

## FRINGE BELT ALIENATION AND NEW KERNELS OF CHINESE MEGACITIES: A CASE STUDY OF QINGDAO

Handuo Deng, Undergraduate Student of College of Urban and Environmental Sciences, Peking University, P.R. China

Keer Zhang, Undergraduate Student of College of Urban and Environmental Sciences, Peking University, P.R. China

Chenyue Wang, Undergraduate Student of College of Urban and Environmental Sciences, Peking University, P.R. China

---

### ABSTRACT

*Despite the comprehensive study on fringe belt phenomenon worldwide, there is a lack of a summary of the common features of the evolution of the fringe belt of Chinese cities. Based on historical documents and remote sensing data, this paper illustrates the alienation of the fringe belt since the 1990s in Qingdao, which reflects the municipal power in Chinese megacities as the leading force in the rapid changes of internal urban structure. Established in the 1890s by German colonizers and then developed by various regimes, the first fringe belt of Qingdao was formed by 1949. In the 1990s, followed by the establishment of the new city center on the previous fringe belt driven by municipal orders, other parts of the fringe belt have undergone different types of alienation. The extent of alienation has varied with location, former land-use and attitude towards historical preservation. The increasing involvement of capital and real estate development driven by market rules also plays a part. The paper concludes with consideration of the common factors and variations in the fringe-belt alienation caused by the relocations of municipal centers in contemporary Chinese megacities, and reflects on the concepts and methodology of urban morphological studies.*

**Keywords:** urban morphology; Qingdao (Tsingtao); fringe belt; alienation; poly-centricity

---

### INTRODUCTION

The fringe-belt phenomenon, defined by Louis (1936) and developed in the Alnwick case by Conzen (1960), reflects the tendency for the urban area to utilize the periphery for such land-uses as factories, institutions, train stations and other public services. In terms of fringe-belt evolution, alienation (land-use transformation) and relocation to more peripheral areas are commonplace (Conzen, 1960). Whitehand extended the scope from small towns (Conzen, 1960) to larger cities (Whitehand, 1967) and applied economic theories to the evolution cycle of fringe belt (Whitehand, 1972). polycentricity in metropolitans complicates the fringe-belt problem (Whitehand, 1981). A hierarchy of fringe belts (Whitehand, 1981) is developed to identify the relationship between multi-kernels and even more fringe belts despite the partial dependency of sub-centers on larger centers.

Recent morphological studies have extended into Chinese cities (Conzen, Gu and Whitehand, 2012; Whitehand and Gu, 2017). In terms of morphological phases, Chinese cities generally experience feudal dynasties (before 1949), socialist exploration (1949-1978) and the present market-economy boom (after 1978). During the last four decades of economic reform, urban areas have increased exponentially in China, largely driven by demographic change, economic growth and land-use policy alteration (Liu, Zhan and Deng, 2005). The urban spatial structure has undergone significant transformations with diverse spatiotemporal features, such as dispersion and polycentricity (Li and Liu, 2018). However, the dearth of historico-geographical documents and complexity of spatiotemporal transformation leads to the deficiency in

the commonality summary on the fringe-belt evolution of Chinese megacities. Besides, current morphological studies in China mostly focus on either macroscopic perspectives at the prefecture level (B. Li and Li 2005) or microscopic perspective at the building/block level (Conzen, Gu, and Whitehand 2012).

To fill the research gap, we illustrate the fringe-belt alienation in Qingdao since the 1990s. Qingdao, as the once colonial city with a cross-cultural planning background, is a perfect case to show the urban form in a different institutional and economic context. Based on the Conzenian theory, we combine historical documents and remote sensing data to demonstrate the historico-geographical process since 1898. Historical documents include literature, official files, maps, photographs and news reports in various periods and remote sensing data are employed to compensate for the incompleteness of traditional sources, including Google Earth Images and LandScan Population Dataset (Dobson *et al.*, 2000). A multi-scale perspective, ranging from city level to building/block level, leads to an explanation of urban form, especially the evolution of the inner structure of the fringe belt.

