

A Tracking Research on a Special Fixation Line in Shenzhen, China

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Abstract: This research tracks on a special fixation line – the Second Line – as the boundary between Shenzhen Special Economic Zone and the mainland. We discuss its general evolution at different scales and the prosperity and decline reasons in the new era. The previous research of this special fixation line in 2010 has analyzed its construction process and expanded the concept of traditional fixation line. Based on previous research, we track the overall historical evolution of the Second Line from its formation to annulment, and comparatively analyze the morphological elements' changes and evolution mechanism at different scales with the hierarchical structures of morphology. We found that, this fixation line interacts with different morphological elements at the scales of city, street, building and region, and the elements at different levels are interrelated as well. Thus, the evolution mechanism of the Second Line in urban landscape is systematically analyzed. Additionally, the value of heritage can be identified by morphological analysis. As an important linear legacy after China's reform and open policy, this fixation line is faced with problems that have some reflective significance for the protection and development of cities.

1. Theoretical basis and methodology

1.1. *Theoretical basis of fixation line*

Fixation line is one of the important terms in the study of Conzenian School. The concept of *fixation line* was refined by M.R.G. Conzen in his study of Alnwick, which was further developed on the basis of its tangible and invisible factors as “the site of a linear feature that has, at some time, provided a barrier to development” by Peter Larkham and Andrew Jones (1989). In the study of urban morphology, *fixation line* usually causes asymmetric distribution on both sides of the “*inner fringe belt*”, which leads to the difference of urban landscape in the old city. Therefore, the study of the fixation line is helpful to grasp the context of the development of the old city (Conzen, 1969). Fixation lines are more commonly associated with urban planning and management.

At present, more focus was put on the relationship of *fixation line* and *Inner Fringe Belt* with the city wall as the main research object, rather than reflection on its nature (Whitehand, 1967, 1988). The article “A special fixation line in Shenzhen, China” takes the the Land Administration Line of Shenzhen Special Economic Zone (referred to as “the Second Line”) as the research

object, analyses the evolution process and characteristics of the *fixation line's* construction period from 1988 to 2010, expands the definition of traditional *fixation line's* terms, explores its generality and provides empirical research support (Xiong Xinkai, Shi Chunhui, etc., 2011).

Based on the previous research, this paper traces the historical process of revocation and demolition in the next 8 years, and re-integrates and analyses the 36-year historical process from development to extinction of “the Second Line”. Combining with the hierarchical structure of morphology, this paper uses the method of multi-scale and system theory to analyze the evolution process and dynamic mechanism of morphological elements at different levels, and pays attention to the root of the prosperity and decline of the *fixation line* in the course of the times, thus developing the understanding of the *fixation line*.

1.2. Methodology of the research

Because of the different fineness observed at different scales, the identifiable morphological elements will be different. According to the hierarchical structure of form, urban form can be understood at different levels of resolution corresponding to the building/lot, the street/block, the city, and the region (Moudon, 1997). *Fixation line*, as one of the morphological elements, has been identified on building, block or land scale in previous studies which are relatively single. Therefore, this paper uses multi-scale analysis method to identify the relationship and role between the *fixation line* and other morphological elements from the four scales of building, block, city and region. It also studies the nature and evolution of the *fixation line* from multiple levels, and explores the motivation mechanism of the historical process of its historical process from the formation to the disappearance.

At the same time, based on multi-scale morphological analysis, it is not a simple space “narrowing” and “enlarging” relationship, but also should be understood the relationship between different levels and the factors of action from the perspective of system theory. This paper systematically analyses the effects of social and economic forces in different periods and external forces in different scales on the evolution of the *fixation line*, so as to reveal the significance and value of the *fixation line* for urban development and protection more holistically.

2. Introduction

2.1. Introduction of Shenzhen Special Economic Zone

Shenzhen is situated in the south of Guangdong Province, east of the Pearl River Estuary, east of Daya Bay and Dapeng Bay, west of Pearl River Estuary and Lingding Ocean, south of Shenzhen River and Hong Kong, north of Dongguan and Huizhou (See Figure 1). The history of Shenzhen's urban development can be traced back to 214 B.C., when it belonged to Nanhai County (County of Guangzhou). After that, Bao'an was set up as a county system, which administered the areas of Shenzhen, Dongguan and Hong Kong today. After Hong Kong became a British colony in 1898, Shenzhen became the gateway connecting the mainland and Hong Kong. Shenzhen is more like a buffer zone separating China's Mainland from Hong Kong, reflecting different political systems.

