Qualities of Density

Sustainable and Livable Renewal of Urban Village's Industrial Parks
in the context of Industrial Transition in Shenzhen

Report

Yingxing Gu

Acknowledgements

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Report
Metropolitan Ecology of Places

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2023-2024
June 18, 2024

During the nine months of study, I finished such a complete and in-depth design project independently for the first time, and gained a deeper understanding of the future development of Shenzhen and the Greater Bay Area. It was your encouragement and companionship that allowed me to benefit from this process.

Firstly, I would like to thank for my first mentor, Alexander Wandl. Your passion for academics and professionalism has made me feel good about this track and its meaning to society. I also appreciate that your approach to educating your students is so efficient and egalitarian that I thoroughly enjoy the learning and design process.

For Diwen, thank you so much for your patience. I have benefited from exploring the direction of urbanism with you from different professional backgrounds. I think I'm going to use some of the design ideas you told me about for the rest of my working life!

Finally, I would like to thank my parents, my family and all my friends who accompanied and helped me during this year. You let me grow so much in my life. I want to share my happiness with all of you here.

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Introduction

The starting point of this project is the search for a renewal approach, including process and outcome, that allows urban village communities to move from labour-intensive industry-dominated production and living space to a sustainable and livable high-density community in the context of industrial transition.

Shenzhen's labour-intensive manufacturing-based system attracted a large number of migrants from other cities. Urban villages were born along with the rapid expansion of factories. However, Shenzhen's shortage of land and expensive housing has forced migrants to live in urban villages, turning them into areas of extremely high density, both in terms of population and building structures. They became the characteristic feature of Shenzhen's landscape. About 60 percent of the people in Shenzhen now live in urban villages, where there are many environmental problems, such as inadequate public facilities and a shortage of housing. Shenzhen government has undertaken various urban village renewal programmes. They either demolish villages for the sake of land finance or focus on micro revitalization aimed at improving the environmental conditions of public spaces.

However, industrial transition has affected people and space along the entire labour-intensive industry chain, which means that the model of high-density urban villages and industrial parks dominated by labour-intensity is facing mismatches in population, space and system in the industrial transition.

In recent years, Shenzhen has launched a new round of urban village improvement programme, which plans to retain most of the existing living spaces in urban villages, while changing the functions or redeveloping the large-footprint industrial zones that collectively owned by villages. The latter contains great opportunities to enhance the urban sustainability and livability. For this project, urban villages' industrial parks in Shenzhen's periphery were selected for planning and design

For this project, industrial parks in the periphery of Shenzhen, which is going to become a high-tech industrial park in the future, were selected for planning and design.

Motivation

As the most advanced special economic zone in China's reform and opening-up programme, Shenzhen's special status has led to it being encouraged to try never-before-seen approaches to urban development. This "experimental" model made Shenzhen controversial. At the same time, the Chinese government is keen for its successes in urban design and planning to be rapidly replicated across the country. Shenzhen's approach to urban renewal has become a bellwether for the whole of China.

As an intern in Shenzhen, I have experienced the two sides of the city, the glittering skyscrapers on one side and the countless factories on the other; the neatly planned but inactive city centre and the energetic urban villages with the surrounding chaos. This contrast made me interested in the future development of this city. I have been on field trips to urban villages in many cities in China. Urban villages in Shenzhen have almost evolved to the forefront, with no other city's experience to draw on, in China which makes me curious about its development trends. Will it still exist? How will its relationship with industrial systems change? There have been countless renewal policies and studies related to urban villages, but they were mainly based on the spatial transformation of the villages themselves, while gnoring the industrial system behind it.

The Shenzhen government often emphasises the fact that industry brings a lot of GDP to the city, but far less effort is made to reach out to the migrants who actually create GDP than to the industry itself. Although industrial transition has been going on in Shenzhen for more than ten years, the implementation of the "vertical factory" policy in Shenzhen in the last five years has shown me that there are some opportunities for upgrading industries and the living conditions of the migrants. I would like to try to use my experience and knowledge from 7 years of design study career to plan and design a sustainable and livable high-density community in urban villages.

01 Introduction

1.1 The Shenzhen Development Miracle

Industrial Transfer in East Asia

Since the 20th century, the international industry, especially the OEM manufacturing industry has carried out three typical transnational transfer, the first transfer is the 1960s Europe and the United States developed countries will be the transfer of industries to South Korea, Taiwan, Hong Kong, Singapore, the four countries and regions to undertake the transfer of labour-intensive manufacturing industries in Europe and the United States, and vigorously develop the export-oriented economy, to achieve the economic take-off.

The second transfer took place in the 1980s. 1978 China implemented the **"Reform and Opening-up" policy**, especially after Deng Xiaoping's southern tour speech in 1992, the Chinese government to attract investment, mainland China began to fully accept foreign investment, Europe, America, Japan, Hong Kong, Macao, Taiwan and South Korea began to labor-intensive manufacturing industries to China, China appeared a large number of processing and manufacturing enterprises that require a large number of labours, such as **electronic and communication equipment manufacturing, textile manufacturing** and so on. This labour-intensive manufacturing industry has developed rapidly on the basis of China's huge labour force. Products that were once labelled "Made in Japan" have become **"Made in China"**.

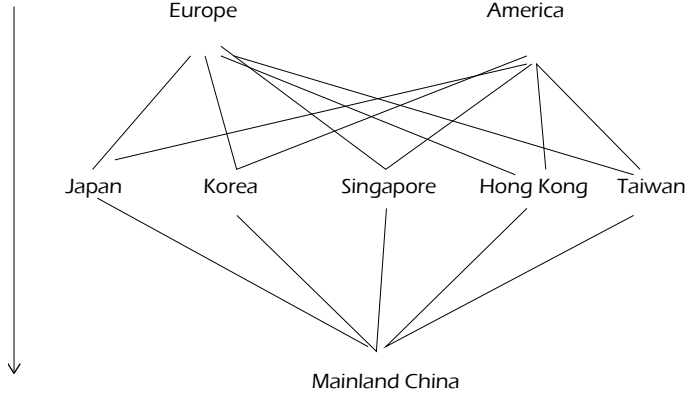


Figure 1.1 Global Labour-Intensive Industrial Transfer in 20th Century

Figure 1.2 Labour Intensive Industrial Transfer Direction in 20th Century in east Asia

Shenzhen and Hong Kong — Back factory, front shop

Economic co-operation between Shenzhen and Hong Kong is based on the **"Back factory, front shop"** model. There are complementary strengths. Shenzhen takes advantage of its land, natural resources and labour force to process and manufacture products, playing the role of a "factory".

Hong Kong has a large amount of capital, technology, talents and management experience. Taking advantage of its overseas trading window, Hong Kong can receive overseas orders, carry out marketing and external sales, and play the role of a "shop".(Victor, 1998)
Hong Kong is in the front and Shenzhen is in the back, working closely with each other, which is thus called "Back factory, front shop". This unique economic model makes full use of the complementary advantages of the two places, achieving a strong alliance and promoting the rapid development of the economies of the two cities. Through the Hong Kong free trade port, Shenzhen indirectly trades with the rest of the world and earns a large amount of foreign exchange from the trade, which has greatly increased the internationalisation of trade in the region. Before 1992, factories in Shenzhen were basically concentrated within the Special Economic Zone (SEZ), but after 1992 they spread to the whole city.

By the end of the 20th century, it had become one of the world's largest production and export bases for electronics and consumer goods. China's labour-intensive manufacturing industry, developed through its massive foreign capital economy, established itself as the **"factory of the world"** at the time.

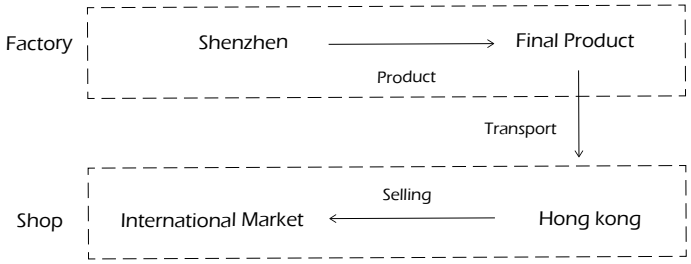


Figure 1.3 "Back factory, front shop" in Shenzhen and Hong Kong

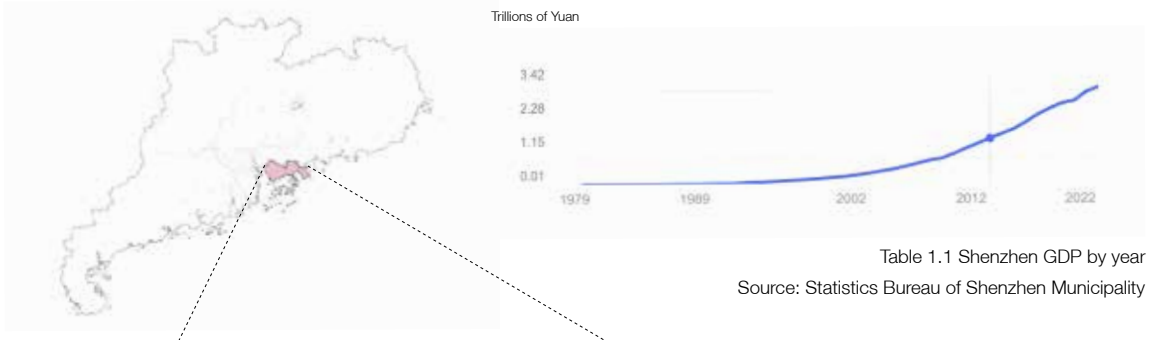


Table 1.1 Shenzhen GDP by year

Source: Statistics Bureau of Shenzhen Municipality

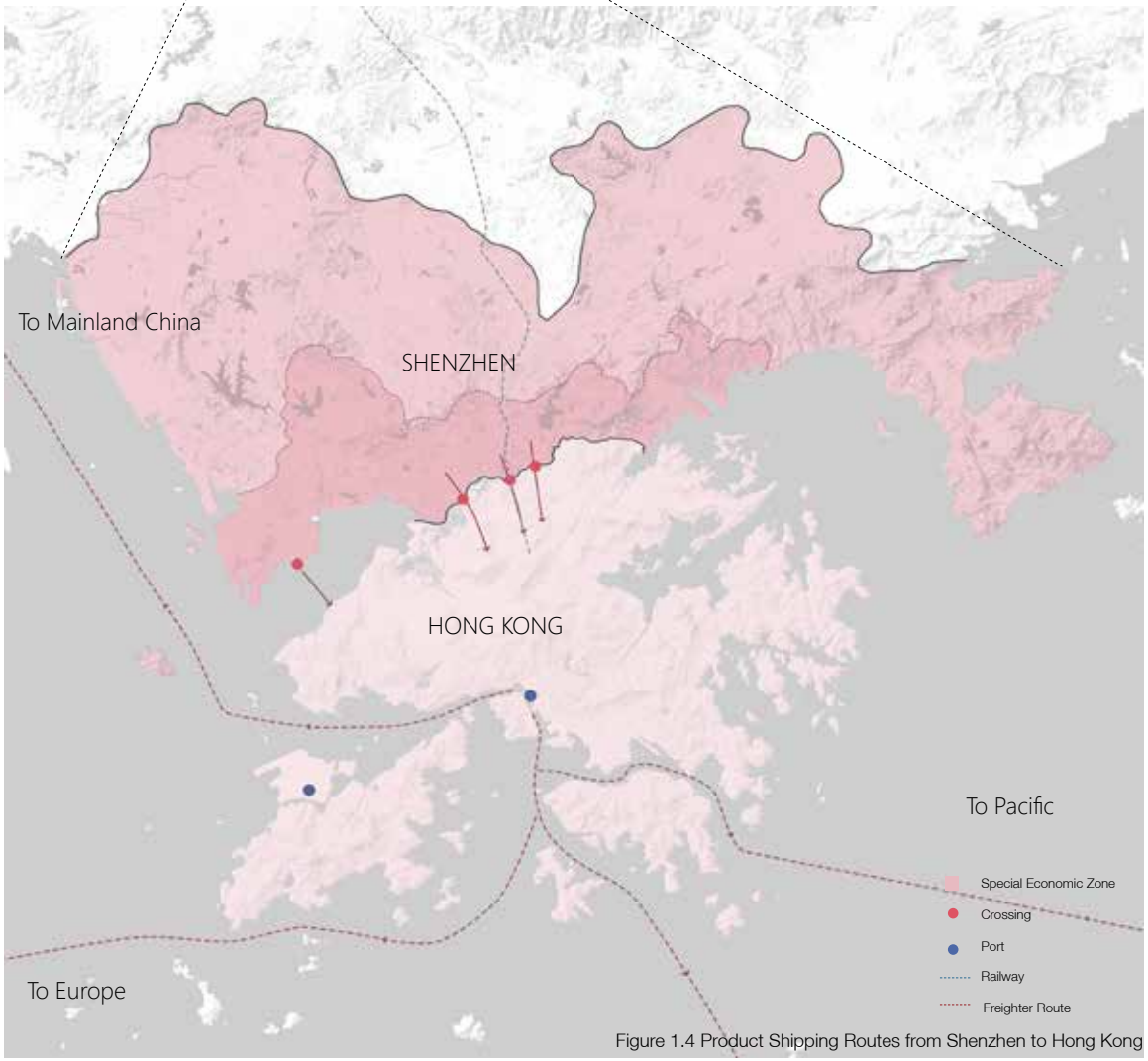


Figure 1.4 Product Shipping Routes from Shenzhen to Hong Kong

Figure 1.5 Labour-Intensive Worker
Source: image.baidu.com

1.2 Industrial Transition in Shenzhen

Relocation of labour-intensive industries

Disappearance of the demographic dividend

The demographic dividend had brought high investment and growth to the Chinese economy. However, China has experienced a decline in the number of working-age people in recent years. Enterprises in developed areas in Canton have often found themselves in the predicament of not being able to recruit enough workers, even when salaries are raised. The disappearance of the demographic dividend is to some extent the main reason for the relocation of labour-intensive industries.

Rising Production Cost

Costs such as land, manpower, logistics and raw materials have been rising in Shenzhen. Land shortage and high property prices have become important reasons for industries to move out of the city. Most enterprises generally choose to relocate factories from traditional industrial districts to reduce costs. Over the past 3 years, production costs in various districts within Shenzhen have gradually converged. Profit have further shrunk, forcing enterprises with lower industrial added value to relocate outside the city and province.

Industrial development in other regions

In recent years, other cities in Canton Province and cities in other provinces in China have taken the initiative to undertake the transfer of industries from Shenzhen. They have stepped up their efforts to attract investment and accelerate the construction of industrial parks. This has also attracted some Shenzhen enterprises, especially large enterprises, to move outside the city as a whole.

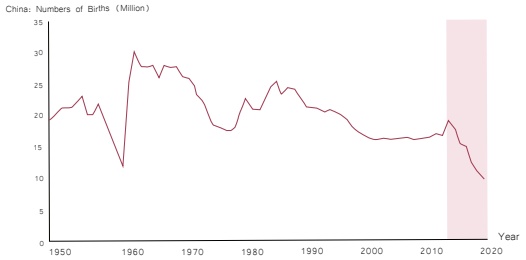


Table 1.2 Number of Births in China Source: China National Bureau of Statistics

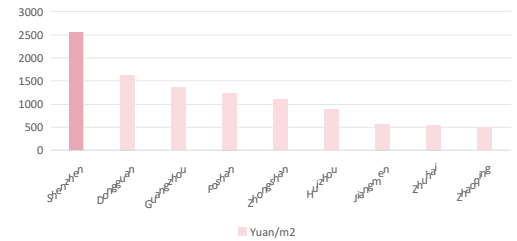


Table 1.3 Average price of industrial land sold in pearl river delta cities

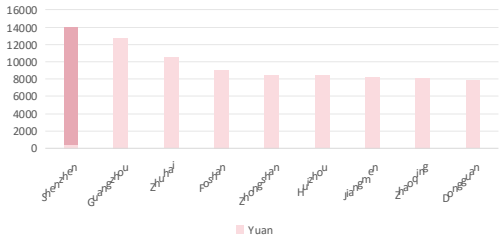


Table 1.4 Average wage of workers

Figure 1.6 Industrial Transfer Direction from Canton
Source: Panoramic Report on the Relocation of Shenzhen's Manufacturing Industry

Development of high-tech industries

In order to adapt to market demand and strengthen the competitive advantage of industries, Shenzhen is transforming from labour-intensive industries to technology-intensive industries. In the past 3 years, Shenzhen introduced many land use policies and industrial renewal policies. This process includes not only the adjustment of **industrial structure**, but also **technological innovation and the introduction of talents**. Nowadays, Shenzhen proposes 'industry upstairs and talents go to the villages' (gongye shanglou, rencai jincun)in order to attract talents to settle down and create opportunities for increased employment.

At the same time, Shenzhen's industrial transition is also aimed at achieving sustainable development. With economic development, Shenzhen is facing problems such as resource shortage and environmental pollution, which makes it necessary to change the original development mode of sacrificing the environment. In addition, as the global economy recovers and competition intensifies, Shenzhen also needs to cope with external pressures through industrial transition to maintain stable economic growth.

	City	Trillions/Yuan
1	Shanghai	4.72
2	Beijing	4.38
3	Shenzhen	3.46
4	Guangzhou	3.04
5	Chongqing	3.01
6	Suzhou	2.47
7	Chengdu	2.21
8	Hangzhou	2.01
9	Wuhan	2.00
10	Nanjing	1.74

Figure 1.9 2023 China's Industrial GDP Ranking by Cities
Source: ceidata.cei.cn

Figure 1.7 Automatic High-Tech Manufacture
Source: image.baidu.com

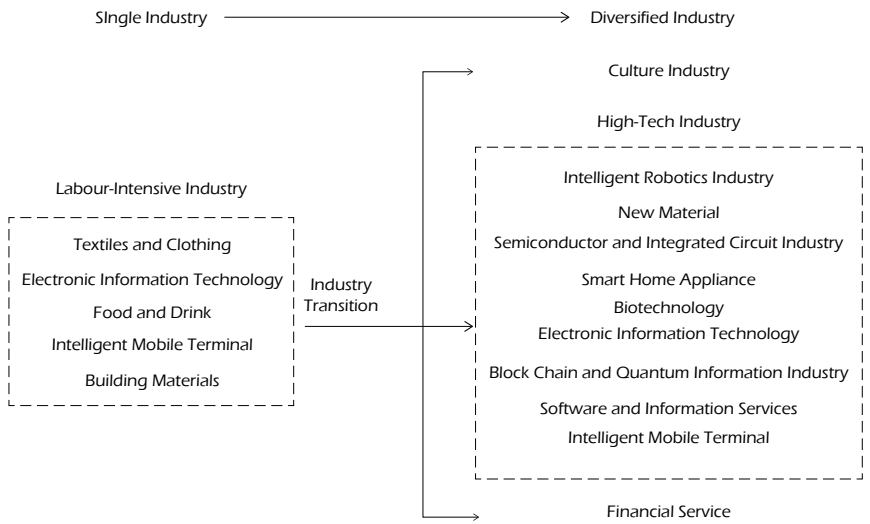


Figure 1.10 Shenzhen Industrial Upgrading Key Industries

Source: Opinions of the Shenzhen Municipal People's Government on Developing and Expanding Strategic Emerging Industry Clusters and Cultivating and Developing Future Industries

1.3 Urban Village and Village Owned Industrial Area

Urban Village

The formation of urban villages is the spatial result of land acquisition in the process of rapid urbanisation. China has a dual land ownership system, with urban land owned by the state and rural land owned by rural collectives. According to the land use category, rural land includes farmland, homestead and construction land(Qu. L, 2020). Since it is much easier to expropriate farmland than residential and construction land, the government has achieved rapid urban expansion by expropriating rural farmland, while rural construction land has been preserved, which became the predecessor of the urban village. While the urban villages retained the collective ownership of the rural areas, they only had the right to use the land, not to own it.

With the surge of foreign population in the city and the significant appreciation of land value, the original villagers, driven by profit, constantly broke the standard of "private housing not higher than 3 storeys"(Shenzhen Planning and Land Bureau, 2001), and without any improvement of the original public space, roads and municipal facilities, the private houses in the urban villages were continuously expanded to even more than 10 storeys, forming the **chaotic structure and dense buildings** of today's urban villages(Han, 2004). They accommodate millions of immigrants for affordable living spaces with proximity to their workplaces, achieving a certain degree of "work-life balance".

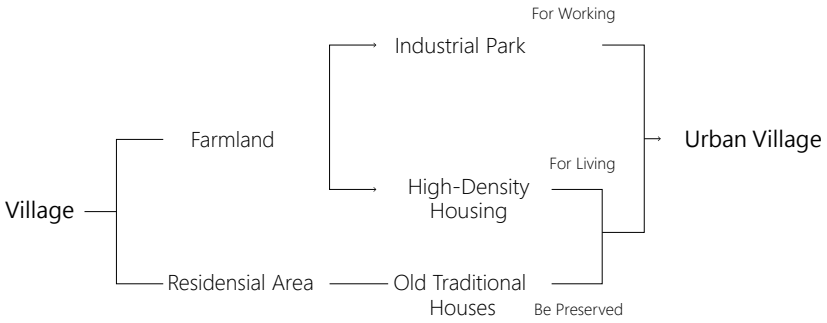


Figure 1.11 The History of Urban Village Formation

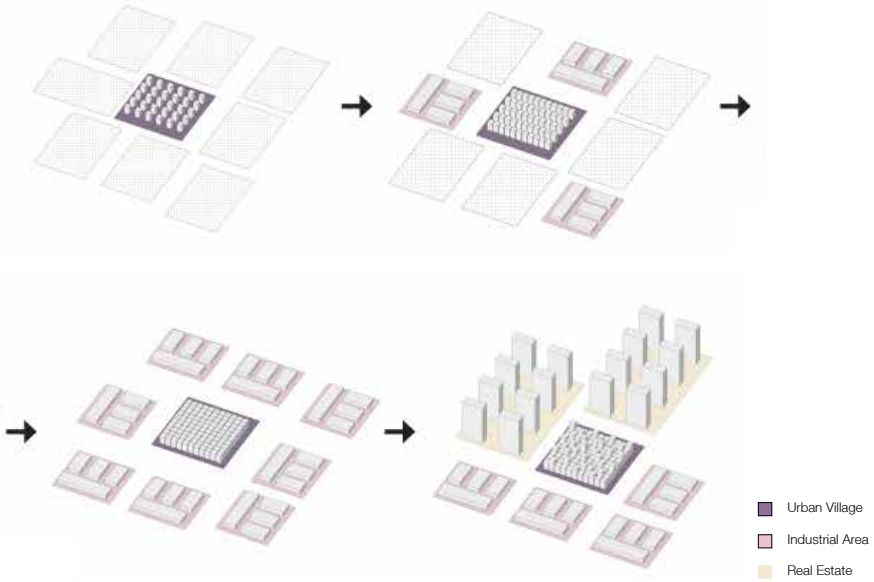


Figure 1.12 Evolution of Urban Village

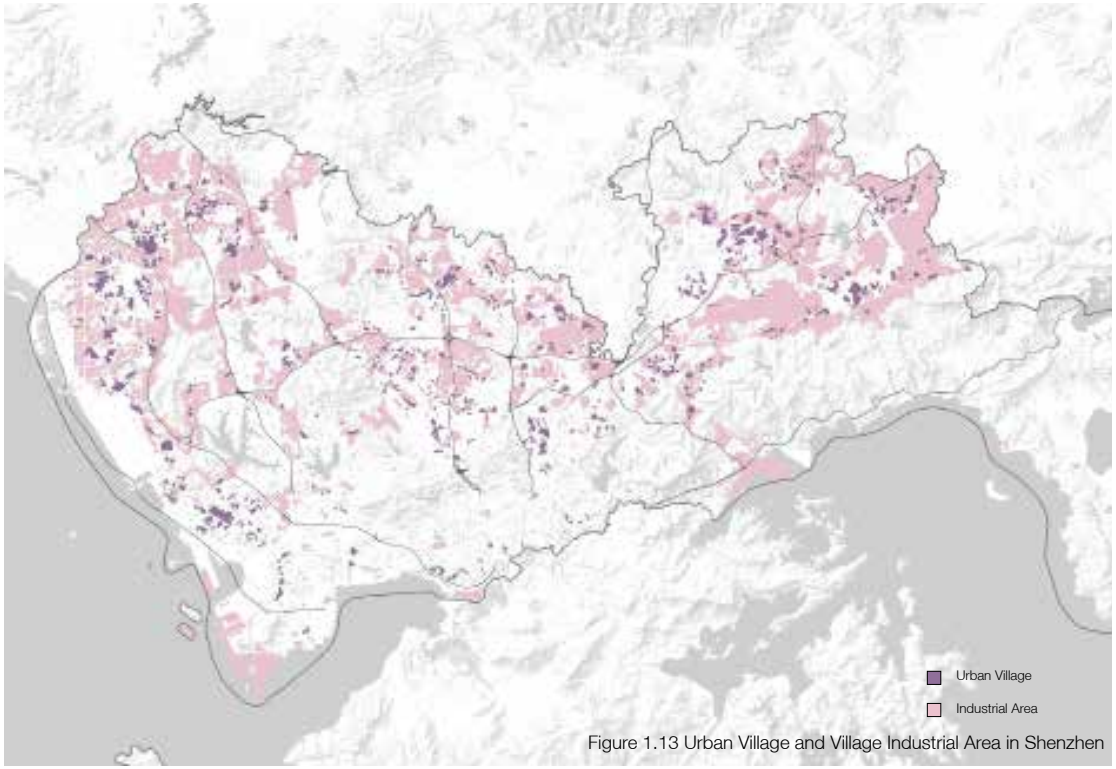


Figure 1.13 Urban Village and Village Industrial Area in Shenzhen

Figure 1.14 Urban Village

Source: image.baidu.com

Migrants in Urban Village

The occupations of the residents of urban villages are characterised by their predominantly low-end service and factory manufacturing and processing industries, with low levels of remuneration. As a special kind of settlement, urban villages are attracted by their low prices despite their poor living environment.Shenzhen's urban villages house nearly 16 million foreigners, serving as a transitional space for immigrants to integrate into the city, a low-cost diversiÞed habitat, and an important springboard for easing housing and employment pressures(Zhang, 2020).

Figure 1.15 Factory Workers Leaving Work
Source: image.baidu.com

Industrial Area in Urban Village

The location of Shenzhen's industrial zones highly overlaps with the location of urban villages. As of 2018, the scale of industrial land within Shenzhen's urban villages reached 158 km2 , accounting for 48% of Shenzhen's current industrial land scale(Huang, 2021). Therefore, urban villages are not only able to provide low-cost housing, but also offer a large number of jobs with low skill level requirements, providing basic living conditions and employment opportunities for a large number of low-skilled migrant workers. Most of the migrants living in urban villages are restricted by skills and income, and can only engage in service-oriented and labour-intensive low-skill jobs in and around urban villages, which has led to a symbiotic relationship between urban villages and village-affiliated industrial zones. For labour-intensive manufacturing industries, urban villages reduce labour costs for them and help prevent the hollowing out of industries. Against these backgrounds, the preservation of low-cost residential space is necessary and important.

Figure 1.16 Urban Village's Industrial Parks
Source: image.baidu.com

02 Problem Field

2.1 Land Constrained Issue

As a city at the forefront of China's reform and opening up, Shenzhen began high-density urban development and construction at the beginning of the city's construction, which has resulted in **the proportion of developed land** in Shenzhen exceeding **50 percent**, far exceeding the international warning line of 30 percent development (Zhang, 2020). The contradiction between developable land and the increasing demand for land brought about by continuous population growth makes urban development move from rough to intensive development.

The past economic growth model that is based on land acquisition for new constructions such as industrial development and commercial housing has been shifting to land redevelopment for maximising spatial resource utilisation and achieving the multiple goals of economic growth, ecological protection, functional enhancement and optimisation.

An important challenge facing Shenzhen is how to balance all aspects of social development under limited land resources. A dilemma lies between the basic ecological control line that demarcated by authories for environmental protection and the land demand for ongoing urban development. The booming property market has not only pushed up property prices, but has also led to the problem of **housing difficulties**, with many residents forced to choose crowded living conditions. At the same time, due to land constraints, Shenzhen's **industrial area** has also been greatly **constrained**, making it difficult to accommodate the development of more manufacturing and service industries.

Figure 2.1 Shenzhen City Landscape

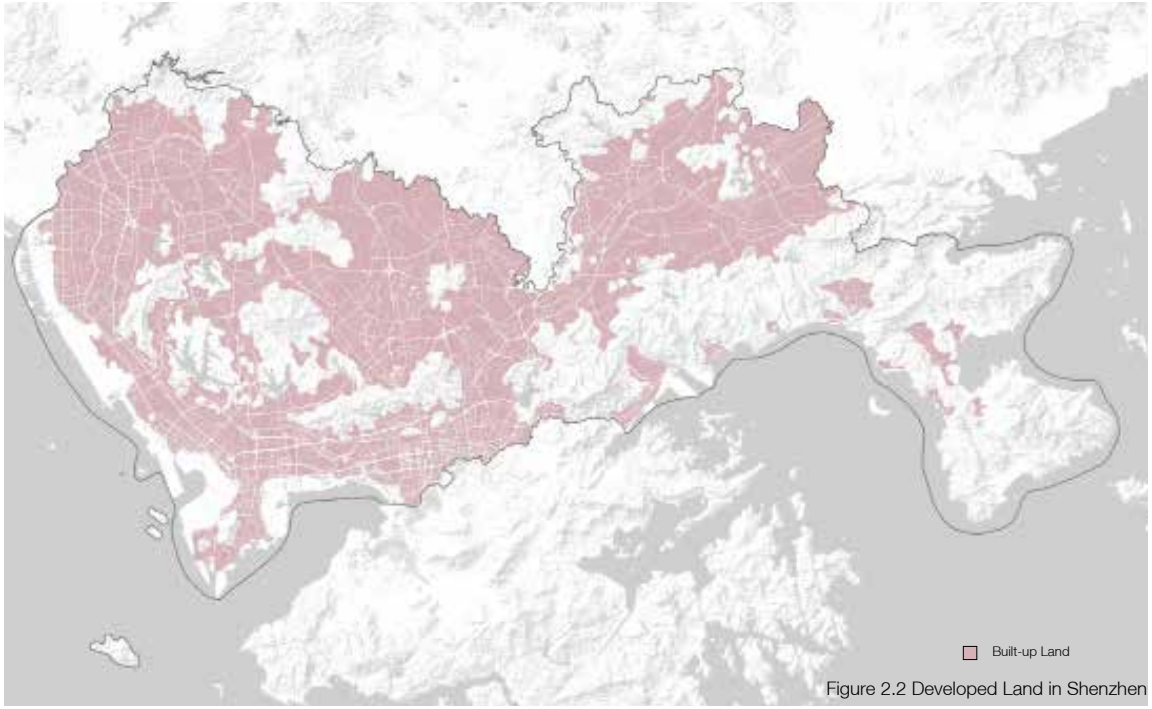


Figure 2.2 Developed Land in Shenzhen

In Shenzhen, land is not enough and developable land is nearly exhausted. However, the population continues to grow. It is an inevitable trend that urban density will continue to rise. The upper limit of the FAR(plot ration) for all districts is still rising, by an average of 0.5, which further moves the city in a vertical direction.

	Residensial Area	Commercial Area	Industrial Are
Density Zone 1	6	5.4	4.0
Density Zone 2	6	4.5	4.0
Density Zone 3	5.5	4.0	4.0
Density Zone 4	4	2.5	2.5

Table 2.1 Maximum FAR in Shenzhen Density Plan

Source: Shenzhen Density Plan

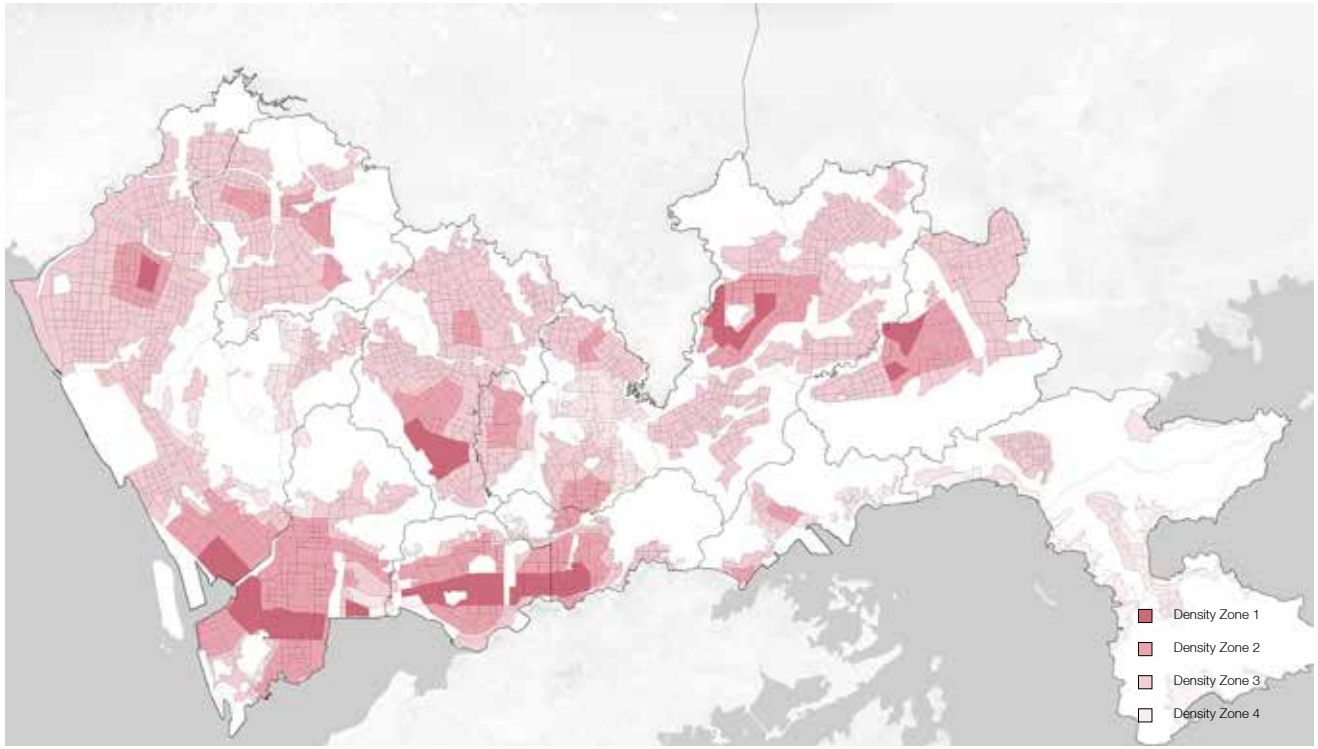


Figure 2.3 Shenzhen Density Plan in <Shenzhen Urban Construction Standards>

CBD
FAR=6

Residensial Area
FAR=3

Industrial Park
FAR=3

Urban Village
FAR=2.5-3

Figure 2.4 Common High Density Land Type in Shenzhen

Source: Google Earth

2.2 Limitations of Renewal in Urban Village

The average population density in Shenzhen's urban villages is about 40,000 people per square kilometre, twice the Shenzhen average. Being described as "**handshake buildings**" the distance between buildings in urban villages is often so close that people can shake their hands from windows. As a result of the informal expansion, public spaces are limited and most of the remaining open spaces are used for roads and parking. Some villages do not even have the conditions to build new stadiums and plazas. The recreational needs of residents can hardly satisfied.

Although the government and the village collectives have been trying to improve the quality of public space in the villages over the years, and have also attempted to build new sports facilities and pocket parks and other public space in the original open space, due to the high-density environment of the urban villages, the narrow streets make it difficult to make improvements to the quality of open space in urban villages. It is difficult to obtain truly open public space, which has limitations.

At the same time, a large number of **factories** in the urban villages are **under closed management**, which makes it difficult to form a quality public space between the industrial area and the residential area. What is left behind is more of a boring and wide street.

