

Urban Industrial Zone Renewal and Spatial Game in China

A case study of Eastern Suburb Industrial Zone in Chengdu

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Keywords: urban form, urban landscape, industrial renewal, spatial game, morphological frame.

Abstract: The change of system constantly reshapes the urban form of China after 1949, among which the renewal and transformation of industrial zones is a typical phenomenon in the changing process of urban landscape in recent years, which centrally reflects the development characteristics of contemporary Chinese cities under new social background. From the perspective of spatial game, this paper studies and interprets the changes of urban form and the causes of these changes in the renewal process of industrial zones on the basis of the existing morphological frame and material landscapes, so then shows the particularity and complexity of the process of urban spatial reconstruction with current Chinese characteristics.

1. Introduction

Different social systems and economic development levels determine the pattern of urban development, and thus bring out different urban forms and urban landscapes. Industrialization was the main construction and development mode of PRC after 1949 when it was founded with planned economy. In order to consolidate the socialist regime and change the backward productivity in China as soon as possible, the state has systematically laid out the overall objectives for the development of industry, especially heavy industry, and has formulated key city construction systems in accordance with the nature of cities and the proportion of industries (Tab. 1). During the first *five-year-plan* of 1953-1957 and the *third-front movement* of 1964-1980, it was the peak period for the state to concentrate on investment and construction of industrial projects, which significantly improved the level of industrialization and urbanization in China. This short 30-year process has laid an important material and institutional foundation for China's current modernization direction. At the same time, the spatial form and social structure of traditional Chinese cities have undergone rapid and tremendous changes in this process. Industrial zones, as a new type of urban landscape, have centrally emerged.

After 1978, China started its period of Reform and Opening-Up as well as market economy which led it entered into rapid development. The state-owned enterprises, which were still under the old organizing as well as management system, generally encountered difficulties in operation and development. Through constant policy exploration and adjustment, the state has vigorously reformed the management system and mechanism of state-owned enterprises, enabling some enterprises to gradually establish modern enterprise system into the market ranks,

Table 1. *Key city systems formulated in 1952.*

Type	Nature of cities	Characteristics and proportion of industry	Cities
I	Key city	City with heavy industrial (8)	Beijing, Baotou, Xi'an, Datong, Qiqihar, Daye, Lanzhou, Chengdu
II		Reconstructing city with large proportion of industry (14)	Jilin, Anshan, Fushun, Benxi, Shenyang, Harbin, Taiyuan, Wuhan, Shijiazhuang, Handan, Zhengzhou, Luoyang, Zhanjiang, Urumqi
III		Old city with small proportion of industry (17)	Tianjin, Tangshan, Dalian, Changchun, Jiamusi, Shanghai, Qingdao, Nanjing, Hangzhou, Jinan, Chongqing, Kunming, Neijiang, Guiyang, Guangzhou, Xiangtan, Xiangfan
IV	General city	Non-industrial city	Cities other than the 39 cities mentioned above

while others have withdrawn from the historical stage; at the same time, with the rapid growth of the tertiary industry, industrial construction has ceased to be the dominant mode of urban development; the establishment of the urban land market and the introduction of capital have led to the replacement of the use of urban land based on land price. These comprehensive factors triggered the retreat, transformation and renewal of the original urban industrial zones, and then led to intense spatial reconstruction, which gradually changed from homogeneous industrial landscape to heterogeneous and diversified urban landscapes.

2. Definition and application of the concept of spatial game in this study

The original meaning of the word *game* is playing chess. It can be extended to a process in which one or more people or teams with absolute rational thinking using their own permissible behaviors or strategies to fight or compete with each other and implement them, and then obtain corresponding results or benefits from each other under certain rules. The fundamental reason for game is the limitation of resources, and the fundamental motivation is to maximize and rationalize people's interests. Spatial game is a game based on certain resources or forces in a certain space. It is a wider phenomenon and exists among different groups in various aspects of human survival and activities, such as politics, economy, military and even biology.

In this study, the definition of spatial game is as follows: it is a process of land redistribution and rebuilding of a specific built environment into a new and stable spatial state of urban form characterized by town-plan, land use, architectural texture and so on, led by new space participants with new interest demands which would take different ways and forces of action and are restrained or supported by the existing urban morphological frame and material landscapes foundation so that morphologically make breakthroughs, continuations or adaptations to the original space, under the change of social, economic, cultural and other background factors.