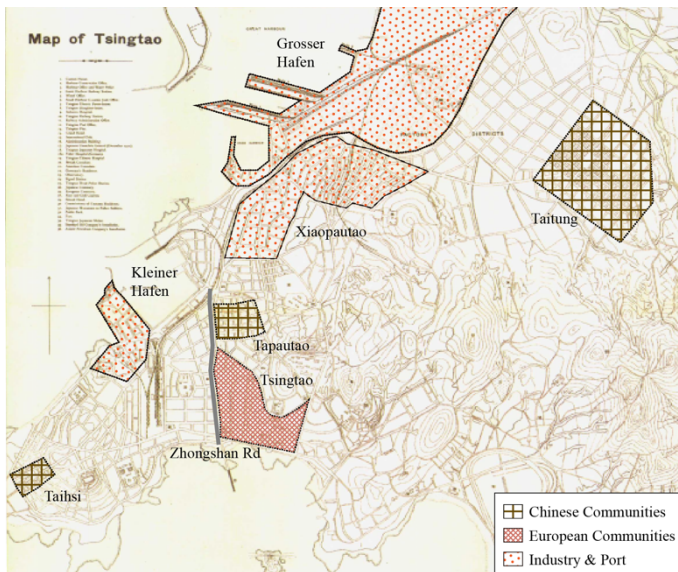
---

#### URBAN FORM OF QINGDAO BEFORE 1994

As for Qingdao's multi-governmental planning, the policies and emphasis vary in different phases, which in turn leads to the complexity of urban form. Accordingly, the morphological period of Qingdao is divided into four major periods of which the first three will be discussed in Section 2 and the fourth in Section 3 in particular.

- (I) Pre-urbanization (before 1898)
- (II) Early urbanization with multi-regime alterations (1898-1949)
  - (1) German occupation (1898-1914)
  - (2) 1<sup>st</sup> Japanese occupation (1914-1922)
  - (3) Peiyang Government reign (1922-1929)
  - (4) 1<sup>st</sup> Kuomintang reign (1929-1938)
  - (5) 2<sup>nd</sup> Japanese occupation & 2<sup>nd</sup> Kuomintang reign (1938-1949)
- (III) Initial establishment of socialism (1949-1994)
  - (1) Establishment and exploration of socialism (1949-1980)
  - (2) Early reform and opening up (1980-1994)
- (IV) Comprehensive reform (1994 to present)

The Qingdao area comprised several fishing villages in the 19<sup>th</sup> century, then a military base in 1891 for coastal defense. Since the agreement of the Kiautschou Bay Concession in 1891, Tsingtao (the former name for "Qingdao" originated from different phonics) was deprived the Qing's sovereignty and became a colony of the Deutsches Reich (German Empire). When choosing the city site, planners chose the east bay near the overseas anchorage, facing south to the sea and protected by northern hills. The railway station was arranged on the west of the Landungs Brücke (landing bridge). The initial plan by 1906, recognized the separation principle of the European and Chinese settlements (Warner, 1996). Four major districts were formed accordingly (Figure 1): (1) European community, Tsingtao; (2) Chinese communities, Tapautao; (3) Two distant labor settlements, Taitung and Taihsi Town; (4) Port and industry, Grosser Hafen (Main Harbor, 1901), Kleiner Hafen (Junk Harbor, 1904) and the affiliated industry.



