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New Towns' Planning and Construction in the Pre-Urbanization or Post-Urbanization Period: A Case Study of the New Towns' Development Process of Beijing

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Abstract: Social background and planning objectives differentiate two kinds of development modes for new towns. One starts in the period of post-urbanization and post-industrialization and is committed to improving living conditions and dispersing urban central areas. The other begins in the stage of pre-urbanization and pre-industrialization with the purpose of promoting the development of urbanization and industrialization. However, academics have not given enough attention to researching the relationship between the different modes and their respective social backgrounds. This paper first proposes these two kinds of development modes and analyses how their different social contexts and institutional backgrounds lead to different planning and construction characteristics. Then, taking Beijing as an example, this paper presents a complete review of the development and transformation history of the planning and construction of China's new towns with different urbanization levels and in an institutional context. The whole history and transformation process can be considered a demonstration and evolution of the two different development modes. Accordingly, by analyzing the respective characteristics and transformation processes in different periods, this study reveals the impact of social background on the new towns' development and the problems caused by different development modes.

Keywords: new town; development mode; pre-urbanization; post-urbanization; Beijing; transformation process

1. Introduction

New town development is a significant tool for solving urban problems and promoting urban development. Since the twentieth century, with the industrialization process of architectural and urban construction, many countries have experienced large-scale construction of new towns [1]. However, due to the diversity of social backgrounds and planning objectives, different countries have used different modes in the development of new towns. Since the foundation of the People's Republic of China (P.R. China), due to the demands of economic growth and long-term rapid urbanization, large-scale urban construction has continued for seventy years. The development of new towns has played an important role in this process [2]. The development mode has also experienced multiple transformations in different stages of urbanization and different political and economic institutional contexts [3]. These variable transformations have led to various urban characteristics and problems.

Theories and practices regarding the development of new towns have been comprehensively researched by academics [1,4,5]. However, compared with the constantly transforming institutional mechanisms and improving social development level of China, the institutional background and social development in most countries where large-scale new town development has occurred have been relatively stable and consolidated. Consequently, within these countries, the planning objectives and development modes of new towns were stable over a certain period. By contrast, the objectives and modes of the development of new towns in China have gone through several transformations and even produced opposite results in the last seventy years. China has also selectively learned and absorbed theories and experiences from different countries in different periods [6,7]. However, the existing research has either focused on a single country or a single region, or a comparison of the situations in countries or regions with similar backgrounds in certain periods. The complete development and transformation history of new towns in China and the inheritance and adjustment of different foreign theoretical experiences in different periods have not been carefully reviewed and discussed as a unique case in the context of a variety of different social backgrounds, institutional mechanisms and new town development modes.

This study attempts to fill these gaps. Through data collection, field work, mapping and literature research, this paper first proposes two different development modes for new towns according to the different social backgrounds and planning objectives and confirms the employment of these modes for the new town researched. Second, taking the planning and construction history of new towns in Beijing as an empirical case study, the development process of China is clearly reviewed and divided into different phases. The characteristics, relationships and distinctions of these different phases are presented to examine the similarities and differences in the new town development modes that were inherited and coordinated. The influencing factors and the current urban problems caused by this transforming background, as well as the new towns' planning and construction processes, are fully analyzed.

This study will contribute to clarifying the reasons for the different modes of new town development and the relationships between these modes and different institutional and social backgrounds. The whole history and transformation process will be divided into four stages, which were respectively from 1950s to 1970s, from 1980s to 1990s, in 2000s, and in 2010s. Each stage can be considered a pure or mixed demonstration and evolution of the two different development modes of new towns. Accordingly, by analyzing the respective characteristics and transformation process of these stages, this study reveals the impact of social development level and institutional background on the new towns' development and the problems caused by the transforming development modes. We hope that this kind of discussion and analysis can serve as a reference that can assist in the construction and transformation of new towns in the future.

2. Theoretical Background

2.1. Concept Clarification

Some countries started new town construction in the post-urbanization and post-industrialization periods [8], when the economy was transferring from a secondary industry economy to a tertiary industry one and the urbanization rate remained stable. For example, during the 30-year New Town Movement that began with the New Town Act in 1946 and ended in 1970s, the urbanization rate of the UK remained at approximately 80%, and the proportion of industry involved in economic production declined [9]. The construction of new towns in this social context was designed to improve the living conditions of the citizens, to decentralize the big cities, and to alleviate the pressure on the population and urban functions of central urban areas [10]. Although some commuter towns had been built in the initial stage, in order to attract people and prevent the sprawl of the original cities the new towns constructed during the mature phase of this movement were planned to be independent, self-sufficient

and balanced [11]. This is a typical development mode of new towns in the post-industrialization and post-urbanization society.

In some other countries, large-scale new town construction began in the pre-urbanization and pre-industrialization stages. This kind of new town construction was often a method of promoting industrialization and urbanization [12]. For example, the urbanization rate of the Soviet Union was only 17.9% in 1929, and the proportion of industry in the GDP was only 20%. A total of 960 new towns had been constructed by 1975. Meanwhile, the urban population increased from 26.3 million to 153.1 million, the urbanization rate exceeded 60%, and the industrial production value increased from $1300 to $6200 [13]. New town construction showed clear characteristics, such as a strict functional division, an inflexible site selection process, and a top-down planning process. Most of the new towns were planned to have a specific industrial target, and approximately 35% of them were constructed on vacant land [5]. This new town development strategy for the purpose of promoting urbanization and industrialization is also a typical development mode during the pre-industrial and pre-urbanization period.

Due to different social development levels, which mainly refers to the levels of industrialization and residents' economic conditions, in new town development there are different development modes with different planning objectives and design methodologies. Additionally, in China, the two kinds of new town development modes were practiced and adjusted to adapt to different social backgrounds and demands in different phases of the seventy-year process of new town planning and construction [3,14]. Similar to the new town development mode in the pre-urbanization and pre-industrialization stages, in the periods and regions characterized by an undeveloped social background environment, the construction of new towns was mainly aimed at promoting industrialization and urbanization. In recent years, some large cities with relatively developed economic conditions have begun to build new towns for decentralization and the improvement of the citizens' living environment; this development mode is similar to the mode involving the construction of new towns in the post-industrialization and post-urbanization periods of some countries. There have also been some studies conducted on new town development that considered both modes above in a comprehensive examination of new town development [2,3,6,14].

As a consequence, some new towns in China were not designed to be as independent from the original urban areas or as self-sufficient as those in Britain. Some of the new towns were designed with a specific functional objective, reflecting a design mode similar to that in the Soviet Union; some were planned to have a clear boundary with the original cities and balanced functions to depolarize the urban central areas, reflecting a design similar to that in Britain. The site selection and development process were also flexible and diverse. Some of the new towns could be transformed from ancient villages or towns, and some of them could be completely built on vacant fields. In China, seventy years of planning and construction resulted in the development of new towns with various shapes and characteristics, reflecting a design mode that was different than the one used in the original new town development in other countries [3,15].

Therefore, in China, the new towns discussed in the following part of this paper can be defined as newly developed urban areas with integrated or specialized functions and a certain population and area, constructed in a short period through careful planning and designed for some specific social or economic objective.

2.2. Literature Review

In the research topics discussed above, there have been great disparities in the focus of academics in analyzing the new town development mode in a post-urbanization and post-industrialization period, the mode in a pre-urbanization and pre-industrialization period, and the new towns' development history and transformation.

For different countries, the post-urbanization and post-industrialization periods of new town development, such as the New Town Movement in Britain after World War II [16–18] and the

construction of new towns around Paris [1,19], have already been researched deeply and widely. The urban and social problems caused by the defects of design methodologies and the inaccuracy of economic and social development prediction have also been discussed in depth [20].

For example, some new towns were too small to maintain comprehensive urban functions and complete urban systems. Others were planned to be too large and have currently not achieved the planned population goals. The new towns that were developed near the original central cities were easily affected by and even merged into those cities. It was difficult to develop public transport connections for new towns that were too distant from the original cities. Thus, the residents had to become dependent on private cars, the use of which caused an increased transportation burden and resource waste. The standards of independence, self-sufficiency and balance were all relative and dynamic; these three characteristics of a perfect new town could not be realized absolutely and completely [21]. These were not so much the main characteristics of the new towns developed by this mode, but rather comprised the goal orientation of the planning and construction activities [4,22].

Meanwhile, the intention of the new town construction of this mode was to solve the development problems of the original big cities. However, it turned out that most people and workplaces that moved out from the central cities did not settle in the new towns. As the population of the new towns were mainly from other regions not from the central cities, the new towns caused the population to actually increase in metropolitan areas. In providing housing and improved living conditions, the new towns were successful, but the urban issues of the original big cities were not fully solved. Besides, with the development of suburbanization in developed countries, new towns and central cities began to face the common problem of shrinking inner cities. After the 1970s, developed countries gradually wound down their new town movements and turned to solving the problems related to big city malaise by concentrating on solutions for the cities themselves [11,18].