Unlike China's ideology and economic structure before the reform and open policy, Shenzhen Special Economic Zone (referred to as SZ-SEZ), as an “experimental area” of the new policy, has gradually developed from a small county to a national economic center and an

internationalized city. Promoted by the market economy, the special economic system, open trade policy and liberal market distribution system of SZ-SEZ have laid the foundation for the success of the experiment, with amazingly rapid growth of economy. Shenzhen's GDP grew rapidly from US\$0.3 billion in 1979 to US\$352.1 billion today, surpassing Hong Kong for the first time in 2018.

Behind the economic growth is the rapid urbanization. Urban landscape has undergone a revolutionary transformation, including transportation, urban form, building types, land use and so on. As the boundary of the special policy at that time, the Second Line undoubtedly played an important role in it.

2.2. Introduction of the Second Line

The Second Line was approved by the State Council in 1982 as a special management line, which separated SZ-SEZ (including Luohu, Futian, Nanshan and Yantian districts) from the Mainland, with the inside and outside parts of it. Corresponding to the border line between Shenzhen and Hong Kong (commonly known as "the First Line"), this management line is also called "the Second Line". The Second Line is 90.3 kilometers long, from Beijiaozi in the east to Gupojiao in Anle Village in the south. It includes 163 duty posts, 16 joint inspection stations and 24 tillage outlets.

The Second Line is not only the administrative line of SZ-SEZ, with different land policies, economic systems and legal systems inside and outside it, which has certain significance of political and economic system isolation. At the same time, it is also the border management line, which consists of a wire mesh and concrete boundary piles up to 90.2 kilometers and 2.8 meters high. Joint inspection stations and tillage outlets have been set up on the main traffic arteries of the administrative line, respectively, for access and exit. Personnel are inspected and have the nature of armed defense along the Second Line.

On the occasion of the 40th anniversary of reform and open policy, the State Council agreed in 2018 to abolish the Second Line. In 37 years (1982-2019), the Second Line has experienced a historical process of development and extinction, which can be divided into four stages:

1. The stage of construction and development (1982-1997): the construction of the Second Line's gateways were increased from 6 to 9, and finally 16 and the roads crossing the line were increased. The overall construction of the Second Line was strengthened, and internal and external supervision was strengthened.
2. The stage of unbalanced development (1998-2002): the Second Line defines two different life forms of Shenzhen. Under the "one city, two laws" policy, the gap of development between inside and outside the line has gradually widened and imbalanced. The rapid economic growth, high-rise buildings and high level of urbanization were in internal area and the external area with clustering of factories has poor environmental conditions and slow development. This division transcends geographical and material boundaries and evolves into cultural and psychological differences.
3. Phase of political boundary disappearance (2003-2012): with the increase of population flow, the growth of external area's economy, under the tide of urbanization, in order to meet the needs of urban integration development, the isolation effect of the Second Line political policy disappeared.
4. Phase of physical boundary disappearance (2013-today): due to the construction of urban roads and the increasing demand for the consolidation of vacant land around the Second

Line, the Second Line has entered the phase of material entity's demise. A large number of gateways and barbed wire nets were removed, leaving only a small number of remains.

The Second Line is a human-made boundary set up under the special political and economic background, which has a great impact on the townscape of both sides. Therefore, the following will explore the evolution mechanism of this administrative line in the townscape's historical process through a multi-scale system analysis method.