**Figure 1. Four regions in the Tsingtao planning in Germany occupation**

The districts differed in population, race, density, function and urban form. The Tsingtao community, centering on Friedrich Street (currently, the south of Zhongshan Rd, Figure 1), contained military camps, administrative centers and European settlements. The European region adopts a baroque style through the central axis and radius roads; the buildings, mostly villas and apartments, exhibited German nationalism and modernism. Segregated from Tsingtao community by watersheds (now vanished) lay Tapautao, the Chinese region. Tapautao adopted gridded road and the typical buildings, *liyuan*, combines Chinese and Western residential forms. Taihsi and Taitung town, remote residential areas built for Chinese labour with gridded roads, reflected the colonial tendency for suburban land use, comprising a new category of

fringe belt regardless of the high population density and small block size. The northern port area incorporated harbour and industry (Grosser Hafen, Kleiner Hafen).

In half a century, Tsingtao's sovereignty alternated among 3 nations and 5 regimes, but the urban form was developed in the German-planned framework. After the outbreak of WWI, Japan seized control over Tsingtao. In 1922, Tsingtao was returned to the Peiyang government of China. In the following warfare, Tsingtao's sovereignty altered frequently from Peiyang (1922-1929) to Kuomintang (1929-1938) to Japanese invaders (1938-1945) to Kuomintang (1945-1949) and finally to the Communist (1949-). Different authorities held various priorities for planning: industry was emphasized during the Japanese occupation (1914-1922) and municipal construction in the first Kuomintang periods (1929-1938). Reflecting fluctuations of the socio-political situations, Tsingtao exhibits notable building cycles.

During the phase III (1949-1994), construction was limited and primarily focused on the industry along the northern coast and railway. Industry has been the prime contributor to Qingdao's GDP since 1952 (Zhang and Rasiah, 2013). As a "terminal city", the direction of urban expansion and economic connections was consistent, accounting for the belt expansion along the railway. However, the belt led to the dis-economy of internal connections, such as work-residence imbalance and traffic problems. It is unrealistic to stretch indefinitely along the belt, which calls upon the necessity for the adjustment of development direction.

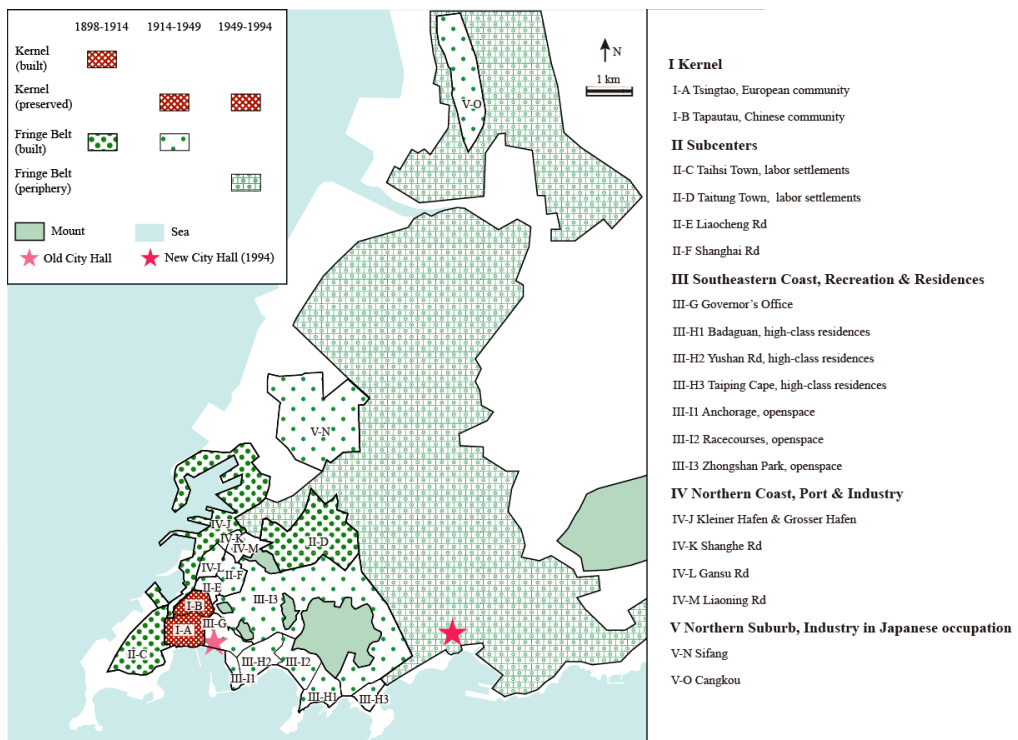


Figure 2. Plan of Qingdao's urban areas by 1994.

