Regeneration of Campus-proximate Areas for Better University-City Relationship

A Dissertation Submitted for the Degree of Master

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Abstract

As the reform of the higher education system accelerates and the era of the knowledge economy fully arrives, the relationship between universities and cities is becoming increasingly close. They have become an interdependent community with shared destinies, jointly creating vibrant and competitive region. Cities provide robust support for the construction and development of campuses, while in the face of diverse demands for urban construction and development, universities also contribute to the city by leveraging their talent and knowledge resources. The campus-proximate areas are the preferred locations for universities to radiate outward and drive regional development. However, research on land use and spatial planning in these areas has not been adequately emphasized in urban development, failing to unleash their potential driving force. Stimulating the vitality of the campus-proximate areas and driving urban development is an inherent and pressing need.

The development of the relationship between university and city serves as a crucial entry point for studying the campus-proximate areas. The interaction between university and city has been increasingly strengthened during their respective development processes, leading to significant mutual influences. Based on a thorough analysis of the university-city relationship, this paper views the campus-proximate areas as an integral part in order to enhance their interaction. It emphasizes the close linkage of resources between universities, the campus-proximate areas, and cities, promoting better interaction and development between universities and cities.

This paper analyzes the relationship between university and city from three aspects: the evolution of the relationship, their interaction, and development trends. It summarizes the impacts of campus development and functional spillover on land planning and spatial structure in the campus-proximate areas. Based on the development of this relationship and incorporating relevant perspectives conducive to university-city interaction, The paper proposes that the spatial regeneration of the campus-proximate areas be categorized into two main types: activity spaces and innovative functional spaces.

By studying three cases with varying degrees of interaction between universities and cities, the paper analyzes their spatial organization patterns, and characteristics. It then summarizes regeneration strategies and experiences to promote interaction between universities and cities in the campus-proximate areas. Inspired by theory and case studies, the paper proposes regeneration strategies focusing on the functionality, space, and resources of the campus-proximate areas, and applies them to the area outside the west gate of the Wushan campus of South China University of Technology. By analyzing the current development challenges and opportunities, identifying specific problems, the regenerating strategies have been proposed: promoting mixed-use development, creating interactive spatial systems, and collaborative construction and governance.

Through the study of the relationship between university and city, this paper constructs a framework for regeneration strategies in the campus-proximate areas. Comprehensive regeneration strategies are proposed from the perspectives of functionality, space, and resources, considering the interaction between the university and the city and the integrated development of spatial systems. Hoping that these strategies can provide guidance and reference for future research on regeneration strategies in the campus-proximate areas.

Keywords: Campus-Proximate Areas; University-City Relationship; University-City Interaction; Urban Regeneration; Integrated Strategy

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Chapter 1 Introduction

1.1 Research background

1.1.1 The requirements for the high-quality development of urban regeneration

As China's economy transitions from the previous high-speed growth stage to a phase of high-quality development, urban development is also shifting from an extensive and rapid growth model to a more refined approach. This transition involves moving from an incremental development model to one focused on the redevelopment of existing urban areas. The "Proposals of the Central Committee of the Communist Party of China on Formulating the Fourteenth Five-Year Plan for National Economic and Social Development and the Long-Range Objectives Through the Year 2035" explicitly states that implementing urban regeneration actions is a crucial means to promote the structural adjustment, functional optimization, and quality enhancement of cities. It is an inevitable requirement for achieving high-quality urban development [1][2].Urban regeneration to reshape urban functions and governance patterns is a critical issue for urban development in the era of existing urban assets. Against this backdrop, the contradictions and problems in campus-proximate areas are becoming increasingly prominent, characterized by high dependence but low efficiency in spatial development, high demand but low level of supporting services, and high inheritance but low quality of the human environment. From practices across various regions, urban regeneration focused on improving urban functions and comprehensively enhancing the living environment has emerged as a key approach to promoting sustainable urban development.

1.1.2 Interactions between universities and cities in development

As the concept of open campus and the socialization of logistics management deepen, Chinese universities are gradually evolving into open community systems. The lives of university faculty and students are expanding beyond the confines of campus to the broader urban environment. Campuses are no longer isolated parts of cities but integral components of urban space. Simultaneously, as the interaction between universities and their surrounding

environments deepens, universities become increasingly reliant on cities and play a significant role in their development.

However, the current state of university-campus relationships in China presents various challenges. As extensions of campus life, most university proximate areas face issues such as aging infrastructure, economic stagnation, and environmental degradation. Commercial development is often disorganized, and surrounding urban villages pose significant risks, exerting a considerable impact on both universities and their surroundings.

Currently, the contradictions between universities and their surrounding environments are receiving increasing attention. Many local governments have begun to improve the surrounding environments of campuses because any imbalance in their development could greatly affect the lives of both university and local residents.

1.1.3 The need of regenerating Wushan campus-proximate areas, SCUT

Since 2020, the Guangzhou municipal government has proposed a plan to establish the Peri-Wushan Innovation District, designating South China University of Technology (SCUT) as the leading university in this area. This initiative marks a new developmental phase for the university. Through multiple meetings, the Guangzhou municipal government has emphasized the utilization of South China University of Technology's research and innovation capabilities to drive industrial development and attract research and development bases to stay in Guangzhou, further advancing the development of the city. For SCUT, it is crucial to tap into its potential, fully utilize both on-campus and off-campus resources, and leverage the support from relevant departments of the municipal government to address bottlenecks and challenges in its development through the Peri-Wushan Innovation District. Currently, there are still significant gaps in various aspects such as faculty apartments, student dormitories, and innovation parks. By adopting a cooperative development model between the government and the university, expanding the development space around the campus, and addressing issues such as the commercialization of scientific research achievements and the incubation of industries, we can achieve the common goals of resource integration and high-quality development.

1.2 Research aims and significance

1.2.1 Research aims

Entering the "14th Five-Year Plan" phase, China pays more attention to urban space transformation and urban regeneration governance. Exploring and activating urban internal spaces has become an important approach for urban regeneration and development. Deepening research and exploration on existing urban spaces is an effective means to activate the vitality of urban public spaces and promote urban economic development. It is also an effective way to enhance the comprehensive strength and competitiveness of cities. Campus-proximate areas, as special areas jointly constructed by cities and universities, are important spatial units to drive and accelerate regional high-quality and innovative development. Optimizing the resource allocation of campus-proximate areas is of great significance for universities to enhance their capabilities and for regional innovative development. China's university planning began in the last century, and the construction of campus-proximate areas started after relatively mature university planning. The theoretical research and practical work on the regeneration of campus-proximate areas are still in the development stage. Western countries entered industrialization and urbanization earlier, resulting in higher levels of university planning and development. As a result, universities and their surrounding areas developed rapidly, leading to coordinated urban prosperity. With the increasingly close relationship between Chinese universities and urban development, urban construction and development require universities to play a leading role, while campus construction and development rely on cities, with a focus on meeting their own educational functional needs. Therefore, this paper aims to propose a regeneration approach for campus-proximate areas based on the interactive development between universities and cities, establishing their development on a sound physical space foundation. The main objectives of this study are as follows:

① Unveiling the crucial role of universities in urban regeneration

The role of universities in urban development is undeniable and cannot be replicated easily. Stimulating the vitality of campus-proximate areas for their healthy and dynamic

development is an inherent requirement. Therefore, this paper attempts to start from spatial analysis within the discipline to explore the significant role of universities in activating the vitality of surrounding areas and driving community development. Through relevant research, the ways and types of interaction between universities and their cities are identified.

② To promote better interaction and development between universities and cities

Existing research mainly focuses on regional development at the macro level or building renovations at the micro level, which has certain limitations for the regeneration and development of the campus-proximate areas. This paper considers campus-proximate areas as a whole, analyzing the resource advantages of universities and campus-proximate areas, and then explores the strategies and paths for the interaction and promotion of urban regeneration between universities and cities, aiming to promote better interaction and development between universities and cities.

1.2.2 Research significance

Given the large number of universities in China, the issue of regenerating and transforming their proximate areas is complex. In recent years, there has been an increasing amount of research on urban regeneration, but studies specifically focusing on campus-proximate areas are relatively few. This paper, building upon the analysis of the interactive development between universities and cities, seeks to explore regeneration strategies for campus-proximate areas. The specific significance is as follows:

(1) Theoretical significance

Currently, most domestic research treats universities, communities, and blocks as independent regeneration units. Unlike previous approaches focused on demolition and reconstruction or large-scale development to drive urban regeneration, there is relatively little exploration of regeneration strategies for campus-proximate areas at the spatial level, and an overall framework has yet to be established. Through research on the development of university-city relationship, this paper can provide ideas and references for future studies or practices of a similar nature.

(2) Practical significance

The design strategies obtained in this study attempt to provide reference and inspiration for the construction of campus-proximate areas in contemporary universities. It encourages designers to break away from conventional design patterns and transform campus-proximate areas into interactive spaces, with the aim of generating greater momentum to promote university-city interaction and development.

(3) Managerial significance

The relevant research and findings of this paper are beneficial for university managers to contemplate the relationship between universities and cities. From the perspective of interactive development between universities and cities, it promotes the upgrading of management models. Additionally, it is conducive for city managers to actively promote the collaborative construction between universities and cities, facilitate the mixed management of universities and cities, and achieve common development.

1.3 Research subject

Starting from the relationship between universities and the city, this paper discusses the regeneration strategy of the campus-proximate areas, taking the area outside the west gate of Wushan Campus of South China University of Technology (SCUT) as an example for regeneration design. Over the years, leveraging its unique resource conditions and superior geographical location, the campus-proximate areas have become an important engine driving local and even city-wide development. However, research on land use and spatial planning in these areas has not been adequately emphasized in urban development, failing to unleash their potential driving force. With the accelerating pace of modernization, various issues faced by the campus-proximate areas have begun to emerge, making them key areas in urgent need of resolution and focus for urban regeneration processes. To promote sustainable urban development, unleash the vitality of these areas, and drive the prosperity and progress of the surrounding and entire city, has become an inherent and imperative demand and choice for us. Therefore, from the perspective of strengthening the interaction between universities and cities, the author proposes regeneration design strategies and frameworks for such areas,

focusing on functional, spatial, and resource aspects, and putting forward corresponding solutions. Design site as shown in the following diagram (Figure 1-1).