The inspiration for, and demonstration of, this kind of new town development for China has also been discussed in various ways [23–26]. The research comparing the new town development of China with that of advanced countries, such as Britain, France, and Japan, has been a popular subject as well [27–30].

Although there are some studies on the pre-urbanization and pre-industrialization period mode of new town development, such as the study of ongoing planning and construction in developing countries [31–33], the distinction between this mode and the former has not been clearly indicated and has not been linked to different levels of urbanization and industrialization in different territories. The new town development of the Soviet Union, as an early prototype of this mode, is of even less concern to academics, and is therefore less informative.

In reality, the Soviet Union's social background, such as its lower level of urbanization and industrialization, its unique economic and political institutions, and its powerful top-down planning mechanism [34–36], was more similar to that in the P.R. China in certain periods. China had indeed integrated new urban planning methodologies and systems, including the new town development mode, from the Soviet Union [5,6,37]. For example, new town planning has emphasized meeting a functional objective rather than a self-sufficient comprehensiveness goal, construction resources may be more concentrated, and site selection could also be broader and not fully focused on only the original constructed areas. Moreover, in planning in the early era of P.R. China, this kind of development mode was practiced in the industrial development zones, university new towns, high-speed railway new towns and other new towns, which were designed with specific functions and constructed after the Reform and Opening Up period, which began from 1978 [15]. However, few academics have focused on systematic classification and research into this.

Similarly, the new town development of China after the Reform and Opening Up period has been discussed in various aspects among academics [2,7,38,39]. The planning and construction in the thirty years before the Reform and Opening Up was also an important part of the entire development and transformation process but, has received little attention up until now [40]. The relationship between the different development modes of new town development, the respective urbanization level and social

context, and the urban problems caused by the continuous transformation and unstable development modes is hardly noticed. In fact, in the transition period since the 1950s, the learning from the Soviet Union and its unique political and economic institutions still has had a huge impact on new town development in terms of the use of top-down planning mechanisms, subject setting and functional divisions [6,14,15]. Taking the development of the past seventy years as a whole research object will help us understand the transformation track and the inherent causality.

2.3. Case Selection and Methodologies

Beijing, as one of the key areas of urban development in the past seventy years, experiencing all the phases of rapid development and post-urbanization, has gone through urban development and new town construction. Therefore, it was chosen as the case for the empirical study.

In the early 1950s, the development goals of Beijing were to be a big city with a population of 10 million and a productive industrial system. Affected by the planned economic institutions and the policy of comprehensively learning from the Soviet Union, the local government of Beijing, taking the Soviet Union's experts' advice, proposed a master plan with more than forty satellite towns to constitute a sub-parent urban system (Zi Mu Cheng) [41]. These satellite towns could be regarded as the first generation of planned new towns in P.R. China. Most of these new towns relied on original villages for industrial transformation. The main role of the new towns was to promote the development of the industrialization and urbanization of Beijing. Because of the subsequent Great Leap Forward (from 1958 to 1961) and Cultural Revolution (from 1966 to 1976), this master plan was not realized. Beijing's urban construction was caught in a phase of stagnation and contraction. After the Reform and Opening Up period, the urban construction and new town development of Beijing restarted. The rapid development of the economy brought a heavy demand for new town construction, and various institutional reforms and social transformations led to the repeated trial and adjustment of the planning and construction mode of new towns [14]. Peripheral constellations, industrial development zones and satellite towns were all examples of the new towns planned according to the development mode in this period. After the marketization of real estate, the population of Beijing kept growing rapidly, and various metropolitan diseases gradually emerged. In 2000, the urbanization rate of Beijing had increased to over 70% [42], and industrial development was no longer the urban planning objective. As in postwar Britain, the population evacuation from the urban central areas in China and the depolarization of the monocentric city became the primary focus of the new towns' planning objectives. In the master plan of 2004 to 2020, the development of eleven new towns was confirmed, marking the first time that the term "new town" officially appeared in the text of the Beijing master plan [43]. However, in 2017, the central government of China announced that a state-level new town [44], the Xiong'an New District, would be constructed southwest of Beijing and designed as a concentrated area to disperse the non-capital functions of Beijing.

A typical embodiment of the transformation process of new town construction in China, the new town planning objectives and development modes of Beijing have experienced several transformations accompanied by continuous urban development, social changes and institutional reforms. This article mainly researches this through the collection and organization of historical documents and archives. The authors read and analyzed the original files, documents and socioeconomic statistics of various urban planning projects in Beijing over the past 70 years, combed the context, linked this to the relevant research materials from the United Kingdom and the Soviet Union for comparison, extracted the similarities and differences, and established a new concept framework. Subsequently, an empirical case study was analyzed to prove the applicability of this framework.

3. The Empirical Study—The Planning and Construction History of New Towns in Beijing

As Beijing is the capital of P.R. China, its urban planning and construction have always been valued by the central and local governments. There were six master plan editions proposed and approved in 1957, 1973, 1982, 1993, 2005 and 2017 [41,43,45,46]. The registered urban population has

increased from 3 million to 8 million [42], and from 1982 to 2016 the urban built-up area increased from 673 km^2 to 3000 km^2 [42]. With the changes in institutional background and economic development, the objectives and design of the six master plans have been continuously adjusted, and the planning of new towns has also been transformed several times.

The new towns' planning and construction was modeled on the urban planning theory and practical experience of the Soviet Union. In the first edition of Beijing's master plan in the 1950s [41], a sub-parent urban system and the construction planning of satellite towns were proposed. In the next several master plans, the new town planning of Beijing was characterized by different nomenclatures and orientations, such as sub-parent city, peripheral constellations, satellite towns, and new towns, which was finally confirmed as the current term, new town.

From the 1950s to the 1970s, Beijing experienced a significant transition from an agricultural city to an industrial city, and then started the process of deindustrialization. The sub-parent city design included a new town planned for industrial development and to be constructed as a polycentric city. However, in the subsequent period, the planning of subsidiary towns could not be realized, and urban construction concentrated on the areas around the original city center. This made the monocentric spatial trend of Beijing increasingly more evident [41]. By the 1990s, with the population explosion, traffic growth and the urban sprawl based on multilayered ring roads, this monocentric urban system became unsustainable and caused serious traffic congestion, bad living conditions, environmental degradation and the unbalanced development between the city center and suburban areas [47]. Beijing had to change the monocentric spatial structure and implement newer planning methodologies and more effective actions. In this context, new town planning and construction became increasingly more important and explicit in the subsequent Beijing master plans.

3.1. From the 1950s to the 1970s

In 1953, the Municipal Committee of Beijing adopted the Draft Plan of Beijing's Redevelopment and Expansion [41], which was the first master plan for Beijing. This draft plan only contained a master plan for the 600 km^2 of the urban central area and did not cover the overall scope of the surrounding suburbs or mention the construction of any satellite towns. It was not officially approved by the central government.

In 1955, the Municipal Committee of Beijing hired Soviet experts, who had participated in the planning of Moscow, to guide the Urban Planning Commission of Beijing. Based on the Draft Plan of 1953, in the spring of 1957 the Planning Commission developed the Preliminary Master Plan of Beijing's Urban Construction. The scope of this master plan expanded the city from 600 km^2 to 8860 km^2, including the large suburban areas and original villages. The spatial structure reflected the sub-parent city design based on the Soviet Union's urban planning theory. The urban central area, as a parent city, contained a construction area of 600 km^2. In addition, approximately 40 satellite towns (Figure 1), such as Mentougou, Nankou, Chanping, Shunyi and Tongxian, were planned as subsidiary towns in the suburban and exurban scope. The population of the parent city would be controlled at 5 to 6 million, and the total population including subsidiary towns would reach 10 million or even more in the long run.

These satellite towns were mainly planned to be consistent with the ideology of the industrial development of Beijing. Larger industrial factories and districts would be constructed in these towns. Most of these satellite towns would be linked with the original villages and were planned to promote the industrialization and urbanization of these villages. This plan can be regarded as the prototype of the first generation of new town planning in P.R. China.

When the Great Leap Forward movement was promoted by the central government, the municipal government of Beijing revised the previous master plan. The new edition emphasized the guiding ideology of rapidly turning Beijing into an important industrial base and adjusted some specific land use planning. A new spatial structure called decentralized groups was proposed to limit the urban central area and to develop the exurbs. Large-scale industries, such as metallurgy, machinery, chemicals,

and textiles, would be constructed in the satellite towns. There were 113 industrial construction projects planned in 37 satellite towns. These towns would become key bases of the rural industrial network that would drive the industrialization and urbanization of the surrounding villages.

In 1955, the total population of Beijing was approximately 5.6 million, and the urban population was 2.8 million [48]. Although the proportion of the urban population was not very low, it was still far from the population target set in long-term planning. Likewise, the industrial development level was far from the development target. The proportion of industrial contribution was about 57%, but its absolute value was very low. Influenced by this situation and the socialist ideology of supporting the working class, the aim of urban construction was primarily to promote urbanization and industrialization, as was the planning and development of more than 40 satellite towns. This kind of industrial-oriented and functional-specified new town planning was similar both in the aspects of social-economic background and construction goals to that employed in the new town development of the Soviet Union from the 1920s. The master plan was even directly guided by Soviet experts.