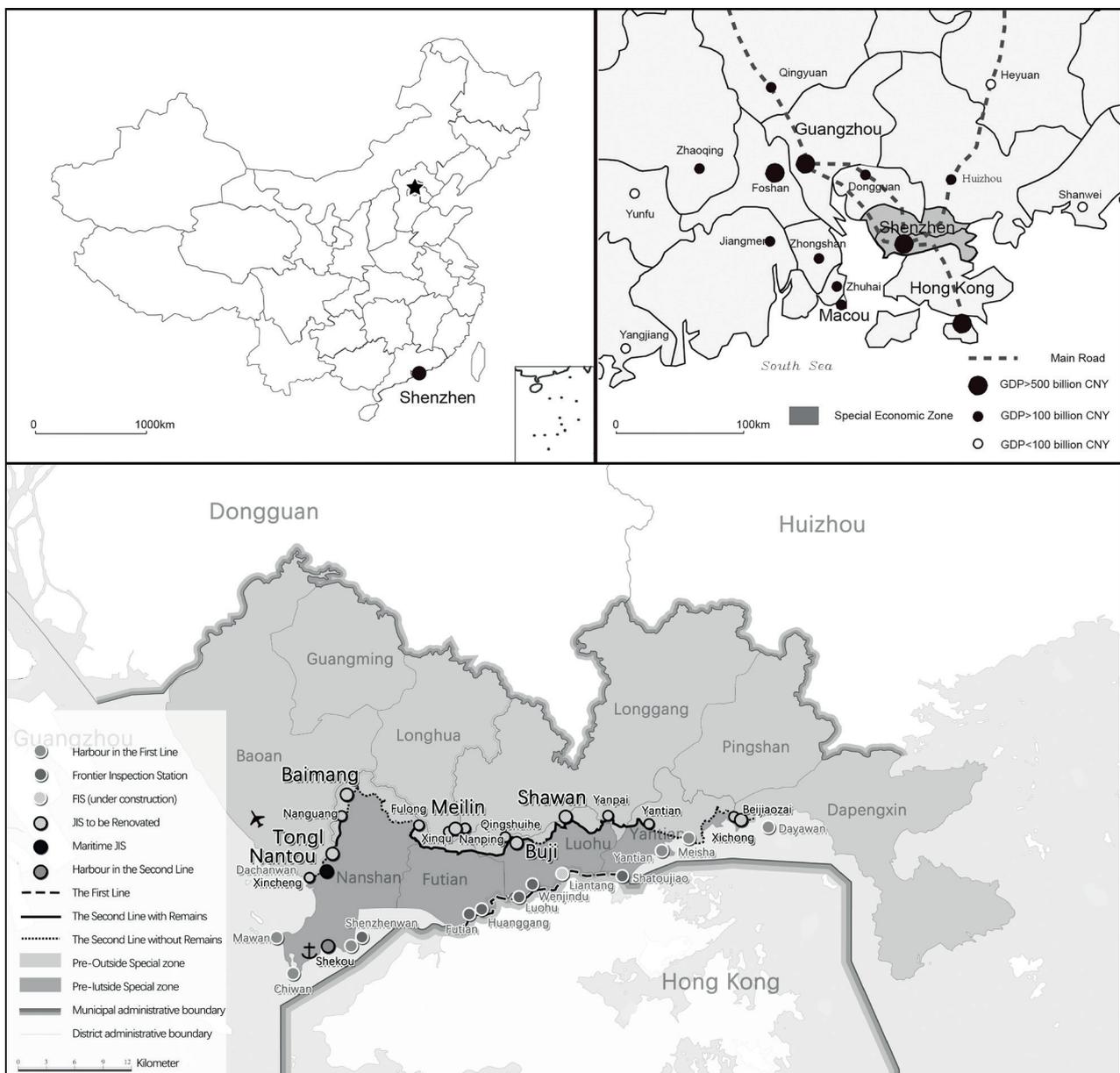


Figure 1. Location of Shenzhen and Shenzhen Special Economic Zone (upper-left: location of Shenzhen in China; upper-right: location of Shenzhen in Guangdong Province; lower: location and the status quo of the Second and First Lines).

3. Townscape Analysis of the Second Line under multiple scales

Firstly, starting from the urban scale, this paper analyses the status quo of the Second Line and divides it into sections according to the types of urban land use. According to the sectional selection of representative areas, the town plan analysis is carried out on the block scale, focusing on the differences of landscape changes around the Second Line. Then from the building scale, the characteristics of its material survival are analyzed. Finally, in the light of the current development background of Guangdong-Hong Kong-Macao Greater Bay Area (GBA), the “First Line” and “Second Line” under regional integration are analyzed at the regional scale.

3.1. Urban Scale: the Second Line crossing the city's interior

On the urban scale, we can identify the types of urban land use, and the administrative boundary, ecological control line and other urban multiple boundaries similar to the Second Line, so that we can segment the type of the Second Line. On the other hand, we can classify the Second Line's junctions by identifying different levels of urban traffic.

Line Section: Linear Section Division of the Second Line

The site of the Second Line crosses the east-west direction of Shenzhen interior. Its development is mixed with hilly terrain, showing a mixture form of natural landforms and urban patches. According to the status quo of the “Second Line” and urban land use types with the multiple urban boundaries, the “Second Line” can be divided into three types: Built-up area crossing, informal patches and the eco-control category.

- Built-up area crossing category: the Second Line and administrative boundary basically coincide, with urban construction land mainly on both sides, divided into the internal area and the external area. In the process of urban development, the heterogeneity of this type of landscape is obvious, so it has typical representativeness. At present, most of the Second Line has been demolished, and a small number of discontinuous wire mesh remains exist in some sections.
- Informal patches category: because of the inconsistency between the “Second Line” and the administrative boundary, a “vacuum zone” in management (i.e. “mosaic parcel”), has been formed between the administrative regions. Its ownership relationship is complex, mainly with villagers building their own private houses.
- Eco-control category: located in the basic ecological control line, about 52 kilometers of the second-line patrol road has been transformed into Guangdong Green Road Line 2. This type has complete preservation, and can identify wire mesh, patrol Flagstone road, and some duty posts and pavilions.