Tsingtao and Tapautau area established by Germans are recognized as the kernel and the Shantung Railway as the fixation line (Figure 2). A discontinuous fringe belt gradually shaped around the kernel during the German Occupation (1898-1914). The fringe belt embodies industries, ports, schools, hospitals, upper-class and labour-concentrated residential areas, open spaces (i.e. racecourses) and other institutions. During the first Japanese occupation (1914-1922), factories (i.e. Sifang and Cangkou) were built along the northern coast, joining the fringe belt. It was further enriched with upper-class residences on the southern seashore chiefly during the first Kuomintang rule (1929-1938). Construction in the initial establishment of Socialism (1949-1994) was limited except for the sanatorium on the southern coast and factories on the north. By 1994, Qingdao's fringe belt comprised upper-class residences on the southern coast, Taihsi, Taitung and the mix of industry and residence along the northern coast.

#### FRINGE BELT ALIENATION OF QINGDAO SINCE 1994

##### ALIENATION AS THE NEW KERNEL

In 1994, the Qingdao Municipal government was moved from the German Governor's Office to the eastern suburbs on the south waterfront of the bay around the former site of Fushansuo Village. The construction led to the rise of the new city center and large-scale alienation of the fringe belt (Figure 3). As a consequence of alienation, a new kernel emerged in the fringe belt of Qingdao.