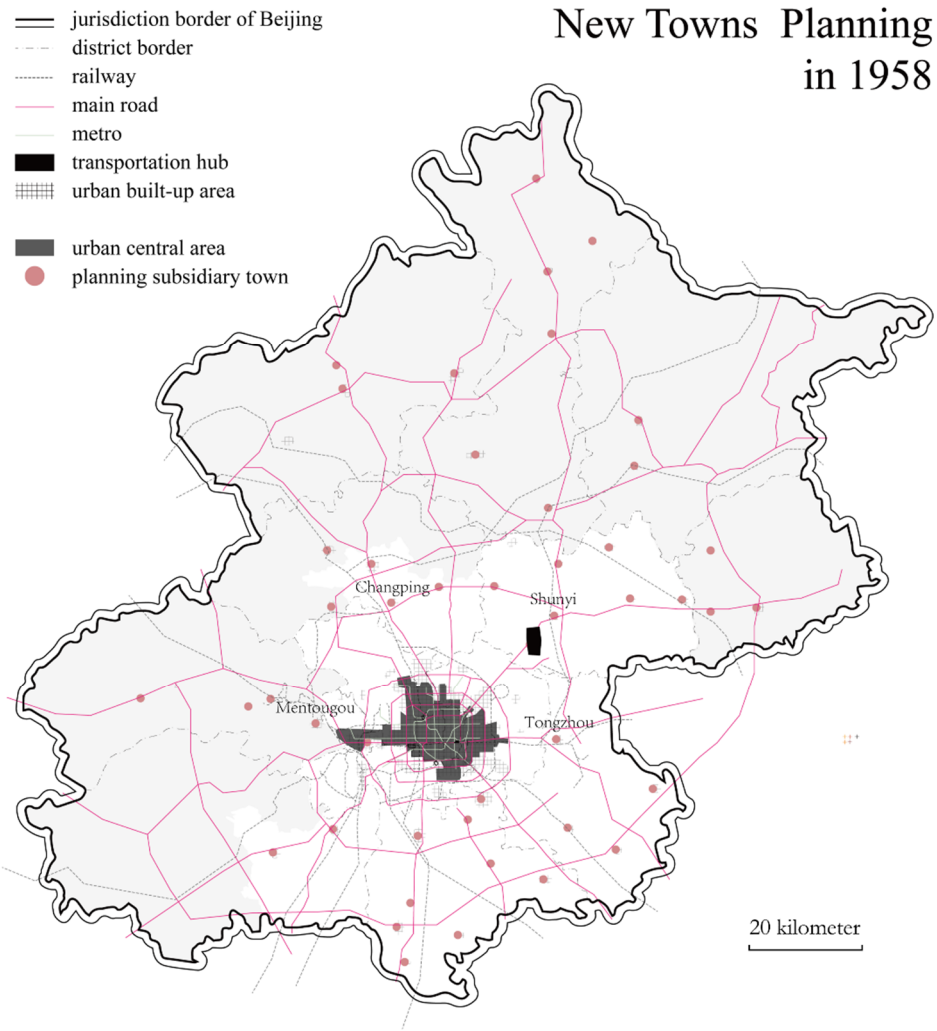

Figure 1. The planning and construction of the new town system of Beijing in 1958. Drawn by the author, based on the Preliminary Master Plan of Urban Construction of Beijing (Trial).

Note also that in 1950, Liang Sicheng and Chen Zhanxiang proposed a master plan for Beijing, namely, the Recommendation on the Location of the Administrative Center of the Central People's Government [49]. This master plan was based on some experiences from the Greater London Plan and included a metacentric urban spatial structure design realized by protecting the ancient city and building a new administrative center and commercial areas. However, it was not accepted by the

government. Guided by the Soviet experts' suggestion, the adopted master plan was similar to that employed in Moscow's planning morphology, i.e., a single center based on the ancient city and a road system of rings and radical lines. This was the beginning of the establishment of the monocentric urban structure of Beijing.

From 1958 to 1961, the three difficult years caused by the Great Leap Forward, due to the economic difficulties and the deconcentrated planning of satellite towns, the construction completed was generally poor. It was difficult to connect most of the towns with the central city because of the long distance and poor road traffic situation. Many factories and workers moving out from the urban central area returned, and only a small number of them remained in Tongzhou, Changping and other towns that were nearer to the city or in a better location [47]. After a short period of rapid promotion, most urban and industrial construction experienced a stagnation phase. Only approximately 60 of the more than 100 projects planned in the satellite towns had been launched.

After this difficult time, an adjustment and recovery phase began in 1961. The urban development and infrastructure construction tasks of Beijing were greatly reduced, and even the urban population was reduced. Workers were mobilized to return to the countryside. The urban population of Beijing decreased by 420,000 from 1961 to 1965 [48]. The shrinking construction scale led to a slowdown in the development of the deconcentrated satellite towns. Factories and industrial districts returned back to the urban central area and even expanded to include residential land. This reconcentration strengthened the monocentric spatial structure of Beijing. The original planning modes of the sub-parent city and decentralized groups were not achieved, and there was no growth pole formed outside the city center.

During the Cultural Revolution, influenced by anti-urbanization thinking, a large number of urban residents left cities and went to the countryside. The master plan of Beijing was suspended, and the Planning Commission was dissolved for a time. Urban construction experienced a chaotic period. All new construction was postponed, and only some projects could be built on the vacant lands in the urban central area. Therefore, the central area became more disordered. Many industries that were not consistent with the development of the city center had emerged, thereby increasing the burden on the urban central area.

The Planning Commission of Beijing was reinstated in 1972 and proposed a new master plan in 1973 [41]. Although the development planning of suburban industries and small towns was still written in this new plan (Figure 2), the local government did not have enough funds for construction. The plan basically called for the concentration of new industries in ten peripheral constellations, such as Beiyuan, Qinghe and Fengtai, which were located approximately five kilometers from the urban central area and were isolated by a green belt.

The development of these peripheral constellations played a definite role in the decentralization of the population and industry from the city center at that time. In addition, the urban morphology prototype became a foundation for the subsequent planning and construction of the new towns. However, due to inadequate urban planning control, after the Reform and Opening Up period, urban construction accelerated and eroded the green belt and farmland between the peripheral constellations and the city center. These peripheral constellations close to the urban central area were merged into the city center, leading to unlimited urban sprawl [50].

From 1949 to 1978, the urban population of Beijing increased from 1,649,000 to 4,670,000, the urbanization rate increased from 42% to 55%, and the industrial production value increased 19 times its original value [48]. The satellite towns in the master plan of the 1950s were not fully realized, and the development of peripheral constellations in the 1970s also left many latent problems. However, these development designs could still be regarded as the early forms of new town development in China. Regarding social background and planning objectives, these new towns were mainly developed to promote industrialization and urbanization in the initial socialist and undeveloped phase of China's growth, and the new towns' planning and construction in China was similar to that in the Soviet Union. Regarding the planning methodology and mechanisms, the planning process was a totally top-down process that was directly guided by the Soviet experts and determined by the political environment of

the country. These two stages reflect the typical characteristics of new town planning and construction in the pre-urbanization and pre-industrialization period of China.

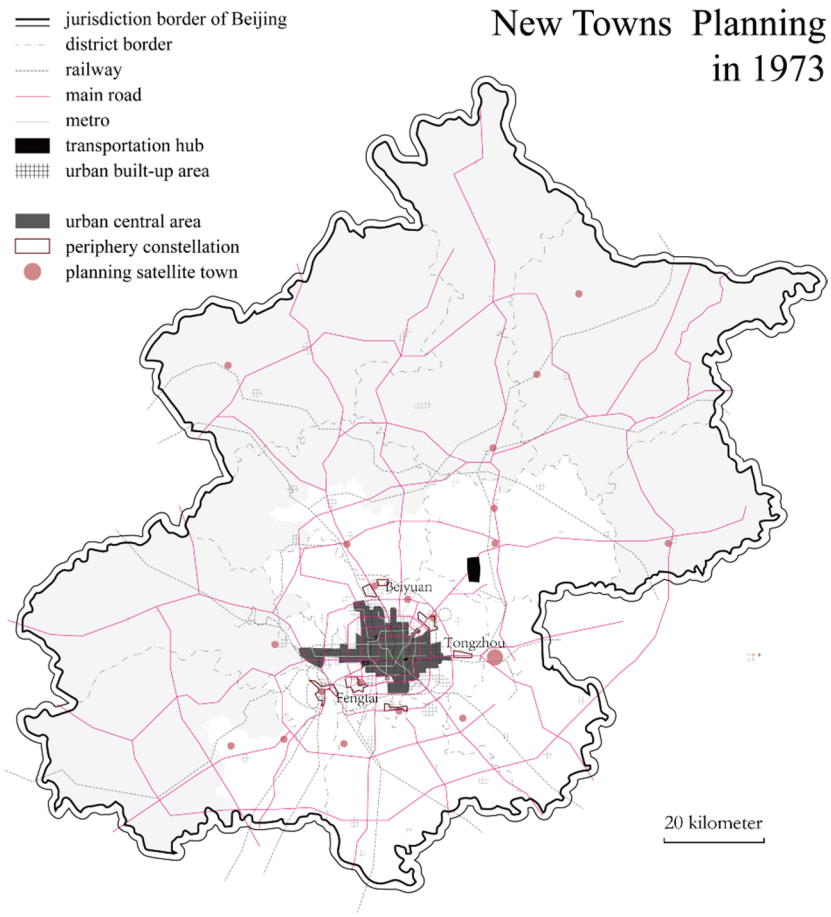

Figure 2. The planning and construction of the new town system of Beijing in 1973. Drawn by the author, based on the Urban Master Plan of Beijing of 1973.

