DOI: 10.38027/N152020ICCAUA316300

Reverse, Inaction or Promotion: The Effects of Long-term Top-down Driving Forces on the New Town's Development in China: Taking Tongzhou New Town as an Example

[1] * M.A. **Xiaoxiao Cai**
[1] *Department of Architecture, University of Leuven, Leuven, Belgium*
E-mail [1]: xiaoxiao.cai@kuleuven.be
ORCID [1]: *https://orcid.org/ 0000-0003-0638-2823*

Abstract
New towns' development is a product of top-down planning and construction. Because of the unique political and economic regime and institutional transition, the role of top-down driving forces reflect even more explicitly in the new town's development in China. Previous studies have primarily been conducted from a static point of view by examining the process of a new town's construction in one time period under one master plan. Few studies have investigated the temporal dynamics of the effects of the top-down driving factors in new towns' development and transformation. Choosing Tongzhou, a new town in Beijing, as a case study, this paper reviewed the 70-year development and transformation process from a general satellite town to a key new town as the sub-city center of Beijing to explore the effects of reverse, inaction or promotion on the new town's development due to the long-term top-down executive forces. This research analyzed the advantages and disadvantages of the top-down development mode and thus can help us improve the urban planning and management in the new towns under the current social and institutional context of China.
Keywords: New Town; Top-down; Driving Force; Long-term; China.

1. Introduction

New town is an important strategy for solving various urban problems in metropolises and promoting urban development. Since the 20th century, a series of new town have been constructed for different development objectives in different countries (Wakeman, 2016), including China. The planning and construction of new town have been increasingly significant for the rapid urbanization and economic growth in the last three decades of China (Xiao, 2017). Unlike the traditional city, new town's development is a product of top-down planning and concentrated construction instead of a natural evolutionary process (Clapson, 2017). However, after being promoted by the top-down executive forces in the initial phase, new town's long-term development also requires the bottom-up driving factors, such as the market demands and residents' behavior. The top-down and bottom-up driving factors jointly promote a virtuous and efficient development process of the new town. However, due to unique governance institutions, this synergy is often imbalance in China (Xue, 2015) (Zhou, 2017). The top-down forces are too strong, and the bottom-up ones are partially invalid.

These top-down and bottom-up driving forces of urban development, the former such as population, economic growth, transportation accessibility, and etc., and the latter such as urban planning, land use policies, administrative regulations and etc., have all been researched in various of aspects. Scholars comes to different conclusions about the importance of each factor in different studies (Braimoh & Onishi, 2007) (Dewan & Ymaguchi, 2009) (Dubovyk, Sliuzas, & Flacke, 2011) (Lambin, et al., 2001). But The existing literature is mainly based on the sprawl of traditional cities, and the results will be different for the new town's development. For example, population and economic growth, which are crucial driving forces of urban sprawl (Dubovyk, Sliuzas, & Flacke, 2011) (Kuang, Chi, Lu, & Dou, 2014), may not be the key factors which can influence the decision of new town's location choice and planning in the preliminary period, while the top-down executive forces, such as urban planning and land policies, are more important. Especially considering the unique political and economic mechanism, these top-down factors are more efficient and decisive (Han, 2010) (Deng & Si, 2015). But few studies have been conducted to these particularities.

Hence, this paper attempts to fill the gap by investigating the driving forces of urban development and transformation in each phase through a study of the decades-long planning and construction process of a typical new town in China. Tongzhou, one of new towns of Beijing, is selected as the empirical research case. From being planned as one of the forty satellite towns of Beijing in 1957 (Editorial Department of Beijing Construction History Book Editorial Committee, 1987), it is one of the earliest constructed and longest growing new town in China. In the past sixty years, it has transformed from a common satellite town established for industrial development to the sub-city center undertaking the transfer of administrative and other non-capital functions in the original city center of Beijing. This development

and transformation is comprehensive and tremendous, so it can fully represent the new towns of China for the study of different roles played by various driving forces in a long period.

This study borrowed the theoretical system of four types of driving forces of urban sprawl, which is widely used by urban economics and urban geography scholars in quantitative analysis, and adjusted it for the new town's distinctiveness. It firstly develops a new conceptual framework based on top-down and bottom-up forces, which originated from the reclassification of the preceding driving factors. And then, various research approaches including literature study, data collation, field investigation and mapping were used in the empirical study to elucidate and test the conceptual framework. It reveals the internal relationship and causality of development modes, driving forces and construction results. This is essential for effectively planning and guiding the new town's development and transformation.

2. Theoretical Background

2.1 Literature Review

The construction and development of new town are the result of the joint effects of various driving factors. Although the initial phase of planning and construction originated from the top-down promotion of governments (Clapson, 2017), the succeeding development process still can be regarded as a normal urban expansion. Therefore, the theoretical framework of driving factors of urban sprawl can be borrowed here to help us better understand the new town's development modes and the relationship of construction consequences and driving forces.

Scholars of urbanism, geography and economics have used many theories and approaches to research and understand the modes, driving factors and mechanisms of urban sprawl (land use/land cover change). These driving factors, including slope (Dubovyk, Sliuzas, & Flacke, 2011) (Aspinall, 2004), elevation (Dewan & Ymaguchi, 2009) (Müller, Steinmeier, & Küchler, 2010), topography/land type (Verburg, Ritsema van Eck, de Nijs, Dijst, & Schot, 2004) (Deng, 2015) (Wu, Zhao, Zhu, & Jiang, 2015), population density or growth (Dubovyk, Sliuzas, & Flacke, 2011) (Kuang, Chi, Lu, & Dou, 2014) (Sun & Xu, 2016) (Liu, Zhan, & Deng, 2005), economic growth/gross domestic product (GDP) (Dewan & Ymaguchi, 2009) (Li, Zhou, & Ouyang, 2013) (Mu, et al., 2007), neighborhood impact (Braimoh & Onishi, 2007) (Luo & Wei, 2009) (Li, Zhou, & Ouyang, 2013), transport accessibility (Deng, 2016) (Patarasuk & Binford, 2012), construction density (Carmen & Irwin, 2004), land use policy (Seto, Fragkias, Güneralp, & Reilly, 2011) (Lambin, et al., 2001) (Zhang T. , 2000), urban planning (Long, Gu, & Han, 2012) (Deng, 2015) (Mu, et al., 2007), regulatory institution (Tavares, Pato, & Magalhães, 2012) (Lee & Shin, 2012), international capital flows (Seto, Fragkias, Güneralp, & Reilly, 2011) (Beaverstock, Smith, Taylor, Walker, & Lorimer, 2000), industry structure (Briassoulis, 2000), have all been deeply researched all around the world. They are identified and examined by quantitative and qualitative methods to test the effect on the urban sprawl in different countries and areas including China. But for the priority of their importance, scholars reach different conclusions in different specific cases.