Nodes: Joint inspection stations and tillage outlets

As a transverse and vertical hub of a city, joint inspection station of SZ-SEZ is an important morphological element closely related to urban traffic on urban scale. As the joint inspection station is a way for citizens and goods to enter and exit SZ-SEZ, it is a road of different levels in the city where the gateway is perpendicular to the Second Line.

According to the change of urban road traffic grade structure and the plan of traffic transformation in 2015, the gateway can be divided into five types: Track Connection Type,

Bus Distribution Type, Through Relieving Type, Passage Type and Functional Replacement. Track Connection Type has more major urban traffic roads crossing, mainly highway, expressway and urban major road with a complex traffic organization; Bus Distribution Type is mainly related to traffic transfer, involving facilities such as bus stops, pedestrian overpasses; Through Relieving Type is a type of urban main road with large traffic flow; Passage Type is a general type of urban main road. Functional Replacement is Tongle gateway as the only reserved one for functional replacement to become a museum of history (See figure 2 and table 1),

Beside, the transit tillage outlets are “special passageway” for the former border residents to transit farming. In the past, farming outlets were set up on the management line to facilitate farmers’ access to farmland because the Second Line divided the fields into two parts. With the gradual development of urbanization, farming outlets became work outlets and self-management outlets. Self-management outlets were applied to the government by villages, enterprises and factories close to the Second Line wire mesh. By 2013, there were 29 work outlets and 24 self-management outlets. The orifice is distributed along the Second Line.

3.2. Block Scale: Analysis of the town plan in a special area

According to the line segment and node classification of the Second Line, the typical Nantou-Tongle section is selected as a special area for town plan analysis. In order to reveal the influence of the second-line development on the urban form, this paper analyses the town plan in 1982, 1998, 2010 and 2019, and pays attention to the changes of the *street system*, the *plot and building pattern*.

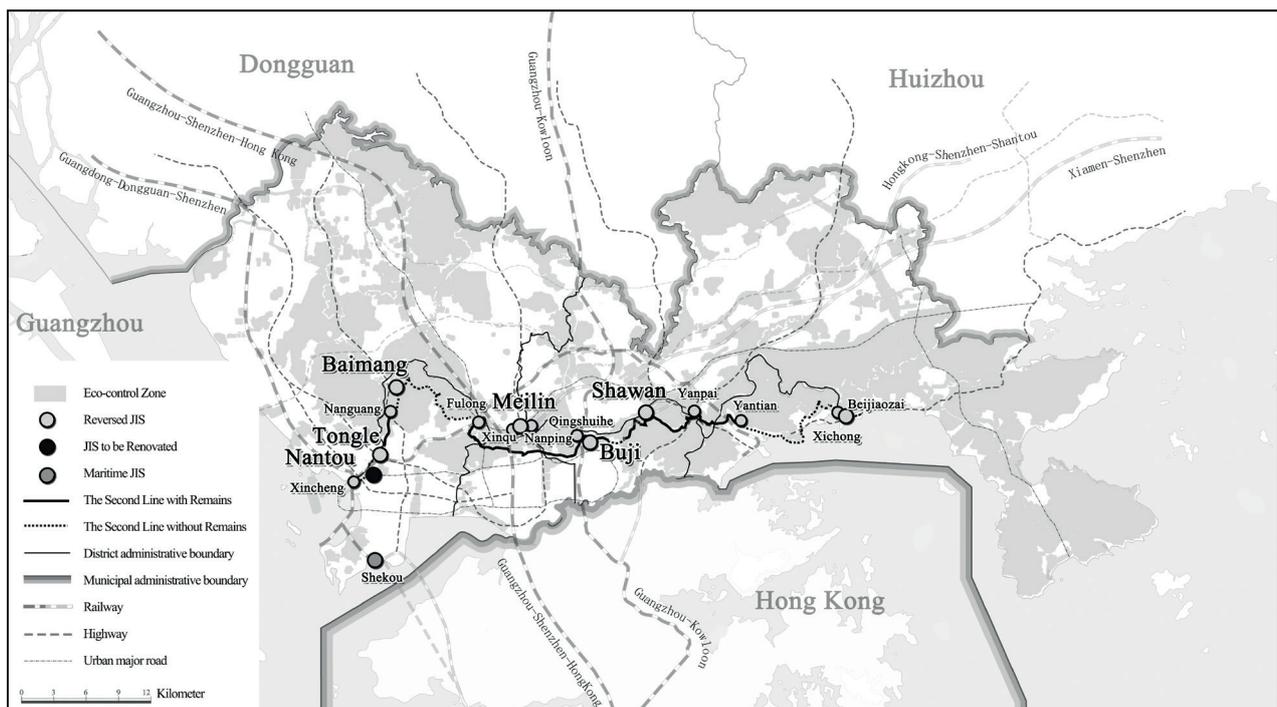


Figure 2. The Second Line with urban traffic and land use patterns.