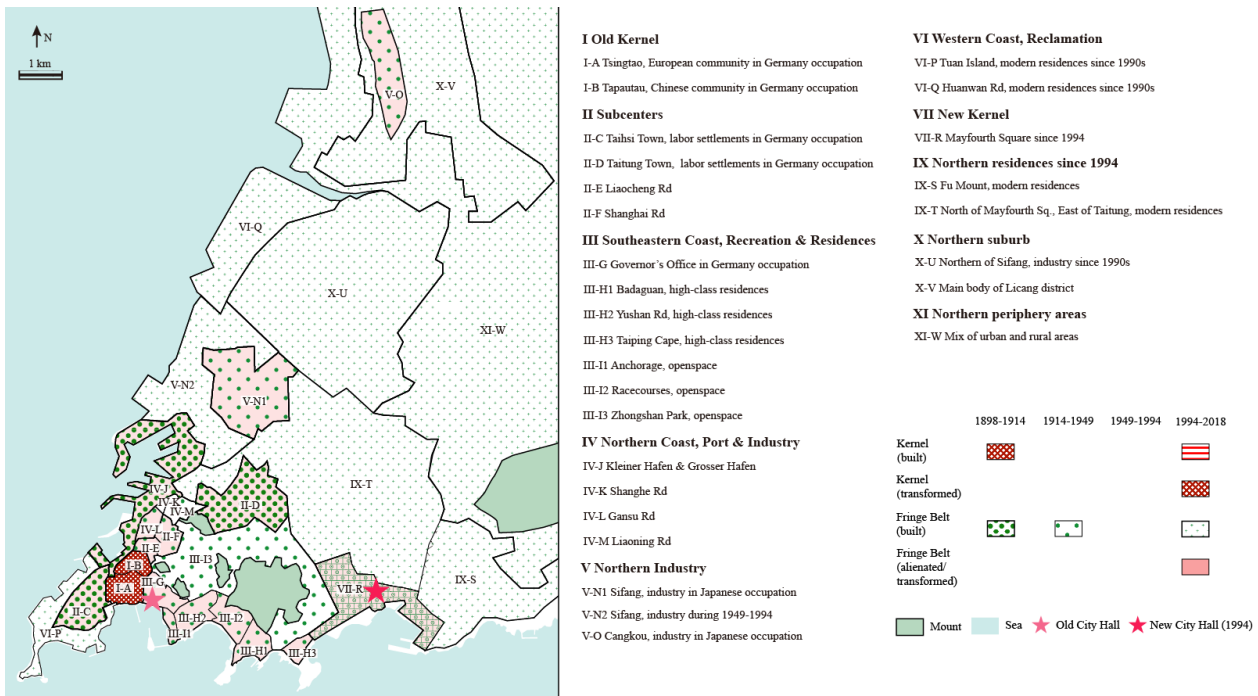


Figure 3 Pan of Qingdao's urban areas by 2018.

The new city hall area used to be occupied by farmlands, fishing-farming villages, military heritages and factories. The original urban form was developed in the military reclamation around the 14th century, with the formation of a cross street. In WWII, the Japanese Army occupied here and started the military construction. In 1982, a north-south ditch was transformed into a road, now the Shandong Rd. With the removal of farmlands and forests, dormitories of state-owned factories were built. In the early 1990s, Shandong Rd went through another regeneration with the construction of a west-east road, Hong Kong Rd. The new city hall was built on the intersection of the two roads.

Urban planning increased confidence in real estate investment in this area with skyrocketing land rent, investments and construction of high-class residences, malls, offices and squares (e.g. May Fourth Square, Olympic Sailing Center). Increasing land demands led to the removal of many villages in 1999, with bungalows and fields replaced by urban texture. The former suburb was completely alienated into the city center. The relocation of city hall has successfully formed and consolidated the new center of Qingdao, confirmed by the change in population distribution. Based on the LandScan data (Bright, Coleman and King, 2004; Rose *et al.*, 2019), the population density has declined dramatically in the old town and increased around May Fourth Square from 2003 to 2018 (Figure 4).

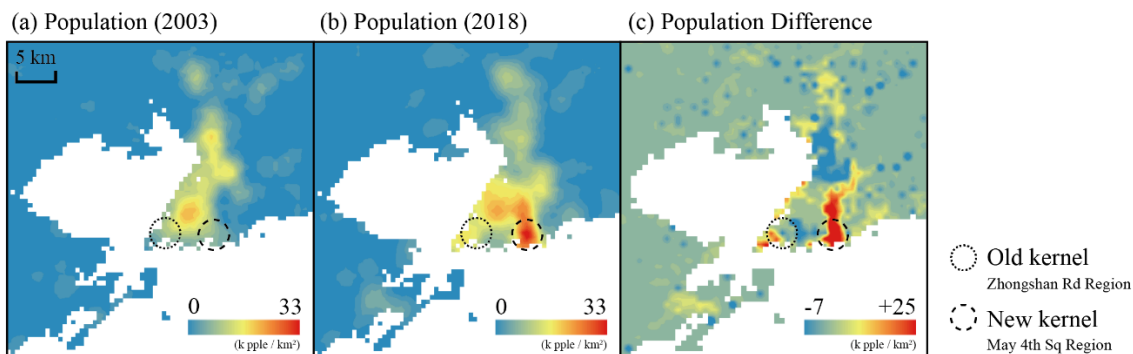


Figure 4 Population distribution of Qingdao in 2003 (a), 2018 (b) and the difference (c) (Kriging interpolated)

Source: Landscan Population Dataset

---

## ALIENATION OF THE OTHER PARTS OF THE FRINGE BELT

In the rest of the fringe belt, intense changes have taken place since the municipal movement. Xiaopautao Village was located on the north of Tapautao. Kleiner Hafen was built on the coast north to Xiaopautao with intense construction in the 1920s. Since 2002, old residences have been demolished for the Master Plan of High-tech Industrial Development Zone. Apartments, high-tech corporations, offices and hotels replaced most two-storey Japanese-style houses, tiny blocks were amalgamated for massive real estate development, and minor streets vanished.