In additional, these driving factors are classified into several categories as needed. The most widely used classification has four categories, but the names used by different scholars differ slightly. Deng (2015) called them transport accessibility, neighborhood development level, urban master plan, and socioeconomic indicators. Long (2012) named them location variables (market incentives), neighborhood variable, institutional variables, and inherent variable. Li (2013) used the names of physical factors, socioeconomic factors, neighborhood factors, and land use policy and urban planning. There are also scholars divided them into two kinds, such as socioeconomic driving forces and biophysical conditions (Tavares, Pato, & Magalhães, 2012) (Thapa & Murayama, 2010), three kinds, such as natural geographic environment, socioeconomic factors, and political factors (Zhang, 2010), or five groups including political, economic, cultural, technological, and natural driving forces (Bürgi, Hersperger, & Schneeberger, 2005), or neighborhood variables, topological variables, neighborhood factors, socioeconomic factors, and policy guidance (Zhang, Su, Xiao, Jiang, & Wu, 2013).

This driving factor theory has also been used to research on the rapid urbanization process of China. Many scholars have studied on different empirical cases and given different conclusions due to respective spatiotemporal ranges. Mou (2007) argues that population growth has a significant driving effect on the sprawl of Beijing's built-up areas, economic growth is one of the main driving forces for urban construction, the development of transportation is guiding the direction of urban expansion, and policy and institutional factors have largely determined the macro spatial pattern of Beijing. Zhang (2000) indicates that the new tax-sharing system and the land market generated by land policy transformation are the crucial driving forces that lead to the urban sprawl of China. Sun (2009) suggests that the urban sprawl in contemporary China is a result of combined driving factors. Economic and population growth has created the demand of urban space. Participants in the growth-led coalitions led by local governments seek profits and jointly promote the cities' development. The state is still the leading factor in China's urban expansion, because of the executive force guiding the locations of major projects and government administrative sections. Kuang (2009) proves that significant event, population growth and economic development are the main driving factors, among which significant event is more prominent for the urban development in Beijing central city since 1932. However, Li (2013)

argues that physical, socioeconomic, and neighborhood factors have simultaneously affected the expansion of Beijing in the last forty years. The magnitude of the unique effects of physical factors and neighborhood factors declined while that of socioeconomic factors increased along with the urbanization process.

This driving factor system is a comprehensive and widely accepted theoretical framework for urban sprawl (land use/land cover change) research. But most of literature using this framework is studied by economists and geographers to research on part of the factors that are easy to be quantified, such as slope, transport accessibility, population, and economic growth. While the others like master plans, policies and institutions are usually researched by the urbanism scholars qualitatively. These two parts are dissevered, and both mainly focus on the traditional urban sprawl instead of the development of new town. Therefore, if this theoretical framework is applied to the new town's research, it needs to be readjusted. For example, the population and economic growth, which are crucial driving factors for the urban sprawl of a traditional city, are not that important for the new town's preliminary phase. Because the initial planning and construction objectives may be decentralizing a megapolis or promoting the industrial development. The socioeconomic status of the new town's construction site is not the decisive reason for the consideration of development goals and location choice, and the population and economic growth may be the consequences of the new town's development instead of driving forces. But the executive forces from governments, like urban master plan and guiding policies, are more significant (Dai, 2016) (Deng, 2016). And if a long-term development and transformation process of a specific new town is selected as the empirical case, the effects of the constant physical factors, such as scope and elevation, will decline with time (Li, Zhou, & Ouyang, 2013). While the effects of urban planning during the urban expansion increase over time, and are significantly stronger in exurban areas than in central cities and suburban areas (Long, Gu, & Han, 2012), this conclusion can also be applied to new towns which are mostly located in the exurban areas of cities.

2.2 Conceptual Framework

Base on the preceding review, I reorganize these factors into four categories and name them natural physical conditions including elevation, slope, climate, topography, and etc., socioeconomics indicators including population, GDP, development levels of the three industries, and etc., neighborhood impacts and accessibility including the distance from the socioeconomic center, the accessibility of main roads and rail transit, urban development levels in surrounding areas, and etc., and policies and planning including master plans, land policies, various regulatory systems and related policies, and etc.. The driving forces of natural physical conditions and policies and planning are impacted the new town's development from top to down, and the forces of socioeconomic indicators and neighborhood impacts are driven from bottom to up through market factors such as land rent, commuting costs, and housing prices (McGrath, 2005) (Long, Gu, & Han, 2012). In the process of the new town's planning and development, their relationship is as the Figure 1 shows below.

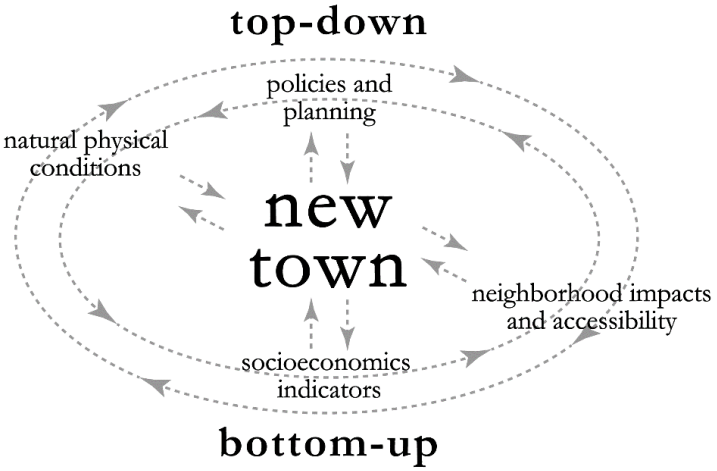

Figure 1. Conceptual Framework of the Top-down and Bottom-up Driving Factors' Circular Effects.

Ideally, there is supposed to be a feedback loop in the long-term development process. The top-down planning leads the new town's construction, and the development consequences in turn affect the planning and policy adjustments. The new town's development promotes the population aggregation and economic growth, while vice versa. The neighborhood areas impact each other, even the topography will be changed after influence the site choice of the new town. However, due to the unique political and economic institutions, the top-down governance forces are too powerful (Zhou, 2017), and this feedback loop cannot be balance and stable, which causes various urban problems. This study selected a specific new town, Tongzou, to discuss in depth how the top-down and bottom-up factors drive the development of the new town in a long term, to what extent is affected by the new town's development, and the

positive and negative consequences brought by this development mode. It helps us better understand the internal relationship and causality of development modes, driving forces and construction consequences.

2.3 Case Selection

Tongzhou is located in the east of Beijing, about 20 kilometers from Tiananmen Square (Figure 2). It was planned as one of forty satellite towns of Beijing in 1957 (EDBCHBEC, 1987), which was the earliest and longest-growing new town in China. In the past sixty years, it has transformed from a common satellite town established for industrial development to the sub-city center which will undertake the transfer of non-capital functions from original city center of Beijing. The development and transformation are comprehensive and tremendous, so it can fully represent the new towns of China for the research of different roles played by various driving forces in a long period.

