

Evolution of Living Space in Qingdao in Different Periods

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Keywords: Living space; Evolution; Qingdao

Abstract: Using longitudinal data on socio-economic and demographic aspects, combined with remote sensing images and planning drawings, the spatial pattern and evolution of residential space in Qingdao at different periods since its establishment are analyzed. The spatial pattern of the city has changed from the initial triangular grouping pattern to the ribbon pattern, and then to the zigzag and multi-core grouping pattern, which shows that the scale of residential space has been expanding, the spatial structure has become more complex, the internal construction is mainly block filling, and the peripheral development is mainly piecemeal development. The reconfiguration of residential space is formed by the external force of natural environment limitation and transportation corridor guidance, as well as the internal force of commercial industry space leading and planning policy guidance.

1. Introduction

The residential function is one of the basic functions of the city. How to adjust and transform the structure of urban living space through a reasonable organization and layout approach in order to improve the level of urban livability is the current challenge [1].

As an important central city along the coast of China, Qingdao is at the strategic highland of opening up and developing to the world in Shandong [1] Province. From a small fishing village in the German-occupied period to a modern big city, Qingdao City has been expanding in scope, expanding in population and changing in spatial pattern of living in the process of development from nothing to something, from a port to a trade and industrial city, and to a regional comprehensive central city. The study of Qingdao's living space has practical and theoretical value in the context of new policies, new environment and new opportunities.

2. Grouping pattern during the establishment and colonial periods

2.1 Construction period - triangular grouping pattern (1891-1897)

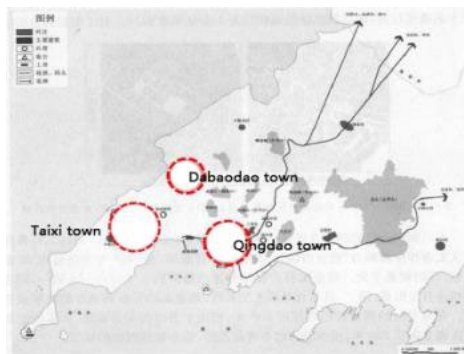


Figure 1 Triangular grouping pattern in 1897

Qingdao is located in the southeast of Shandong Peninsula, at the exit of Jiaozhou Bay, and has a unique advantage of land and sea. In 1891, the Qing government set up a defense in Jiaozhou Bay,

Zhang Gaoyuan built a government office and a fortress, and open up the road from the entrance of Qingdao to the mainland. The construction of the pier of the trestle bridge was the beginning of Qingdao's port. At this time, the spatial shape of the city was triangular (Figure 1), in which Qingdao town was the district where Qingdao port and the chief soldier's office were located, Dabaodao town was the residential area, and Taixi town was the area where the barracks were stationed, and the functional space was mainly military space.

2.2 German-occupied period – European - chinese residential zoning system (1898-1914)

In 1898, the Qing government was forced to sign *Sino-German Treaty of Jiao'ao Lend-Lease*, which marked the beginning of the German occupation period. The construction of Qingdao port and Jiaoji railroad led to the rapid development of commerce, trade and industry, and Qingdao was rapidly transformed from a small fishing village into a port city centered on commerce and trade. "Qingdao City Plan" made in 1900 planned the administrative, residential and commercial areas along the southern coast, and the port, railroad, warehouses and industrial areas along Jiaozhou Bay in the northwest [2]. It also divided the leased land of Qingdao into two boundaries, the outside world called Li-cun and the inside world called Qingdao, and planned the district of Qingdao where Europeans lived, the district of Baodao where Chinese lived, and the towns of Taidong and Taixi where laborers lived [3], laying down the spatial form of the European-Chinese zoning system and widening the differences in living environment and facilities (Figure 2).



Figure 2 European-Chinese residential zoning in 1913

2.3 Japanese-occupied period - expansion of urban spatial pattern to the north (1914-1922)

With the outbreak of World War I and the first Japanese occupation of Qingdao in 1914, Japan used Qingdao as a bridgehead for resource plundering in China, building a large number of factories involved in various industries such as finance, industry and commerce, and Qingdao transitioned from a port city to a modern industrial city with both industry and commerce and light textile. Japan carried out three phases of the new city street expansion program, and eventually five areas were formed [4], dividing the land into ten classes. At the same time, land was reclaimed in the area of Sifang Cangkou, and "six major yarn factories" were built successively, forming an industrial zone along the railroad and the eastern shore of Jiaozhou Bay, laying the foundation for the urban pattern of "Living in the South and working in the North" (Figure 3).

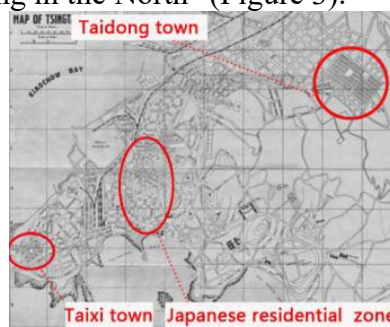


Figure 3 Expansion to the north in 1917

3. Belt Pattern from the National Government Period to the Reform and Opening-up Period

3.1 Nationalist government period - urban integration and expansion to the north (1922-1937)

In 1922, the national government took back Qingdao and encouraged national industries and the development of urban and rural areas. The economic structure developed comprehensively into industry, commerce, trade and finance, and Qingdao changed from a port city centered on commerce and trade to a multifunctional city center. In 1935, *Qingdao Master Plan* expanded the planning area to the north of Licun and Cankou, and to the east of Xinjiazhuang and Maidao, dividing the city into administrative districts, commercial districts, industrial districts, residential districts, port and harbor districts. Residential areas were divided into four classes according to different locations (Figure 4).