3.2. From the 1980s to the 1990s

After the end of the Cultural Revolution and the beginning of the Reform and Opening Up period in 1982, the municipal government of Beijing formally proposed a new edition of the Beijing Urban Construction Master Plan [41]. Because of the disordered planning and construction in previous periods, there had been various problems in the execution of certain urban functions. The urban central area was overburdened with excessive industrial land, an large population, and congested transportation. Due to this situation, the new master plan identified Beijing as the national political and cultural center and no longer referred to it as an economic center and industrial base. This new plan expanded the planning area to 16,800 km^2 of all of Beijing's jurisdiction and emphasized the development of satellite towns. The ten peripheral constellations proposed in the previous plan and four towns, Yanhua, Tongxian, Huangcun and Changping, would be the key objects of the satellite town construction (Figure 3).

The local government attempted to gradually disperse the functional pressure of the monocentric city with these policies, and even issued the Interim Provisions on Speeding up the Construction of Beijing's Satellite Towns in 1984 [51] to encourage the development of the suburban areas. Meanwhile, the implementation of the compensated use system of state-owned land resulted in differences between the rent for the land in urban central areas and that in suburban areas. Many large factories started to move out of the city center to the satellite towns in the suburbs for cheaper land.

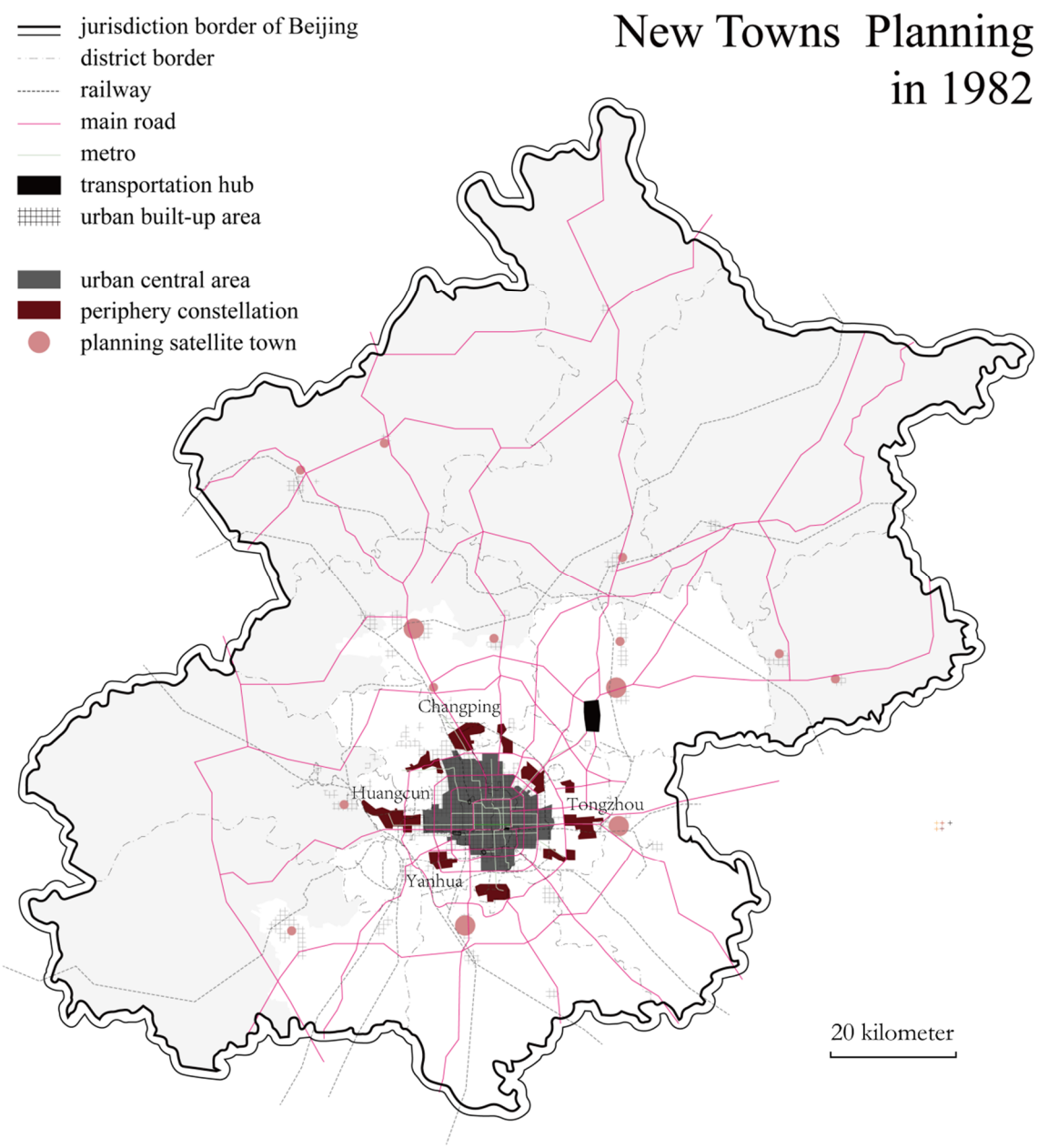

Figure 3. The planning and construction of the new town system of Beijing in 1982. Drawn by the author, based on the Urban Master Plan of Beijing of 1982.

The master plan of Beijing from 1991 to 2010 was adopted in 1993 [45]. This plan clearly proposed the strategy of population and industry shifts from the urban central area to the suburbs or exurbs and the construction of 10 peripheral constellations and 14 satellite towns (Figure 4).

To promote economic development and encourage industries to move out of the urban central area, the municipal government began to construct industrial development zones [52]. By 1996, more than 30 new development zones had been approved by the government [53]. Because of the lower land price in the suburbs and exurbs, most of these development zones were located in the satellite towns outside of the city center. The rural township enterprises dispersed in the towns and villages were also becoming concentrated in these industrial zones. In this period, the industrial development zones and satellite towns developed rapidly as the new growth locations of the suburban area. This, however, caused greater burdens to the monocentric city: some development zones constructed close to the urban fringe were gradually merged into the sprawl of the city center [47].

After the housing marketization in 1998, the local government and developers were actively engaged in real estate construction for large profits. Some huge affordable housing projects were constructed in the peripheral constellations, such as Tiantongyuan and Huilongguan [54]. These residential areas were located in the urban fringe with some urban functions and were built on a large scale; they were regarded as commuter towns. Although these areas offered citizens improved living conditions, they still had to rely on the original city because of the site selection and unbalanced functions. These areas were gradually merged into the city center but were also isolated to some extent due to their huge scale. Their inadequate infrastructure and public facilities made the lives of residents inconvenient; therefore, they could not attract the urban population from the city center. With lower housing prices, they absorbed more people from the exurbs and migrants from other cities. These factors made these peripheral constellations transit areas for newcomers to Beijing and aggravated the pressures on the city [54].