It can be seen that spatial game is a causal process in which people interact with physical environment as well as the new interact with the old, so that specific results are produced. Therefore, it includes three levels: participant level, force level and landscape level. In the process of reconstructing the industrial area, the new spatial participants, under their interests, compete with the original spatial form which has a certain restrictive role through different forces, and ultimately lead to different forms and landscape representations. Only from these three levels can we fully understand the particularity of urban form change in the reconstruction of built environment such as industrial zone renewal, and then recognize the characteristics and laws of contemporary urban development in China.

3. The motivation of spatial game in Eastern Suburb Industrial Zone

3.1. Background of Eastern Suburb Industrial Zone

The construction of Eastern Suburb Industrial Zone has undergone an important historical process in contemporary China. In 1953, Chengdu, one of the 8 heavy industrial cities, began its planning and construction of industrial zone with machinery, electronics and instrumentation as the main components. In 1955, with the approval of the central government, industries were arranged along the Sha River in the eastern suburb of the old urban area, as the starting point of Chengdu’s modern industry (Figure 1). Since then, Eastern Suburb Industrial Zone has experienced expansion: during the *third-front movement* from 1960s to 1970s, a number of key military enterprises moved into this area; in the 1980s, during the period of adjustment and transformation of the *third-front*, a large number of enterprises moved in again, and the industrial scale of Eastern Suburb reached its peak in history, becoming an important industrial area in southwest China. More than 200 large and medium-sized enterprises and scientific research institutes have been gathered in Eastern Suburb, with hundreds of thousands of employees. By the 1990s, the total output value of this industrial zone accounted for 52.4% of the city’s industry and 75% of the city’s state-owned industry.