Figure 4 Four classes of residential areas in 1935

3.2 Japanese-occupied period - spatial pattern of belt corridor (1937-1949)

Qingdao was occupied by Japan for the second time when the full-scale invasion war broke out in 1937. Japan attached importance to the industrial and transportation construction of Qingdao for the purpose of economic plundering. In 1941, *Qingdao Special City Local Plan* included Jiaozhou and Jimo into the regional planning. It was planned to establish 3 industrial zones in northern Qingdao, Huangdao and Jiaozhou, connected by railroad, and to build a new port in Huangdao. The city was divided into commercial, industrial, residential and villa areas [5-6]. The groups are divided and do not interfere with each other, and are separated by large green areas in the mountains and forests. Although the city center is laid out in multiple core clusters, the overall geometry has shown a tendency to develop into a belt type.

3.3 The early period of the founding of china - reinforced belt pattern (1949-1978)

After the founding of New China, the national strategy attached importance to industrial production, so the construction of Qingdao city returned to the east coast of Jiaozhou Bay, building a large number of industrial plants, relying on the port and railroad to transport production materials, and building a large number of factory dormitories and houses to go with them. The newly built industrial areas were in a confused spatial form, with disorderly zoning of urban functions, and a serious "mixed industrial and residential" situation [7].

4. Pinnacle cluster after reform and opening up to the end of 20th century

4.1 The early stage of reform and opening up - breaking the belt pattern in a group (1978-1989)

After the reform and opening up, the country started to reform the housing system, and initially implemented the model of "unified planning and comprehensive development". In 1984, *Qingdao Master Plan (1985-2000)* showed the establishment of suburban industrial zones and the development of the city to the east, and the water system was used as the boundary to designate the north of the Licun River as the northern cluster, the middle cluster from the Licun River to the

Haipo River as the middle cluster, and the south cluster south of the Haipo River as the southern cluster [8-9]. The three groups have their own advantages, and the development of the city to the east and the establishment of suburban industries have broken the limitations of the north-south strip development (Figure 5).



Figure 5 Qingdao Master Plan (1985-2000)

4.2 Reform and opening up the stage of great development - pinnacle grouping form (1989-2000)

In 1989, Qingdao proposed the layout structure of "one center, one ring and one group", the original belt-type urban space and the eastward expansion of high-tech industrial parks form the "main city", the westward shift of Qingdao Port and the construction of Qingdao-Huangdao Expressway around Jiaozhou Bay drive the development of the west bank of Jiaozhou Bay to form the "secondary city", and the expansion along Jiaozhou Bay with Chengyang Industrial Zone as the central group, the Pinnacle cluster form is initially formed. The residential land was built in enclaves, with the East Cluster being formed by the eastern border of Licun and Zhonghan Street, and the West Cluster being formed by the Economic and Technological Development Zone and Huangdao City (Figure 6).

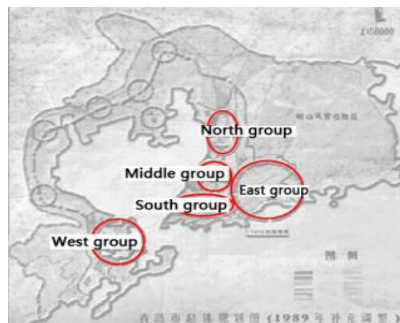


Figure 6 Qingdao Master Plan (adjustment in 1989)

In 1999, *Qingdao City Master Plan (1995-2010)* planned the city into a general layout structure of "two points and one ring": the six districts of the main city on the east coast of Jiaozhou Bay as the main nodes, the central city of Huangdao on the west coast as sub-nodes, and the development groups of Licang and Hongdao along the ring of Jiaozhou Bay (Figure 7) [10].



Figure 7 Qingdao Master Plan (1995-2010)

5. Polycentric cluster pattern since the 21st century (2001 -)

After entering the 21st century, Qingdao's urban spatial development skeleton has been gradually improved. The latest *Qingdao City Territorial Spatial Master Plan (2021-2035)* proposes a spatial pattern of "one main city, three sub-center cities, two peripheral new towns", with East Coast - Chengyang - Huangdao as the main center city, Jiaozhou, Jimo and former Jiaonan as sub-center cities, Dongjiakou Port City and Blue Valley Marine Science City as peripheral new towns, and multiple functional centers. The city is gradually formed, and more abundant residential space groups appear (Figure 8).

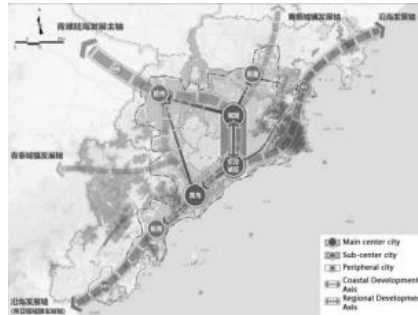


Figure 8 Qingdao Master Plan (2021-2035)

6. Conclusions

From the evolution of urban residential spatial structure in Qingdao for more than 100 years, the evolution of residential spatial structure in different periods has inheritance and shows the characteristics of suburbanization and residential differentiation. From the initial triangular cluster pattern, it changed to a belt pattern, and then to a pin-shaped, multi-core cluster pattern, with the overall expression of expanding urban space scale, more complex urban space structure, internal construction mainly in block filling, and peripheral development mainly in piece development; the residential space structure of Qingdao has a certain inheritance over time, with the coastal area always being a villa area with beautiful environment, the northern part of the city being a villa area. Chengyang District and Licang have been promoting the development of residential spatial structure together, and have shown suburbanization and residential differentiation with the urban spatial structure.

Acknowledgment

This article was founded by Qingdao Philosophy and Social Science Planning Project (QDSKL2101111)

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