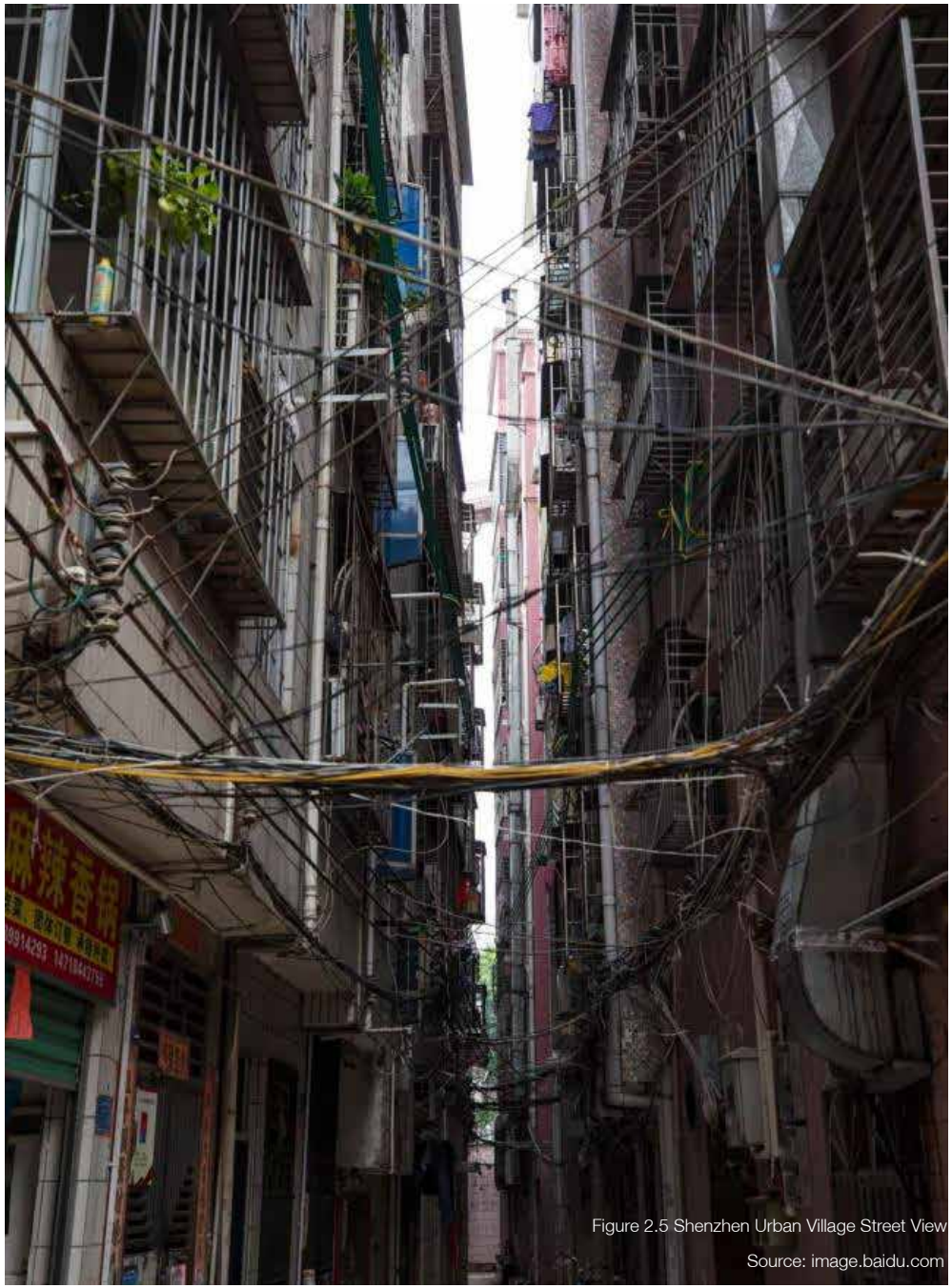


Figure 2.5 Shenzhen Urban Village Street View

Source: image.baidu.com

2.3 Gap between Urban Village's Industrial Parks and Industrial Transition

Shenzhen's booming high-tech industry has attracted a large number of young graduates and skilled labourers to work here. In the foreseeable future, the number of migrant labourers flowing into urban villages will continue to grow. The new generation of migrants have higher education and new lifestyles, and are more engaged in information-intensive services and high-tech industries. They are more willing to settle in cities than the first generation of rural migrants, which challenges the goal of urban villages in industrial transformation to meet the diverse needs of different social groups. Currently about 73 percent of people in Shenzhen live in rented accommodation . Urban villages have become a key area for security and even housing. The existing housing conditions, security conditions and amenities in urban villages, especially factory dormitories within their industrial parks, are to be transformed to meet the needs of the new generation of migrants. At the same time, the cost of renting an ordinary house is still rising, which makes the new generation of immigrants face the dilemma of choosing between too expensive and too poor living environment.

At the same time, the development of land resources in various districts of Shenzhen tends to be saturated, and the current productive factory buildings are unable to meet the development needs of Shenzhen's manufacturing enterprises, most of which have chosen to relocate to other areas in pursuit of specialised factory buildings that are more suitable for their own industrial characteristics, in order to expand the space for enterprise development and production efficiency. The original factory buildings suitable for labour-intensive industries are facing vacancy or transformation.

The increasing cost of industry and living and **the mismatch of space** have become the biggest obstacle to retaining high-tech enterprises and immigrants. The original high-density settlements in urban villages and single- or multi-storey factory buildings are difficult to meet the space needs of new industries and new people.

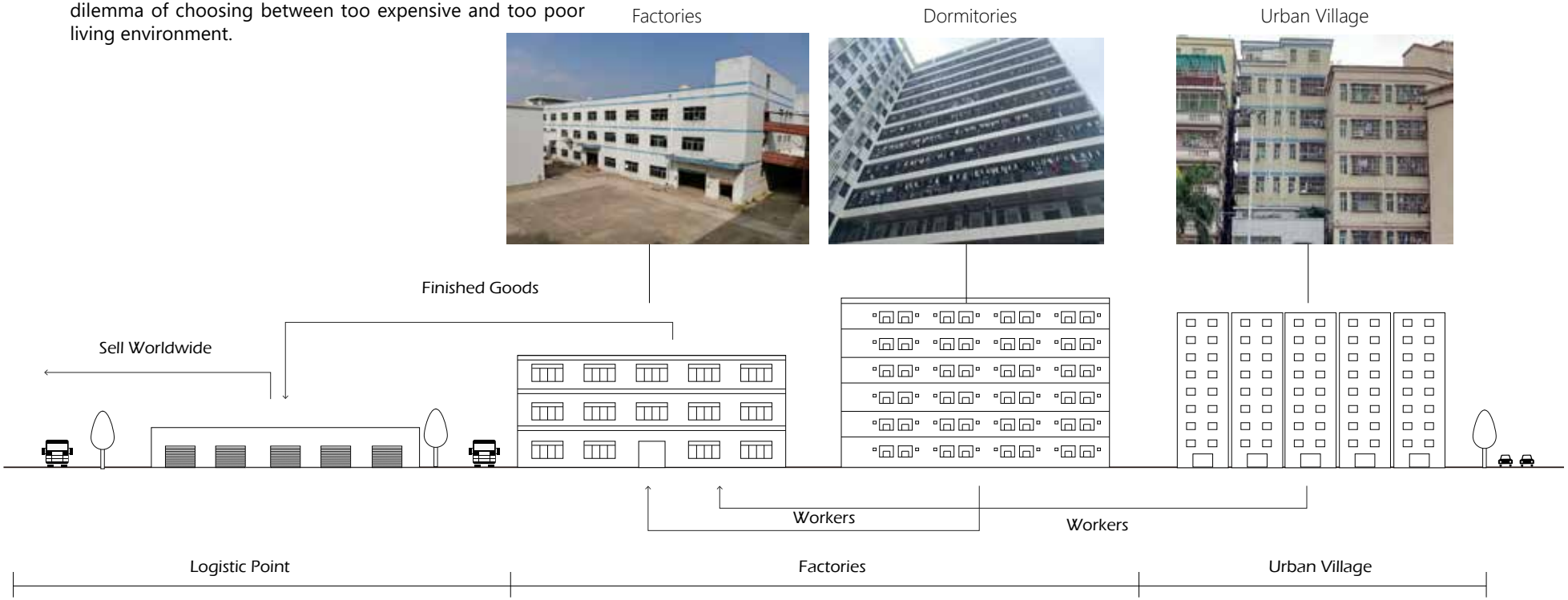


Figure 2.6 Labour-intensive industries in urban villages

2.4 Urban Growth Machine - Renewal in the past

Focusing on the physical environment and paying little attention to the renewal of the city's overall functions is one of the main problems facing the transformation of Shenzhen's urban villages.

As a mega-city with a shortage of land resources and a net inflow of people, the once-popular model of large-scale demolition and renewal of Shenzhen's urban villages has objectively improved the living environment, but this usually leads to higher cost of living and the number of people that can be accommodated is much smaller than that of the original urban villages, which, based on the migrant population's demand for low-cost housing, will only lead to the displacement of the villages to the more distant suburbs or other neighbouring cities. On the one hand, the **high threshold of apartments** will always exclude them, and they will still have to return to the dirty and messy environment. Their living and housing conditions will not be improved at all; on the other hand, this will lead to the **loss of rural migrants** in Shenzhen, which will directly weaken the competitive advantage of the city and hinder the transformation of Shenzhen's cities and industries. Under such circumstances, it is necessary to maintain the affordability and adaptability of urban villages to migrants.

In existing urban village renewal projects, the most common way is to demolish an urban village or an old industrial park and rebuild it with high-density property. This approach has gained popularity over the past decade, because it can generate huge profits for both the government and the indigenous people affected by the demolition. However, the "planting" of a large number of extremely similar high-density neighbourhoods is symptomatic of a lack of urban design considerations(Chien, 2018). Another approach that has gained popularity in recent years is the conversion of old industrial areas into flats disguised as office buildings. The advantage is that it provides high-quality accommodation for a larger number of young people. Moreover, such flats are generally non-gated, which facilitates connectivity between neighbourhoods. However, this kind of renewal is easy to have the problem of excessive distances between work and residence.

Figure 2.7 Common Real Estate
Source: image.baidu.com

Figure 2.8 Common Apartment
Source: image.baidu.com

Figure: ?

2.5 Problem Statement

Shenzhen's rapid urban expansion in the past has resulted in **land constrained issue** and **high-density urban fabric**. The land constrained issue has created a serious housing problem in Shenzhen, which has led directly to the development of urban villages(Zheng, 2007). When there is no new land to build on, urban renewal will only push the density of land over the upper limit, but existing renewal policies do not take full advantage of the benefits of high-density. On the contrary, it magnifies some of the shortcomings brought by high-density cities. At the same time, Shenzhen's industrial development is limited by land constrained issue, which indirectly affects urban development.

As a typical high-density space, urban villages have a **complex and ambiguous property rights issue**, which makes it difficult to improve the private residential parts during the renewal process, but only in the internal restricted public space. There is an urgent need to find other spaces such as **village owned industrial parks** that can be utilised in urban villages.

With the context of industrial transition, many labour-intensive industries in and around the village are facing closure and relocation. The **old factories** are **unable to meet the spatial demand** for the production of high-tech industries. The low-quality living environment in the urban village also struggle to meet the needs of the new generation of migrants.

In response to the economic transition, Shenzhen has launched a series of urban renewal programmes towards urban villages and old industrial areas. The renewal approach, dominated by demolish and rebuilt, however, has forced many migrants to change their jobs and move out of their former homes, resulting in a **monotonous, high-density urban space**.

All in all, urban village renewal is facing the prospect of unlivable and unsustainable development in the context of Shenzhen's high-density space and industrial transition. New problems, opportunities and challenges are emerging.

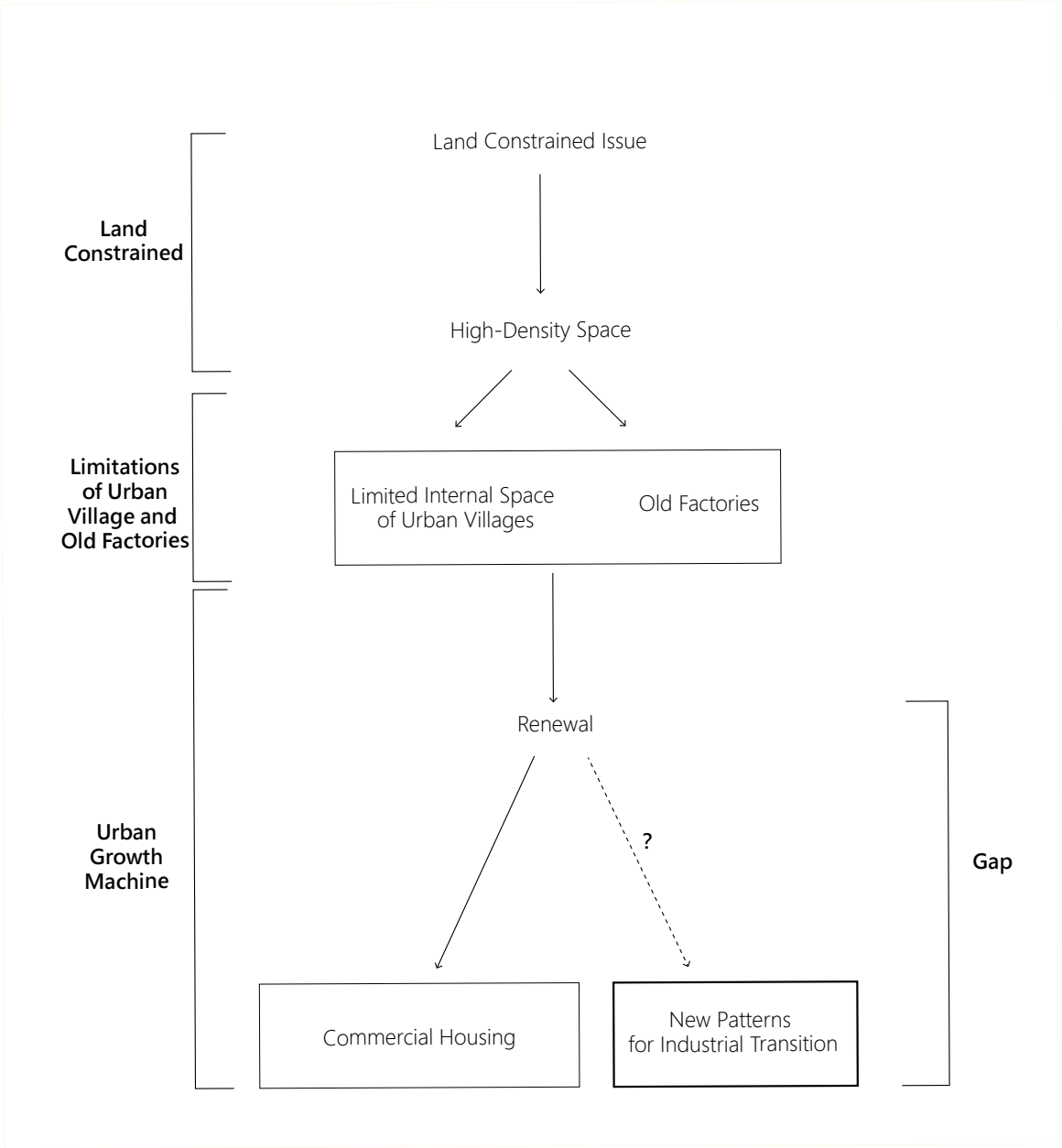


Figure 2.9 Problem Statement

03 Research Design & Methods

3.1 Research Questions & Aims

Main Question

How could urban village's Industrial Parks be developed in the context of Industrial Transition into a new type of High-Density Sustainable and Livable Community in Shenzhen?

Sub-Question

1 Historical Development

How did high-density affect the living quality of a community over time?

Aim: Spacial historical changes are analysed to understand how the current high-density urban village community came to be and the impact of changes in density on livability.

2 Community

What characteristics contribute to a sustainable and livable community?

Aim: Understanding the characteristics that make a community sustainable and liveable allows for an analysis of the shortcomings of the local environment.

3 Policy Trends

What are the social-spatial and environmental effects of existing policies on industrial transition and urban renewal?

Aim: To understand the preferences of existing policies for industrial transition and urban renewal spaces. Look for the strengths and weaknesses in the policies. Try to establish transitional renewal strategies.

4 Pattens

What is a new type of high-density sustainable and livable community in the process of industrial transition?

Aim: Finding spatial forms of high-density community suitable for industrial transition. Provide a quality production and living environment adapted to the needs of people and enterprises. To help spatial optimisation in the peripheral areas of Shenzhen.

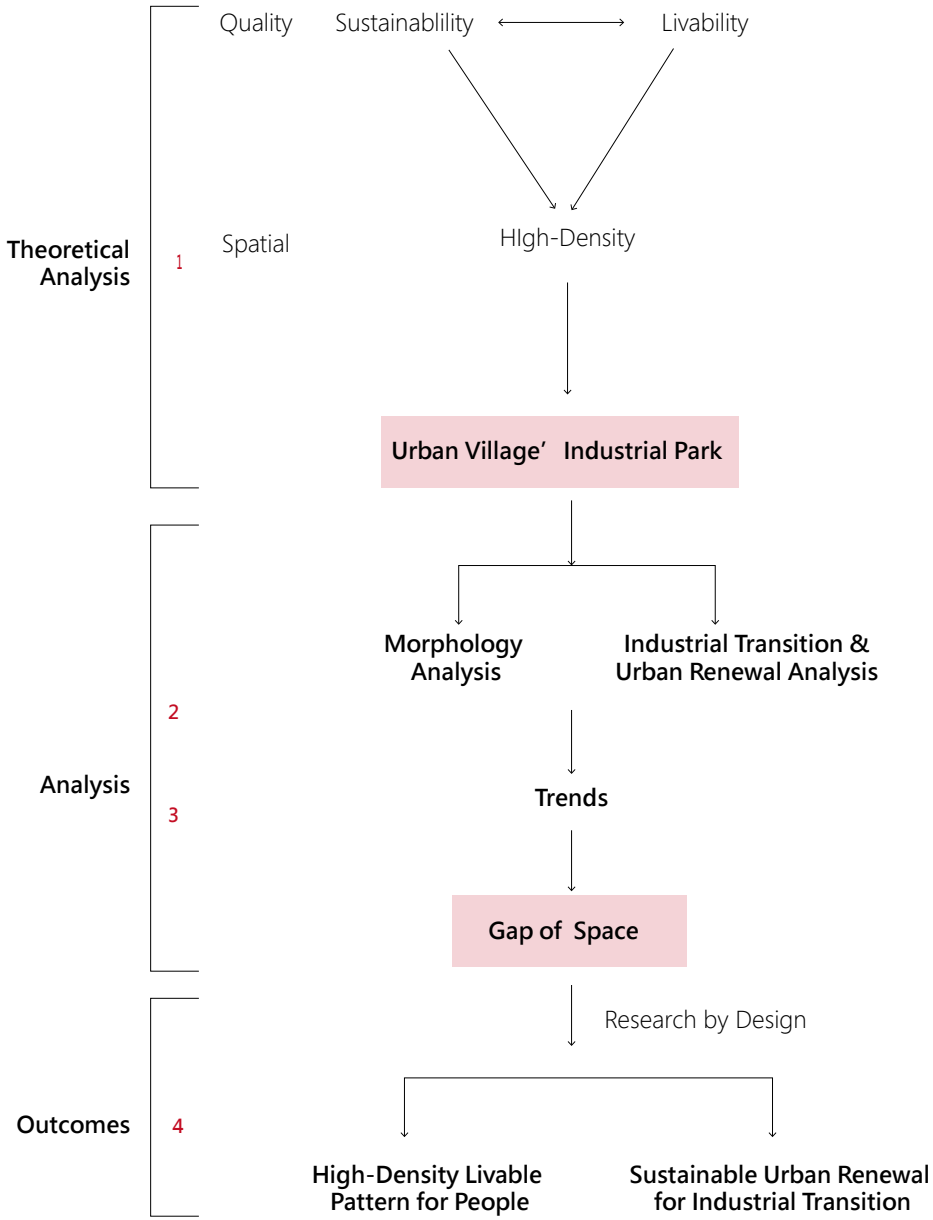
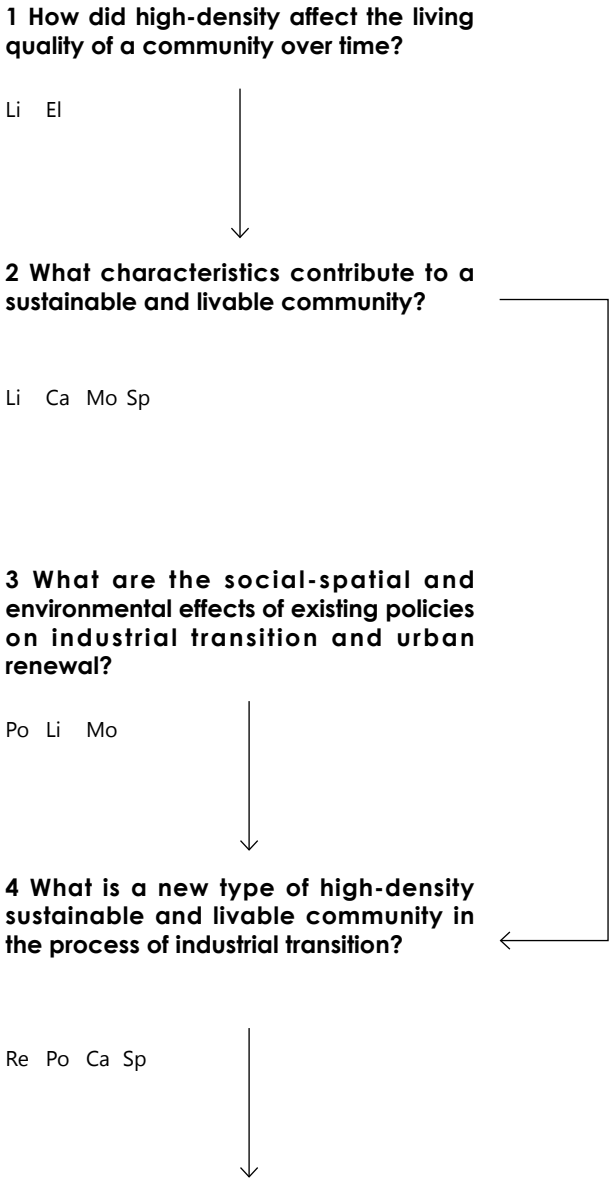


Figure 3.1 Research Framework

3.2 Analytical Framework

How could the Urban Village's Industrial Parks be developed in the context of Industrial Transition into a new type of High-Density Sustainable and Livable Community in Shenzhen?

The analytical framework explains the methodologies used to answer the different sub-questions and the causal relationships between different sub-questions. The characteristics of sustainable and liveable communities are analysed first. After analysing the current situation of existing high-density urban village communities, spatial shortcomings are searched for. The policy analysis is used to find the spatial renewal methods that are now encouraged by the Shenzhen government. Then, combined with the previously analysed characteristics of sustainable and livable communities, possible design strategies are researched underneath this site.



Li	Literature Review
Ca	Case Study
El	Element and Layer Analysis
Po	Policy Analysis
Re	Research by Design
Mo	Morphology Analysis
Sp	Space Matrix

Outcome: The project will propose a spatial renewal approach for urban villages in the context of industrial transition, including renewal strategies and sequences for large-scale spaces, spatial designs for mid-scale spaces, and some policy recommendations. These designs and strategies will contribute to the renewal of sustainable and livable high-density communities in Shenzhen.

3.3 Methods

Morphology Analysis

Action: Draw the morphology of various types of spaces in history and the present moment.

Aim:
To understand the changing shape of urban villages, industrial parks, other functions and neighbourhoods over the ages, and their shape today.

Steps:
1 Draw Morphology.
2 Analyse future trends and types with potential for renewal.
3 Analyse quality and density of the site.

Element and Layer Analysis

Action: Understand the spatial distribution of the community at multiple levels by overlaying spatial structures, ecological structures and open spaces.

Aim:
To understand the distribution of different spatial factors present in industrial urban village neighbourhoods. Explore their problematic points and sites with potential for regeneration.

Steps:
1 Analyse industry, housing, mobility, nature facilities and open space in large and middle scale
2 Analyse interactions between diffrent layers and scale

Literature Review

Action: Read and summarise relevant parts from literatures

Aim:
Summarise the concepts of sustainability and livability and explore how they will be defined in this project and what important elements they will contain. To summarise what has been said in the literature in the past about sustainability, livability and high density. To analyse how they relate to each other and how they interact with each other.

Steps:
1 Finding relevant literatures;
2 Reading relevant arguments;
3 Determine and Summarize the relevance;
4 Conclusion

Case Study

Action: Analysing the design focus and spatial design approach in cases related to high-density livable communities

Aim:
Understand how various types of communities in reality achieve livability based on high-density model and summarise the spatial strategies in the case studies. Urban villages, mixed-use communities and vertical industrial parks are included here. Cases from Singapore, Shanghai and Chengdu are included.

Steps:
1 Find relevant case studies
2 Analyse spatial strategies
3 Summarise strategies that can be used to this project

Research by Design

Action: Searching for possible new ways of renewing space in design

Aim:
Finding a more appropriate and innovative design amongst the many options available through different experiments in design can help to open up the designer's mind and explore some new and distinctive spatial outcomes.

Steps:
1 Identify design-related elements
2 Design
3 Adjust for deficiencies
4 Continue designing

Policy Analysis

Action: Read and analyse existing policies related to industrial transformation and urban renewal in Shenzhen.

Aim:
Understanding the spatial guidelines for regeneration now underway in Shenzhen, what are the objectives of regeneration in residential areas, urban villages and industrial areas respectively. What are the newer regeneration methods and directions

Steps:
1 Find relevant policies
2 Read relevant guidelines
3 Summarise according to project needs

Space Matrix

Action:Drawing the space matrix to analyse certain space and population properties of different typologies.

Aim:Understand the building density, population density and other characteristics of the various types of existing typology. Understand trends in density and predict the future by comparing typologies over time.

Steps:
1 Analyse the density of different typology
2 Analyse the density and space of housing, working and open space of different typologies
3 Select appropriate typology in design after analysis

04 Theory

4.1 Sustainability

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In its broadest sense, the strategy for sustainable development aims to promote harmony among human brings and between humanity and nature(Imperatives, S., 1987).

Economic

Growth by itself is not enough. High levels of productive activity and widespread poverty can coexist, and can endanger the environment. Hence sustainable development requires that societies meet human needs both by increasing productive potential and by ensuring equitable opportunities for all.
All countries stand to benefit from having a healthy and well-educated workforce with the knowledge and skills needed for productive and fulfilling work and full participation in society.

Environmental

Economic growth always brings risk of environmental damage, as it puts increased pressure on environmental resources. Economic and ecological concerns are not necessarily in opposition. But policy makers guided by the concept of sustainable development will necessarily work to assure that growing economies remain firmly attached to their ecological roots and that these roots are protected and nurtured so that they may support growth over the long term. Environmental protection is thus inherent in the concept of sustainable development, as is a focus on the sources of environmental problems rather than the symptoms. Promote Sustainable Housing, including affordable and social housing; Ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums. Accessibility to important services is a crucial sustainability indicator to make cities more inclusive (United Nations, 2015). It focuses on enabling ease to reach different destinations by endorsing access through proximity and transport systems (Cervero, 1997) and is widely used in transportation planning and urban development.

Social

Sustainability in Communities

From a sustainability perspective, a sustain able community must also be characterised by willingness to minimise the consumption of natural capital, increase social capital, and use urban spaces efficiently; the sense of community is expressed through community spirit, trust, mutual benefit, and art (Roseland, 2000). More recently, the ability of communities to intentionally improve their ter ritorial environment through planned interventions has also been recognised (Moayerian et al., 2022)
Sustainable urban development and management are crucial to the quality of life of our people. We will work with local authorities and communities to renew and plan our cities and human settlements so as to foster community cohesion.

The English Government(2003) defifines a sustainable community in 'Communities Plan (Sustainable Communities: Building for the future)'. Sustainable commu nities are defifined as places where people want to live and work, now and in the future. They meet the diverse needs of existing and future residents, are sensitive to their environment, and contribute to a high quality of life. They are safe and inclusive, well planned, built and run and offer equality of opportunity and good services for all.

To summarise, development brings both positive effects such as high rates of economic growth, and most likely negative effects such as inequality, poverty, and over-consumption of resources, which are unsustainable both for society and the environment. Shenzhen's previous urban development has amplified the negative effects of unsustainable development patterns, such as unequal distribution and the difficulty for lower-income rural migrants to obtain better social benefits and public services locally through their own efforts. The primary aim of the project is therefore to make the endeavour accessible to all who live and work in the area, whether they are locals or migrants. This more equitable development model will be achieved through the provision of more cost-effective housing, more stable employment, healthy environment and inclusive public services.

4.2 Livability

In academic research, there are several different definitions of livability. It is indicated that "livability is about the human requirement for social amenity, health and well-being and includes both individual and community well-being" (Newman,1999, p. 222).
Livability could be described as "the quality of the person-environment relationship, or how well the built environment and the available services fulfill the residents' needs and expectations" (Kovacs Györi et al., 2019).
Aranoff, Clark, Lavine, and Mam Suteethorn (2013) define livability as "a set of physical conditions that integrate the natural and built environments, include engaging facades, and offer easy access to services and transit" (p. 153)

How to achieve livability?

They underscore old buildings to create a diversity of structures and styles that embrace a changing a physical form, a high enough density that promotes community activities, adequate access to parks and civic facilities, and to carefully manage borders as to not reduce walkability and remove dead-ends (Lund, 2003).

The US Environmental Protection Agency (EPA, 2016) to promote actions called livability principles:
1.Provide more transportation choices; 2. Promote equitable, affordable housing; 3. Enhance economic competitiveness;

Among the more recently developed factors of livability, Lowe et al. (2015) and Tapsuwana, Mathot, Walker, and Barnett (2018) contribute social cohesion and identity, health and well-being, inclusiveness, affordability, and housing diversity as elements of a livable neighborhood.
The livability indicators selected for this project include accessibility and connectivity, affordability and inclusiveness.

Connectivity

Urban form, at the community scale, is often defifined in terms of connectivity and accessibility (street network, transportation). Many studies have focused on the accessibility metrics that capture the quality of services that reflect the urban environment's interfaces (Jiang, Claramunt, & Batty, 1999; Lotfifi & Koohsari, 2009). The spatial distribution of urban facilities such as public space utilization and accessibility are inflfluenced by location, proximity, travel time, and street's physical characteristics(Pasaogullari and Doratli, 2004). Facility choice and service quality the built environment offers are achieved not only through higher densities but also through pathway configuration (Porta, Crucitti, and Latora, 2005).

The number, size and spatial distribution of facilities influence livability by determining whether urban resources are available to the entire population. The closeness to open spaces could be used to determine the residents' livability conditions (Oppio et al, 2018). Apart from provision, the overall proximity and connectivity to services and facilities is important for livability (McCrea et al., 2006; Marans, Stimson,2011). Community facility accessibility depends on road network connectivity and building density. A livability score could be calculated by assessing the accessibility of all modes of transport (walking, cycling, public transport and private vehicles) (Higgs et al., 2019). Besides measuring absolute distance, livability studies take the quality and accessibility of the connections into account.

Affordability

A Liveable city is one where people aspire to live and can afford to live (Newman, 1999). Myers (1988) considers the cost of urban facilities and the affordability of daily life activities to be an essential component of livability.

The concept of livability encompasses the opportunities (occupation, business, educa tion), and facilities (leisure, sports, healthcare, and housing) that a city has to offer.
A satisfactory access to community facilities and adequat provision of daily services and amenities within walking distance from homes or workplaces are fundamental standards of a good living en vironment and closely linked to people's livability standards (Jacobs,1961).
Hence, urban planning and design play a significant role in promoting livability (Kashef, 2016).

Inclusiveness

Inclusiveness is a policy concept that has been created to express "the willingness to recognize and acknowledge the distinct and diverse needs and abilities of people" (Herzele et al., 2005, p. 178). It implies public participation in decision-making and equitable distribution of benefits (Herzele et al., 2005). During urbanization, migrants will have an impact on the social environment. The smaller the social welfare gap between local residents and migrants, the more inclusive the city is (Wang et al., 2018), in other words, the higher level of urban inclusiveness the city achieves. Inclusive urban transformation needs to be achieved through the economic integration, physical improvement and social development.

The New Urban Agenda 2 promotes the concept of 'inclusive housing' and recommends that goverment should invest more in affordable housing, quality infrastructure, and basic services (Arman et al., 2009; Wang et al., 2021). Safe, accessible green spaces and public spaces also enhance urban inclusiveness.

Walkability

An existing research specifically focuses on the creation of a pedestrian-friendly environment near transit nodes with local street connectivity, road segments, block sizes, building design patterns, density, and intersection patterns (Boarnet & Crane, 2001; Cervero & Kockelman, 1997). People living in more walkable neighborhoods (characterized by mixed-use buildings, functional street connectivity, high density, and pedestrian-oriented environments) walk more than people living in less walkable communities (Frank et al., 2006).

The Diffrence between Sustainability and Livability

In the heart of the modern living experience, lie two largely intersecting yet occasionally contrasting concepts of sustainability and livability. Livability can be defined as the combined objective influences on a community's quality of life. Livability is hypothetically reflected on the subjective satisfaction of the community with their surrounding environment, while sustainability is concerned with the balance between the social, economic, and environmental facets of development as well as the preservation and regeneration of resources for both present and future generations. Livability is concerned with present, immediate needs, while sustainability is concerned with the overall longterm wellbeing of humanity and Earth. These two concepts must be reconciled and colligated to advance a happy, comfortable way of living (Chazal, 2010; Gough, 2015).

The core of the conflict and tension between sustainability and livability is that many of the instantaneous needs and desires of the population to make life quality better, have unsustainable consequences on the long term. Livability has a narrower scope than that of sustainability, which suggests more of a macro- or global-level application.

Livability and sustainability again differ in context and perception. Livability has a fluid concept that changes depending on the community values and context, whereas sustainability is a constant that establishes a set of long-term aspirations, usually in regard to the 'three E's': eco nomic opportunity, environmental quality, and social equity (Campbell, 1996; Gough, 2015). There is a need for livability to be more broadly situated within these three E's so that it is not prioritized at the expense of exhaustive resource consumptive patterns. Achieving the broader scope of sustainability in the local context, livable outcomes over time can generate sustainability locally through establishing protocols and guidelines (Gough, 2015). Livability, thus, bridges sustainability to a local agency through observable modifications such as within the built environment, and the neighborhood functions as units of change (Lynch & Mosbah, 2017).

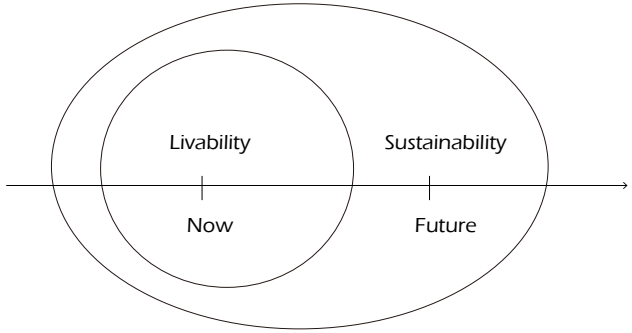


Figure 4.1 The Relationship between Sustainability and Livability
By: author

Conclusion of the Characteristics of Sustainability and Livability

In the heart of the modern living experience, lie two largely intersecting yet occasionally contrasting concepts of sustainability and livability. Livability can be defined as the combined objective influences on a community's quality of life. Livability is hypothetically reflected on the subjective satisfaction of the community with their surrounding environment, while sustainability is concerned with the balance between the social, economic, and environmental facets of development as well as the preservation and regeneration of resources for both present and future generations. Livability is concerned with present, immediate needs, while sustainability is concerned with the overall longterm wellbeing of humanity and Earth. These two concepts must be reconciled and colligated to advance a happy, comfortable way of living (Chazal, 2010; Gough, 2015).

As summarised above, the definition of sustainability focuses more on the long-term development and equitable distribution of the local area, whereas the related definition of livability only considers the current situation. After combining the characteristics of sustainability and livability, the ways to improve the quality of community finally come together into six factors, which are housing, working, mixed use, nature, mobility and open space. Of these, housing and jobs are the foundation for improving the quality of a community, guaranteeing people a basic income.

In this project, therefore, the prediction of housing and working is the most important which determines the quantity. The other four factors are environmental optimisation methods that are carried out after both housing and jobs have been met.

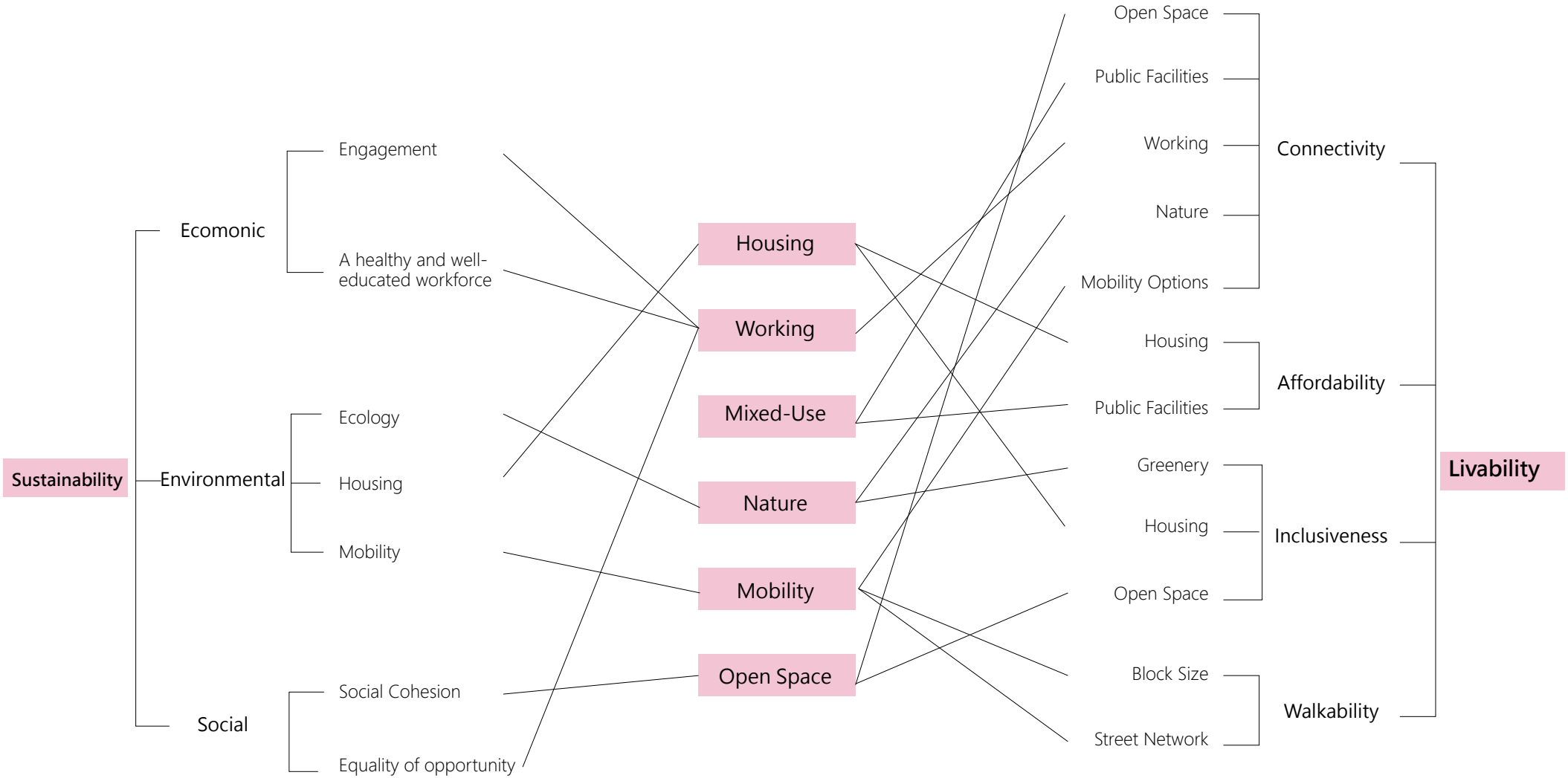


Figure 4.2 Quality of Sustainable and Livable Community

4.3 High-Density

As a special characteristic of urban form, Various definitions of density have been provided on different scales, ranging from rooms to buildings and neighborhoods to cities, from physical forms of density to non-physical aspects, such as the number of persons, households or dwellings perunit of land (Boyko & Cooper, 2011). Three concepts are used to address the issue of density and how density affects people's lives: densit y, perceived density, and crowding (Alexander, 1993). Within the planning field, the word "density" refers to cities and neighborhoods (indeed the number of individuals or dwelling units per acre) (Forsyth, 2003).

