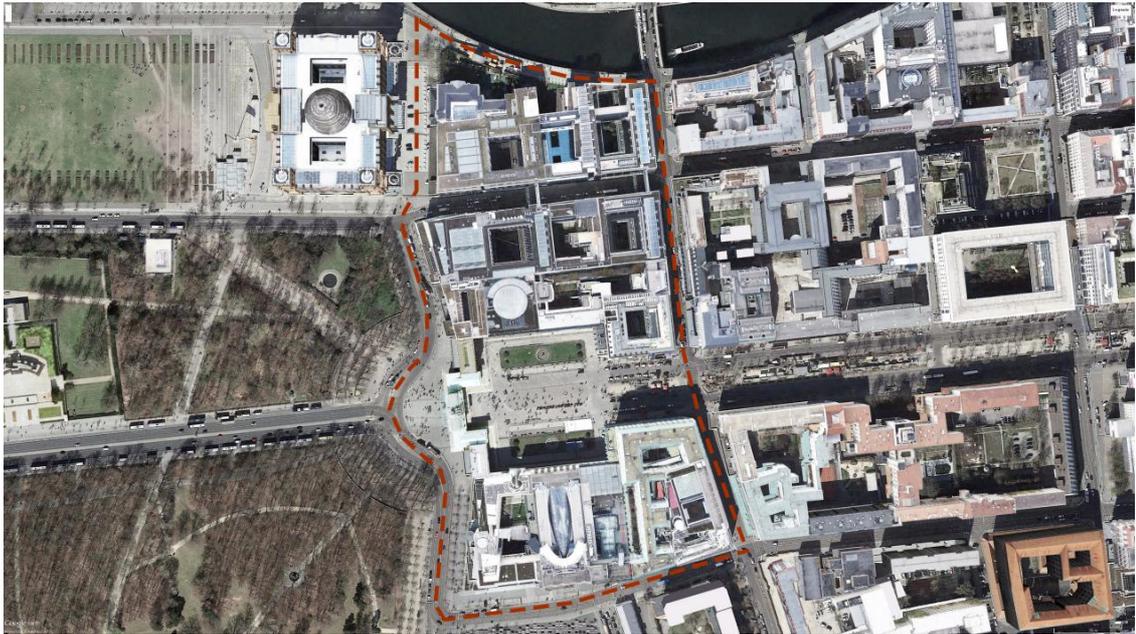
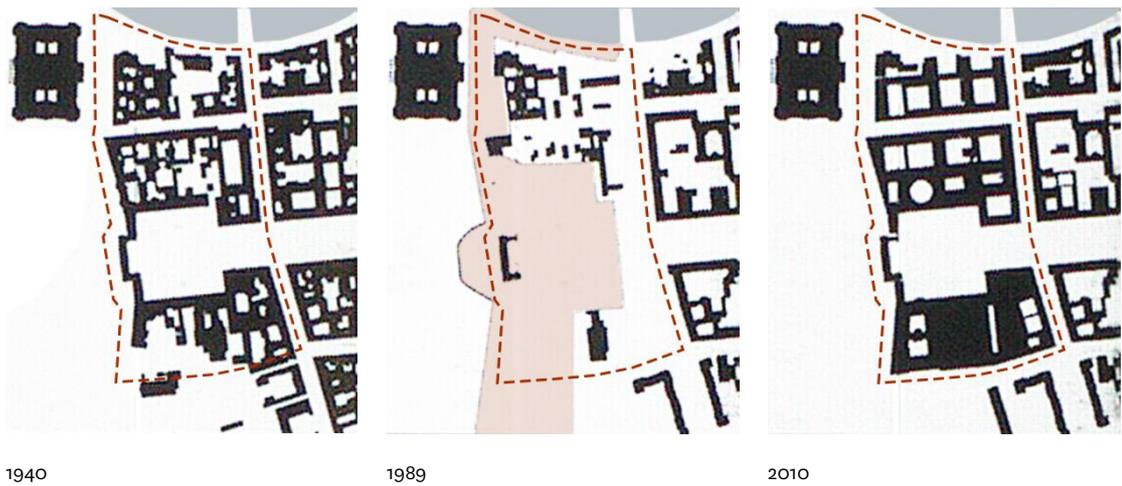


Fig. 6.8: Pariser Platz in 2017 [Source: Google Map]



1940

1989

2010

Fig. 6.9: Transformation of building footprint in Pariser Platz from 1940 to 2010 [Source: Modified by the author according to Stimmann, H. (2000)]

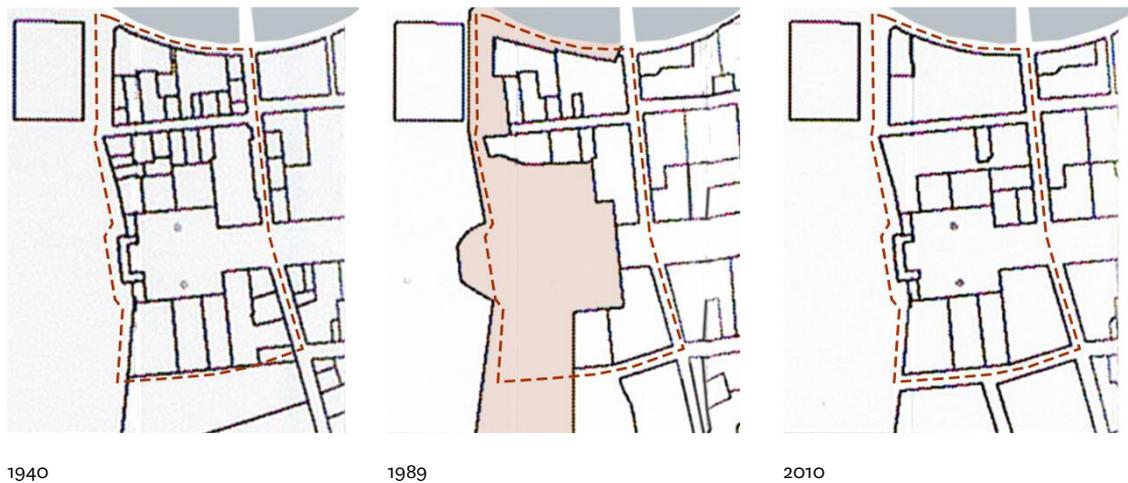


Fig. 6.10: Transformation of plot pattern in Pariser Platz from 1940 to 2010 [Source: Modified by the author according to Stimmann, H. (2000)]

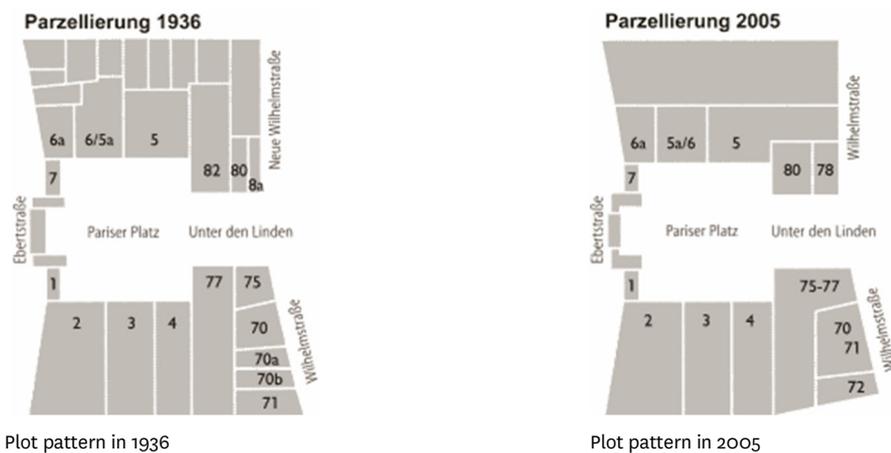


Fig. 6.11: Plot redivision preserves the historic morphological characteristics of the square [Source: <http://www.stadtentwicklung.berlin.de>]

(3) Morphological restoration

Street pattern

In order to improve the spatial quality for civic activities, Pariser Platz was designated as a pedestrian area. Correspondingly, two bypasses, Dorotheen street in the north and Behren street in the south were set as the substitution of east-west traffic connection⁷. In the east, Wilhelm street, intersecting with Unter den Linden, was planned to be an important commercial street, while the western Eber street, as the border between the large-scale green park (Tiergarten) and the urban center, would bare a quiet atmosphere. In order to preserve the historic urban structure, all reconstructed roads should not exceed historic street borders (Fig. 6.6).

⁷ The northern bypass, Dorotheen street mainly serves institutions of German Parliament on both sides of it. The extension of Behren street as a southern bypass of the Brandenburg Gate was newly created. The new road was necessary to expand the limited capacity of East-West traffic. Despite a trend of growing traffic capacity, it should avoid becoming a rear road.

Plot pattern

The plot redivision around the square strictly preserved the historic pattern, which was mainly manifested as the preservation of the original plot width and plot shape in the block corner (Fig. 6.10). But the plot depth were readjusted in adaption to the practical situations. Plot redivision in the periphery of the square tried to make a balance between the historic preservation and the contemporary redevelopment. For example, the group of undersized plots in the southeast outside the square were amalgamated into two larger plots. However, the amalgamation still made efforts to remain the plot subdivision, as smaller plots (plot 78 and 72, Fig. 6.11) were kept in the corner of the block.

The refurbishment of historical space does not mean totally giving up the mode of megaplot which has been an indispensable mode for contemporary land development. Actually, the desired small-scale land use was suppressed in the north as German Parliament (*Deutschen Bundestag*) expropriated 54000m² land on both sides of Dorotheen street. However, the parliamentary institutions were not allowed to extend southward to the square space so that the historical scale of the square could be preserved.

Apartment from the reorganization of plot pattern, the plot-based prescriptions were also established to control the building form. Above all, one most significant prescription is that all buildings around the square should be constructed along the historic building line without any intervals so that a closed square interface could be recovered. Comparatively, the river bank in the north and the Behren street in the south were reconstructed with more open structure.

Building form

The regulations on building form was the main content of the morphological framework, including prescriptions on building facades, building materials, corner buildings, as well as the zoning of building height limit. The aim was to continue historic characteristics of buildings around the square rather than a total reconstruction of the lost buildings.

In terms of the facade control, the proportion of window and door openings should be controlled no more than 50% of total facades area, in order to maintain the historically closed spatial characteristics. The vertical structure of buildings on the Pariser Platz is divided into three zones. The façades material of new buildings on the Pariser Platz and on Unter den Linden should use stone with a dull surface or plaster. The coloring is determined by the spectrum between ocher, yellow and gray.

The main starting point in classifying the zones of building height is to highlight the spatial importance of Brandenburger Gate as the urban entrance (Fig. 6.7). The buildings are arranged in three zones with maximum heights of 16.70 m (Gate houses with flat roofs), 20 m (buildings around Pariser Platz) and 22m (Eaves heights of building in the back), which ensures that the Brandenburger Gate, with a perspective from Tiergarten, can still dominate all other buildings.

The success of practical construction shows that under strict morphological stipulations there is still great potential to present the diversity of individual architectural design. A typical example is the DZ Bank built on Plot 3 (Fig. 6.12). It is designed by deconstructionist architect Frank Gehry, whose work is recognizable through the use of asymmetry, exaggerated proportions and unconventional materials. In this case, the architect molded a modest street frontage in accordance with the requirements of conservative morphological

framework, but realized his exaggerated design style inside the building. To some extent, it is the strict morphological regulations on individual plot that motivated the creativity of architectural design.

The successful refurbishment of Pariser Platz indicates the significance of the plot in reconstructing historic urban form. The essence of the refurbishment is not about the reconstruction of lost buildings, but the preservation of the fundamental morphological identity, the square space defined by plots. Several rules for the plot redivision of historic district can be summarized:

- (1). The historic plot pattern on important boundaries must be preserved. Above all, the plot arrangement, plot width and the corner plot are primary control elements.
- (2). On subordinate boundaries, a rational amalgamation of undersized plots could benefit contemporary land development. But plots on key positions, like the block corner, should remain the historic characteristics.
- (3). The historic district does not reject the megaplot completely. But efforts must be made to minimize the impact of the megaplot to the historic context. For example, the megaplot can be set on the subordinate boundary or embedded inside the block.
- (4). The plot-based control on the building form is another essential point to the reconstruction. Apart from individual building forms, the relationship between the building and the plot, typically manifested as the building line, building interval and building setback in the zoning plan system, should be paid special attention.

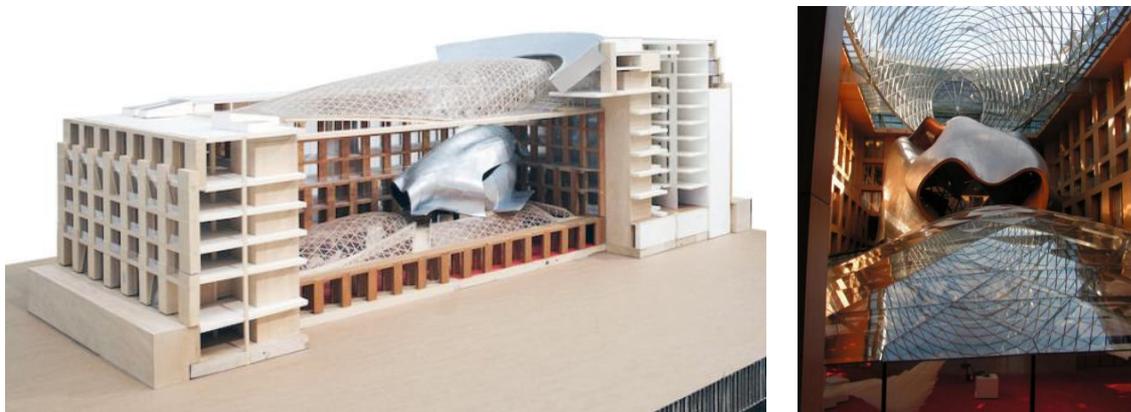


Fig. 6.12: DZ Bank on Pariser Platz, Frank Gehry [Source: http://stadtentwicklung.berlin.de/planen/staedtebau-projekte/pariser_platz]

6.2.2 Residential redevelopment: Friedrichswerder

(1). History and evolution

Friedrichswerder is located in the central area of Berlin inner city, between Unter den Linden and Spittelmarkt. It was originally built in 1658 as an extension urban area of the middle age city. In the 18th and 19th century, it gradually developed into an elegant residential and commercial area. During that period several important buildings and institutions were constructed there, including Friedrichswerdersche Church (1824-

1831), Bauakademie (1832), the first department store of Berlin (1849) and Reichsbank (1855)⁸. Before the war, this area was dominated by a series of small blocks. Apart from few large plots like Reichsbank and the Ministry of foreign affairs, most of the plots were in small scale, generating a very dense urban fabric. Tenements, also known as Berlin Mietkasernen were normally designed around a series of courtyards inside the blocks⁹, indicating an intensive urban land development. In the Second World War this area was heavily damaged and then completely torn down by GDR in the later reconstruction. The west section was abandoned and turned into idle land, while the majority of plots in the east section were amalgamated into several megaplots. Until 1989 the original urban pattern had been totally destroyed. The discussion about the reconstruction of Friedrichswerder began soon after the reunification, but the final redevelopment scheme was not made until 2000 (Fig. 6.16, Fig .6.17).

(2). Main principles of the reconstruction

The reconstruction of Friedrichswerder was made in the period when the fever of real estate speculation was gone and the orientation of the inner city altered from pure commercial and business redevelopment to recovering an attractive and livable city¹⁰. Above all, an attractive city center needs the mix of living, working and recreational functions, which could also remedy the outflow of population, especially the young generation from the inner city in the early 1990s. Under this background, the local government made efforts to create affordable housing for a wide range of citizens, in order to realize the re-urbanism of the inner city.

The reconstruction proposed the strategy to re-introduce small-scale land development and its corresponding building type of townhouse, in order to attract private developers of self use (Fig. 6.13). It meant that the state owned land would be redivided into small plots for private development. The fundamental transformation of land development indicated not only a break with the state-led large-scale residential development in the inner city, but also the political intention to re-activate the urban center where the land had been nationalized under GDR.

(3). Morphological restoration

Street pattern

At the street level, the disappeared street network was recovered as the foundation for the following redevelopment. Jäger street and Alter Leipziger street as main east-west traffic connections divide the long and narrow site into three sections. Together with the street reconstruction, two parks with different shapes were established to improve the residential environment and realize a proper residential density. Both parks were enclosed by urban blocks, well integrated with the historic urban ground plan. The northern triangular one is surrounded by three new residential blocks, while the southern one, taking up two original blocks, creates an active relationship between the new residential district and other existing buildings through a shared public space.

⁸ Cf. Stimmann, H. (2009).

⁹ Cf. Rossi, A. (1982).

¹⁰ Cf. Bodenschatz, H. (2010).

Plot pattern

The reconstruction consists of three five-storied perimeter blocks. The northern block was subdivided into ten plots in favor of individual housing units. Above all, the residential function should take up 60% of the whole building area. The other two southern blocks, located on the former site of the Reichsbank, are the core part of Berlin Townhouse. The blocks were redivided into a series of small plots for private development. Apartment special corner plots, most plots in the middle have similar sizes of plot frontage, averagely 6.50m wide (4.50m to 9.75m), while the plot depth differs prominently in order to adapt to the block shape. In this way, the area of individual plot arranges from 125m² and 280m² (Fig. 6.15).

Building form

The redevelopment preserved only one building in Niederwall street 39th which was renovated and used as Moroccan Embassy. Besides, all new houses are under control of a detailed plot-based morphological regulations. For example, the house type differs according to its location, specifically whether the plot is faced with a street or a park. The house, to be built on the plot facing a park, is required to set the front garden which should be deep enough to accommodate a parking space. The house, to be built on the plot directly facing a street, is required to provide its ground floor for commercial use. In addition, the house to be built on the plot facing a narrow street, is required to reduce the roof height of its fourth floor and set it back for two meters to accommodate a roof balcony.

The Townhouse, a type of compact, multistoried and terraced houses, is actually different from the original housing type in Berlin inner city, the Mietkasernen. However, this type, prevailing in northwest European cities like Cologne, Paris, London, Amsterdam and Brussels, is an important building type in constituting traditional European urban form. Built on the thin and deep plot by individual property owners, it generates compact and diversified urban space, which is just in accordance with the development goal of Berlin inner city (Fig. 6.14).



Fig. 6.13: Planning of Friedrichswerder
Source: Adopted from Bodenschatz, H. (2010)



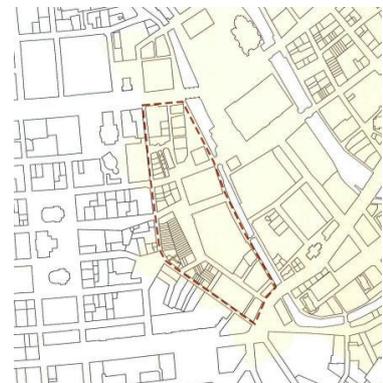
Fig.6.14: Recovery of plot subdivision in Friedrichswerder [Source: Adopted from Bodenschatz, H. (2010)]



1940



1989



2010

Fig. 6.15: Evolution of plot pattern in Friedrichswerder [Source: Modified by the author according to Stimmann, H. (2009)]

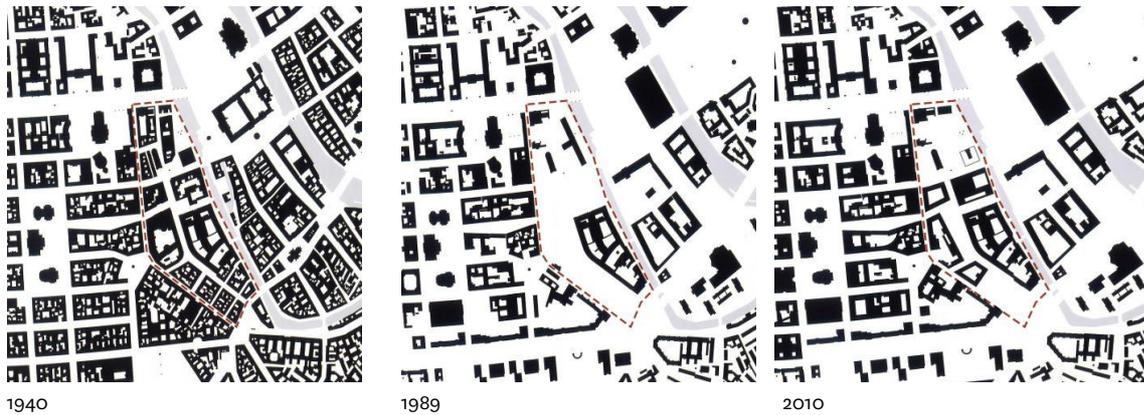


Fig. 6.16: Evolution of Building Footprint in Friedrichswerder [Source: Modified by the author according to Stimmann, H. (2009)]



Fig. 6.17: Photos of Friedrichswerder in 1937, 2000 and 2010 [Source: Picture 1 and 2, <http://www.stadtentwicklung.berlin.de/planen/staedtebau-projekte/friedrichswerder/>] Picture 3, Stimmann, H. (2009)]

The successful reconstruction of Friedrichswerder indicated a double reversion both in morphological and land property terms. Realizing the significance of plot subdivision in the restoration of historic urban pattern and small-scale land development in attracting private developers of self use, the project promoted the redivision of the once state owned land into small pieces of plots. Thus the megaplot was recovered to plot subdivision, while the state owned urban land was reprivatized. The reconstruction indicated not only the big potential of private residential development in creating attractive urban space, but also the flexibility in implementing the Planwerk Innenstadt Berlin. Key rules for the success of the residential redevelopment in the inner city are summarized:

- (1). New street network fully considering the historic street pattern lays the foundation of the redevelopment.
- (2). On the premise of a well integration with the historic urban pattern, new open space is encouraged to improve the environmental quality of the old city.
- (3). That the residential redevelopment re-introduced the small-scale and subdivided plot pattern is essential for the restoration of historic town plan, in which the plot frontage is a key morphological element.