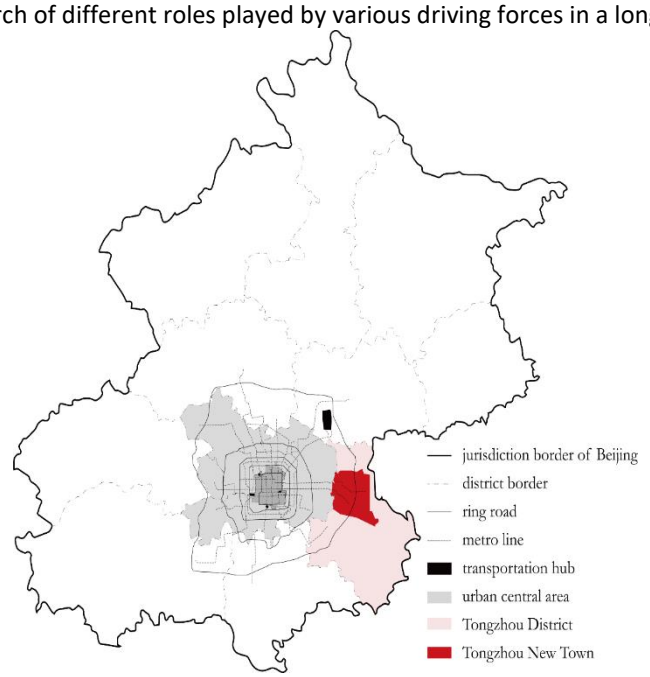

Figure 2. The Location of Tongzhou New Town

3. The Development Process of Tongzhou New Town

The 1st master plan of Beijing in 1953 and 1958

As it had not yet been placed under the jurisdiction of Beijing, Tongzhou was not contained within the planning area in the Draft Plan of Beijing's Redevelopment and Expansion in 1953 (EDBCHBEC, 1987). This draft focused on the planning and reconstruction of the central area of Beijing, and was not approved by the central government of China. In June of 1958, the municipal planning commission proposed the Preliminary Master Plan of Beijing's Urban Construction with the guidance of planning experts from the Soviet Union (EDBCHBEC, 1987). Beijing would be developed into a huge industrial city besides a political and cultural center of the country. A spatial structure named as sub-parent city, learned from the master plan of Moscow, was designed in this master plan. There would be a city center surrounded by more than forty satellite towns, and Tongzhou would be one of the satellite towns planned in the suburban area. This spatial structure would also constitute the urban-rural industrial network in the meantime. Tongzhou was one of the key industrial areas with light industry base.

Under the call of striving to build Beijing into a modern industrial base within five years, Tongzhou did build some new factories. At that time, 113 construction projects were arranged in 37 towns in the suburban area, but due to the following difficult times from 1959 to 1961, more than half of them were not started. Also because of the three-year difficult period, urban planning and construction was shrunk sharply and tend to make full use of the vacant lands in the urban area and fringe area first. Tongzhou, as an exurban satellite town, quickly suspended the pace of construction, and even was re-downgraded into a rural county, Tongxian County, from an urban district in 1960.

The 2nd master plan of Beijing in 1973

After the Cultural Revolution began, in January 1967, the master plan of Beijing was ordered to be suspended, and then in October 1968, even the Beijing Municipal Planning Commission was revoked. The former Construction Commission of China proposed that the urban construction of Beijing would be mainly built on the vacant lands in the original urban constructed area in the Report of Housing Construction in 1966 and Opinions on Housing Construction in 1967 (EDBCHBEC, 1987). This report greatly impeded the development of the suburban area including Tongzhou.

Beijing Municipal Urban Planning Administration Bureau was re-established in December 1972, and proposed a new master plan in the next October. This plan presented that new factories should still be located in exurban area, and some industries in the urban central area currently was supposed to be moved to suburb. However, it was not approved after being submitted to the municipal party committee. The urban construction of Beijing kept developing disorderly without the guidance of master plan.

The 3rd master plan of Beijing in 1982

After the Great Cultural Revolution, a new Beijing Urban Construction Master Plan was formally proposed in 1982 (EDBCHBEC, 1987). There would be three key belts of satellite towns in the northeast, northwest and southwest area of Beijing developing along the main transportation lines. The population size of one satellite town was generally planned to be 50,000 to 200,000. Tongxian was one of the key industrial towns.

During this period, the planning and construction of Tongzhou Satellite Town had only a large guiding framework without specific policies and effective coordination. And it was included in the overall planning of Tongxian County. Even the boundary and scope were not clear. There was no independent statistical data on population, industrial production and construction area, which brought a lot of inconvenience to construction, management, and research (Zhou, 2002). Besides, being impacted by the inconsistent planning objective and the stagnant socioeconomic environment in the recovery period, Tongzhou Satellite Town could not have a standing continuous efficient and healthy development.

The 4th master plan of Beijing in 1993

With the increasing pressure of rapid urban expansion and the promotion of the economic development of suburban counties, Beijing Urban Master Plan (1991-2010) approved by the State Council in 1993 clearly defined the construction of 14 satellite towns for the first time (Beijing Municipal People's Government, 1993). This master plan proposed that these satellite towns should be developed into relatively independent towns with considerable scale, self-sufficient facilities, and their own characteristics. Before 2010, the population size should generally be around 100,000 to 250,000, and in the long run, it would possibly retain 400,000 or more. Tongzhou Satellite Town, as the central area of Tongxian, became one of the three key satellite towns because it was located at the intersection point of the external trunk highways. A metro line would be built to connect the urban central area and the important satellite town.

However, Tongzhou Satellite City had been subject to various constraints in the development process in this period. The construction area was basically limited in the scope of the original town and county. The speed of new development was relatively slow due to multiple reasons, such as lack of water resources, weak regional transportation, the risk of environment pollution, bad infrastructure conditions, and decentralized construction forces. In addition, the municipal government was vacillating between the development priority of the urban central area and the exurban satellite towns. Due to its first-mover advantage, the city center had easily gathered more resources. On the contrary, the construction of the satellite town has been restricted in many aspects such as population scale and land use scale, and it had not received sufficient policy tilt because of the sway of the upper-level planning. Under such circumstances, the overall development scale of Tongzhou Satellite Town did not reach the expected speed during this period. The Batong Metro Line, which connects the urban central area to Tongzhou, was opened to traffic till the end of 2003 (People's Daily Online, 2003).

The 5th master plan of Beijing in 2004

To disperse the increasing urban function and population pressures, Beijing Urban Master Plan (2004-2020) (Beijing Municipal People's Government, 2005) proposed a new planning strategy for building 11 new towns, and designed an urban spatial structure with two axes, two belts, and multiple centers. This was also the first time that the term of satellite town had been upgraded to new city in Beijing's official master plan. The new plan further emphasized the independence of the new town, requiring to play the role of dispersing the population and functions from the urban central area, gathering new industries, and leading the regional development.

Tongzhou belongs to the west development belt of the two belts. It was positioned as a comprehensive service center in the planned multiple centers and was one of the three new towns to be developed first. It was the main area that undertook the decentralization of population and functions from the city center, and lead the development of administrative office, business finance, culture, and exhibition functions. It was also a supplementary supporting area for central city's administrative office, financial and trade functions. The new city would develop mainly from east to south in space, and also be supposed to be an important area connecting Tianjin and Hebei Province. The future population size was planned to be from 700,000 to 900,000, and reserve a development room of one million. In the meanwhile, the plan also proposed that the construction land should have enough space for a new Beijing East Railway Station.

