

# Diversification of Grid Blocks' Morphology in Beijing, China, from the View of Block Formation

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## Abstract

Urban blocks are the highly unchangeable units that make up urban form. Grid blocks have been commonly applied in the continuous top-down planning in Beijing, China, since ancient time. However, the uniform urban planning did not lead to standardized block form, but has morphological diversification appeared. Hence, the research attempts to clarify its dynamic from the initial formation process. It investigates the typological formation process of grid blocks in Beijing from historical maps, and their correspondence with urban development stages. It concludes that the construction of grid blocks covers a long time span without any certain order of boundary defining and subdivision forming. The irregularity and diversity in block morphology result in both conflicts and potential in creating urban diversity in the urban renewal in Beijing city.

## Keywords

Grid block, Urban morphology, Block formation process, Diversification

## How to cite

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## INTRODUCTION

Urban blocks are the 'basic units' making up urban form and are highly unchangeable. Their arrangement reflects social change and economic development, and they are a kind of media for plot/building to realize street publicity, accessibility and livability. Hence, urban blocks, can also be called a city's DNA, and their transformation process is possibly a physical clue of reading urban morphology.

Beijing is the capital city and traditional city of China. It has implemented a centralized government management system since ancient times, in continuity with top-down urban planning. Three models could be identified in Beijing depending on national investment and policies in different epochs, including 1) The imperial city model, 2) the socialist city model, and 3) the neo-liberal city model, but not one of them has managed to get the upper hand.<sup>1</sup> It is described as a city that grows only via radical changes, where massive uprooting occurs and demolition becomes the main action of the urban planner.<sup>2</sup> On the one hand, it originates from the uniform and conventional grid plan in ancient China. But the grid blocks in Beijing transformed diversely in microscope, either on purpose or spontaneously. On the other hand, its historical continuity with unprecedented modern urbanization process brought drastic changes to the urban morphology, adding complexity and uniqueness to the block form transformation. Thus, the unification and diversification of grid blocks require clarification.

Because urban blocks are considered as a product of the combined influence of social, economic, historical, political, and environmental factors in a given geographical environment and historical period, accordingly, reviewing the formation of blocks and their background at the specific time is the precondition for understanding the following transformation.

Hence, the objective of this research is to investigate the typological formation process of grid blocks in Beijing, in order to clarify their possible influence on the subsequent transformation process. The proposed approach and findings contribute to further analyzing the process of urban morphological diversification in Beijing, and understanding the urban form transformation, through grid blocks.

In previous literatures, urban morphology of Beijing in ancient times,<sup>3,4,5,6</sup> Republic of China,<sup>7,8</sup> and modern time are fully discussed from the perspective of what was coming out. For urban space analysis, the Old Town is usually focused on spatial transformation.<sup>10,11</sup> However, limited research has taken block as the basic unit to clarify their roles in leading grid geometry transform diversely either on purpose or spontaneously. Among the few research on urban blocks, the current morphology of limited indicators was investigated, but their formation process that may influence the transformation have not drawn enough attention. Hence the clarification of grid block formation establish the foundation for clarifying the mechanism of diversification in the transformation process of urban morphology in Beijing.

## RESEARCH METHODOLOGY

The urban road and street system in Chinese city can be classified into 4 categories in middle class: Expressway, arterial(trunk) road, secondary trunk road, and branch road.<sup>12</sup> Expressway, arterial(trunk) road and secondary trunk road are included in Arterial road system, and branch road mainly serves for local activities. Blocks considered in this research represent the areas bounded by expressway, arterial(trunk) roads or secondary trunk roads, and may be further subdivided by branch roads inside into sub-blocks. They refer to not only the Rectangle ones, but also those adopt at least 3 of the 4 sides being orthogonal to each other.

Based on the above definitions, excluding those with large part of unconstructed areas or irregular river, lake, forest etc. inside, 194 cases were collected within the 3rd Ring Road of Beijing which covers most of the Core Area of Beijing.

Based on the satellite maps and city maps of Beijing from 1750 to present, the approximate time of the above four time points in block formation were confirmed. Then, the corresponding stages of Beijing's urban development stages were recorded based on historical maps.<sup>13</sup> Finally, the typologies of formation process of grid blocks in Beijing was classified according to the order of initial construction, boundary defining, and subdivision.