(4). In order to realize the small-scale land development, a detailed plot based morphological regulation is necessary. Above all, building type should be strictly regulated in order to generate a unified urban fabric. The specific and proper building types in adaption to the small-scale plot pattern should be determined through cautious researches and discussions.

6.2.3 Large-scale commercial redevelopment: Potsdamer Platz

(1). History and evolution

Potsdamerplatz was once the traffic hub and commercial center of Berlin before the Second World War. It was framed by the department stores and business of the new middle class. In the last days of the war, it was pulverised as the Russian army moved street-by-street to take Hitler in the Chancellery. Due to its critical location on the border of East Berlin and West Berlin, this area was turned into a military dense area after 1961, with the demolition of the majority of buildings.

Since the German reunification and the removal of Berlin Wall, Potsdamer Platz swiftly became the most concerned urban area in terms of both its value in land speculation and the significance in re-connecting the City West and City East. Since 1991, a two stage competition was launched by the municipal authority, aiming at solutions to the fissure and disorder of urban space. The first stage would select a master plan and the second stage would require its development into architectural form. In the first stage, the prize winner was the Munich architects Hilmer& Sattler with a project which “did not fall in line with the urban model for an agglomeration of high-rises, such as is generally found throughout the world, but sought to present a compact, spatially complex, European urban model.”¹¹ In the second stage, the master plan of Hilmer& Sattler was further extended and refined to integrate with schemes and plannings made by individual investors in 1992 and 1993.

After intensive plannings and designs, the construction began since 1994 and completed in 2004. Currently Potsdamer Platz is seen as a big success of urban redevelopment and has become an attractive urban quarter for both local people and tourists (Fig. 6.18, Fig. 6.19).

(2). Plan of Hilmer & Sattler and the new street pattern

The plan of Hilmer& Sattler fully reflects an intention of returning to the European urbanism, which favors the compact urban space and complex urban function. Urban life should not arise in the interior of large-structured building complexes, but on streets and squares, that is, in urban space. It was also faced with the practical difficulties to connect the opposing realities in the east and west through establishing a new spatial order on the roughly 50-hectare reconstruction site.

Under these backgrounds, the plan created a block grid of 50*50 meters as a contemporary interpretation of the Berlin block (Fig. 6.20). This dimension was considered as the appropriate size of building unit in accommodating various uses, including apartments, offices, department stores, company headquarters, theaters and hotels etc. Short and narrow streets between blocks were to lead into wider city spaces¹².

¹¹ Cf. Stimmann, H. (1994).

¹² Cf. Stimmann, H. (1995).

The grid pattern was well integrated with the overall street pattern formed in the eighteenth century. Within the planning site, existing historical streets were to be reinstated wherever possible. In the south part, the tracks that had formerly carried the trains to Potsdamer Station would be reconstructed into a grand promenade.

This plan not only raised the Berlin eaves height from 22 meters to 35 meters, but also decisively changed the urban atmosphere with a vertical street profile. Particularly, the spatial profile of public streets had a proportion of 2:1, with building heights of 35 meters and a street width of 17.5 meters. However, the homogenizing street pattern inherently constrains the land speculation, as no building can rise above any other except in the public interest. The Hilmer and Sattler plan was made consciously modest so that it fundamentally eradicated those radical and Utopian desires which had been prevailed but finally had shattered in Berlin's urban planning history through the 20th century¹³.

(3). Megaplot based redevelopment

Compared with the cases of Pariser Platz and Friedrichswerder, Potsdamer Platz is characterized by the megaplot based redevelopment. By the end of 1991, the land was redivided into three megaplots and were sold to different corporations. The north-west sector with the area of 3ha went to Sony, the south-east sector with the area of 0.7ha to the Asea Brown Boveri Corporation, and the south-west sector with the largest area of 6.7ha to the Debis Development Corporation, a wholly owned subsidiary of Daimler Benz (Fig. 6.21).

Each plot made its detailed plan individually. As the construction of Sony Center had begun before the master plan was approved, it did not follow the idea of grid pattern. Instead, buildings were arranged around an central oval public space with a tent-like roof above. Despite a totally different plan, buildings were set along the unified building line with moderate intervals so that the triangular plot boundary could be identified.

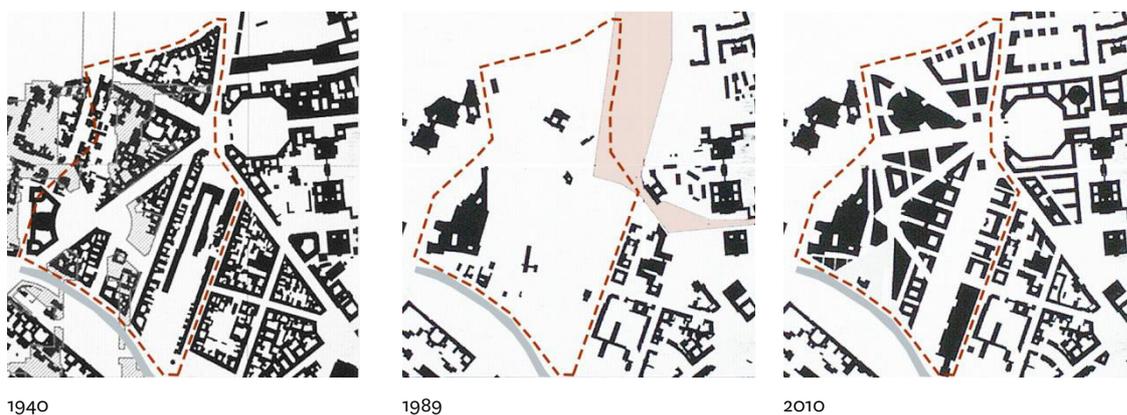


Fig. 6.18: Transformation of building footprints in Potsdamer Platz from 1940 to 2010 [Source: Modified by the author according to Stimmann, H. (2000)]

¹³ Cf. Balfour, A. (1995).

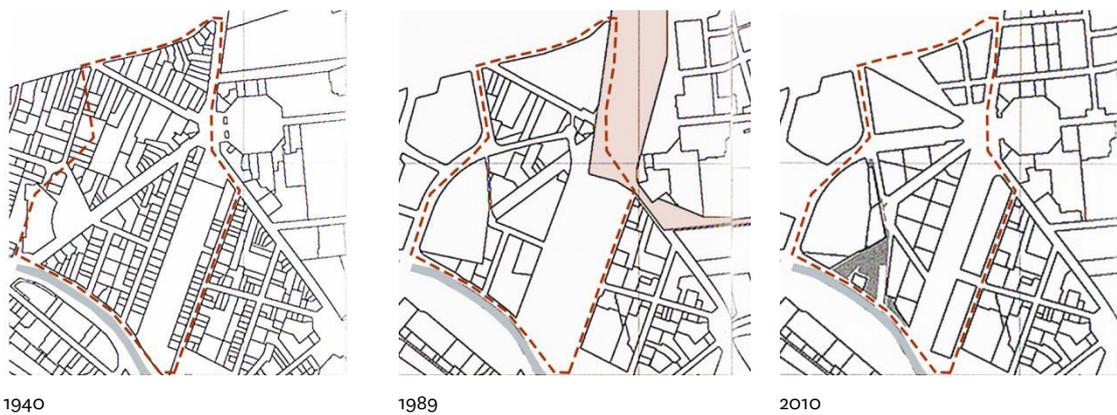


Fig. 6.19: Transformation of plot pattern in Potsdamer Platz from 1940 to 2010 [Source: Modified by the author according to Stimmann, H.(2000)]

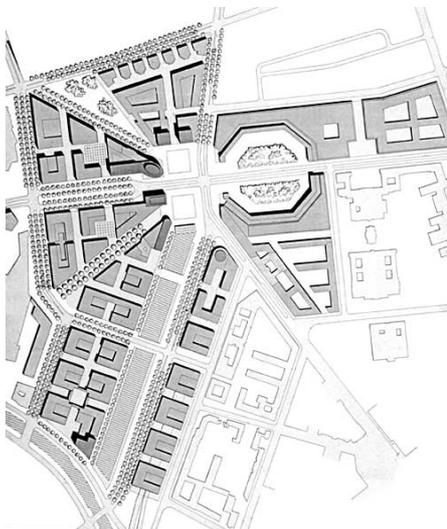


Fig. 6.20: Masterplan of Hilmer & Sattler, 1991
[Source: Archiv: Leipziger und Potsdamer Platz,
<http://www.stadtentwicklung.berlin.de/>]

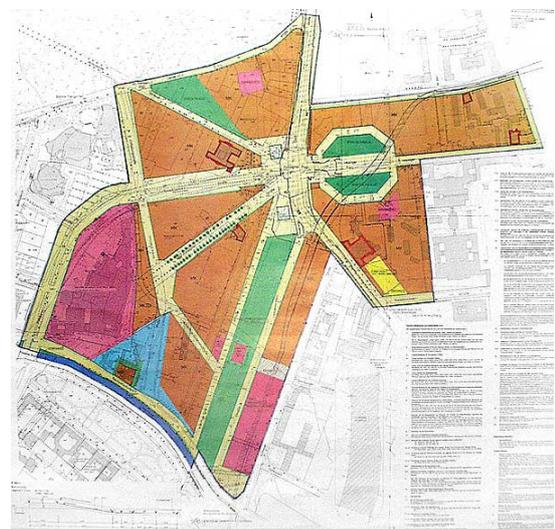


Fig. 6.21: Coordination Zoning plan, 1994
(*Kordinierungs-Bebauungsplan*)
[Source: Archiv: Leipziger und Potsdamer Platz,
<http://www.stadtentwicklung.berlin.de/>]

In comparison, Giorgio Grassi's and Renzo Piano's projects represented more continuation of Hilmer & Sattler's plan in form and function. Renzo Piano made the plan of the south-west sector which was to be developed by Debis Development Corporation (Fig. 6.22). The tremendous 6.7ha site area required a subordinated division of the construction land and the non-construction land at first. The former was the land for development, while the latter was the land for public use, including the traffic space (pedestrian), green or public service. Although the block grid of Hilmer&Sattler's Plan was continued, the major street pattern was changed into a radial pattern, with a central square set within the district. Three towers were set on both ends of the district, adding emphasis to northern Potsdamer Platz and southern Landwehrkanal. As they are located on the plot corner, the strict building line identifying the plot boundary was emphasized to preserve the street wall.

For the long, narrow plot on the east side of the site Grassi developed a plan consisting of an additive sequence of H-shaped building volumes (Fig. 6.23). Connecting the theme of the master plan, the plot is subdivided into five blocks. On the north end is a 12-storey high-rise building with a curve frontage facing

Potsdamer Platz, which echoes the historic form of the block corner. Immediately to the south of this tower are attached by three 8-storey, H-shaped blocks with open courtyards facing outwards. The southern end of the complex is defined by a U-shaped building, which contains 225 apartments in meeting the minimum residential proportion of 20%.

Despite a megaplot based redevelopment, Potsdamer Platz successfully created a new urban pattern which can be well integrated with the historic context. It reveals the potential of the megaplot in generating diversified urban form. In terms of the plot redivision and the morphological control, following lessons can be learned from this case:

- (1). The small-block structure is given the priority in re-creating the internal street pattern of the megaplot.
- (2). It is necessary to have a subordinate subdivision of the megaplot, in order to separate the construction land for private development and the non-construction land for public use.
- (3). Continuous street frontage should be particularly preserved in the development of megaplot. Especially, it should become the major principle in dealing with the insertion of high-rise buildings into historic urban pattern (Fig. 6.24, Fig. 6.25).



Fig. 6.22: Zoning plan (*Bebauungsplan*) of southwest part

[Source: *Bebauungspläne im Verfahren*, <http://www.stadtentwicklung.berlin.de/>]

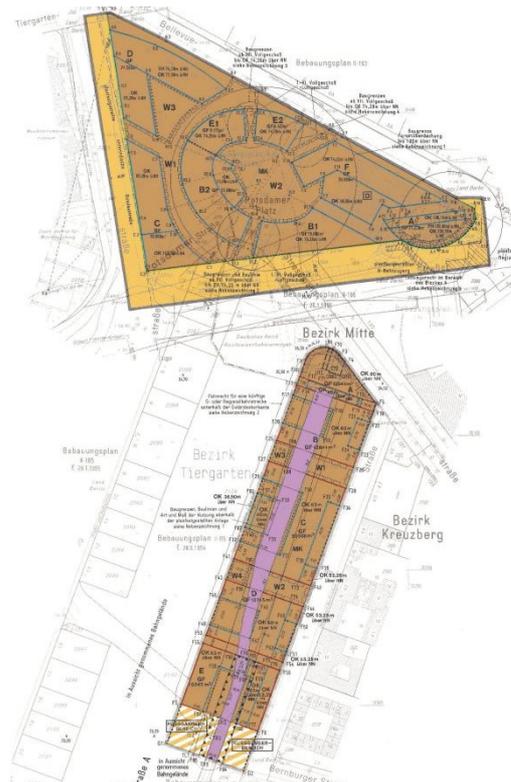


Fig. 6.23: Zoning plan (*Bebauungsplan*) of northwest part (above) and southeast part (below)

[Source: *Bebauungspläne im Verfahren*, <http://www.stadtentwicklung.berlin.de/>]

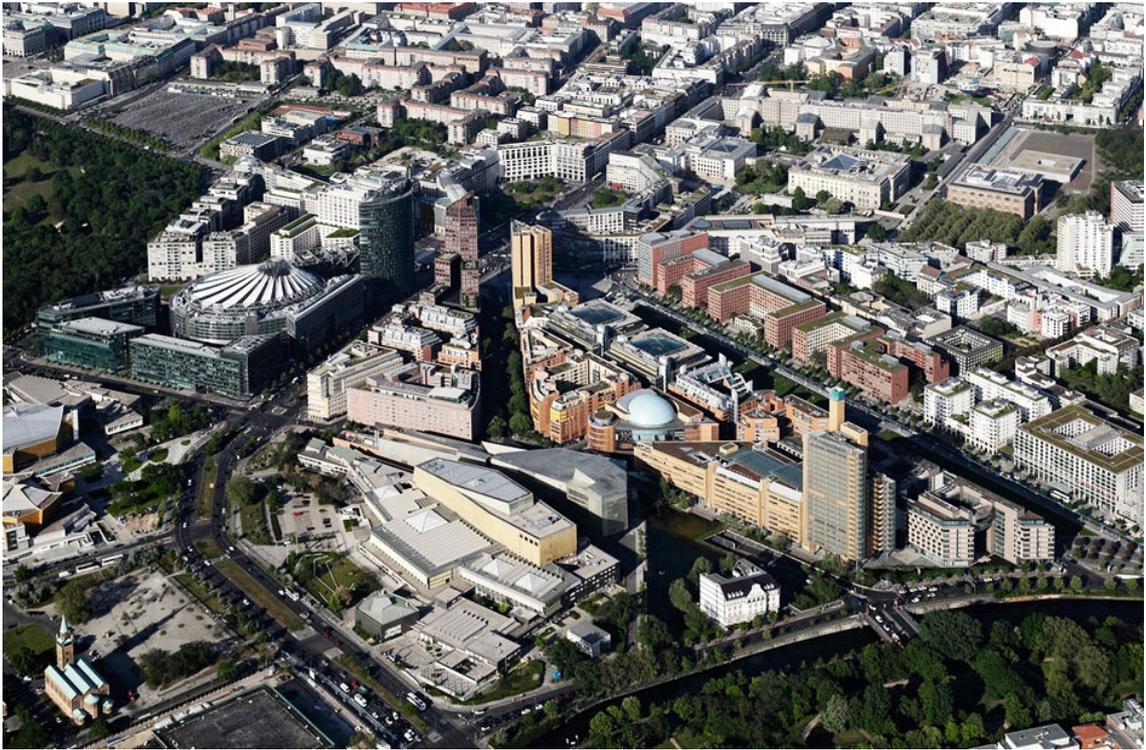


Fig. 6.24: Bird view of Potsdamer Platz [Source: Google Earth]



Fig. 6.25: Bird view of Potsdamer Platz (southwest part) [Source: Google Earth]

6.3 Institutional guarantee for the plot redivision

6.3.1 Reconstruction based on nationalized land

Although the Planwerk Innenstadt aimed to promote the state or collective owned land for private development, it must be noticed that the reconstruction was based on the precondition that nationalized land took up the largest proportion in the inner city.

According to the research of Goebel, the trend of deprivatization in Berlin historic center (*Alt-Berlin*) from 1840 to 1990 is prominent¹⁴. In 1846 of the total 1100 plots in Berlin historic center only 45 were state owned, while by 1990 only 4 plots, including Marienkirche, Häuser Rosenstrasse no. 16-19 were not in the hand of the state. In the period of Weimar Republic (1918-1933), 45 plots were nationalized; 192 in the period of the Third Reich (1933-1945); 48 in the period of allied occupation (1945-1949); and 162 in the period of GDR (1949-1990) (Fig. 6.26). Above all, the 162 plots took up only 33% of all the nationalized plots, indicating that two thirds of the land in Berlin historic center had been already nationalized before 1949 when the communist regime launched the land nationalization through the Construction Law (*Aufbaugesetz*) (Fig. 6.27). In this sense, the series of reconstruction plans proposed since 1840s and the land deprivatization they led to have played a more essential role for the transformation of Berlin historic center than the commonly recognized Construction Law and the damage by wars.

After the reunification, German federal government declared the “Re-transfer” (*Rückübertragung*) of the nationalized land back to original owners, which raised the hope of reprivatization in Berlin inner city. However, only a small proportion of nationalized land could be finally re-transferred, most of which were the land expropriated in the period of 1933-1945 and 1977-1990. According to the Joint Declaration of 15 June 1990 on the Settlement of Open Property Issues¹⁵, the land expropriated in the period of Soviet Union occupation (1945-1949) and the subsequent GDR (1949-1977) was thought “legal” and could not be re-transferred or compensated. With the same opinions, the Property Act (*Vermögensgesetz*) in 1991 and the Compensation Act in 1994 (*Entschädigungs- und Ausgleichsleistungsgesetz*) further guaranteed the continuation of deprivatization after 1990. In Berlin historic center, only one thirds of the original owners finally got the compensation because only those with their land expropriated by Nazi government had the right to appeal under the framework of the Compensation Act. All in all, a great proportion of land in Berlin inner city remained state owned after the unification, which actually provided land sources for the overall reconstruction in the following years.

¹⁴ Cf. Goebel, B. (2002).

¹⁵ Gemeinsame Erklärung der Regierung der BRD und DDR zur Regelung offener Vermögensfragen, 19.

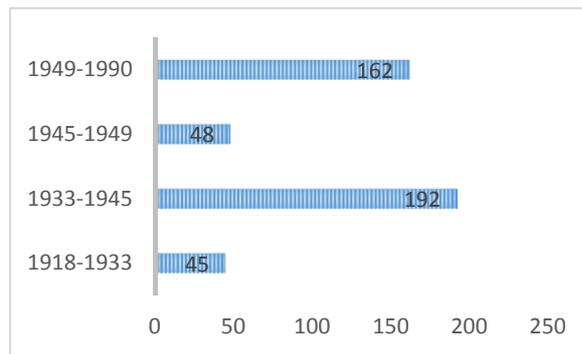


Fig. 6.26: Deprivatization in Berlin historic center (*Alt-Berlin*) from 1918 to 1990 [Source: Produced according to the statistics in Goebel, B. (2002)]

6.3.2 Land Reallocation as the institutional guarantee for the plot redivision

As the Re-transfer policy was obstructed, the redevelopment of a majority of land in Berlin inner city had to depend on the government. Thus it must establish a special regulation to promote the reallocation of nationalized land. In Germany, land management, including land expropriation, land compensation, land reallocation as well as the land use is thought as a significant component of urban development. The Federal Building Code (*Baugesetzbuch, BauGB*) as the main legal basis for urban development, aims to establish the legal status of land and determine its potential uses, thereby regulating the site-specific requirements applying to a building project¹⁶. Its regulations have great influences on the form, structure and development of urban space and habitability of cities and villages. Above all, the Code set out provisions, known as the Land Reallocation (*Umlegung*), for the redevelopment of plots based on location, shape and size, which becomes an institutional guarantee for the ordered land redevelopment.