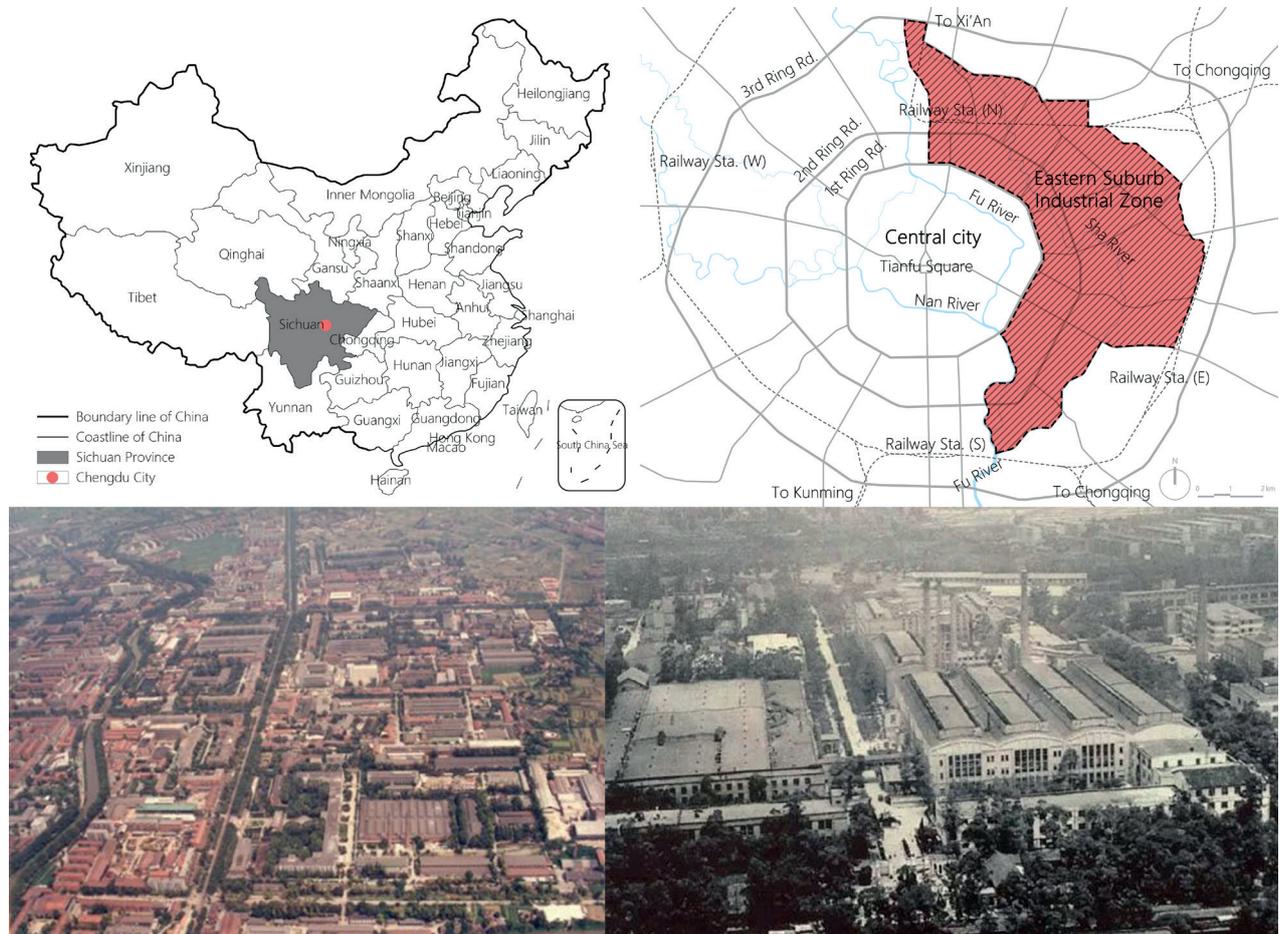


Figure 1. Geographical location and historical images of Eastern Suburb Industrial Zone.

3.2. Reasons for the renewal of Eastern Suburb Industrial Zone

Since the 1990s, with the establishment and continuous improvement of the socialist market economic system, China's society, economy and culture have entered a new stage of development, and the structure and organization of the national economy have undergone institutional changes. The change of system has caused the change of urbanization process and pattern, and also changed the fate of urban industrial zones. Specifically, the objective factors to promote the renewal and transformation of Eastern Suburb are as follows.

A. Social institutional factors

The state-owned enterprises established under the traditional planned economy system depend on state investment, which is not only the social production unit, but also the important social organization and the supply unit of living welfare. In the process of deepening the market economic system, this so called *danwei* (the unit) system has been gradually broken down, and profit has become the sole purpose of enterprises. Due to the gradual withdrawal of state supply, a large number of state-owned enterprises in Eastern Suburb were difficult to adapt to this new social system and market environment, and many enterprises got into a loss predicament or even bankruptcy. This forces the government to adjust the local industry as a whole and reform the system of state-owned enterprises.

B. Urban economy and development factors

Since the establishment of market economy, various types of capital have appeared one after another, and various forms of tertiary industry, especially real estate industry, have become the leading force of the economy and development of an urban. At the same time, the system of compensated use of urban land enables capital to acquire the use right of specific urban land through bidding, thus forming the characteristics of urban spatial evolution in which land value determines the form of land development. Obviously, the old industrial land with centralized, continuous and inefficient output hinders the capital input, affects the development of urban economy, and greatly limits the direction of urban expansion. At the same time, the aging infrastructure has aggravated the imbalance of urban development. These factors prompt the government to relocate the original enterprises and replace the original industrial land, that is, urban renewal. Especially in recent years, with the opening of Chengdu East Railway Station and the proposal of the strategy of *expanding eastward*, the land value of the industrial zone in Eastern Suburb has been rising, which has accelerated the pace of urban renewal and capital injection.

C. Environmental and residential factors

The negative impact of industry on the urban environment has begun to be paid increasingly attention, to control industrial pollution has become an inevitable trend. In addition, the surge of urban population also promotes the improvement of living environment. Since 2001, the urban population of Chengdu has risen rapidly from 10.2 million to 16.33 million in 2018, people's requirements for living environment and quality have been continuously improved. This requires the government not only to relocate industries, but also to restore ecosystems and to

provide green space, while improving and upgrading urban infrastructure and living services facilities.

D. Cultural factors

Eastern Suburb Industrial Zone is associated with important historical events, forming a number of industrial heritages with the characteristics of the times. Owing to common and special production and living experiences, ordinary citizens or workers in old industrial zones have specific collective memory and historical feelings towards Eastern Suburb; for the government, Eastern Suburb is also the cultural symbol of urban civilization and the propaganda tool of urban image; for the capital involved in this area, the historical trace is the embodiment of land value and cultural connotation in some cases. These cultural factors play an important role in the process of renewal of industrial zones in Eastern Suburb.