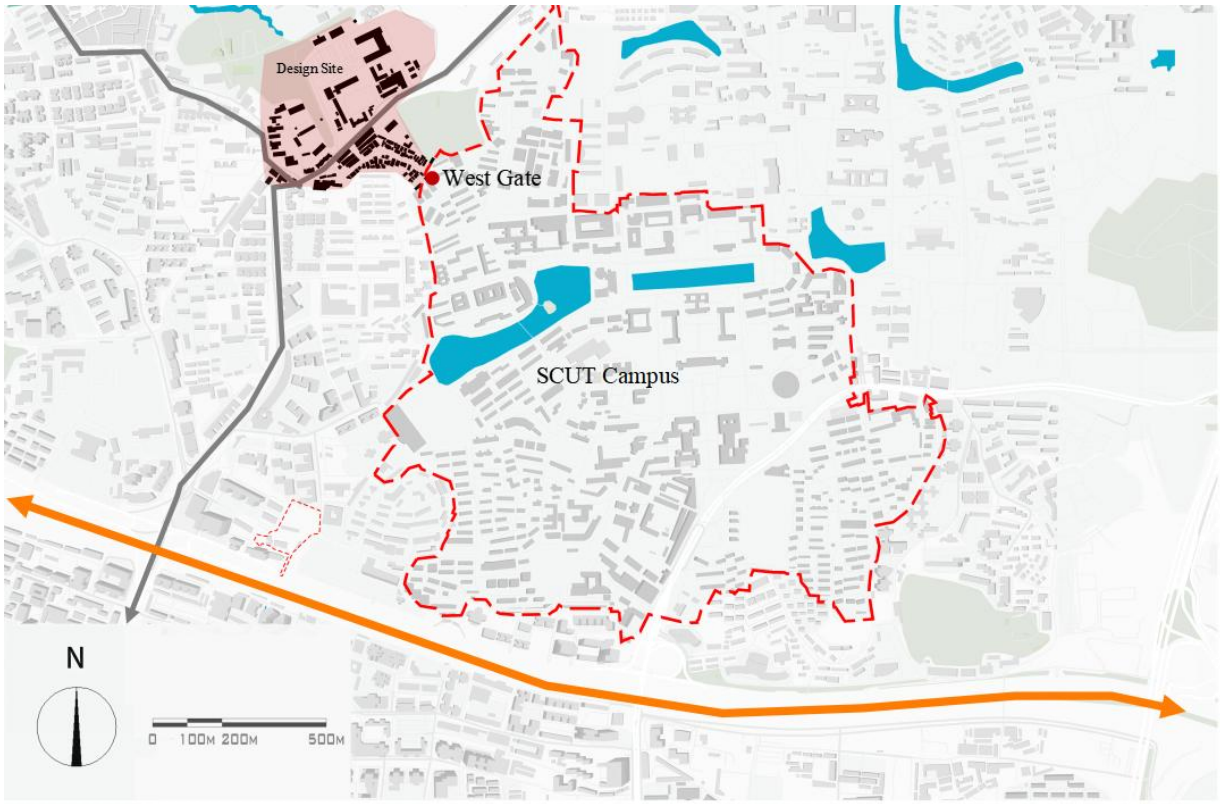


Figure 1- 1 Design site

(Source: Drawn by the Author)

1.4 Relevant concepts and research content

1.4.1 Relevant concepts

(1) Campus-proximate areas

Currently, the scale of campus-proximate areas cannot be fully quantified, and there is no clear definition in academia. Typically, people can intuitively identify the approximate spatial range of Campus-proximate areas, where university campus activities are closely integrated with urban life outside the campus, and are endowed with certain cultural symbols.

Although there is no clear concept and boundary definition for "Campus-proximate areas" in the domestic academic community, in order to make the entire study more clear, this paper refers to relevant literature to make certain definitions: ① Quantitative: The existing scope of district-level urban design generally within 10km^2, providing a basis for the

delineation of the research scale in this paper; ② Qualitative: Mainly based on the emphasis of the research and the influence of the university on the surrounding areas. According to the emphasis of the research, the spatial range is defined as: taking the campus as a "core" and forming a network structure from points to lines and from lines to areas based on its influence strength.

When delineating its spatial extent, the level of influence that a university has on its surrounding areas is also a crucial factor to consider. Specifically, based on this influence, the relationship between the university and campus-proximate areas should include the following aspects: the area can benefit from direct or indirect services provided by the university; the university indirectly impacts the development of campus-proximate areas through economic, cultural, and functional connections.

(2) University-city relationship

Due to various factors such as educational philosophies, government planning, and social activities, universities form a complex and intertwined system with their surrounding environment. The relationship between universities and their surrounding environment includes both positive and negative forms such as cooperation, adaptation, assimilation, competition, contradiction, and conflict. The American Chicago School categorizes these interactions and influences between two or more entities as various forms of "interaction".[3]

Therefore, this paper primarily aims to promote the harmonious development and positive interaction between universities and campus-proximate areas. It analyzes the development of university-city relations, starting from the medium of the relationship, and proposes regeneration strategies to facilitate the harmonious development.

① Mediums of relationship

This paper divides the mediums facilitating the positive interaction and development between universities and their surrounding areas into two levels: physical space and non-material aspects. Physical space serves as the medium and carrier connecting the relationship between university campuses and the surrounding environment, including the distribution of public facilities, connectivity of transportation networks, and land use. Non-material aspects

refer to policies, systems, social structures, and economic structures, such as demographic composition, employment status, economic structure, industrial composition, urban resource development level, and natural structure. Campuses and campus-proximate areas depend on and permeate each other within the realms of physical space and non-material content.

② Relationship analysis

There are visible surface spatial relationships, deep-seated spatial relationships awaiting further exploration, and quantifiable dynamic interaction relationships between universities and campus-proximate areas. Surface spatial relationships involve the physical spatial forms of university campuses and their surrounding areas, manifested in the connectivity between campuses and campus-proximate areas in terms of boundaries, road networks, functions, landscapes, etc. Deep-seated spatial relationships involve the relevance between universities themselves and social and economic activities in the campus-proximate areas, manifested in campus accessibility, spatial vitality of the surrounding environment, openness of campuses to the surrounding environment, and integration of campuses with the campus-proximate areas. The dynamic interaction between internal and external personnel of the university reflects the interaction between the university campus and the surrounding environment. The positive interaction between universities and their surrounding areas is a dynamic process that promotes the coordinated and complementary development of campuses and campus-proximate areas.

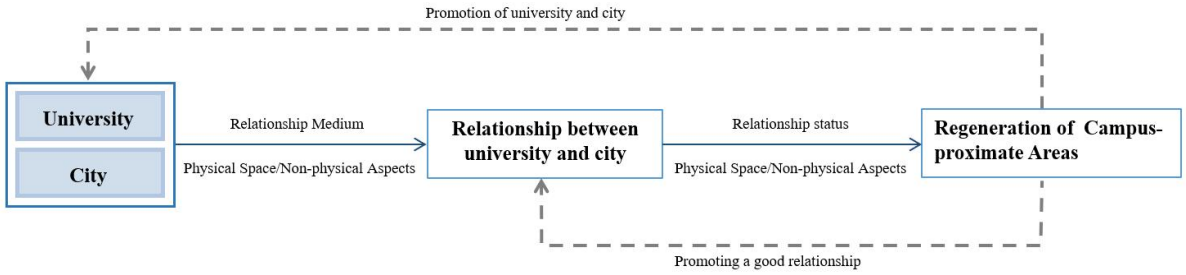


Figure 1- 2 Perception of university-city relationship

(Source: Drawn by the Author)

1.4.2 Research content

The opening chapter of this paper describes the research background of the regeneration of campus-proximate areas based on university-city relationship, and discusses the research object as well as related concepts, and clarifies the research methodology and framework structure.

The chapter 2 is literature review. Firstly, the relevant studies at home and abroad are sorted out, and then the university-city relationship is researched, and the university-city relationship is analysed in terms of the evolution of the relationship between universities and cities, the impact of interaction, and the trend of development. Secondly, combined with the relevant points to enhance university-city interaction, it is proposed that the spatial renewal content of university peripheral areas is divided into two categories: activity space and innovation function space, which paves the way for the subsequent research.

The chapter 3 is case study, which analyses the spatial organisation patterns and characteristics of three cases with different degrees of university-city interaction, and summarises the strategies and experiences of regeneration of campus-proximate areas that promote university-city interaction.

Chapters 4 to 6 are the core chapters of this paper. Inspired by theories and cases, the regeneration strategies for the three aspects of function, space and resources for campus-proximate areas are proposed and applied to the area outside the west gate of Wushan Campus of South China University of Technology. By analysing the dilemmas and opportunities of the current development of the site and summarising the specific problems, the regeneration strategies for the functional, spatial and resource aspects of the site are proposed: promoting mixed functional development, creating interactive spatial systems, and collaborative construction and governance.

1.5 Research methods and framework

1.5.1 Research methods

(3) Data collection and literature review method

The author collected, organized, and read relevant domestic and foreign literature materials and engineering projects related to this study through online searches and library inquiries. By grasping the forefront dynamics, research achievements, and their existing deficiencies, the author compiled literature reviews related to the interaction between universities and cities, providing relevant reference materials and theoretical basis for subsequent research work.

(4) Case analysis and field research method

Based on the collection and identification of the research object in this paper, the author conducted field investigations and experiential surveys on some typical cases within their capabilities. Data collection methods included interviews, observations, photography, questionnaires, and online searches. The author also analyzed the design features and design methods of excellent cases at home and abroad to provide a strong foundation for design strategies.

(5) Interdisciplinary research method

The planning and construction of campus-proximate areas are closely related to factors such as policies and the environment. This requires the research to not only focus on architectural design, but also integrate disciplines such as behavioral psychology and sociology. By comprehensively understanding the needs of campus interaction development and the relevant knowledge of campus-proximate areas renovation, effective methods and conclusions can be drawn.