The Federal Building Code defines Land Reallocation (*Umlegung*) as follows: in order to reorganize or redevelop areas, it shall be permissible for both developed and undeveloped land to be reorganized through reallocation in such a manner as to create plots that are suitable in terms of location, shape and size for built development or for other uses¹⁷. The municipality is responsible to order and implement reallocation with independent decision-making powers. It establishes a specific institution, the reallocation committee which is authorized to guide and control the procedure of land reallocation. As the reallocation is generally applied in areas where many plots of different owners are involved, individual owners and other interested parties must be involved in this procedure. The stipulations of reallocation, especially the redistribution standard, the relocation and compensation policy, must be discussed and agreed by them.

The reallocation starts from a resolution made by the reallocation committee with a required hearing of land owners (Fig. 6.28). The resolution designates the reallocation area, and all properties located within it

¹⁶ Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety. German Federal Urban Development Law-the Federal Building Code. (2014). <http://www.bmub.bund.de/en/topics/city-housing/urban-development-law/federal-building-code/artikel/german-federal-urban-development-law-the-federal-building-code/2014.11>.

¹⁷ Federal Building Code (*Baugesetzbuch-BauGB*), 2004.

should be itemized. Cadastral map and inventory of plots depicting the existing land property in the reallocation area should be made. Both the map and the inventory are required to be placed on public display for a period of one month. In addition, the property alterations should be informed to the Land Registry.

One important ground work is the assessment of the land value. In Berlin's case, the assessment was made by a specific committee composed of representatives from the federal government, state government and the major developer DSK. The assessment should determine a reference land value and proper plot size for sale. It not only serves as a major reference in making compensation, but also clarifies the profit space brought about by the land development.

To create a new plot pattern, the existing property relationship should be at first clarified and simplified. Thus, all existing plots within reallocation area are merged into an entire plot, known as Reallocation Mass (*Umlegungsmasse*). Then the land, stipulated in the zoning plan for public use e.g. the infrastructure land and the green space, should be excluded in advance from the Reallocation Mass. The remaining mass becomes the Redistribution Mass (*Verteilungsmasse*) and is reallocated between the involved land owners based on specific criteria, either in land value or in land area. The reallocation takes place in such way that each land owner acquire its own proportion of land value or land area from the Reallocation Mass.



Fig. 6.27: Deprivatization of Berlin historic center(*Alt-Berlin*) from 1846-1989 [Source: Adopted from Goebel, B.(2002)]

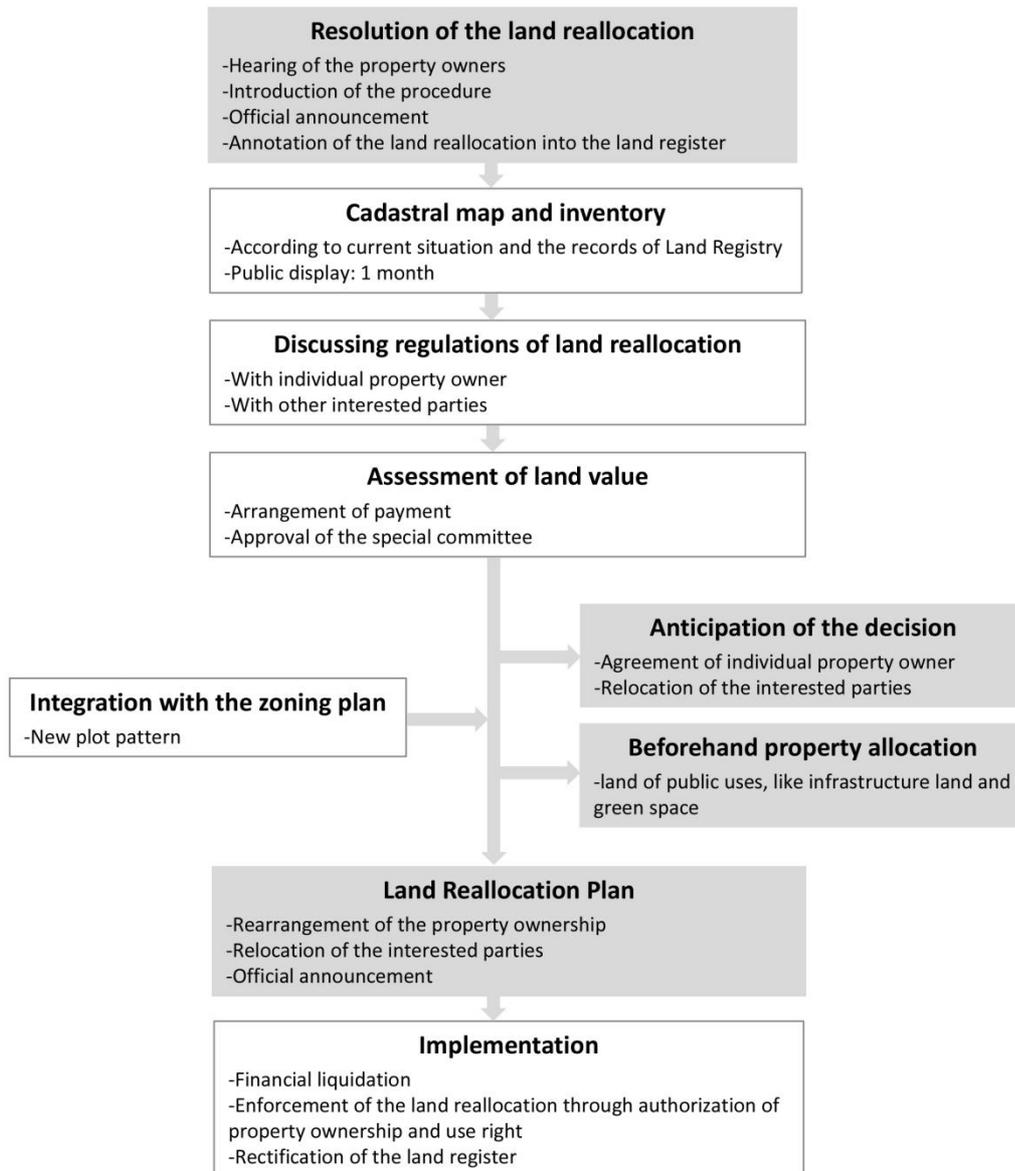


Fig. 6.28: The main procedure of the Land Reallocation

The key link of land reallocation is the making of Land Reallocation Plan. It comprises the reallocation map and the reallocation inventory, indicating the new plot pattern and form, and rearrangement of land property. Above all, the new plot pattern and form should be in accordance with the zoning plan. Before the reallocation plan come into force, it is necessary to issue the public notice and make corresponding rectifications in the Land Register. In some cases, land reallocation cannot be in accordance with the share of each property owner. On this condition, the yielding advantages or disadvantages can be balanced through pecuniary compensation.

6.3.3 case: Land reallocation in Friedrichswerder

The reconstruction of Friedrichswerder, known as “Berlin Townhouses”, was a typical case that the mechanism of land reallocation (*Umlegung*) promoted the return of subdivided plot pattern and lost street pattern. Before the World War II, this district was a traditional residential area, composed of a large number of plots with various sizes. As most buildings were damaged in the war, this district was demolished and turned into parking space and green space in the period of GDR. By the time of German reunification, there were only two existing property owners: the federal government owned the 9100m² parking space, while the state government owned the green space.

The redevelopment aimed to promote the re-privatization of the nationalized land through reconstructing a subdivided plot pattern in favor of private development. This goal largely depended on the mechanism of Land Reallocation. There were two pillars in this procedure, the property assessment and the property reallocation. The former provided the reference value of plots of Friedrichswerder in the land market; while the latter provided an approach for the alteration of land property.

Firstly, the existing land property in this district was examined. As none plots needed to be re-transferred to original owners, the whole district went directly into the process of Land Reallocation. The property of the parking plot was then transferred to the state government so that the property of all plots could be kept in one hand. After this essential step, the former plots could be merged into a Reallocation Mass (*Umlegungsmasse*). Based on the zoning plan (*Bebauungsplan*), a new plot pattern characterized by plot subdivision could be finally realized (Fig. 6.29).

This process was carried out in close co-operation between the municipal government, the major developer as well as other institutions including the Real Property Fund and the surveying center. Consequently, the underlying chaos of land registration in Friedrichswerder was successfully averted.



Fig. 6.29: Land Reallocation in Friedrichswerder [Source: DSK / Zech + Ruth ÖBVI, 2005]

6.4 Conclusion: Implications to Nanjing

The reconstruction of Berlin inner city since the German reunification has provided a paradigm that the reconstruction of a new urban center and the refurbishment of damaged historic urban pattern could be well integrated. Despite the institutional and developmental differences, Nanjing can draw key lessons from Berlin in three aspects: the development orientation and main principle, the strategy of urban refurbishment and the innovation of the land property system (Tab. 6.1).

(1). Development orientation and main principle

The reconstruction of Berlin inner city was made under the guidance of Critical Reconstruction which aimed at a return to the traditional European urbanism. Above all, the refurbishment of the historic urban ground plan was the major strategy. Instead of reconstructing lost buildings or recovering a nostalgic urban plan, the refurbishment molded a history-based but contemporary urban structure, which functions as a framework for the experimentation of contemporary architecture.

The Planwerk Innenstadt Berlin (*PIB 1999*) provided practical orientations and strategies for the development of Berlin inner city from 1999 to 2010. It emphasized the integration of fragmented urban areas into a whole, thus the main areas of intervention are not great central locations, but the linking points that are essential to the integration. Faced with the challenge of attracting population back to inner city, Berlin inner city was oriented not only as a political and commercial center, but also as a living place, implying that the housing densification and mixed land use were necessary.

In comparison, Nanjing South Historic Urban Area was for a long time not considered as a whole. Most redevelopments were made in a fragmented way, isolated from historic urban pattern. In addition, as the conservation of historic districts emphasized the recovery of traditional streetscape and building form, antique building became the major building form. The strict design guidance in a way constrained the possibility of contemporary architecture. In terms of the development orientation, commercial redevelopment was given a priority, while the continuation of residential function was restrained, showing an inclination of land speculation. The redevelopment greatly pushed up the land price of the historic urban area and brought about the problem of gentrification.

(2). Plot based morphological refurbishment

Under the guidance of Critical Reconstruction, the plot is considered as the key factor in the refurbishment of historic urban ground plan. Rather than a hasty reconstruction of small-scale and subdivided plot pattern, the difference of development goals and historic background in individual districts were taken full consideration. Thus three typical strategies were established for the refurbishment of historic center, the residential redevelopment and the large-scale commercial redevelopment respectively.

In the reconstruction of Berlin's historic center Pariser Platz, the historic plot pattern around the square was deliberately preserved, while some undersized plots on subordinate boundaries were amalgamated rationally in favor of contemporary urban development. The residential redevelopment in Friedrichswerder re-introduced the small-scale and subdivided plot pattern as well as the corresponding building type of town-

house, aiming at attracting private developers of self use. In order to realize the small-scale land development, a detailed plot based morphological regulation is necessary. Despite a megaplot based commercial redevelopment, Potsdamer Platz successfully created a new urban pattern which can be well integrated with the historic context. The key lesson is that a small-block structure should be given the priority in order to create the internal street pattern of the megaplot.

In comparison, plot was not paid enough attention in the conservation of Nanjing old city. Although the Renewal Unit strategy was established after 2010 to promote the small-scale renewal, its application is basically limited in historic districts. A majority of reconstructions outside historic conservation areas are still based on the megaplot.

(3). Innovation of land property system

As an overwhelming majority of land had been nationalized by the German reunification, the realization of land re-privatization depended on the renaissance of plot subdivision. But more essentially, an institutional guarantee for the redistribution of the land property is indispensable. In Germany, the Federal Building Code establishes an effective legal mechanism, Land Reallocation (*Umlegung*) for the readjustment of land property and plot pattern in order to meet the demand of urban redevelopment. In the case of Berlin Townhouse, it is through the mechanism of Land Reallocation that the megaplots formed in the period of GDR were successfully transformed again into the small-scale and subdivided plot pattern in favor of the private investors. The key to the success of this mechanism is the close cooperation between plot redivision, land property management and the practical urban redevelopment, which makes the plot a positive factor in promoting the sound development of historic city.

In comparison, the relationship between the land property management and the urban development in Nanjing is looser. In a long time the preference of megaplot based land allocation in favor of speculation and the appeal of small-scale urban renewal in the historic urban area have constituted a sharp contradiction. The Renewal Unit strategy was proposed after 2010 when Nanjing south historic urban area started the overall conservation, revealing a preliminary acknowledgement on the significance of land property in preserving and restoring traditional urban form. However, the redevelopment, like the case in Mendong Changledu district, was still based on megaplot, because the plot subdivision scheme formed under Renewal Units strategy did not lead to the subdivision of land property.

Based on these reflections, next chapter will finally propose the strategy for the refurbishment of Nanjing south historic urban area.

Tab. 6.1: Comparison of urban refurbishment between Berlin and Nanjing [Source: Compiled by the author]

Comparative factors	Berlin inner city	Nanjing south historic urban area
Development orientation and main principle		
Main problems	<ul style="list-style-type: none"> ·Damage by modernist urban development; ·Fissures of urban pattern; ·Population outflow 	<ul style="list-style-type: none"> ·Pre-modern urban area with bad living conditions; ·Thorough renewal of urban structure; ·Overpopulation
Development orientation	<ul style="list-style-type: none"> ·Return to traditional European urbanism; ·Integration of fragmented urban areas into a whole; ·Diversified urban function including the intensification as a living place 	<ul style="list-style-type: none"> ·Constant changes of development orientation ·The current goal is to develop a cultural tourist attraction; ·Connecting existing traditional cityscape into a network with few consideration of renewed areas
Main principle	Critical Reconstruction	Overall conservation (only limited in historic conservation areas)
Major strategy	<ul style="list-style-type: none"> ·Refurbishment of historic urban ground plan; ·Housing densification and mixed land use 	<ul style="list-style-type: none"> ·Recover traditional streetscape and building form; ·Culture and tourism-based redevelopment;
Morphological refurbishment		
Urban ground plan	Molding a history-based but contemporary urban ground plan	<ul style="list-style-type: none"> ·Fragmentation of urban redevelopment; ·Separation of redevelopment area and conservation area.
Major element	Plot based	Building based
Strategy on plot pattern	Integration-based plot typology: historic center, residential redevelopment and large-scale commercial redevelopment	Self-centered and isolated plot strategy: "Renewal Unit" in historic districts; Megaplot in redevelopment area
Architecture	Contemporary architecture under historic framework	Antique building style
Institutional innovation		
Land property	Reprivatization of nationalized land	State land ownership; Land Use Rights system (<i>LURs</i>)
Mechanism of plot redivision	Land Reallocation(<i>Umgangung</i>)	Land banking system
Land development goal	<ul style="list-style-type: none"> ·Land reprivatization; ·Return to subdivided plot pattern 	<ul style="list-style-type: none"> ·Contradiction between land speculation and historic conservation; ·Lack of morphological vision for plot pattern.
Role of plot redivision	<ul style="list-style-type: none"> ·Important component of land development; ·Close integration with zoning plan 	<ul style="list-style-type: none"> ·Loose relationship with practical urban development; ·Rough integration with zoning plan
Morphological preference of the institution	<ul style="list-style-type: none"> ·Diversified modes of plot pattern; ·Favoring plot subdivision 	<ul style="list-style-type: none"> ·Megaplot; ·Excluding plot subdivision

7 Strategy: Refurbishment of the historic urban area and Form-based Code

7.1 Establishing new development mode and principles

7.1.1 Developing a culture-led and comprehensive historic urban area

For a long time the development goal of Old South was the modernization of urban landscape and the upgrading of urban function through a thorough reconstruction. But it proves that simply promoting industrialization (development orientation before the 1980s) or CBD construction (development orientation since the 1990s) could hardly realize the conservation and sustainable development of the historic urban area. Until 2010 the Conservation Plan of Old South area finally ended the course of large-scale urban renewal, and turned to the overall conservation, which was a critical shift in terms of the urban development concept. However, with the booming archaized reconstruction and commercialized historic districts in areas of Nanbuting, Mendong and along Qinhuai River, it needs to be alert that turning the historic urban area into a pure commercial area or a museum catering to tourists. In summary, the renaissance of the Old South requires the exploration of a new development mode which goes beyond the existing framework of the industry-oriented development mode.

Saying farewell to the industry-oriented development mode, the historic urban area should establish a development mode aiming at molding a sustainable neighborhood. In this sense, the Old South should develop into a culture-led comprehensive urban area, indicating that the development goal is not an industrial park, nor a museum catering to tourists, but a special mixed-function area which is based on the civil life.

A culture-led comprehensive urban area is characterized by the encouragement of intensive mixed use, which can be understood in three aspects of urban function, social structure and urban morphology (Fig. 7.1). From the functional perspective, the local government plans to develop the Old South into a National Cultural Industry Quarter¹, a special borderless cultural and creative space. This goal can actually integrate with the neighborhood-oriented development mode. The cultural industrial quarter accommodates multiple urban functions and industries, including tourism, commerce, recreation and culture experience, creative industry, media and business of art. On the one hand, it can promote the utilization of cultural resources and the renovation of existing building space, rather than a continuation of the large-scale renewals. For example, Menxi industrial area has the potential to be renovated into a cultural industry park. Some old microdistricts

¹ Qinhuai District Government. (2017). Suggestions on establishing National Cultural Industry Quarter and Promoting the Development of Cultural Industry of Qinhuai District.

can be renovated into mixed-function parks. In addition, the cultural industrial quarter could greatly promote the development of middle and small-sized enterprises.

From the perspective of social structure, the historic urban area encourages the mix of different social groups, which is reflected in two aspects: (1). the mix of original residents and new residents. The protection of original residents depends on the reduction of great demolition and reconstruction, which also indicates that the traditional plot pattern where they reside can be kept. In addition, the institutional design should provide the possibility for original residents to make independent renewals. (2). The mix of working people, residents and tourists. The renaissance of historic urban area depends on the industrial development which brings about a large number of working people and tourists. Compared with traditional tourism industry, cultural industry tends to bring about more diversified working people, including scientific workers and highly educated people. The neighborhood-oriented development mode indicates that although the outflow of population from the old city is still necessary, the historic urban area, especially historic districts should keep a basic proportion of residential population and residential land.

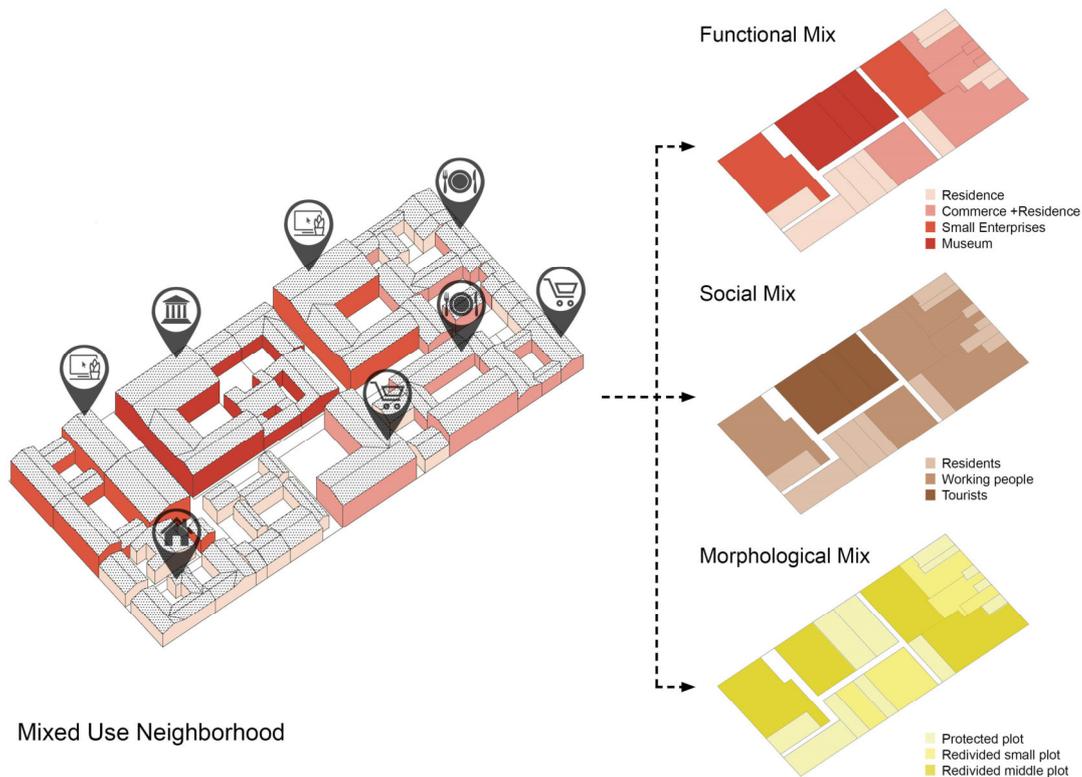


Fig. 7.1: Mixed use neighborhood

From the morphological perspective, a comprehensive urban area must develop an intensively mixed land use structure, which requires not only a finer resolution of mixed use on the urban ground plan, but also the mixed use in vertical direction. In this sense, the small-scale plot pattern provides a good condition for mixed land use.