Master Plan of Tongzhou New Town (2005-2020) issued in 2007 (People's Government of Tongzhou District, 2007) mentioned that by 2020, the total urban and rural population of Tongzhou District would be controlled at 1.191 million,

of which 900,000 would belong to the new town. The planned scope of the new town was 155 square kilometers, and the construction area was 85 square kilometers (Figure 3).

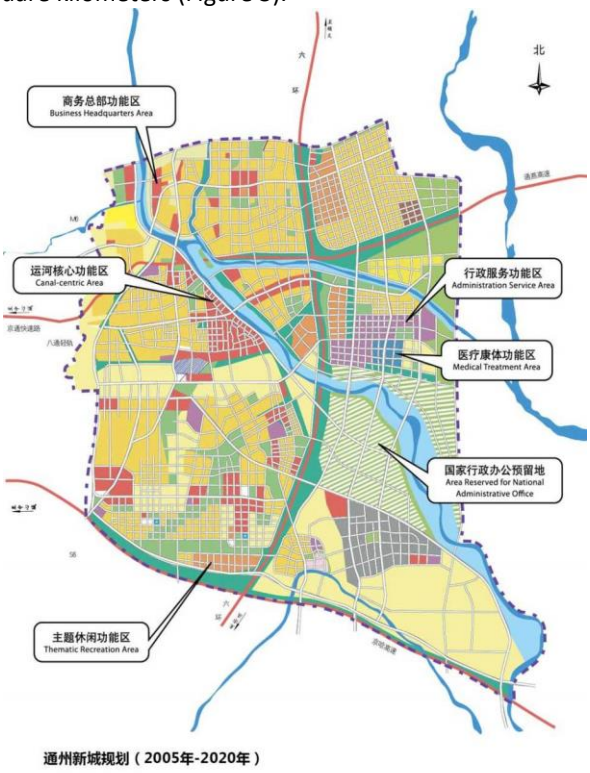

Figure 3. Master Plan of Tongzhou New Town: Source: Master Plan of Tongzhou New Town (2005-2020)

The 6th master plan of Beijing in 2017

In April 2015, the Political Bureau of the CPC Central Committee researched on the construction of Beijing's sub-city center in Tongzhou, and promoted it as a national strategy along with the construction of the Xiong'an New District (Leading Group of Outline of Coordinated Development for the Beijing-Tianjin-Hebei Region, 2015). Beijing's new master plan and Tongzhou's new plan as a sub-city center have also begun to be compiled. In the Beijing Urban Master Plan (2016-2035) adopted and published in September 2017 (Beijing Municipal People's Government, 2017), it was proposed that in order to implement the city's strategic positioning, defuse non-capital functions, and promote the coordinated development of Beijing, Tianjin, and Hebei, a new urban spatial structure with one core, one center, one sub-center, two axes, multiple points and one area would be formed. This new plan focused on changing the development mode of polycentric agglomeration and building a new urban development pattern in Beijing. The sub-city center of Beijing referred to by one sub-center will be planned and constructed on the basis of the original Tongzhou New Town.

In the urban master plan, Tongzhou and Xiong'an served as the city's sub-center and the capital's sub-center respectively, forming the new two wings of Beijing together. The task of Tongzhou is to undertake the decentralization of population and functions from the urban central area. It was led by receiving municipal administrative function and combined with other urban functions to form a comprehensive and independent sub-city center. The planned area was 155 square kilometers, and the peripheral control area was 906 square kilometers. This new town would drive the coordinated development of Langfang City and Beisanxian district.

By 2020, the construction of the main infrastructure framework in the sub-city center will be basically completed. The target of the permanent population size was adjusted to 1 million, and will be limited to 1.3 million by 2035, of which 400,000-500,000 residents will be relocated from the central city. Tongzhou will be initially built as a world-level harmonious and livable modern new town.

In December 2018, the latest edition of master plan of Tongzhou New Town, Regulatory Detailed planning for Beijing Urban Sub-center (block level) (2016-2035) (People's Government of Tongzhou District, 2019), was approved by the State Council of the Central Committee of the CPC. This version of detailed plan basically inherited the ideas and indicators of the master plan of Beijing. In addition to confirming the population and construction land indicators of the sub-center, it further specified that the population target of the entire peripheral control area would be 2 million to 2.05 million by 2035, and the construction land would be 275 square kilometers (Figure 4).

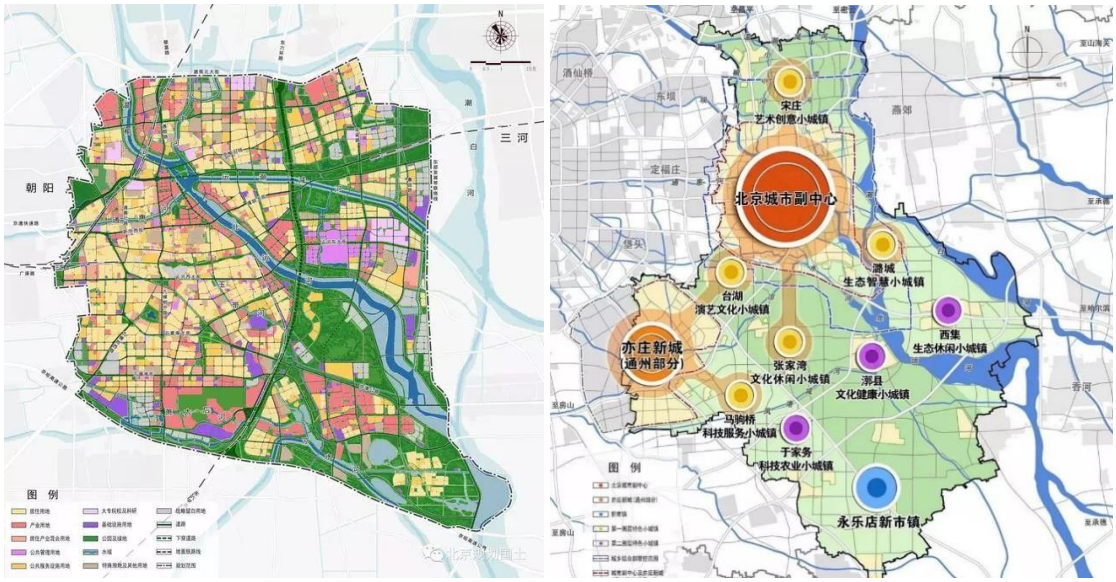

Figure 4. Detailed Plans of Beijing Urban Sub-center and Peripheral Control Area: Source: Detailed planning for Beijing Urban Sub-center (block level) (2016-2035)

Based on these two latest plans, the Tongzhou District Government adjusted the outline of the 13th Five-Year Plan in July 2019 and raised the population size target for 2020 to 1.8 million people (People's Government of Tongzhou District, 2019).

Due to the direct intervention of the state-level government, the planning and construction of Tongzhou New Town once again made a rapid top-down response and adjustment. Both the planning objective and construction scale were changed for a qualified sub-city center and municipal government location of Beijing.