(6) Classification analysis method

This study classified and summarized the collected domestic and foreign literature and cases, using graphs and abstract diagrams to highlight key factors and general characteristics of the information. This approach aims to provide a better, more intuitive, and accurate understanding of the subject matter, as well as to summarize relevant design strategies.

1.5.2 Research framework

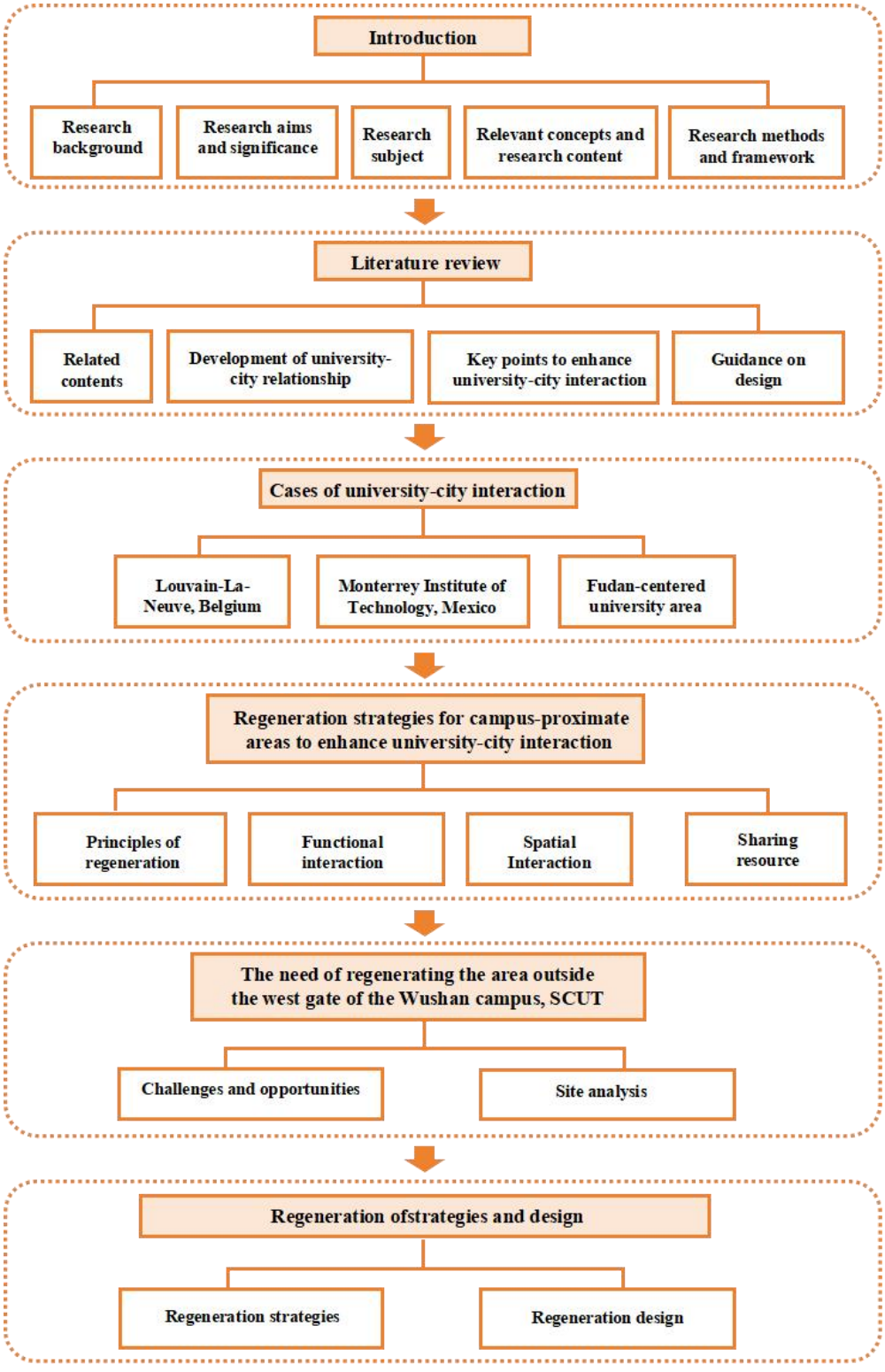


Figure 1- 3 Research framework

(Source: Drawn by the Author)

Chapter 2 Literature review

2.1 Related contents

2.1.1 University-city relationship

In the early 1970s, Harka, Director of the Community Partnership Research Center at the University of Pennsylvania, and Wiewel, Dean of the College of Urban Planning and Urban Affairs at the University of Illinois at Chicago, published their insights into the state of research in this field at that time in the Metropolltan University journal. They believed that there were not many literature on the relationship between universities and communities at that time. In fact, there was almost no rigorous evaluation of the success and failure of collaborative activities — the academic community had not yet devoted more effort to studying collaborative relationships and their role in the social, economic, and political environment.

In his book "City and University," published in 1969, Martin Meyerson et al. analyze the contradictions between universities and cities in terms of housing, income, and socio-economic pressures. They argue that universities today are no longer closed, self-contained "ivory towers" but must assume responsibility and obligations in urban development. The relationship between universities and surrounding communities should be complementary, with universities assisting in the orderly and qualitative renewal of surrounding areas during community redevelopment processes； Lynch (1984) emphasized that the overall planning and design of universities should consider their surrounding areas simultaneously[4]. He pointed out the dilemma between the closed nature of university campuses and the openness of urban spaces. Bender (1988) argues that campuses not only provide space for the concentration of higher education buildings but also create a "semi-enclosed" space within large cities, dedicated to meeting the work and leisure needs of students and the academic community[5]； Etzkowitz et al. (1997) metaphorically describe the relationship between universities, government, and industry as the "Triple Helix." In this model, universities, government, and industry break down their traditional organizational boundaries and, while

maintaining their separate identities and roles, also act as components of each other [6]; Bennewortha et al. (2010) propose that campuses and cities need to be jointly managed to avoid adverse impacts on both sides [7].

Research on the relationship between universities, communities, and cities in China began in the 1980s. Later, there was a gradual emphasis on the interaction between universities and cities in the planning and design of university campuses. By the end of the 20th century, research on the development of universities and cities focused on the impact of "university towns" on urban spatial development, and specialized discussions were conducted in the form of dedicated topics. The planning and design of universities were no longer limited to architectural design alone; various fields such as urban design, urban planning, ecology, sociology, economics, political science, policy studies, demography, and urban geography began to be researched. A notable example is Huang Shimeng's concept of the "invisible campus" proposed in "The Experience and Strategy of Taiwan University Campus Planning"[8]: dividing the planning scope of university campuses into two categories, one being the "planning area," where the university has ownership, management, and usage rights, and the other being the "research area," which is significantly influenced by the university's daily life and activities. These affected surrounding areas constitute the scope of the "invisible campus," indicating that the university's relevant functions have gradually expanded to the surrounding communities. Through the rational and effective use of land both inside and outside the campus, the development of interaction between universities and cities can be promoted, creating a valuable urban environment overall. He (2004) analyzed the background of university participation in regional development, pointing out the significance of universities participating in the development of surrounding areas: it helps to achieve the basic educational functions of universities, fosters specific campus spirits, establishes unique regional characteristics for the institution, gradually forms the traditions and reputation of the university itself, and facilitates the transformation of scientific and technological achievements from universities[9].

In recent years, research has focused more on the interactive development between the two. Tu and Ding (2021) introduced the concept of the "conjugate dynamic body" to explore the impact of the current relationship between universities and cities on social development[10]; Shi and Zhou (2022) proposed that the relationship between universities and the government occupies a central position in the tripartite relationship between government, industry, and academia. The interaction within the university-town community involves both cooperation and conflicts, requiring the establishment of internal integration mechanisms and external control mechanisms to maintain its smooth operation[11]. Research on the development of the relationship between universities and cities is gradually becoming more abundant.

2.1.2 Campus-proximate areas

As urbanization continues to advance, scholars first recognized the importance of universities to the areas proximate to their campuses. Markusen (1996) explored the potential for the development of industrial zones around universities[12]. Sassen (2001) argues that universities play a significant role and hold a prominent position in global cities within the world economy. She suggests that universities should serve as engines for urban development[13]. Florida (2002) explores the impact of the rise of the creative class on cities and societies, emphasizing the importance of talent and innovation for urban development[14]; Brown et al. (2010) studied how universities can become drivers of economic development in campus-proximate areas, including aspects such as economic growth and job creation[15]. Garcia (2014) explores how universities can become anchor institutions for urban regeneration, driving urban development and societal change. The author points out that universities, as centers of knowledge innovation and social service, can lead positive urban transformations through collaborative projects, urban planning, and community engagement. The article also emphasizes the importance of cooperation between universities, government, businesses, and communities to achieve comprehensive urban development[16].

In the early stages of campus planning and development in China, universities were often regarded as "ivory towers" independent of the surrounding cities. Their planning and design were typically conducted independently, with little emphasis on the development of the

surrounding areas. In recent years, there has been an increasing amount of research on the environment surrounding universities.

Domestic research focuses on different types of spatial relationships. Pan (2005) He believes that the surrounding areas of universities have a multitude of stakeholders but lack effective facility allocation and support systems, making it difficult to form mechanisms for coordinated development with universities. This is also a dilemma faced by the regeneration of areas surrounding universities[17]. Gao (2011) discovered that the trend of independent development is hindering the healthy development of urban spaces[18].Pan and Xie (2020) found that areas with higher concentrations of universities exhibit more pronounced gentrification characteristics, while isolated campuses lack a sufficient potential consumer base to drive the gentrification process[19]. Liu (2022) pointed out issues such as the contradictions between neighboring urban villages and universities and how urban villages constrain urban development[20].