It's worth noting that the small plot based pattern in the historic urban area provides good conditions for the development of small and medium sized enterprises. With the readjustment of economic structure, Chinese government launched the "mass entrepreneurship and innovation" plan in 2014, striving to develop

small and micro businesses. Many cities establish venture capital fund and a series of supporting policies, which have generated large demands for small-scale office space and business incubators². Currently many small companies rent residential building as the office space, which in fact can be seen as a mix of residence and business. In terms of the spacial scale, many business incubators range from 1000m² to 3000m², just in accord with the scale of medium and small plots in the historic urban area.

Dream Town is a typical case in regards to the combination of business incubator and historic districts. Located in the suburb of Hangzhou with an area of 3km², it is a small town of Internet Startups, which serves as an incubator for small and micro enterprises specializing in e-commerce, software design, information service, integrated circuit, big data and cloud computing. Proposing the development principle that “environment first, then life, and then production”³, Dream Town combines multiple functions of culture, tourism and neighborhood. Apart from the office space, it also equips the talent apartment, shopping centers, medical treatment, and educational facilities. Cooperating with the preferential policies, it aims to promote the entering of enterprises, scientific people and highly educated people. With these measures, Dream Town has the potential to develop into a lively neighborhood instead of a simple industrial park. In addition, as it is located in a historic district, industrial buildings, old street, paddy field, and historic buildings are protected. In this sense, it is the rise of “Mass entrepreneurship” plan and the characteristic town that creates a new way for the sustainable development of small plot based pattern.

This mode can be also applied in the Old South to promote the re-utilization of small plots. The small plot based pattern, with its high resolution of plot subdivision, can accommodate multiple functions including the small and micro enterprises, residence, commercial and cultural facilities, becoming the basis for the development of mixed-use historic urban area. The functional mix further brings about the mix of social groups, especially it attracts more young people and highly educated people. Thus the identity of the historic urban area can be molded through the functional and social mix on small plot based pattern, which is essential to the renaissance of the historic urban area.

7.1.2 Integrated refurbishment of the historic urban area

From the perspective of urban form, the biggest problem of Old South area is that the integrated historic urban structure was separated into fragments with different development goals and spatial characteristics. It has been proved that previous practices focusing on the protection of isolated cultural relics or historic districts failed to solve the development dilemma of the historic urban area. The Old South area is inevitably in need of an integrated refurbishment of the urban ground plan. In the development of Berlin inner city since the 1990s, the principle of Critical Reconstruction was proposed to sew up the fissures caused by great demolition and modernist reconstruction. As Nanjing has the similar spatial problem, Critical Reconstruction provides a good reference to the refurbishment of Nanjing south historic urban area.

The integrated refurbishment requires that Old South area should neither pursue the urban image of Americanized metropolis characterized by skyscrapers and thoroughfares, nor a rough recovery of a nostalgic cityscape through large-scale construction of antique buildings. Instead, the focus should be placed on the

² A business incubator is a company that helps new and start-up companies to develop by providing services such as management training or office space.

³ Yao, S. Hangzhou Dream Town: Entrepreneurship and innovation system makes the dream of Makers come true. (2017). http://www.thepaper.cn/newsDetail_forward_1721769/ Accessed 2017.06.30.

refurbishment of damaged historic urban pattern, and integration of urban fragments. Through a cautious design of urban ground plan, an integrated urban structure should be molded. Under this structure, contemporary architectural experimentation is also encouraged so that a balance between the old and the new could be achieved. The integrated refurbishment consists of five parts. According to the practical situations of the Old South, major principles are set up as follows:

Overall urban ground plan

- (1).The identity of the Old South as a whole could only be improved through the integration of urban fragments with different morphological characteristics. The integrated refurbishment considers all development stages of the Old South rather than a rough return to a specific historical period. Thus contemporary representation of the urban form and architecture is encouraged.
- (2).An overall design of the urban ground plan is necessary for the integrated refurbishment. Detailed planning and architectural design of individual districts should also be in accordance with the overall urban ground plan.

Land use zoning

- (3).The neighborhood-oriented development requires a higher resolution of mixed land use. Large-scale redevelopment of pure residential areas or transformation of historic districts into pure commercial areas should be avoided.
- (4).The vertical mixed use should be promoted. Above all, the vertical mix of housing and commerce should become a typical land use mode in the historic urban area.
- (5).Form based zoning should integrate with the conventional land use zoning so that the zoning can reflect morphological characteristics.

Street pattern

- (6).The dense street networks with small block pattern is encouraged in the historic urban area.The inappropriate through traffic should be replaced by efficient urban streets with developed public transportation.
- (7). The continuous street frontage should be molded through the cautious definition of the road hierarchy,road scales, and frontage lines.
- (8). Urban redevelopment should generate more open space in order to raise the habitability of the old city. The existing open space and green space should be connected by pedestrians.

Plot pattern

- (9). Establishing specific standard of plot redivision in the historic urban area. Plot subdivision as the essential morphological feature should be respected and restored.
- (10). Redefining the plot size appropriate for the land development in the historic urban area. Megaplot mode should be avoided as much as possible. The maximum admissible plot size is the block.
- (11). A specific plot redivision mechanism should be developed in the regulatory planning to promote the plot subdivision.

Building form

- (12). Building Window should be introduced into the regulatory planning system to improve the control of building.
 - (13). The control of building siting should be based on the relationship with the plot frontage.
 - (14). The control of building height should be based on the plot instead of the block.
 - (15). Faced with disordered building types, it is necessary to define building types appropriate to historic urban area. Above all, the town house built on individual plot is a recommendable type.
-

7.2 Form-based Code as the strategy of refurbishment

The realization of the integrated refurbishment depends on establishing a set of Form based Code for the historic urban area. The refurbishment of historic urban area is not a one-off solution, but a long-term, complex and dynamic process, which contains a large number of local constructions. Above all, urban coding plays a critical role in this process. The cases of American Smart Code, German B-plan and French PLU have shown that Form-based Code could be a useful tool in creating good urban form. Through Form-based Code the principles and scheme determined in the overall urban design can be transformed into legal regulations, guiding the renewal of specific plots in the form of rules.

Considering the practical situation in Nanjing, Form-based Code is a supplement for the current regulatory planning system. As the regulatory planning emphasizes on the control of land development and land use, Form-based Code focuses on fostering predictable built results through a set of prescriptions. It should be integrated into the regulatory planning, becoming a component of the legal planning. The integration involves the unification of zoning, unification of control unit, and the unified standard and principles in determining land development indexes and morphological indexes.

The readjustment of zoning is one of the most important operation in order to integrate the Form-based Code with the regulatory planning. Nanjing regulatory planning system establishes a two-level principles of land zoning, including the division of *Plan and Management Unit* and the division of plot. *Plan and Management Unit* is the basic control unit of the regulatory planning. Currently its division is mainly based on the administrative boundaries(e.g. subdistrict and administrative community) for the sake of management. As the administrative zoning is so different from the morphological zoning, the existing *Plan and Management Units* can hardly reflect the morphological characteristics and shows a deficiency in the control of urban form.

A key point in solving this problem is to transform the morphological regulations into corresponding administrative zones. It means that the plot should serve as the basic unit for morphological control so that the administrative communities can directly manage the plots on their coverage. In addition, the subdistrict in Chinese administrative system is a higher administration level compared with the administrative community. In the Old South area, the division of morphological units has no conflict to the division of subdistricts, indicating that the Form based Zoning is not essentially in contradiction with the administrative based zoning.

Tab. 7.1: Framework of the Form Based Code [Source: Compiled by the author]

Morphological elements	Control indexes	Main Measures
Street pattern	Zoning of plan-units	·Readjustment of the division of plan-unit; ·Readjustment of road hierarchy;
	Road hierarchy/Road Width	·Restoration of street pattern
Plot pattern	Plot pattern	·Principles of smart plot division
	Plot shape	·Transect of Plot Pattern
	- <i>Plot width</i>	·Establishment of Renew Unit system
	- <i>Plot size</i> - <i>Plot coverage</i>	·Improvement of Land Banking system
Building form	Building height	·Plot based dual control system;
	Building siting	·Establishment of Building Window
	- <i>Setback (Front, side, and rear)</i>	
	- <i>Proportion of building line</i>	
	- <i>Parking setback line</i>	
	Building type	
	Building configuration	

Form based zoning aims to define plan-units with morphological characteristics that are worthy of protection. Accordingly, the zoning is based on important morphological boundaries (e.g. rivers and roads), and the identity of street pattern within each unit. Fig. 7.2 shows the form based zoning of plan-units. Based on a typo-morphological analysis, the historic urban area is divided into 21 plan-units, each containing sub-zones and being assigned with morphological prescriptions.

Form-based Code consists of three parts, namely street pattern, plot pattern and building form, corresponding to the morphological framework proposed by Conzen. Each part contains individual control indexes and improvement strategies (Tab. 7.1), which are determined by the principles of integrated refurbishment. In a word, the aim of the code is to promote the refurbishment and continuation of historic urban form.

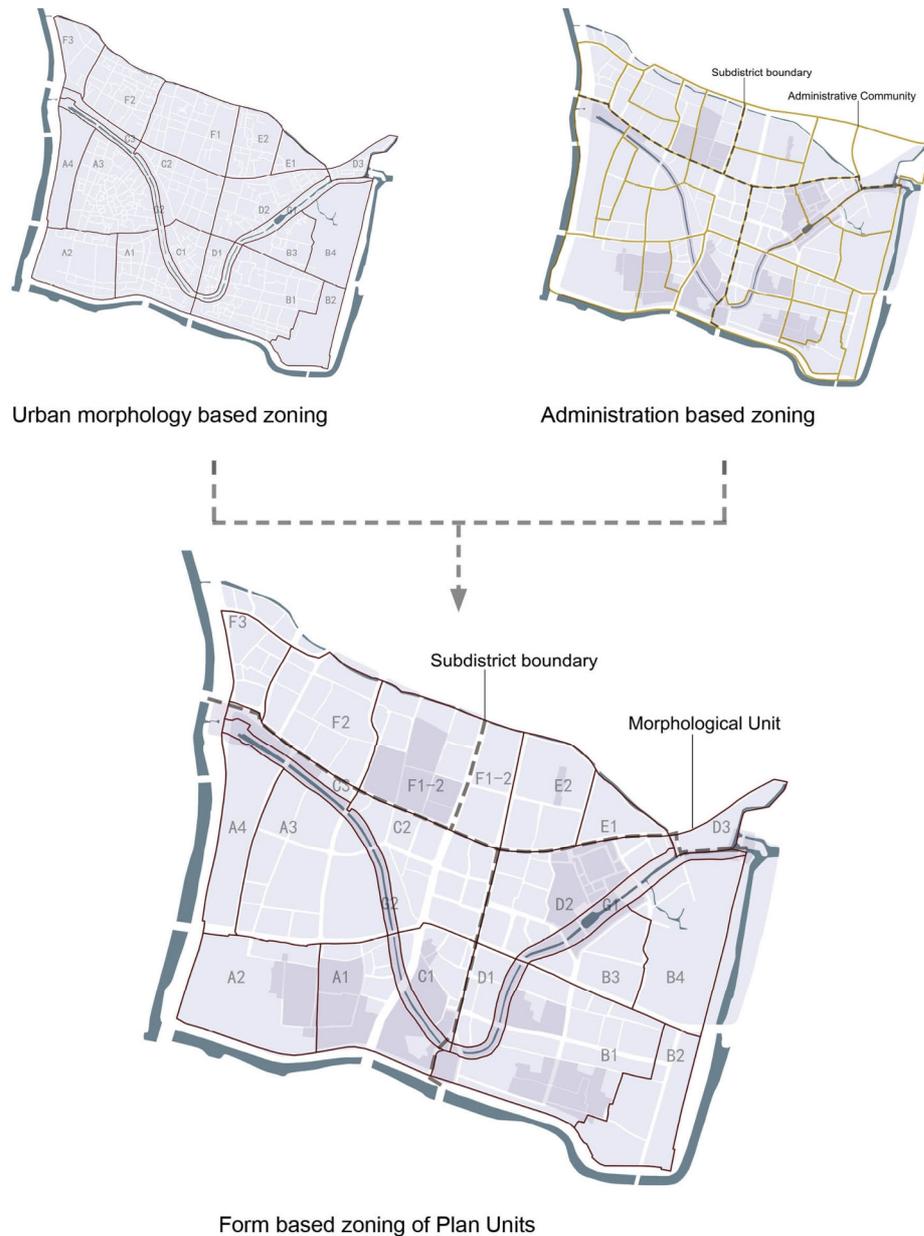


Fig. 7.2: Readjustment of zoning at the level of plan-units

7.2.1 Refurbishment of the street pattern

(1). Readjustment of road hierarchy

Form-based Code makes a readjustment of road hierarchy and road width in the historic urban area, in order to create a pedestrian-friendly urban structure. The comparative research⁴ between Nanjing, Berlin and Kyoto shows that the road scale in Old South area is too big to be well integrated in the historic contexts. What's more, as the regulation on the building height in the historic urban area is increasingly strict, the

⁴ The ratio of road width to building height (D/H) is one critical element in defining the proper road width.

maximum building height is reduced to 24m, and in historic core is limited under 12m, which makes it more necessary to refurbish the oversized roads.

The readjustment of road hierarchy mainly contains following measures (Tab. 7.2, Fig. 7.3): (1). Alley is absorbed into the automobile traffic system, so that the block scale can be reduced. (2). The scale of all three existing road hierarchies (artery, sub artery, and local road) are reduced to keep the proper proportion of road section under the new building height standard. (3). The setback of street frontage line should be more shallow. (4). With the reduction of road width, the application of arcade can provide more pedestrian space. (5). With the reduction of road width, regulations on the setback of floors above eave height should be made.

Tab. 7.2: Readjustment of the road width standard [Source: Compiled by the author]

Road hierarchy	Nanjing-readjusted	Nanjing-existing	Berlin (Inner city East)	Kyoto
Artery	40m	35-50m	30-40m	Max.50m
Sub artery	30m	20-35m		18-30m
Local road	15m	6-20m	10-20m	6-10m
Alley	6m	---	---	4-6m

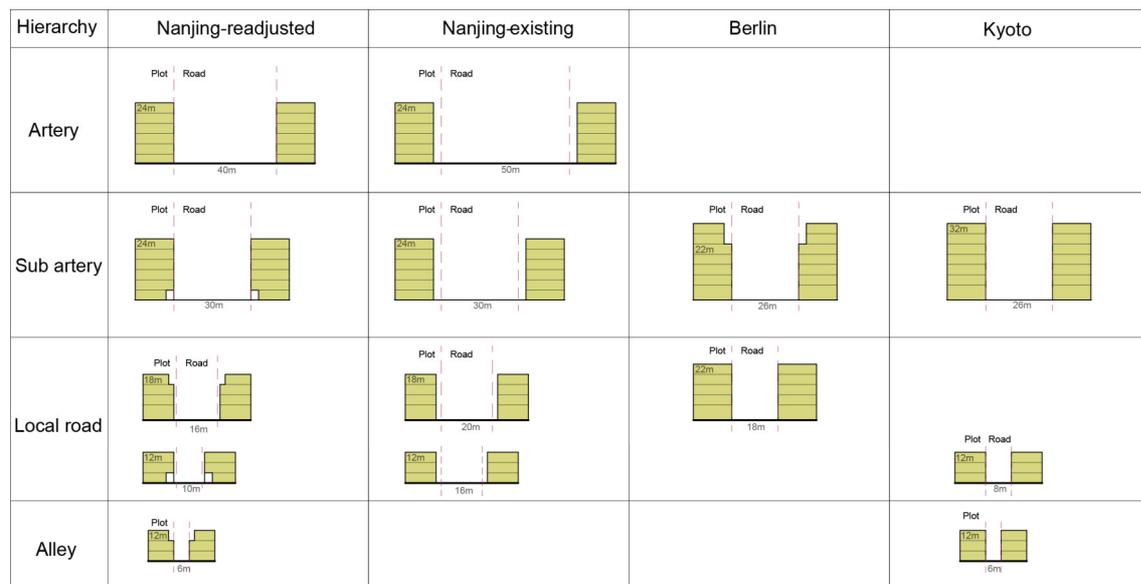


Fig. 7.3: Readjustment of the road section

(2). Restoration of street pattern

The Form Based Code proposes three main strategies to promote the restoration of street pattern in the historic urban area: (1). narrowing the oversized roads; (2). supplement of local roads or alleys to oversized blocks; and (3). protecting existing historic streets and improving their traffic capacity. It must be clarified that the restoration of street pattern is a gradual process, and a new round of radical urban renewal is inappropriate for the Old South area. But these strategies provide a long-term behavior framework and mark the key points in need of interventions.

(1). Narrowing the oversized roads. Some roads built in the 1990s were too wide to destroy the integrity of historic urban form. They need to be narrowed to a pedestrian scale, especially those located in important historic districts, like Mendong area and Menxi area. In the refurbishment of Gutong alley in Mendong area, the automobile-favored road was successfully renovated into a commercial pedestrian street, well integrated with the surrounding historic street pattern. It provides a paradigm for other areas with the same problem, e.g. the south section of Zhongshan Road South where separates Menxi historic district into halves.

(2). Supplement of local roads or alleys to oversized blocks. Many historic streets have been falsely erased in previous urban renewals, leading to the generation of megaplot or super sized blocks. The problem is especially prominent in Menxi industrial areas (A2, A4) and Chuanban Alley residential areas (A3). The road density after renewal is drastically reduced, and the traffic connection with exterior is weak. In this condition, the supplement of local roads and alleys becomes necessary. Above all, the reconstruction of lost historic streets should be given the priority whenever possible.

(3). Protecting existing historic streets and improving their traffic capacity. It is suggested to develop the micro-circulation traffic system in historic districts like Mendong area and Menxi area. This means some existing historic streets and alleys have to be renovated, in some cases with minor broadening, so that they can be integrated into the urban road network.

7.2.2 Standard of smart plot division: Transect of Plot Pattern

The essence of the integrated refurbishment is the refurbishment of plot pattern. After long-term disordered urban renewals, Old South area formed a plot pattern characterized by megaplot and fragmentation. As plot subdivision is considered as the basic feature of the historic urban area, the refurbishment of plot pattern aims to recover the plot subdivision and develop diversified land development modes that are suitable for the historic urban area.

In order to realized this goal, this research holds that the historic urban area should establish the a set of smart plot division mechanism. Specifically, smart plot division has five main principles:

- (1). The recovery of plot subdivision should be based on the protection of existing historic plot pattern.
- (2). It is suggested to recover the traditional plot scale in the renewal of blocks located in traditional cityscape districts.
- (3). The existing land property and plot pattern of blocks that still keep the plot subdivision should be respected.
- (4). Meso scale plot pattern is recommendable for the redevelopment in the historic urban area. The division of blocks should keep the plot subdivision as much as possible.
- (5). Megaplot based redevelopment is also necessary in the historic urban area, but its proportion should be strictly controlled.

A major challenge for smart plot division is to establish a standard of plot division that can meet various land development requirements rather than a simple one. The American Smart Code proposes the concept of Transect Zones, providing Nanjing valuable ideas worthy of learning. The six Transect Zones vary in the level and intensity of their physical and social characters, the principle behind which is that specific forms and elements belong to a corresponding environments.

In this sense, a Transect of Plot Pattern is proposed as the principle of smart plot division in the historic urban area. It consists of five scenarios from the conservation areas to the redevelopment areas, including (1). Historic plot pattern; (2). Hybridization pattern; (3). Redivision pattern; (4). Megaplot based refurbishment and (5). Megaplot based redevelopment (Fig. 7.4). The five scenarios correspond to different locations, development intensity and morphological characteristics, reflecting the requirements of developing mixed and comprehensive urban area (Tab. 7.3, Fig. 7.5).

Of the five plot patterns, Historic pattern and Hybridization pattern are mainly located in areas with traditional cityscape. As their plot patterns don't need to be redivided, the main ways of intervention are protection and minor readjustment. In comparison, Redivision pattern, Megaplot based refurbishment and Megaplot based redevelopment are located in redevelopment areas. They all derive from plot redivision according to different development intensities.

Plot width is the most critical variable in the control of plot shape. The traditional plot width is generally no more than 16m. Hybridization pattern and Redivision pattern are characterized by meso scale plot. Their maximum plot width are set to 50m and 70m respectively, with an overall consideration of their current situation and the standards of typical cities like Berlin and Kyoto. In addition, the five plot patterns develop different strategies of plot organization. For example, Historic pattern should strictly protect the plot pattern; Hybridization pattern should keep the characteristics of plot series; Redivision pattern should continue the plot subdivision despite the increase of plot scale and development intensity. In terms of the megaplot, it is suggested to create a structure of small-scale blocks to confine the development volume.

Each kind of plot pattern should develop specific building siting and building form. Above all, Historic pattern and Hybridization pattern should respect and preserve the historic frontage line. The other three kinds of plot pattern should also endeavor to keep a continuous street frontage, which is further transformed into three control indexes, the setback line, building line, and the side building interval. In addition, due to the difference of development intensity, each kind of plot pattern should develop specific building height limit and building types. Above all, mid-small plot based patterns (Historic pattern, Hybridization pattern and Megaplot based refurbishment) are suggested to adopt the townhouse type, a building type suitable for the plot pattern of old city. In comparison, building types typically based on the megaplot like the microdistrict, and commercial complex should be limited in a small proportion.