4. Discussions

New town is a product of top-down planning and centralized construction, and the development process of Tongzhou New Town in the past 70 years has reflected this characteristic from the beginning to the present. Its planning and construction have always been guided by the needs of the development and transformation of Beijing's urban spatial pattern, and have been accompanied with the imprint of a super strong top-down executive motivation (Deng, 2016) (Zheng, 2017). Due to Beijing's need to become a large industrial city, the disappearance of top-down driving forces in the special period, and the increasing urgency of decentralized demand of the urban central area, the planning objective and development strategy of Tongzhou New Town have been changed and even reversed time after time by the governments at all levels from the state's to the district's. In the past 70 years, the positioning of Tongzhou New Town has undergone several changes from a satellite town, a key satellite town, a key new town, the administrative sub-center, and Beijing's sub-city center in various editions of master plans of Beijing. And it inherits and embodies the changes and results brought about by the transformation of the top-down driving factors in detailed planning and actual construction. Because of China's unique political and economic system, the top-down executive power is highly direct and efficient, which also makes its advantages and disadvantages more clearly reflected in the development process and result of Tongzhou New Town.

Table 1 is summarized by briefing the all the versions of master plans of Beijing and other related detailed plans and economic plans of Tongzhou. It can be seen that the planning objective of Tongzhou changes every decade, and the population and planning scope also change accordingly. This makes these plans lack of continuity and the effect of construction implementation unsatisfactory.

Table 1. Planning Objectives of Tongzhou New Town in Different Master Plans of Beijing

Time	Spatial Structure of Urban Master Plan	Development Objective New Town	Planning Population New Town	Planning Scope Area of T Town
1958	sub-parent city: one city center and more than 4 town	a satellite town, one of the key points industrial network		
1973	development stagnation in the special period			

1982	gradual reconstruction of the ancient city, functional re-adjustment of the urban fringe ar active development of the exurban area	one of the four key exu towns	50,000-200,000	
1993	a multiple-level of spatial structure with a ci periphery constellations, fourteen satellite tov than thirty central towns	one of the three key sate	250,000 by 2010, 400,000 in the long r	
2004	one urban central area and eleven new towns	one of the four key new	600,000 by 2010, 900,000 by 2020	85 square kilometers
2016		administrative sub-cente		155 square kilometers
2017	● one core of capital functions, one area, one sub-city center, two axes, multiple n one ecological conservation area	Beijing's sub-city center	1,000,000 by 2020, 1,300,000 by 2035	155 square kilometers an kilometers periphery cont

In order to more intuitively show the development and transformation process of Tongzhou New Town, this paper selected three indicators of the total population, population urbanization rate and GDP index of Tongzhou and Beijing for comparison, and obtained Figures 5, 6, and 7, respectively. The GDP index is the percentage obtained by dividing the GDP of the current year in the corresponding region by the GDP of the previous year, and it can reflect the economic growth trend and degree in a certain period.

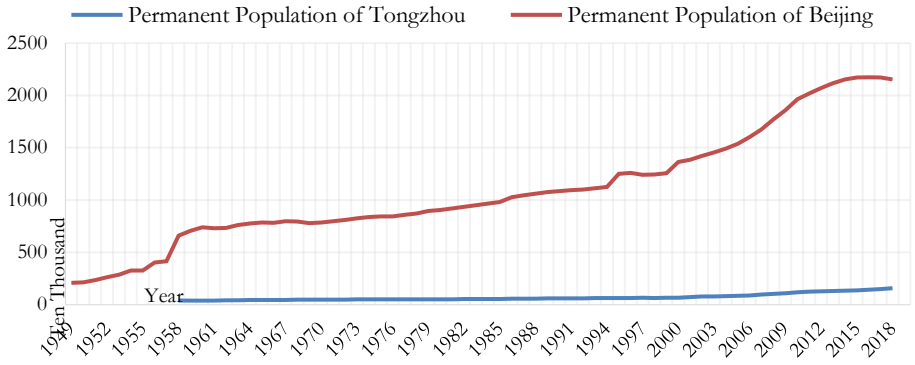

Figure 5. Permanent Population Growth Trend of Beijing and Tongzhou.
Data Source: Yearbook of Beijing, Yearbook of Tongzhou (Beijing Municipal Bureau of Statistics, 1990) (Beijing Municipal Bureau of Statistics, 2019)

From the population growth trend in Figure 5, it can be seen that the total permanent population of Beijing has maintained an increase since the reform and opening up in 1978, and the overall trend has been stable from slow to fast, and it has started to decline after 2016. The two editions of urban master plans in 1993 and 2004, which proposed that population growth should be controlled, basically had no significant impact on this trend. However, the population of Tongzhou grew very slowly before 2000. No matter whether the various master plans decided to promote or suspend the development of satellite towns and new towns, they did not reflect in population growth. The node at which the population growth began to accelerate in 2003 was also the year when Batong Metro Line connecting the urban central area and Tongzhou was opened to traffic. In 2017 and 2018, population growth accelerated again. Correspondingly, in 2016, the Political Bureau of the CPC Central Committee proposed to step up efforts to relocate population and non-essential functions from Beijing, especially from the urban central area. Therefore, a national strategy was formulated to build Tongzhou New Town into Beijing's sub-city center to accept the relocation of Beijing municipal government agencies. It was also from 2016 that the total resident population in Beijing really started to decline.

As circumstantial evidence of this effect, the sales price of second-hand housing in Tongzhou has slowly increased from 15,000 yuan/m2 in January 2012 to 25,000 yuan/m2 in April 2016. However, from May 2016, around the announcement of the strategy that Tongzhou will be built as a sub-city center of Beijing, until the end of 2016, housing prices skyrocketed from 25,000 yuan/ m2 to 45,000 yuan/m2. In 2016 alone, the transaction price of second-hand housing in Tongzhou increased by about 75% (Wang, 2018). The top-down administrative order introduces high-end resources represented by the government's administrative agencies into the new town to promote the development, which is also an executive power driving mode with unique Chinese characteristics (Deng, 2016).

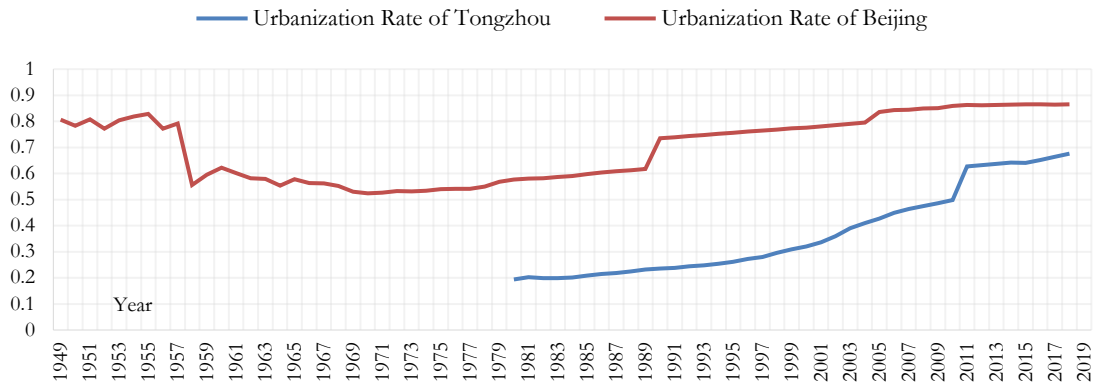

Figure 6. Population Urbanization Rate Growth Trend of Beijing and Tongzhou
Data Source: Yearbook of Beijing, Yearbook of Tongzhou (Beijing Municipal Bureau of Statistics, 1990) (Beijing Municipal Bureau of Statistics, 2019)