High-density Urban Form in China

In China, density is a key controlling variable for urban development. The Floor Area Ratio (FAR), also named as 'Plot Ratio', is critical in understanding the Chi nese system of regulating development (Sun, 2009). It is calculated as a ratio of the total built-up flfloor area to the total site area. Thus, the FAR can represent the intensity of construction on a specifific site. The site scale of development, also known as the variable 'plot area' in planning practice, is another key variable that also greatly inflfluences urban form in China. It is also related to density, as density is not meaningful until the territory for measurement is defifined (Dovey & Pafka, 2014) and the calculation of FAR (flfloor area/site area) also has to be area based.
Studies usually remain narrow in focus only dealing with density to refer to the urban form, and generally overlook the role of the other aspects of the built environment design.

Furthermore, the same population density can be manifested in a quite different dwelling and built form configuration, layout, and design, which can lead to different types of accessibility and physical proximity (Neuman, 2005; Raman, 2010; Soltani et al., 2020)

Comments on High-density Urban Form

Bourne (1992) directs attention to "more compact and humane" urban forms in the face of challenges from urban sprawl and rapid urbanization. Urban growth's pace requires urban and community facilities supporting development to coincide with urban form's impact. However, Bourne provides little empirical evidence for his argument that compact urban form tends to be more dense and equitable with better urban quality of life (Bardhan, Kurisu, & Hanaki, 2015; Burton, 2000; Gordon & Richardson, 1997).

There are conflicting arguments regarding the drawbacks and social benefits of higher densities (Tang et al., 2019), especially in the context of developing countries. The paradox of high-density compact development in Hong Kong or other similar cities, like Kolkata, Bandung, Tokyo, and Beijing, often insinuates a compromise with livability and quality of life. Thus, many studies have examined the relationship between compactness and urban environmental quality (Burton, 2000; Burton et al., 1996; Calthorpe, 1993; Newman & Kenworthy, 1989; Pacione, 1989; de Schiller & Evans, 2000; Thomas & Cousins, 1996).

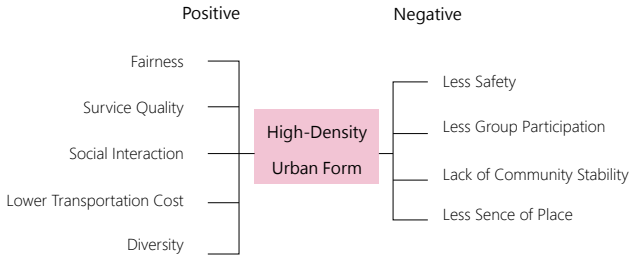
Density is positively related to service quality in the particular context of an urban environment (Carruthers & Ulfarsson, 2003). Denser cities generate higher levels of interaction between people and their living environment (Talen & Duany, 2006) and impose lower transportation costs. However, density alone is insufficient to warrant desirable interactions for living, working, and recreation (Larice, 2006).

Urban planning policies in many western cities have promoted a more compact form by increasing density and using more pedestrian-friendly urban design to encourage more social interaction (Bamford, 2009; Gordon & Vipond, 2005).

According to Jacobs (1961), density can keep the diversity of cities contributing to the attractive and dynamic urban environment (Caprotti and Gong, 2017). The relation ship between density and social interactions is not linear throughout all quantitative densities. High density per se does not lead to social dis orders and social withdrawals but poor planning does (Tang et al., 2019). Also, the acceptability of high-density living may vary in different social and cultural contexts (Breheny, 1997).

While the compact city is becoming the dominant urban strategy because of its environmental and economic benefits, its impacts on residents, however, are open to controversy. Some scholars claim that compact city is not only an inevitable scenario for today's growing global urbanization and population, but can also contribute to the livability (McCrea & Walters, 2012; Walton, Murray, & Thomas, 2008) through the provision of social sustainability conditions (Laatikainen, Tenkanen, Kytt ¨a, & Toivonen, 2015; Quastel, Moos, & Lynch, 2012; Steemers, 2003).

Several studies report undesirable impact of high density on some aspects of social sustainability. The results of a study conducted in the UK show that denser areas have negative effects on the sustainability of community by reducing perceived safety, social interaction and group participation. Such char acteristics lead to a lack of community stability and sense of place (Bramley, Dempsey, Power, Brown, & Watkins, 2009b; Dempsey, Brown, & Bramley, 2012).



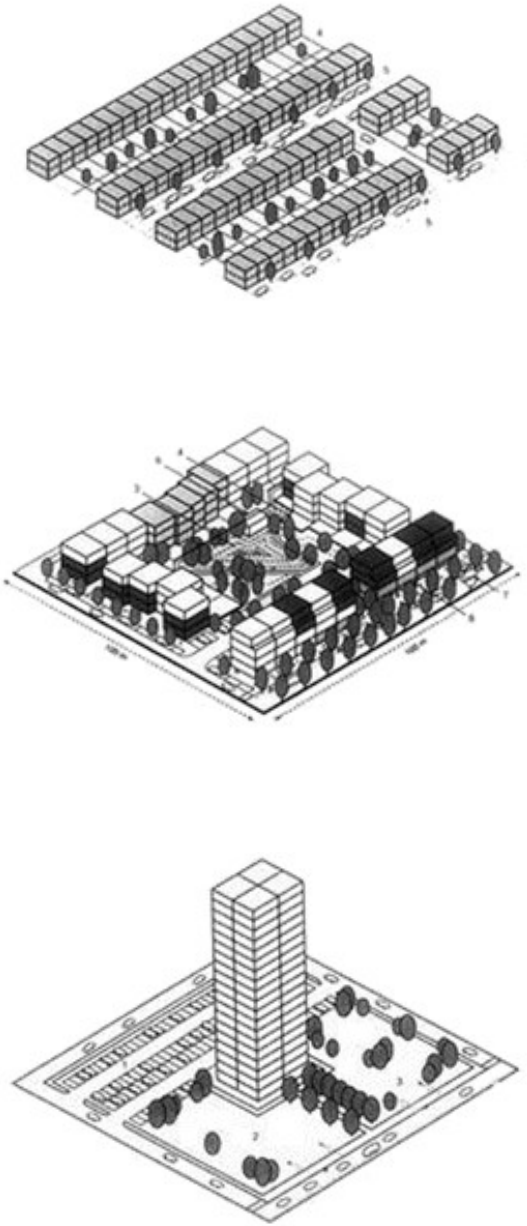


Figure 4.3 The imprecision of the quantitative approach to density: three areas with 75 dwellings per hectare

Source: Fernández Per and Mozas, 2004: 206-207

Density and Sustainability

However, studies conducted in various parts of the world indicate that the exact link between aspects of social sustainability in correlation with density and design configuration is complicated, frag mented and seemingly contradictory.

Kytta et al. (2016) found that the correlation between density and social sustainability is rather complex and context dependent. Similar to previous studies, they demonstrate that high density areas support better accessibility in both urban and suburban neighborhoods. Contrary to urban areas, better accessibility does not support perceived environmental quality by residents in sub urban areas which also induces poor well-being conditions.

Compact urban form emphasizes the rational utilization of urban land, which can help reduce carbon emissions during commuting, strengthen social and economic cooperation, improve urban residents' quality of life, and finally pro mote urban sustainability (Bibri, Krogstie & K ¨ arrholm, 2020; Wang, Wang, Fang & Li, 2019).
Dave (2011) showed that perceived density, which is defined by the built form, design, layout and mix of land use, as well as socio-demographic characteristics, have more im pacts on social sustainability dimensions than physical density.

Density and Livability

Population density should be considered in urban planning to ensure an adequate supply of resources (Campbell et al., 1976), and avoid overcrowding that can negatively affect livability (Türksever & Atalik, 2001).

To sustain a healthy, livable community with appropriate and necessary facility services accessible to all neighborhood residents, it is vital to determine compact urban form's effects on the distribution pattern of community facilities in the existing urban fabric (Lin et al., 2017).

In a highly dense city, neighborhood service access is associated with the unique characteristics of centralized demand, which enables high livability and sustainability due to the adequacy of facility service provision (Tang, 2017).

Compact land use in high-density cities en courages walking and improves overall public transit services (Cervero & Kockelman, 1997; Krizek, 2003; Lang, Long, & Chen, 2018). Lang et al. (2019) find that high-density urban form with a mixing of commercial, business, and public facilities provide better accessibility, resulting in a higher Quality of Life. Relevant principles to achieve a more livable space in clude mixed-land uses, smaller city blocks to increase the number of intersections as well as compact urban form (Raman, 2010)

Firstly, high-density urban form bring more housing and employment to an area of the same size. Not only that, but high-density urban form also bring richer services, shorter commuting distances, and more communication, all of which contribute to the quality of a community.
Although there are some high-density but uninhabitable cities and regions around the world, these deficiencies can be improved through design. This project should make full use of the compact city, improve the public transport system, and establish a three-dimensional open space system so that people have enough space to move around even in high-density environments.
Finally, the high-density community should apply mixed-use to improve accessibility to all types of facilities.

05 Analysis

Location

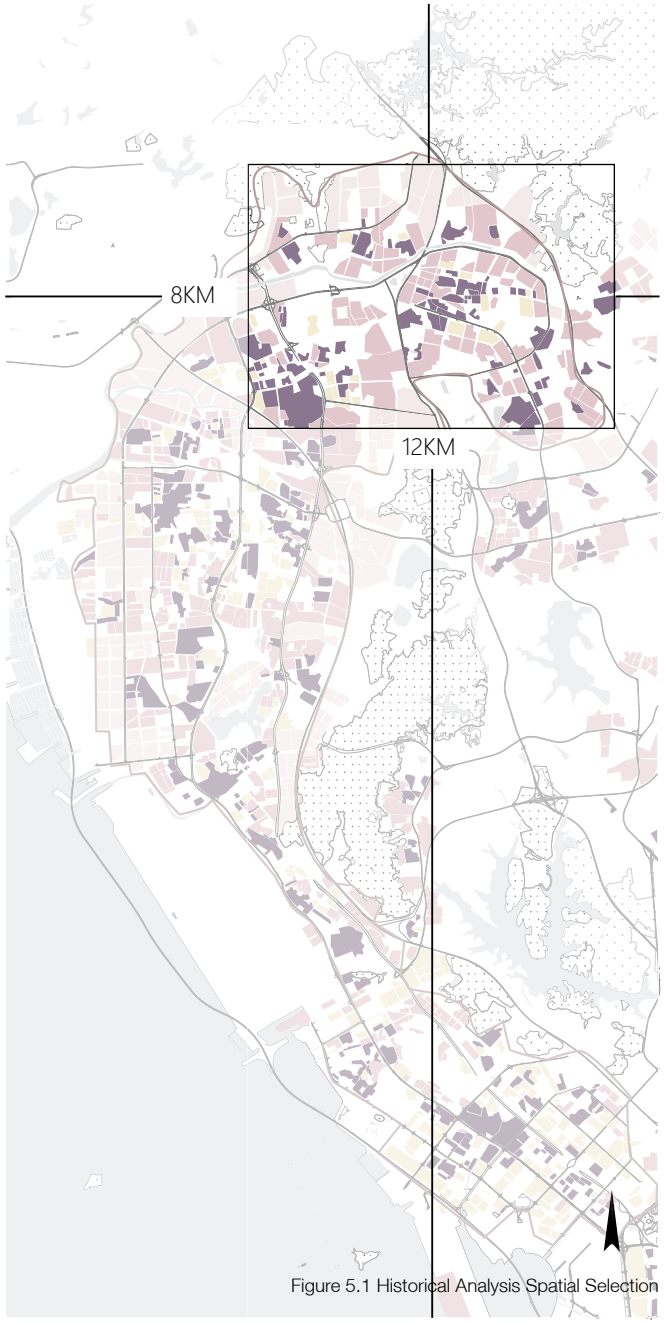


Figure 5.1 Historical Analysis Spatial Selection

The big-scale area is located in the northwestern part of Shenzhen. It has a total area of 93 square kilometres. The terrain is high in the north-east and low in the south-west, and the landforms are mountains, hills and plains. This area is surrounded by vast waters and green hills. The Maozhou River runs through the area. Besides the main stream of the river, there are also many tributaries in the area. About 5 percent of the population is indigenous, and the remaining 95 percent is foreign. About 80 percent of the region's industrial GDP comes from small labour-intensive industries.

Figure 5.2 Maozhou River
Source: image.baidu.com

5.1 Historical Analysis

1978

Although Shenzhen is close to Hong Kong, before the reform and opening up of the country, it was just a small fishing village with rice production as its main focus. Villages were spread out over the land at a distance from each other, and each village preferred to have its own "feng shui" pond in front of it. Traditional villages usually preferred to be located in a south-facing direction. With a big hill behind and facing the water is the best location for a village.

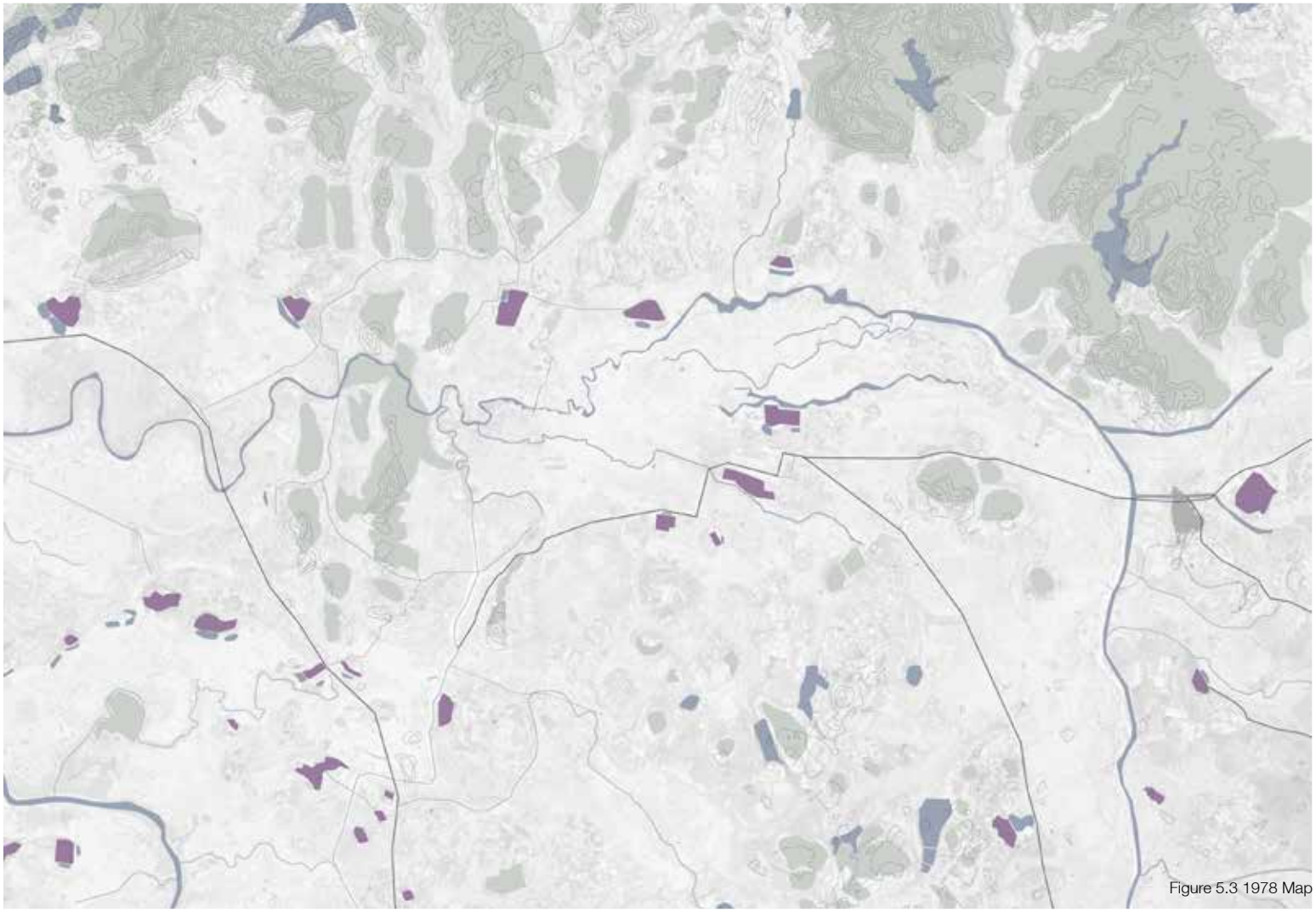


Figure 5.3 1978 Map

Nature

Mobility

Housing

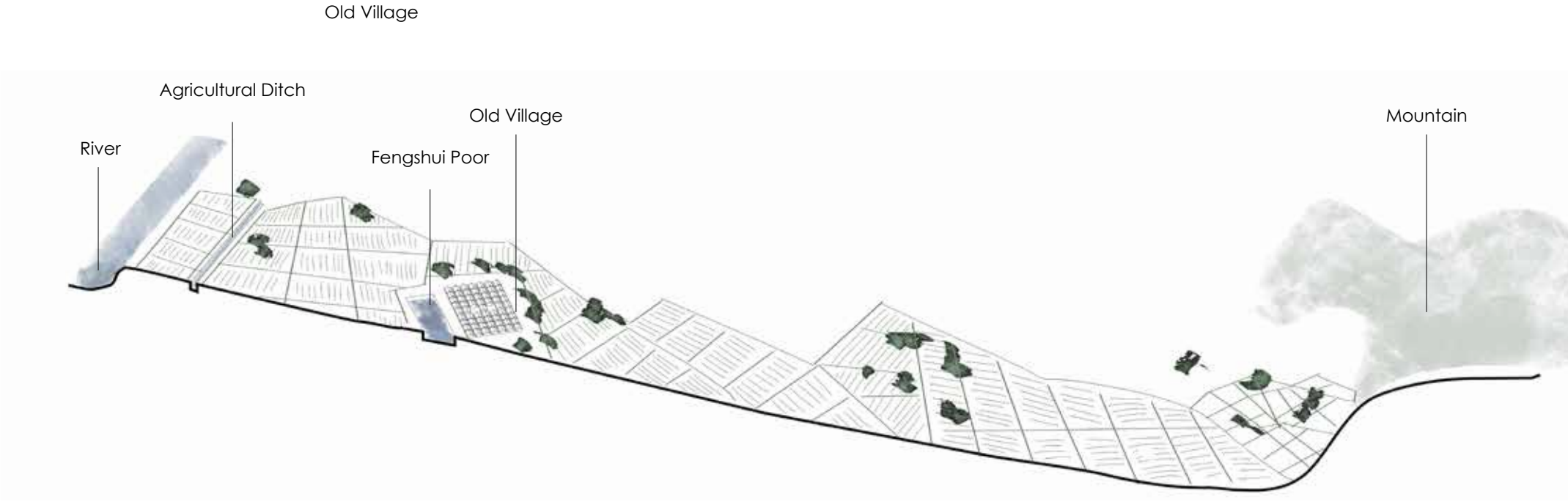


Figure 5.4 1978 Morphology

All of the housing in the village are bungalows. This was a time when there was more living space per person. People lived in their own houses. The villagers are engaged in agriculture. There is a clear separation between living and working areas. People live in the village and work outside the village. The river is bordered by wetlands and there is no riverbank, which makes the farmland easy to be flooded. There is some forest on the plains, and the rest of the area is cereal-based farmland. Walking is the main focus, no carriageways, only country lanes.

5.1 Historical Analysis

1978-1992

The first industrial transfers were concentrated within the Shenzhen Special Economic Zone, and the towns outside the Special Economic Zone were still predominantly in agricultural production. However, due to the dramatic increase of the number of migrants coming to Shenzhen, the towns on the periphery had a first round of expansion, with many private houses occupying the farmland around the old villages. Overall, there has been little spatial change outside the Shenzhen Special Economic Zone in this decade.

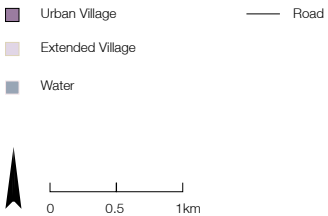


Figure 5.5 1990 Map

Nature

Housing

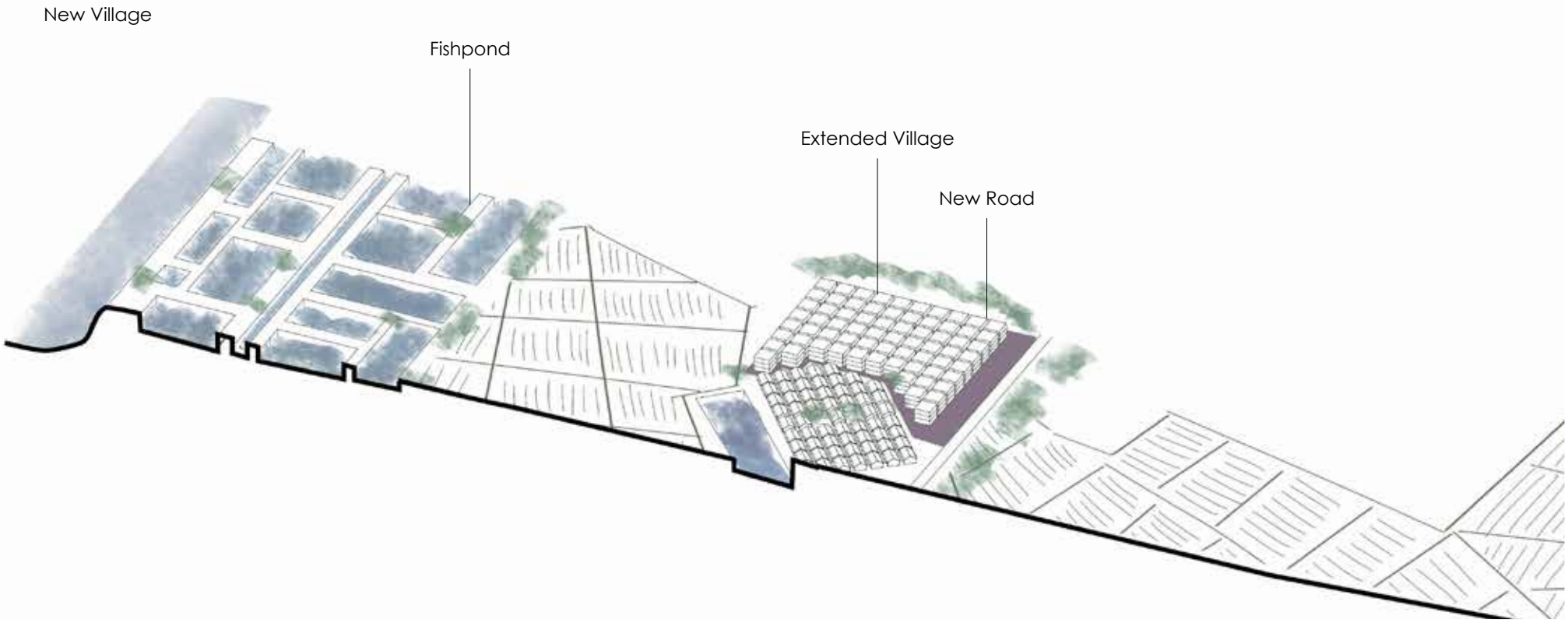


Figure 5.6 1990 Morphology

New houses built in village expand per capita living area. Villagers are engaged in farming and fishing, which increases their income. The ground floor of some of the new houses are used as small shops or restaurants. Dams have been built along the river, eliminating the original wetlands. Wide roads begin to be built to connect villages. There is no obvious use for open space within the village. Connectivity of it is still very good.

1992-2000

After Shenzhen abolished the distinction between the internal and external policies of the Special Economic Zones, factories sprang up on the periphery of Shenzhen. Most of the unauthorised extensions of buildings in the residential areas and industrial zones of urban villages were built during this period. Newly developed land focused on providing space for migrants and labour-intensive industries, with large quantities but low spatial quality.

Villages continued to expand on the periphery of their original settlements, and there are also a few new urban villages. These villages have truly transformed from ordinary villages into "urban villages" surrounded by factories. The village collectives upgraded village farmland into village industrial zones, which enabled villagers to make a lot of profit from rent collection. During this period a large number of migrants with a low level of education came to Shenzhen to work in labour-intensive factories such as electronics factories and garment factories.ecial Economic Zone were still predominantly in agricultural production. However, due to the dramatic increase of the number of migrants coming to Shenzhen, the towns on the periphery had a first round of expansion, with many private houses occupying the farmland around the old villages. Overall, there has been little spatial change outside the Shenzhen Special Economic Zone in this decade.

Figure 5.7 2000 Map

Mobility Housing Industrial Park

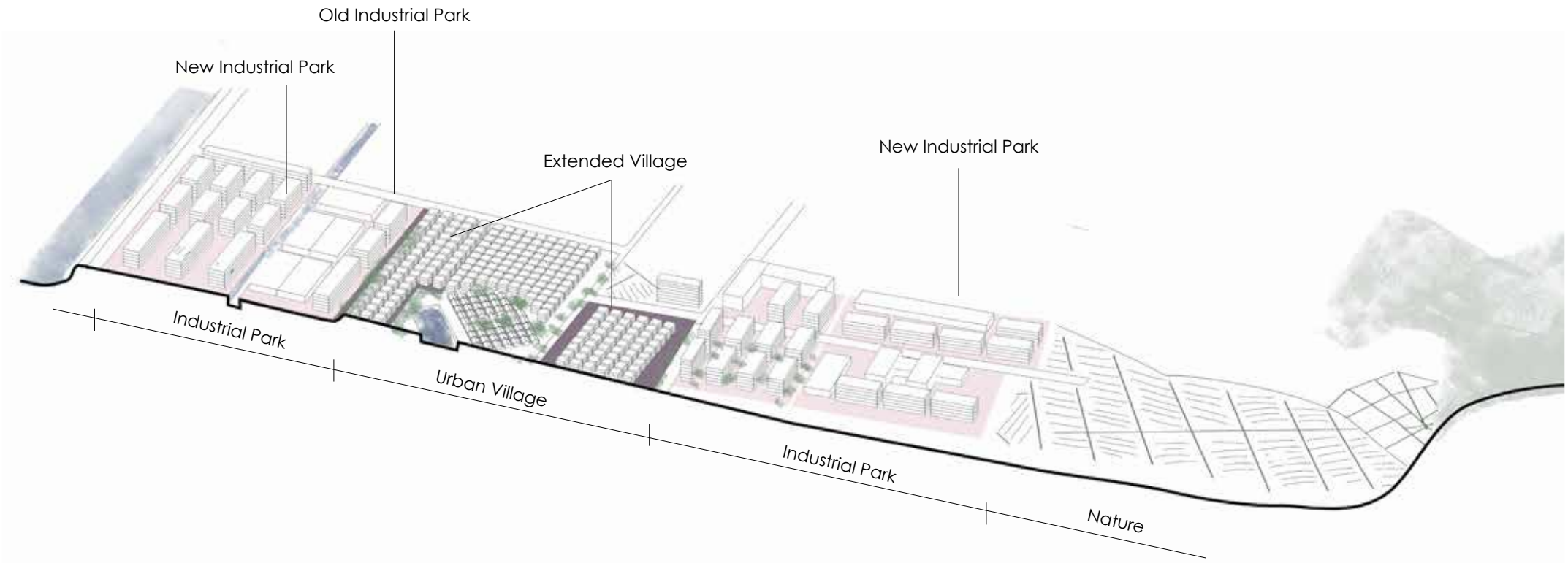


Figure 5.8 2000 Morphology

A large number of labourers livedin the cheap urban villages and industrial dormitories, causing a sharp drop in living space per capita. The majority of local jobs are for labourers in labour-intensive factories. There are plenty of jobs, but it is difficult for workers to get stable income and work. Factories and dormitories are the most popular form of mixed-use in the industrial park. Nature has been severely affected by the process of industrialisation. Large amounts of agricultural land have been encroached upon by factories. The greenness and natural diversity within these factories is very low. Freight-based transport are advancing rapidly. However, it neglects the space for walking and cycling. Due to the closed management, there is not much accessible open space in the industrial area.

2000-2010

Most of the industrial estates expanded during this period were internally managed industrial parks, which were usually able to provide adequate housing for their workers. However, many workers still chose to live in urban villages as the factory dormitories could not provide accommodation for their families.
The outskirts of some of the urban villages are being expanded, but not on a large scale. More villagers are rebuilding higher, even more than ten-storey private houses with lifts on the same sites.ere concentrated within the Shenzhen Special Economic Zone, and the towns outside the Special Economic Zone were still predominantly in agricultural production. However, due to the dramatic increase of the number of migrants coming to Shenzhen, the towns on the periphery had a first round of expansion, with many private houses occupying the farmland around the old villages. Overall, there has been little spatial change outside the Shenzhen Special Economic Zone in this decade.

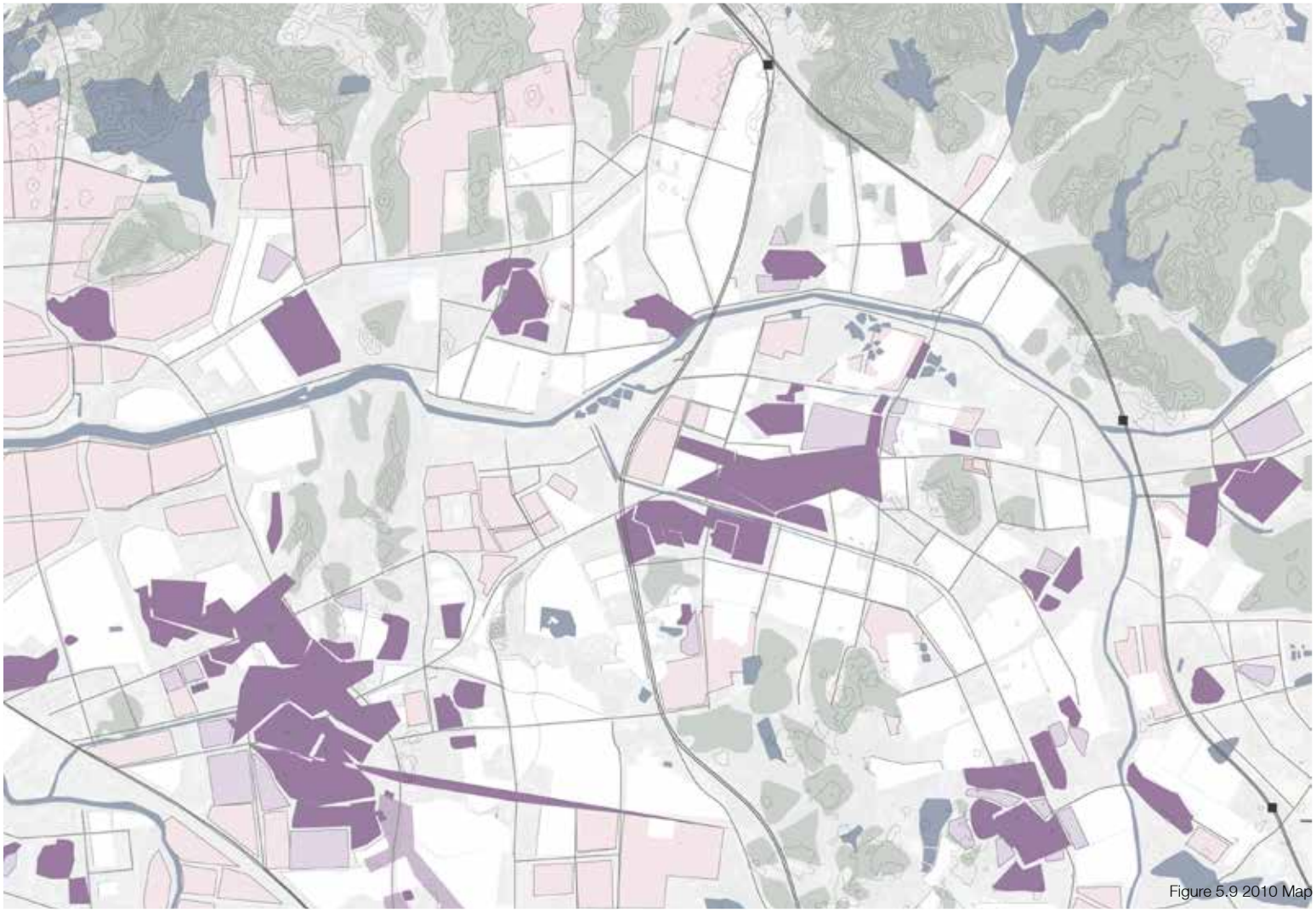
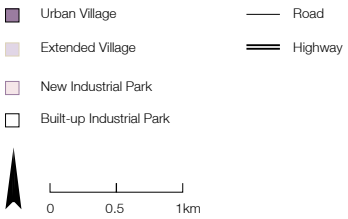


Figure 5.9 2010 Map

Nature

Mobility

Housing



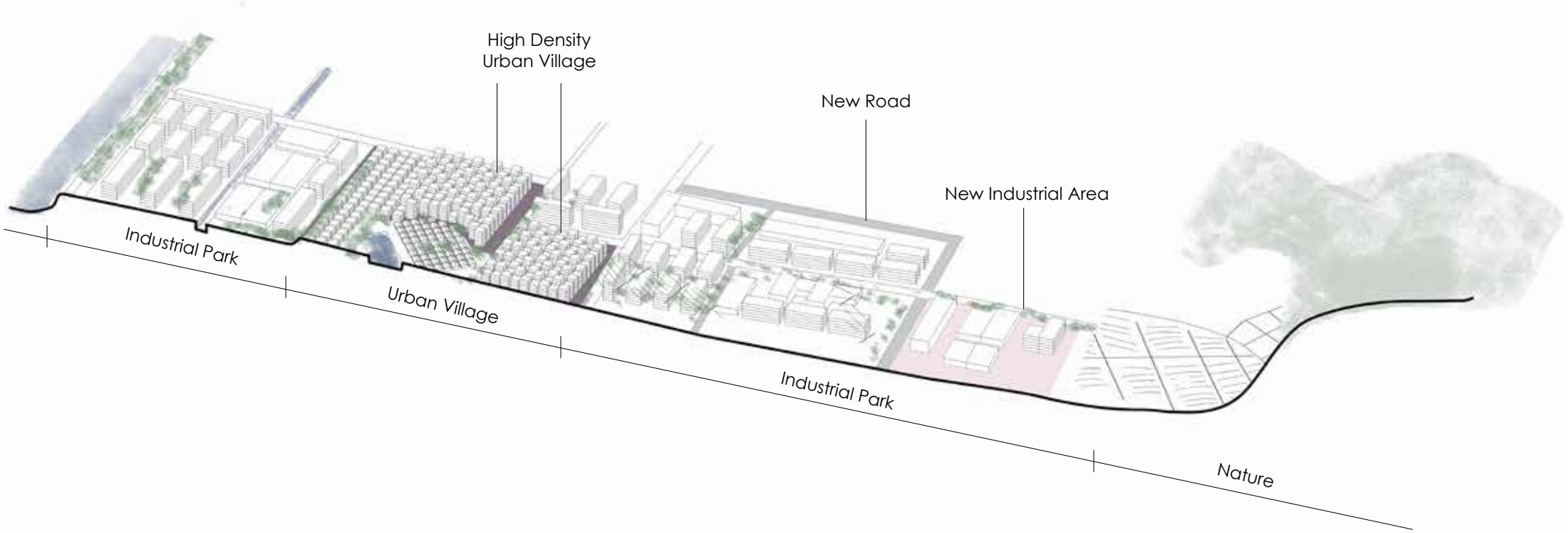


Figure 5.10 2010 Morphology

Urban villages have provided enough housing for labours while there are more people, the living space per person has remained the same. The number of labour-intensive workers has risen further. More and more ground floors of street-level buildings are converted to basic services. Agricultural land has been disappeared.Completion of highways and urban arterial roads, allowing freight transport needs to be met. Open space available in the city is concentrated in urban villages and on the outside of neighbourhoods.

2010-2022

The industrial parks expanded during this period were basically no longer ordinary factory buildings, but specially designed factory buildings based on the needs of the enterprises. Many old factory buildings were demolished and turned into other functions such as residential area and commercial area.

The renewal of urban villages focused on remedying safety hazards and optimising the environment. However, these measures were basically limited to the interior of the urban village settlements, with less consideration given to the relationship with the surrounding environment and functions.