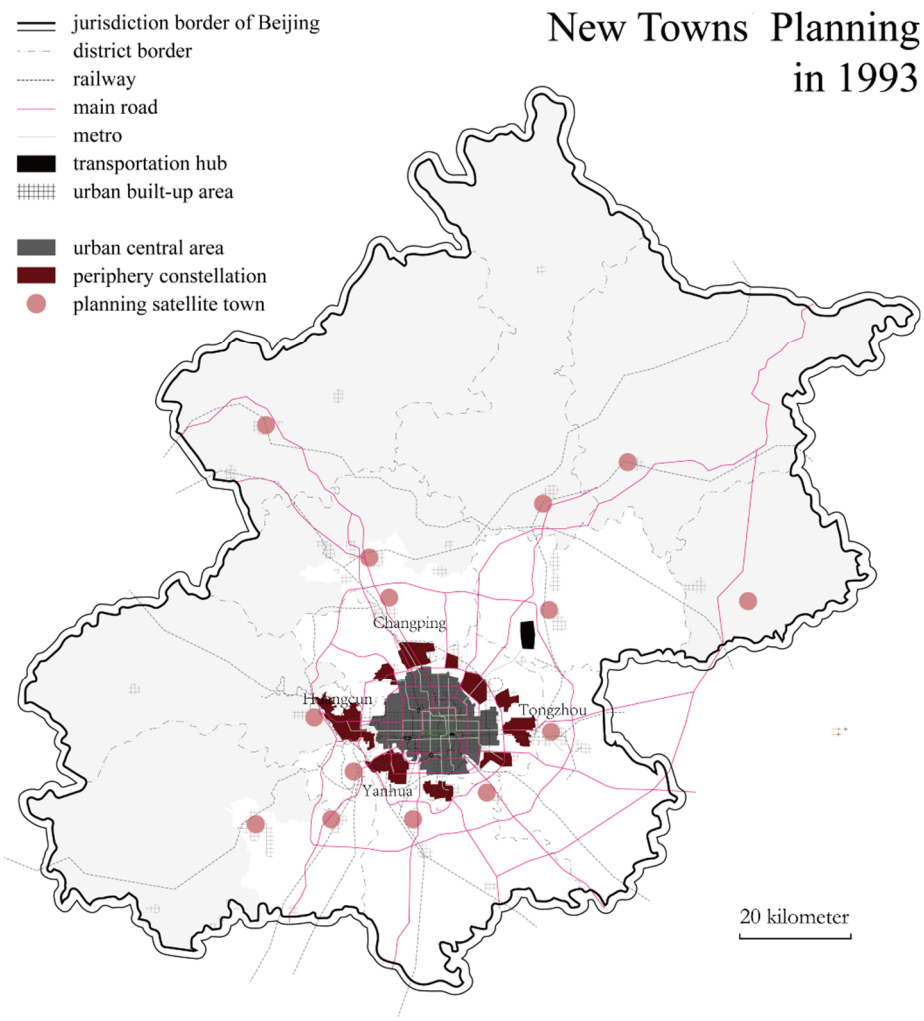

Figure 4. The planning and construction of the new town system of Beijing in 1993. Drawn by the author, based on the Urban Master Plan of Beijing 1991–2010.

To sum up, the planning and construction of new towns in Beijing went through a complex transformation period as the political and economic institutions and social background of China changed from the 1980s to the 1990s. The planning objectives and development modes of new towns also experienced various trials and transformations. Some of the new towns, such as a large number of industrial development zones, were planned and constructed to promote industrialization and economic growth as the development mode in the pre-urbanization and pre-industrialization phase.

Some others, such as the huge commuter towns, were constructed to improve living conditions and disperse people from the original city, reflecting a new town development mode similar to that used for some new towns constructed in the initial stage of the new town movement in Britain. However, due to their functional design and site selection, these new towns had either an industrial or residential focus and could not be self-sufficient and independent. As a result, they could not depolarize the monocentric city, and, conversely, their development aggravated the urban functional pressure on the city center. Some peripheral constellations were merged into the urban sprawl of the urban central area and promoted its limitless expansion. Some exurban satellite towns had been constructed on an elementary scale that generally had a population size of 100,000, but the development level was still far behind that of the urban central area and could not have exerted a strong antimagnetic force on the city center.

3.3. The 2000s

A new urban spatial structure, which had two axes, two belts and multiple centers, was proposed in the Urban Master Plan of Beijing 2004–2020 [43]. The two axes were the east development axis covering Tongzhou, Shunyi, Yizhuang, Yanqing and Pinggu and the west development axis ranging over Daxing, Fangshan, Changping, Yanqing and Mentougou (Figure 5). The two belts would include 11 new towns and complete the urban structure of a central city, new towns and organic towns. In the master plan, this structure was referred to as new decentralized groups, which was the first time that the term "new town" officially appeared in the text of a Beijing Master Plan, instead of satellite town, peripheral constellation or other similar words. However, this was also an inheritance of the sub-parent city and a decentralized groups' design structure that included some innovation and had been extended according to the current urban problems to decentralize the urban space of Beijing. The new master plan clearly proposed that the new towns should be constructed as independent and self-contained districts offering a good environment, convenient transportation and developed public service facilities based on the design of current satellite towns and infrastructures. Shunyi, Yizhuang and Tongzhou would have a population of 700,000 to 900,000, Daxing, Changping and Fangshan should have a population of 600,000, and the population target of other new towns was planned to be between 150,000 and 350,000 until 2020.

The 11 new towns were to be the important nodes of the new spatial structure and were designed to attract population from the central city, gather the new industries and help improve the metropolitan area. The development of new towns would shift the urban morphology from a single-center format to a multiple center one. The plan represented a change not only in the morphologic aspects but also in the urban functions, such as housing and work opportunities and the establishment of a self-contained, integrated and stable social service mechanism that was independent from that of the central city.

In 2000, Beijing's urbanization rate had reached 70% [42], the population size was far beyond the planning target, and the proportion that industry contributed to the economic product had also declined year by year. The planning and construction purpose of new towns had finally been transformed from the promotion of urbanization and industrialization development to the decentralization of the city center and the improvement of living conditions. The self-sufficient and independent new towns planned in the Beijing Master Plan 2004–2020 had many similarities with the new towns constructed in the Greater London Plan and New Town Movement of the 1940s. After the reforms of the political and economic institutions and changes of social background, some of the new towns in China abandoned the original development mode that they had learned from the Soviet Union and was applicable to the pre-urbanization and pre-industrialization period and turned to another mode.

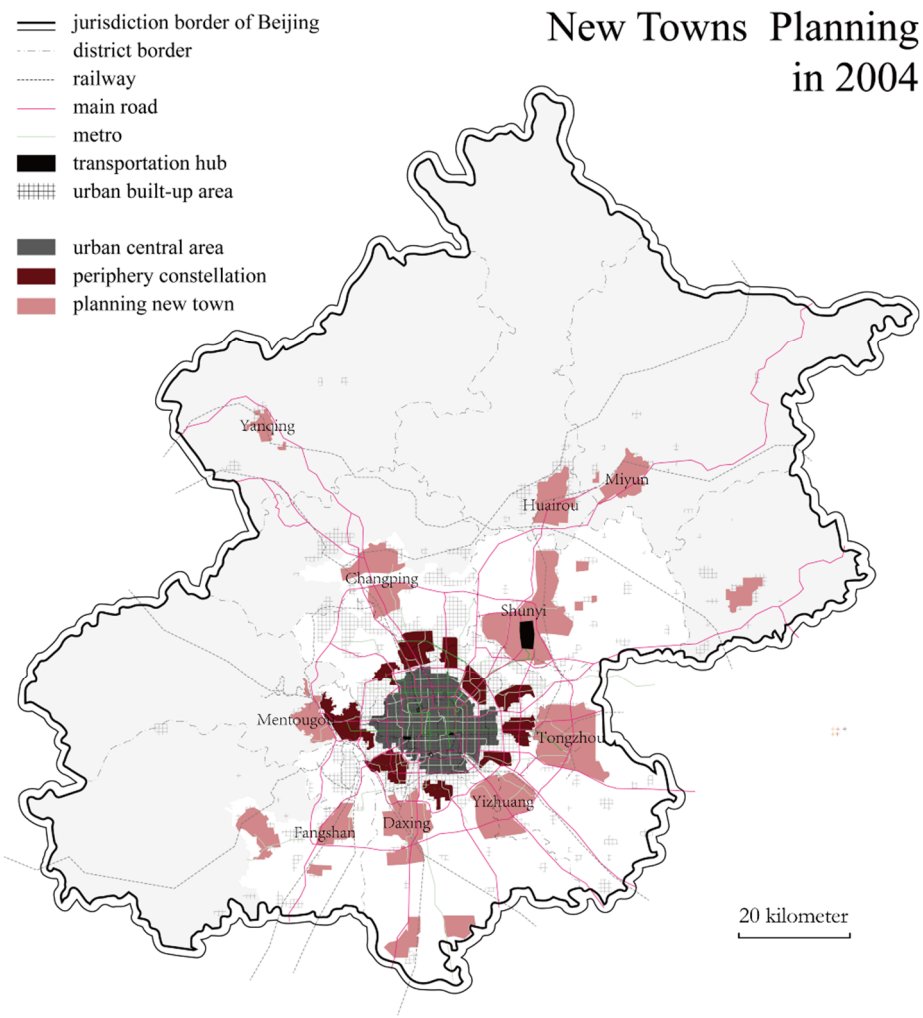

Figure 5. The planning and construction of the new town system of Beijing in 2004. Drawn by the author, based on the Urban Master Plan of Beijing 2004–2020.

3.4. From the 2010s to the Future

Since the 2010s, various metropolitan diseases in Beijing have become increasingly serious. Overcrowded public transportation, congested roads, polluted air and exploding housing prices represent clear evidence of the failure of previous master plans [55]. The 11 new towns in the latest plan had not been completed and were not sufficient to solve the current problems. Thus, to disperse the urban functions and the population, the planning of a subcenter of Beijing in Tongzhou [46] and a subcenter of the capital in Xiong'an [44] was proposed by the municipal government of Beijing and the central government of China (Figure 6).