As can be seen from Figures 6 and 7, Tongzhou's urbanization rate and GDP growth rate have long been lower than Beijing's overall level. Both the growth trends of urbanization rate and GDP have been slow and stable, and there have been no significant changes before and after every time of the urban plan launches of Beijing and Tongzhou. While in June 2000, the municipal government passed the Outline of the Tenth Five-Year Plan for National Economic and Social Development of Beijing, which proposed to construct the Beijing Central Business District (CBD) (Beijing Municipal People's Government, 2000). The location of CBD is in the area closest to Tongzhou within the city center. In 2009, the Beijing Municipal Government decided to continue to expand CBD to the direction of Tongzhou New Town (Figure 8) (SOM, 2009). Correspondingly, the area of land purchased by real estate companies in Tongzhou skyrocketed from about 100,000 m2/year in 2006 and 2007 to 700,000 to 1,000,000 m2/year from 2008 to 2010 (Wang, 2018). After these lands have gone through an average 2-or-3-year flow of procedures including preparation, approval, construction, completion, and acceptance (Wang, 2018), a large number of completed dwellings are put on the market. In the same period, Tongzhou's urbanization rate accelerated, and the GDP growth rate also started to exceed Beijing's overall level from this time.

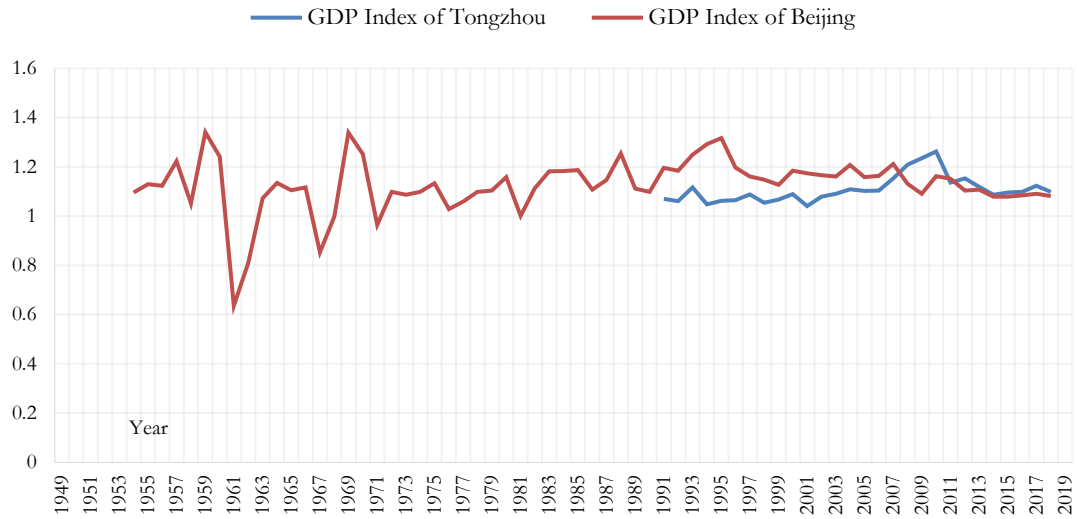

Figure 7. GDP Index of Beijing and Tongzhou
Data Source: Yearbook of Beijing, Yearbook of Tongzhou (Beijing Municipal Bureau of Statistics, 1990) (Beijing Municipal Bureau of Statistics, 2019)

The growth trends of three important indicators reflecting the level of urban development, the number of permanent residents, the urbanization rate, the GDP index, are all weakly related to the formulations and changes of urban master plans. This explains to a certain extent that the top-down driving factors are difficult to really promote the development of the new city just by themselves. The changes of positioning of the new town in the master plan are always due to

the overall demands of Beijing, not the population and economic development needs of its own. On the contrary, the opening of a metro line and the significant change in neighborhood's development will have an impact on the market demands of the new town for housing and other aspects, and these market demands will be more able to drive the development of the new town from the bottom to up. However, the higher-level interventions of executive orders and policies from the state government can play a more powerful role in promoting the construction of the new town. This is also in line with the current situation of China's governance system, where resources and policies are too concentrated to the central government, resulting in a reduction in the effectiveness of local governance (Zhou, 2017). The relationship between market behavior and government governance is from bottom to up, as is the relationship between local governments and the central government. China's current governance mechanism is a top-down decision-making implementation mechanism, not a bottom-up information collection and transmission mechanism (Zhou, 2017). No matter at which level, the excessive strength of the top-down mechanism leads to the absence and weakness of the bottom-up mechanism. And the top-down solo governance and promotion often fails without the bottom-up cooperation.

5. Conclusions

There are many driving factors affecting urban expansion. This paper classifies them into four categories including natural physical conditions, socioeconomics indicators, accessibility and neighborhood impacts, and policies and planning. And according to the differences between new town's development and traditional city's expansion, the mechanism that influences the development of new town is conceptualized as a framework of top-down and bottom-up circular effects. However, due to the excessive concentration of power brought about by China's unique political system, this circular mechanism cannot continuously and balancedly affect the development and transformation of a new town. This paper, based on the 70-year development history of Beijing Tongzhou New City, analyzes to what extent the top-down and bottom-up factors have influenced and promoted the development of its development, and explores various problems this mechanism brings to the construction of the new town because of imbalances between these different factors and their respective shortcomings.

Over the past 70 years, due to changes of top-down planning and policies, Tongzhou New Town has experienced a series of transformations from an ordinary satellite town to a key satellite town, a new town, a key new town, the administrative sub-center, and Beijing's sub-city center. Because each version of a new master plan was revised at the beginning of the setting, the inter-period implementation of a plan was not effective. The planning objectives and strategies are not continuous, which makes the construction of Tongzhou New Town often go backwards and forwards, and results in a significant difference between the actual development and urban planning (Tan, 2008). Coupled with its own insufficient bottom-up development driving forces, the actual development of Tongzhou as a key satellite town in the early period was only equivalent to the level of a rural town.

After 2000, due to the construction of the metro line and the nearby CBD, the driving factors of accessibility and neighborhood impacts were changed. These changes have brought about the demand for housing and other related living functions, which in turn has promoted the construction of Tongzhou New Town in the bottom-up way. But the lack of strong and reasonable top-down planning guidance and policy support make Tongzhou cannot truly become an independent and self-sufficient new town, but has only been a commuter town for the population working in the urban central area for a long time. Although the bottom-up driving factors have brought in conventional resources such as residents and real estate construction, Tongzhou New Town still had difficulty in comprehensive development and cannot effectively optimize the spatial structure of Beijing in this period (Deng, 2016). After the intervention of the central government in 2016, with a more powerful top-down national governance force, some of the functions and population of the urban central area were compulsively relocated to Tongzhou, which greatly promoted the speed and quality of the new town's construction. The development of Tongzhou New Town is accelerating and transforming again. The relocation work has not been completed, and we will expect to see the future effects.