It is against these backgrounds, that in 2001, the city government of Chengdu initiated and led the industrial restructuring strategy of the whole city, which was driven by the transformation of Eastern Suburb, and carried out the overall relocation and transformation of enterprises in the eastern suburb. Over the past few years, more than 100 enterprises have moved to farther suburbs, accompanied by the reform of the enterprise system, while other enterprises with backward production capacity have been eliminated. At the same time, the government brought Eastern Suburb Industrial Zone into the overall development pattern of the city and re-planned it. All kinds of forces entered it one after another. Thereafter, the spatial game began and changed the urban form and landscape of this region greatly in just over 10 years.

4. Patterns and results of spatial game in Eastern Suburb Industrial Zone

In fact, spatial game is a process of spatial reconstruction in which participants with new spatial demands overcome the existing built environment with certain particularity and complexity. Restricted by the limited land and the existing morphological frame, different participants participate in the spatial game in different forms according to their own needs, and thus produce different shape results in the process of land redevelopment, so as to achieve the final balance of the game.

4.1. Participants in spatial game

In the spatial game, the groups that play an important role in urban form are mainly composed of three parts: the managers, owners and users of urban land, whose behaviors run through the whole process of decision-making, management, sell, development as well as use of urban land and so on, and directly or indirectly determine the morphological results of the spatial game.

A. Managers of urban land. The government is the decision-maker, promoter and leader in the whole process of industrial zone renewal, and also the provider of land and the formulator of land development rules. Through the formulation, implementation and control of planning, the utilization of urban space is balanced in the most optimal way among various stakeholders, with relative public welfare, fairness and authority. In China, nothing is more powerful than the government.

B. Owners of urban land. Including the government and its affiliated social institutions and various types of capital subjects, which correspond to two different ways of land acquisition,

namely, government agencies' land acquisition through the allocation of higher government; capital subjects under different forms of ownership, such as state-owned enterprises and private enterprises, acquire urban land through selling by government. These two different ways of land acquisition determine the different contents and requirements of land development. Land owners with government agencies as the main body pursue the public welfare of land, while land owners with capital as the main body pay more attention to the profits brought by land development. At the same time, the relationship between different government agencies is synergistic, while the relationship between different capital is more competitive. These are also the main forces that decide the changing intensity of the original spatial form and landscape in spatial game.

C. Users of urban land. In addition to the land owner's own right to use the land, the public is the largest group of urban land users, and also the direct group-oriented public attributes of the city, so it has a demand for the service and public welfare of the city. Because of the private nature of capital, in the development and use of urban land, public demands are often checked and balanced with capital, with the intervention of the government and relevant laws and regulations.

4.2. Morphological result of spatial game: an investigation at different levels

The renewal of industrial zones in Eastern Suburb is not only a process of reconstructing the urban landscape in a local area, but also a process of reconstructing the relationship between the local and the whole city. Through the analysis of the participants and their demands in spatial game, and based on the current situation of urban landscape, this study makes a textual research on the characteristics of urban form at different spatial levels such as city, land and building, which can interpret the different forms and characteristics of spatial game in the renewal of industrial zones, and then judge its impact and role on urban development.

A. Morphological frame and characteristics of overall plane

The important position of Eastern Suburb Industrial Zone in the development of Chengdu City has laid an important influence on the urban form, which also determines the particularity of the spatial game process. It was built on the basis of the countryside adjacent to the city. Besides the river system, there were fewer constraints. In planning and construction, *danwei* was used as land use unit (which is divided into production area and living area) to organize space together with each other, and gradually formed a morphological frame with roads, *danweis*, railway lines and natural river courses as the main elements. The industrial zone was roughly the area outside (to the east of) today's 1st Ring Road, the boundary. In order to connect the life of factories with the life of cities, and to place the production part relatively far away from the city center as well, most factories' production areas and living areas were separated. With today's 2nd Ring Road as the demarcation line, the production areas of factories were centralized outside the 2nd Ring Road, while the living areas were arranged outside the 1st Ring Road and inside the 2nd Ring Road.

Therefore, there are distinct differences in land use and urban landscape between the inner and outer parts of the industrial zone. The plots inside the 2nd Ring Road are smaller and more regular in shape; the roads basically follow the chessboard road network structure of the old urban area; the residential buildings organized by courtyards are the main texture of the city; and the urban landscape is the continuation of the old urban area. Outside the 2nd Ring Road,

according to the different nature and scale of industry, the size and shape of plots are quite different; the main roads are divergent and assume the function of regional connection channels outside the city; the texture is medium and lower density industrial buildings; because the area has not been fully developed, the outer the more dominated by mixed rural landscape. This difference in the morphological frame will have different impacts on the way of urban renewal.