From existing research findings, it is evident that there has been considerable attention both domestically and internationally on the regeneration of campus-proximate areas. However, due to differing social, cultural, and economic backgrounds, studies on the regeneration of these areas exhibit distinct characteristics at different stages. In foreign contexts, after undergoing prolonged physical space transformations, recent research has placed greater emphasis on aspects such as cultural inheritance and enhancement, long-term economic development and sustainability, and the intrinsic integration of universities with surrounding communities. Conversely, in the early stages of urban regeneration in China, economic growth often served as the primary objective, and due to the relative independence of campuses from cities, the regeneration of universities and cities was often disjointed. In recent years, research focusing on the optimization and regeneration of existing resources has increased, alongside growing efforts to comprehensively renew campus-proximate areas and establish long-term mechanisms, although there remains a gap when compared to international practices. Furthermore, studies often compartmentalize universities,

communities, and urban blocks as independent regeneration units, resulting in a relative lack of comprehensive research on campus-proximate areas as a whole.

Based on the analysis above, this paper views campus-proximate areas as a holistic regeneration unit. Building upon existing perspectives from management studies and sociology, it conducts an in-depth analysis of the development of the relationship between universities and cities. From the perspectives of architecture and urban planning, it constructs a comprehensive framework for regeneration strategies to reshape the vitality of campus-proximate areas.

2.2 Development of university-city relationship

2.2.1 Evolution of this relationship

History is like a mirror. Studying the evolution of the relationship between universities and cities from its historical origins helps strengthen our understanding of fundamental issues such as the functions of modern universities and the spatial relationships between cities and universities. This understanding is essential for approaching the future with caution.

Higher education in Europe has a long and early history, characterized by relatively mature construction models and educational systems. Over time, it has established a longstanding relationship of mutual interaction and development with cities. Traditional university towns in Europe typically feature universities organically integrated within towns without physical walls, allowing for seamless permeation and integration with the urban public space system[21].

In the late 11th and early 12th centuries, universities were established as "street universities," situated in separate street buildings within the central areas of cities. In smaller European towns like Cambridge, Oxford, and Leuven, this gradually evolved into characteristic university towns with the university as the core function of the city. The emergence of universities had a significant impact on social relations within these university cities, leading to two distinct phases: confrontation and conflict between the university and citizens (from the 13th to the 19th century), followed by cooperation and complementarity

(from the 19th century to the present)[22]. As European political entities trended towards centralization and the privileged status of universities gradually declined, friction and conflict between university and city were replaced by cooperation and mutual complementarity. Universities, towns, faculty, students, and citizens coexisted and depended on each other within the university cities. The towns provided living services such as food, accommodation, and entertainment for university faculty and students, while the universities offered professional education and services to the towns, actively engaging in town and community affairs[22]. The close integration of universities and urban industries, with purpose-built residential buildings and universities, formed the core of the new society[23].

The development of Chinese universities shows different characteristics from those of foreign countries. After the founding of the People's Republic of China, the fundamental change in China's social and political system led to the predominance of the "comprehensive study of the Soviet model" as the main trend in campus construction during this period. Universities were concentrated in the suburbs, becoming large-scale "talent factories" that drove the development of the suburbs[24]. However, such "unit compounds" with living facilities do not share amenities with the city, making universities independent social systems immune to external interference within the urban setting. After the reform and opening-up policy, higher education moved towards the transformation of "socially-run universities". With the advent of the knowledge economy era, universities, where cutting-edge knowledge and high-quality talents converge, have become central institutions for the transformation of research outcomes into practical applications.

2.2.2 Impact of university-city interaction

The interaction between university and city, as a complex and diverse social phenomenon, directly or indirectly shapes the spatial organization and environmental characteristics of the areas surrounding universities[25][26]. The interaction between universities and cities not only directly affects the spatial organization of campus-proximate areas but also indirectly influences the environmental landscape and development through various aspects.

This interactive relationship is not only an inevitable trend in urban development but also a significant driving force for the mutual prosperity of universities and their surrounding areas.

In terms of direct impacts, universities, as hubs for knowledge, talent, and technology, directly drive the transformation of spatial organization in their surrounding areas through their expansion and development. With the expansion of university campuses, the demand for campus construction, student dormitories, and teaching facilities continues to increase, prompting the surrounding areas to undergo land planning, optimize transportation networks, and develop public facilities to provide corresponding functions to meet the needs of university development. At the same time, the research activities and technology transfer of universities also directly drive the upgrading and innovation of industries in the surrounding areas, forming an integrated development model of industry, academia, and research.

In terms of indirect impacts, the cultural atmosphere, lifestyle, and consumption habits of universities subtly influence the environment of the surrounding areas. As a distinct group within the city, the cultural demands, aesthetic concepts, and consumption levels of university faculty and students impose higher requirements on the commercial layout, cultural atmosphere, and environmental quality of the surrounding areas. This prompts the surrounding areas to enhance environmental remediation and elevate cultural standards to meet the needs of university faculty and students, thereby improving the overall image and attractiveness of the entire area.

Given the significant radiating influence and leading effect exhibited by universities in the process of urban development, the evolution of their surrounding areas is gradually shifting from a spontaneous and disorderly state to a more systematic and orderly development mode. These areas are not only becoming increasingly multifunctional, covering education, commerce, and residential functions, but also their population structure is becoming more diverse, attracting various groups such as students, faculty, businesses, and residents, forming unique urban zones. They serve as important carriers for accommodating the spillover effects of university functions, not only sharing some educational and research tasks but also expanding functions related to culture and social interaction. This development

trend has gradually made the surrounding areas of universities important nodes in urban development, attracting considerable attention to their planning and development strategies.

In recent years, more and more scholars have begun to pay attention to the problems existing in the surrounding areas of universities, especially in areas such as urban villages and student streets, where issues such as environmental pollution, chaotic management, and outdated facilities are often exposed. In response to these issues, scholars have proposed various regeneration strategies aimed at promoting the sustainable development of the surrounding areas of universities through optimizing spatial layout, improving environmental quality, and enhancing public service facilities.

The presence of universities attracts various talents and resources, bringing more development opportunities and vitality to the surrounding areas. At the same time, universities establish close connections with the surrounding communities through initiatives such as open education and community services, promoting social harmony and inclusiveness. With the overall trend of increasingly frequent exchanges and interactions between universities and cities, the coordinated development of campuses and cities is an inevitable trend[27]. The data statistics conducted by the China University Media Alliance in 2016 regarding whether 131 universities are open showed that 81.89% of respondents indicated that their respective universities allow outsiders to enter the campus[28]. After the pandemic, many universities have announced plans to further open their campuses in an orderly manner to meet the growing demand for campus visits from the public. Harbin Institute of Technology has fully opened its campus, and facilities such as the HIT Center, museum, and aerospace museum are now open to the public around the clock. In early 2024, Tsinghua University and Peking University announced that they would also advance campus opening arrangements in an orderly manner[29].

As the core of campus openness lies in breaking the traditional campus's closed nature and allowing the public to have freer access to and use of campus resources, undoubtedly, this greatly enhances the public's participation and sense of access to higher education. However, some universities have yet to open their campuses to the public, hindering public visits to

universities. Due to concerns about student and staff safety, as well as campus capacity, some universities implement closed management to control the flow of people, maintaining order and security on campus, and preventing outside individuals from disrupting normal teaching activities[30]. For university administrators, opening up campuses means they need to face a more complex and dynamic management environment. On one hand, campus openness leads to more frequent and diverse activities on campus, increasing the difficulty of campus security management. University administrators need to invest more resources and effort to ensure the stability of campus order and the guarantee of public safety. On the other hand, opening up campuses may also lead to the overuse and depletion of campus resources. As public demand for campus resources continues to increase, how to allocate and manage these resources reasonably, avoiding waste and misuse, becomes an important issue that university administrators need to address.

2.2.3 Trends of this relationship

Universities are products of highly developed cities, utilizing urban resources for their own development from their inception. In the current close interaction and development between universities and cities, their relationship is mutually beneficial and reinforcing. The various resources of universities can only exert their strong capacity for feedback to the city, aiding in urban construction and development. As the city further develops, it will in turn promote the university's advancement towards a better direction, presenting a spiral-like interactive development model.

Based on the review of the historical evolution of the relationship between universities and cities both domestically and internationally, as well as the study of their interactive effects, the author believes that the relationship between universities and cities will become even closer, with an increase in the frequency of interactions. This will be manifested in three specific aspects: complementary resource advantages, coordinated transportation construction, and innovative cooperation and exchanges. Through a thorough analysis of the development trends of universities and cities, it will help to reconsider the focal points of updates and provide a social foundation for the formulation of subsequent design strategies.

(1) Sharing resource advantages

As urban consumption undergoes an upgrade in China, the development of cities is transitioning from broad-scale expansion to refined enhancement, becoming a new norm aimed at improving living standards. However, throughout this process, high-quality public spaces, necessary for various activities, remain scarce[31]. The complementary advantages between universities and urban resources are an inevitable trend in the broader social context. This is mainly manifested in two aspects:

Firstly, universities have significant advantages in knowledge innovation, talent cultivation, and scientific research. With abundant high-quality faculty and advanced research equipment, universities can conduct in-depth academic research and technological innovation. Moreover, universities serve as important bases for talent cultivation. Through systematic education and training, they provide a large number of high-quality talents for the city, thus offering strong talent support for the city's sustainable development.

Secondly, cities possess unique advantages in resource aggregation, industrial development, and market demand. As the hub of economic, cultural, and social activities, cities boast abundant natural and cultural resources, providing rich materials and cases for the research and teaching activities of universities. Additionally, the industrial development in cities offers vast application scenarios and practical opportunities for universities, enabling the rapid transformation of university research achievements into tangible productivity.

The complementary advantages between universities and cities are manifested in various aspects such as knowledge innovation, talent cultivation, scientific research, resource aggregation, industrial development, and market demand. This complementarity not only promotes the development of both parties but also provides powerful momentum for the progress of the entire society.