To sum up, the development and transformation process of Tongzhou New Town has distinct historical phases, and different top-down or bottom-up driving factors in different periods have different effects on its planning and construction. In order that Tongzhou New City can develop healthily, quickly and sustainably, this paper suggests that future top-down planning policy and strategy design can fully consider the real socioeconomic background, the bottom-up market incentives and the continuity of previous and subsequent urban plans. The balance of top-down and bottom-up powers can better help the development of Tongzhou New Town. And authors believe that this research conclusion can also provide reference for other new towns in China.

References

AspinallRichard. (2004). Modelling Land Use Change with Generalized Linear Models--A Multi-Model Analysis of Change Between 1860 and 2000 in Gallatin Valley, Montana. Journal of Environmental Management, 72(1-2), 91-103. https://doi.org/10.1016/j.jenvman.2004.02.009

Beaverstock, J. V., Smith, R. G., Taylor, P. J., Walker, D. R., & Lorimer, H. (2000). Globalization and world cities: some measurement methodologies. Applied Geography, 20(1), 43-63. https://doi.org/10.1016/S0143-6228(99)00016-8

Beijing Municipal Bureau of Statistics. (1990). Forty Years of Beijing: Socioeconomic Statistics. Beijing: China Statistics Press.

Beijing Municipal Bureau of Statistics. (2019). Beijing Statistics Yearbook. Retrieved January 2020, from http://tongji.cnki.net/kns55/Navi/HomePage.aspx?id=N2016010098&name=YOFGE&floor=1

Beijing Municipal Commission of Construction. (1986). Report on the work summary of 1985 and the work arrangement of 1986. Beijing: Beijing Municipal People's Government.

Beijing Municipal People's Government. (1984). Several Interim Provisions for Accelerating the Construction of Satellite City in Beijing. Access Date: 2019, January, Source: http://liuyanlun.chinalawedu.com/falvfagui/fg22598/135803.shtml

Beijing Municipal People's Government. (1993). Urban Master Plan of Beijing 1991-2010. Access Date: 2020, January, Source: https://wenku.baidu.com/view/95f67cf5f5335a8103d22069.html.

Beijing Municipal People's Government. (2005). Urban Master Plan of Beijing 2004-2020. Access Date: 2020, January, Source: https://zh.wikisource.org/zh-hans/%E5%8C%97%E4%BA%AC%E5%9F%8E%E5%B8%82%E6%80%BB%E4%BD%93%E8%A7%84%E5%88%92%EF%BC%882004%E5%B9%B4%EF%BC%8D2020%E5%B9%B4%EF%BC%89

Beijing Municipal People's Government. (2017). Urban Master Plan of Beijing 2016-2035. Access Date: 2020, January, Source: https://zh.wikisource.org/wiki/%E5%8C%97%E4%BA%AC%E5%9F%8E%E5%B8%82%E6%80%BB%E4%BD%93%E8%A7%84%E5%88%92%EF%BC%882016%E5%B9%B4%EF%BC%8D2035%E5%B9%B4%EF%BC%89

Braimoh, A. K., & Onishi, T. (2007). Spatial Determinants of Urban Land Use Change in Lagos, Nigeria. Land Use Policy, 24(2), pp. DOI: 502-515. 10.1016/j.landusepol.2006.09.001

BriassoulisHelen. (2000). Analysis of land use change: theoretical and modeling approaches. Jackson R. (Ed.)W., The web-book of regional science. USA: Regional Research Institute, West Virginia University.

BürgiMatthias, HerspergerM.Anna, & SchneebergerNina. (2005). Driving forces of landscape change - current and new directions. Landscape Ecology, 19, 857-868. DOI: 10.1007/s10980-005-0245-3

CarmenCarrión-Flores, & IrwinG.Elena. (2004). Determinants of Residential Land-Use Conversion and Sprawl at the Rural-Urban Fringe. American Journal of Agricultural Economics, 86(4), 889-904. DOI: 10.1111/j.0002-9092.2004.00641.x

Clapson, M. (2017). The English New Towns since 1946: What are the Lessons of their History for their Future? Histoire Urbaine, 50(3), 93-111. DOI: 10.3917/rhu.050.0093

Xiongci, D. (2016). The Urban Sprawl in Tongzhou New Town and Anti-sprawl Strategies. Development of Small Cities & Towns, 7, 92-98. http://en.cnki.com.cn/Article_en/CJFDTotal-XCJS201607025.htm

Deng, Y., & Si, Y. (2015). The Spatial Pattern and Influence Factors of Urban Expansion: A Case Study of Beijing. Geographical Research, 34(12), 2247-2256. DOI: 10.11821/dlyj201512004

DengYu, & SrinivasanSumeeta. (2016). Urban land Use Change and Regional Access: A Case Study in Beijing, China. Habitat International(51), 103-113. https://doi.org/10.1016/j.habitatint.2015.09.007

DewanM.Ashraf, & YmaguchiYasushi. (2009). Land Use and Land Cover Change in Greater Dhaka, Bangladesh: Using Remote Sensing to Promote Sustainable Urbanization. Applied Geography, 29(3), 390-401. DOI: 10.1016/j.apgeog.2008.12.005

Dubovyk, O., Sliuzas, R., & Flacke, J. (2011). Spatio-temporal Modelling of Informal Settlement Development in Sancaktepe District, Istanbul, Turkey. ISPRS Journal of Photogrammetry and Remote Sensing, 66(2), 235-246. https://doi.org/10.1016/j.isprsjprs.2010.10.002

Editorial Department of Beijing Construction History Book Editorial Committee. (1987). Beijing Urban Construction Data Book since the Founding of P.R.China: Vol. 1. Urban Planning (Vol. 1). Beijing: Beijing Construction History Book Editorial Committee.

FragkiasMichail, & SetoC.Karen. (2009). Evolving Rank-Size Distributions of Intra-Metropolitan Urban Clusters in South China. Computers, Environment and Urban Systems, 33(3), 189-199. https://doi.org/10.1016/j.compenvurbsys.2008.08.005

Sunsheng, H. (2010). Urban Expansion in Contemporary China: What Can We Learn from a Small Town? Land Use Policy, 27(3), 780-787. https://doi.org/10.1016/j.landusepol.2009.10.010

Hebei Provincial Committee of the Communist Party of China; Hebei Provincial People's Government. (2018). Hebei Xiong'an New District Planning Outline. Access Date: 2020, January, Source: https://zh.wikisource.org/wiki/%E6%B2%B3%E5%8C%97%E9%9B%84%E5%AE%89%E6%96%B0%E5%8C%BA%E8%A7%84%E5%88%92%E7%BA%B2%E8%A6%81

KuangWenhui, ChiWenfeng, LuDengsheng, & DouYinyin. (2014). A comparative analysis of megacity expansions in China and the U.S.: Patterns, rates and driving forces. Landscape and Urban Planning, 132, 121-135. https://doi.org/10.1016/j.landurbplan.2014.08.015

KuangWenhui, LiuJiyuan, ShaoQuanqin, & SunChaoyang. (2009). Spatio-temporal Patterns and Driving Forces of Urban Expansion in Beijing Central City Since 1932. Journal of Geo-Information Science, 11(4), 428-435. DOI: 10.3724/SP.J.1047.2010.00428