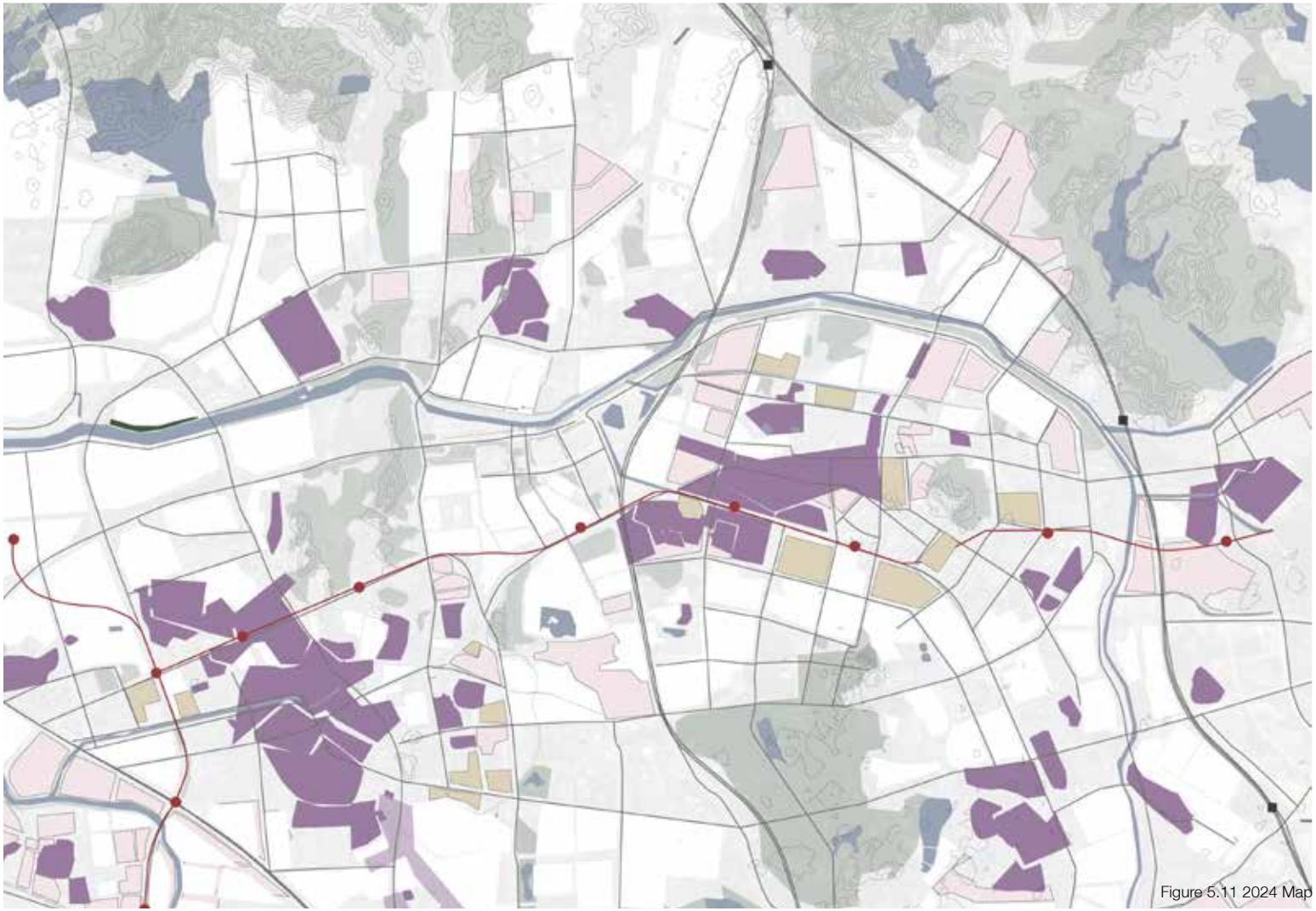


Figure 5.11 2024 Map

Nature

Mobility

Housing

Industrial Park

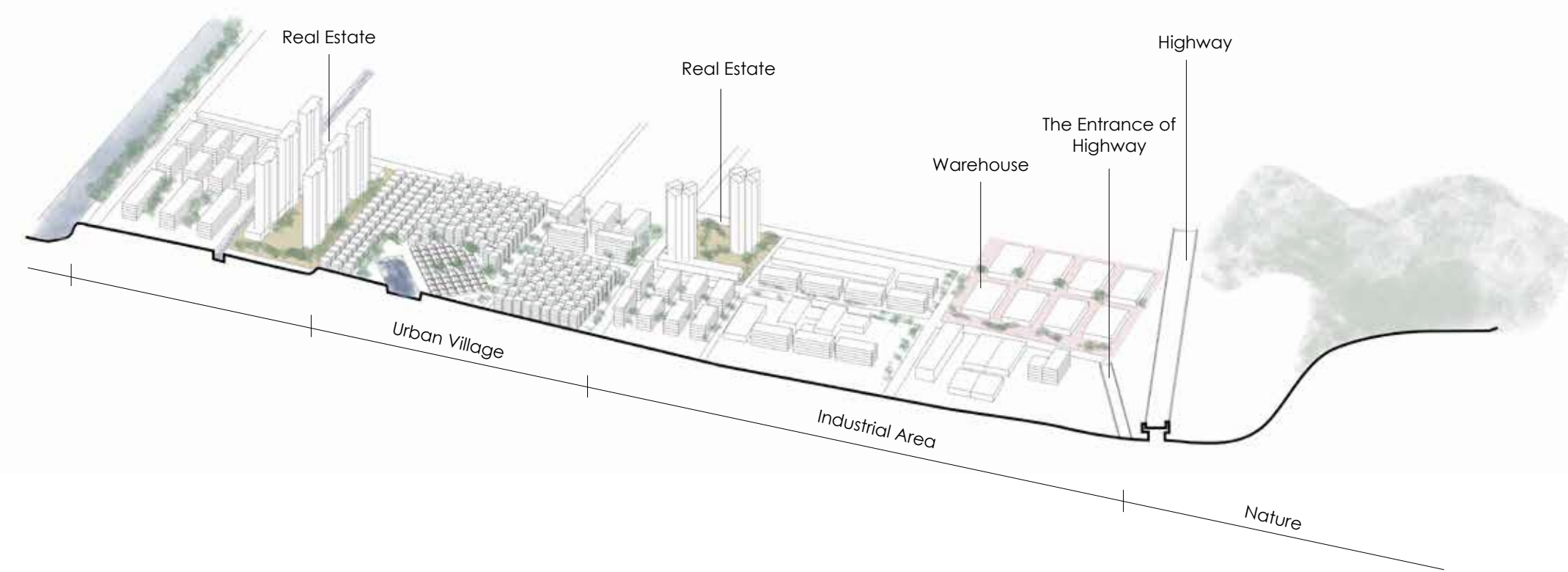


Figure 5.12 2024 Morphology

The commercial housing has improved the living conditions of the rich, but the remaining housing, especially factory dormitories, is still very poor. The combination of commercial housing and businesses is very common. There are more service facilities, such as schools, shopping malls and sports facilities. The natural space is retreating further into the foothills. The riverside is protected due to the construction of greenways. However, there are very few nature in the city. Some of the regenerated neighbourhoods have become more walkable, but there are still detours due to the gating blocks. Although the unbuild trend is increasing, the accessibility of open space is decreasing.

Site Choose

Advanced Manufacturing Parks

The vast majority of the buildings belong to labour-intensive industries, with urban villages and factories predominating. Freight transport is well developed here, and the Mau Chau River runs through the city here.

In order to make manufacturing space better protected, Shenzhen is building industrial clusters in 20 advanced manufacturing parks to upgrade the industrial chain.
Gongming advanced manufacturing park as one of them, with a planned land area of 6.16 square kilometres, has gathered 15 new materials industry enterprises, 11 science and technology innovation platforms, with a total output value of more than 10 billion yuan. It has formed a fledgling industrial chain, which is to be laid out in the clusters of new materials and biomedicine. In the field of new materials, several leading enterprises have gathered here.
Source: Nanfang Daily(Newspaper)

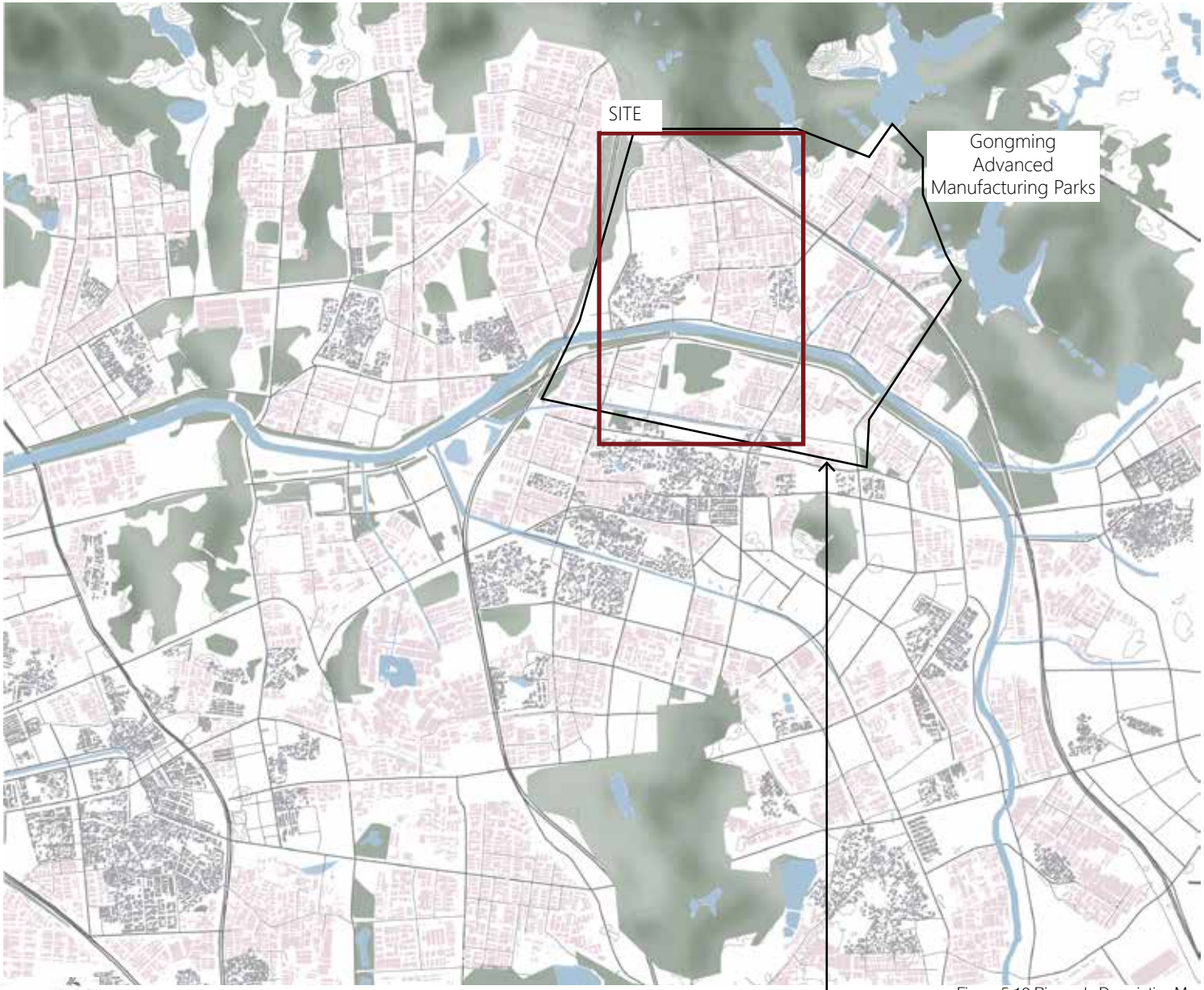


Figure 5.13 Big-scale Descriptive Map

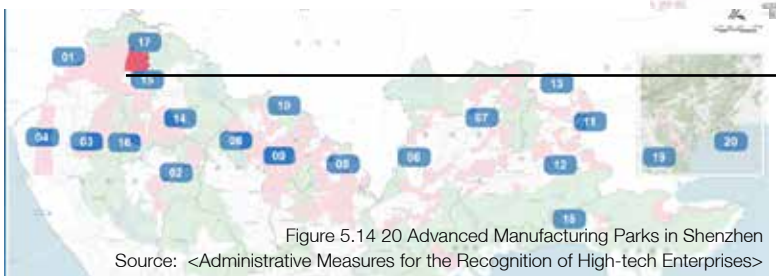


Figure 5.14 20 Advanced Manufacturing Parks in Shenzhen
Source: <Administrative Measures for the Recognition of High-tech Enterprises>

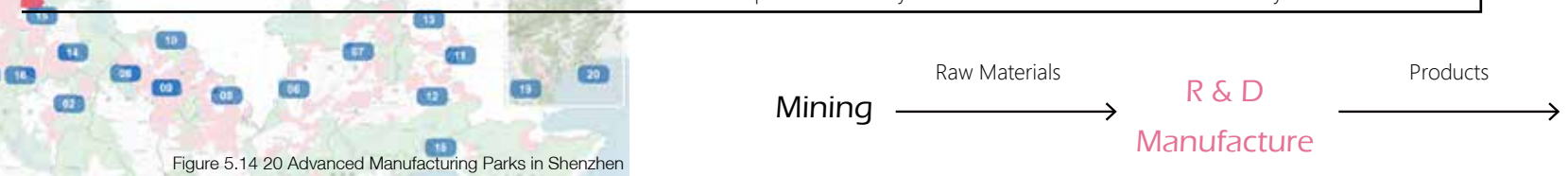
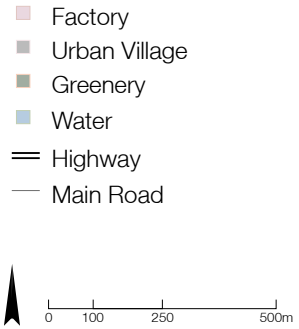


Figure 5.15 Industrial Chain

Middle-Scale

A large number of factories for labour-intensive industries are on the site, most of which are oriented north-south. The factories along the river in the southern part of the site are very low lying and prone to flooding. In the centre there is a huge irregular urban village. There are two small regular urban villages on the east. These urban villages are located in areas of higher ground. There is a substantial urban village on the southern edge. The River Mau Chau runs through the centre of the site.



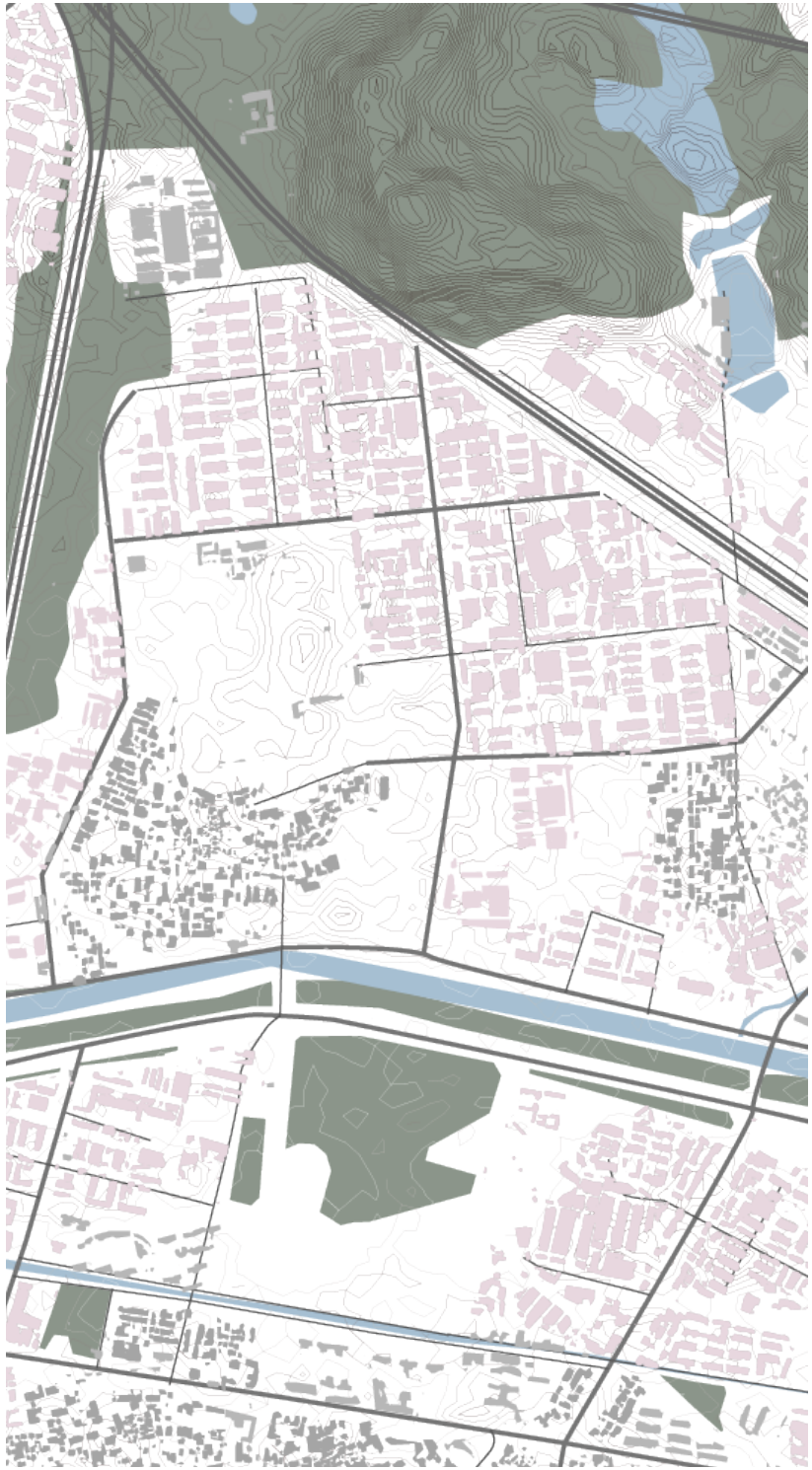


Figure 5.16
Middle-Scale Descriptive Map

5.2 Quality and Density Analysis

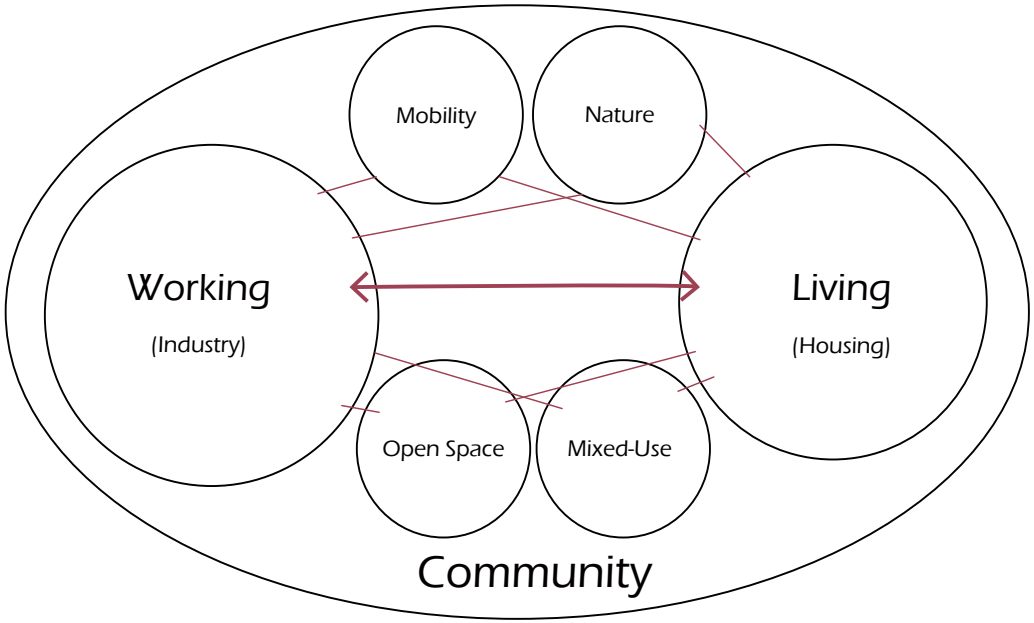
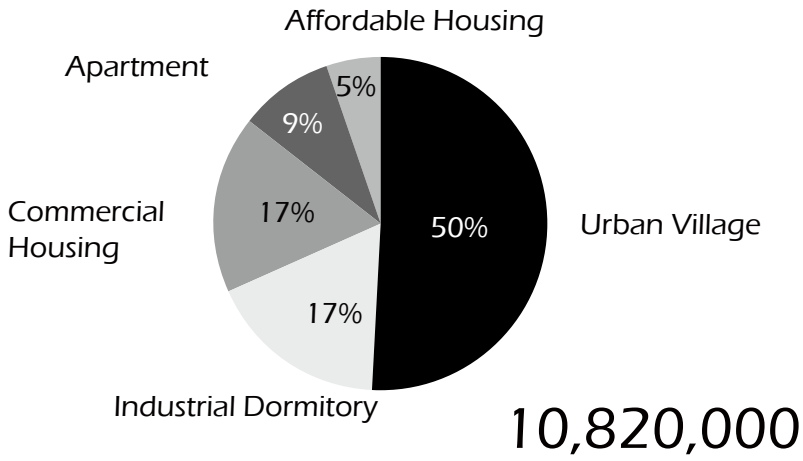


Figure 5.17 Analysis and Design Objects

The analysis and design of this project focuses on working, housing and the relationships between them in a community in thg context of industrial transition. Mobility, nature, open space and mixed-use need to be designed as part of enhancing the quality of the living and working environment. The final conclusion will be a high quality sustainable and livable community model.

HOUSING



10,820,000

80% Rent a house /17,560,000

Figure 5.18 Housing Situation in Shenzhen
Source: Statistics Bureau of Shenzhen Municipality, Coral Data

About 1.08 million housing units exist in Shenzhen, nearly half of which are in urban villages. The proportion of commercial housing has risen rapidly in the past, and the proportion of industrial dormitories is also high. In the future, the number of protected housing units will increase significantly, mainly provided for talents. The proportion of commercial housing is slowly increasing.
80 percent of Shenzhen's population live in rented accommodation.

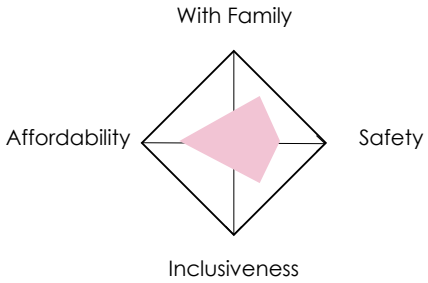
How to provide high-quality housing is one of the issues that the project needs to focus on. Currently the popular housing in Shenzhen is urban villages, factory dormitories and commercial housing. Although Shenzhen does not have a shortage of housing due to the existence of urban villages, the price of high-quality housing is very high and unaffordable for people. Inexpensive dormitories and urban villages are difficult to provide a good living environment for residents.
It is selected four indicators to measure the quality of housing: with family, affordability, safety and inclusiveness

1 With Family
Whether or not the house is family-friendly. The more family members you can bring, the higher the quality of the housing.
Currently, many factory dormitories in Shenzhen do not allow family members to move in, which is not conducive to maintaining family relationships and protecting the privacy of workers.

2 Affordability
By comparing the price of housing with the average local income, if the price of housing is more than half of the disposable income, it is considered unaffordable.

3 Safety
The safety of a neighbourhood is judged by comparing the crime rates of different types of neighbourhoods and whether people from outside can enter the neighbourhood.

4 Inclusiveness
The greater the variety of household types, the greater the types of people who will live here. This facilitates communication between different groups and promotes the inclusiveness of the city for different groups.

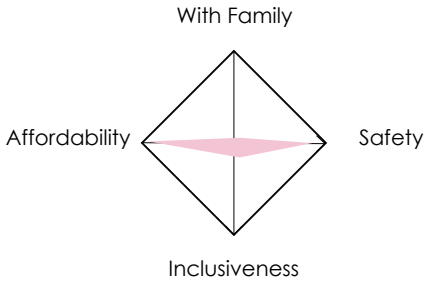


Urban Village

Urban villages, with their abundant supply of housing and cheap property prices, can provide both a commuter-friendly home for labourers and transitional accommodation for many people.

However, the property rights of houses in urban villages belong to the villagers and cannot be sold. People here therefore have no choice but to rent. In recent years some villagers have also sold their houses to them, but the government does not recognise these sales.

Figure 5.19 Urban Village

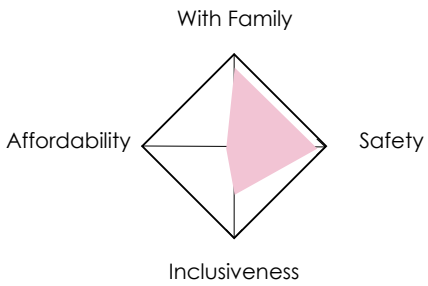


Industrial Dormitory

The living conditions in industrial quarters are poor, and their numbers will decline in the future because of their overcrowding and the inability to bring family members with them. These declines will be replaced by sheltered housing.

Industrial dormitories in Shenzhen are usually 8-bedded, with a few 6-bedded or 4-bedded dormitories, providing the first residence for many people who have just come to Shenzhen to work.

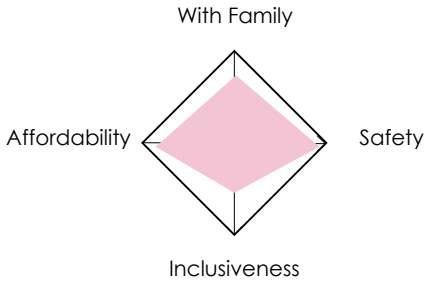
Figure 5.20 Industrial Dormitory



Commercial Housing

After decades of speculation in Shenzhen, the sales volume of commercial property has gradually shown a steady sales trend. Therefore, it can be predicted that the number of new commercial properties will not be too high in the future, and the high property prices also make it impossible for ordinary working class people to afford to buy a local house. As a result, the area of land required for commercial property will gradually decline in the future.

Figure 5.21 Commercial Housing

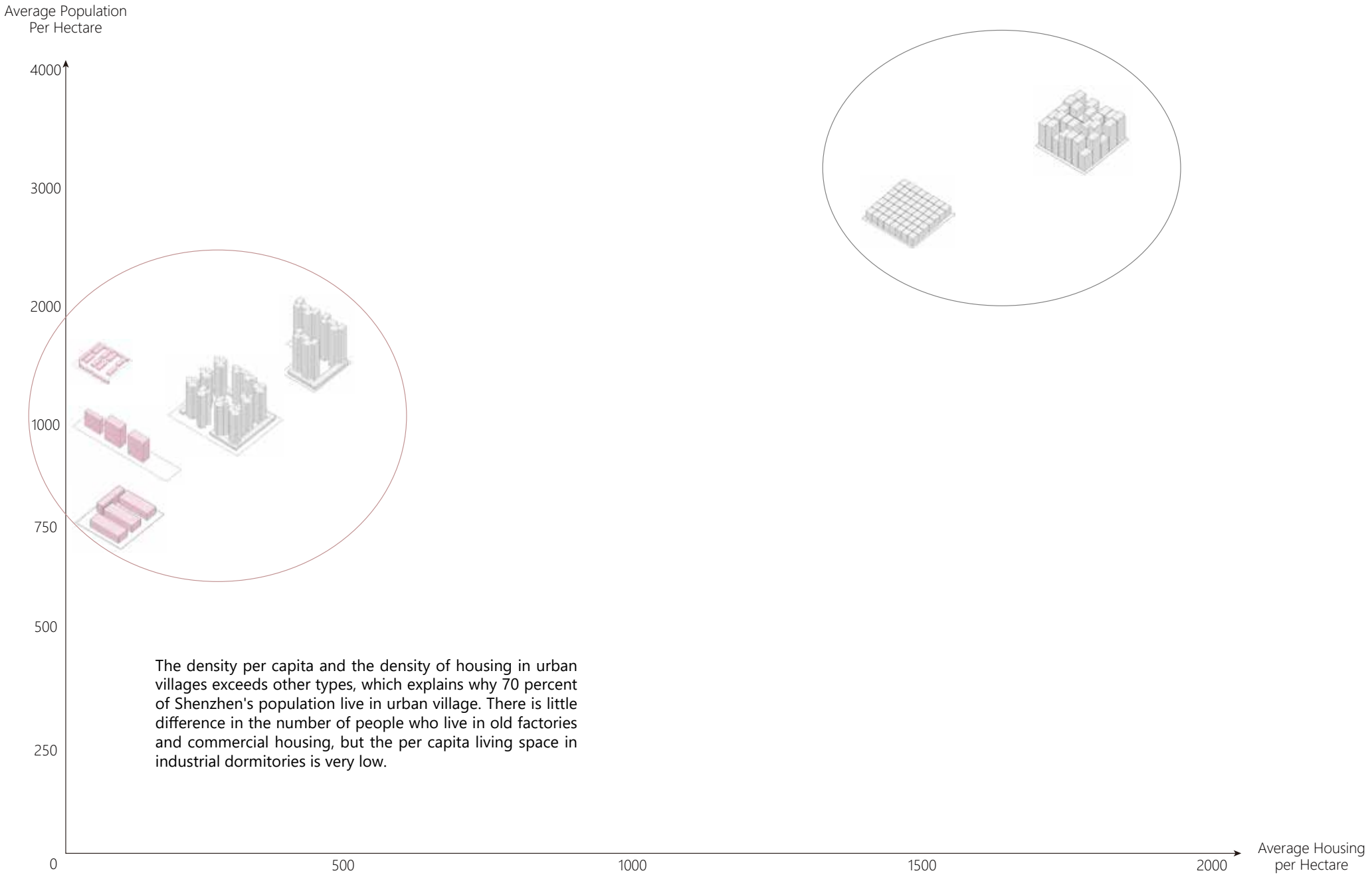


Affordable Housing

Shenzhen's future new supply housing structure of 40 per cent commercial housing and 60 per cent sheltered housing is clear (). Therefore more of the renewed land will be used to build sheltered housing.

Affordable housing is used to supply talents who come to work in Shenzhen. Although Shenzhen is now building a large number of affordable housing units, the supply still falls short of demand.

Figure 5.22 Affordable Housing



The density per capita and the density of housing in urban villages exceeds other types, which explains why 70 percent of Shenzhen's population live in urban village. There is little difference in the number of people who live in old factories and commercial housing, but the per capita living space in industrial dormitories is very low.

Figure 5.23 Density Analysis of Living Block

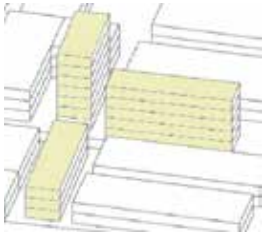
Urban villages are always located near large industrial areas that provide a large amount of housing for workers. Factory dormitories are located within or on the edge of industrial parks. New commercial housing is located near district centres and metro stations.

Urban Village
Commercial Housing
Dormitory

Figure 5.24 Different types of Housing

Old Village

Urban Village

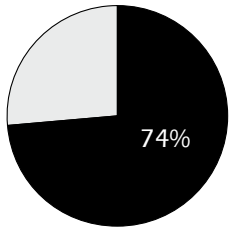


Industrial Dorimitory

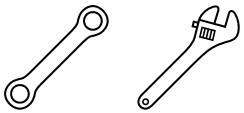
Commercial Housing

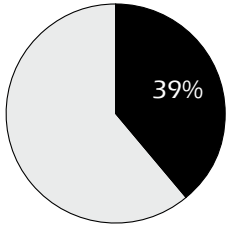
WORKING

The total employed population of Shenzhen is 12.56 million, accounting for 74 percent of the total population.



Employed Population

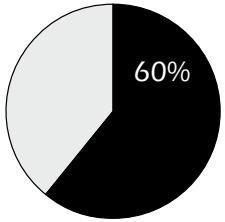




Industry

The number of people employed in the industry sector in Shenzhen was 4.864 million, accounting for 39 percent of the employed population

The number of people employed in the service sector in Shenzhen was 7.57 million, accounting for 60 percent of the employed population



Service Sector

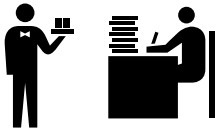


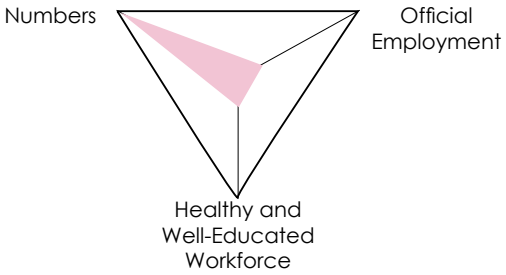
Figure 5.25 Working Population and Jobs Structure in Shenzhen
Source: Statistics Bureau of Shenzhen Municipality

With 17 million people living in Shenzhen, they need many jobs. Most of the jobs in Shenzhen today are provided by labour-intensive factories, but many of them are informal, which is not worker-friendly. Fortunately, such jobs are becoming fewer due to industrial transition. Shenzhen's basic services and high-tech manufacturing industries are both attracting more jobs. In China, Shenzhen is one of the most attractive cities for young people, and the reason is that it can provide enough jobs of all types, especially high-quality jobs.
The indicators for the evaluation of employment are the number of jobs, the number of stable jobs and he level of education of the employed population.

1 Sufficient Jobs
The higher the number and quality of jobs provided by this type of industry, the higher the quality.

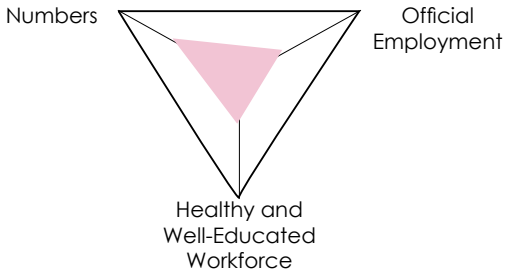
2 Official Employment
The higher the proportion of stable employment in this type of industry to the total, the higher the quality.

3 Health & Well-Educated Workforce
The higher the average educational attainment of people employed in this type of industry, the higher the quality.



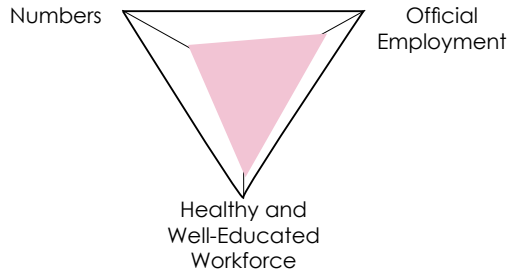
Labour-Intensive Industry
Nearly half of the jobs in Shenzhen are provided by labour-intensive factories. They have created economic development for the city in the past, however in recent years they are at risk of being eliminated due to low productivity. Many of the jobs in such factories are not stable, but are paid on a daily basis, which makes it difficult for many workers to obtain stable insurance and benefits. Thus they change jobs frequently. The education level of workers is also basically junior high school graduates, with few high school or college graduates.

Figure 5.26 Old Industrial Park



Basic Service Sector
As Shenzhen's population grows, so does the demand for basic services. It has in recent years absorbed a large number of young people who do not want to work in factories because the work is not as hard and there are more stable positions without having to worry about changing jobs frequently. It has therefore become the preferred choice of employment for the less educated in recent years.

Figure 5.27 Basic Service - Restaurant near by Urban Village



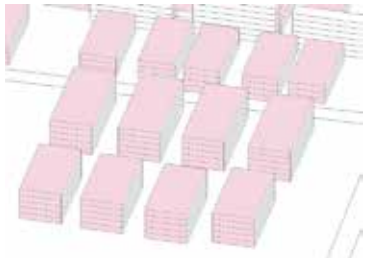
High-tech Industry
High-tech industry, as a target industry for industrial transition in Shenzhen, can provide employment for a disproportionate number of Chinese university students, which means it has a highly educated workforce. It can also provide many high-quality, stable jobs and is one of the highest quality types of employment available.

Figure 5.28 High-Tech Manufacture Factory

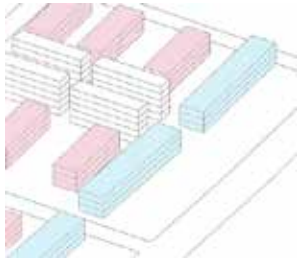
The old factories are usually located close to the urban villages. Basic services are located between the urban villages and the factories, which can serve people on both sides of the border. A few high-rise office buildings are located in the centre of the industrial park.