Tab. 7.3: Key indexes of the five scenarios of plot patterns (Source: Compiled by the author)

	Historic pattern	Hybridization	Redivision	Megaplot(Refurbishment)	Megaplot(Redevelopment)
General principle					
Distribution	Historic district	Traditional cityscape area	General cityscape area	Traditional cityscape area	Commercial center, residential area
Protection focus	Historic plot pattern	Preserving existing pattern	Preserving street frontage	Recovering traditional scale	Large scale redevelopment
Development intensity	Low	Medium	Medium-high	Low	High
Change of plot pattern	Little	Readjustment, Minor amalgamation	Renewal	Renewal	Renewal
Plot form					
Plot size	Small	Small-medium	Medium	Small-medium	Large
Plot width	16	50	70	16	—
Plot organization focus	Historic plot pattern	Plot series	Plot subdivision	Small blocks, Renewal Unit	Small blocks
Building siting					
Setback	not permitted	not permitted	shallow	shallow	—
Building line	100%	100%	80%	100%	80%
Side building interval	not permitted	not permitted	permitted	not permitted	permitted
Building form					
Height limit zoning	10m(SSS)	18m(SSS,SS)	12m-24m(SS,S)	10m(SSS, SS)	24m(SS, S)
Building type	Traditional courtyard building	Townhouse	Townhouse, detached buildings	traditional courtyard building; townhouse	Microdistrict, complex, detached building

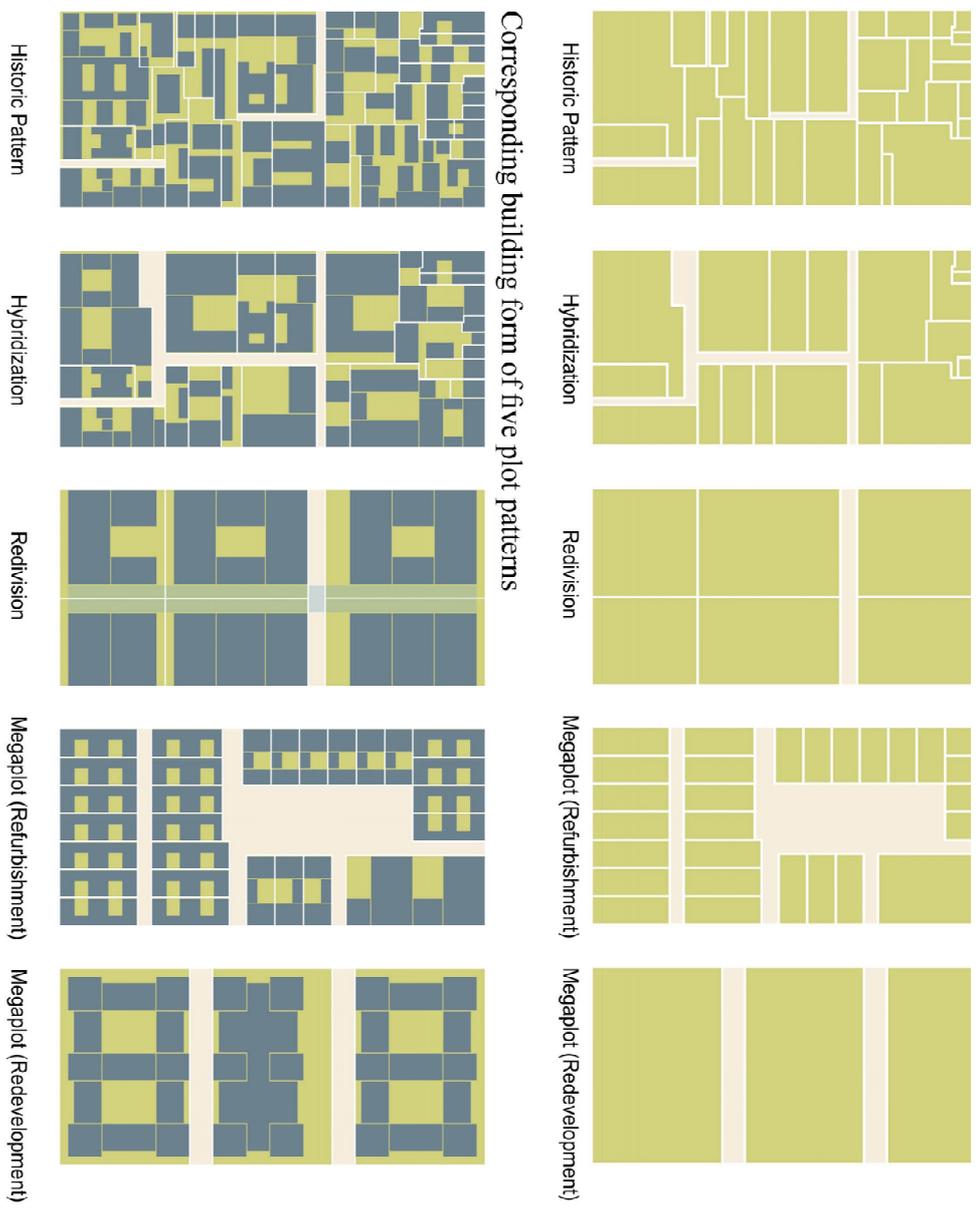


Fig. 7.4: Transect of plot patterns

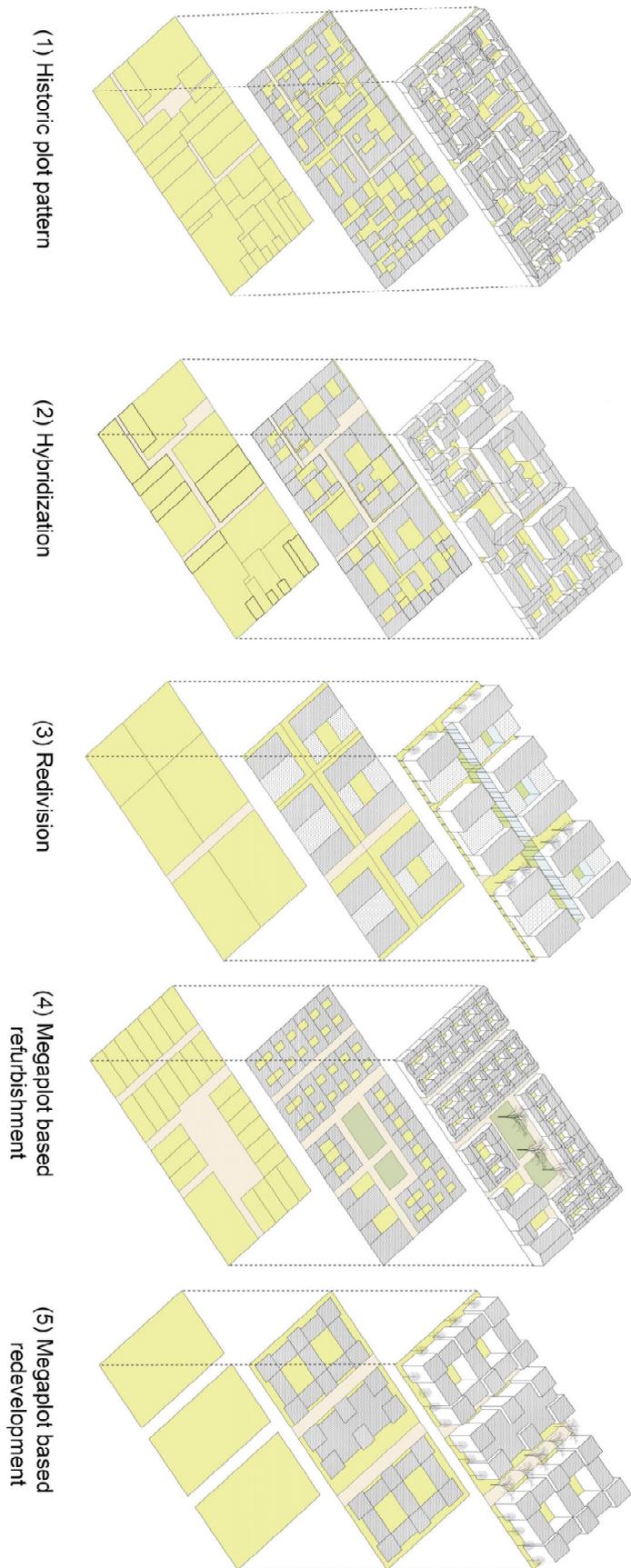


Fig. 7.5: Three dimensional building form of the five plot patterns

(1.) Historic pattern (P1)

General principles

Historic plot pattern refers to the plot pattern characterized by traditional scale and formed before 1949. It is mainly distributed in historic conservation areas. In Old South area, most historic plot patterns are located in the south of Jiqing Road and Changle Road. As an essential morphological element identifying the historic district, historic plot pattern should be strictly protected, which indicates that very few plot amalgamation or changes are allowed in this pattern. This pattern corresponds to a low development intensity, but the mixed use of commerce, culture and residence is encouraged.

Plot pattern

Historic plot pattern is characterized by small plots. They are arranged along the street, constituting compact and dense plot series. Generally the width of a traditional residential plot in Nanjing Old South area ranges from 8m to 16m; the reference value (maximum value) of traditional plot width is set as 16m.

Building siting

The historic frontage line should be respected and preserved. It means that the front and side setbacks are not permitted.

Building form

As the historic plot pattern are almost located in historic districts, the eaves building height is limited under 7m (no more than two storeys). According to the conservation regulation, traditional courtyard buildings is the preferred building type.

(2.) Hybridization pattern (P2)

General principle

Hybridization pattern refers to plot patterns with a mix of existing plots and redivided plots. The main goal of this pattern is to keep the existing subdivided plots as much as possible and respect the existing land property structure. Almost distributed in areas with traditional cityscape, this pattern emphasizes the protection of existing plot pattern, and the clarification of existing property boundary. Not being protected as strictly as the historic pattern, hybridization pattern focuses on the continuation of traditional cityscape. Thus appropriate readjustments, including a minor plot amalgamation are permitted. This pattern corresponds to a medium level of development intensity, with a highly mixed use of residence, commerce, culture and public services.

Plot pattern

Hybridization pattern is characterized by small-medium plot size. Despite a minor plot amalgamation, the plot series should be kept identifiable. Thus a typical plot width after amalgamation is 30m, while the maximum plot width is 50m. The width and shape of new plots on important street frontages, e.g. plots on the corner, should be carefully controlled. Large sized plots are given a preference to be located in the interior of the block.

Building siting

The historic frontage line should be respected. For the building siting, the front and side setbacks are not permitted.

Building form

The hybridization pattern is mainly distributed in the south of Shengzhou Road and Jiankang Road where the building height limit is set under 18m with no more than four storeys. Considering the apparent plot series

and preserved existing buildings, townhouse is a recommended building type. Buildings are required standing side by side and joined by common walls, so that a continuous street frontage can be formed.

(3). Redivision pattern (P3)

General principle

Redivision pattern refers to plot patterns that are totally redivided but still keeps the plot subdivision as a critical morphological feature of the historic urban area. It can be seen as a direct means of “learning from history” or better, learning from previous experience. This pattern is widely distributed in redevelopment-oriented areas where the contemporary cityscape is needed. In the Old South area, most redivision patterns are distributed in the north of Jiqing Road and Changle Road. Compared with the megaplot mode, this pattern regards the plot subdivision of the essential morphological elements that are in need of protection. But a mid-high development intensity can still be achieved, with a highly mixed use in the vertical direction. Thus it is a suggested plot pattern for urban redevelopment.

Plot pattern

Redivision pattern is characterized by the medium sized plots. In order to keep the plot subdivision, a typical plot width is defined as 50m, while the maximum plot width is 70m. The largest plot is not allowed to take up more than 50% of a block. Big plots are suggested to be located in the interior of a block so that more plot subdivision can be generated on the block boundary. For those big blocks new accessibility (alleys) or open space are suggested to be set inside the block for better pedestrian and activity.

Building siting

As an intensive development mode, a shallow setback and side building interval are permitted. But the use of building line should take up at least 80% of the street frontage so that a continuous street frontage can be ensured.

Building form

As Redivision pattern corresponds to a mid-high development intensity, the building height is generally determined between 12m-24m. As a shallow side building interval is permitted, both townhouses and detached buildings are admissible building types.

(4). Megaplot based refurbishment (P4)

General principle

Megaplot based refurbishment refers to the plot pattern that is characterized by traditional scale and form but is reconstructed on a megaplot. This pattern is typically distributed in the historic core, including Mendong area, Menxi area and Confucius Temple area. The restoration of Changledu district in Mendong area is a typical case of this pattern. Blocks with this pattern are generally in the periphery of historic districts. Having been damaged by improper demolitions or renewals, they are considered necessary to recover the traditional cityscape. As it is reconstructed on a megaplot, existing plot pattern has to be thoroughly renewed. But the new plot pattern should be regulated under the strategy of Renewal Unit. Similar to historic districts, megaplot based refurbishment pattern accommodates only a low development intensity, but encourage the mixed use of residence, commerce and culture.

Plot pattern

Megaplot based refurbishment pattern is characterized by small plot size. The plot width ranges from 8m to 16m, in accordance with the traditional plot size. In order to meet the contemporary living and traffic demands, the megaplot should develop the structure of small blocks, creating better accessibility and more open spaces.

Building siting

As a reconstructed plot pattern, a shallow setback is permitted. But side building interval is not permitted so that a continuous street frontage can be remained.

Building form

As the megaplot based refurbishment pattern are almost located in the historic core, the eaves building height is limited under 10m. In order to integrate well with the historic context, traditional courtyard and townhouse are considered as the preferred building types.

(5). Megaplot based redevelopment (P5)

General principle

Megaplot based redevelopment refers to blocks that are completely redeveloped without plot subdivision. With the highest development intensity in the historic urban area, megaplot based redevelopment is mainly distributed in commercial center or residential area, mostly in the north of Jiqing Road and Changle Road. As megaplot mode eliminates the plot subdivision, its proportion in the historic urban area must be strictly controlled. With a great building volume, this pattern must develop a highly mixed building uses (especially in the vertical direction).

Plot pattern

Under the megaplot based redevelopment, creating a structure of small-scale blocks is a preferred strategy for the integrated refurbishment. On the one hand, it provides more pedestrian and open spaces inside the megaplot; on the other hand, the buildable areas are confined to small blocks, reducing the construction volume on the megaplot. This strategy has been proved in practices both in Nanjing and in Berlin. The reconstruction of Confucius Temple area retains the characteristic small-scale block pattern, making it one of the most active area in Old South area. In the case of Potsdamer Platz, the plan created a block grid of 50*50 meters as a contemporary interpretation of the Berlin block, which promoted the megaplot based redevelopment to be well integrated in existing urban structure. Based on researches of the existing block scale in Nanjing and lessons from other paradigmatic structure of small-scale blocks, the reference value of the small-scale block is set as 70m.

Building siting

As an intensive redevelopment, shallow setback and side building interval are permitted in Megaplot based redevelopment. But the use of building line should take up at least 80% of the block perimeter, so that a continuous street frontage can be generated.

Building form

With the highest development intensity, the building height of this pattern can reach 24m with six storeys. Typical building types include microdistrict, complex, and detached buildings. It should be mentioned that historic buildings located within the megaplot shall be preserved as much as possible.

7.2.3 Improvement of plot division mechanism

(1). Establishment of Renewal Unit system (RUs)

Although Form-based Code proposes the standard of smart plot division, its realization depends on an improvement at the institutional level (Fig. 7.6). The main problem of current land banking system is that it encourages the production of megaplot and resists small plots, which is largely due to several institutional difficulties including the pursuit of land finance, the balance of development cost, and management deficiency.

In the Transect of Plot Pattern, the Historic pattern (P1) and Hybridization pattern (P2) belong to mid-small plot pattern. In these patterns, a quite number of existing plots need a protection or minor readjustment rather than a total redivision. However the self-led renewal of mid-small plots are very difficult under current land development system.

There are two institutional difficulties obstructing self-led renewal of small plots: First, the current land banking system and land allocation system don't support small plot based land allocation. The unified land allocation and development mode is not in favor of the continuation of historic plot pattern. What's more, it's difficult for small land owners to obtain the land development right of their own property, indicating that self-led renewal is almost impossible.

Second, the renewal of small plots don't have to go into the process of land banking. Land Banking system is a typical top-down land development mode, as the decision of most key links including the making of annual plan, the plot division scheme, and the ways of land allocation, are made by local government. However, interest appeal of existing property owners can not be fully reflected and cared. In many cases, the small property owners are willing to renew their own plots, but they are hardly to be answered under the current institutional framework. In addition, it is common that some adjacent plots need to be amalgamated or a plot need to be subdivided in order to meet practical development requirements. Faced with this situation, it is critical to make negotiations between property owners rather than push these plots into the land banking system. All these institutional difficulties indicates that the civil participation should get more involved in plot division mechanism. Apart from current land banking system, another system in favor of the bottom-up renewal of small plots should be established.

In recent years some cities issued their regulations on the urban renewal, in which institutional innovations supporting bottom-up renewal are also explored⁵. Above all, Regulations on Urban Renewal of Shenzhen establishes multiple renewal modes including governmental resumption, governmental acquisition and property owner-led renewals. According to this regulation, property owners are authorized for the right of independent renewal, which is a breakthrough of current institutional limitation that land development can only be conducted by legal developers. Meanwhile, it means that land development right can be allocated to property owners without the process of allocation (land bid, auction and listing)⁶.

In order to realize the self-led renewal of small plots, a Renewal Unit land development system (*RUs*) should be specially established. The principle of this system is to loose the restriction of land redevelopment on the local scale. In the form of individual declaration and governmental approval, the development right of small plots is authorized to property owners. Plots smaller than 5000m² are all qualified to apply RUs.

⁵ Since 2009 several cities including Shenzhen, Guangzhou and Shanghai have established the regulations on urban renewal, encouraging the renewal of old industrial area, villages in the city and old city.

⁶ Cf. Shan, H. (2013).79-84.

This system especially aims at the individual renewal under Historic pattern and Hybridization pattern. For Megaplot based refurbishment, if the subdivision of renewal units can promote the subdivision of land property, its second round renewal can also apply this system.

RUs consists seven steps (Fig. 7.7):

- (1). Definition of plot pattern. The authorization of RUs is based on the block level. In the regulatory plan each block should be designated with the permitted plot patterns. Those classified as prohibitive to have a thorough reconstruction (e.g. historic pattern and hybridization pattern) are qualified to apply RUs.
- (2). Personal declaration. Property owners or developers who are willing to make self-directed renewals make the application to the planning bureau. Although the subjects of application could be different, it is a prerequisite that at least two thirds of property owners within the renewal scope must agree with the renewal application. If developers plan to renew specific plots, they must primarily negotiate with property owners and reach an agreement before they send the application.
- (3). Definition of Renewal Units. If the application is approved, the plots to be renewed are defined as Renewal Units. The plan of Renewal Units should also meet planning requirements determined in the regulatory planning.
- (4). Approval of renewal plan. The renewal plan should meet the requirements of integrated refurbishment and regulations determined in regulatory plans, including the development goal, development intensity, building functions and morphological regulations. According to the planning requirements, some plots could be renewed only after it provides some proportion of land for public service. In some cases, self-directed renewals have to make adjustments for the regulatory plan. In this situation, the renewal plan could be approved only after an agreement is achieved between the planning bureau and applicants.
- (5). Coordination with the regulatory plan. The changes of property and control conditions brought about by the renewal should be readjusted in the regulatory plan. Above all, Renewal Unit as a special land development (or land-use) type should be marked in the statutory plan.
- (6). Compensation of land value. The government and the renewal applicants should propose a compensation plan for the change of land value brought about by the renewal.
- (7). Finally the applicants are authorized with the land redevelopment right of the Renewal Units.

In addition, the personal application- governmental approval mode can also be applied in the reorganization (amalgamation and separation) of adjacent small plots within a block according to the practical renewal requirements, through which the land expropriation and reallocation can be avoided.

(2) Improvement of Land Banking system

Despite the supplement of a new land development mode, plot patterns in need of thorough reconstruction (Redivision pattern, Megaplot based refurbishment pattern, and Megaplot based redevelopment pattern) are still controlled by current land banking system. Although the protection and renovation of existing buildings are currently paid more attentions, over a period of time the reconstruction will still be an important way of renewals in Nanjing south historic urban area. What's more, some areas where were heavily damaged by inappropriate renewals in the previous period have to be reconstructed for the sake of urban refurbishment. The aim of plot division is to keep the plot subdivision as much as possible and reduce the proportion of megaplots. In this sense, the proportion of Megaplot based redevelopment pattern should be strictly controlled in the regulatory plan.