The subcenter of Beijing in Tongzhou was an extension of the Tongzhou New Town planned in the master plan of 2004. It was positioned as the administrative center of Beijing. The planned area of the new town was 155 km^2, and the town would mainly share some of the municipal administrative functions moved from the original city center. The construction of this new town would focus on the depolarization problem of the stubborn monocentric urban morphology and the development of a new center of the city. The relocation of the municipal government functions of Beijing was already underway. According to the authors' fieldwork at the end of 2017, the new town of Tongzhou still faces problems, such as unbalanced development levels in different areas with or without subway stations and a functional dependence on the city center. Whether these problems can be alleviated

with the relocation of the municipal government and the development of the new town of Tongzhou as a true Beijing subcenter remains to be seen.

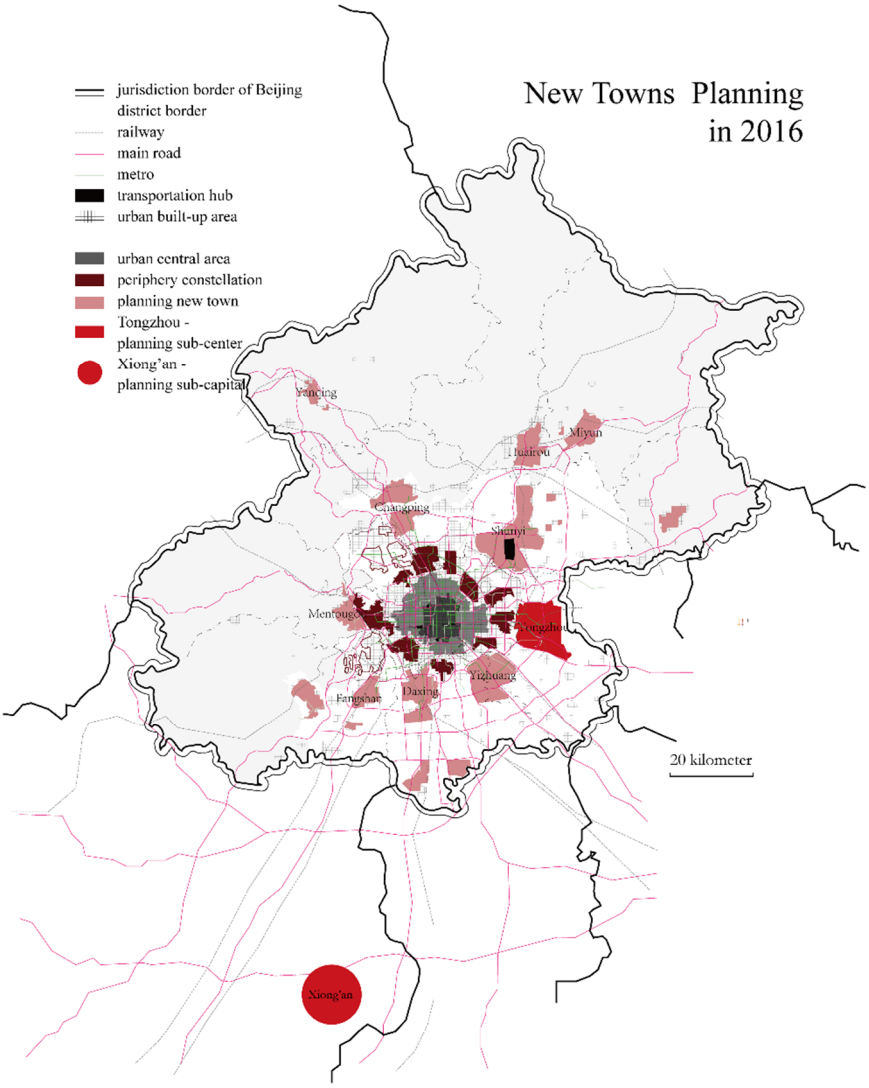

Figure 6. The planning and construction of the new town system of Beijing in 2016. Drawn by the author, based on the Urban Master Plan of Beijing 2016–2035.

The Xiong'an New District, the first state-level new town established by the central government, has an unprecedented status. The primary district has a planned area of 100 km^2, and the mid-term and long-term constructed areas would be 200 and 2000 km^2, respectively [56]. This district was designated as a subcenter of the capital and was planned to serve as an important development node of the Beijing–Tianjin–Hebei metropolitan area and as a concentration area to conduct the non-capital functions dispersed from Beijing [57]. Although the primary planning objective was to solve the urban problems of Beijing, Xiong'an was the first new town outside of Beijing's jurisdiction and was located in the crevice of a metropolitan area and a city agglomeration area. Beijing had entered the post-urbanization and post-industrialization stage, but the entire metropolitan area, especially the cities of Hebei, was still in a phase of rapid urbanization and industrialization. Therefore, the Xiong'an New District was envisioned as a comprehensive experiment based on two different new town development modes. It would promote the economic and industrial growth of the less-developed cities of Hebei, and, at the same time, it would also foster the decentralization of the urban functions and the population of Beijing. This plan represented a transcendence of the two development modes and a new attempt

at new town development in the special context of the current transforming political and social background in Beijing and China.

However, according to the authors' fieldwork in 2018, the development is still in the preparatory stage, and construction and future development were currently unpredictable.

4. Discussion: Analysis and Comparison

From the 1950s to the 1970s, the new town planning of Beijing went through several stages, beginning with a dispersive distribution with a large number and moving to a concentrated distribution with a smaller number. However, none of these plans were realized, and they only provided a foundation for the peripheral groups in the next period.

In the 1980s and the 1990s, the peripheral groups started to be constructed but were merged into the rapid urban sprawl of the original city, thereby putting greater pressure on the city. The construction priority of the satellite towns that were chosen for construction was changed several times, and none of them became new towns with the antimagnetic power to attract people and resources from the original city.

In the 2000s, the planning and construction of 11 officially proposed new towns in the exurbs began to be implemented, but construction has not yet been completed. As the infrastructures and public facilities are still inadequate in these independent new towns, the effective dispersal of the population from the urban central area was not been realized.

In the 2010s, unlike the development of the ten new towns proposed in the former master plan, the development of Tongzhou as a subcenter of Beijing was re-emphasized. Xiong'an is the first new town outside of Beijing's jurisdiction to solve the urban problems of Beijing at the city agglomeration level (Figure 7).

Zooming in on two specific cases (Figure 8), due to its closeness to the urban fringe, Beiyuan, a planned satellite town initially became one of the ten peripheral groups. One of the biggest residential districts, Tiantongyuan, was constructed in this area after housing marketization began in 1998, making Beiyuan a typical Beijing commuter town. The huge-scale construction of real estate gradually eroded the green belt between the city center and the new town and eventually merged them together. Because of the large area, large population and some remaining green belt land, the town is isolated to some extent, and, due to the lack of certain urban services, it still has to rely on the original city. The transportation overload between Beiyuan and the city center is one of the most severe problems in Beijing.

Tongzhou is always a key point in new town development in every master plan for Beijing. In a difficult period, it was planned as one of the peripheral groups and then replanned as an important new town located in the outer suburbs. Its design was upgraded, and it was planned as the Beijing subcenter for providing the municipal government's administrative functions dispersed from the original city center. The planned area was enlarged to 155 km^2.

Figure 9 shows that the urbanization rate during the New Town Movement in Britain from the 1940s to the 1970s remained at a high level, approximately 80% [9]. This rate was maintained during the stage of post-urbanization and post-industrialization. The construction of new towns was planned to improve living conditions and disperse the urban pressures of the original big cities. After the 1970s, because of a counter-urbanization process, the original big cities began to shrink, and the New Town Movement also ended.

In the 1920s, when the large-scale construction of new towns in the Soviet Union started, urbanization and industrialization were at a lower level. Those levels gradually increased along with the development of new towns [5]. The construction of new towns in this pre-urbanization and pre-industrialization period was an important means of promoting urbanization and the growth of industrialization. After urbanization and industrialization developed to a certain level, and due to the economic difficulties of the Soviet Union during the late Cold War period, the new towns' construction was terminated.