Table 1. Classification of Joint Inspection Stations.

Batch	Built Time	Name	Category	Urban Traffic Grade Crossing	Classification
First Batch (6)	1983.9	Nantou	Main Pass	National Highway/ Expressway/ Urban major road	Track Connection Type
	1983.9	Baimang	Main Pass	Urban major road/ Highway	Bus Distribution Type
	1983.9	Buji	Main Pass	Railway/ Urban major road	Track Connection Type
	1983.9	Shawan	Main Pass	Urban major road	Bus Distribution Type
	1983.9	Yantian	Main Pass	Highway	Through Relieving Type
	1983.9	Beijiaozai	Main Pass	Urban major road/ Highway	Through Relieving Type
Second Batch (3)	1995.7	Meilin	Main Pass	Urban major road/ Highway	Track Connection Type
	1994.7	Tongle	Main Pass	Highway	Functional Replacement
	2001.5	Xichong	General Pass	Highway	Passage Type
	2005.7	Qingping	General Pass	Expressway	Passage Type
	2006.5	Yanpai	General Pass	Urban major road	Passage Type
Third Batch (7)	2006.6	Nanping	General Pass	Expressway	Passage Type
	2007.6	Xinquadao	General Pass	Urban major road	Passage Type
	2007.7	Xincheng	General Pass	Urban major road	Passage Type
	2007.12	Fulong	General Pass	Urban major road	Passage Type
	2008.1	Nanguang	General Pass	Highway	Passage Type
		Shekou	Water Pass	---	---

Street system

The demand of traffic development directly affects the street system. Macroscopically, the change of urban street pattern affects the construction of the Second Line gateway, while the new highway and expressway change the pattern of old settlements; but the street system inside the old settlements has little change microscopically, and the plot pattern has hardly changed.

In the early period of reform and open policy, national highway G107 was the main traffic channel connecting Guangzhou to Shenzhen. Accordingly, near Tongle Village, the Beijing-Hong Kong-Macao Highway connecting Beijing to Hong Kong and Macao, and the Guangzhou-Shenzhen-Zhuhai Highway connecting Guangzhou, Shenzhen and Zhuhai were established successively, thus Tongle Gateway was built and the Beijing-Hong Kong-Macao Highway became one of the most important highways in southern Guangdong Province. Since then, along with the improvement of the city's overall traffic road grid bureau, railways, metros and other ring roads have been added around Nantou Gateway. Crossing the Second Line traffic network is becoming more and more complex, and the gateways have become a traffic hub node.

As the second-line junction in the process of urban development is facing problems such as poor traffic flow and serious interweaving of traffic flow, Shenzhen launched the second-line junction traffic improvement project in 2015, with the exception of Tongle Gateway, the other joint inspection stations were demolished. Under the change of urban road system, it affects the development of surrounding plot and building pattern.