The current land banking system should also be improved in order to promote the plot subdivision, which includes the following measures (Fig. 7.7):

- (1). **Defining the types of plot pattern** ensures that not all the blocks are put into the scope of Land Banking. Thus the majority of historic districts and existing blocks with plot subdivision can survive from land expropriation and great demolition.
- (2). **The standardization of plot division** should be improved. The current plot division is almost based on the scheme of regulatory planning. But some regulatory plannings make plot division in a pragmatic way without specific urban design so that they can not meet the morphological and development requirements of historic urban area. In addition, as the plot redivision is related to the reallocation of land property, it is necessary to hear the opinions of existing property owners. Accordingly, it is necessary to establish a specific procedure to integrate the regulatory planning, development requirements and appeal of existing property owners so that the scheme of plot division can be optimized.
- (3). The generation and allocation of mid-small plots should be promoted through **joint allocation policy**. Inevitably the allocation of small plots will bring about higher management cost and development difficulty. Fig. 7.8 shows conceptually how the phased development of one large site by a single developer differs from its simultaneous (i.e. in parallel) or sequential (i.e. in series) build-out by multiple developers⁷. The involvement of multiple actors needs to be matched by institutional arrangements that enable the increased co-ordination costs to be offset by increased value gained from effective place-making.

In this sense, the Lank Bank Center is suggested to develop a joint allocation policy to solve this problem. There are two forms of joint allocation: (1.) The joint allocation of a small plot in the historic urban area and a megaplot outside the old city. In order to guarantee the morphological requirements of the small plot, the development intensity of the megaplot could be improved through the operation of Transferable Development Rights(TDR)⁸. (2). The joint allocation of several independent small plots which are not located next to each not only ensures the scale of land allocation (so that the demand of land finance can be met), but also guarantees the continuation of plot subdivision.

⁷ On the left hand side of this diagram, the same developer takes responsibility for all the phases of a large development. In the middle, each phase becomes the responsibility of a different developer, who work in series to build out the site. On the right hand side of the diagram, each phase is split up into several parcels, with each being the responsibility of a different developer. Some developers secure parcels in more than one phase. This produces a richer and more diverse urban form, but the benefits of this approach have to be balanced against increased complexity and transaction costs.

⁸ Transfer of Development Rights (TDR) is a zoning technique used to permanently protect farmland and other natural and cultural resources by redirecting development that would otherwise occur on these resource lands to areas planned to accommodate growth and development. (<http://conservationtools.org/guides/12-transfer-of-development-rights>).

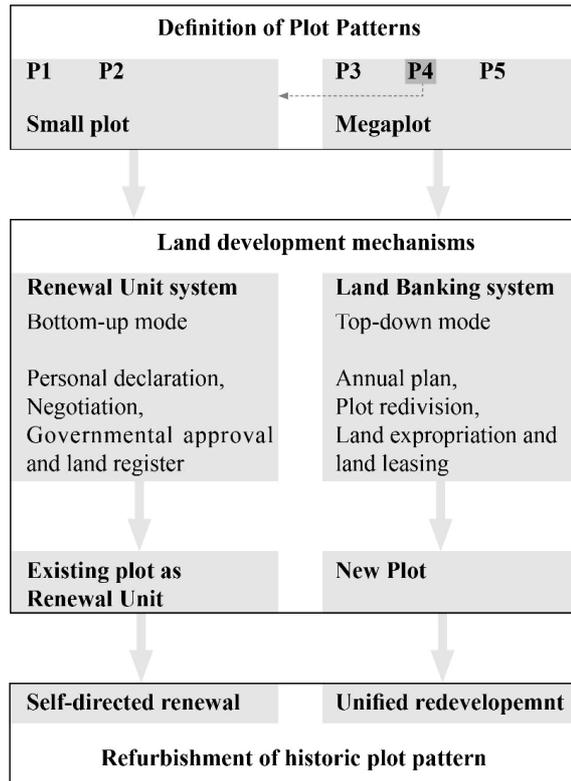


Fig. 7.6: Readjusted plot division mechanism



Fig. 7.7: The process of Renewal Units system and Land Banking system

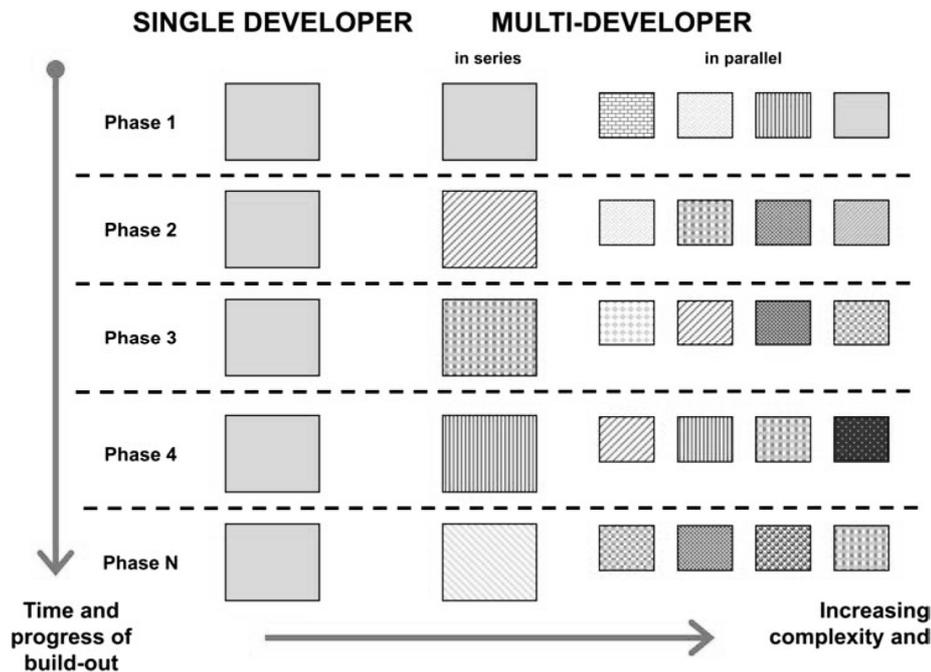


Fig. 7.8: The potential complexity of multi-developer projects [Source: Adopted from Adams, D. Tiesdell, S. White, J. (2013)]

7.2.4 The control of building envelope

Form-based Code proposes the standard and tools to promote the control of building envelope, which is a supplement to the current control system. Some researches has proposed the possibility of establishing a dual control system in the regulatory planning system, in order to improve the control on physical form. The current control indexes focusing on the development intensity and land use are kept as the primary level of control, while a set of indexes focusing on physical form is supplemented as the secondary level of control⁹. Considering the significant path dependence of Chinese planning system, this could be a practical way for the implementation of refurbishment strategies.

The control of physical form consists of five parts, building height, plot occupation, building siting, building type and building configuration, each part containing subordinated indexes (Tab. 7.4). Above all, the building height and building siting constitute the **building envelope**, which means the three-dimensional space within which a structure is permitted to occupy. From the cases of German B-plan, American Smart Code and French PLU, it is clear that all these Form-based Codes establish effective mechanisms to control the building envelope.

Besides establishing the dual control system, it is necessary to rectify some inappropriate regulations on building siting (Tab. 7.5). There are four critical indexes in need of a readjustment, including the front setback, side setback, proportion of building line and building height. Current standards of these indexes are mostly based on considerations of safety, technical and functional matters. Instead, the morphological rationality and historical continuation are almost neglected.

⁹ Cf. Cao, S., Weng Y. (2006).

In this sense, it should be clarified that the primary principle in determining the building envelop is the continuation of historic urban form. Nanjing old city should be listed as a special area where specific standards of building siting are required. For example, construction without setback should be permitted when the historic frontage line exists. In historic districts or blocks with Hybridization pattern, buildings should be better to be constructed without side setback from the plot boundary. In the historic urban area, building line should take up at least 80% of the street frontage. In addition, the control of building height should be refined from the current block level to plot level, and the specific height should be determined by urban design.

Tab. 7.4: Plot based dual control system in the regulatory planning [Source: Compiled by the author]

Primary control:development intensity	Secondary control:physical form	
Land use	Building height	
Building function(vertical)	Plot occupation	Plot width
Plot Area		Plot coverage
FAR (Floor Area ratio)	Building siting	Setback(Front, side, and rear)
Building Density		Proportion of building line
Greening Rate		Parking setback line
Public Facilities	Building type	
Traffic Organization	Building configuration	

Tab. 7.5: Readjustment of standards for building envelop [Source: Compiled by the author]

Elements	Existing standard	Readjustment
Front setback	Road setback determined by road width and building height; Minimum setback =6m	Under special historic environment construction without setback is permitted
Side setback	Determined by building interval which is defined by building height; Minimum interval of multistorey building =8m	Shallow setback; under special historic environment construction without setback is permitted
Proportion of building line	No specific regulations	At least 80% along street frontage
Height	Controlled at block level; No specific urban design	Controlled at plot level; Determined by specific urban design

Learning lessons from German's Bebauungsplan, Form-based Code introduces Building Window as the main tool in controlling the building envelope. Building Window is defined by two different boundary conditions: the building line and setback line. Setback line delimits the scope or boundary that buildings and their parts can not extend. In contrast, the front facades of buildings must be directly positioned on the building line instead of staying behind. The orientation of both lines are based on the position relative to the plot frontage. Above all, the building line as a compulsory spatial regulation is an important supplement for the control of building siting.

Apart from the control on the building siting, the building window can also refine the control on building height. Through designating subordinate building windows, buildable areas of different building height can

be clarified. Thus the height control becomes more accurate as the variation of building height inside a plot can be reflected.

In addition, Building Window could promote the secondary subdivision of megaplot. As the structure of small-scale blocks is a preferred strategy for megaplot based redevelopment, it is important to separate the non-construction area, including pedestrians, preserved buildings and open spaces at first. Through setting up subordinate Building Windows within a megaplot, non-construction area can be specifically separated out.

The biggest advantage of Building Window is that it visualizes and integrates elements of building envelop (both building siting and building height), greatly facilitates the morphological control in three dimension. In addition, the realization of Building Window should cooperate with the plot-based urban design.

7.3 Conclusion

Based on the analyses of morphological transformation, institutional analysis of plot division, as well as the comparative research of Berlin, this chapter proposes the strategy for the refurbishment of Nanjing south historic urban area. The strategy proposes both the development mode and principle at the planning level and a set of Form-based Code at the institutional level.

The new development mode aims at molding a culture-led and comprehensive historic urban area which encourages an intensive mixed land. Drawing lessons from the Critical Reconstruction of Berlin inner city, it is suggested to conduct an integrated refurbishment for Old South area, in which the focus should be placed on the refurbishment of damaged historic urban pattern and the integration of urban fragments.

In order to realize the integrated refurbishment, it is necessary to establish a set of Form-based Code, as a supplement for the regulatory planning system. Form-based Code helps to transform the principles and schemes determined in the overall urban design into legal prescriptions, guiding the generation of predictable good urban form. It consists of three parts, namely street pattern, plot pattern and building form, corresponding to the morphological framework proposed by Conzen.

At the street pattern level, Form-based Code makes a readjustment of road hierarchy and road width in the historic urban area in order to create a pedestrian-favored urban structure. On this basis, three main ways of interventions are proposed to cope with different problems, which provide a long-term behavior framework for the restoration of street pattern.

The essence of the integrated refurbishment is the refurbishment of plot pattern. The aim is to recover the plot subdivision and establish diversified land development modes that are suitable for the historic urban area. In this sense, a Transect of Plot Pattern was proposed as the standard of smart plot division. It consists of five scenarios from the conservation areas to the redevelopment areas, including (1). Historic plot pattern; (2). Hybridization pattern; (3). Redivision pattern; (4). Megaplot based refurbishment and (5). Megaplot based redevelopment. The five scenarios correspond to different locations, development intensity and morphological characteristics, reflecting the requirements of developing mixed and comprehensive urban area.

The realization of the smart plot division depends on institutional innovation. The current land banking system encourages the production of megaplot and resists the self-led renewal of small plots. In order to realize the self-led renewal of small plots, a Renewal Unit land development system (*RUS*) should be specially established. RUs is especially applied to Historic pattern and Hybridization pattern. In the form of individual

declaration and governmental approval, the development right of small plots is authorized to property owners. However, blocks in need of thorough reconstruction still have to depend on Land Banking system. On this condition, several improvement measures are proposed to promote the plot subdivision, including defining the types of plot patterns, setting plot division as an independent procedure of Land Banking system, and the joint plot allocation policy.

To promote the integration between Form-based Code and regulatory planning, a dual control system is proposed, in which current control indexes focusing on development intensity and land use are kept as the primary control level, while indexes focusing on physical form are supplemented as the secondary control level. Building envelope is the key point for the control of physical form. Consisting of building siting and building height, it marks the three-dimensional space within which a structure is permitted to occupy. In order to promote the continuation of historic urban form, it is necessary to rectify some inappropriate regulations on building siting. Learning lessons from German's Bebauungsplan, Form-based Code introduces Building Window as the main tool in controlling the building envelope. The biggest advantage of Building Window is that it visualizes and integrates elements of building envelop, greatly facilitates the morphological control in three dimension.

8 Conclusion

8.1 Summary of the research

8.1.1 Research findings

This research makes a typo-morphological analysis on the transformation of Nanjing south historic urban area since 1949, and explores the mechanism and problems of plot division in the current planning system and its impact on the morphological changes. On this basis, a set of Form-based Code is proposed as the strategy for the refurbishment of the historic urban area. In summary, this research has the following findings:

- 1. The continuing urban renewals since 1949 have led to the elimination of the traditional plot subdivision and the prevalence of megaplot, the oversized plot defined as larger than 5000m² in the historic urban area.**
- 2. Current Chinese planning system and land development system do not have a developed standard of plot division specially for the historic urban area. As a result, the pragmatic way of plot division has further promoted the megaplot schema.**
- 3. Establishing a standard of smart plot division is key to the refurbishment of the historic urban area, which means not only to protect and continue the historical urban form but also to meet the diversified land development requirements.**

8.1.2 Summary of the research

(1). Motivation and research questions

This research stems from a constant observation of the damage of Chinese historic urban areas and an attempt of analyzing the transformation of Chinese cities with European planning theories. Chinese historic cities have experienced drastic transformation since the socialist revolution of 1949, leading to a fundamental change of urban form. For a long time, the research on Chinese urban form mainly focuses on morphological elements like the street pattern or building space but pays little attention to the plot pattern. The theoretical research and planning practices in Germany have brought my attention to the significant impact of plot division on the urban form. Despite a quite different urban development history and urban planning system, I hold that the transformation of Chinese urban form is also greatly influenced by the plot division, though this influence is not yet clearly known to us. In this sense, I believe that the introduction of a plot

based perspective will bring about a cognitive shift for both the research on Chinese urban form itself and the practical planning control.

After the thirty years of rapid urban renewal, the conservation and refurbishment of Chinese historic urban areas are paid increasingly more attention in recent years. Even so, the conservation of plot pattern is still largely neglected. A large number of cases across the country have shown that the damage of plot pattern has become a most common problem for historic cities. Obviously, the current plot division mechanism is not necessarily in favor of the conservation and continuation of historic cities.

Under this background, this dissertation takes the first step to understand the special role of plot division in affecting the transformation of urban form in the historic urban area. Specifically, the research tries to answer the following questions: (1). How is the evolution of plot pattern in Chinese historic urban area since 1949 and what is the impact of plot division on the process? (2). Is the current plot division mechanism in favor of the conservation of historic urban area? and (3). is it possible to establish a set of smart plot division strategy to promote the conservation and refurbishment of the historic urban area?

(2). Concept and research methods

According to the literature research, plot division has three levels of connotations: (1). plot pattern is an element of urban morphology; (2). plot division serves as a planning apparatus, and (3). plot division is a link in land development. The plot serves as a mediator connecting urban morphology and land development. Based on this hypothesis, this research establishes a plot-based morphological-institutional analytical framework, exploring the morphological evolution of Nanjing south historic urban area since 1949 and its plot redivision. Combining the morphological analysis and the institutional analysis, the backbone of the framework consists of three elements, including the plot pattern, the unit plot and the plot division, reflecting the process how unit plots are divided and controlled by a series of planning regulations and how they constitute a plot pattern by specific morphological rules. The research is composed of four parts, including the analysis of morphological evolution, the institutional analysis of plot division, the comparative research of Berlin's Critical Reconstruction and the strategy for the refurbishment of the historic urban area.

(3). Morphological evolution of Nanjing south historic urban area

Based on the typo-morphological theory, the analysis of morphological evolution is made at three different spatial levels, including the historic urban area, the unit plot and the plan-units. The plot based analytical framework contains three major components, the unit plot, the plot pattern and the rules of plot arrangement. It is through specific arrangement rules that different types of unit plots constitute the plot pattern.

Historic urban area

The overall transformation of Nanjing south historic urban area since 1949 is first discussed. When we think about the morphological evolution of the historic urban area, we must put it into the context that the overall urban structure of Nanjing keeps expanding despite the ever-changing development orientations and modes. The development of the Old South area since 1949 can be divided into three stages: industrial construction

(1949-1980), upgrading and modernization (1980-2010) and overall conservation (2010-). The big differences in the development orientation and development mode through the time have aggravated the fragmented way of urban renewals. Coupled with the long-term lack of overall urban design, the fragmentation of urban form was intensified.

Types and transformation of spatial modes

The concept of the spatial mode is specifically established for the typological analysis on the unit plot. **Spatial mode**, defined as the synthesis of a plot and buildings on it, is the smallest morphological cell of the city. It contains three major components, plot shape, building types and plot-building relationship, each containing several subordinated indexes. The predominant spatial mode of the historical Chinese city is the traditional courtyard house together with its corresponding small-scale plot. This pattern generates the rhythmic and ordered traditional urban form. However, since 1949 ever-changing development goals and development modes in three development periods have generated diversified spatial modes in the historic urban area, including 4 primary spatial modes and 12 subordinated modes. Above all, the four primary modes include work-unit mode, residential mode, commercial mode and historic conservation mode.

The transformation of spatial modes shows that the megaplot has prevailed in all four spatial modes. Megaplot, defined as the oversized plot larger than 5000m² in the historic urban area, has become a basic feature of Chinese historic urban area. In fact, it is the result of multiple influential elements such as urban development orientation, land property system, land development mode and regulations of urban codings. In addition, megaplot mode also leads to the excessive differences in building types and an increasingly alienated plot-building relationship, which becomes a big reason for the fragmented urban form.

Transformation of the plot pattern

The morphological analysis on the transformation of plot pattern is based on the theories developed by the Conzenian school. Primarily, Nanjing historic urban area is divided into 21 plan-units according to the traditional street pattern. Considering the major spatial modes of each plan-unit, there are four types of plan-units including work unit plan-unit, residential plan-unit, commercial plan-unit and historic conservation plan-unit. Empirical researches are made on five typical plan-units. Based on three major morphological elements, street pattern, plot pattern and building form, the analysis emphasizes how unit plots constitute the plot pattern through specific arrangement rules.

The result shows that the prevalence of megaplot has led to the dramatic simplification of the plot pattern. Plot subdivision, one of the most significant morphological characteristics of the historic urban area is eliminated. Currently, the plot series which is essential to the generation of ordered plot subdivision is only well preserved in a few historic conservation areas. Commercial plan-unit like the case of Yanliao Fang has preserved the minimal plot subdivision, but there lacks a regular plot division. In addition, a large number of residential and industrial plan-units have totally transformed into the megaplot-based pattern. On the other hand, the renewed plot pattern has neither continued the characteristics of the historic urban form nor generated better urban space. In other words, the plot redivision in most plan-units failed to create more public space and improve the road density for the historic urban area.

(4). Institutional analysis of the plot division

The damage to the historic plot pattern shows the deficiency of the current plot division mechanism. At the institutional level, plot division serves as both a planning apparatus and a link in the land development. In this sense, an institutional analysis is made in order to detect the problems of current plot division mechanism, which mainly focuses on three aspects including the conservation planning, the regulatory planning, and the land development mode.

The conservation planning has a decisive impact on the continuation of the historic plot pattern. The analysis of conservation planning includes two aspects: the development of the conservation system and the development of the conservation strategy, in which the role of the plot is given a special attention. The research shows that despite an ever-growing emphasis plot pattern for a long time is not an independent conservation element. The significance of the plot in constituting the “ground” of the historic urban area is largely neglected.

In the Chinese planning system, plot division is directly controlled by the regulatory planning. The significant impact of the regulatory planning comes from three aspects: (1). establishing the standard of plot division, (2). land use zoning and (3). conducting the plot-based control of the spatial form. The regulatory planning does not have a developed standard of plot division. As a result, plot division in the historic urban area was for a long time made in a pragmatic way. What’s more, current land use zoning places too much emphasis on the functional segmentation to depict the form of urban space. In addition, the regulatory planning system shows a deficiency in the control of the spatial form. Through a comparison with typical Form-based Codes, Chinese regulatory planning system should rediscover the significance of the form, especially when it is implemented in the historic urban area.