## BLOCK FORMATION PROCESS

### FOUR TIME POINTS IN THE PROCESS OF BLOCK FORMATION

The process of block formation can be decomposed and described by four important time points: the time of initial construction, the time of block boundary being defined, the time of current subdivision (branch roads) being formed, and the time of current block pattern being finished. They are defined as following in this research (Fig.1):

1. **The time of initial construction.** The target area has begun to be constructed and has covered over half of the area, but it has not formed a clear block yet.
2. **The time of block boundary being defined.** The grid block was clearly defined as a separated and independent area with urban roads as boundaries.
3. **The time of current subdivision (branch roads) being formed.** All the branch roads within the block have been constructed and have not changed significantly until now.
4. **The time of current block pattern being finished.** As there are some cases that had their boundaries defined first, subdivision finished second, while, some had the branch roads constructed first and boundaries defined later. This indicator refers to the time that both boundary and branch road subdivision were finished.

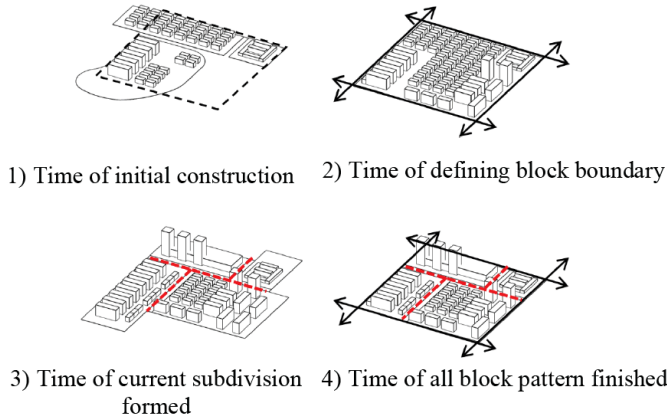


Fig. 1. Four steps in the process of block formation

### URBAN DEVELOPMENT STAGES OF BEIJING

Beijing is a planned imperial city over hundreds of years. It can be traced back to capital Yuan Dadu (Yuan Dynasty, 1271–1368 CE), following closely an ancient Chinese planning model based upon concepts such as the centrality of the city plan, concentricity of city walls, dominance of a north-south axis, a gridded street plan, and a square-shaped plan for the whole city (Zhu, J. 2004).<sup>14</sup> Beijing was remodeled with new constructions under the Ming dynasty (1368–1644 CE), finalizing the prototype of the current Beijing. It is mostly inherited in Qing Dynasty (1644–1911 CE) and became the foundation of the new era of urban development after the establishment of the People’s republic of China in 1949.

In order to clarify the formation process in a more detailed view, the development of Beijing is divided into five periods according to the most dramatic changes of the city forms throughout its history (Table1). I. The imperial city period (1153~1911), II. The initial modernization period (1911-1949), III. Socialist planned period (1949-1982), IV. Socialist marketing period with rapid urban development (1982-2003), V. Internationalization period with urban development and redevelopment (2004-present).

### TIME OF THE FORMATION PROCESS OF GRID BLOCKS AND ITS CORRESPONDING URBAN DEVELOPMENT STAGES

Although the Old Town of Beijing originates from ancient times, the changes and reconstructions were disruptive. Only 14 grid blocks are inherited from the initial boundaries before 1911(Fig.2), and they are mostly closed to the Palace City, near the central city axis. Furthermore, only 7 of these ones inherited the original subdivision. In other words, only seven of 194 grid blocks inside the Old Town of Beijing persist their original urban patterns. If considering the building replacement, the change would be more surprising.

Urban development stages	Year	Description and events
	1000-	
The imperial city period (1153-1911)	1250	1153-1267: Capital of Jin Dynasty 1267-1368: Capital of Yuan Dynasty
	1500	
	1750	1389-1900: Capital of Ming&Qing Dynasty
The initial modernization period (1911-1949)	1900	1900-1911: New policy in late Qing Dynasty 1911 Revolution (Xinhai Revolution), ended up Qing Dynasty and began the modern time 1911-1928: Municipal Office of Beijing (now Beijing) 1928-1937: Beijing (now Beijing) Municipal government
	1950	Foundation of People's Republic of China in 1949 1949-1957: Early New China and Soviet Assistance 1937-1945: Japanese occupation 1945-1949: The independent exploration period of Beijing (now Beijing) government
Socialist planned period (1949-1982)	1955	
	1960	1958-1965: Great Leap Forward* period
	1965	
	1970	
	1975	1966-1982: "Cultural Revolution" period and later time
	1980	
Socialist marketing period with rapid urban development (1982-2003)	1985	Beijing Master Plan (1982)
	1990	1982-1992: The first stage of reform and opening up
	1995	Beijing Master Plan (1993)
	2000	1993-2003: The deep stage of reform and opening up
Internationalization period with urban development and redevelopment (2004-)	2005	Beijing Master Plan (2004)
	2010	
	2015	
	2020	