Old Factory
New Factory
Office Building

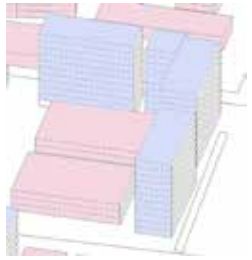
Figure 5.29 Different Working Space



Old Factory



Basic Service



Office Building

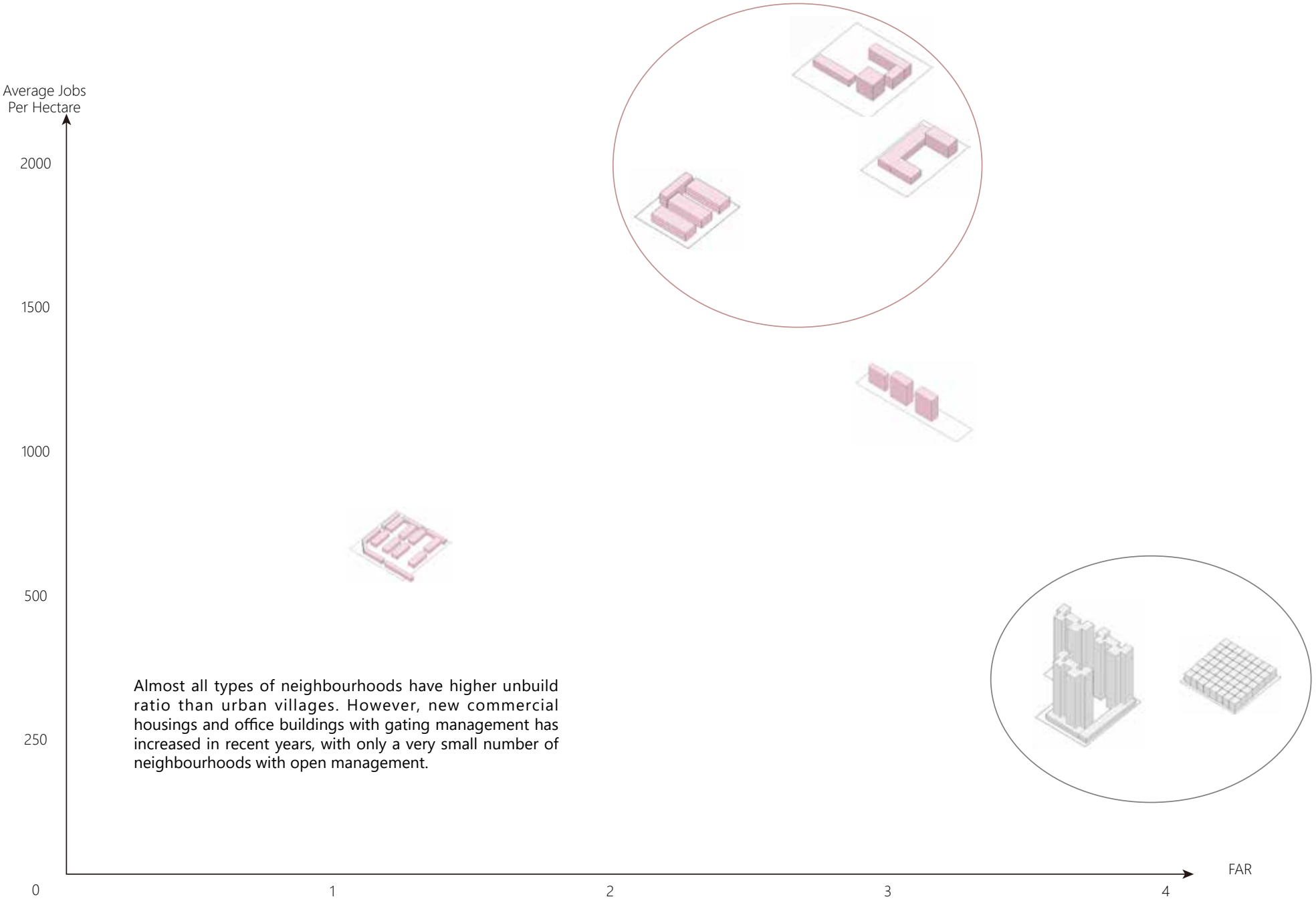


Figure 5.30 Density Analysis of Working Block

MIXED-USE

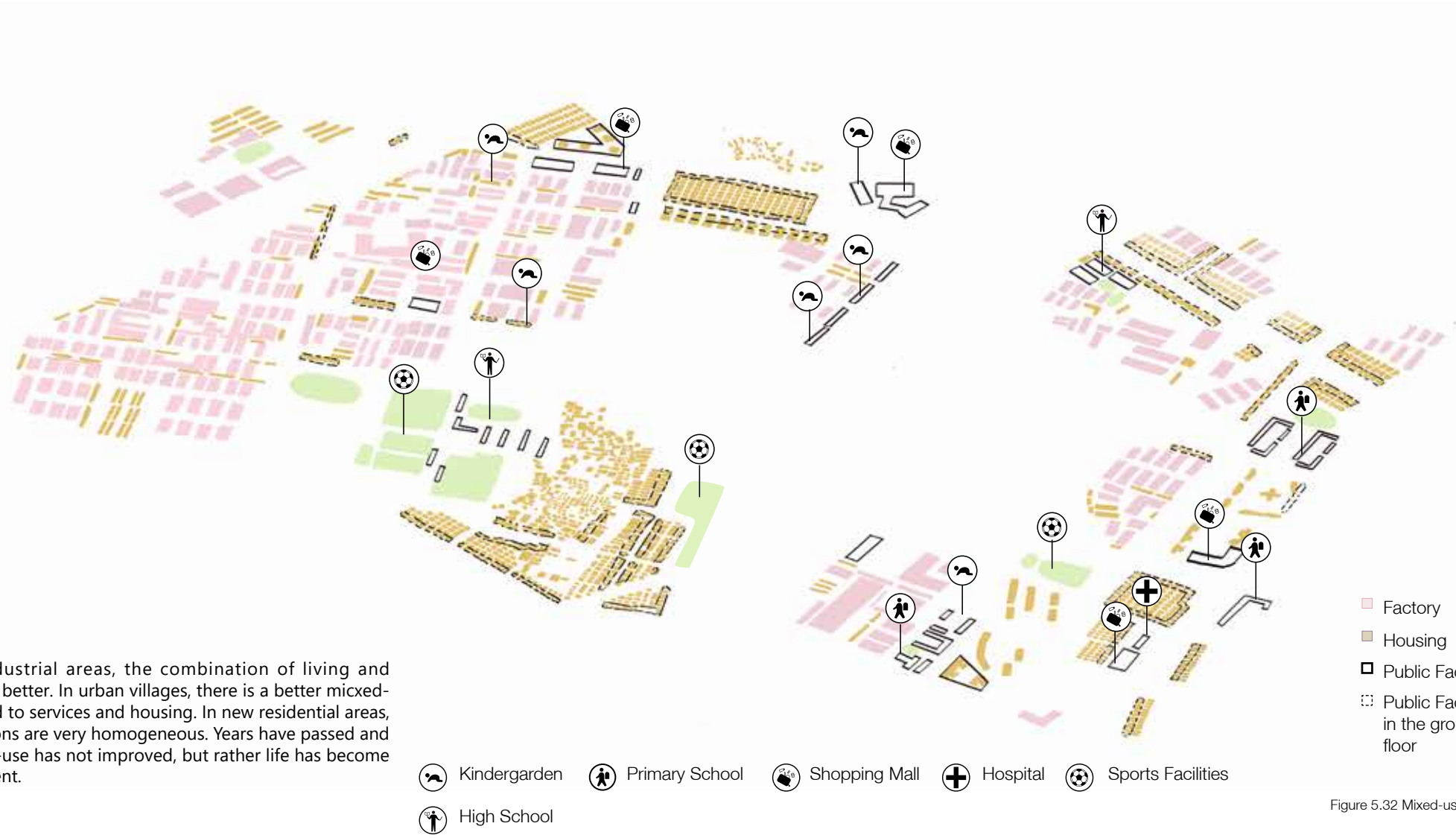
Figure 5.31 Mixed-use building image

Source: s3da-design.com

Shenzhen has a low degree of functional mixing, both within plots and within buildings. This is because urban construction in the past was dominated by considerations of economic development. Planning only needed to meet the goal of economic growth, ignoring whether it was convenient for people to use. However, in a high-density city, the design of mixing helps to reduce commuting time and make people's life more convenient while making space more diverse. Shenzhen has seen an increase in the trend of mixed-use in newly constructed areas in recent years.
The criteria for judging mixed-use are divided into the degree of mixing within the plot and the degree of mixing within the building. It is necessary to consider both the type of functional mixing and the method of arranging the space.

1 Mixing within the Plot
It depends on how it is mixed in a plot and how easy they are to access and use

2 Mixing within the Building
It depends on how it is mixed in a building and how easy they are to access and use



In old industrial areas, the combination of living and working is better. In urban villages, there is a better micxed-use related to services and housing. In new residential areas, the functions are very homogeneous. Years have passed and the mixed-use has not improved, but rather life has become inconvenient.

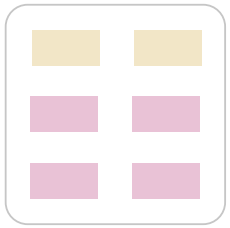
Figure 5.32 Mixed-use Place

Old Factory

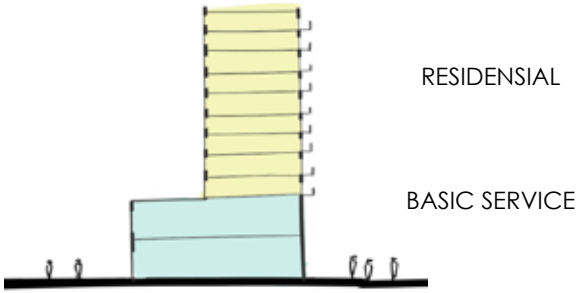
Urban Village

Commercial Housing

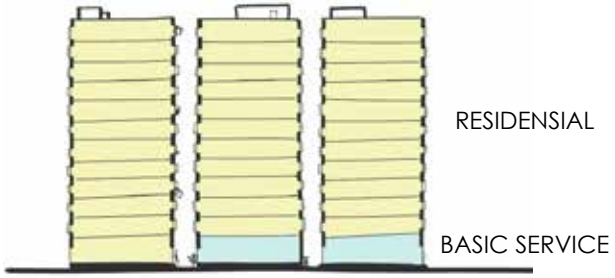
Living and working in two neighbourhoods completely separated from each other can be inconvenient for both living and working. Its spatial typology is very monotonous, which in reality tends to create "sleepy cities" and long commuting times.



Living and working in the same neighbourhood helps reduce commuting time and makes life easier

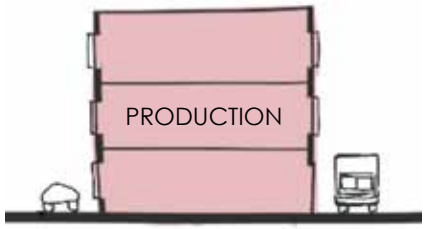


This mix of commercial below and residential above is a very popular design because it can provide numerous services to the residential area. However, the inconvenience of this way is that the entrance to the shops is on the outside of the neighbourhood, so residents of the neighbourhood who wish to enter must go around the outside of the neighbourhood to get in.

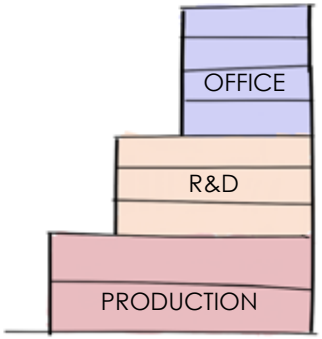


The ground floor of buildings in urban villages are often used for shops and other service functions. The completely open streets and the small scale of the buildings in urban villages allow for excellent access to the ground floor.

Figure 5.33 Mixed-use on the plot



Traditionally, all space in a factory building is used as production space. Workers need to go somewhere else for all their activities except work. This causes that factory buildings always occupies a lot of ground floor space. In Shenzhen, where land is scarce, most of these factory buildings will be demolished.



The vertical factory building mixes production, R&D and office functions. This form of mixed-use is suitable for high-density cities, reducing the footprint of industrial parks.

Figure 5.34 Mixed-use in a building

NATURE

The total length of Greenways in Shenzhen is 3,119 kilometres. The length of greenways owned by 10,000 people is 1.77 kilometres.

Park: 1,215

Green coverage rate

of built-up areas in Shenzhen: 43.09%

River: The total length of rivers in Shenzhen is 1006.9 kilometres

Source: Water Resources Bureau of Shenzhen Municipality, sz.gov.cn

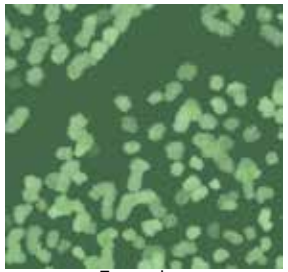
There are a lot if mountains and rivers in the Shenzhen city. However, due to excessive urban development, the natural elements on the plains have been largely removed, and the remaining natural areas are basically located along the river and on the mountains. Nature within the city relies on street trees. In recent years, as Shenzhen wants to create a garden city, there are mandatory greening rate requirements for newly constructed areas, but there are no relevant recommendations on the form of nature.
Nature has always been an important factor in promoting the livability of communities. However, nature is extremely scarce in Shenzhen's urban villages and industrial areas.
The evaluation indicators chosen for nature are green space ratio and landscape diversity.

1 Green area ratio
Green area ratio = green area/ total area
The higher the green area ratio, the higher the quality

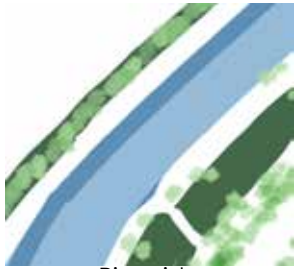
2 Landscape Diversity
The more types of natural landscapes there are, the higher the quality. Common types of natural landscapes in the subtropics include forests and wetlands.

The site has a typical landscape of Shenzhen. The city is surrounded by mountains with rivers running through the centre. In the urban part dense industrial areas, the natural elements are street trees and ditches. Along the riverfront and close to the mountains, many greenbelt and parks for recreation have been built on a large scale to compensate for the lack of natural elements in the built-up areas of the city.

Figure 5.35 Different Natural Landscape



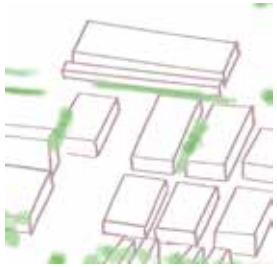
Forest



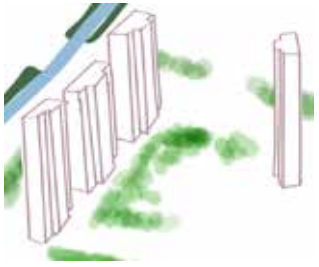
Riverside

Park

Urban Village



Old Factory



Commercial Housing

Urban Villages
There is no green space inside the urban village except for a few public spaces that have been preserved. The only trees are in narrow public spaces. The new areas around the urban villages have some green spaces, but these have low accessibility and are mostly fenced off from pedestrians.

By Ditch
There is a small amount of green belt on either side of the edge of the urban ditch, but the railings makes it impossible for pedestrians to get close to nature. There is also little green belt extending outwards from the ditch.

Old Industrial Parks
Some industrial parks have no green space or trees at all on the inside, while others have lush vegetation on the inside. The roads outside the industrial parks usually have some street trees and green belts on both sides, as one of the few natural elements of the industrial area.

Figure 5.36 Nature Analysis in a small -scale

MOBILITY

Commuting: Shenzhen's average commuting time is 36 minutes, which is the average in China

Shared Bicycle: 520,000 shared bicycles have been placed in Shenzhen, with more than 9 million registered users and 2.5 million riders per day.

Electric Bicycles: The number of electric bicycles owned in Shenzhen is estimated at 5 millions, with an average of one electric bicycle for every three people.

Vehicles: The number of private vehicles in Shenzhen is about 2.2 million, with a per capita ownership rate of 17.3 percent. About 500,000 are new energy vehicles, accounting for 25 percent.

Metro: By 2022, Shenzhen's metro will have a coverage rate of 35 percent in 800 metres radius, making it the highest metro coverage in China.

Source: Shenzhen Traffic Control Bureau, Southern Metropolis Daily (Newspaper)

The popular travelling way in Shenzhen are public transport, electric bikes and shared bikes. Because of the heavy traffic jams in Shenzhen, this discourages many people from travelling by car. Due to the large scale of neighbourhoods and the gating blocks, Shenzhen is also not pedestrian friendly.

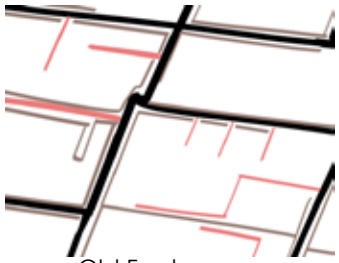
Mobility is an important way to promote livability in high-density neighbourhoods, especially public transportation. On the one hand, the ability of high-density neighbourhoods to connect to the outside needs to be examined. On the other hand, high-density neighbourhoods need to have good walkability within them, so that high-density neighbourhoods can be walked and biked safely and without cars. Finally, the concept of "green travel" encourages a variety of travel modes other than driving.

1 Walkability
Separation of pedestrians and vehicles and continuous footpaths provide a high quality walking environment.

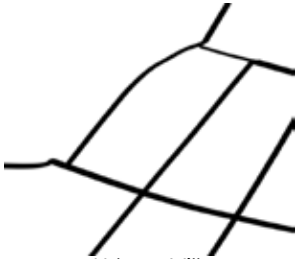
2 Diversity of travel modes
The greater the choice of travel modes other than the car, the higher the quality

Main roads are located close to the metro and regional centres. HIghrways run along the edge of the city. Traffic in the industrial area is dominated by freight transport. Lorries can enter each industrial park. Gating industrial parks ususally have only one entrance for vehicles. Inside the industrial parks there are wide roads for lorries. Streets within urban villages are narrower and only cars can pass through.

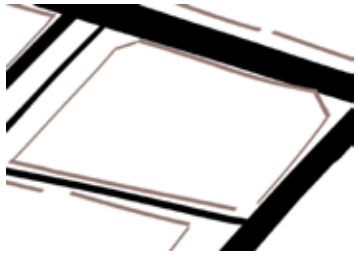
Figure 5.37 Freight Analysis



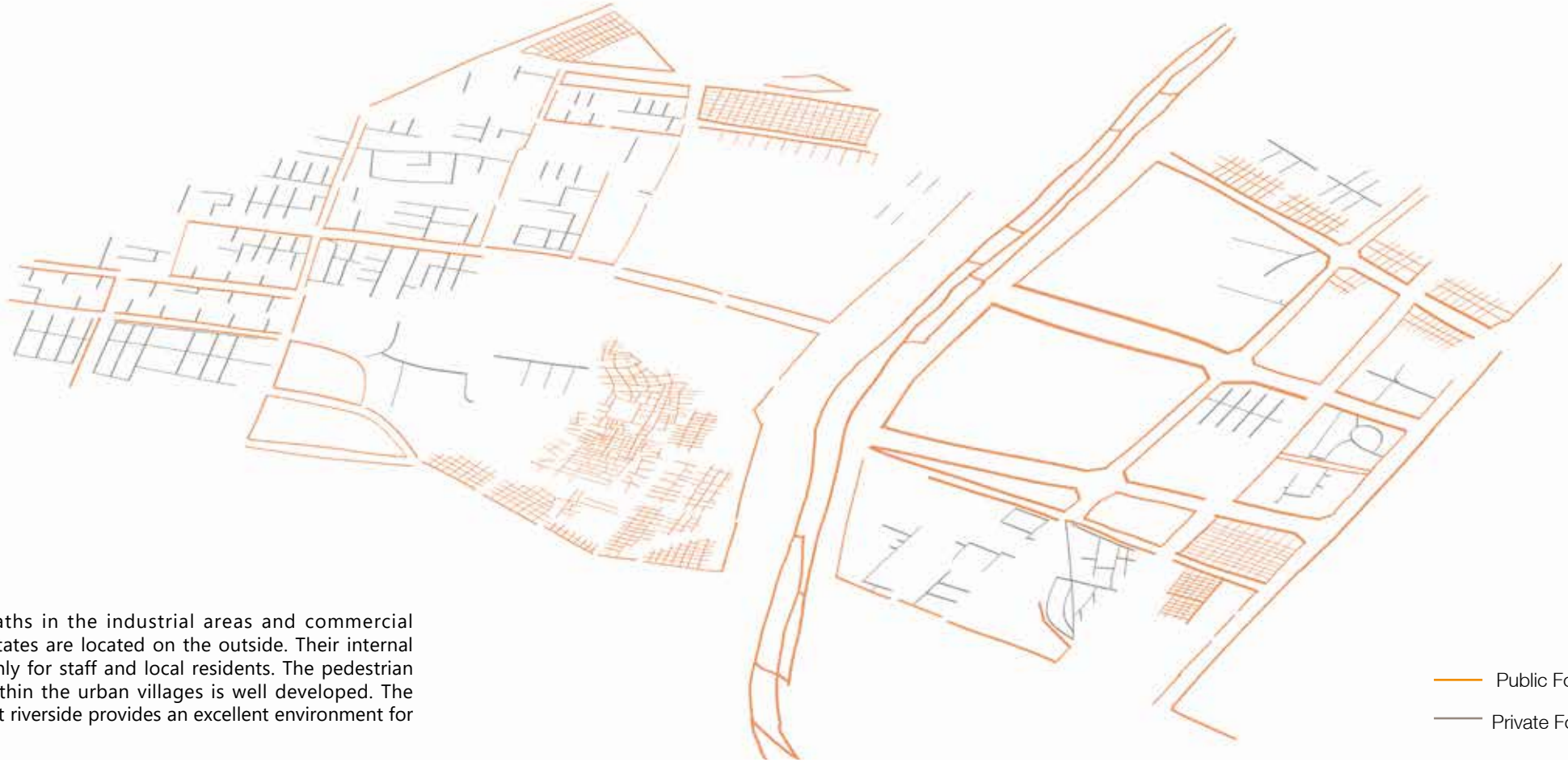
Old Factory



Urban Village



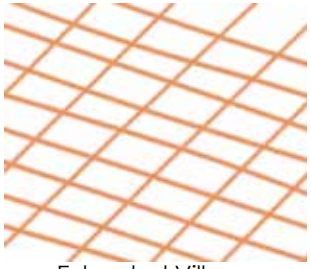
Commercial Housing



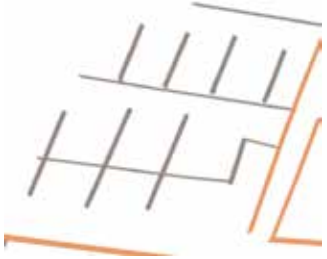
The footpaths in the industrial areas and commercial housing estates are located on the outside. Their internal access is only for staff and local residents. The pedestrian network within the urban villages is well developed. The greenway at riverside provides an excellent environment for footpaths

Figure 5.38 Footpath Analysis

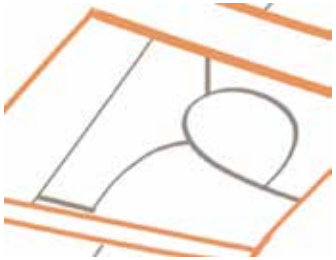
Old Village
Organic



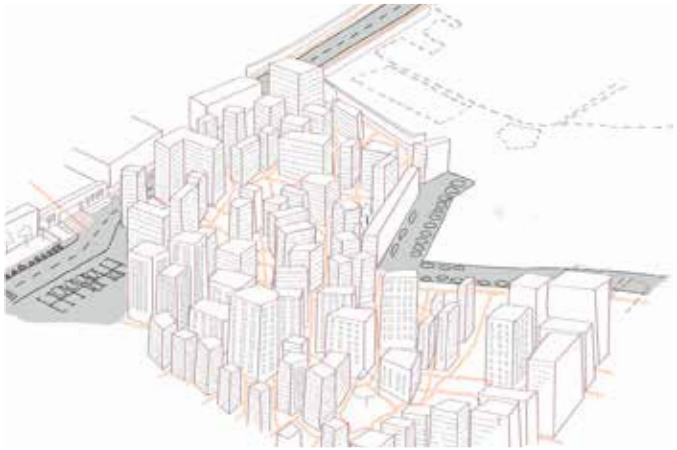
Extended Village
Grid System



Old Factory

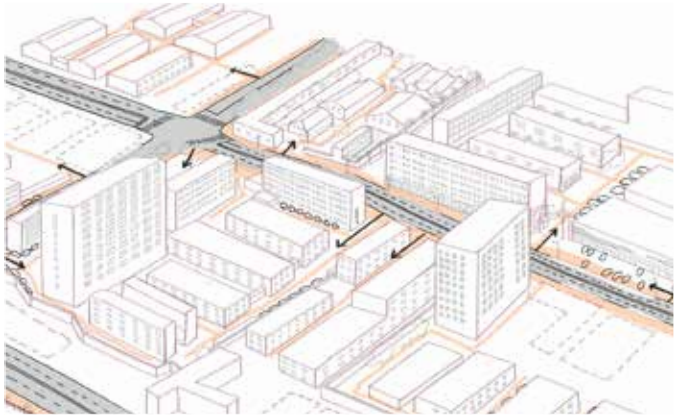


Commercial Housing



Urban Villages
As the roads inside the urban villages are too narrow, cars cannot be driven in. The only open spaces outside the village are often used as car parks. Walking accessibility within the urban village is good.

By Ditch
Almost all access points within the neighbourhood are pedestrian and vehicular, and the traffic organisation is very confusing. In addition there is a shortage of car parks, with vehicles occupying many pavements and public spaces.



Old Industrial Parks
Old industrial parks are usually closed and have only one freight entrance for trucks. Vehicle lanes are mixed with footpaths inside the industrial park. Footpaths exist only on both sides of the external streets

Figure 5.39 Mobility Analysis in a small -scale

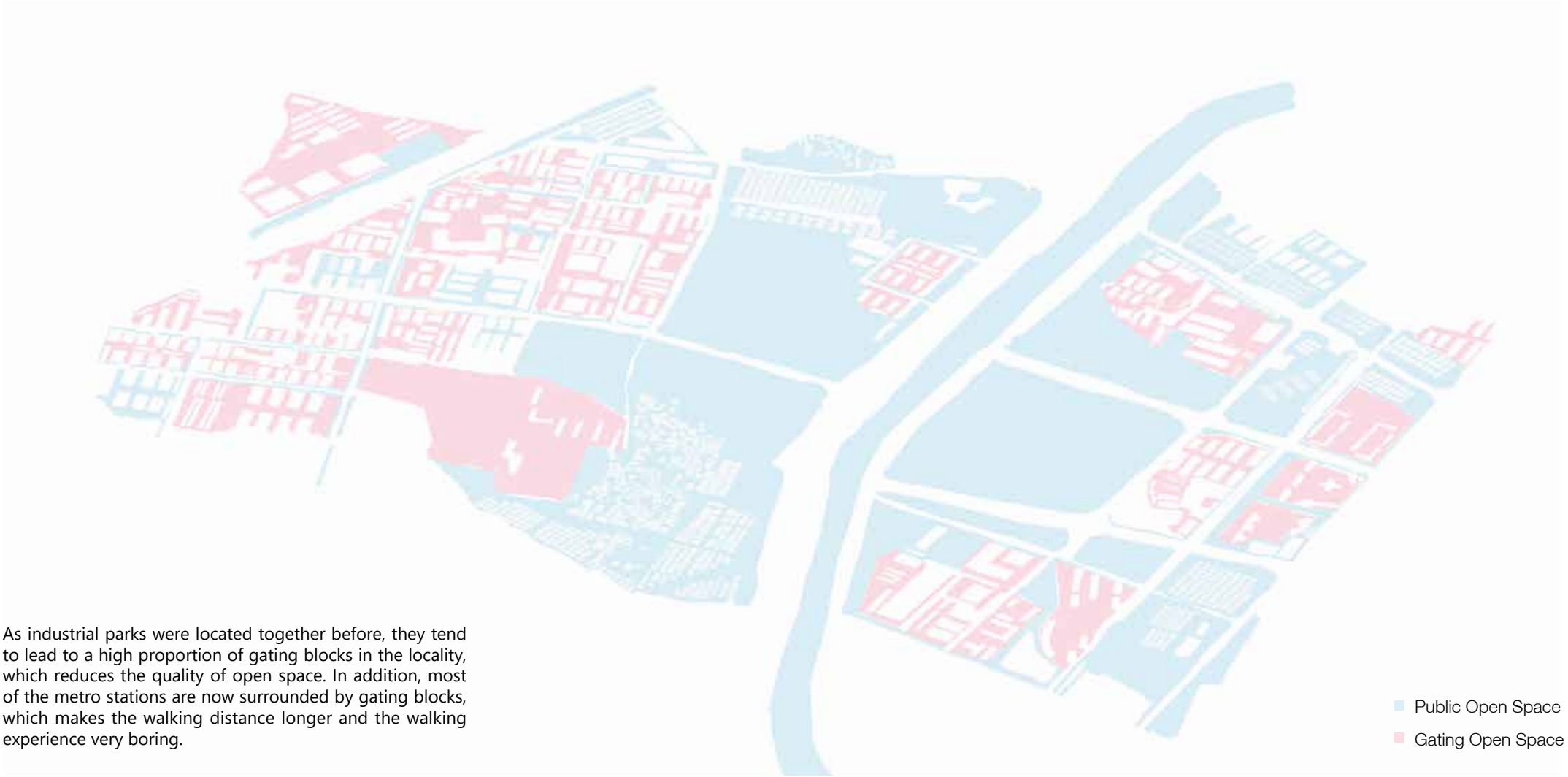
OPEN SPACE

Shenzhen's unbuild area is not low, but due to the old factories and commercial buildings are mostly managed by the gating mode, most of these unbuild areas are turned into private space. Not everyone can use the real open space, which leads to the usage and quality of open space is low. It is a good trend now that open neighbourhoods are encouraged in Shenzhen by the construction of affordable housing and new office areas.
The quality of open space is evaluated by connectivity, unbuild ratio and real open space ratio.

1 Connectivity of Open Space
The higher the connectivity of the open space, the higher the quality.

2 Area of Open Space
The larger the area of the real open space, the higher the quality.

3 The proportion of real open space
The larger the proportion of real open space in the unbuilt area, the higher the quality



As industrial parks were located together before, they tend to lead to a high proportion of gating blocks in the locality, which reduces the quality of open space. In addition, most of the metro stations are now surrounded by gating blocks, which makes the walking distance longer and the walking experience very boring.

Figure 5.40 Open Space

Old Factory

Urban Village

Commercial Housing

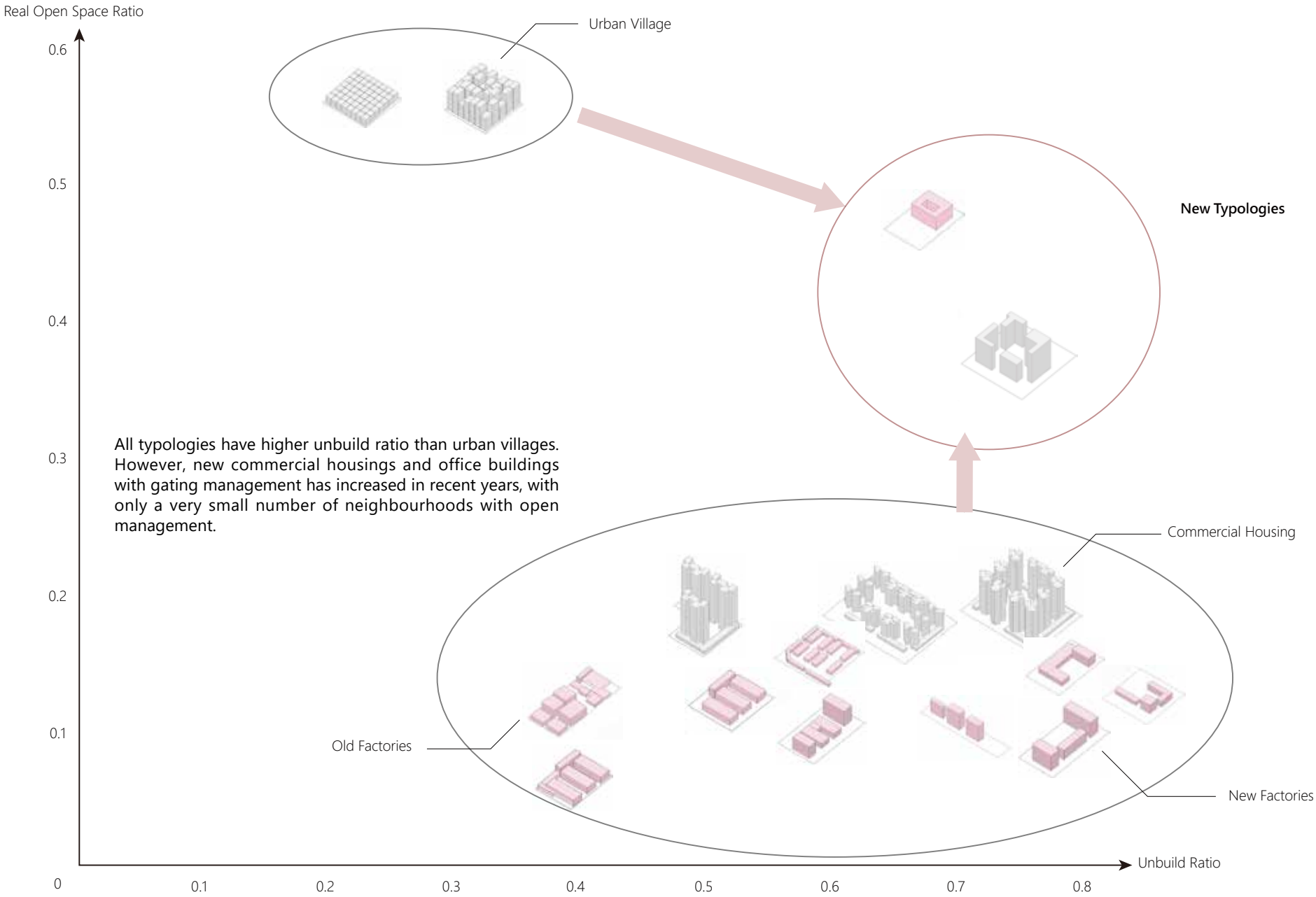
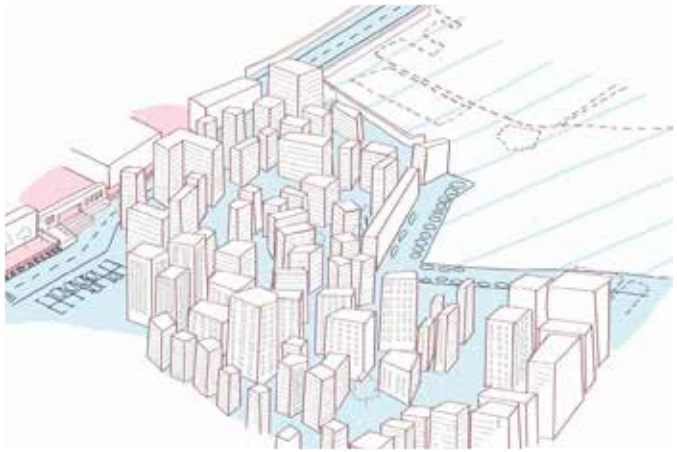
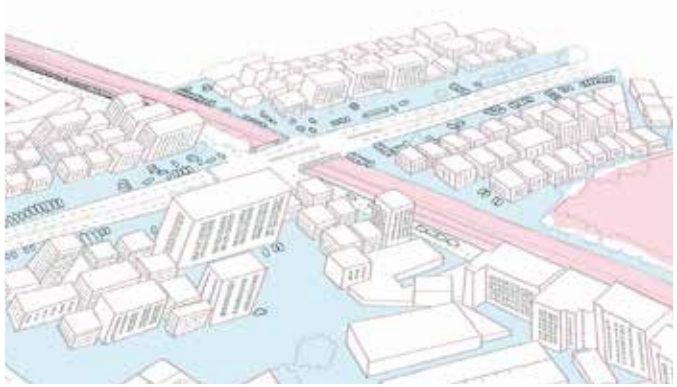


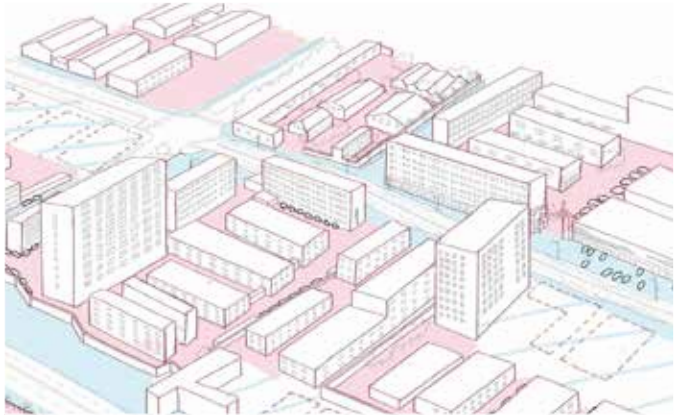
Figure 5.41 Real Open Space and Unbulid Area of Typologies



Urban Villages
Although the total area of open space within the urban village is small, the utilisation and openness is very high. All of the ground floor unbulid areas are available for using. The few remaining contiguous large open spaces in urban village are used as car parks, which reduces the usage of the space. The most highly utilised open space in urban village is the small courtyard next to the kiosk, where many villagers come to cool off and chat in the afternoon. Unfortunately, due to the small total area of public space, the potential for improvement is limited.

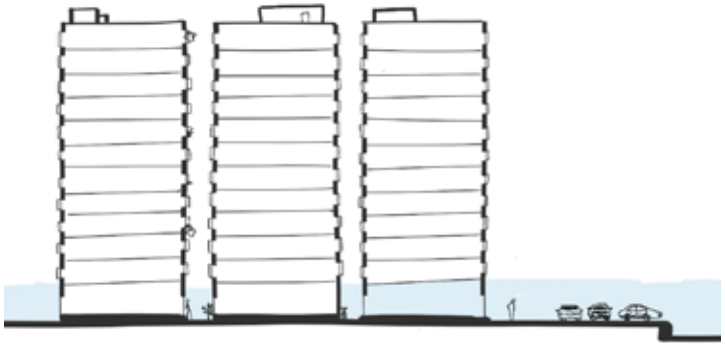


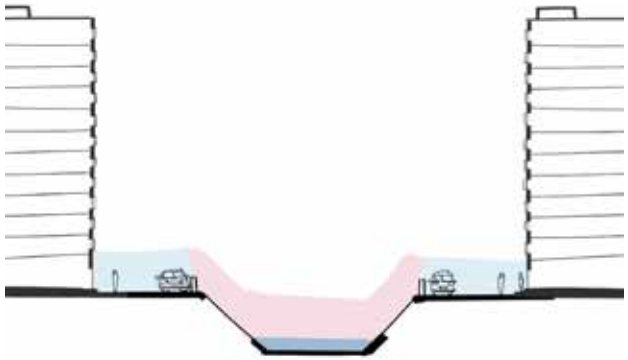
By Ditch
There are ditches inside some urban villages, but they are often surrounded by railings, making them inaccessible to pedestrians and reducing the quality of open space.
Although there are many open spaces in the industrial parks next to the urban villages, they have not been put to good use and have been turned into wasteland. The open spaces on both sides of the road have been turned into car parks.



Old Industrial Parks
The connectivity of the open space in the old industrial park is poor. Because factories had turned themselves into gating blocks for safety management purposes in the pasy. Pedestrians can only use the peripheral pavements of the block. But the potential for improvement of open space here is huge.