Land development is another essential factor affecting the plot division. A historical institutionalist (HI) analysis is made on the plot division mechanism, revealing that the radical transformations of the land tenure, economic system as well as planning system since 1949 have generated four typical plot division modes. Despite the big differences in the procedure, the transformation of the four modes manifests a typical path dependence of “enclosure”, through which the megaplot schema has been strengthened. Although the current Land Banking system has established a relative normative procedure of plot division, it still encourages the generation of the megaplot. In addition, plot division is almost made in a top-down way and the self-led renewal of property owners is largely obstructed by the Land Banking system. Thus, it becomes institutionally difficult to protect the traditional small-scale plots.

(5). Comparative research of Berlin’s Critical Reconstruction

The successful reconstruction of Berlin inner city since the German reunification has provided a paradigm that the reconstruction of a new urban center and the refurbishment of damaged historic urban pattern could be well integrated. Despite the institutional and developmental differences, Nanjing can draw key lessons from Berlin in three aspects: the development orientation and main principle, the practical strategy of urban refurbishment and the innovation of the land property system.

The reconstruction of Berlin inner city was made under the guidance of Critical Reconstruction which aimed at a return to the traditional European urbanism. Instead of reconstructing lost buildings or recovering

a nostalgic urban plan, urban refurbishment aimed to mold a history-based but contemporary urban ground plan, in which the refurbishment of the plot pattern is considered as the key factor. According to the differences in development goals and the historical background of individual districts, three typical strategies were developed for the refurbishment of the historic center, the residential redevelopment, and the large-scale commercial redevelopment respectively. As an institutional guarantee, the Federal Building Code establishes an effective mechanism, Land Reallocation (*Umliegung*) for the readjustment of land property and plot pattern.

(6). Strategy for the refurbishment of the historic urban area

Based on the above analyses, the strategy for the refurbishment of Nanjing south historic urban area is finally proposed. Drawing lessons from the Critical Reconstruction of Berlin inner city, Old South area is expected to develop into a culture-led and comprehensive historic urban area which encourages an intensive mixed land use. To realize this development goal, it is suggested to conduct an integrated refurbishment. Above all, the focus should be placed on the refurbishment of damaged historic urban pattern and the integration of urban fragments.

In this sense, it is necessary to establish a set of Form-based Code as an institutional supplement for the regulatory planning system. The form-based control includes three major components, including the street pattern, the plot pattern and the building form. Above all, establishing the standard of the smart plot division is the most important task of the Code.

Smart plot division aims at recovering the plot subdivision and establishing diversified land development modes. It establishes five plot division patterns which correspond to urban areas with different spatial characteristics and development intensity, transferring from the conservation area to the renewed commercial center. As an institutional guarantee, a Renewal Unit system (*RUs*) is expected to be specially established to realize the self-led renewal of small plots, while the megaplot based urban renewal still depends on the Land Banking system.

8.2 Discussion

8.2.1 Transferability of the smart plot division strategy

In recent years, the Chinese central government has started to promote a shift of urban development mode with the encouragement of developing a finer network of urban blocks and streets¹. In 2017 the Program of Ecological Rehabilitation and Urban Refurbishment was launched, stimulating many historic cities to start the process of urban refurbishment. It should be clarified that the elimination of traditional plot subdivision and the prevalence of the megaplot mode is not only a problem of Nanjing but a common problem widely seen in a majority of Chinese cities. In this sense, the smart plot division strategy can be also applied to other Chinese historic urban others with similar problems.

¹ Cf. Kan, H. et al. (2017):757-777.

(1). Prerequisites and targeting areas

One prerequisite for the smart plot division is that the old city as a comprehensive urban area has diversified development requirements. Some cities currently are keen on the reconstruction of their old cities, transforming the comprehensive urban areas into tourist areas or museums. This nostalgic development goal of urban space will obstruct the organic renewal of the historic urban areas, which is essentially not an urban refurbishment. In this sense, the implement of smart plot division becomes meaningless.

On the other hand, the diversified development requirements are based on the protection of the historic urban form. Despite the establishment of the multiple patterns of plot division in response to different development needs, the primary goal of the smart plot division is to recover the plot subdivision pattern in the historic urban area. In fact, in a large number of Chinese cities, only a few small-scale plot patterns survive in the constant urban renewals, while the proportion of megaplots in the historic urban area is too large. Consequently, the refurbishment of these cities should at first improve the proportion of mid and small plots.

Smart plot division strategy aims at the historic urban area. As a designated conservation hierarchy, most of the Chinese historic urban areas range from 10km² to 20km². For a majority of Chinese historic cities (except for ancient capitals like Beijing and Nanjing), this scale corresponds to the scope of the old city. Accordingly, the smart plot division strategy also applies to those old cities having not been designated as historic urban areas.

Smart plot division does not require the urban renewal in the short term but provides a long-term development framework of the urban form. Under its guidance, the damaged plot pattern can be gradually refurbished and the plot subdivision can be recovered. In a majority of Chinese cities, the historic urban areas after renewal are characterized by a modern urban landscape. In some cases, the old city has been totally renewed and taken up by high-rise building groups. Even the control standard of spatial form in the regulatory planning has been changed. It is urgent for these cities to keep the last remaining historic morphological elements. Compared with buildings, the refurbishment of the plot pattern is feasible.

(2). Calibration and integration

The standard of smart plot division is a model ordinance. It is designed to be calibrated to local circumstances, ideally with the participation of the local citizens.

The five patterns of plot division, established based on the situation of Nanjing south historic urban area, provides the diversified urban development scenarios. However, other historic urban areas don't necessarily contain all the five patterns of plot division. The importance of applying the strategy is to learn the principle of the form-based zoning. As the medium and small plots have been replaced by megaplots in many historic urban areas, the focus of the future target areas should be placed on areas where the urban refurbishment is implemented. Thus, the Redivision pattern and the Megaplot (Refurbishment) pattern should be paid more attention. The former aims at the refurbishment of plot pattern in general redevelopment area, while the latter aims at that in the periphery area of historic districts.

The realization of smart plot division depends on the integration with the urban design and the regulatory planning. It is understandable that the control standard of plot shape and building form differs in cities. Accordingly, indexes and their assignment should be calibrated according to local morphological features.

In addition, it is urgent for many cities to make their own overall urban design so that the control regulations could be more pertinent and systematic.

8.2.2 Reflection

(1). The connotations of the plot

The largest contribution of this research is the reflection on the role of plot in molding Chinese urban form. The plot based morphological-institutional analytical framework provides a new perspective for understanding the process of urban renewal in Chinese historic cities. The hypothesis for the analytical framework that the plot serves as the mediator between urban morphology and land development system has been proved by the empirical research of Nanjing. Based on the analytical framework, two important conclusions are made: (1). The renewal of Chinese historic urban area since 1949 is characterized by the elimination of traditional plot subdivision and the prevalence of megaplot; (2). The prevalence of megaplot is in essence affected by the path dependence of Chinese land development system.

Plot pattern as an element of urban morphology

Plot pattern reflects the fundamental characteristics of urban morphology. The spatial mode, consisting of the plot and the buildings on it, provides a spectrum of morphological models on unit plot, helping detect problems that may probably not be observed from the analysis simply depending on the building fabric. For example, it is not easy to see the differences between the historic conservation mode and the traditional courtyard mode from the perspective of building form, but the addition of the plot as a viable makes it clear that the former is based on the megaplot, while the latter based on plot subdivision. Another example is the transformation of commercial spatial modes. It is hard to summarize a law of morphological evolution just according to the change of building types. But the comprehensive analysis combining the plot shape and the building form makes the trend of megaplot schema remarkable.

Plot series is a key morphological characteristic of historic cities. Preserving the plot series is the prerequisite of continuing the historic plot pattern. However, the conservation of plot series was for a long time neglected. In the five typical plan-unit of Nanjing Old South area, plot series is only preserved in Mendong historic conservation unit. Above all, the work-unit mode and microdistrict mode have caused the largest damages on the plot series.

This problem leads to a further reflection on which existing spatial modes fit for the historic urban area. The early work unit mode has declined, but whether the microdistrict mode can be well integrated into the historic contexts requires further exploration. In 2016 China's State Council released a set of guidelines representing a change in the country's approach toward neighborhood design: to move away from superblock neighborhoods and create a finer network of urban blocks and streets. Learning lessons from the comparison with Kyoto and Berlin, a proper spatial mode should be related to the historic urban form, especially the plot pattern. Unfortunately, Nanjing has not developed a spatial mode so far which truly derives from the city's development history.

Plot division as a planning apparatus

The plot is the basic control unit of regulatory planning. That planning takes use of the plot to mold the urban form is mainly reflected in two aspects: plot division and the morphological control on the unit plot. This research shows that it is necessary to establish a specific standard of plot division for areas with special urban form and development requirements. Megaplot is not appropriate to become a predominant plot type in the historic urban area. But the historic urban area should also not blindly pursue the return to a nostalgic urban ground plan. The smart plot division, on the one hand, promotes diversified and mixed land use in the historic urban area. On the other hand, it requires more refined land management system in order to improve the development efficiency.

The analysis of the morphological control of regulatory planning in Nanjing shows that the key to the control lies in the relative position between the plot and the building. The current control method merely relying on the setback line cannot build a clear relationship between the buildings and the plot frontage, which is a key reason for the ambiguous building siting. In addition, the Building Window in German Bebauungsplan provides a good reference to Chinese counterpart. It actually synchronizes the urban design with the zoning system, through which the physical form inside the plot can be accurately controlled.

In addition, the plot should become the platform for information integration. This research faces the problem of data collection that various kinds of plot-related data (land property, land use, and urban form) are distributed in Land Resource Bureau and Planning Bureau and there lacks a unified standard. In this sense, it is necessary to establish a plot-based GIS platform on which the data can be integrated and shared by governmental organizations.

Plot division as a link of the land development system

From the institutional perspective, the prevalence of megaplot can not totally attribute to the land finance. Other influences including the institutional convention and the practical ways of land development control should also be taken a consideration. Consequently, the path dependence of land development system is an essential reason for the prevalence of megaplot. In the period of the command economy, land allocation depended on the administrative power, while the effects of the land market and urban planning were neglected. This rough land development mode led to the disorder of plot pattern and still draws its influences up to now. Plot redivision is essentially the redistribution of land development right. The plot scale actually sets the threshold for developers. The larger a plot is, the higher land transfer fee is. Thus only large developers are capable to buy the megaplot. In many cases, megaplot becomes an approach to improve the normativity of land development, as the large plot size excludes most small developers who are thought by the local government less normative in land development.

Another problem is that the preservation of traditional plot pattern cannot just rely on the government-led plot division. The traditional small-scale plot needs a specific mechanism which encourages the self-led renewal. The formation and development of the historic urban area have proved the significance of a diversified land structure and a large number of small property owners. However, small property owners are not allowed for the self-led renewal currently, as the government doesn't want to authorize the land development right. This institutional difficulty should be solved as soon as possible.

(2). Form-based Code and the refurbishment of the historic urban area

Form-based Code as an institutional guarantee for urban refurbishment

Form-based Code is a typical case of “design by rules”, which requires the urban design to be closely combined with the zoning system and transformed into regulations. This traditional way of urban management has been largely neglected in the period of rapid urban construction. Remarkably influenced by American zoning system, Chinese regulatory planning system emphasizes the control of land development intensity. But since the start of New Urbanism, more and more American cities have made a readjustment about the traditional zoning system and gradually introduced the Form-based Code. As most of the Chinese old cities have finished the large-scale reconstruction, urban refurbishment will become a main trend in the following years. Thus Form-based Code should become an important approach in improving the quality of urban space.

The principle for the refurbishment of the historic urban area

This research proposes the development principle of Nanjing south historic urban area to conduct an integrated refurbishment of the damaged historic urban ground plan. In fact, the concept “city sewing” has been long established. In recent years, some refurbishment practices have shown that urban refurbishment is paid increasing attention (e.g. the reconstruction of Mendong Changledu district). But compared with the Critical Reconstruction of Berlin, it should be emphasized that the plot pattern instead of buildings themselves plays a critical role in the refurbishment. In the case of Pariser Platz in Berlin, buildings around the square were almost reconstructed, characterized by contemporary building form instead of the antique facade. But the square after reconstruction is still full of historical atmosphere. A key reason is the continuation of historic plot pattern.

Another issue is the relationship between the new and the old. One important goal of Berlin’s Critical Reconstruction is making a contemporary architectural experiment in the historic urban pattern. In the case of Nanjing, the road structure and plot pattern have been totally reconstructed, and a majority of new buildings are either with excessive building height and volume or required to adopt the antique style. The question about the relationship between the new and the old still remains to be answered in Nanjing as well as many other Chinese cities. The disordered philosophy of urban redevelopment directly leads to the fragmented urban space. In this sense, the refurbishment strategy of Berlin is necessary to be applied to the practices of Chinese historic cities, although an institutional readjustment must be made for its realization.

8.2.3 Limitation of the research

(1). Limitation of data

The main limitation of the research is the data collection of the urban form. The difficulty of data collection brought about a deficiency both in quality and quantity. Particularly the cadastral map after 1949 is treated as a secret document and not accessible to researchers. Thus the land use map is utilized as a substitution. However, the plot pattern extracted from the land use map has some differences from that of the cadastral map. In addition, the research had planned to depict the morphological transformation with the mapping of

three chronological stages (1949, 1990 and 2010). This research concept finally could not be completely realized due to the lack of map data of the 1990s.

(2). Limitation of technological means

Because of the accuracy of base maps and the huge amount of data processing, the morphological data cannot be totally inputted into the GIS platform. Thus the quantitative analysis of plot pattern at the level of the historic urban area cannot be completed based on the GIS platform. In some cases, the reference value is determined according to typical cases rather than calculating an average value with big samples.

8.3 Outlook

This research establishes a primary theoretic framework for the morphological analysis of Chinese historic urban area, but follow-up studies are expected so that more well-developed theoretical achievements can be made. In summary, there are three major directions critical for follow-up researches, including the relationship between urban morphology and land system; the coordination between plot division and urban design; and GIS-based research of Conzenian urban morphology.

(1). The relationship between urban morphology and land system

The frequent institutional changes since 1949 are the most significant characteristics for the morphological evolution of Chinese cities. This research has made a classification of four typical plot division modes and given a general description for the procedure and specialty of each mode. In the future, empirical researches under specific mode are expected in order to detect a clearer institutional influence path. As the path dependence of “enclosure” originated from the construction of work units and many of them have experienced the second round of renewal since the late 1990s, work unit compound is a very special spatial mode in the old city. Some latest researches have paid more attention to this issue. For example, Zhang and Ding(2018) make an empirical research in Nanjing, focusing on the evolution of plot pattern progressing through the creation and changes in the physical form of work units².

(2).Coordination between plot division and urban design

This research has shown the significance of plot division in creating good urban form. The establishment of Form-based Code requires that urban design should pay attention to the coordination with plot division rather than only coping with the building layout. This is another direction for future research. The Transect of Plot Pattern proposed in this research provides a conceptual framework for the smart plot division in the historic urban area. But more empirical researches are expected in order to clarify how a given mode of plot division can be realized. Plot subdivision, on the one hand, brings about the place diversity. On the other hand, it brings about the higher cost of land management and development. Thus it is critical for plot subdivision to make a balance between creating land revenue and maintaining urban diversity. This kind of research even requires an interdisciplinary support.

² Cf. Zhang, L. Ding, W. (2018).15-34.

(3). GIS-based research of Conzenian urban morphology

The Conzenian urban morphology is usually applied in the research of historic district, while this research tries to expand its application to a larger spatial level, the historic urban area. Because of the huge amount of data processing, this research mainly relies on the detailed analysis of typical districts(plan-units), instead of inputting all morphological data of the historic urban area into the GIS platform. The future research expects an upgrading of the technology platform, namely realizing a GIS-based research of Conzenian urban morphology. Thus the spatial statistics of GIS will improve the quantitative research and the description of overall characteristics for the plot pattern. In addition, the GIS platform can also promote the correlation research between plot pattern, land use, and building form.