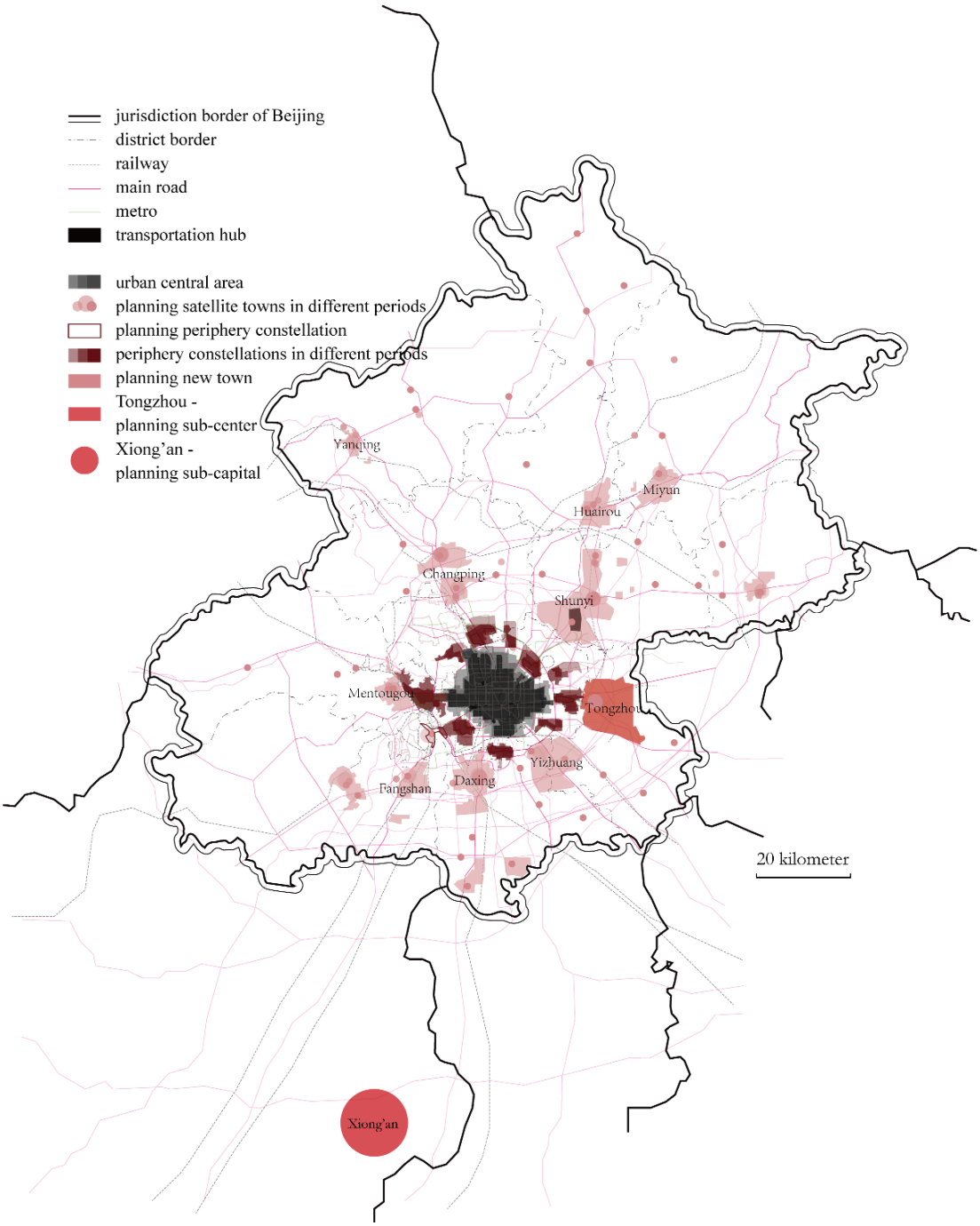

Figure 7. The comparison of the planning and construction transformations of the new town system of Beijing in the six master plans over the last seventy years. Drawn by the author.

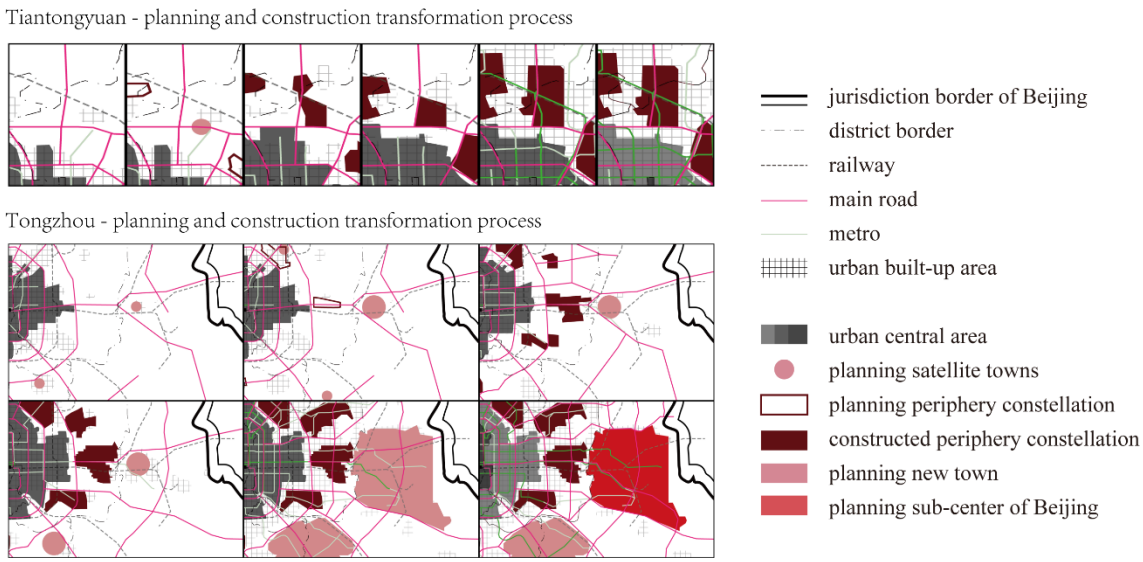

Figure 8. The comparison of transformations of planning and construction of Tiantongyuan New Town and Tongzhou New Town. Drawn by the author.

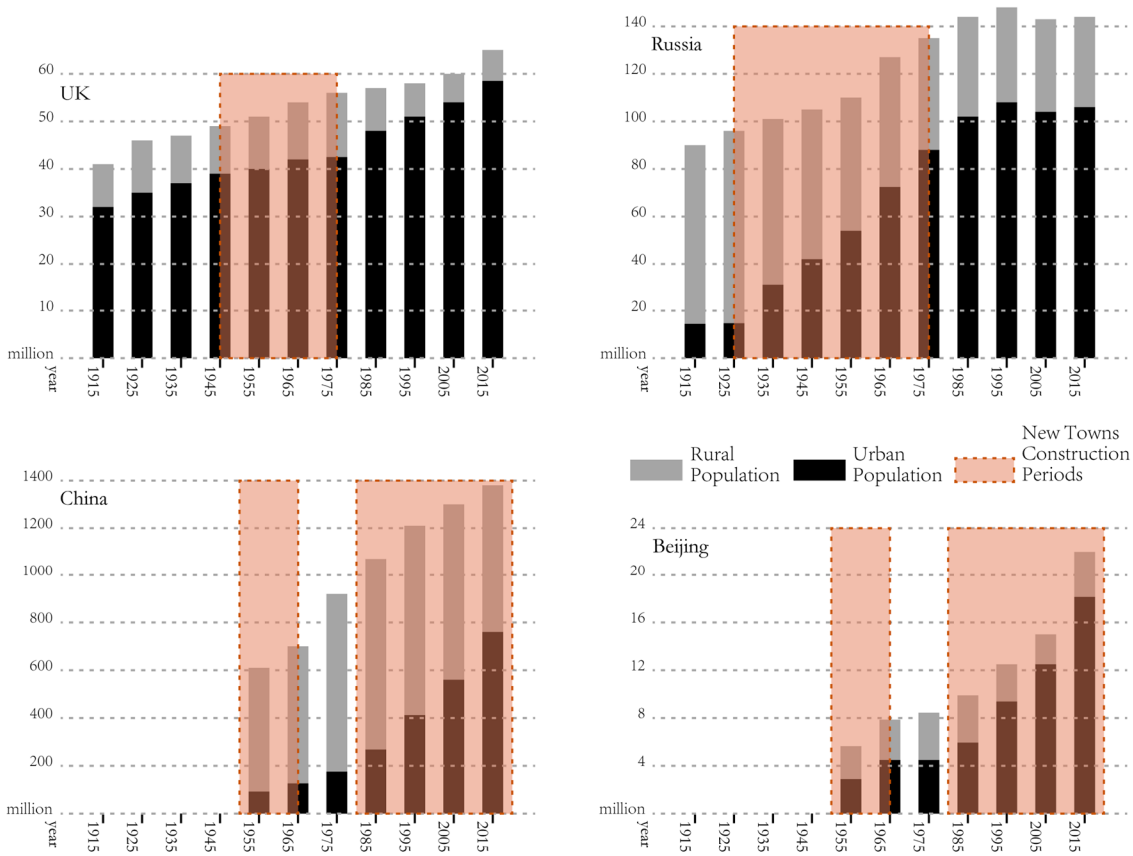

Figure 9. Comparison of different social development levels in the large-scale construction periods of new towns in different countries or regions. Drawn by the author.