Table 1. Urban development stages of Beijing

The outer town of the Old Town was not completely constructed before 1911, which offered a chance for implementing the western modern urban planning concept there. So, a few grid blocks were generated during 1911-1949 in the outer town and the embassy area near Dongjiaomin Lane. But affected by the 2nd World War, the urban modernization process was stopped.

Grid blocks which were started construction in Stage 3 Socialist planned period (1949-1982) adopted the largest number (108 cases), but less than half of them were clearly defined as a “block” (43 cases). It implies a rather rough sprawl tendency in every direction based on the Old Town. The clearly defined blocks were mainly formed towards the west and the east out of the Old Town, which reveals a relative precise sprawl in these two directions. The sprawl was supposed to be following the grid network inside the Old Town, but as a consequence of the social stagnant in the late 1960s and 1970s, many built-up areas remained undefined during Stage 3.

Stage 4 encountered the trend of redevelopment. The huge changes from Socialist planned economy to Socialist marketing economy resulted in new land-use demand. Hence, urban patterns were changed correspondingly to meet new requirements. Not only the cases that had not been completed in Stage 3 were defined and subdivided, but some cases in the Old Town were re-defined or re-subdivided. As the Fig.3-9 shows, 103/194 cases had their block pattern finished, which reached the peak of block construction.

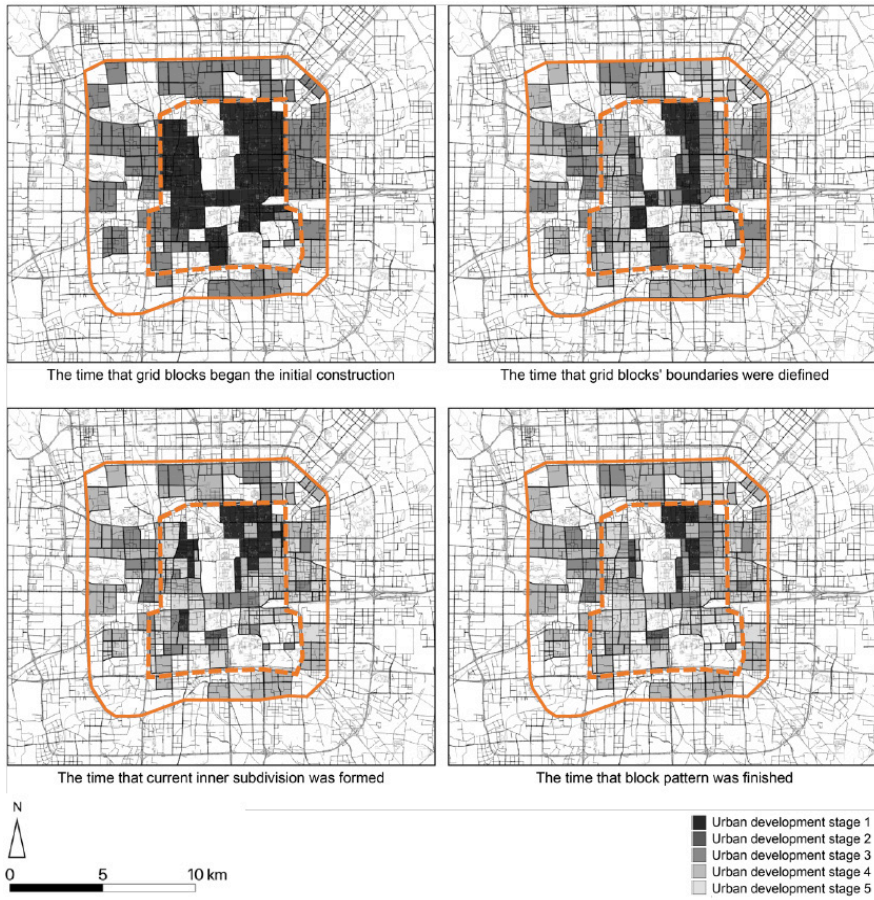


Fig. 2. The time (corresponding urban development stages) of the four steps in block formation process