B. Urban/area level

At the urban level, with the large-scale relocation of enterprises in this area, urban infrastructure led by urban roads invested by the government has been rapidly introduced. Especially since 2011, with the opening of East Railway Station, the largest transportation hub in Chengdu, the location conditions in the eastern part of the city have been fundamentally improved, and at the same time, it has also led to the speed of renewal. In 2017, the city government put forward the strategy of *expanding eastward and southward, controlling westward, reforming northward, and promoting the middle*, further clarifying the main development direction of the city towards the south and the east including Eastern Suburb, in the form of official will. This objectively improves the location advantage of East Suburb Industrial Zone in transforming to the capital-centralized land types of commerce, commerce and residence.

In urban form, the first change is the change of the morphological frame to a certain extent: the road system of this area especially in the production area, is constantly improved, and the road network is more closely linked with that in the urban central area, and a number of main roads are built to radiate to the urban periphery; the original undeveloped rural land is gradually introduced into the urban road and becomes the undeveloped land; some of the railway lines and freight yards used for transporting goods were dismantled. With the introduction of multiple metro lines, the east-west direction of the city has been connected by rapid traffic; high-density commercial and residential land gradually replaced the previous industrial land, and diversified urban functions and landscapes gradually penetrated into the east (Figure 2). From a macro point of view, in the past decade, the decision-making and implementation of the overall development of Eastern Suburb led by the city government have achieved immediate results. Such results are not only driven by the objective law, but also inseparable from the strong political foundation and power guarantee of the local government.

C. Block level

The replacement and implantation of new urban functions and the original plots of this area have produced different degrees of game and caused spatial reconstruction. Because of the overall relocation of production areas, the changes are more thorough, while the living areas are less affected because they mostly continue the residential functions of the original workers. The way and strength of reconstruction are related to 2 factors: the original morphological framework characterized by trunk road system restricts the new types of land blocks, and the changes of land blocks mainly occur on the side of non-trunk roads; at the same time, they are related to the conformity of new and old land blocks in land use scale or shape. In addition to those unchanged plots, the common forms are the segmentation and merging/recombination of the original plots and the accompanying enhancement of development strength as well as replacement of land types (Figure 3).