(2) Transportation coordination construction

The quality of urban transportation directly affects residents' living standards, urban vitality, and the potential for urban development[32]. The rapid urbanization in China has led to a series of transportation problems due to the division of large blocks, the predominant use of

cars in road planning, resulting in an irrational road network layout, low density, and inconvenience for pedestrians. Simultaneously, the continuous growth in the number of motor vehicles has made "parking difficulties" a widespread issue in cities. At the same time, the spatial development of urban road traffic has gradually shifted from traditional "car-centric" road engineering construction to "people-centric" vibrant street creation[33]. The phrases "narrow roads, dense road networks," "green commuting," "limited pedestrian space," "vibrant streets," and "shared parking lots" are increasingly common in the upgrading of urban road traffic and its spatial development. However, large-scale enclosed university campuses have long been significant blocks in urban areas, posing numerous challenges to transportation between universities and cities. This is primarily reflected in the following two points:

Firstly, it disrupts the rational planning and construction of urban roads and public transportation, reducing the accessibility of the campus surrounding areas and leading to traffic congestion, as well as wasting human resources and time due to long detours for pedestrians. For example, the internal roads of the Wangjiang Campus of Sichuan University, covering an area of over 3000 acres, are not open to the public and are enclosed by walls, resulting in a lack of road density in the urban transportation system within the campus area. Continuous walls along the riverfront lead to problems such as longer detours for pedestrians and poor spatial experience[34].

Secondly, the limited and distant entrances and exits of the campus weaken the connection between campus traffic and urban traffic, reducing the convenience of student travel[35]. Students, as the most dynamic demographic in the new era, exhibit a trend towards stronger individual consciousness and increased consumption demands. However, the limited resources of universities cannot satisfy the diversified needs of contemporary students for richer and higher-standard consumption patterns and quality of life, as most students' daily activities are no longer confined to campus. The diverse modes of student transportation require comprehensive support from campus and city transportation infrastructure.

Therefore, integrating campus planning and construction with urban transportation considerations and integrating them with urban transportation and spatial planning will facilitate rational urban transportation layout and street space shaping, as well as providing convenient and efficient transportation services for students. This is an important manifestation of the university's function in serving society and the efficient utilization of land resources.

(3) Innovation co-operation exchange

In today's knowledge economy era where innovation serves as the core, the promotion of the "innovative country" strategy has accelerated the construction of "innovative cities" in cities like Beijing, Shanghai, Shenzhen, Guangzhou, Hangzhou, and Wuhan. In this context, collaborative innovation between universities, social enterprises, and research institutions has become a trend. For example, Tongji University's Siping Road campus leverages its disciplinary strengths in civil engineering, environmental science, telecommunications, and others. By optimizing the spatial environment and service facilities, it extends the design industry chain forward and backward, achieving the integrated development of multiple related industry chains within the core industry cluster[36].

Urban industrial innovation and development rely heavily on the strong support of talent and research capabilities from universities. As the cradle of knowledge and innovation, universities gather numerous outstanding researchers and cutting-edge research achievements, providing a continuous stream of momentum for the upgrading and transformation of urban industries. At the same time, for the research achievements of universities to truly be transformed into practical productivity and drive economic and social development, deep integration with the industry is necessary. Social enterprises and research institutions have unique advantages in technology application, market promotion, and other aspects. They are eager to establish close cooperation with universities to access the latest research results, enhance their technical expertise, and improve their market competitiveness (Figure 2-1). Meanwhile, universities hope to push research outcomes into the market and realize their social and economic value through collaboration with enterprises and research institutions.

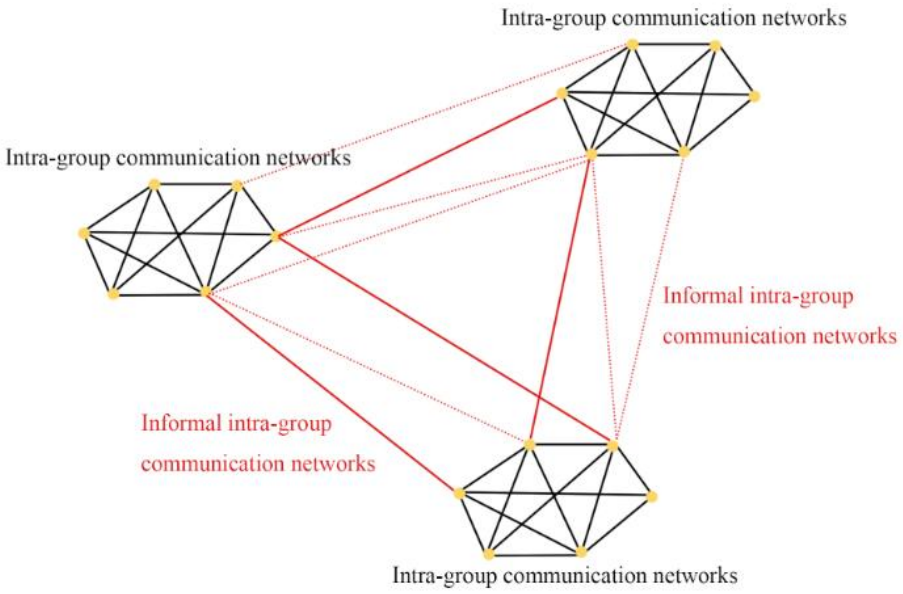


Figure 2- 1 Construction of communication networks

(Source: Drawn by the Author)

Facing the interactive demand for innovative cooperation and exchanges between universities and cities, universities should not only fully leverage their own talent and research advantages to establish formal cooperative relationships with relevant enterprises and research institutions in the city to drive the development of innovative cooperation, but also pay attention to innovation space construction. This includes providing convenient transportation links and venues for exchange activities among different knowledge communities within the university and the city, in order to create more opportunities for interaction and exchange, thus driving the generation of innovative knowledge.

2.3 Key points to enhance university-city interaction

2.3.1 Land use mix

Exploring the potential of the campus-proximate areas to ultimately develop into regions with land use mix and intensive land utilization is an essential measure for their regeneration[37]. The concept of land use mix has been subject to varying interpretations, with scholars both domestically and internationally conducting research and discussions on its definition and implications. The American Planning Association, in its publication "Mixed

Use Development: A New Land Use Approach" from 1976, highlights that mixed land use development can invigorate urban areas, prevent unnecessary urban sprawl, and create diverse urban functions. The book describes land use mix development as follows: (1) It involves the combination of three or more land functions; (2) Land use should adopt high-density and high-intensity development patterns; (3) Land development should align with overall urban planning, and the latter should control aspects such as the type, scale, and density of functions[38]. Berton (2002) believes that mixed land use in cities is one of the guiding principles for compact urban development[39].

Therefore, land use mix manifests as the interconnection and layout of different types of land, facilities, and functional spaces in various dimensions of physical space. It reflects the organic combination of different functional land, facilities, and spaces, emphasizing "diverse functional uses" and "spatial structure." Overall, land use mix is a common characteristic shared by cities worldwide[40].Many scholars at home and abroad have explored the effectiveness of land use mix, and research has found that land use mix has a promoting effect on various aspects such as chronic traffic congestion, public health, urban safety, and urban vitality[41-44] .

Universities, as one of the most promising assets in cities, are increasingly playing a stronger leverage role in urban regeneration processes. Through collaboration with surrounding communities and relevant businesses, they can effectively leverage their local utility. Therefore, their regeneration designs should emphasize a goal of overall structural development and propose regeneration design strategies based on the integration of existing functional resources and intensive land use.

2.3.2 Social interaction

The interaction between universities and the surrounding urban environment contributes to social interaction, and understanding this interaction requires the application of theoretical perspectives from urban sociology, analyzed from the standpoint of social interaction theory. Social interaction theory originated in the early 20th century in the United States as a development of behavioral psychology. This theory suggests that individuals, groups, or

communities engage in interdependent social interactions through the dissemination of information. These social activities lead to mutual influence and behavior change among individuals or groups. The manifestation of public society, namely public social interaction, as elucidated by Habermas in "Toward a Reconstruction of Historical Materialism," highlights interaction as the fundamental force and form of social development[45].

In the process of the development of social interaction theory, a significant number of scholars and their viewpoints emerged. Among them, representatives of role theory such as Robert Park, Jacob Moreno, and Ralph Linton.They suggest that "individuals are seen as playing roles associated with specific positions within the social structure". Herbert Blumer, a representative scholar of symbolic interaction theory, suggests that there are three essential factors constituting social interaction. First, there must be two or more interacting agents. Second, there must be some form of contact between the interacting agents. Third, the parties involved in the interaction consciously consider the "meaning" represented by the "symbols" of their actions[46].

Interaction, as a way for entities to connect, implies at least the following three points. First, the two or more entities involved in generating the interaction are within the same natural or social system, which is a prerequisite for their interaction. Second, the manner of connection between these entities is interaction, meaning that each entity actively influences the other, rather than passively receiving influence. Third, the entities involved in the interaction possess compatibility, harmony, and linearity; the development and progress of one aspect propel rather than hinder the development of another aspect. Therefore, interaction can also be referred to as mutual influence, a process in which entities or systems mutually exert positive effects on each other, leading to changes between the entities or systems.

Table 2- 1 Specifics of activity spaces in the campus-proximate areas (Source: Drawn by the Author)

Crowd type	Activities	Concrete content		Space type
Teachers, students-residents	It includes the content of daily life activities such as daily consumption, transport commuting, dating, leisure and sports.	Commercial retail	Convenience store/accessory store/pharmacy/optician etc.	Spaces in buildings
			Large shopping malls, specialty shops, etc.	
			Drawing materials and other design supplies shop	
		Catering	Restaurants, cafes, bars, etc.	
Residents and industry-related personnel		Residential property	Neighbourhood housing rental, etc.	
		Cultural facility	Art galleries, exhibition halls, museums, etc.	
		Sports facility	Gymnasiums, community centres, gyms, etc.	
		Green area	Courtyard, park, square, etc.	Active open spaces
Teachers, students and industry-related personnel	With the promotion of universities, joint schooling is carried out to cultivate talents demanded by enterprises; universities and enterprises jointly build research centers to form a chain of cooperation.	Cheaper office space, research institutes related to university disciplines, well-known companies, etc.		Innovative functional spaces such as co-working office and R&D spaces

From the perspective of "dynamic agents" in social interaction, human needs are responded to within social production relations and manifest as human interests. In social production relations, the needs, desires, motivations, and behaviors of different individuals and groups exhibit differentiation, leading to the differentiation and combination of interest outcomes, thus becoming different "interest entities"[47]. In the context of the interaction between universities and urban environments explored in this paper, the "interest entities" represented by the population are divided into three categories: teachers and students,

industry-related personnel, and residents. The interaction activities between these groups require the support of physical spaces (Table 2-1). The spaces where these interactions occur provide comfortable environments for various human activities.