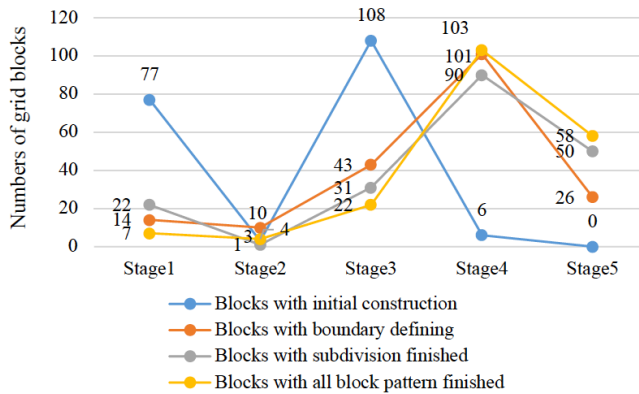


Fig. 3. Numbers of cases in each stage based on different formation process

Last but not least, there is no block that is firstly constructed in Stage5 within the 3rd Ring Road, and only 26 cases had their boundaries defined in Stage5. However, 50 cases, that is more than 1/4 of the 194 blocks, have their inner patterns being re-subdivided. It is a continuity of redevelopment of the built-up areas of Beijing from Stage 4.

As a result, over 1/3 of the cases within the 3rd Ring Road of Beijing were initially constructed in ancient times but few patterns were inherited, which can be an important factor that endowed Beijing with an image of “massive uprooting and demolition”. Most of the areas started the construction process during 1949-1982, reflecting a period of rough urban sprawl, while the redevelopment process got on stage and reached the peak during 1982-2004. The tendency continues but in a weaker degree after 2004.

### TYPOLOGIES OF FORMATION PROCESS OF GRID BLOCKS

According to the time points and corresponding urban development stages confirmed before, the formation process of grid blocks in Beijing can be classified into 6 typologies based on the order of initial construction, boundary defining, and subdivision (Table 2).

More than half of the blocks have their boundaries defined and inner space subdivided in the same period (Type A1, Type A2), and they were mostly a measure of re-arranging the urban spaces that were roughly constructed previously (Type A2).

There are 54 cases (Type B1, Type B2) that were subdivided after the block boundaries were defined, among which 7/14 of Stage 1 and 22/43 of Stage 3 (Type B1) changed the original subdivision patterns (Fig.4). As the branch roads in Beijing are mainly for service functions that have close relationship with place-making and daily life in urban spaces, the high rate of re-subdivision may lead to loss of local identity. It is not only in urban morphology, but in the sense of belonging as well.

The cases that maintain the existed subdivision with boundaries being defined later (Type C1, Type C2) take up less than 1/6 of all. The subdivision were not planned based on the boundaries, but from the view of urban road network and traffic. As a result, it may lead to a weaker connection between the inner patterns and the block boundaries. The inner patterns are cut off suddenly by the arterial road system, leaving the blocks and adjacent blocks separated from each other.

Moreover, from the numbers of each process type based on the time the block was defined (Fig.4), blocks defined in urban development Stage 1, Stage 2, and Stage 3 are mostly in Type B (B1 or B2). It means that they were re-subdivided in the later periods. The distinctive urban forms that may maintain the social identities of specific time were probably lost during the re-subdivision process. On the contrary, cases defined in Stage 4 mainly had their boundaries and inner patterns constructed simultaneously. Large numbers of new blocks were built up, but whether they were planned in a brand-new way or implemented with inherent patterns from the previous, need to be further investigated.

According to the typologies of block formation process classified above, grid blocks in Beijing were not constructed in a certain order or integrally within specific urban development stages. Moreover, they distribute rather randomly(Fig.5). Their formation covers a large time span. Consequently, their construction may be required to comply the principles of different periods, lacking in continuity and integrity. Moreover, the uncertain order of boundary defining, and inner space subdivision increases the separation between the two elements.