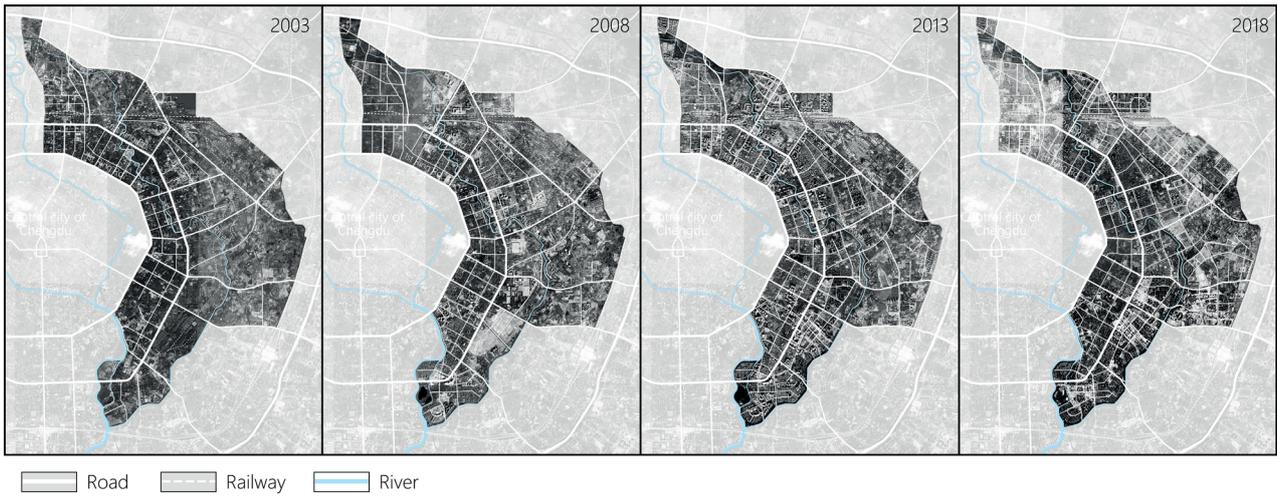


Figure 2. *Evolution at the urban level.*

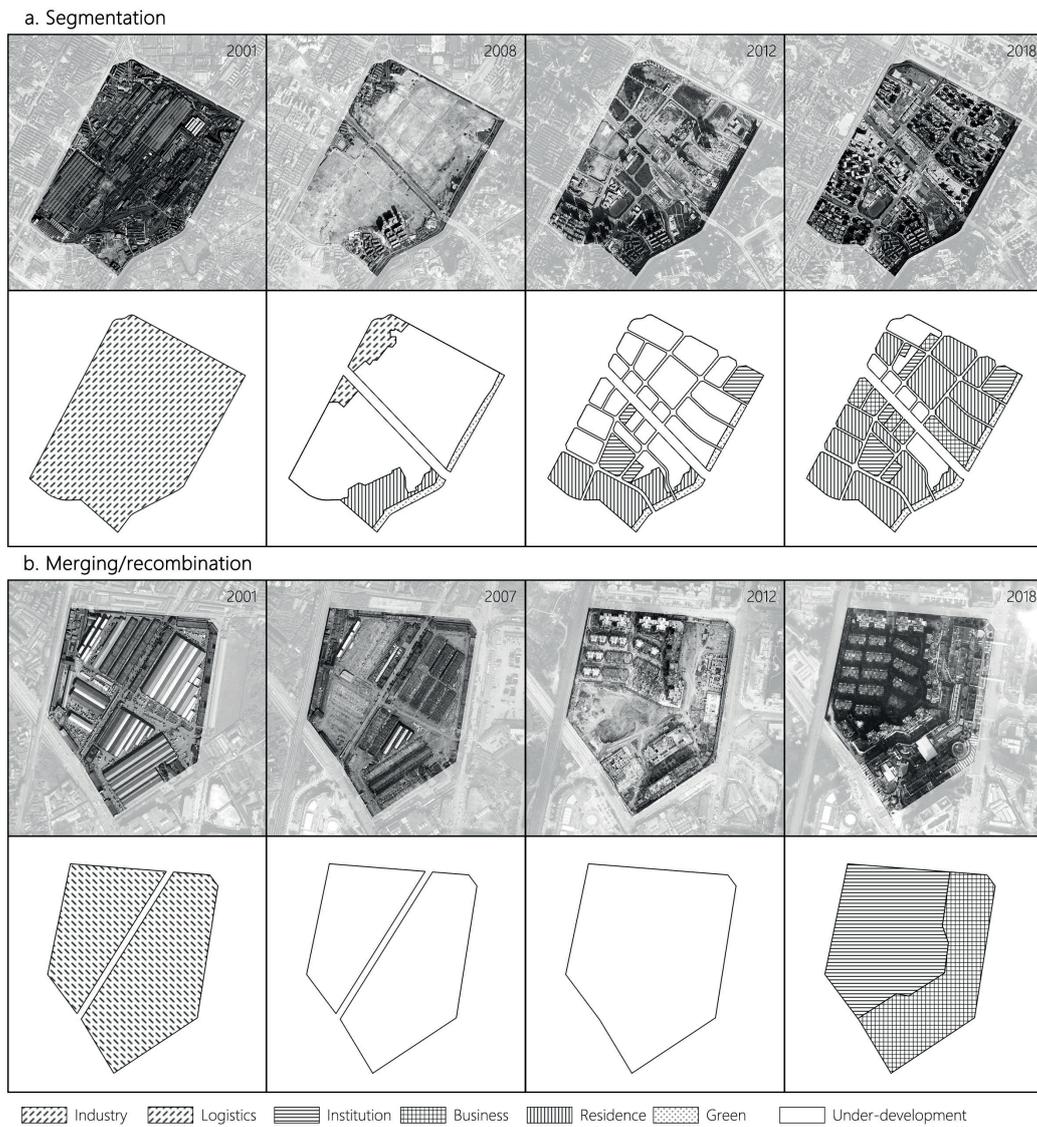


Figure 3. *Evolution at the block level (a. Segmentation; b. Merging/recombination).*

a. Segmentation

This is the most common situation in the spatial reconstruction of industrial zones, which generally occurs in a large production or living land, i.e. *danwei*, which belongs to the same property right subject. Due to the transfer of all or part of the functions within the original plot and the substitution of other functions, in order to organize transportation, equalize the scale of land and facilitate the selling of land, the original *danwei* plots have been taken different forms of segmentation. On the one hand, block segmentation needs to be combined with the organization of surrounding roads, especially with high-grade roads. On the other hand, it sometimes follows the road or space division within the original block to a certain extent, because the factory has a certain logic of space utilization in its space organization. The most typical example is the former Chengdu Seamless Steel Tube Plant.