Figure 5.42 Open Space Analysis in a small -scale





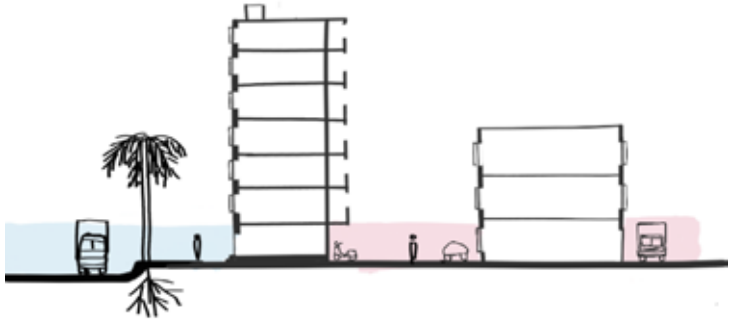
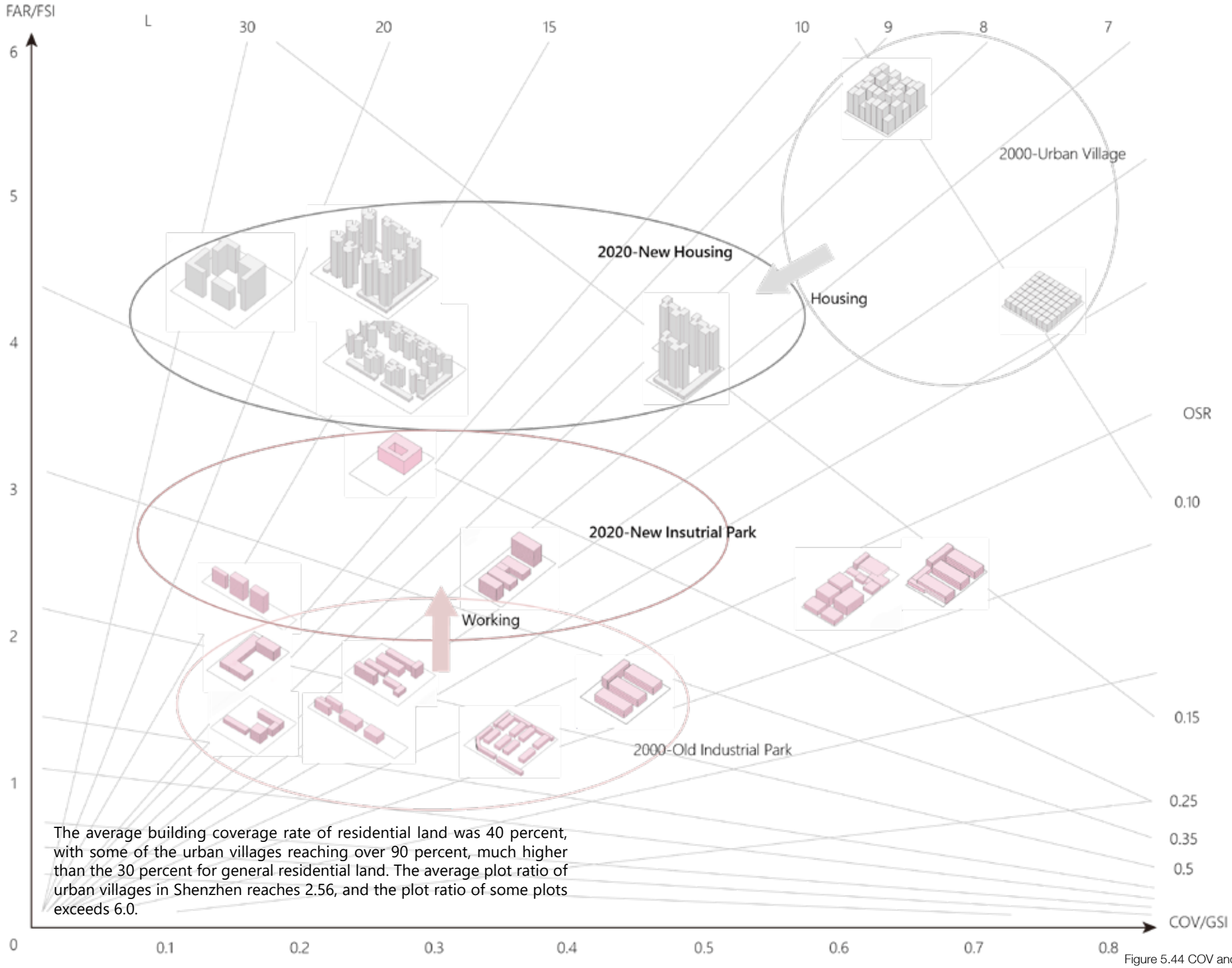
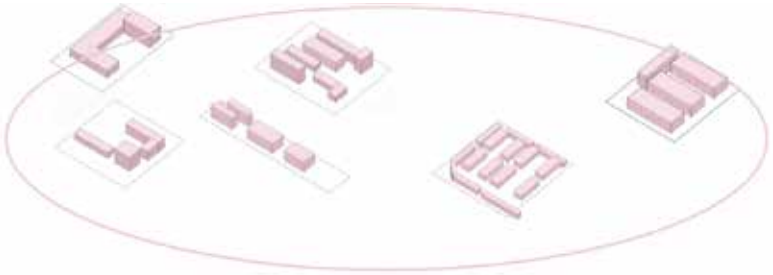


Figure 5.43 Open Space Analysis on Section

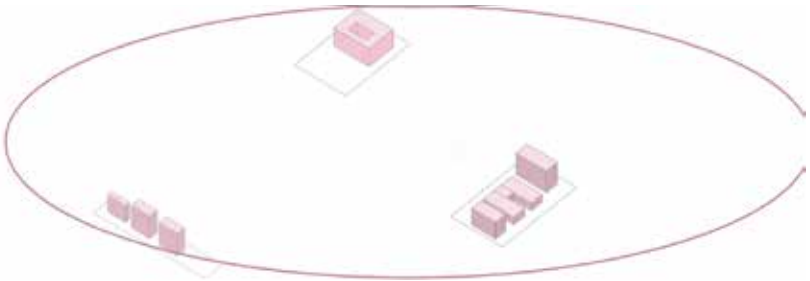


The average building coverage rate of residential land was 40 percent, with some of the urban villages reaching over 90 percent, much higher than the 30 percent for general residential land. The average plot ratio of urban villages in Shenzhen reaches 2.56, and the plot ratio of some plots exceeds 6.0.

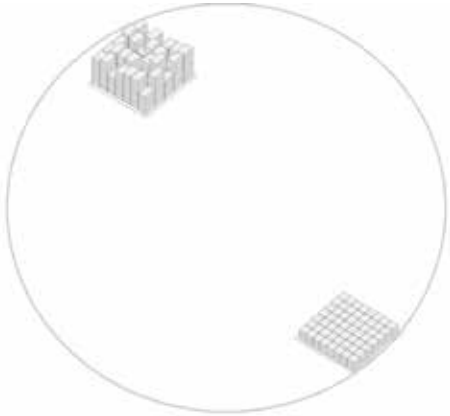
Figure 5.44 COV and FAR Values of Typologies



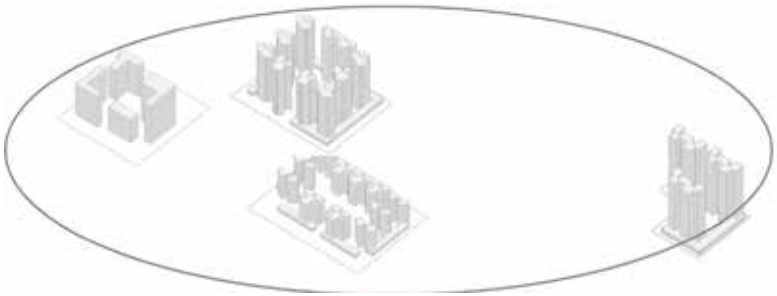
The **old industrial parks** have high COV values. The FAR is 1-2, which is low. However their unbuild areas are of low quality, both natural, walkable, and open space quality is low. In addition, they have the least amount of working and living space per capita.



The **new industrial parks** have a higher FAR, which means they are denser. There is more open space with more landscaping, pavements, sports facilities, etc. However, these open spaces are in gating management mode and are not accessible to the public.



The **urban village** has the highest FAR of all typology, due to its high COV and few open space for residents. With the buildings being retained, the quality of the larger areas of open space around the village could be improved.



The FAR of popular typology of **residential area** is 4-5. The developer chooses the building form of tower in order to pursue a smaller COV, which makes the area of open space larger and increase the quality of the open space. However, the low-rise circle of podium reduces the connectivity of the open space.

5.3 Conclusion of Quality and Density Analysis

1 Housing

Most of the residential units are factory dormitories and urban villages, with a few commercial housing. There are no flats or affordable housing on the site.

Challenges: The living space per capita is not enouth. It doesn't have many unit types to choose. Housing with good environment is expensive.

Development Trend: The proportion of affordable housing is going to increase in the future. Living area per capita will increase.
Reduct the number of industrial dormitories

Suggestion:
There should be no more factory dormitories in the plan. Affordable housing equivalent to the capacity of industrial dormitories should be provided. The number of people living in urban villages remains the same, but the quality of the environment needs to be improved. Provide more housing choices. Increase in the number of commercial housing.

2 Working

About 90 percent of the population is employed in labour-intensive industries and the rest in basic services on this site.

Challenges: Many labourers work informally. They are not insured, and lose their jobs frequently. The educational level of most of the employed population now is middle school literature. There are no high-tech industries here yet.

Development trend: Labour numbers will decline with industrial transition and the number of talented people will gradually rise.

Suggestion: Provide more stable and suitable jobs for talents through industrial transition.

3 Mixed-use

Common forms of mixed-use on the site are mixed residential commercial and mixed factory dormitory.

Challenges: There are few mixed uses at the architectural scale. Service facilities are inadequate in old industrial park. The trend of mixing in residential areas is gradually declining Service facilities usually exist only on the periphery of the gaiting block.

Suggestions: Add more facilities inside the building to increase the degree of mixed use in the building. The ground floor of the building can provide more facilities or be turned into a public space.
Mixed-use should be used both horizontally and vertically.
There is a high mix of building functions in the vicinity of the metro station. More service facilities such as parks, hospitals, recreation and stadiums should be provided in the future.

4 Nature

Existing natural landscapes are on the sides of rivers and at higher elevations of mountains. Natural elements in the city are of low quality, less diverse and generally grassy.

Challenges: There is Less nature and low greenness in the industrial area,with less extension of the landscape into the city.

Suggestions: It can use rivers and ditches to extend nature towards the interior of the city, increasing the greening rate. The type of natural landscape on the urban edge can be made richer, such as wetland parks and forests. Green roofs can be used to increase the gree ratio where COV are high.

5 Moblity

There is a good freight access. Road grades are not evident.People usually travel on foot and by electric car.

Challenges: Unfriendly walking and cycling environment is a serious problem. Walking accessibility is poor. People and vehicles are usually mixed on the road, which is dangerous for the pedestrians. Local public transport is used less frequently.

Development trends: higher walkway and cycleway network density

Suggestion: Go green and encourage the use of public transport, walking and cycling. Construct a good walking and cycling network. Only essential carriageways are retained in residential areas. Walking and cycling should be the mainstay of traffic in the vicinity of the metro station. Freight traffic should be kept away from residential areas.

6 Open Space

The percentage of open space is high, except in urban villages.

Challenges: the utilisation of open space is low. The accessibility and quality of real open space is low. In both industrial and residential areas, the connectivity of open space is diminished by large ground floor buildings.

Development trend: With the increase of commercial housing, there is a trend of more gating blocks.

Suggestion: Combine open space with some sports facilities and greenery to increase people's usage of open space. Reduce the proportion of gating blocks in the district centre so that open space can be connected to each other to improve connectivity. The building near the open space where people usually use should be broken down. In Shenzhen, where it is very hot in summer, it is possible to elevating the ground floor of the building into a open space.

5.4 Policies Analysis

The Shenzhen General Plan focuses on urban regeneration as a topic for study, taking urban regeneration as the most important method to achieve the comprehensive goals of spatial optimisation, Vertical Factory, social harmony and low-carbon ecological development. The Shenzhen General Plan classifies Shenzhen's urban renewal targets into three categories: urban villages, old industrial areas, and old residential/commercial/residential mixed areas. The plan proposes different urban renewal strategies for different targets.

Urban Village Renewal

On the residential side, Shenzhen has issued the Shenzhen Urban Villages (Old Villages) Comprehensive Rectification Master Plan (2019-2025), which will bring an average of 55 per cent of the city's urban villages, and up to 75 per cent of those in the central city, into the scope of comprehensive rectification and safeguard low-cost living space.

For urban villages with better architectural quality, comprehensive renovation will be adopted as the main method of renewal, supplemented by demolition and reconstruction; for old urban villages with dilapidated and aging buildings, hidden safety hazards and poor living environment, demolition and reconstruction will be adopted as the main method of renewal, so as to change the physical and spatial form of the urban villages completely. For the old urban villages with dilapidated and aging buildings and poor living environment, the demolition and reconstruction should be the main focus, so as to completely change the material and spatial form of the urban village. At the same time, the renewal of urban villages should focus on the protection of heritage resources, the inheritance and continuation of the historical lineage, and the maintenance of the community texture and social network and neighbourhood.

Priority should be given to promoting the comprehensive improvement of urban villages and old residential areas, upgrading the functions of residential and living services, perfecting basic living facilities, and improving transport conditions; priority should be given to guaranteeing the supply of policy housing, and selectively transforming some housing in urban villages, old industrial areas or old residential areas into policy housing by means of repossession or repurchase.

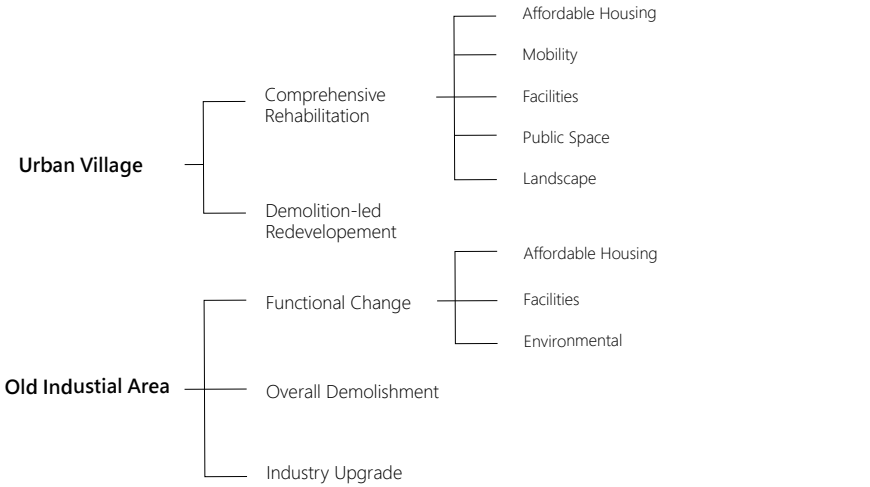


Figure 5.45 Focus of Urban Renewal Policy for Urban Villages and Old Industrial Areas

Old Industrial Area Renewal

Adopting a renewal approach for old industrial areas that gives equal weight to demolition and redevelopment and functional changes.

For old industrial zones that were built in the early years, with aging material forms, low floor area ratios, and existing buildings that cannot meet the needs of industrial development, demolition and reconstruction will be the main focus;
For old industrial zones located in the central area and around rail stations with urgent needs for functional replacement, demolition and reconstruction and functional change will be chosen depending on the building structure, quality and strength of the current situation.

For old industrial zones where the building structure and quality can basically meet the current development requirements, but the building appearance and environment are poor and the supporting facilities are lacking, comprehensive improvement and functional changes are the main focus, and renovation of factory buildings is carried out to improve the supporting facilities and beautify the environment. Promote Vertical Factory, reintegrate old industrial areas and improve land output efficiency

On the industrial front, in order to cope with the tendency of "office building" on industrial land and reduce industrial costs, Shenzhen has put forward the Measures for the Management of Block Lines in Shenzhen Industrial Zones to ensure that a sufficient amount of industrial land will not change its function as a result of renewal.

What is vertical factory?

"Vertical Factory" refers to industrial buildings ranging from single-storey to multi-storey buildings for industrial research and development, design, production, office, etc., with a storey height of between 24 and 100M, or with a floor number of six or more. Upstairs object for light production, environmental protection and low energy consumption type of high-end manufacturing, such as new generation of information technology, biomedicine, intelligent manufacturing, industrial Internet, big data and other strategic emerging industries.
"Vertical Factory 1.0 is aimed at land conservation, and most of these factory buildings are production-oriented, such as Hong Kong in the 1950s.

"Industry on the floor" 2.0 will further refine the industrial chain, so that the R&D innovation upstairs, mainly characterised by high-rise R&D, new R&D priority upstairs, such as Singapore in the 1980s;
"Vertical Factory 3.0 combines the experience of 1.0 and 2.0, splits up the development links of the industrial chain, and further refines the industrial direction, e.g. Shenzhen.

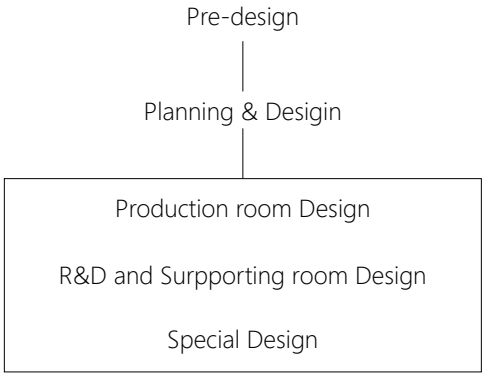
In the case of limited land resources, Shenzhen City has introduced a series of industrial land transformation support policies, and encourage "Vertical Factory", but in the urban renewal demolition and redevelopment as the leading push, the emergence of industrial space alienation, insufficient market power and a series of problems, for industrial land to reduce the burden of unbundling of the comprehensive support policy system is still lacking.

Policies to support the veitical factory

FAR	<Several Measures on Further Promoting Urban Renewal Work and High-Quality Development in Cities>.
	Promoting "Industrial to M1" through a number of innovative measures, such as relaxing the age limit, simplifying the process, reducing or waiving the low price of self-owned factory buildings, and supporting the increase of the plot ratio of industrial land.
	<Administrative Provisions on Supporting the Development of Real Economy and Promoting the Economical and Intensive Utilisation of Industrial Land in Shenzhen City>
	Comprehensive and systematic provisions have been made to increase the development intensity of industrial land, while policies have been introduced to support "vertical building" in terms of planning standards.
	<Shenzhen Urban Planning Standards and Guidelines>
	Cancellation of the General Industry 4.0 cap, increased floor area ratio measurement
Landuse	<Measures for Co-ordinating the Interests of Land Preparation in Shenzhen>
	Promoting the supply of large land preparation space for high-quality industries through the continuous transformation of large industrial land
	<Several Measures to Further Promote Steady Growth and Quality of Shenzhen's Industrial Economy>
	Proposing to promote land preparation and development and construction in large industrial space preparation areas and pilot areas for continuous transformation
	<Opinions on Developing and Strengthening Strategic Emerging Industry Clusters and Cultivating Future Industries>
	Define "20+8" industrial clusters and division of labour among districts, and plan and build 20 advanced manufacturing parks in Shenzhen with a total area of about 300 square kilometres. Adhering to the centralised and continuous, intensive and economical, highlighting high-end advanced manufacturing, forming a system of "start-up area, expansion area and reserve area", implementing regional ecological environment evaluation, and constructing a number of customised factories.
Building	<Interim Measures for the Transfer of Industrial Buildings in Shenzhen>
	Raised the height limit of ordinary industrial buildings to 100m
	<Shenzhen Building Design Rules>
	Promoting the secondary development and intensive use of industrial land, improving the land output rate

Figure 5.46 Policy on Vertical Factory

<General Design Guidelines for Industrial Upstairs >
In April 2024, Shenzhen introduced China's first design regulation for vertical factories, integrating previous planning and design guidelines at different levels and scales. It filled the gap in China's building design codes for vertical factories.
The document unprecedentedly includes building and industry chain design contents such as pre-design, planning design, production room design, R&D and supporting room design, and special design. It classifies industrial processes into four categories: "upstairs", conditionally "upstairs", suitable for low floors, and not "upstairs".
It aims to provide enterprises with high-quality, low-cost, customised industrial space to meet the individual needs of emerging industries, aiming to create an industrial ecosystem with high-standard hard facilities and high-level soft services, and production demand.



In the general rules, the functional zoning of the park should be clear, and it should be divided into production groups (production buildings, warehouses and other production buildings), research and development groups (administrative offices, research and development experiments and other research and development buildings) and supporting groups (supporting dormitories, supporting commercial and other supporting buildings). In addition, there is also a new content of living service facilities, such as support for the sharing of public facilities with the surrounding area. It is appropriate to layout supporting dormitories, supporting commercial, canteen, car parks, sports venues, culture and entertainment and other supporting service facilities for life functions.

Critical Thinking

The previous policy was more focused on the preliminary work for the construction of vertical factories, such as land preparation and adjusting the density limitation., with only numerical standards but no specific implementation methods. The new policy is comprehensive in terms of vertical factory design. This policy aims to provide better living facilities for employees, such as:

1) Enterprise exhibition centres, shared laboratories, scientific and technological services, financial services, exhibition and marketing services, testing and certification services, education and training services, and other productive services.
training services and other supporting functions for productive services;
2) Shared living room, public reading area, public laundry room and other living services;
3) Sports facilities such as gymnasium, badminton court, basketball court and outdoor track.

This is a good news that the new policies related to vertical factories are improving the quality of industrial communities.

However, the part of the policy on functional zoning deserves more discussion. This is because the policy encourages clear zoning in industrial parks, such as living areas, production areas, and so on. The benefit of such zoning is to improve the efficiency of design and construction. However, these zoning districts do not have to be so clearly defined. Some districts can be considered to be more mixed, as this can facilitate the exchange of people and enhance spatial richness. In the long run, future designers can try to provide higher quality industrial parks.

In addition, this new policy lacks consideration of urban form. As the cap on FAR has been broken, because of the towers that used to be built for commercial housing, vertical factories are now using the tower form. These towers have become more massive and oppressive.

5.5 Reference

Reference 1 - Singapore

Background

Since its founding, Singapore has regularly analysed the global industrial and economic situation. This has led to timely adjustments in the direction of industrial development. The optimisation and upgrading of its industrial parks have also been synchronised. This adjustment was reflected in the technology-intensive industrial parks of the 1970s, the specialised parks of the 1980s, and the high-tech science parks of the 1990s.

After Singapore's independence in the 1960s, the economy reached its peak after going through labour-intensive and capital-intensive development phases. After 1990s, Singapore faced tremendous pressure from China and India externally, as well as insufficient innovation capacity and pressure for industrial transition internally.

Around 2000, Singapore invested a lot in improving its infrastructure and setting up industrial parks to cater for the development of different industries, in order to attract top international high-tech companies and creative talents to settle in Singapore.

Figure 5.47 Singapore Industrial Park Plan

Source:

Industry-Electronics Industry Chain

The electronics and information industry is the largest manufacturing sub-sector in Singapore, employing over 70,000 people and accounting for 39 percent of manufacturing GDP in value added. Major products include semiconductors, computer equipment, data storage equipment, telecommunications and consumer electronics. Singapore has more than 300 semiconductor companies. Singapore has built a complete and mature semiconductor industry chain, covering all aspects from IC design to manufacturing and testing.

A major new economic project started in 2000 by the Singapore Government at a cost of S$15 billion. Located in the heart of Singapore's technology corridor, Tech City is well served by the city's expressway and MRT, and is only a 20-minute drive to Singapore's CBD and 45 minutes from the airport. It is also in close proximity to a number of tertiary institutions, as well as social and recreational facilities, hospitals and other infrastructural services in the northern part of the city.

Advantages

1 Dymanic Mixed Use

The most important feature of the planning of the One-North is integration: it breaks away from the traditional framework of facilities in the park and takes into account the needs of work, study, living and consumption, creating opportunities and spaces for people to interact with each other. In terms of land use, the two-square-kilometre campus of One-North includes both R&D areas and other supporting facilities such as public services, education, flats, and commercial facilities, making the campus an integrated community.

Almost every building is connected to each other, with walkways leading to different buildings, encouraging interaction within the campus by architectural design.

2 Eco-Community

The One-North is both an ecological community. A long green belt runs from north to south, forming a harmonious and ecological green space. This open and natural activity space also connects the enterprises and talents in the park.

At the same time, environmental protection has also been taken into account from the very beginning. 10 percent of the land has been systematically reserved for the construction of parks and scenic areas. Among them, there are the world-famous Bird of Prey Park, Chinese-style parks, forest parks, which have made the Jurong Island into a unique industrial area and tourist area, known as the "Garden Industrial Town", attracting a large number of multinational corporations. New housing and amenities are located in green spaces, close to parks and nature.

3 "3-dimensional development" and multi-functional vertical integration

By mixing the functions of work, living, entertainment, and learning horizontally, the One-North City has become an integrated community with both R&D areas and other supporting facilities such as public services, education, flats, and commercial facilities.

Vertically, it puts forward the concept of "a building is an innovative community", insisting on spatial "3-dimensional development" and multi-functional vertical integration.

Many of the buildings in Tech City house have research institutes and technology companies, as well as residential flats, retail and leisure supporting commercial units and government services. Kaihui City has opened a metro station on the ground floor of the building. Some of the stacked factories are fitted with a ramp for lorries to go up the side of the building, allowing them to reach all floors directly. The different buildings are all directly connected by air traffic corridors and other ways. On the ground floor of the office building there is a restaurant and a café. This is a place where professionals and business people can obtain valuable information or develop innovative ideas.

This mixed-use design not only improves the efficiency of land use, increases the density of funding inputs and the economic benefits per unit of land, but also creates a comfortable and convenient working, living and recreational environment for employees, which plays an important role in attracting talents.

Reference 2 - Xicun Dayuan, High-density Enclosing Block

Located in the city of Chengdu, China, the project is 237m long and 178m wide. It is bordered on all sides by streets and surrounded by multi-storey residential buildings.

FAR:2.0
COV:40%
Building Height: 24m
Floors: 6

Housing: It has a large number of rooms. The buildings are spaced far apart, which helps to increase sunlight hours.

Mixed-Use: The living units, services, sports facilities and greenery of the entire courtyard are mixed on different floors.

Nature: The internal courtyard is planted with local specialities.

Mobility: The block has a complete, three-dimensional pedestrian network. Although it occupies a large area, it does not disrupt the neighbouring streets, and people are still able to move through it, adding to the connectivity of the different blocks.

Open Space: The public space inside the courtyard is large enough to accommodate a variety of services, such as sports facilities, shops, barbecue areas and so on. The enclosing form protects the open space from future encroachment by other projects. At the same time such a structure connects the inside and outside through four cross-street entrances, giving the typology a state of enclosure and openness.

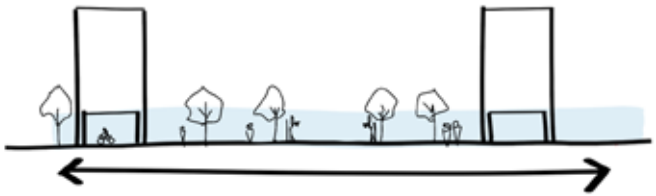


Figure 5.48 Xicun Dayuan

Figure 5.49 Open Space and Mobility in the Xicun Dayuan

Reference 3 - Interlace, Singapore - High-density Community

This 170,000 square metre residential complex in Singapore was conceived as a 'vertical village', with 31 flat blocks arranged in a hexagonal pattern around eight spacious courtyards, creating a complete network of living and social spaces within the site.

FAR: 2.1
Housing Unit: 1,040
Building Height: 66m
Floors: 20

Housing: There is a diverse range of affordable housing units.

Mixed-use: The ground floor has diffrent kinds of services and facilities.

Nature: The ground floor is elevated to increase the amount of greenery on the site. Increased roof area allows for large green roofs.

Mobility: There is a comprehensive internal walking and cycling network.

Open space: There is open space on both the ground floor and the rooftop of the building. The open space on the ground floor is very well utilised and well connected.

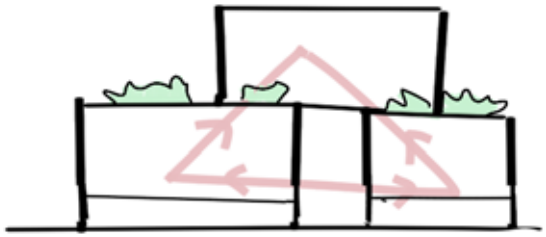


Figure 5.50 The Picture of Interlace

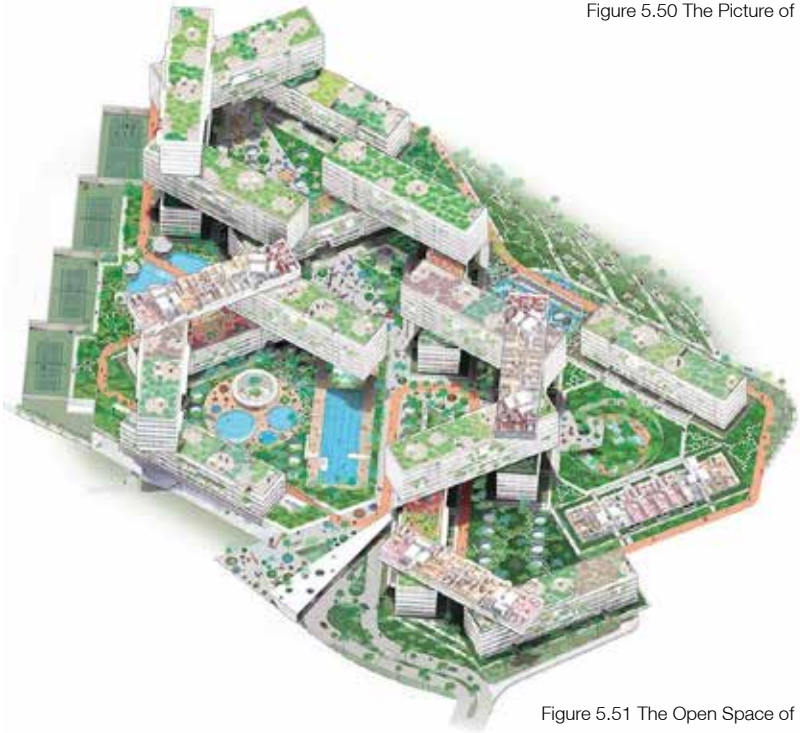


Figure 5.51 The Open Space of Interlace

06 Research by Design

6.1 Prediction

While living and working are the design objects of this project, population is the basis for both. With population predictions, it is possible to know the future demographics of the site and the population to be served by the plan and design.

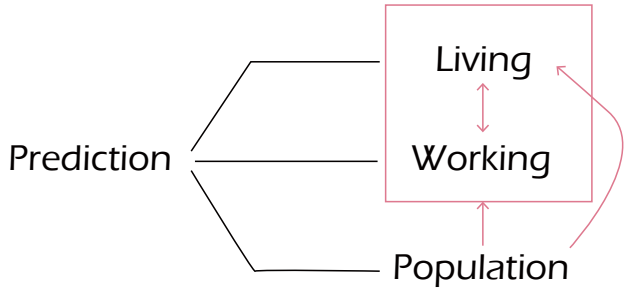


Figure 6.1 Content of Prediction

Prediction of Population

Since China reached its peak fertility in 1987, the number of births has shown a steady decline since then. The most recent peak in births was in 2016 at nearly 17 million. By 2023 there will be only 9 million births, a reduction of about 45 per cent. This shows that China's population will show a slow decline in the future, and the demographic dividend will slowly disappear.

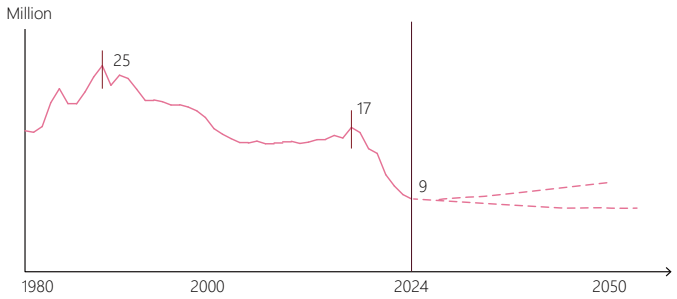


Figure 6.2 Population of Birth in China

Source: China National Bureau of Statistics

Prediction of China's employment demographics

Rural Migrant

China's migrant workers are the main force behind the creation of GDP. Although the number of migrant workers has still been rising in recent years, more and more migrant workers are choosing to develop near their hometowns rather than travelling far away to make money, which has led to a gradual decline in the number of migrant workers in first-tier cities. This has also led directly to recruitment difficulties and relocation out of labour-intensive enterprises.

University Graduates

In recent years, the population of university graduates in China has exceeded the birth population, giving rise to difficulties in finding jobs. In fact, the existing jobs in China are unable to cope with such a large number of university graduates, and many of them have become unemployed. In response to this problem, the Chinese government has decided to adopt a policy of "general vocational streaming", which is expected to produce more high-level technical personnel for the high-end manufacturing industry in the future.

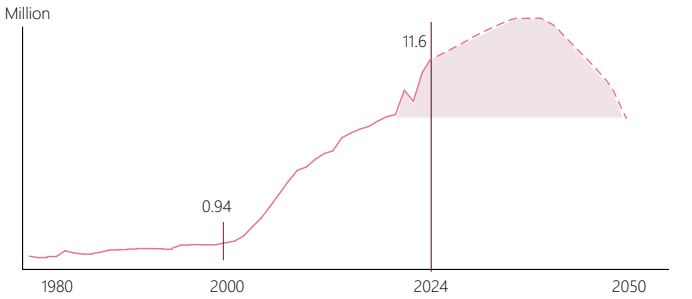


Figure 6.3 Numbers of HIgh-Educated Graduates in China

Source: Chinese Ministry of Human Resources and Social Security

Senior Technician

At present, China has about 3 million senior skilled labourers, with a shortfall of about 10 million. They are an important talent to support China's future development of high-end manufacturing. As a result of the new policy, the Chinese government will train a large number of senior technicians in the coming decades.

Population in Shenzhen

Shenzhen's population has been growing explosively since 1980, and then rapidly for the next 20 years. 2000-2010 saw a gradual slowdown in population growth, and after 2010 the population increased rapidly again. By 2020, the population will reach a peak of about 17 million, and will remain virtually unchanged for the next three years. It is predicted that Shenzhen's future population will struggle to grow as fast as it did in the previous 40 years, but will remain stable.

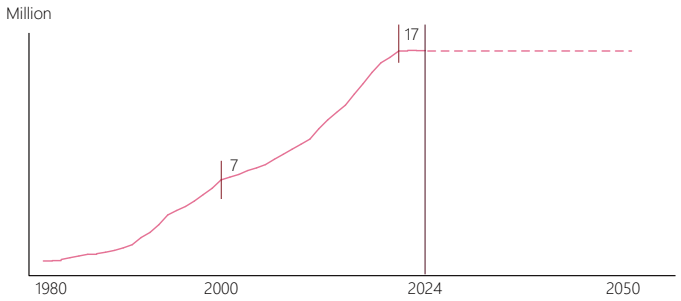


Figure 6.4 Population in Shenzhen

Source: Shenzhen National Economic and Social Development Statistics Bulletin 2023

Employed Population of Shenzhen

The employed population in Shenzhen reaches 12,480,100 people, which means that 70 percent of people are employed in Shenzhen, ranking first in China. This is corroborated by the age structure of Shenzhen's population, which is the youngest in China, and a young population structure of course means a large number of employed people.

Source: Shenzhen Business News (newspaper)

Prediction of Industry

GDP of Shenzhen

The rise in Shenzhen's GDP is still showing rapid growth after a brief slowdown in 2020 when the new crown epidemic hit the city. However, the structure of Shenzhen's GDP composition has changed dramatically over the years.

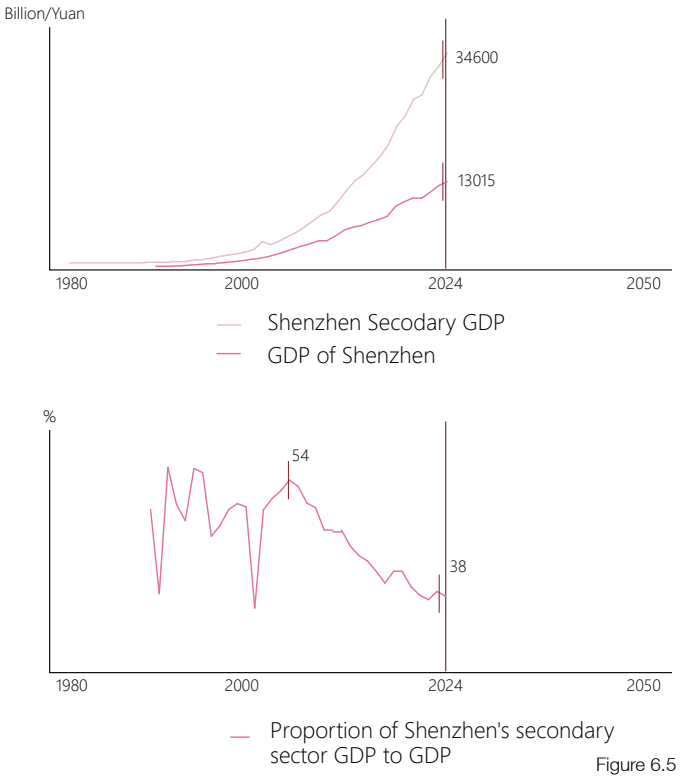


Figure 6.5 GDP in Shenzhen

Source: Shenzhen National Economic and Social Development Statistics Bulletin 2023

The industry in Shenzhen accounted for about half of the city's GDP in the period 1990-2000, after which it gradually declined. Although the GDP of the industrial sector in Shenzhen has continued to rise steadily in recent years, its share has shown a gradual decline. For its part, the Shenzhen Government hopes that the share of industry in GDP will not continue to decline, as industry is the most important sector for providing jobs.