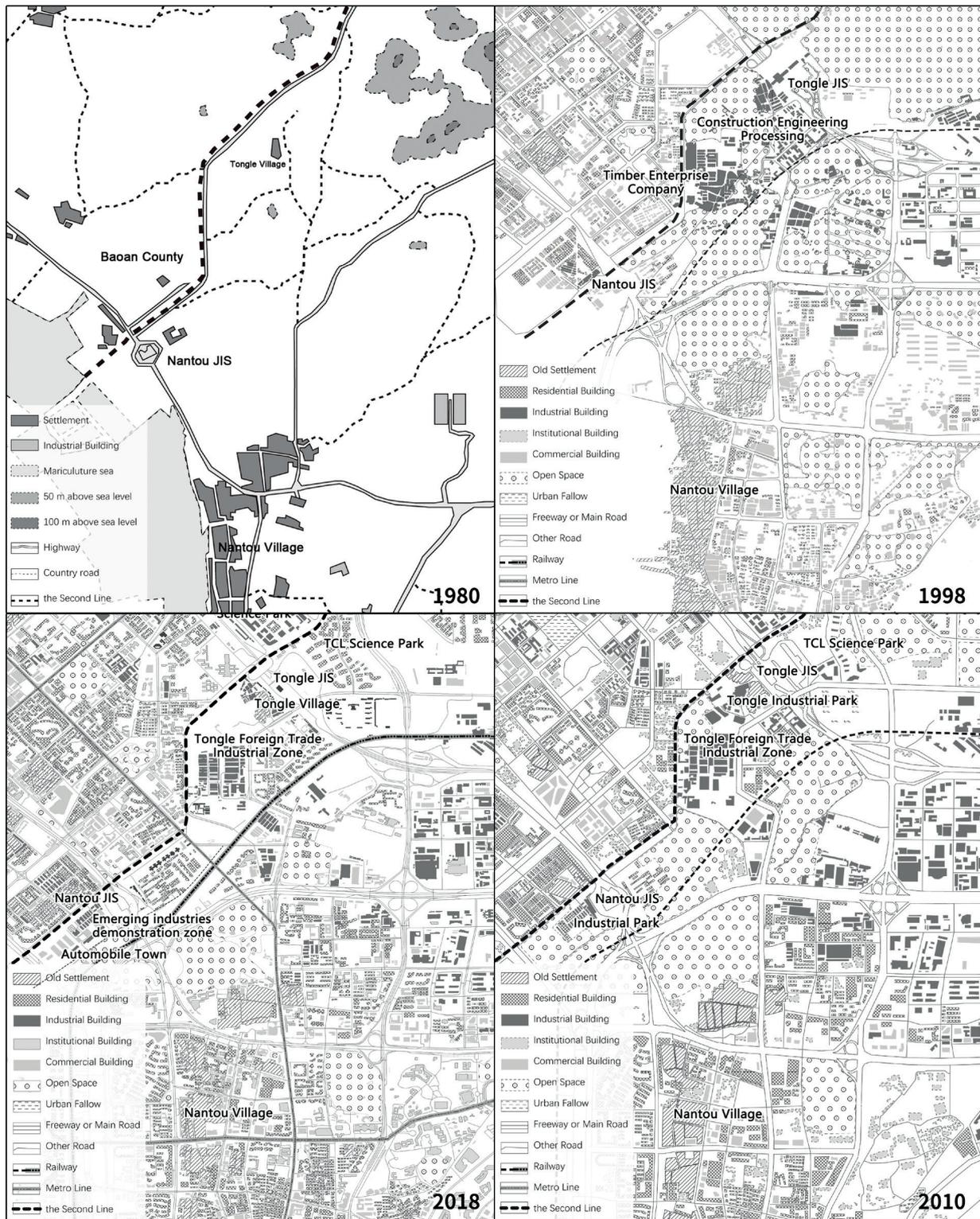


Figure 3. The western part of the Second Line. (Clockwise, 1980/1998/2010/2018).

Plot and building pattern

In the early period of reform and opening policy (1982), the Second Line as a border line was far away from settlements. Nantou Village is one of the small fishing villages along the coast in SZ-SEZ, while Baoan County outside the Special Zone is located in the northern part of the Second Line. Around the Second Line are farmland, military management facilities and a small number of villages. At that time, Baoan had ponds and paddy fields all over the country, and the Second Line divided part of the fields of the outside villagers into the internal and external area. Therefore, in the Second Line part of the nodes, tillage outlets were set up for farmers to cultivate land.

With the rapid development of urbanization and economy in internal area (2010), the industrial construction of SZ-SEZ has been strengthened in the mode of export processing zones. The two sides of the Second Line are in the stage of repletive phases, and the number of buildings has increased. Under the influence of “three plus one” enterprises (“three means manufacturing with supplied materials, designs or samples and “one” for low trade taxes), which was an experimental form of enterprises promoted by the government in 1980s, the external area gradually extends to the Second Line, with a large number of factories gathering in the inside of the Second Line, while the outside is mostly a newly developed living space. The original tillage outlet has been changed into work outlet and self-control outlet, which is convenient for enterprises and factories to manage by themselves.

Under the integrated development of the whole city, the difference of urban development between the two sides of the Second Line has gradually narrowed, and the repletion of the two sides has reached the climax stage (2018). Due to the change of urban life and production mode, the original industrial production has been transformed into service innovation production. The original processing plant is transformed into a complex high-tech industrial park, which replaces the industrial plant by building replacement and repletion. Additional integrated service functions such as R&D office, enterprise club, exhibition hall, Hotel and so on have been added, such as TCL Science Park near Tongle Gateway and emerging industrial park near Nantou.

From the analysis of the town plan, we can see that the form change of the street scale is influenced by the interaction of the Second Line, and the adaptability of the form to the social functional needs is demonstrated.

3.3. Building Scale: Material decay and retention

On the micro-building scale, Second Line as a special *fixation line* can be analogized with the city wall, and it is affected by functional adaptability in the process of morphological evolution.