b. Merging/recombination

Contrary to segmentation, some fragmented areas need to be integrated to form new ones of moderate scale and easy to use. Because the original plots in the industrial area are generally more regular and large-scale, this situation is less. Typically, the demolition of the railway line is characterized by the fact that the plots originally located on both sides of the railway line can be merged into one plot, or occasionally occur between two plots divided by roads. After merging, a new unit of space utilization has been formed in the original land with different ownership, the reorganization of the interior space of the plot will be more thorough.

D. Building level

Compared with the change of plot, because of the different demands of different participants, the change at the building level is more significant, and there are several forms, such as substitution, transformation and preservation. Overall, the areas outside the 2nd Ring Road are more thoroughly replaced, while the areas inside the 2nd Ring Road are more retained. There may also be both ways of substitution and transformation within the same plot, which depending on the value of the original plot's internal buildings and their value in the new land development (Figure 4).

a. Replacement

As the most typical type of way, it is also the most direct result of industrial zone transformation. Industrial buildings in the production area are generally demolished and replaced by institutional, commercial or residential buildings, also, landscapes have been updated. There are fewer substitutes for buildings in living areas. Some commercial buildings originally belonging to factories and serving the family members of workers are purchased and rebuilt by external capital. The development intensity of buildings after substitution has been generally increased a lot compared with the past because of the need for profit-seeking of capital, which reflects the directive force power of capital in the space game under certain space conditions, and achieves the game results that are most conducive to the realization of profits.