Vision of Employment Structure

	Labour-Intensive Industry	High-Tech Industry	Service Sector
Industry	Electric Industry Textile Industry	High-Tech Industry Culture Industry	Finance Basic Service
People	Rural Migrants	Talents Workers	Talents Rural Migrants

Figure 6.6 Employed people in different industries

Labour-Intensive Industry
Shenzhen's labour-intensive industries reached their peak around 2013, after which more and more factories closed or moved out of the city due to rising land and employment costs. The trend does not seem to be stopping at the moment.

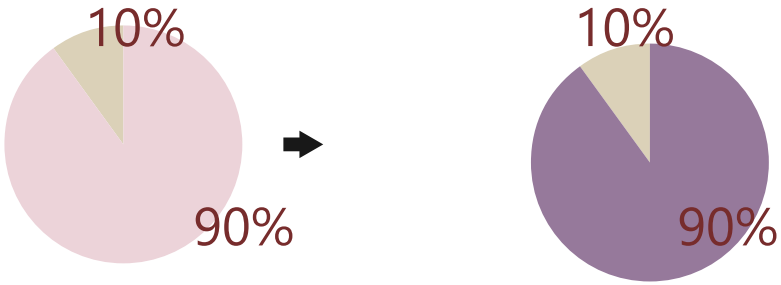
High-Tech Industry
Shenzhen's high-tech manufacturing sector has seen explosive growth over the past decade, and it has become the most innovative place in China. Many large high-tech industries, such as Huawei and DJI, are based here. Although these high-tech industries have faced some difficulties in the past due to U.S. sanctions, their growth in the foreseeable future will be unstoppable despite the difficulties ahead.
High-tech enterprises engaged in R&D and innovation of scientific and technological personnel need to account for no less than 10 percent of the total number of employees.

Basic Service Sector
This is an industry that will almost never disappear; as long as there are people around, the general service industry will exist. Its changes will depend largely on future demographic changes in Shenzhen. As of 2024, the proportion of basic services employment in China to national employment is about 10 percent.
Source: National Bureau of Statistics

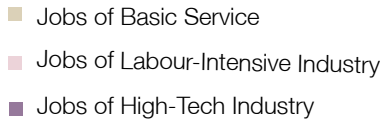
Population on Site 125,000

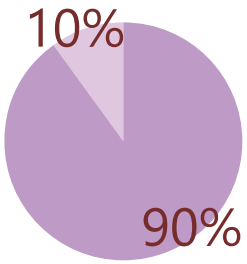
Jobs=125, 000×0.7≈88, 000

Basic Service Jobs = 88,000×0.1=9,000



High-tech Industry Jobs = 88,000×0.9≈80,000





Jos for **Senior Technicans** = 80000×0.9≈72,000

Jos for **Talents** = 80000×0.1≈8,000

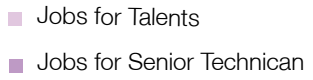


Figure 6.7 Employed Structure
Source: <Administrative Measures for the Recognition of High-tech Enterprises>

Factory Reference

NOW

Figure 6.8 A labour-intensive industrial park

Labour-Intensive Industrial Park

Factory Area: 26,860 ㎡

Jobs: 6,240

Average Working Area: 4.3 ㎡

FUTURE

Figure 6.9 A High-tech new material industrial park

High-Tech New Material Industrial Park

Factory Area: 85,500 ㎡

Jobs: 7,908

Average Working Area: 11.9 ㎡

Quantities

Working Quantities

About 90% of the jobs on the site are now provided by labour-intensive industries. With the gradual relocation of these factories, the number of jobs in labour-intensive factories will gradually decline. In addition, this is a key planned high-tech industrial park in Shenzhen, which, given China's national conditions, will gradually turn into a high-tech industrial park focusing on new materials and biomedicine in the future. Of those who work in the manufacturing industry, 10 percent are engaged in R&D and the remaining 90 percent will be engaged in production.

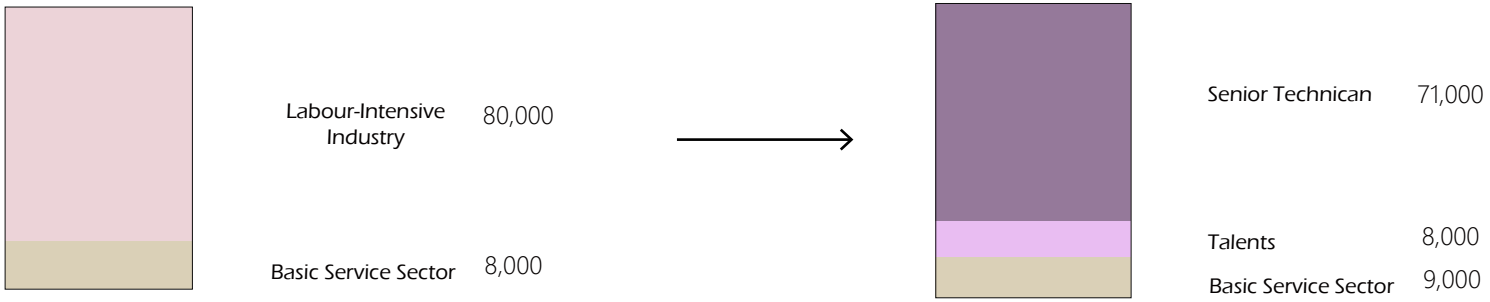


Figure 6.10 Changes in the structure of employment

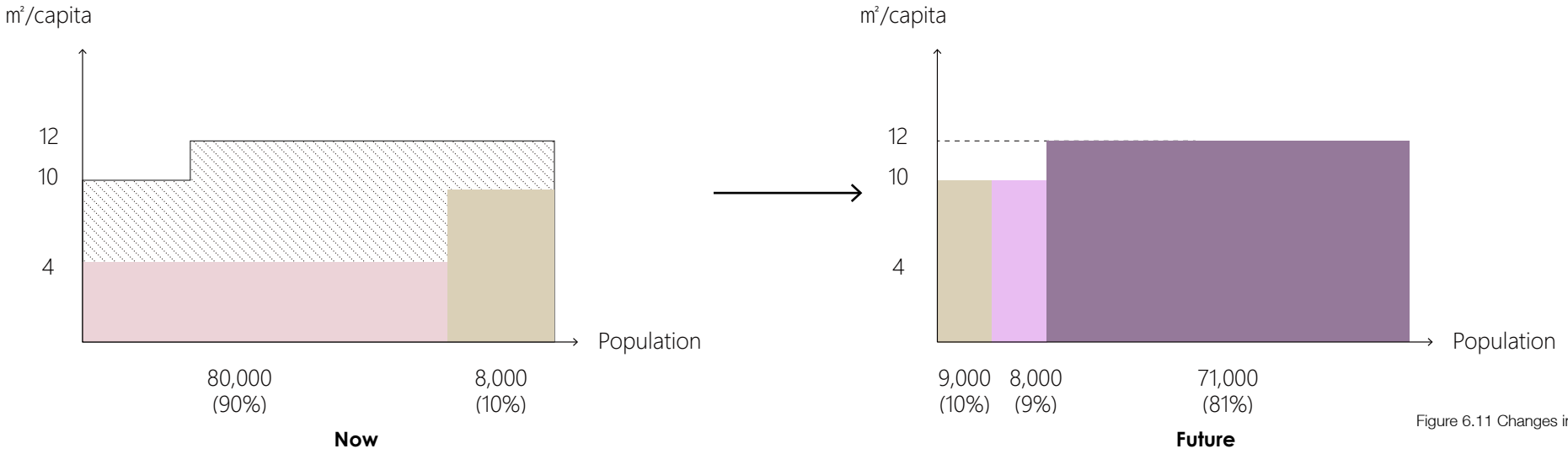


Figure 6.11 Changes in Area of Working

Housing Quantities

The per capita living space of urban households in China is 36.52 m². The per capita housing floor space in Shenzhen is only 21.8 m². About 40 percent of the people on the site now live in industrial dormitories, which have a per capita living area of only 3 m² and very poor living conditions. These dormitories will be replaced by affordable housing in the future. Urban villages are now home to more than half of the population. Their per capita living space is much larger than that of industrial quarters, at about 20 m² per person. The per capita living space of commercial housing is 27 m².

Shenzhen currently has three kinds of affordable housing, their average per capita living space standard is 20 m² per person. In the future, urban villages will also be used as a type of affordable housing, using the same per capita living space standard as affordable housing. There has been an increase in the number of commercial housing units and in the per capita living space.

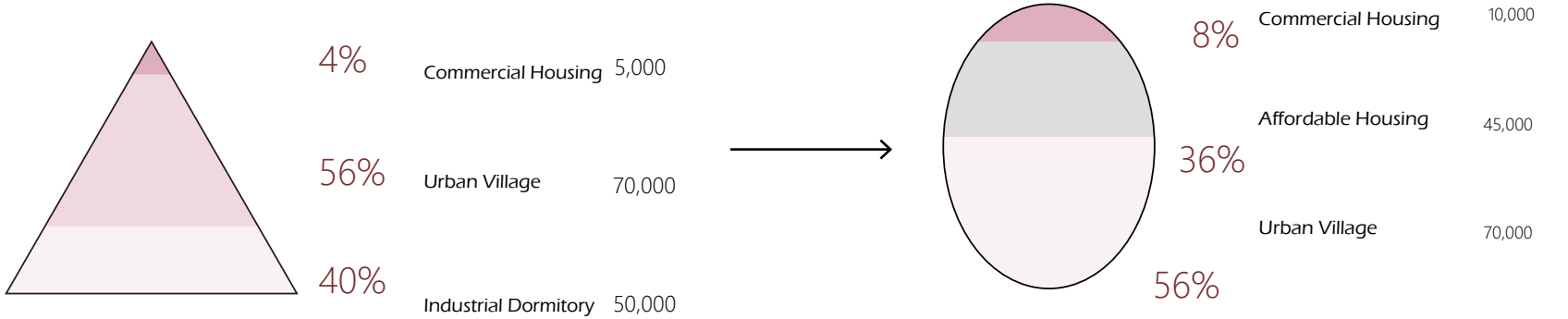


Figure 6.12 Changes in the structure of Housing

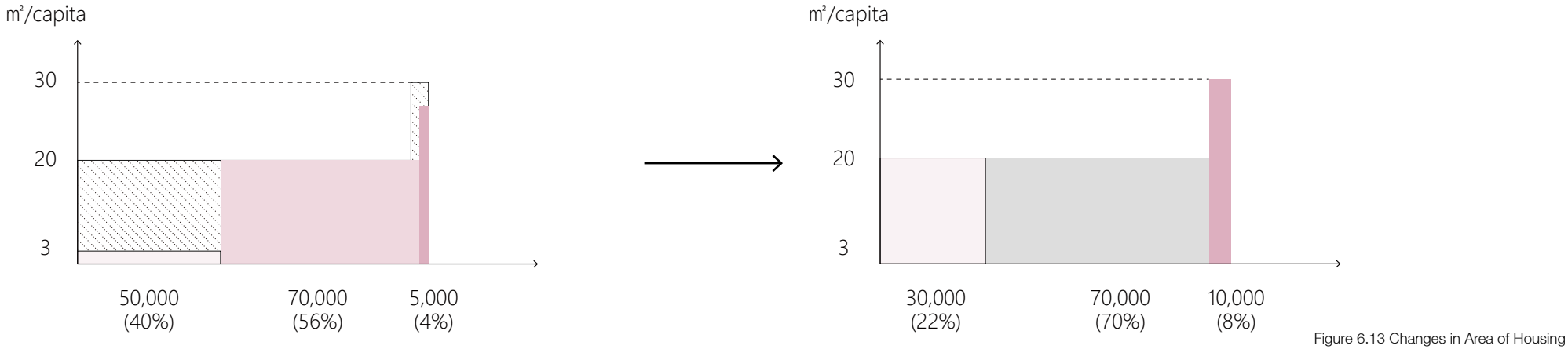


Figure 6.13 Changes in Area of Housing

Source: Shenzhen Special Administrative Region News, China Population Census Yearbook-2020, Shenzhen Statistical Yearbook 2022

Now

Source: Shenzhen public housing construction standards, Administrative measures for planning and construction of affordable housing in Shenzhen

Future

6.2 Design Across Scales

Factory & Urban Village Analysis

Urban villages are usually on the edges of industrial areas, located on higher ground. The form is organic and small.

Industrial areas follow the local topography and are mainly orientated north-south in a regular form.

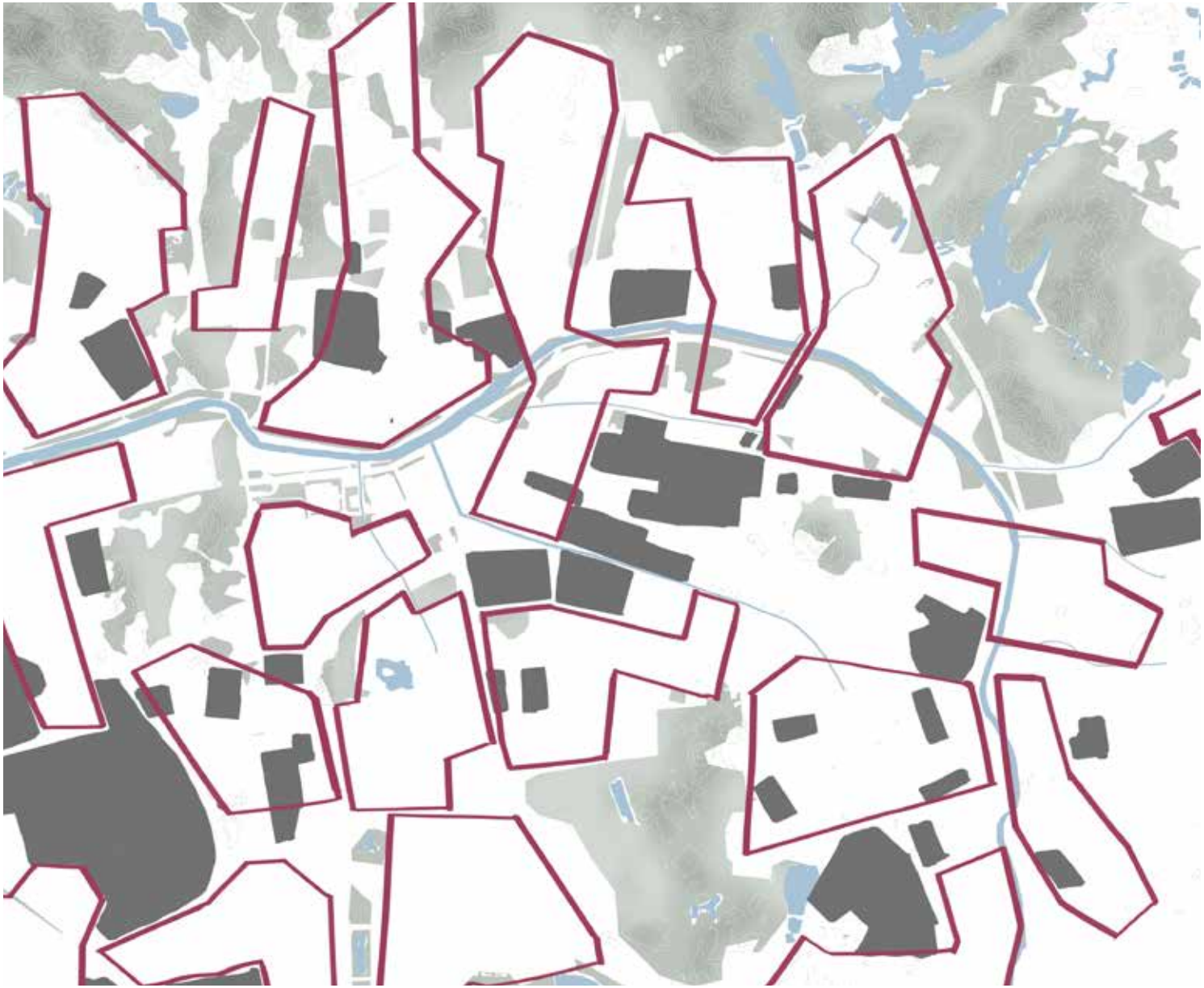


Figure 6.14 Relationship between Urban Villages and Industrial Parks

Landscape Design

The area is bordered by mountains and has a rich water system, with much mud in the centre near the river, which means that there has been a lot of flooding.

A number of strips of landscaping perpendicular to the water system are added to the area along the river and ditch. Some areas that were previously low-lying and prone to flooding alongside the river are reinstated as wetland parks.

Figure 6.15 Landscape Design of the Big-Scale

Renewal Map

Older industrial areas in the surroundings of the landscape zone will be prioritised for regeneration. The buildings to be regenerated are all industrial parks around the urban villages with mainly labour-intensive factories, and there are no residential areas in the urban villages need to be renewed. The areas to be regenerated are mainly located in the northern part of the site near the mountains and along the river.

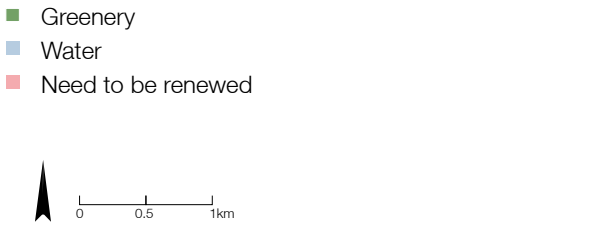


Figure 6.16 Old Industrial Parks

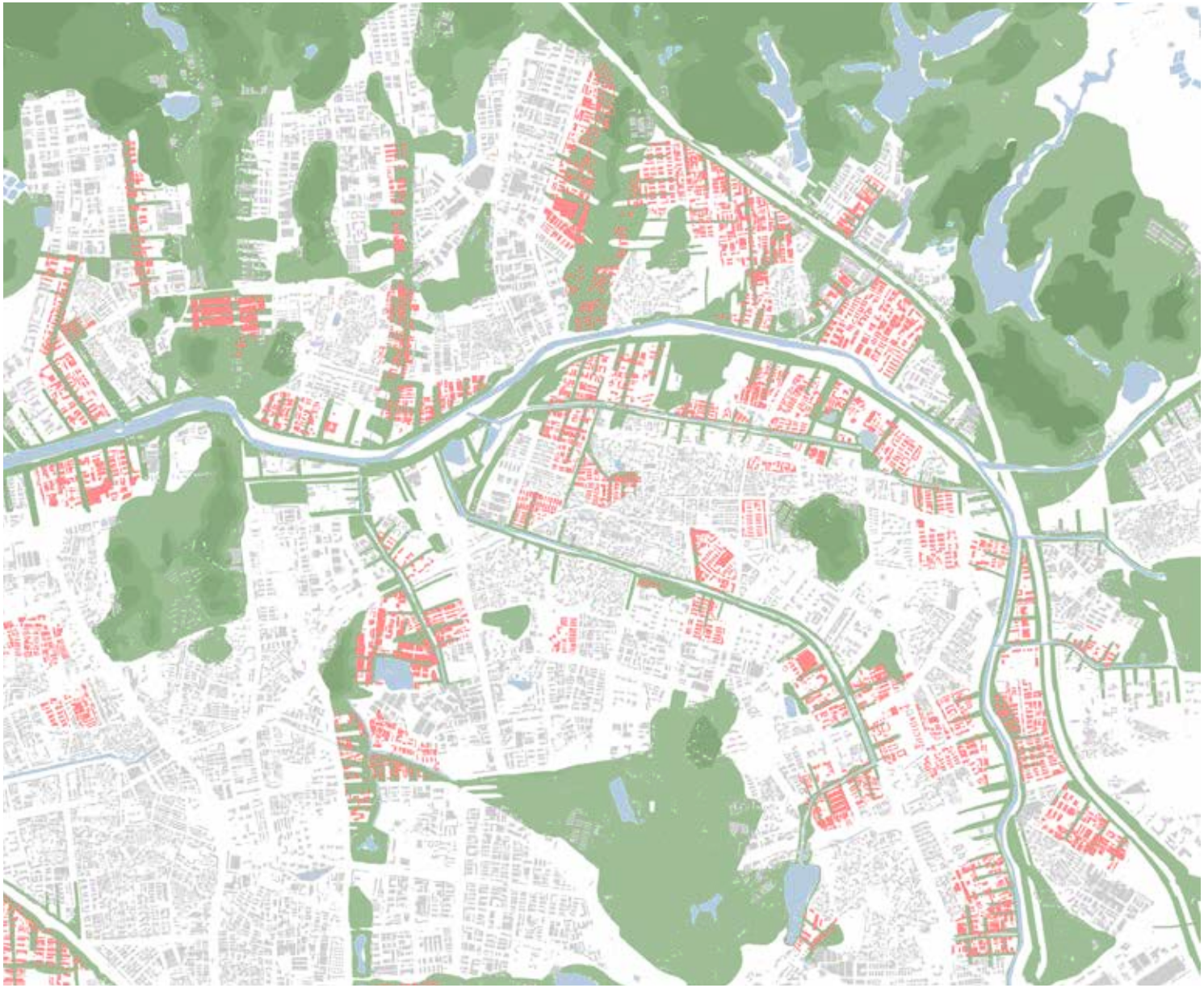


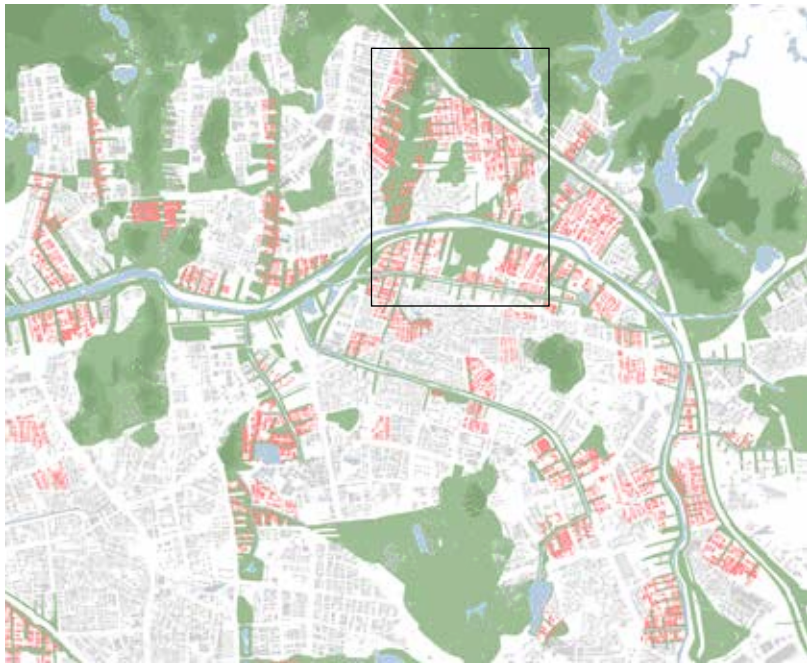
Figure 6.17 Buildings needed to be renewed based on landscpae design and age of buildings

Mid-Scale Renewal Map

Established urban villages, commercial housing and large industrial parks on the urban edge are retained. It is mainly the old industrial parks within the city and the low-lying flood-prone factories along the riverside that are being regenerated. These factories in need of regeneration are usually located together to form a large industrial park.

Need to be renewed

0 100 250 500m



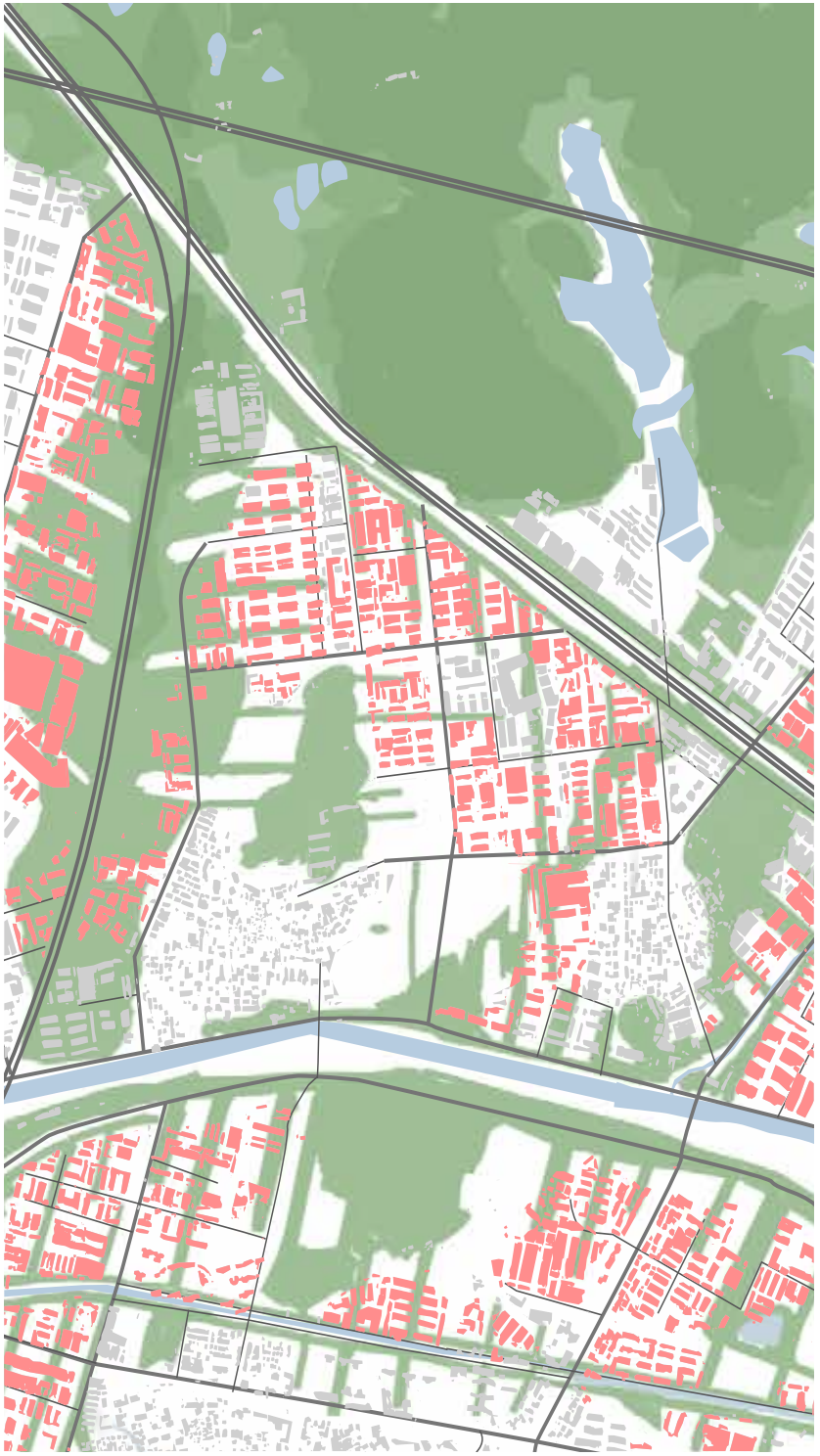


Figure 6.18
Buildings needed to be renewed

Figure 6.19 Pictures of Buildings needed to be renewed
Source: map.baidu.com

Strategy 1 - Jobs-housing Mismatch

The people who live here usually commute to the city centre for work, so this is just a place to live for them. The core requirements of these people are proximity to public transport and ease of living. Necessary amenities should be available on the commuting route.

Housing: Housing is affodable housing, which is located within 800m of the metro station.

Working: Employment is n the basic services sector of the living category, with a small number of office jobs.

Mixed-use: A high degree of mixed-use within the building at the station entrance, including residential, office, shopping malls, community service centres, and so on.

Nature: There is a high level of building coverage around the metro station, making roof gardens the main place to provide greenery. There is a small amount of greenery at the street level. Greenery in more peripheral areas can be more at ground level.

Mobility: The area encourages walking and public transport trips. It is connected to the surrounding neighbourhoods through pedestrianised lanes. There are no carriageways within the blocks.

Open Space: There is good open space connectivity between neighbourhoods. Some open space is placed on rooftops.

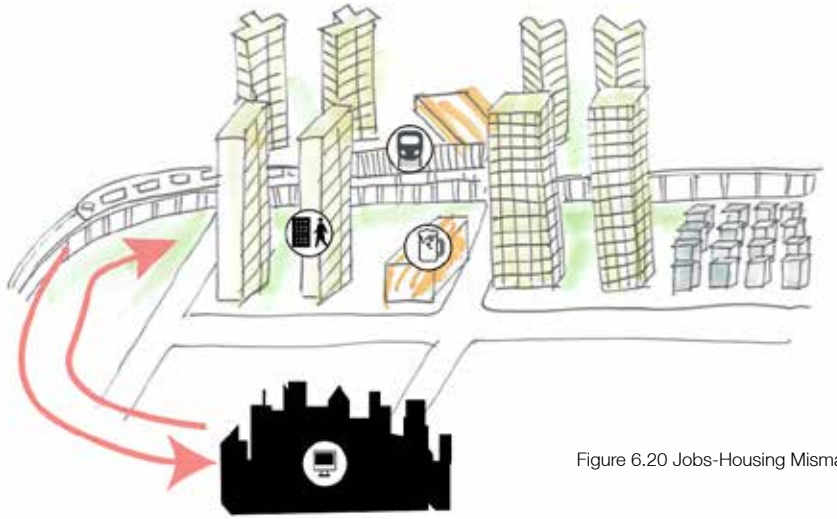


Figure 6.20 Jobs-Housing Mismatch

Strategy 2 - Jobs-housing Balance

People here do not have to travel very far during the week due to the availability of adequate housing, jobs and services. The shorter commuting time helps people spend more time on their lives.

Housing: Housing near the factories is ffordable housing and urban villages, with a little commercial housing.

Working: Most of the jobs come from R&D staff and senior technicians in the factories, with a small number of jobs in basic services.

Mixed-use: Production and housing can be mixed in the same building. Office, production and service functions can be mixed-used within the factories.

Nature: Factories require a large area of production space on the ground floor, so some nature here are located in the periphery of the factory and on the roof garden.

Mobility: Separation of people and vehicles. There should be direct access to the footpaths between the factory and the housing blocks.

Open Space: Good connectivity of the open space within the neighbourhood. The open spaces in the industrial area are located in the periphery.

Figure 6.21 Jobs-Housing Balance

Middle-Scale Urban Design

Figure 6.26 Strategy Plan

Jobs-Housing Mismatch
Jobs-Housing Balance
Metro Station

New Buildings
Retained buildings
Forestation
Wetpark
Greenery
Water

0 100 250 500m

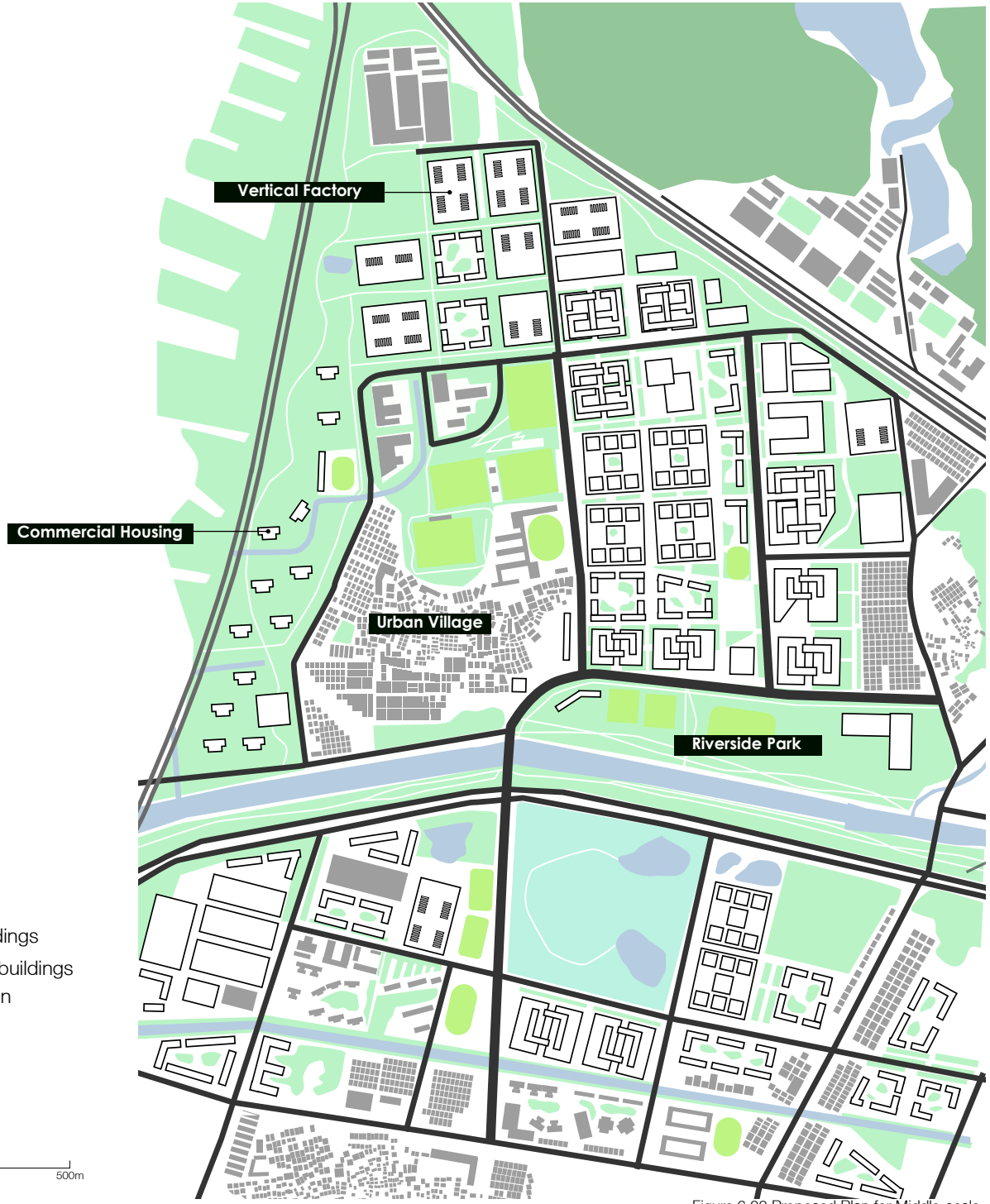


Figure 6.22 Proposed Plan for Middle-scale

Housing

Figure 6.23 Proposed Plan for Housing

- Urban Village
- Commercial Housing
- Affordable Housing

Urban villages are still in their original locations. Affordable housing is located near metro stations and near factories. Commercial housing is located in places with good environment.

Working

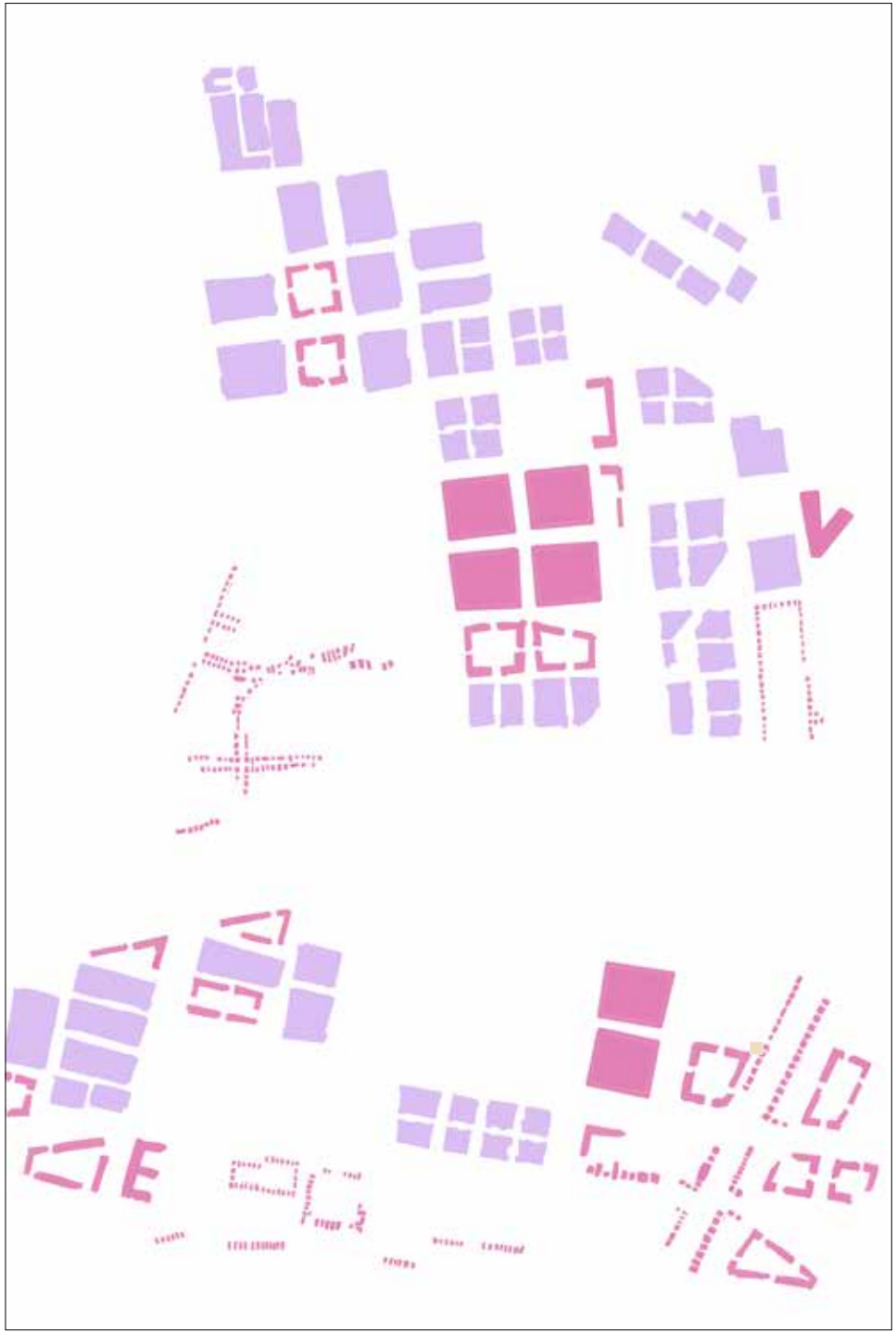


Figure 6.24 Proposed Plan for Working

- Factory
- Basic Service

The location of new factories is based on the location of existing factories. The surroundings of metro stations, affordable housing and urban villages can provide people with the basic services.