North of Kleiner Hafen lies Grosser Hafen and Sifang Village, another fishing-farming village. In the 1920s, Japanese colonizers built cotton, mill factories and railways outside the village. After 1949, more factories were constructed there along with schools, universities, institutions, a railway station and a coach station. The mix of villages and industries was the most common landscape of the northern fringe belt until the late 1990s. Factories underwent fundamental changes in land-use and form after 2000. Some have been demolished or transformed into residential and commercial use and those remaining have been preserved as industrial heritage. Natural landscapes also changed, with minor rivers (i.e. Tiny Village River) converted into roads and small hills flattened.

There are also parts where less alienation has taken place. The former residential area for the upper class with villas along the coast from Guanhaishan (literally, Sea-watching Mount) to Badaguan Historic Districts (literally, Eight Great Passes) comprises the southeastern part of the fringe belt. After the foundation of the P. R. China, villas and colonial institutions were confiscated and transferred to the government. Little has changed in street patterns and building texture for the protection; however, land-use has been transformed into universities, schools, hospitals, parks and tourism attractions, with the transfer and division of property rights.

---

## OUTER EXPANSION: NEW FRINGE BELT?

In the more periphery areas, urban construction is accelerating following the rise of the new city center (Figure 3). In the east, the new-district plan focuses on the sub-administrative government and adopts the central axis, similar to the planning ideal of the old kernel planned by the German while indicating differences in block scales. Mega-blocks, which typically cover over 100 hm<sup>2</sup>, is the contemporary form in the new-town planning in China. The northern periphery is still an urban-rural integration area that are not fully developed despite the rapid, intensive residential construction recently. Terrain and capital preferences contribute to uneven construction densities. Intensive apartments, loose rural settlements, uncultivated arable land and even wilderness mixed in this vast district.

There are two kinds of views accounting for constructions in the outer peripheral areas. Some emphasize the weak connection between the periphery areas and the city center, reflecting the urban expansion as a process towards polycentricity. Others reflect the essence of fringe belt and argue that there lies generality on the loose outer edge of fringe belt in Chinese megacities. To some extent, construction in the periphery is a parallel version to that in Grosser Hafen, Sifang and May Fourth Square, adding generality to the evolution of the fringe belt in Qingdao.

---

## DRIVING FORCES

The alienation of the fringe belt as the new kernel reflect the power of imperative orders on investments and urban construction. Before the economic reform in 1978, land transaction was forbidden in China. Since 1978, the Central Government started to support the rapid development in some pilot cities through finance and policies, while the contradiction between the tremendous number of cities and the lack of central finance finally put an end to direct financial support. In 1994, the national reform on the Tax Sharing System allows less financial power while increasing responsibilities for local governments, explaining the

local desire to increase fiscal revenue by transferring state-owned lands to the capital, thus accelerating urban expansion and regeneration.

Qingdao may have initiated the trend of the relocation of city halls in Chinese megacities. Before the 1990s, the narrow cape area restricted the urban expansion of Qingdao. The moving of the city hall to the more spacious east guaranteed space for future expansion and prevented further belt-growth along the railway. Qingdao was one of the first northern Chinese cities to raise funding via land transferring. By transferring the lands in the old-town area to foreign investors, the local government raised enough funds not only for the construction of the new city hall but also for the old-town regeneration, which proved a success in planning and finance. Transfer fees, along with social capital is obtained from Local Government Funding Vehicle (LGFV)<sup>1</sup>.

The rise of the new city center has profoundly changed the urban geospatial pattern. Overall, the alienation of the fringe belt above could be classified into 5 types according to the forms before and after the alienation as well as the major driving force (Table 1). The local government has driven most of the alienation, and the increasing involvement and leading of capital and real estate development deserve attention as well. Capital investment tends to enter the areas with less difficulty in demolition and construction. The difficulty refers to not only the regeneration of physical space but also the obtaining of administrative approval.