Type		Number	Diagram
<b>Block boundary and subdivision formed at same stage</b>			
Type A1	Original pattern	28 cases	
Type A2	Initially constructed without forming block; then re-define & re-subdivide	81 cases	
<b>Boundary was defined first, then subdivided</b>			
Type B1	Original boundary, then re-subdivide	29 cases	
Type B2	Initially constructed without forming block; then re-define; finally re-subdivide	25 cases	
<b>Subdivision formed first, then boundary formed</b>			
Type C1	Original subdivision, then re-define	24 cases	
Type C2	Initially constructed without forming block; then re-subdivide; finally re-define	7 cases	

Table 2. Typologies of formation process

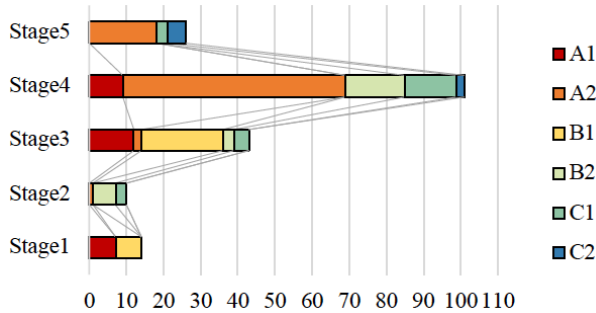


Fig. 4. Numbers of each pro-type based on the time the block was defined (By author)



## CONCLUSIONS

### CONSTRUCTION OF GRID BLOCKS COVERING LONG TIME SPAN

The initial construction of grid blocks in Beijing did not leave much impact on their current form for most cases. The characteristics of urban space construction in ancient times and Socialist planned period (1949-1982) transformed and adapted to updated requirements in subsequent epochs. The overlaid process makes the block pattern more complicated, resulting in diverse forms.

### UNCERTAIN ORDER IN BLOCK FORMATION PROCESS

Although Beijing has a continuous history and a rather unified urban planning process from antiquity, its process of forming the current demarcative urban pattern had twists and turns. Some patterns were constructed integrally, and some were developed in a serial order, while some others were formed in a more passive way without enough consideration for the connection inside and outside the block. The uncertain order of formation process endowed the traditional grid blocks with higher possibilities in diversifying into more patterns.

The aforementioned factors contribute to the irregularity and diversity in block morphology in the uniformly planned Beijing. In addition, a single block may adopt characteristics of principles in different periods. It, on the one hand, conflicts may be intensified when the former ones were transformed passively in urban development. On the other hand, it shows the potential in creating diversity in both urban physical form and human life, which require consideration in urban renewal in Beijing city.

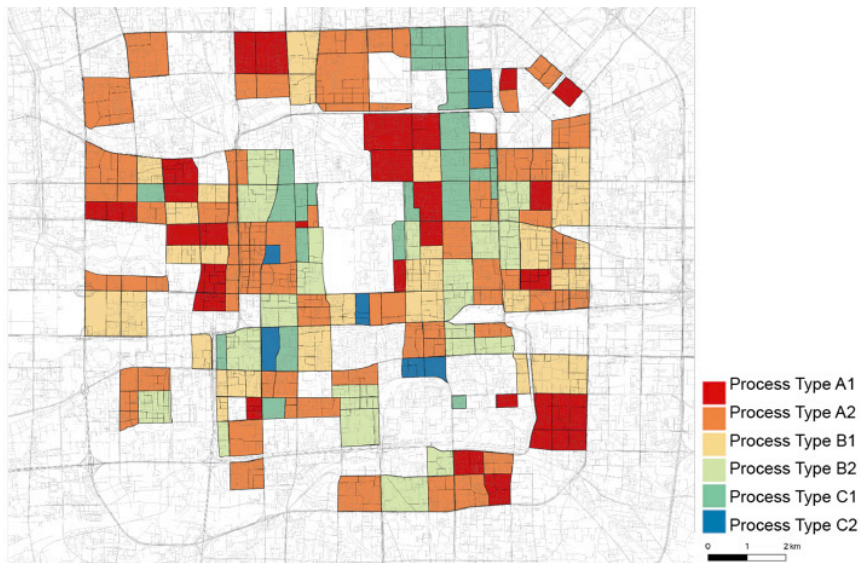


Fig. 5. Distribution of each formation process type (By author)

## DISCLOSURE STATEMENT

No potential conflict of interest was reported by the author.

## ENDNOTES

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#### IMAGE SOURCES

All figures by author.