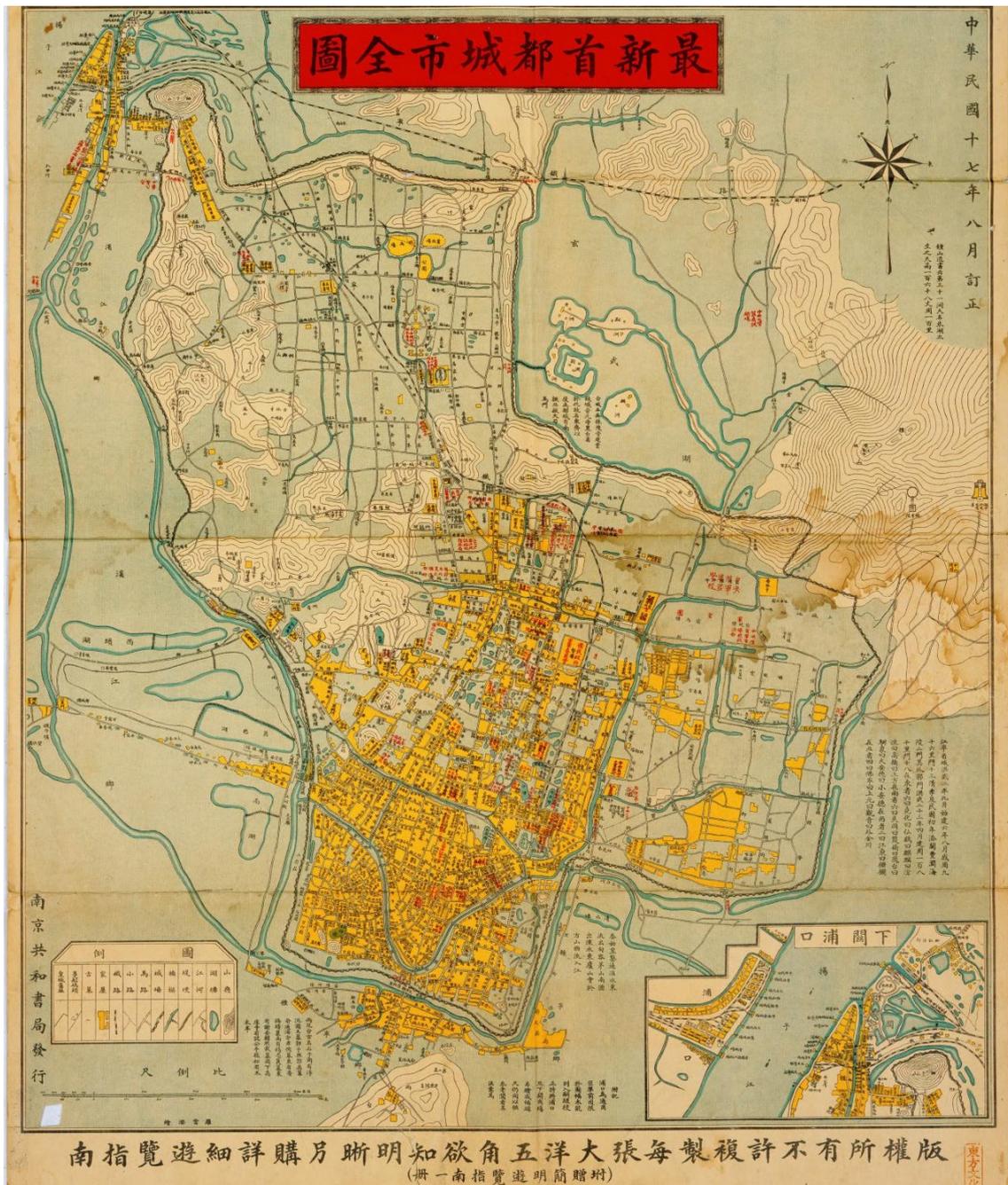
8.4 Appendix

8.4.1 Appendix. 1 Land leasing in Old South area since the establishment of land banking system(2002- 2015)

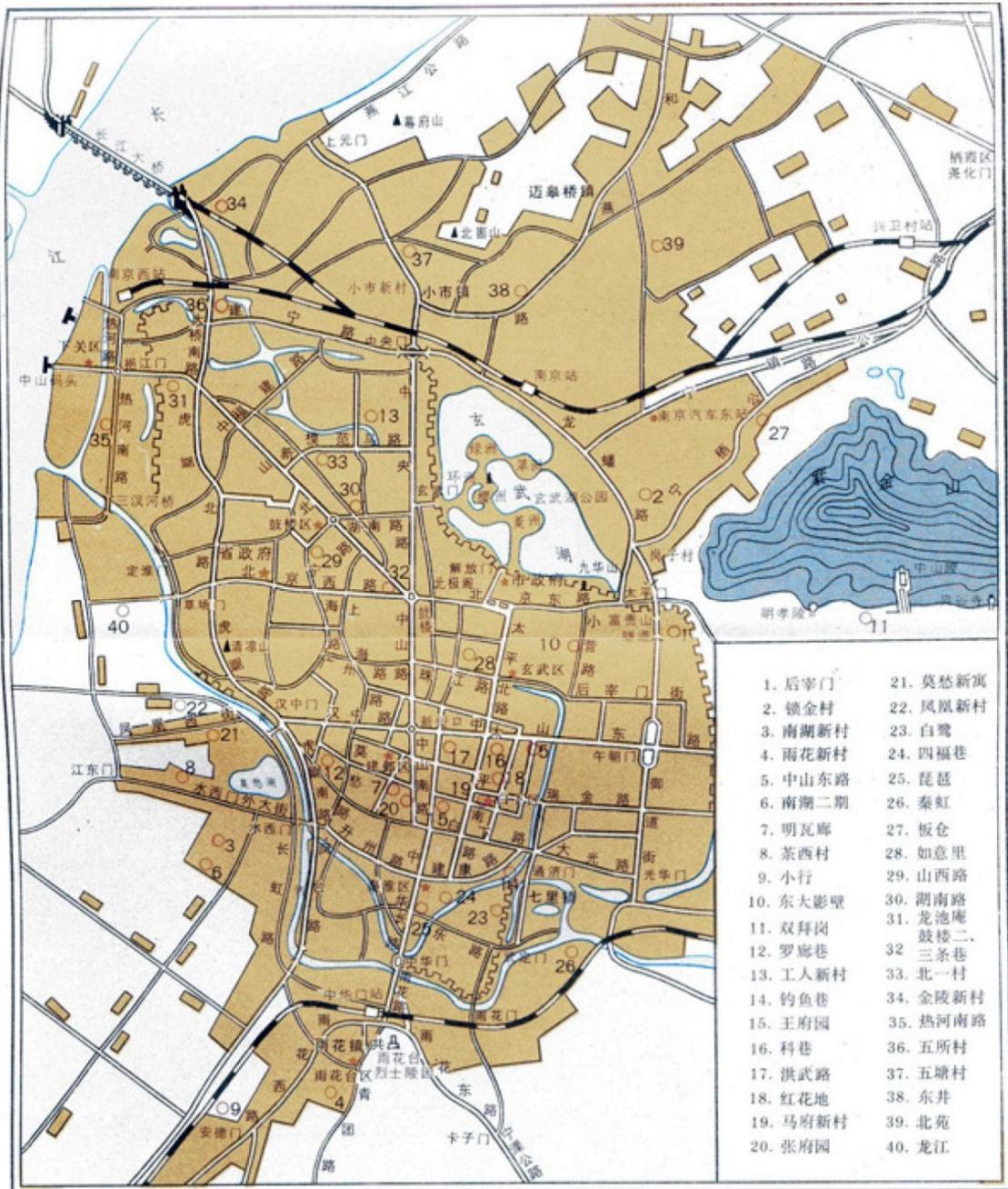
No	Plot	Plot Address	Plot Area(m ²)	Land Use	FAR	Leasing Time
1	2002R25	Madao Str. 88	2544.58	Residence	2.3	2002
2	2002G11	Laifeng Str. 6	7882.7	Residence	1.5	2002
3	2005G13	Anping Street	27324.6	Residence	2.05	2005
4	2005G03	Laifeng Str. 1	13620.3	Residence	1.1	2005
5	2007G37	Liangziying	5256.4	Commerce, business	2	2007
6	2007G59	Changledu	59899.9	Commerce, culture, entertainment, residential	---	2007
7	2007G117	Zhonghua Rd. 26	12723.9	Commerce, business, hotel	4.25	2008
8	2008G18	Yanliaofang	79047.8	Mix of commerce and resi- dence	---	2008
9	2009G11	Zhonghua Rd. 26	12730.7	Residence, commercial	---	2009
10	2010G16	Jiqing Rd. 1	7979.7	Commerce	---	2010
11	2011G56	Ganxi House south	12226	Culture, recreation	---	2011
12	2011G57	Canxi House north	7772.7	Recreation	---	2011
13	2011G95	Jiankang Road Jiaofu Al- ley	13452.5	Commerce, business	3	2012
14	2014G35	Bailuzhou Metrol Station	6130.5	Commerce, business, culture, entertainment	0.95	2014
15	2014G35	Confucius Temple Metrol Station	10752	Commerce, business	2.31	2014

Source: The statistics is based on the records of land leasing published on *Nanjing Land and Resource*, <http://www.jsmlr.gov.cn/gtapp/njxqbjShowListMore.action?&xzqhdm=320100&xsys=1>

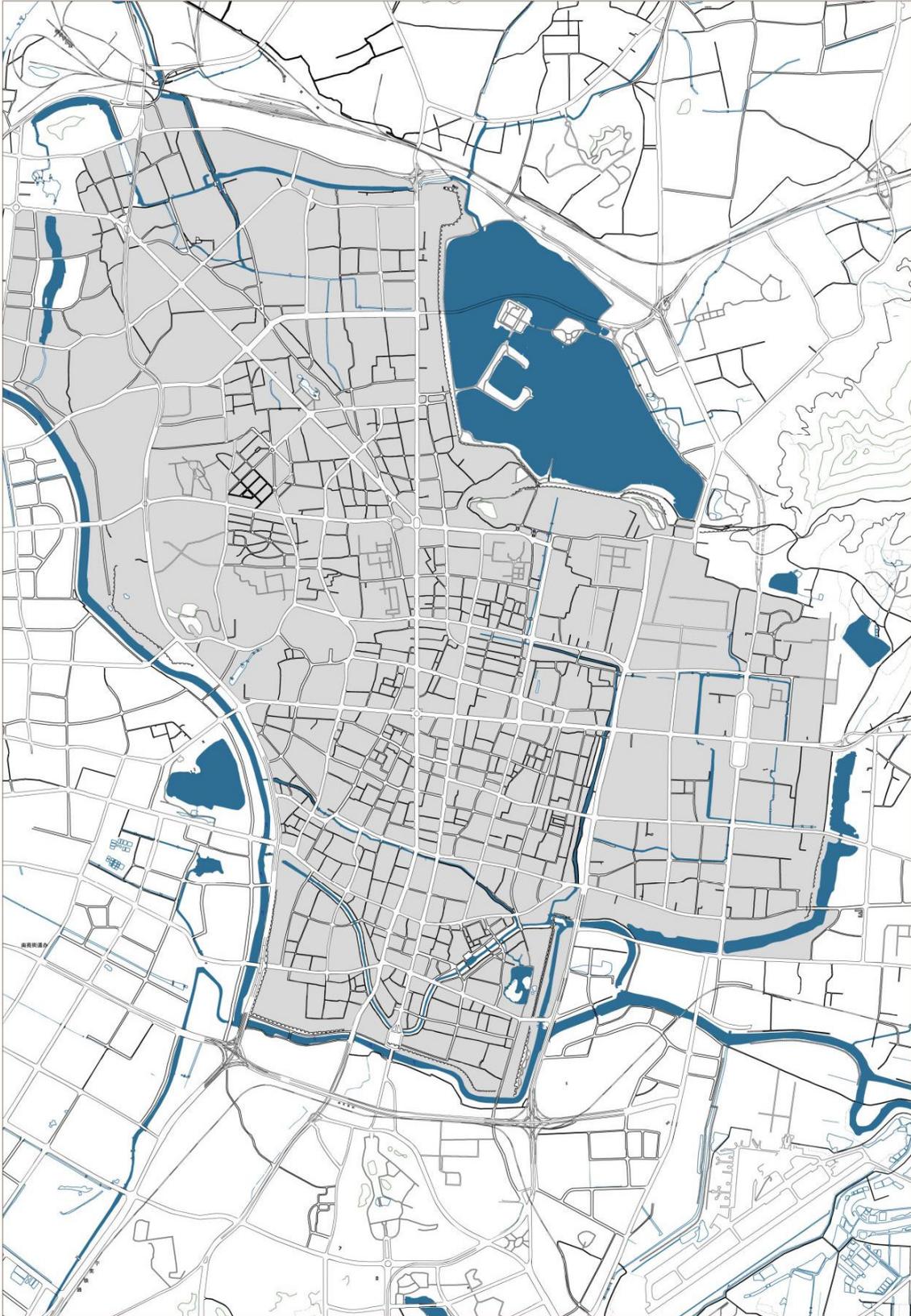
8.4.2 Appendix.2 Base maps for the extraction of morphological information



(1). Nanjing city map of 1928



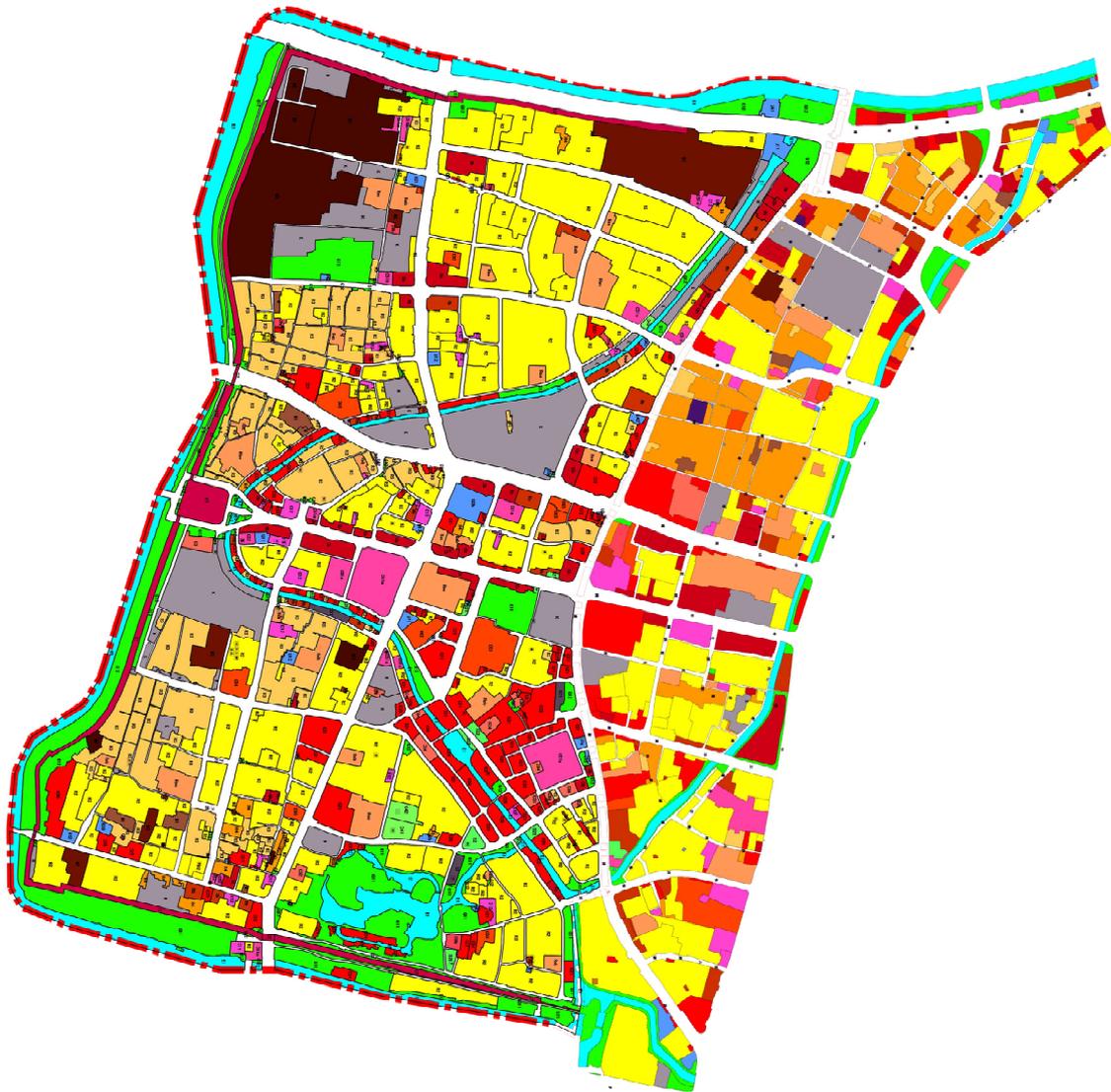
(2). Nanjing city map of 1990



(3). Road map of Nanjing old city in 2005



(4). Cadastral map of Nanjing Old South area made in 1933

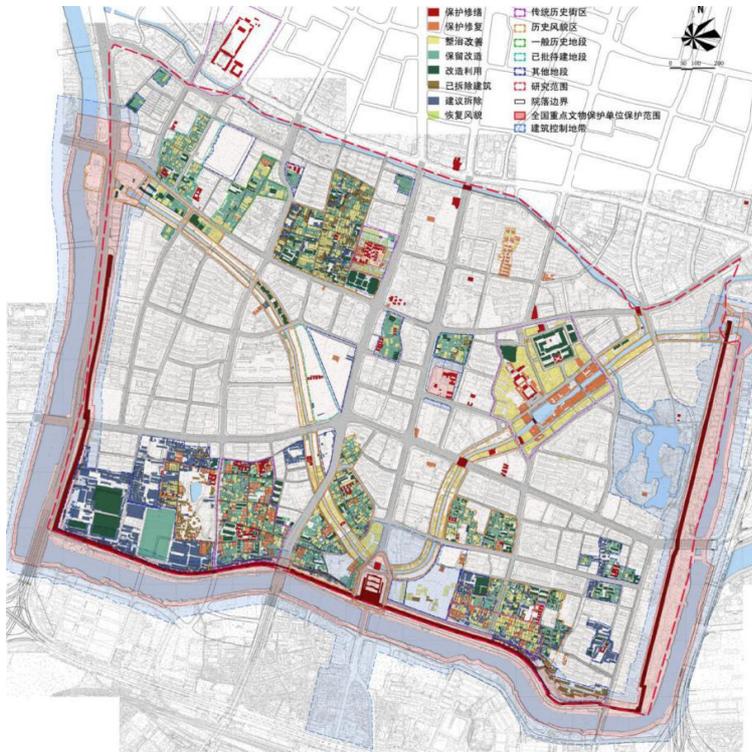


(5). Land use map of Nanjing Old South area made in 2012



(6). Overlapping of the Cadastral map (1933) and Land use map(2012)

8.4.3 Appendix.3 Conservation Plan of Nanjing South Historic Urban Area (2012)



(1). Conservation scope and measures



(2). Overall urban design

Glossary

Building siting

Building siting determines the building position in the plot, which further reflects its relationship towards the urban street. It is generally defined by three major indexes, including building setback, build-to line and building interval.

Building Window

German B-Plan creates an effective but flexible tool, Building Window (*Baufenster*) in controlling the building form, especially the building siting. It sets up a permissible buildable area in the plot where any development has to be located. Building window is defined by two different boundary conditions: build-to line (*Baulinie*) and setback line (*Baugrenze*). Setback line (*Baugrenze*) delimits the scope that buildings and their parts can not extend beyond. In contrast, the front facades of buildings must be directly positioned on the build-to line instead of staying behind.

Comprehensive development

Comprehensive development mode, prevailing from the 1980s to the early 1990s, was established under the state ownership and the command economy. This development mode combined housing construction and infrastructure construction together, effectively promoting the implementation of master plan.

Critical Reconstruction

Originating in IBA Berlin 1987, Critical Reconstruction was the main principle in guiding the reconstruction of Berlin inner city since German reunification. Its essence is a return to the traditional urbanism, which is predominantly represented as the refurbishment of historic urban ground plan.

Form-based Code

The Form-based Code is defined as a land development regulation that fosters predictable built results and a high-quality public realm by using physical form (rather than separation of uses) as the organizing principle for the code. It is not mere design guidelines, but a regulation adopted into city, town, or county law, which makes it a powerful alternative to conventional zoning regulation.

Historic urban area

The concept of historic urban areas was first proposed by Washington Charter in 1987, for the purpose of protecting areas embodying the values of traditional urban cultures. It was officially accepted as an independent conservation level in Chinese urban conservation system in 2005.

Historical institutionalism

Historical institutionalism (HI) is considered as a social science methodology focusing on the innovation, continuation and change of institution in different times. It includes two related but analytically distinct claims, the critical junctures and the developmental pathways.

Megaplot

According to empirical research of Nanjing Old South area, megaplot has four connotations: (1). The basic scale of megaplot in the historic urban area is defined as 5000m²; (2). Megaplot-based development generally follows the principle of Six Unification; (3). The building form of megaplot-based development shows an inclination of closure and self-sufficiency; (4). Megaplot schema originates from the Work Unit spatial mode.

Microdistrict schema

Microdistrict schema was first introduced from Soviet Union in middle 1950s and became the predominant planning model for urban residential development all over the country since the 1980s. It is a self-contained residential complex, typically covering the area of 10ha and providing dwellings for a population of 10000-15000.

Land Banking system

Land banking refers to the process in which local government purchase land from previous users, convert it to productive use, or hold it until it is profitable to sell. It is composed of four main stages: land expropriation, land arrangement, land reserve and land supply.

Land Reallocation

As a regulation set in the Federal Building Code, Land Reallocation (*Umlegung*) is defined as follows: in order to reorganize or redevelop areas, it shall be permissible for both developed and undeveloped land to be reorganized through reallocation in such a manner as to create plots that are suitable in terms of location, shape and size for built development or for other uses.

Land Use Right system (LURs)

The amendment of Chinese Constitution in 1988 added the clause that the land use right can be transferred in accordance with the law, marking the reconstruction of Chinese land market. Although private ownership of land is not possible in China, LURs separated the land use right from land ownership, thus making it is possible for the land use rights to be privatized.

Negotiation

Negotiation mode was the predominant way of land leasing since the establishment of Land Use Right system in the 1990s. Conditions and requirements of land development are made through the negotiations between the government and the developers.

Path dependence

In the institutionalism, path dependence suggests that institutions continue to evolve in response to changing environmental conditions and ongoing political maneuvering but in ways that are constrained by past trajectories.

Plan-unit

Plan-unit is an individualized combinations in different areas of the town, which derives uniqueness from its site circumstances and establishes a measure of morphological homogeneity or unity in some or all respects over its area. It contains three distinct complexes of plan elements: street pattern, plot pattern and building footprints.

Plot pattern

When considered separately from other elements of the town plan, the arrangement of contiguous plots may be called the plot pattern. The morphological characteristics of plot pattern include both the plot shape and the relationship between plots and the block plans of buildings.

Plot redivision

Plot redivision refers to the procedure of land redistribution in redevelopment area, which is influenced by multiple institutions including given property system, land development mode as well as planning system.

Plot series

A row of plots, placed contiguously along the same street-line, each with its own frontage, forms a plot series.

Road density

Road density can be calculated according the equation: $DR=LR/SP$, where DR is the road density; LR is the total road length of the plan-unit; SP is the area of the plan-unit.

Regulatory planning system

Regulatory plan is the statutory planning in China, equivalent to the zoning system in US or Bebauungsplan in Germany. It is the major planning tool in controlling the land development. The main control elements of regulatory planning include land use, plot division, development intensity as well as physical form.

Six Unification

Six Unification was originally proposed in the 1980s as a basic principle of comprehensive development. It means the unification of planning, design, investment, construction, distribution and management.

Spatial mode

This research defines the synthesis of a plot and buildings on it as the spatial mode, which provides a morphological model based on unit plot. The whole historic urban area are composed of several types of spatial

modes. The transformation of urban form then can be explained by the development of specific spatial modes.

Overall conservation

The conservation plan of Nanjing in 2010 proposed the overall conservation strategy of the historic urban area. The focus of urban development transformed from the renewal to the conservation. Under the guidance of overall conservation, the urban refurbishment was made, focusing on the integration of urban pattern and the return of traditional scale.

Transect of Plot Pattern

In order to recover the plot subdivision and establish diversified land development modes that are suitable for the historic urban area, a Transect of Plot Pattern is proposed as the principle of smart plot division. It consists of five scenarios from the conservation areas to the redevelopment areas, including (1). Historic pattern; (2). Hybridization pattern; (3). Redivision pattern; (4). Megaplot based refurbishment and (5). Megaplot based redevelopment.

Typo-morphology

Since the 1990s the typo-morphological studies has been established, seen as the integration of the two major schools of urban morphology and building typology. It describes urban form (morphology) based on detailed classifications of buildings and open spaces by type (typology). The type here becomes a morphological model for the interpretation of the forms.

Urban morphology

Urban morphology is the study of the form of human settlements and the process of their formation and transformation. Form, resolution and time constitute the three fundamental components of urban morphological research.

Work Unit

Work unit (*Danwei*) refers to a place of employment during the period when the Chinese economy was still more heavily socialist. Prior to Chinese economic reforms in the 1980s, it acted as the first step of a multi-tiered hierarchy linking each individual with the central Communist Party infrastructure. Most factories, schools and government offices were organized under this system.

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ABSTRACT

China's historic cities have experienced drastic transformations since the socialist revolution of 1949. One essential change in this regard is the reconstruction of the prevalent land plot pattern; the historic plot pattern has been heavily damaged by constant urban renewals, as oversized plots, deriving from amalgamation of previous small plots, have become a prominent feature of contemporary historic urban areas. The damage to the historic plot pattern has shown that the current plot division mechanism does not support the conservation of historic cities. Taking Nanjing's Old South area as an example, this research analyses the changes in and problems with the plot division mechanism since 1949 and its impact on urban forms. Changes in the plot division mechanism show that megaplots have been a constant in the ever-changing land development system since 1949, leading to elimination of historic land subdivisions and to inefficient regulatory planning with limited affordances. In this sense, it is necessary to establish a set of smart plot division strategies to promote the refurbishment of this historic urban area. The essence of the strategy proposed here involves five patterns of plot division, corresponding to different land development requirements and morphological zones.



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