Lambin, E. F., Tuner, B. L., Geist, H. J., Agbola, S. B., Angelsen, A., Bruce, J. W., . . . Moran. (2001). The Causes of Land-use and Land-cover Change: Moving Beyond the Myths. Global Environmental Change, 11(4), 261-269. https://doi.org/10.1016/S0959-3780(01)00007-3

Leading Group of Outline of Coordinated Development for the Beijing-Tianjin-Hebei Region. (2015). Outline of Coordinated Development for the Beijing-Tianjin-Hebei Region. Access Date: 2020, 1, Source: http://www.cre.org.cn/list3/jjy/15279.html

Lee, Y.-S., & Shin, H. (2012). Negotiating the Polycentric City-region: Developmental State Politics of New Town Development in the Seoul Capital Region. Urban Studies, 49(6), 1333-1355. DOI: 10.1177/0042098011411947

LiuJiyuan, ZhanJinyan, & DengXiangzheng. (2005). Spatio-temporal Patterns and Driving Forces of Urban Land Expansion in China during the Economic Reform Era. AMBIO A Journal of the Human Environment, 34, 450-5. DOI: 10.1639/0044-7447(2005)034[0450:SPADFO]2.0.CO;2

LiXiaoma, ZhouWeiqi, & OuyangZhiyun. (2013). Forty years of urban expansion in Beijing: What is the relative importance of physical, socioeconomic, and neighborhood factors? Applied Geography, 38, 1-10. https://doi.org/10.1016/j.apgeog.2012.11.004

LongYing, GuYizhen, & HanHaoying. (2012). Spatiotemporal heterogeneity of urban planning implementation effectiveness: evidence from five urban master plans of Beijing. Landscape and Urban Planning, 108(2-4), 103-111. https://doi.org/10.1016/j.landurbplan.2012.08.005

LuoJun, & WeiDennisY.H. (2009). Modeling spatial variations of urban growth patterns in Chinese cities: The case of Nanjing. Landscape and Urban Planning, 91(2), 51-64. DOI: 10.1016/j.landurbplan.2008.11.010

McGrathT.Daniel. (2005). More evidence on the spatial scale of cities. Journal of Urban Economics, 58(1), 1-10. https://doi.org/10.1016/j.jue.2005.01.003

Mu, F., Zhang, Z., Chi, Y., Liu, B., Zhou, Q., Wang, C., & Tan, W. (2007). A Dynamic Monitoring of Built-up Area in Beijing during 1973 to 2005 Based on Multi-original Remote Sensed Images. Journal of Remote Sensing, 11(2), 257-266. http://en.cnki.com.cn/Article_en/CJFDTOTAL-YGXB200702017.htm

MüllerKalin, SteinmeierCharlotte, & KüchlerMeinrad. (2010). Urban growth along motorways in Switzerland. Landscape and Urban Planning, 98(1), 3-12. https://doi.org/10.1016/j.landurbplan.2010.07.004

PatarasukRisa, & BinfordW.Michael. (2012). Longitudinal analysis of the road network development and land-cover change in Lop Buri province, Thailand, 1989–2006. Applied Geography, 32(2), 228-239. https://doi.org/10.1016/j.apgeog.2011.05.009

People's Daily Online. (2003, 12月27日). Beijing Metro Batong Line officially opened for trial operation today. Access Date: 2020, 1, Source: http://www.people.com.cn/GB/shizheng/14562/2267791.html

People's Government of Tongzhou District. (2007). Urban Master Plan of Tongzhou New Town 2005-2020. Access Date: 2020, 1, Source: https://wenku.baidu.com/view/32fdac6148d7c1c708a145a5.html

People's Government of Tongzhou District. (2016). The 13th Five-Year Plan for National Economic and Social Development of Tongzhou District, Beijing (2016-2020). Access Date: 2020, 1, Source: http://www.beijing.gov.cn/zfxxgk/tzq11L002/zxgh32/2018-04/10/13596196f1b54a3d884fbc1fe4d46a86/files/4bb7f530ac2c40a380d268f33184577a.doc

People's Government of Tongzhou District. (2019). Regarding the adjustment of the contents of the 13th Five-Year Plan for the National Economic and Social Development of Tongzhou District, Beijing. Access Date: 2020, 1, Source: http://www.beijing.gov.cn/zfxxgk/tzq11LA21/gh001/2019-08/30/content_349d360adbc442c78cb242cef3f0dc6e.shtml

People's Government of Tongzhou District. (2019). Regulatory detailed planning for Beijing Urban Sub-center (block level)(2016-2035). Access Date: 2020, 1, Source: http://www.beijing.gov.cn/zfxxgk/tzq11L027/gh32/2019-07/19/c53835fcd99f450bb3647ef6df05ce9d/files/1e6c43c64e9c4b22a4fbdd89b7aef6f9.pdf

Seto, K. C., Fragkias, M., Güneralp, B., & Reilly, M. K. (2011). A Meta-Analysis of Global Urban Land Expansion. PLoS ONE, 6(8), p. e23777. https://doi.org/10.1371/journal.pone.0023777

SunDonghu, & XuHui. (2016). Outline of the History, Humanities and Geography of Beijing. Beijing: China Social Science Press.

TavaresO.Alexandre, PatoL.Rosinda, & MagalhãesC.M. (2012). Spatial and temporal land use change and occupation over the last half century in a peri-urban area. Applied Geography, 34, 432-444. https://doi.org/10.1016/j.apgeog.2012.01.009

ThapaBahadurRajesh, & MurayamaYuji. (2010). Drivers of urban growth in the Kathmandu valley, Nepal: Examining the efficacy of the analytic hierarchy process. Applied Geography, 30(1), 70-83. DOI: 10.1016/j.apgeog.2009.10.002

VerburgH.Peter, Ritsema van EckR.Jan, de NijsC. M.Ton, DijstJ.Martin, & SchotPaul. (2004). Determinants of land-use change patterns in the Netherlands. Environment and Planning B, 31, 125-150. https://doi.org/10.1068%2Fb307

Wakeman, R. (2016). Practicing Utopia: An Intellectual History of the New Town Movement. Chicago: University of Chicago Press.

WuWenjia, ZhaoShuqing, ZhuChao, & JiangJinliang. (2015). A comparative study of urban expansion in Beijing, Tianjin and Shijiazhuang over the past three decades. Landscape and Urban Planning, 134, 93-106. DOI: 10.1016/j.landurbplan.2014.10.010

ZhangTingwei. (2000). Land market forces and government's role in sprawl: The case of China. Cities, 17(2), 123-135. https://doi.org/10.1016/S0264-2751(00)00007-X

ZhangZhonghao, SuShiliang, XiaoRui, JiangDiwei, & WuJiaping. (2013). Identifying determinants of urban growth from a multi-scale perspective: A case study of the urban agglomeration around Hangzhou Bay, China. Applied Geography, 193-202. https://doi.org/10.1016/j.apgeog.2013.09.013

Zhou, X. (2017). The Institutional Logic of Governance in China: An Organizational Approach. Beijing: SDX Joint Publishing Company.