Second Line's linear wire mesh is similar to the wall of a city. Joint inspection stations and tillage gates are the big and small gates for people and goods to enter and exit. There are defensive facilities and armed forces guarding nearby. Unlike the city wall, the early second-line linear barrier force is toward the city (i.e. outside the gates), the defense target is the people in the city, and the population mainly flows from the city to the outside, including ordinary citizens and farmers which is in opposite for the wall. This is because in the early stage of reform and open policy, in order to maintain the stability of SZ-SEZ as an experimental area, it is necessary to isolate the influence of other factors in the city on the experimental area. Preferential policy conditions make the development outside the city superior to that inside the city, so the population flows outward.

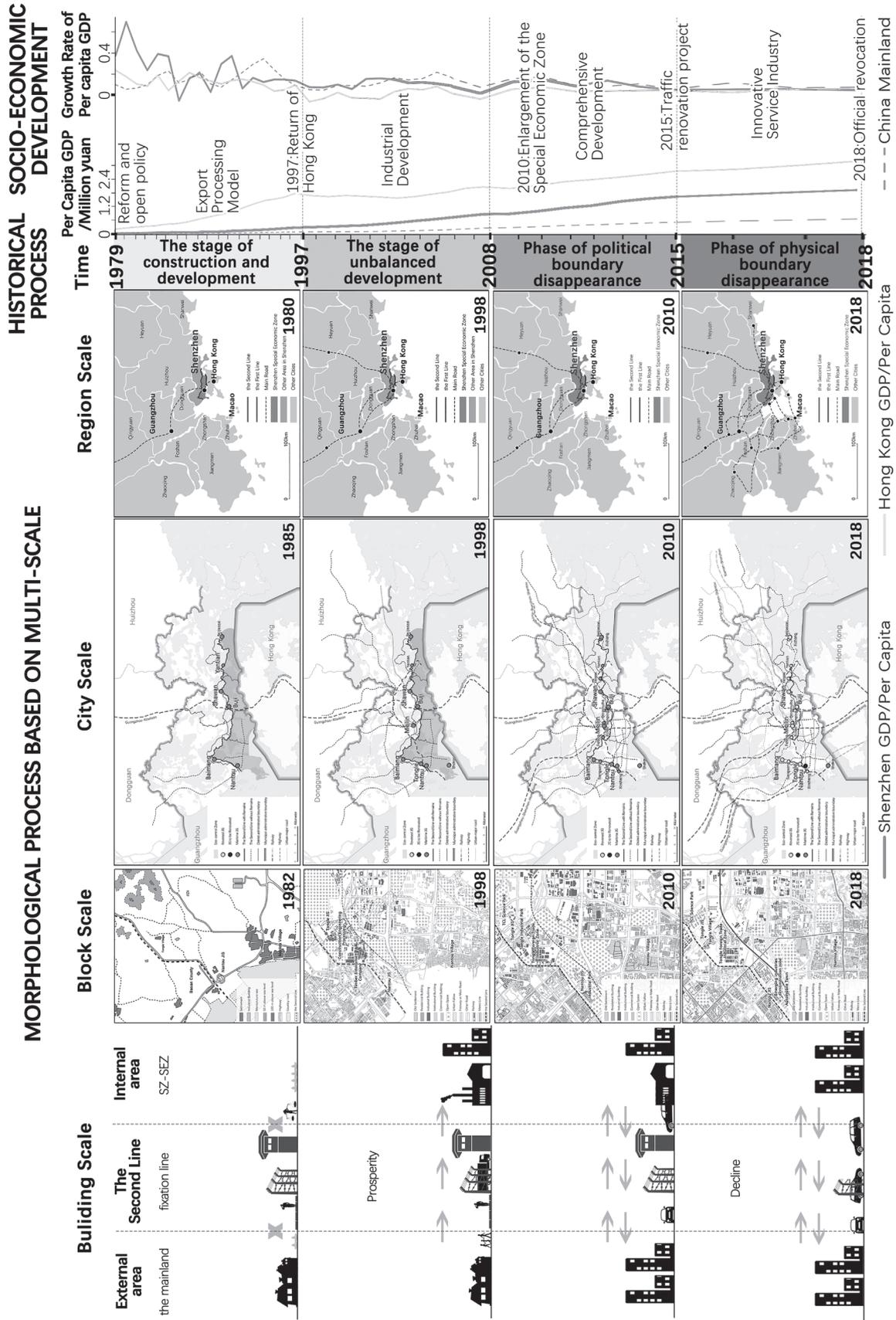


Figure 4. The evolutionary mechanism of the Second Line.