**Table 1. Types of alienation on Qingdao's fringe belt since the 1990s**

| Type | Before the alienation                            | After the alienation                              | Major driving force                 | Cases  |
|------|--|---|-------------------------------------|--|
| I    | Traditional villages & urban wastelands          | Municipal institutes & Public services            | LGFV (driven by the government)     | May Fourth Square                            |
| II   | Industrial area                                  | Modern community                                  | Real estate investment              | Grosser Hafen; Kleiner Hafen; Sifang; Licang |
| III  | Industrial area                                  | Heritage parks & Commercial area                  | Government & Capital investment     | Sifang                                       |
| IV   | Residential area for civilians before 1949       | Modern community                                  | Government & Real estate investment | Xiaopautao; Taitung; Taihsi                  |
| V    | Residential area for the upper class before 1949 | Public services, tourism and historical districts | Government                          | Xiaoyushan; Guanhaishan; Badaguan            |

The extent of alienation, mostly decided by the willingness of the government to preserve the original urban form, reflects the social values towards the definition and significance of historical heritage. Villas and western-style blocks tend to survive because they are usually viewed as examples of exquisite architecture, while most civilian residences have been removed. The location also influences the extent of alienation, as areas closer to the city center are more likely to undergo fierce regeneration.

## CONCLUSION AND DISCUSSION

<sup>1</sup> Local Government Funding Vehicle (LGFV): A type of financing channel for infrastructure construction and new district development which gained popularity after 1994. LGFV releases urban investment debts endorsed by the local government.

This paper illustrates the alienation of the fringe belt since the 1990s in Qingdao, which reflects the municipal power in Chinese megacities as the leading force of the rapid changes of internal urban structure. Established in the 1890s by German colonizers and then developed by several authorities, the urban form of Qingdao was similar to most Western towns before 1949. From 1949 to 1994, the industrial functions of Qingdao were strengthened and few changes of form were made in the rest of the city. In the 1990s, the relocation of the city hall led to the alienation of a part of the fringe belt as the new kernel. Other parts of the fringe belt have also undergone different types of alienation, in the form of village demolition, old-town regeneration, industry eviction and urban expansion. The extent of alienation of a certain area depends on its location, the former land use and most importantly, the preservation values of the government. Apart from municipal orders, the increasing involvement of capital and real estate development driven by market rules also plays a part.

In the past three decades, it has been common to move the city hall as the drive for the establishment of the new city center in Chinese megacities. The effects of the move vary. In some cases, i.e. Qingdao, the city center moves and leads to the hierarchical reconstruction of urban space directly and rapidly. In other cases, the status of the old kernel remains with the progressive development of new sub-centers and new districts on the outer edges. In some provincial cities, i.e. Hefei and Chengdu, the city halls were moved, which led to the alienation of the fringe belt and the polycentricity of the urban spatial structure. In other cases, i.e. Harbin, the move of the city hall proved to be a failure in terms of transforming the fringe belt into the new city center, due to the decline of heavy industry, the stagnation of economic development, and the severe outflow of the population since the mid-1990s.

To conclude, the relocation of city halls is just one means to stimulate urbanization. Due to the lower land price and construction density, local governments prefer the urban fringe when seeking sites for projects (Zhong and Guo, 2019). The results depend on terrain conditions, the new location, the socio-economic foundation of the city and its economic hinterland. The powerful influence of municipal orders makes the expansion and construction of new districts in China distinctive. Through the process of fringe-belt alienation, the morphological heritages of a traditional city have been integrated into the new central district, whose concept completely differs from the kernel in ancient times. Modern metropolitan areas have gradually come into being owing to increasing inter-city connections.

---

#### ACKNOWLEDGEMENT

This work was supported by the National Innovation Training Program under Grant 7310200686 and the Undergraduate Scientific Research Training Program of Peking University, Beijing. The authors appreciate Dr. F Song and JWR Whitehand for their valuable suggestions and comments.