Activity spaces primarily emphasize the the functions that people use when they stay, providing a comfortable and pleasant environment for various human activities. Due to the complexity of the functional composition and the diversity of spatial environments in the vicinity of universities, activity spaces exhibit diverse forms and scales. These spaces accommodate interaction activities among various groups of people and can be categorized into activity spaces in buildings, active open spaces and innovative functional spaces based on their types.

2.3.3 Urban innovation space

In recent years, universities, especially research-oriented ones, are increasingly recognized as drivers of regional innovation and development, playing a crucial role in knowledge production and innovation. Scholars generally believe that universities are institutions engaged in research activities, supplying qualified labor, and generating and disseminating knowledge throughout the social system." The Triple Helix theory posits that the interaction among universities, industries, and governments is crucial for improving the conditions for innovation in knowledge-based societies. Innovation is not only about the development of new products by companies but also about creating new arrangements in the institutional domain[48].

In the backdrop of the "knowledge economy" and the era of the "Fourth Industrial Revolution," countries worldwide have been enhancing their core competitiveness and emphasizing the strategic role of universities in driving innovation through the implementation of national innovation plans. In 2011, the UK government introduced the "Innovation and Research Strategy for Growth," allocating £150 million annually in government funding to promote collaboration between academia and industry, thereby facilitating the translation of innovative outcomes and benefiting higher education from regional cluster innovation development[49]. In 2015, the United States National Economic

Council and Office of Science and Technology Policy jointly released the "National Innovation Strategy (A Strategy for American Innovation)" and the "National Network for Manufacturing Innovation (NNMI)," establishing an innovation network system that brings together universities, businesses, federal agencies, and other institutions. In 2016, General Secretary Xi Jinping proposed at the National Conference on Science and Technology Innovation to optimize the layout of research institutes and research-oriented universities, respect the regional clustering laws of technological innovation, and build several innovative cities and regional innovation centers with strong driving forces. The 20th National Congress of the Communist Party proposed to build a synergistic innovation system with enterprises as the main body, market orientation, and deep integration of industry, academia, and research.

Innovation is the essential driving force for high-quality development, and urban innovation space is an important spatial carrier for innovation activities. Urban innovation space is a space where knowledge and technology production-intensive activities such as knowledge learning, processing and re-creation are concentrated in the built-up environment of urbanisation with human capital at the core, and where the agglomeration of innovative enterprises, innovative talents and other innovative subjects, as well as scientific research institutes, incubation accelerators, service organisations and other basic elements, within a certain geographical area in the urban space, is the main manifestation of this[31] (Figure 2-2). In recent years, as innovation activities have increasingly returned to urban areas, the study of innovation spaces at the urban scale has attracted the attention of scholars at home and abroad.

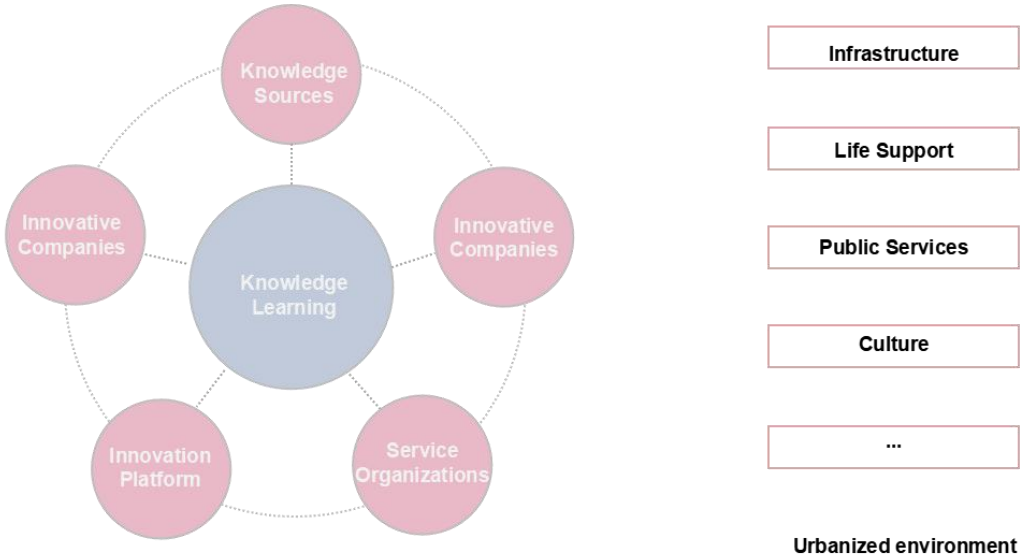


Figure 2- 2 Conceptual framework of urban innovation space[31]

2.3.4 Guidance on design

Through analysis of the main points, it has been clarified that in order to promote interaction between campus and campus-proximate areas, the physical space regeneration in campus-proximate areas mainly involves two categories: activity spaces and innovative functional spaces (Table 2-2).

Table 2- 2 Interactive spatial system (Source: Drawn by the Author)

Types	Regeneration targets	Points
Activity spaces	System coordination	Active open spaces: Scale of space, openness, and continuity of streets
		Pedestrian organisation: Walkability and continuity
Innovative functional spaces	Refine and upgrade	Upgrading of the space organisation model

(1) Active open spaces

For active open spaces, scale is one of the factors influencing human interaction. The design of the physical environment can influence the people using the space, the quantity of activities, the types of activities generated, and their duration to some extent[52]. Once a space is constructed, it inherently carries certain meanings, conveys specific messages, and consequently either promotes or constrains certain behaviors. Moreover, humans naturally

seek high-quality spatial environments. There has been considerable research on spatial scale. Jan Gehl defines the range of 0-100m as the social field of vision. Within the range of 70-100m, individuals have the basic conditions to discern activities and observe crowd states. At a distance of 20-25m, individuals can perceive each other's expressions, and interpersonal interactions gain social significance. Communication frequently occurs within 1-3m, and decreasing the distance allows individuals to perceive each other through sight and hearing[52]. Edward T. Hall, in "The Hidden Dimension," posits that different types of activities require different spatial distances. He delineates individual activity distance, group activity distance, and public activity distance, respectively, at 0.45m, 1.3m, and 3.75m. Research by Yoshiro Watanabe on external spaces also suggests that 20-25 meters is a comfortable scale for outdoor spaces, where people are more likely to engage in deeper communication and interaction. There's also the well-known theory of street scale, where changes in the ratio of building height to spacing on both sides of a street will alter the spatial atmosphere.

As the ratio of height to width increases, it implies a decrease in spatial enclosure and an increase in openness (Figure 2-3). When the ratio is less than 1, the space feels strongly enclosed, potentially leading to feelings of oppression. When the ratio equals 1, there is a sense of symmetry. When the ratio falls between 1.5 and 2, it can become an open and welcoming space conducive to various activities. When the ratio exceeds 2, the space, if not further developed, may appear barren and negative[50].

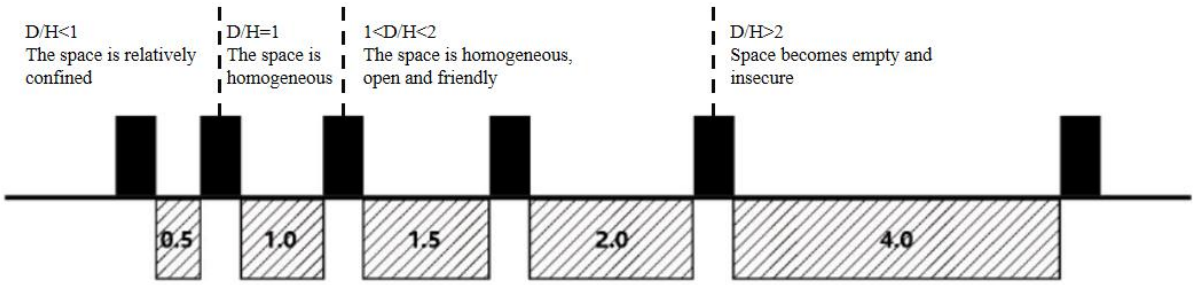
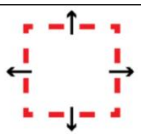
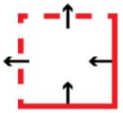
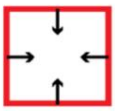


Figure 2- 3 Spatial scale change and its perception[50]

The openness of a space conveys its usability, with higher openness indicating greater public accessibility and lower openness suggesting greater privacy. The degree of openness in a space is determined by two factors: physical accessibility in spatial traffic and individuals' subjective perceptions of the space. Factors such as the degree of enclosure in space

boundaries, the permeability of architectural interfaces, and the compatibility of architectural forms can influence people's perception of the openness of external spaces and the accessibility of architectural functions, thereby affecting the occurrence of behavioral activities (Table 2-3). For instance, a space enveloped by towering walls or dense foliage may evoke a sense of confinement, prompting individuals to perceive it as less open despite physical accessibility. In contrast, architectural designs that prioritize transparency through glass facades or open layouts can imbue spaces with an inviting ambiance, encouraging exploration and communal activities.In essence, the interplay between physical accessibility and subjective perceptions defines the openness of a space, exerting a profound influence on the behavioral dynamics within it.

Table 2- 3 Types of spatial patterns with different degrees of boundary enclosure (Source: Drawn by the Author)

Type of spaces	Illustrations	Characteristics
Full open space		The space as a whole is open, with no strong sense of boundaries.
Semi-open space		The boundaries have a strong sense of limitation, and it is easy to create multi-layered spaces
Enclosed space		The boundaries have the strongest sense of delimitation, with a clear inward orientation

(2) Pedestrian organisation

The continuity of street life spaces is an important criterion for measuring the vibrancy of urban public spaces. Jane Jacobs argues that streets are the containers of urban public life: "Streets and their sidewalks, the main public spaces of a city, are its most vital organs. If a city's streets look interesting, the city looks interesting; if they look dull, the city looks dull"[51]. 140 people engage in various activities on the streets: stopping conversing, observing, and being observed, among others. People engage in unconscious social activities while walking on city streets. It is this unconscious socializing that creates a street-level community life pattern, which can enhance the order and safety of public spaces.