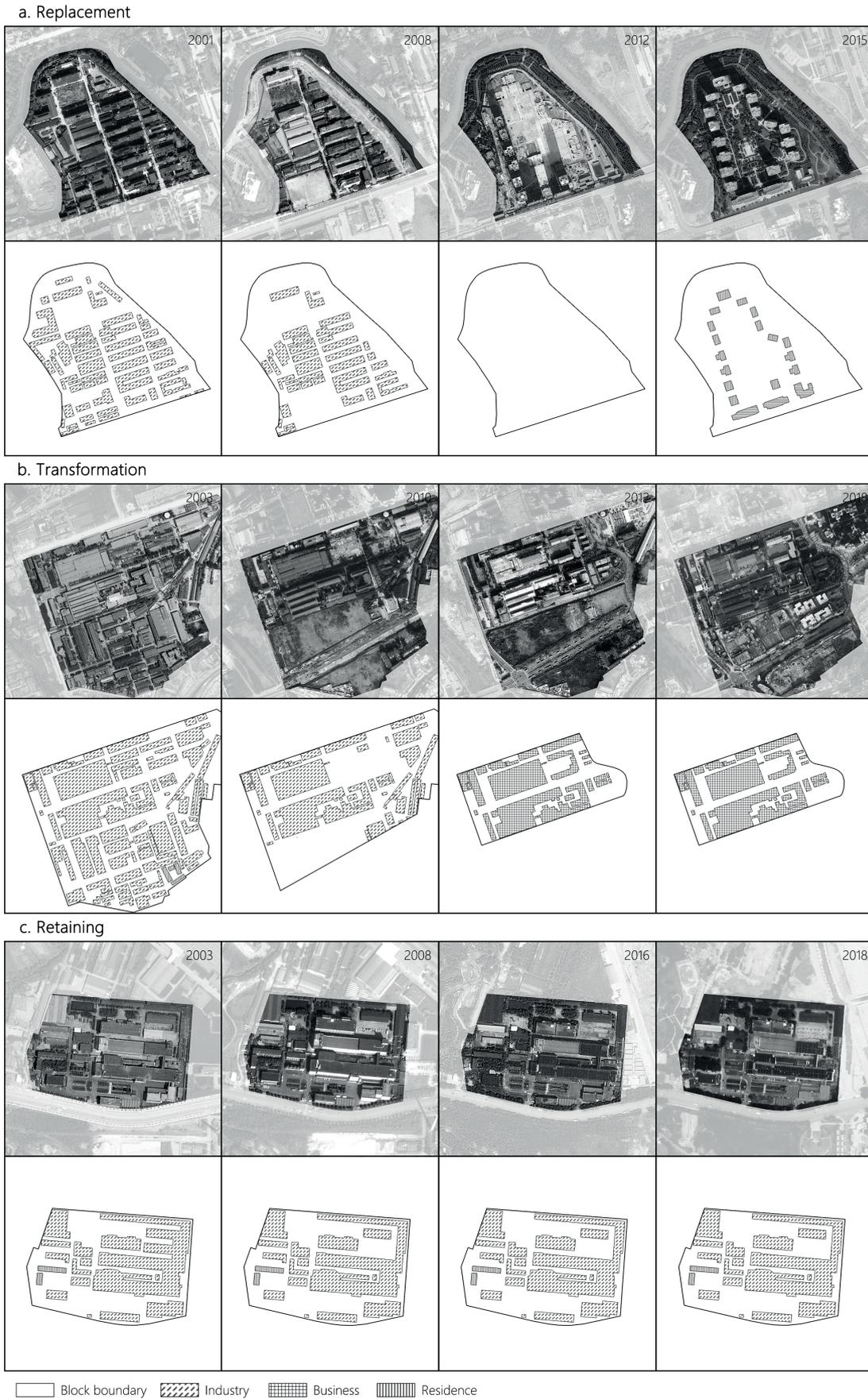


Figure 4. Evolution at the building level (a. Replacement; b. Transformation; c. Retaining).

b. Transformation

Some of the original buildings with better quality have certain use value because they are consistent with the interests of land development. They are not demolished with the relocation of industrial zones, but transformed into commercial services under the function of capital. Most of them are office public buildings. In addition, under the influence of public demand for collective memory for Eastern Suburb, some industrial buildings have been preserved and protected by the government as historical buildings. At the same time, they have been transformed and utilized by injecting commercial capital, making them monumental public spaces serving all citizens, and realizing the public welfare transformation of the functions of the original industrial buildings. Such examples include the theme park of *Eastern Suburb Memory* transformed from the former Red-light Electron Tube Factory.

c. Retaining

Only a few enterprises did not relocate because of some special reasons such as policies, production nature and conditions. They remained in the original site to engage in production as a whole or in part, while slowly realizing self-renewal. In addition, in the living areas inside the 2nd Ring Road, due to the high cost of relocation of residents, the workers' residential buildings originally belonging to the factories are generally retained, but they are separated from the original factories in the management system and become part of the urbanization management. Although the building itself has not changed much, the landscape and social structure of these large number of workers' living areas are gradually approaching to the city core because the existence of the relationship between the construction and organization of the original *danweis* has been no longer existed, and then the alienation of the industrial landscape unit to the urban landscape unit is manifested in the form.

5. Summary

From the perspective of the driving mechanism of the development and evolution of urban landscape or cultural landscape, all human construction activities are carried out in order to achieve a certain need, and a specific space and landscape phenomenon is inevitably generated. The form of human material environment construction is directly related to the social system and development pattern in a specific period. In order to realize the continuous development of human civilization, the current construction behavior constantly struggles with the nature and its past, and finally achieves balance and progress in the historical process of negation of negation. Due to the limitation of space resources, with the expansion of population and urban scale, new construction activities are increasingly affected by the past, that is, the historical built environment.

Spatial game is a spatial phenomenon produced by the combination of realistic needs and historical products. It includes the forms of obedience, superposition and subversion of realistic activities to the historical environment. It is finally presented by the urban form and landscape features with special characteristics of the times, which reflects the different cognitive, intervention and competition behaviors of human beings under different realistic purposes and dominant forces to the environment. It contains the basic philosophical dialectical relationship of human development.

Spatial game is a common phenomenon in China, which is experiencing intense social and economic transformation. In the past few decades, Chinese society has achieved many turning points and made tremendous progress. Accordingly, a large number of traces of construction belonging to different historical periods have been left in the material space. Nowadays, new development and transformation are continuing. As a large developing country with a large population, it is bound to have a long process of collision and game with the historical environment, and constantly review and remodel the built environment of the past. From the past to the present, the driving force of spatial game relies on strong government decision-making and capital operation. In the future, new driving forces will inevitably emerge along the road of social and urban development in China, and new urban morphological characteristics will be brought again.

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