---

#### REFERENCES

- Bright, E. A., Coleman, P. R. and King, A. L. (2004) 'LandScan 2003'. Oak Ridge, TN: Oak Ridge National Laboratory SE - July 1, 2004 (LandScan). Available at: <https://landscan.ornl.gov/>.
- Conzen, M. P., Gu, K. and Whitehand, J. W. R. (2012) 'Comparing traditional urban form in China and Europe: A fringe-belt approach', *Urban Geography*. Taylor & Francis, 33(1), pp. 22–45.
- Conzen, M. R. G. (1960) 'Alnwick, Northumberland: A Study in Town-Plan Analysis', *Transactions and Papers (Institute of British Geographers)*. doi: 10.2307/621094.
- Dobson, J. E. et al. (2000) 'LandScan: A global population database for estimating populations at risk', *Photogrammetric Engineering and Remote Sensing*, 66(7), pp. 849–857.



- Li, B. and Li, C. (2005) 'A Study of the History of Qingdao Early Modern City Planning (1891-1949)', in *Urban planning forum*.
- Li, Y. and Liu, X. (2018) 'How did urban polycentricity and dispersion affect economic productivity? A case study of 306 Chinese cities', *Landscape and Urban Planning*. Elsevier, 173(January), pp. 51–59. doi: 10.1016/j.landurbplan.2018.01.007.
- Liu, J., Zhan, J. and Deng, X. (2005) 'Spatio-temporal patterns and driving forces of urban land expansion in China during the economic reform era', *Ambio*. 2005/10/06, 34(6), pp. 450–455. doi: 10.1579/0044-7447-34.6.450.
- Louis, H. (1936) *Die geographische Gliederung vom Gross-Berlin*. Bayerische Staatsbibliothek.
- Qingdao City Archives (2002) *Qingdao Map General*. Jinan: Shandong Map Press.
- Rose, A. N. et al. (2019) 'LandScan 2018'. Oak Ridge, TN: Oak Ridge National Laboratory SE - July 1, 2019 (LandScan). Available at: <https://landscan.ornl.gov/>.
- Warner, T. (1996) 'Die Planung und Entwicklung der deutschen Stadtgründung Qingdao (Tsingtau) in China', *Der Umgang mit dem Fremden*. Hamburg: Technische Universität Hamburg-Harburg, 142.
- Whitehand, J. W. R. (1967) 'Fringe Belts: A Neglected Aspect of Urban Geography', *Transactions of the Institute of British Geographers*, 41(41), p. 223. doi: 10.2307/621338.
- Whitehand, J. W. R. (1972) 'Building cycles and the spatial pattern of urban growth', *Transactions of the Institute of British Geographers*. JSTOR, pp. 39–55.
- Whitehand, J. W. R. (1981) 'Conzenian ideas: extension and development', *The urban landscape: historical development and management. Papers by MRG Conzen, Inst. Br. Geogr. Spec. Publ*, 13, pp. 127–152.
- Whitehand, J. W. R. and Gu, K. (2017) 'Urban fringe belts: Evidence from China', *Environment and Planning B: Urban Analytics and City Science*, 44(1), pp. 80–99. doi: 10.1177/0265813515608849.
- Zhang, M. and Rasiyah, R. (2013) 'Qingdao', *Cities*, 31, pp. 591–600. doi: 10.1016/j.cities.2012.06.021.
- Zhong, R. and Guo, Z. (2019) 'The Fringe city: Economic interpretation and extended thinking on the discontinuous expansion of urban space', *Planners*, 35(13), pp. 76–81.

---

CORRESPONDING AUTHOR

Handuo Deng, Undergraduate Student, College of Urban and Environmental Sciences, Peking University, No.5 Yiheyuan Rd, Haidian District, Beijing, P.R. China. [chrishdd@163.com](mailto:chrishdd@163.com)