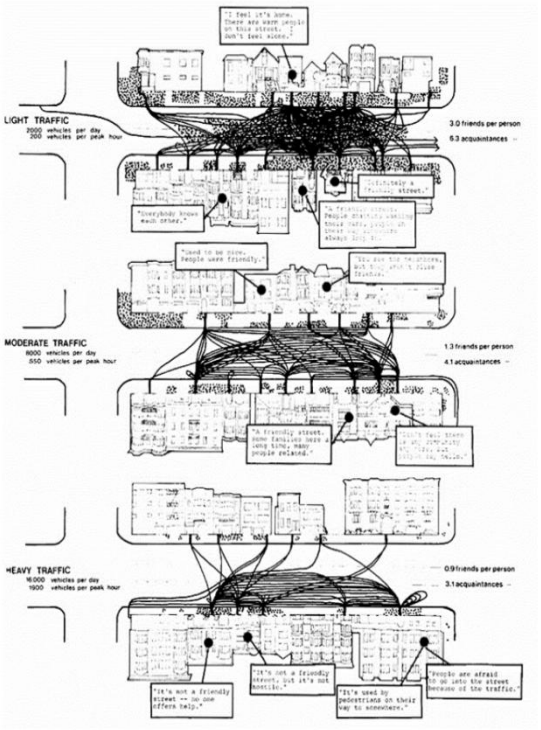


Figure 2- 4 Traffic-related Neighbourhood Interaction Study[52]

Meanwhile, there is a negative correlation between the frequency of outdoor activities and the volume of street traffic. Jan Gehl found in a study of San Francisco that when comparing three nearly parallel streets, residents on streets with heavy traffic had fewer outdoor activities, and communication among neighbors in the community was nearly absent[52]. However, on streets with lighter traffic, outdoor activities among residents significantly increased. Therefore, reducing street traffic volume can increase the occurrence of interactive activities (Figure 2-4).

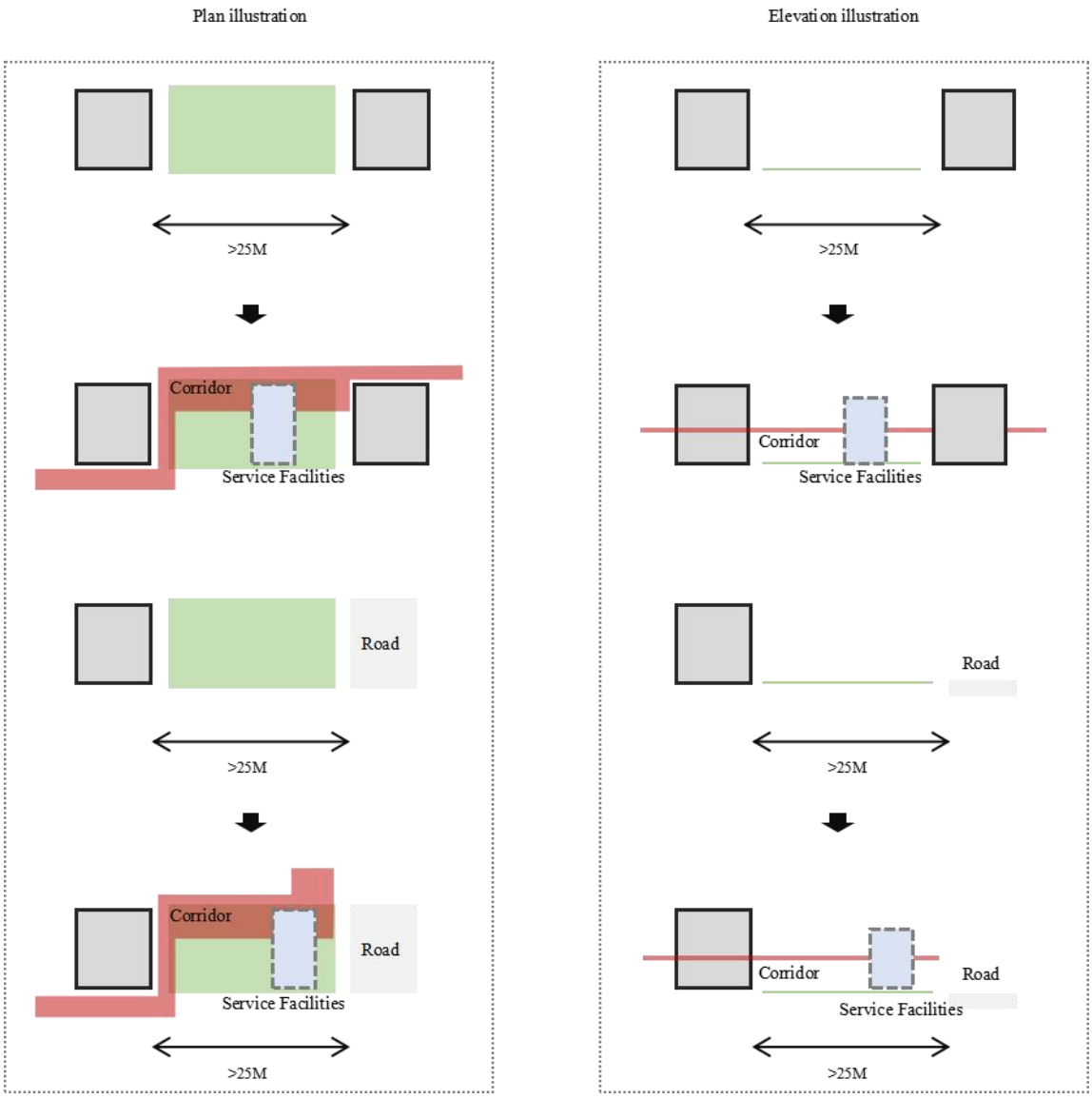


Figure 2- 5 Spatial creation of active open spaces

(Source: Drawn by the Author)

Thus, for activity spaces, scale, openness, and continuity of streets are crucial. To create activity spaces suitable for various interactions, appropriately scaled open spaces can be developed and interconnected through pathways and corridors to enhance the quality of public open spaces (Figure 2-5).

(3) Innovative functional spaces

Innovation, research and development, learning and communication are all key knowledge activities, reflecting the core characteristics of urban innovation space[53]. Urban innovation spaces can be broadly based on scale from small to buildings (innovative buildings), then to the scale of districts (innovative neighbourhoods, innovative parks), and

ultimately to innovative cities[54]. As a new type of urban space, urban innovation space exhibit some new characteristics in spatial form and organization.

The components of urban innovation space not only include elements such as enterprises, universities, and research institutions that generate innovation but also encompass supporting elements such as business services and financial services that provide various services for innovation development. Moreover, environmental factors such as material, cultural, and policy environments also influence the formation of urban innovation spaces[55].

Furthermore, due to the high integration of industrial and non-industrial functions in the innovation-driven economy, the mixing of functions within plots (even within buildings) has become a prominent feature of high-quality urban innovation spaces. Under this trend, the carrier function of innovation activities has shifted from closed and singular innovation production spaces to innovative communities that revolve around the actual needs of specific groups, integrating innovation activities with social life[56]. This transformation leads to a shift in the organizational model of urban innovation spaces from closed and clustered to embedded (Figure2-6). Campuses, parks, and communities are merging, and small-scale, mosaic-like embedded innovation spaces are becoming the most dynamic places in the city[57].

The composite functional structure has created a multi-layered, densely developed pattern for urban innovation spaces, characterized by high floor area ratios and building densities in spatial form. The architectural form also tends to resemble commercial office buildings, exhibiting features of functional integration and compact land use.

Figure 2- 6 Evolution of the organizational mode of urban innovation space[57]

Scholars suggest that the requirements of innovative enterprises for industrial parks have evolved from basic physical space needs to environmental value demands, and further to soft environmental needs such as technology, innovation, communication, information sharing,

and intelligent operation. The selection of parks by enterprises is undergoing a process of weakening materialization and strengthening cultural aspects[58][59]. Therefore, the planning of innovation functional area in the new era needs to start from meeting the needs of innovative enterprises and innovators. In terms of functional configuration, it is necessary to moderately provide three categories of life service functions including residential, living, and entertainment, as well as relatively complete production service functions such as technology intermediation and technology finance services, constructing a functionally diverse "comprehensive urban functional area " (Figure 2-7).

In terms of environmental construction, it is essential to create a conducive environment for technological innovation. This can be achieved by constructing informal interaction spaces that encourage communication and socialization among people, fostering an innovative atmosphere that inspires the vitality of innovators. As informal spaces accommodating innovative activities, open spaces should fully consider the interaction habits between people and pedestrian accessibility. Relevant studies indicate that innovative enterprises and talents tend to concentrate in urban spaces with open social environments and humanized living scenes. Additionally, block scales suitable for walking and high-quality public space designs meet the spatial needs of innovation activities[60].