From the above analysis, we can see that the Second Line is in the stage of material extinction. The retention and access of material form depends on the adaptability of function. The barbed wire mesh lost its original function, some of which were preserved as relics and some of which were demolished; some of the Joint Inspection Stations and Sentinels were replaced by new functional forms (like Tongle Gateway), because they could not meet the current functional needs, and most of them were directly demolished. In addition, only a small part of the remains are still in use, such as some of the workplaces changed to community service stations.

3.4. Regional Scale: the First Line and the Second Line under regional integration

Under the background of regional integration development in Guangdong-Hong Kong-Macao Greater Bay Area (GBA), regional traffic has a deeper impact on the development of urban boundaries. Therefore, it is necessary to analyze the relationship and change between the Second Line of Shenzhen-Mainland boundary and the First Line of the Shenzhen-Hong Kong border.

In the early stage of the establishment of SZ-SEZ, the First Line and Second Line played an important role in regional isolation. As the First Line's buffer boundary, the Second Line is the guarantee of maintaining the prosperity and stable development between Hong Kong and the mainland. The links between Guangdong, Shenzhen and Hong Kong are limited to some extent. The relationship between the three places forms an outer circle with Hong Kong as the core. The regional traffic is dominated by Guangdong-Shenzhen and Shenzhen-Hong Kong Highways, while the links between the inland and Hong Kong outside Shenzhen are weak.

With the opening to the outside world and the development of inland cities, the links between Guangdong, Hong Kong and Macao have been gradually strengthened, and the gap of urban development has been narrowing. Under the construction of cross-sea corridor, Hong Kong-Zhuhai-Macao Bridge, Shenzhen-Medium Corridor and Guangzhou-Kowloon Railway of Guangzhou-Guangzhou-Shenzhen-Hong Kong Intercity High-speed Railway completed in 2018, the passage time between Guangdong and Hong Kong has been greatly shortened, and the former pattern of Shenzhen-Hong Kong First-line Gateway has been changed. At the same time, the current First-line Gateway is newly built at Liantang Gateway, which connects Hong Kong-Shenshan

Guided by Shenzhen's "Seven Horizons and Thirteen Longitudes" regional traffic planning and the "Port Economic Zone" inter-city development strategy, the three regions of Guangdong, Hong Kong and Macao have strengthened their regional links, and the blocking role of the Second Line and the First Line has gradually weakened. The connection between port dredging, transit traffic corridors and Shenguan and Guangzhou has broken and changed the pattern of Second Line and First line.

4. Conclusion and discussion

4.1. The evolutionary mechanism of the Second Line

According to the above analysis, it can be concluded that the Second Line in different scale resolution urban morphological system, will be associated with different morphological elements, the interaction between elements, and then affect the Second Line's morphological evolution. Urban landscape itself has a certain hierarchical structure. Fixation line, as a component ele-

ment of the morphological framework, shows different spatial order and organizational logic in different hierarchical structures. The morphological elements before different levels may be interrelated, so the Second Line can be systematically and comprehensively analyzed based on multi-scale.

Taking the Shenzhen Second Line as an example, we can summarize the role of the consolidation line at different scales and levels. (See Figure 4) In the course of historical development, the adaptability to changes in functional requirements is the fundamental reason for the survival of the Second Line. The process of morphological change of Second Line under different scales is essentially influenced by specific social and economic forces. Based on the analysis of morphological process and socio-economic role, we can find that the Second Line as an important linear heritage after China's reform and opening up, can map the development process of Shenzhen Special Economic Zone, and therefore has certain value.

4.2. Fixation line and the balance of urban protection and development

Traditional research on the *fixation line* has focused more on the city walls with a long history. Morphological analysis can identify its historical value to the old city. However, for China's rapid development, the Second Line is undoubtedly a valuable linear heritage, which symbolizes the historical process of Shenzhen's social experimentation as a pioneer of reform and open policy. Therefore, even if its history is not as long as the city wall, its role in urban landscape composition and urban development can not be underestimated.

At the same time, we see that the Second Line is facing the problem of extinction. Heritage protection is complex, and the problems to be considered in practice are comprehensive, and the basis of urban morphology is only one of the factors to be considered. As M. R. G. Conzen, said in his classics, two seemingly contradictory passages.

The historicity of Alnwick's Old Town is as yet largely unimpaired but as a matter of urgency needs active and intelligent collaboration between the local community and its regional planning authority if it is to be preserved in order to do for future generations what we have taken for granted in the enrichment of our own lives.

On the other hand, the congested townscape behind the front rows of plot dominants, though of great interest to the historical geographer, cannot claim the same intrinsic value as a physical environment for present-day living and working and is bound to disappear in time.

I believe that under the same background, Shenzhen will find an appropriate balance between the protection of the *fixation line* and the protection of urban development.

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