Mixed-use

Figure 6.25 Proposed Plan for Mixed-use

Urban Village Commercial Housing Dormitory

Shopping Mall Hospital Sports Facilities

Kindergarden Primary School High School

Residence and work are mixed in some of the new typology. In areas where jobs are co-located, there is a higher degree of mixing of housing and factories. Residence and basic services are more mixed in areas where jobs and residences are separated.

Mixed-use

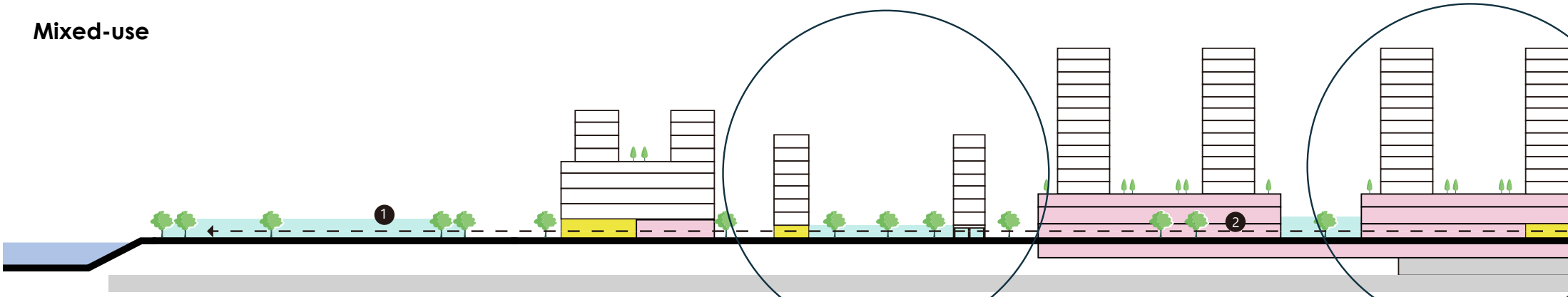


Figure 6.27 Section of Affordable Housing

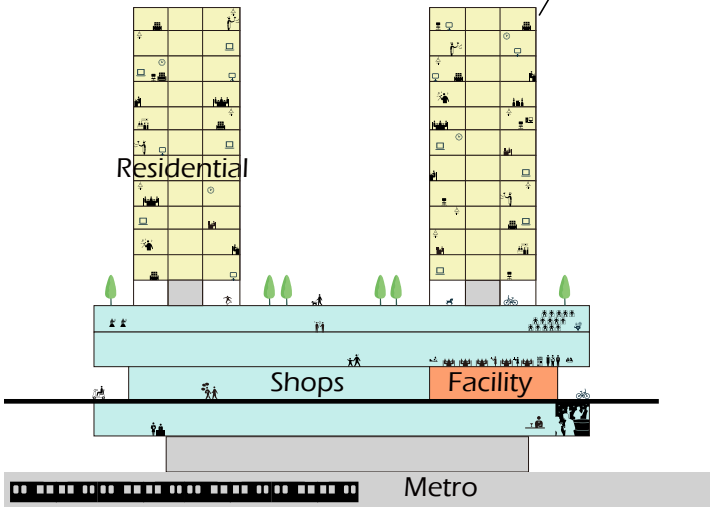


Figure 6.28 Section of Affordable Housing ②

The activity area of the residents is located at the ground floor. The ground floor is partially elevated to better suit the subtropical climate of Shenzhen. A part of the roof has a roof garden.

This is a common form of mixed use in high density urban areas. The metro station exit has the highest building and population density in the area. The outdoor activity space is elevated to the roof garden.

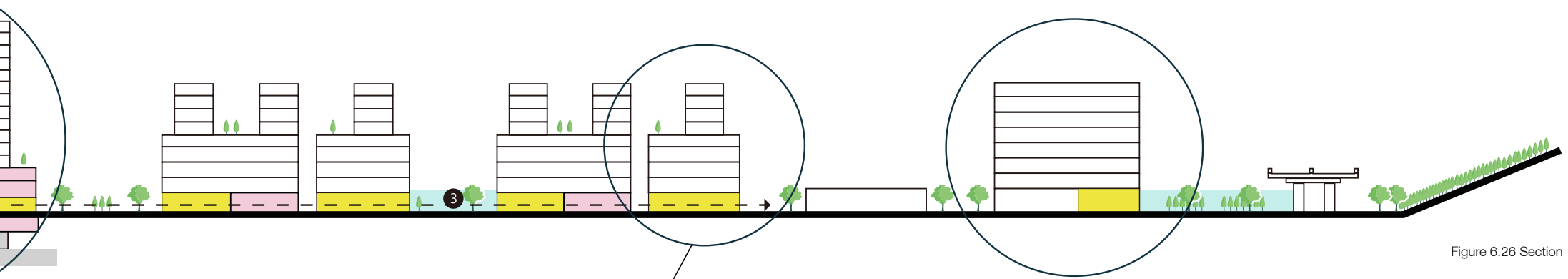


Figure 6.26 Section

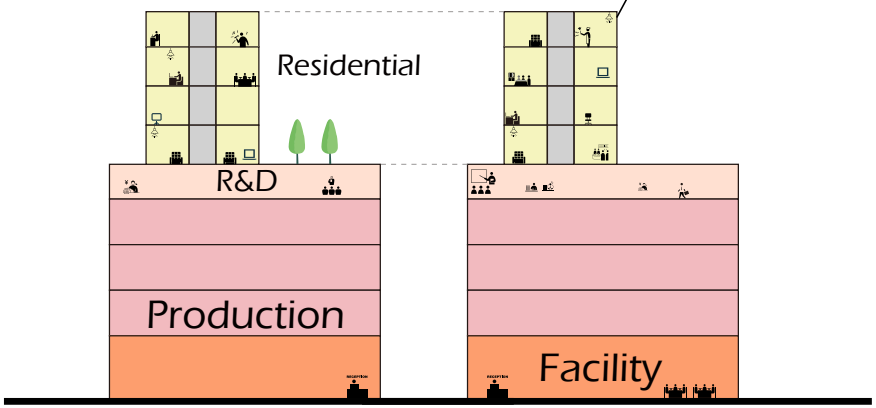


Figure 6.29 Section of High-tech Industrial Park

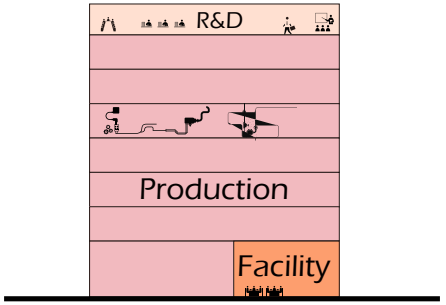


Figure 6.30 Section of Vertical Factory

This is a mixed residential and production building form. The production space on the ground floor has a higher floor height. The living space is located above the production space due to its lower load-bearing requirements.

This building form is suitable for industrial processes where large machines are used in the production process. Service facilities on the ground floor shorten the distance workers used to go to the amenities.

Nature

Figure 6.31 Proposed Plan for Nature

Forest
Plantaiton
Wet Park
Greenery

The forests are located on hills at higher elevations. The greenery close to the sides of the highway is plantation. The natural landscape along the riverbank is greenways and wetland parks.

Mobility

Figure 6.32 Proposed Plan for Mobility

Highway
Road
Cycle Path
Walkway

Freight: Freight access is restricted to the periphery of the residential area, with only roads providing access to the factory. Lorries are not permitted on internal roads within the settlements.
Cycle paths and footpaths: Walking and cycling are the main ways that people travel on a daily basis.

Open Space

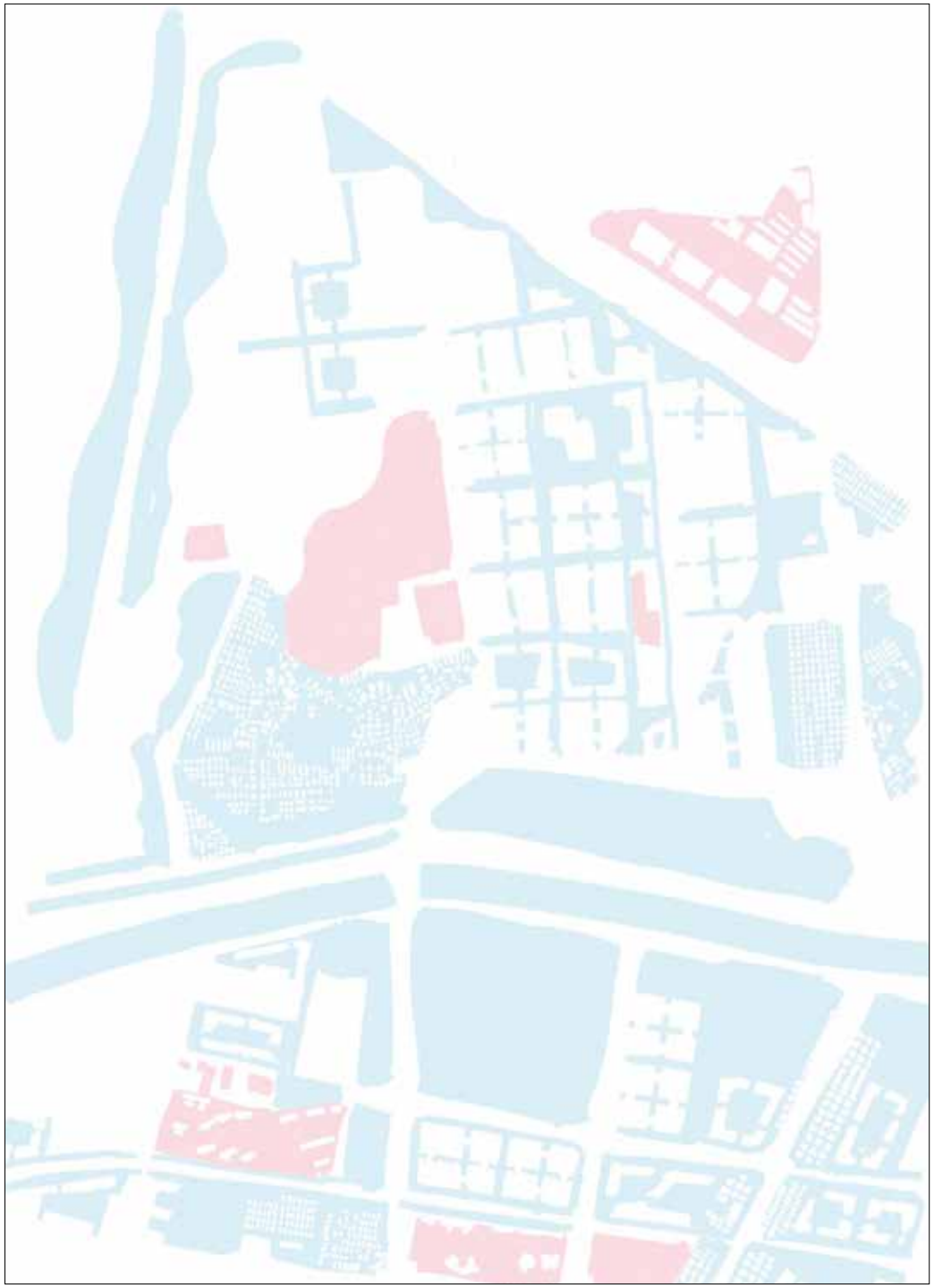


Figure 6.33 Proposed Plan for Open Space

Real Open Space

Private Space

The unbuild area is freely accessible, except for the open spaces of the original commercial property, the school, the training base and the large industrial park, which are inaccessible. Open space connectivity within the residential area is good.

6.3 New Typologies

① Affordable Housing

Figure 6.34 Typology of Affordable Housing ①

Housing: This is the typology that provides the most living space and therefore the largest number of people. The decreasing height of the floors allows for more active terraces on the top floors, which ensure that the rooms are exposed to sunlight. Multiple house types allow for a wide range of choices. Open courtyards allow other people to come in and move around, increasing the inclusiveness of the area.

Working: There are few jobs available and only a few people can work in the basic service sector. Most people need to work in the neighbouring factories.

Mixed-use: In this neighbourhood, housing, basic services and sports facilities are integrated. Inside the building, there are shops and community services on the ground floor, housing in the middle and roof gardens on the top floor.

Nature: There is a high level of greenery both inside and outside the courtyards. The landscape within the courtyard is more irregularly arranged. There are lawns, ponds, and different types of trees. The trees on the outside of the courtyard are of a more homogenous type and are arranged in a regular pattern. Roof gardens may also provide a small amount of vegetation.

Mobility: Pedestrians are able to move freely through the ground floor from one block to the next. There is both a pedestrian network and a cycle path on the ground floor.

Open Space: There is a wide variety of open space in the middle of the courtyard. Some areas of the ground floor are elevated to spatially connect the inner courtyard with the outer open space, making it easier for pedestrians to discover the large inner open space. The roof garden is also used as a public area. All unbuilt areas here become open space.

Figure 6.35 The Courtyard of Affordable Housing

Figure 6.36 Open Space between Affordable Housing and Urban Village

② Affordable Housing

Figure 6.37 Typology of Affordable Housing

Housing: Affordable housing is located in the towers. As they are located near metro stations, they provide a shorter commute and affordable accommodation for people working along the metro lines.

Working: Basic services in the The building podium underneathcan provide a lot of stable employment. Due to their proximity to the metro stations, most of the people living here need to commute to work in places farther away.

Mixed-use: Large areas on the ground floor can be used as shopping malls and community service centres. The large roof area can be used for sports facilities and some green roofs.

Nature: Most of the greenery is located on the rooftop, except for an outer ring of grass and trees.

Mobility: This is the exit point of the metro station. Ground traffic is mainly vehicular. Walking areas are located on the roof and inside the building. There is also a cycle path that runs through the ground floor of the building. There are many options for travelling here.

Open Space: The open space on the ground floor is located indoors and there are not many outdoor areas. Higher quality open space is placed on the roof for the residents to use. The open space is also connected to the neighbourhood through bridges to form a circulation ring of open space.

Figure 6.38 Roof Garden of Affordable Housing outside Metro Station

③ Vertical Factory

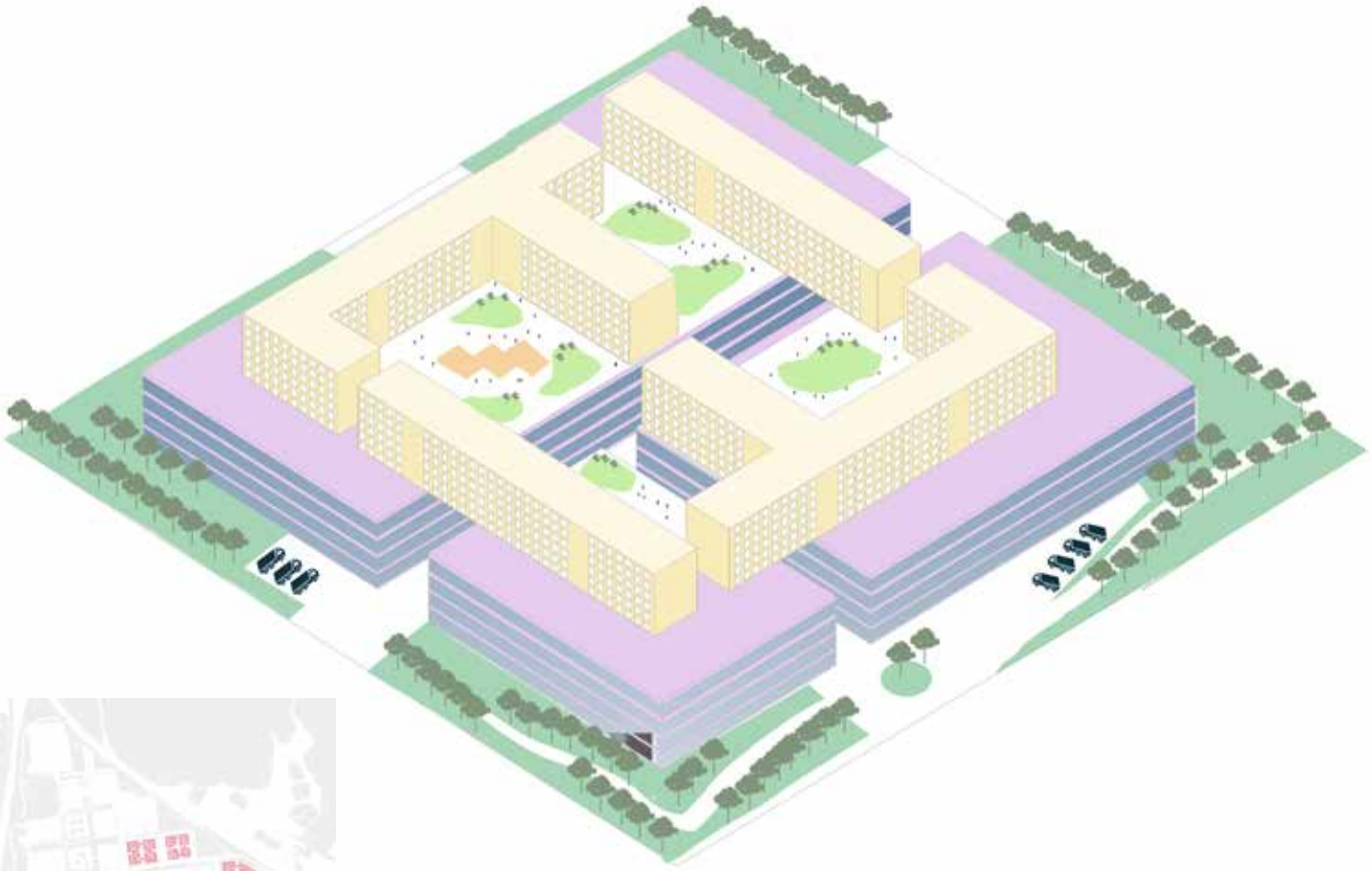


Figure 6.29 Typology of High-tech Industrial Park

Housing: The affordable Housing is located above the factory, allowing employees to live and work within the same neighbourhood, reducing commuting time.

Working: The workplace is located in the building underneath. Inside, production areas are located on the lower floors. Office areas are located on the higher floors. These buildings have a vertical factory character and provide a large number of jobs in the neighbourhood.

Mixed-use: It achieves a mix of work, residential and service facilities within the building. The ground floors of the work and residential areas can provide different types of service facilities depending on the height of the floors. Part of the roof of the top floor can be used as a roof garden.

Nature: Due to the large footprint of the typology, the natural area at ground level is only an outer circle. Some grass and small trees are planted on the roof garden.

Mobility: The separate areas in the centre of the factories are used as the main pedestrian and cycling routes. The periphery of the building is used as a freight route for each factory.

Open Space: The connectivity of the open space is low and the proportion of open space is small. Therefore more open space is placed on the roof. People living in different buildings can move to different roof gardens. The rooftop gardens are not connected, but belong to each building independently.

④ Vertical Factory

Figure 6.40 Typology of Vertical Factory

Working: The total production area of the vertical factory is very large, thus providing a very large number of jobs.

Mixed-use: The ground floor is used as a public exhibition and service area. Above that is the production area.

Nature: The periphery of the vertical factory is surrounded by a green belt and trees.

Mobility: Goods are transported via a ramp on the side of the building. There are many car parking spaces on the outside of the building.

Open Space: The open space is located on the outside of the building. However, people's activities here are usually on the ground floor of the building, so the open space on the outside of the building is less utilised.

Figure 6.41 Vertical Factories

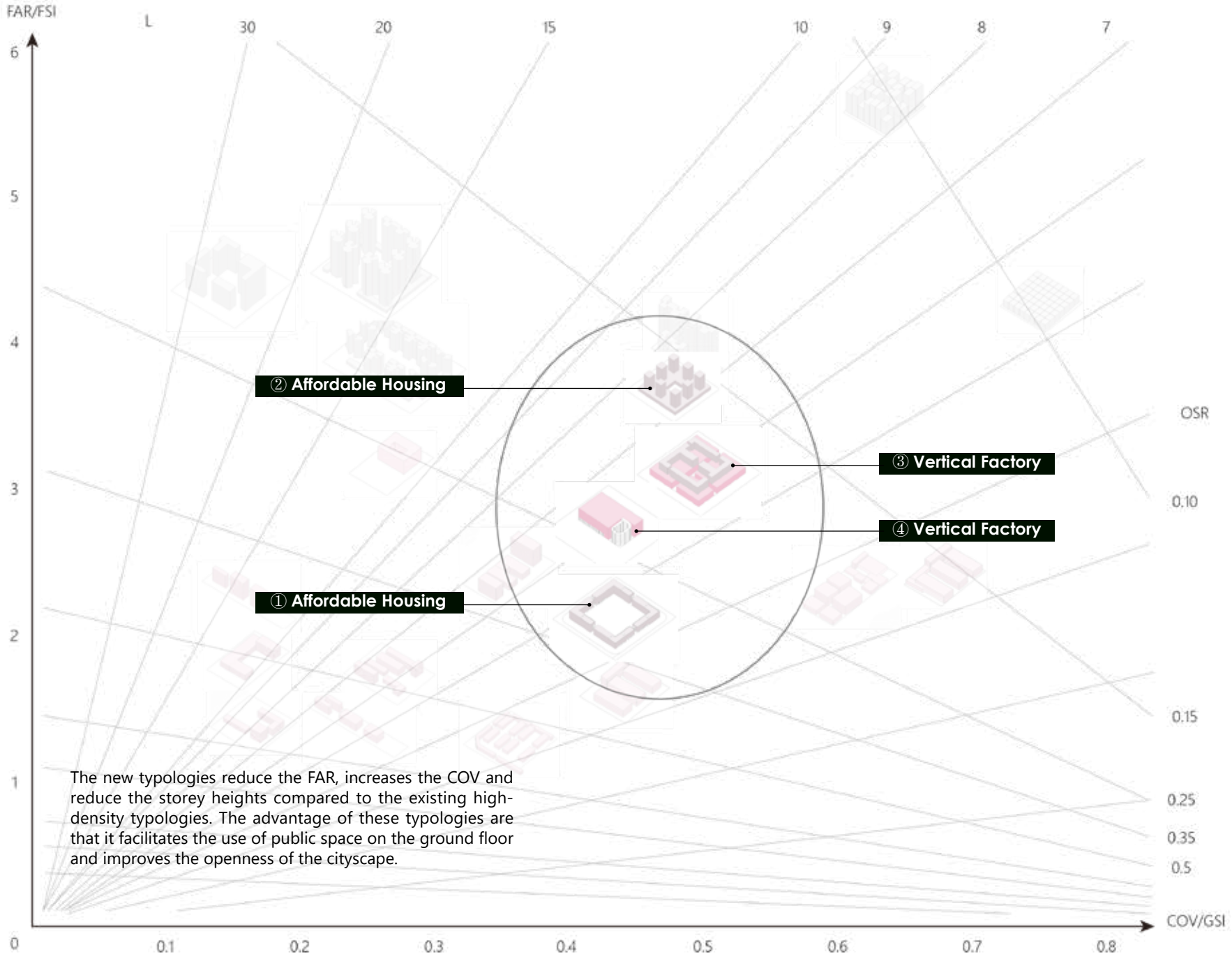


Figure 6.42 Density Analysis of New Typologies

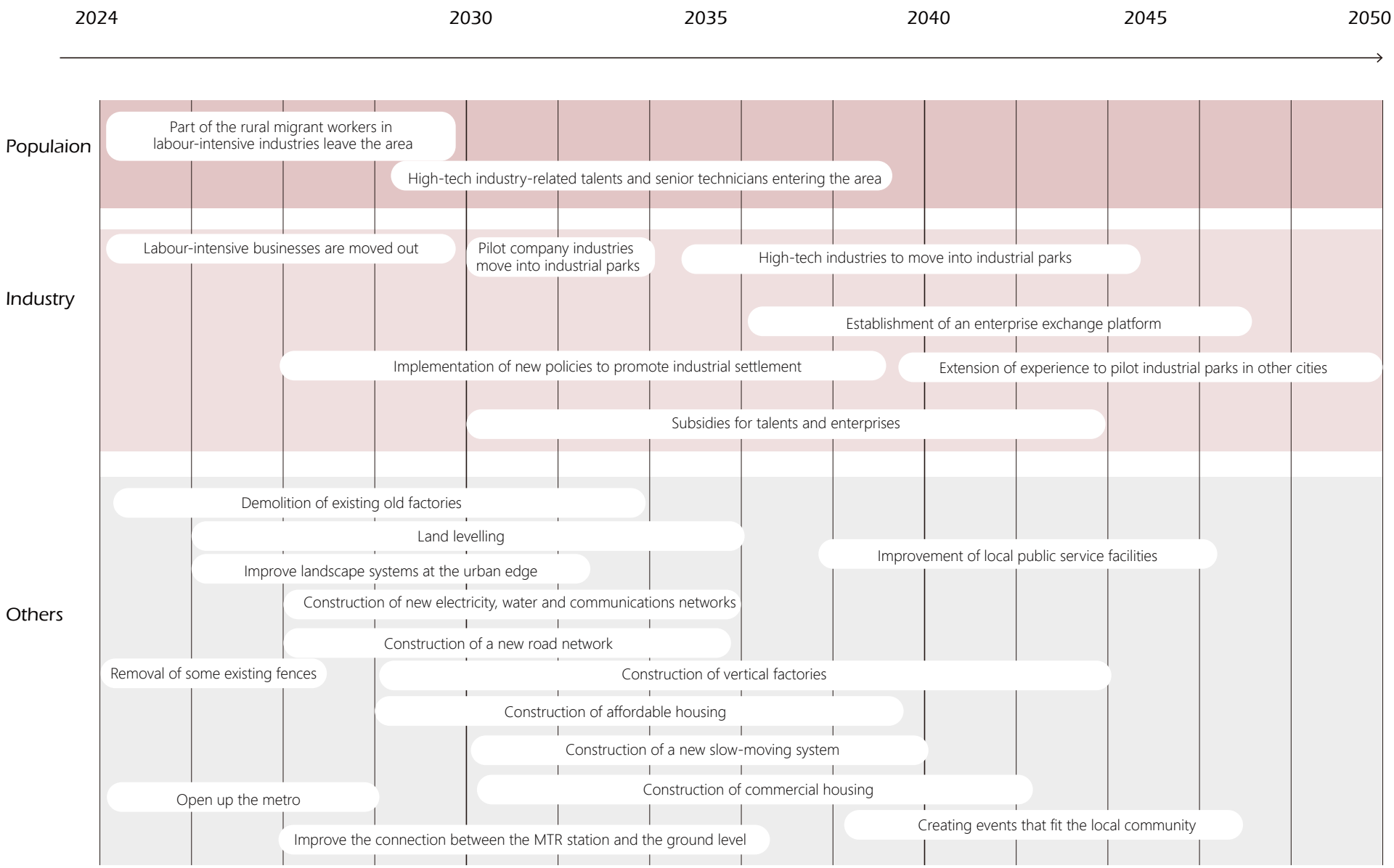


Figure 6.43 Timeline

Figure 6.44 The Proposed Future of Urban Village's Industrial Parks

07 Conclusion

Main Question
How could urban village's Industrial Parks be developed in the context of Industrial Transition into a new type of High-Density Sustainable and Livable Community in Shenzhen?

Urban village's industrial parks used to have a high population density, but the per capita living and working areas were very low. In order to improve the quality of living and carry out industrial transition with the same population, the development trend of urban form is densification. Living patterns in high-density community have been categorised as jobs-housing mismatch and jobs-housing balance. Enough stable jobs and enough affordable housing can form a sustainable community. Increasing the area of open space at ground level in residential areas, encouraging walking cycling and public transport, increasing the degree of mixed use within plots and buildings, and increasing the richness of the landscape are the main ways to improve the quality of a high-density community.

1 How did high-density affect the living quality of a community over time?

With the gradual increase in population density, the quality of living in the community shows a trend of increasing, then decreasing and then increasing. At the beginning, the population growth rate was slow. Villagers were able to obtain larger living areas through new self-built houses. The quality of open space was also improved. However, with the rapid increase in population later, the urban villages and factories were unable to cope with the sudden influx of people, and began to sacrifice the quality of living for the quantity of living by increasing the density of the urban villages and factories. At this time, urban villages had the most crowded environment and the least amount of open space.

In recent years, with the growth machine, the quality of open space, nature and mobility have gradually become better. However, the high cost of this pattern of development makes it difficult for people to continue to work and live where they are. Many rural migrants have left because of the lack of suitable jobs and housing. New migrants cannot find affordable housing, which creates unsustainable local development. At the same time this developemnt pattern has brought some problems to the city, such as reduced use of open space, gating blocks, and poorly connected neighbourhoods. This makes people's lives not livable.

2 What characteristics contribute to a sustainable and livable community?

In the definition of sustainability, economic, environmental, and social are factors in making a community sustainable. In the definition of a livable community, a livable community should be well connected, affordable, diverse, and walkable. After combining the above two together, the characteristics of a sustainable and livable community are housing, working, mixed-use, nature, mobility and open space. Of these factors, housing and jobs are the core elements that make up a community. Mixed-use, nature, mobility, and open space are the environmental elements.

3 What are the social-spatial and environmental effects of existing policies on industrial transition and urban renewal?

The policies encourage that urban villages should be preserved where the architectural quality is good and the quality of local life should be upgraded on that basis. This means that villagers' historical memory of the locality can be preserved through the reservation of villages' buildings. This will help maintain the neighbourhood and social network within the original urban villages. In addition, encouraging the supply of affordable housing can enhance social inclusion and diversity, so that Shenzhen belongs to all who work here, not just the rich. The current urban village renewal policy is conducive to improving the quality of the community, such as improving basic living service facilities, nature and mobility conditions.

However, the current policy pays insufficient attention to the socio-spatial and environmental impacts of old industrial areas. The policy is more related to the quality of industrial buildings, plot ratio and industrial production area. The part about social space concentrates on the part of functional change, as this can leave some memories of labour-intensive industries for the city, which is also cheap.

As for the policies related to vertical factories, the main impacts are focused on the environment. Less policies related to social space. Vertical factories will increase in the floor area ratio of future industrial parks and a higher degree of land consolidation. Industrial parks will be larger than the old ones.

All in all, the current policy on the renewal of industrial areas is only related to workspace and ignores other qualities.

4 What is a new type of high-density sustainable and livable community in the process of industrial transition?

In the process of industrial transition, part of the land will become jobs-housing mismatch based on the TOD model. In this mode, the original labour-intensive industries gradually disappear and no new manufacturing industries move in. Instead, there will be a residential area with affordable housing. People living here need to use the metro or other public transport to get to the city centre for work.
The other mode of living is jobs-housing balance. The original labour-intensive industries will become to high- tech manufacturing industries. People live and work in close proximity.
These two have both commonalities and their own unique guidelines. The common point is that the principles of environmental factors are similar. Increase the proportion of services on the ground floor. Encourage the use of roof gardens in areas with high building coverage. Elevate the ground floor of buildings where available to enhance connectivity between neighbourhoods. Walking and cycling are encouraged within neighbourhoods. The urban edge can have multiple types of natural landscapes that extend into the inner city. Finally, open space connectivity should be good, and neighbourhoods are managed openly.
The difference is that the ratio and relationship between living and working are different. In the model of jobs-housing mismatch, there is a higher amount of affordable housing. This type of neighbourhood is dominated by residential and basic service functions. Vertical factories are widely used in the model of jobs-housing balance, and this community has a more balanced ratio of living, working and basic service functions.

08 Reflection

Reflection

Academic Value: Previous research on urban villages has focused on the dense residential areas of urban villages and explored how people live inside, but there has been less spatial research on the industrial areas that support the existence of urban villages. This project provides a more comprehensive understanding of the spatial qualities of urban villages through the study of urban village's industrial area and the boundaries between industrial areas and residential areas in urban villages. In China, there are fewer sustainable and livable analysis and designs for urban village's industrial areas.

Approach value: Morphology is mainly used on the analysis of quality on the site, especially on the mid-scale and small-scale. It clearly presents spatial relationships and plays an important role in quality analysis.
The policy analysis helps to understand how Shenzhen's policies encourage high-density urban and industrial development in the context of industrial transition.
The Case Study helps to understand the urban form and operation of existing sustainable and livable high-density neighbourhoods. By analysing the characteristics of the case study, it provides some design princeples and strategies for the design of this project.
Research by design allows the design to be improved over and over again, by comparing and contrasting designs from different perspectives to find a more suitable solution for the site.

Social value: Shenzhen is now undergoing a large-scale urban renewal. This project helps to provide a reference of new ideas for such process. This is because while urban renewal in the past has brought higher density space and stronger economic development to the city, it has neglected the livability and sustainability of the use of space.
More than 70 percent of Shenzhen's population live in urban villages and they face many problems with their living environment. This project helps many workers who have not enjoyed enough of the dividends of urban development to improve their living and working environments and relationships. It allows them to not only play a GDP-generating role in the city, but also to enjoy the benefits of urban development at the same time.

Transferability: Shenzhen is now undergoing extensive urban regeneration in the suburban area. As industrial transition is taking place throughout Guangdong Province and many old factories need to be regenerated, the results of this project will be of value mainly in the old industrial areas of urban villages in the local and neighbouring cities.
Popular commercial housing in China has been in the form of towers, but this approach is not conducive to people access to public space. The construction of new affordable housing could take more of a courtyard form.

The motivation for this project was the design of an urban village renewal I did as an undergraduate. That urban village provided a lot of employment to the area. However, when it came to the final scoring, the design that demolished the entire site and started over got high scores. This was although those designs had nothing to do with the analysis of the site as it is. However, such a program of demolishing everything and starting over is happening extensively in my hometown. As a student with a planning background, I had a lot of doubts looking at the changes that were taking place. Whether there is still improvement for progress in the renewal approach and whether spatial design should not only be used as an accessory while considering economic development but can bring about positive changes for local people. With this in mind, I chose urban villages as the design target for my graduation project, looking forward to a different result.

During research in Shenzhen two years ago, I learned about the vertical factories being promoted there. The project leader of the neighbourhood renewal said that both factories and residential units in their neighbourhoods were quickly off the market. And the vertical factories, in particular, saw an oversupply. Even though there are so many factories and office buildings in Shenzhen, companies are very eager for higher quality office and production space. So I choose the industrial areas near the urban villages.

In the context of industrial transition throughout the Greater Bay Area, the renewal way of Shenzhen can be used as a reference for areas with urban villages in neighbouring cities, such as Guangzhou, Dongguan, Huizhou, and so on. It is valuable that the renewal of this project not only considers the quality of space. It also considers the feeling of human use and the use pattern.

However, the challenge soon arose. When I evaluated the quality and density of the local area, I realized that in my previous designs. Despite knowing some of the techniques of design and the standards of facilities required in policies and guidelines, I had no idea where the numbers and requirements came from, my brain had been acting like a machine to meet the requirements in the guidelines until then. This was my first attempt at defining a high-quality city on my own. Although the six factors I chose gave me a lot of work, I still felt it was worth it after doing the project, which allowed me to draw out a more comprehensive understanding of the many aspects involved in urban design.

While designing, I learned for the first time to look at sites from a landscape perspective. I felt that my understanding of urban design was completely different. This is because, in my undergraduate studies, I was unlikely to consider the influence of natural conditions in design and how they affect sites. This almost nature-ignorant design approach on the one hand allows designers to pursue only good looks rather than the practicality of the landscape. I believe that I will consider the influence of landscape more.

As the design progresses, I find that some subconscious design guidelines are still influencing me, such as the tendency to demolish the buildings and rebuild them, disregarding the impact of the landscape, and using economic development as the guide for design. Therefore, for me, design is a process of fighting with myself, and the more intense the fight, the more I can find out which design methods are more evidence-based and which are ridiculous.

When the project is about to be finished, I will compare my proposal with the one that is being updated in reality in Shenzhen, to see where it can be improved. But at the same time, no matter when the project is finished or when it is in progress, I am worried about whether the idealistic plan has any significance in reality. For example, although I am aware that gating block brings inconvenience to the use of many spaces, it is becoming more and more popular in China. The reason for the popularity has nothing to do with the design itself, but people are more interested in the sense of security and privacy that it brings.

Before this project, as a student with a planning background, I had never analyzed a city on such a small scale. It gave me a much more realistic view of how a project can be put into reality.

The report, as the final form of submission for this project, has taught me a lot. Because a report is different from a thesis or a design, it needs to tell a story to both professionals and the general public at the same time, using easy-to-understand words and graphic language. Therefore it should neither be too obscure nor too simple. I think it is balanced and practical so I will continue to use the relevant writing way in my future work, which is an effective way to help students connect with their work.
As for the collaboration, I believe a mentor can bring a clear direction for the project to proceed. I think the configuration of two mentors is very reasonable because it allows me to learn knowledge from mentors with different backgrounds, which helps to make the project more comprehensively considered.

At the same time, I am very grateful to the cordinaters and my classmates. The cordinaters gave me great support before P1, as I had not confirmed the mentor at that time, so the advice from the cordinator helped the focusing process. Through their perspectives, they explained what the studio wanted students to learn.

This year I participated in two workshops, the first one was Pattern Language, which taught me to present strategies in an easy way to understand, which was very useful for showing different dimensions of strategies, proposals, and concepts together. The second workshop was about how to write a reflection, which taught me to take a broader view of what the project means to me personally and to the community, and how to look at the project and my future as an urban designer, which I enjoyed!

This project allowed me to look at some Chinese design methods through a Dutch design way. This gave me a completely different feeling. By comparison, I can find out which methods are regionally specific, and which ones are generalizable and worth promoting. If I have the opportunity to work on real projects related to urban village renewal after work, I think I can look at the site from a broader perspective.

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