The urbanization development of China is still an ongoing process. The overall urbanization rate has increased from 10% to 50% from the 1950s, and growth was maintained for approximately 20 years [48]. As Beijing was a relatively developed city, the urbanization rate and industrial proportion of its economic aggregate production were not very low from the beginning, but the absolute numbers were small. Therefore, the city was in a stage of pre-urbanization and pre-industrialization and

maintained a rapid growth rate for decades. In the last 20 years, the urbanization rate has been stable at approximately 80% [42], and the contributed proportion of industry to the economic aggregate has been declining. The city is in the post-urbanization phase and is becoming deindustrialized. Thus, it can be said that Beijing has experienced a complete process from pre-urbanization to post-urbanization. Along with the changing social background, the planning and construction objectives of the city and new towns have also been transformed many times. From the 1950s to 1970s, as the urbanization and industrialization levels were very low, the new town development goal of Beijing was to promote the development of urbanization and industrialization, to create a large number of industrial facilities, and to encourage the population and economic growth; these goals were similar to those of the new town development of the Soviet Union. In the 1980s and 1990s, on the one hand, due to the emphasis on economic development after the Reform and Opening Up period, many industrial development zones were constructed to promote economic growth. On the other hand, to solve various metropolitan problems, such as the spread of diseases caused by the former chaos in urban planning and construction and the explosion of development caused by the excessive concentration of resources, Beijing also constructed some commuter towns to disperse the urban functions from the original central city area and to improve the living conditions. However, both the industrial development zones and commuter towns were solutions addressing only one aspect of urban functions, i.e., industrial or residential issues, and some of the site selections were improper. Therefore, these solutions did not achieve the desired results. The new town construction in this period could be considered parallel to the practices of the two different development modes. After 2000, different kinds of urban problems became increasingly prominent in Beijing, and the monocentric spatial structure became unsustainable. Beijing began to fully promote new town construction. Learning from the experience of the New Town Movement of Britain, to decentralize the urban pressures of the city center, the new towns constructed in this period were to be independent and self-sufficient. In 2017, Tongzhou New Town and the Xiong'an New District, two high-standard and planned new towns, were proposed successively. To create a new growth pole, functions from the original urban area and linked to the whole Beijing–Tianjin–Hebei metropolitan area would be dispersed to these towns. This plan was an integration and progression of the two new town development modes.

In different social and economic contexts, Beijing's new town planning and construction followed different development modes for different development goals and inherited, adjusted and integrated these modes of pre-urbanization and pre-industrialization or post-urbanization and post-industrialization according to its own development levels and demands (Table 1).

The new town planning and construction of Beijing were constantly adjusted according to the changing socio-economic contexts and due to the top-down planning mechanism and were greatly influenced by political institutions and backgrounds. This influence resulted in a lack of foresight and continuity in planning. The construction process was sometimes interrupted by events in a specific historical period, such as the difficult times that were experienced during the Cultural Revolution. The planning was sometimes designed with improper goals and was not always consistent with long-term interests, such as the expansion of the industrial base. A new planning project might be proposed by the state government before the former planning project, such as the Xiong'an New District, had been completed. The planning objectives, functional designs and even site selections of new towns were constantly changed from monofunctional towns to comprehensive functional towns, from dispersed spatial structures to concentrated spatial structures, from small-size towns on a large scale to the uncontrollable sprawl of the huge newly constructed areas. In most cases, the planned new town development could not be completed and was not as effective as expected. So far, none of the planned new towns has become a new center with the antimagnetic ability to decentralize the population and reduce urban pressure on the original city. The new towns have not been able to become self-sufficient or have been merged into the expanding city, thereby even aggravating the burden and urban problems of the city. This can also be seen from the population growth trend of the entire city, central city, and new towns in recent years (Figure 10). Before the implementation of the

latest version of the new town planning, the growth trend of the new towns' population has not been more obvious than that of the central city. Population diamagnetic force is not significant.

Table 1. The comparison of different phases of new town development in Beijing over the last seventy years.

Planning Time	Social Development Level	New Town Planning	Planning Objectives	Development Modes
1950–1970s	Undeveloped industrial level; under-urbanized population	A sub-parent city system (Zi Mu Cheng)	Promote industrialization and urbanization	Pre-industrialization and pre-urbanization mode
1980–1990s	Rapidly developing period; urban population exploding	Satellite towns and peripheral constellations	Promote industrialization and urbanization; decentralization	Pre-industrialization and pre-urbanization mode; post-industrialization and post-urbanization mode
2000s	Deindustrialization; urban population exploding	New towns	Promote decentralization and living condition improvement	Post-industrialization and post-urbanization mode
2010s	Deindustrialization; limit population growth	New towns and subcenters	Promote decentralization; guide the development of the whole metropolitan area	Post-industrialization and post-urbanization mode; pre-industrialization and pre-urbanization mode

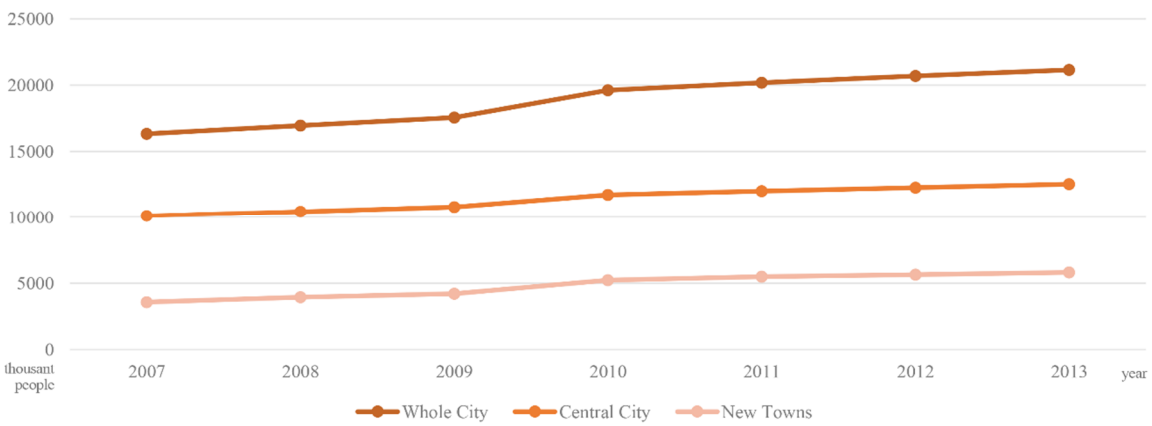

Figure 10. The population growth of the whole city, central city and new towns from 2007 to 2013. Source: based on Beijing Statistical Yearbook [42].

5. Conclusions

New town development is an important method to solve urban problems and promote urban development. Since the twentieth century, many countries have experienced the large-scale construction of new towns. Social background and planning objectives differentiate the two kinds of development modes for new towns. One mode that has been used in periods of post-urbanization and post-industrialization is committed to improving the living conditions of citizens and dispersing the population of urban central areas. The New Town Movement, which started in the 1940s in Britain, was representative of this mode. Another mode used in the pre-urbanization and pre-industrialization stages aims to promote the development of urbanization and industrialization. The large-scale new town construction of the Soviet Union from the 1920s to the 1970s was an example of this mode.

In China, due to the demand of economic growth and long-term rapid urbanization, large-scale urban construction has continued for seventy years. New town development has played a significant role in this process. The development mode for new towns has also experienced multiple transformations at different levels of urbanization and in different political and economic institutional contexts. Beijing, as one of the key areas of urban development in the past seventy years, has gone through urban development and new town construction in every phase of pre-urbanization, rapid development and post-urbanization. However, the planning and construction that has taken

place over the past thirty years has received little attention from academics. The relationship between the different new town development modes and the respective urbanization level and social context, as well as the urban problems caused by the continuous transformation and unstable development mode, has hardly been noticed. This paper has to some extent filled that research gap.

Considering development objectives and characteristics, the process of new town planning and construction in Beijing includes six editions of master plans and can be divided into four phases that have occurred over the past seventy years. From the 1950s to the 1970s, reflecting the new town development mode in the pre-urbanization and pre-industrialization stage, new town planning was mainly focused on the development of urbanization and industrialization. In the new town construction of the 1980s and the 1990s, industrial development zones were planned to promote industrialization and economic growth, and commuter towns were planned to improve the living conditions and to disperse the population and urban functions from the city center. Two different new town development modes of pre-urbanization and post-urbanization were practiced in the same period. The new towns proposed in the master plan in the 2010s were required explicitly to be independent and self-sufficient in order to decentralize the urban pressures from the monocentric urban central area. This plan was consistent with the new town development mode of the post-urbanization and post-industrialization period. The Xiong'an New District, established in the 2010s, was planned as the new town for receiving the dispersed functions from Beijing and the new growth pole for promoting the economic development of the Beijing-Tianjin-Hebei metropolitan area. The Xiong'an New District development integrated the objectives and characteristics of the two different new town development modes. Therefore, these four phases can all be regarded as pure or mixed demonstrations of the two different new town development modes.

The constant transformations in development objectives and modes reflected the lack of planning foresight and have resulted in noncontinuous construction. As a consequence, the new towns have not achieved their planning goals and expected results. The polarization of the spatial structure continues to aggravate existing urban problems. Moreover, Beijing's urban problems, such as the unbalanced distribution of infrastructure and public facilities, severe air pollution and heavy traffic pressure, will not be relieved for a long time.

This paper has reviewed and clarified the relationship between the planning objectives, the development modes of new towns, the social development levels of urbanization and industrialization, and the institutional background. We hope the clear transformation track and inherent causality can provide a reference for the development and transformation of new towns in the future and can assist in solving current urban problems.

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