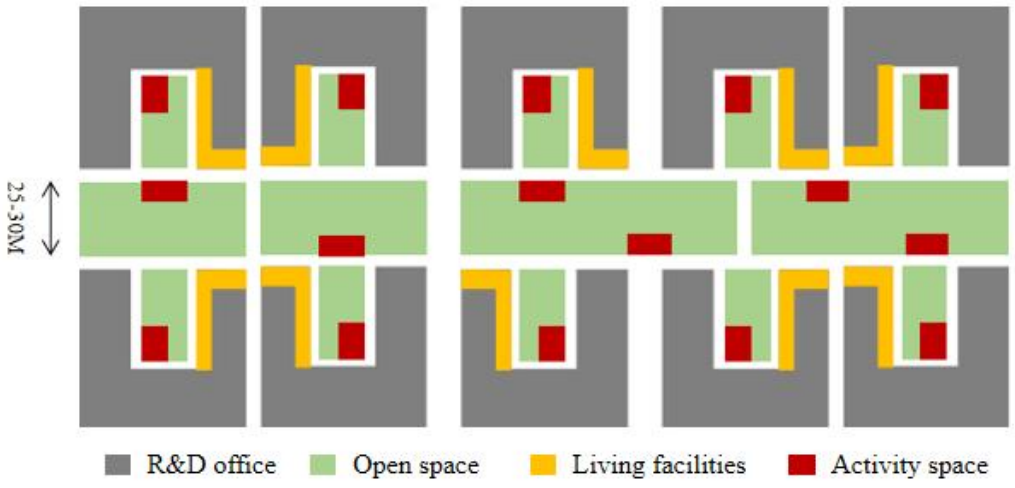


Figure 2- 7 Basic layout patterns of small-scale industrial parks [58]

The open spaces mainly include public open spaces and open spaces enclosed by buildings. In terms of spatial scale, the cluster length is approximately 300 meters (equivalent

to a 3-4 minute walk), and the width of public activity spaces is 25-30 meters. The interaction spaces between buildings generally have an inward orientation, facing towards the central open spaces.

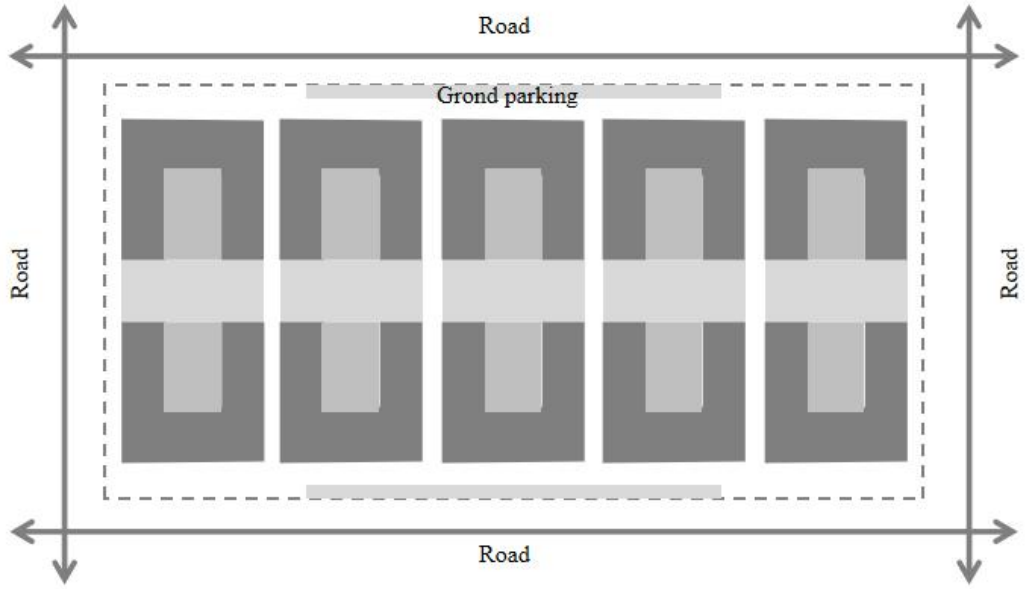


Figure 2- 8 Traffic organisation patterns[58]

Additionally, by arranging activity bases and related supporting facilities, combined with open spaces, the effectiveness of space utilization can be enhanced. In the construction of innovation functional zones, according to the planning scheme, different types of core functions can be designed for the research area and the living area to promote interaction among researchers and facilitate convenience for residents.

In small scale innovation functional area, it is recommended to adopt a traffic organization model that separates pedestrians and vehicles, with a focus on pedestrian traffic organization. Parking facilities should primarily be located underground to reduce surface parking. Surface parking lots are preferably located along the perimeter roads to minimize disruption to the internal pedestrian environment. Innovation functional zones place greater emphasis on pedestrian rights and have a well-developed pedestrian system (Figure 2-8).

2.4 Summary

Throughout history, the relationship between domestic and foreign universities and cities has evolved from estrangement to symbiosis and co-prosperity. The mechanism of interaction

has also expanded from internal communication to synergistic development that is closely integrated with the city.

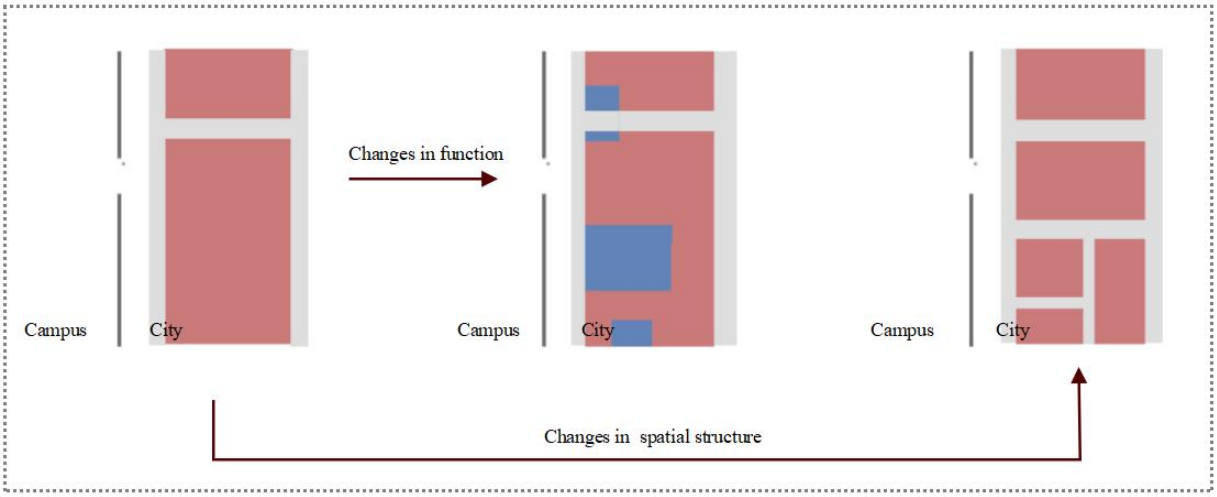


Figure 2- 9 The influence of universities on campus-proximate areas

(Source: Drawn by the Author)

The development of universities has driven the planning of the campus-proximate areas, the optimisation of transport networks and the construction of public facilities to meet the needs of university development (Figure 2-9). These areas are becoming more and more functional and demographically diverse, and have become important carriers for carrying the spillover effects of university functions (Figure 2-10). They not only undertake part of the education and research tasks, but also expand the cultural and social interaction and other related functions.

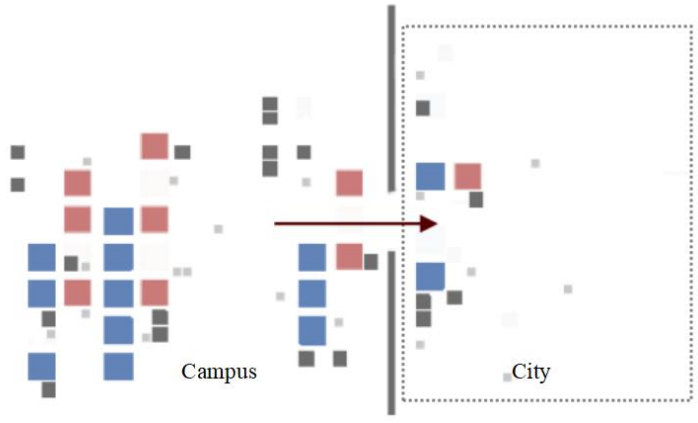


Figure 2- 10 The campus-proximate areas accommodating spillover functions

(Source: Drawn by the Author)

The campus-proximate areas, as an important area directly affected by the university, is the front line of university-driven urban development. To enhance university-city interaction, the regeneration of material space mainly involves two major categories: activity spaces and innovation spaces. By controlling the scale, openness, street continuity, and walkability of spaces, the vitality of activity spaces is ensured. Through the regeneration of innovative functional spatial organisational patterns, the enthusiasm of industry-university-research cooperation can be improved. In this way, the campus-proximate areas will be activated and will develop in synergy with the university.

Chapter 3 Cases of university-city interaction

Different areas have different social backgrounds, traditional cultures and social resources, and the relationship and degree of interaction between university cities vary. The following cases are selected according to the degree of interaction: Louvain-la-Neuve (Belgium), the Universidad Tecnológica de Monterrey (Mexico) and its community, and Fudan-centered university area and KIC (China), and the aim of this study is to investigate the characteristics of the spatial organisation of the cities in order to obtain strategies for improvement.

3.1 Louvain-la-Neuve, Belgium

3.1.1 Introduction

In exploring the integration and development of universities with cities, the case of Louvain-la-Neuve in Belgium is worth studying in depth. In the context of high urbanization, the initial goal of Louvain-la-Neuve was to build a compact, small to medium-sized city. Louvain-la-Neuve emerged from the foundation of the Catholic University of Louvain, building upon the template of Louvain (Figure 3-1）. Following this template, the university adhered to planning principles that align with traditional European town values, including walkability, human-scale spatial dimensions, vibrant public spaces, diverse social composition, and strong adaptability to urban development.

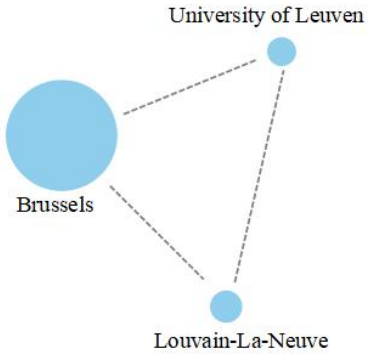


Figure 3- 1 Locational relationship

(Source: Drawn by the Author)

Since the planning was initiated in 1968 and the overall planning outline of Louvain-la-Neuve was designated in 1970, the construction of Louvain-la-Neuve officially began. The construction of the Louvain-la-Neuve railway station was completed in 1975, and the construction of the first phase of the project was completed by 1979. Over the past 40 years of development, Louvain-la-Neuve has successfully achieved its planning goals and has demonstrated a sustainable and positive development status (Figure 3-2).

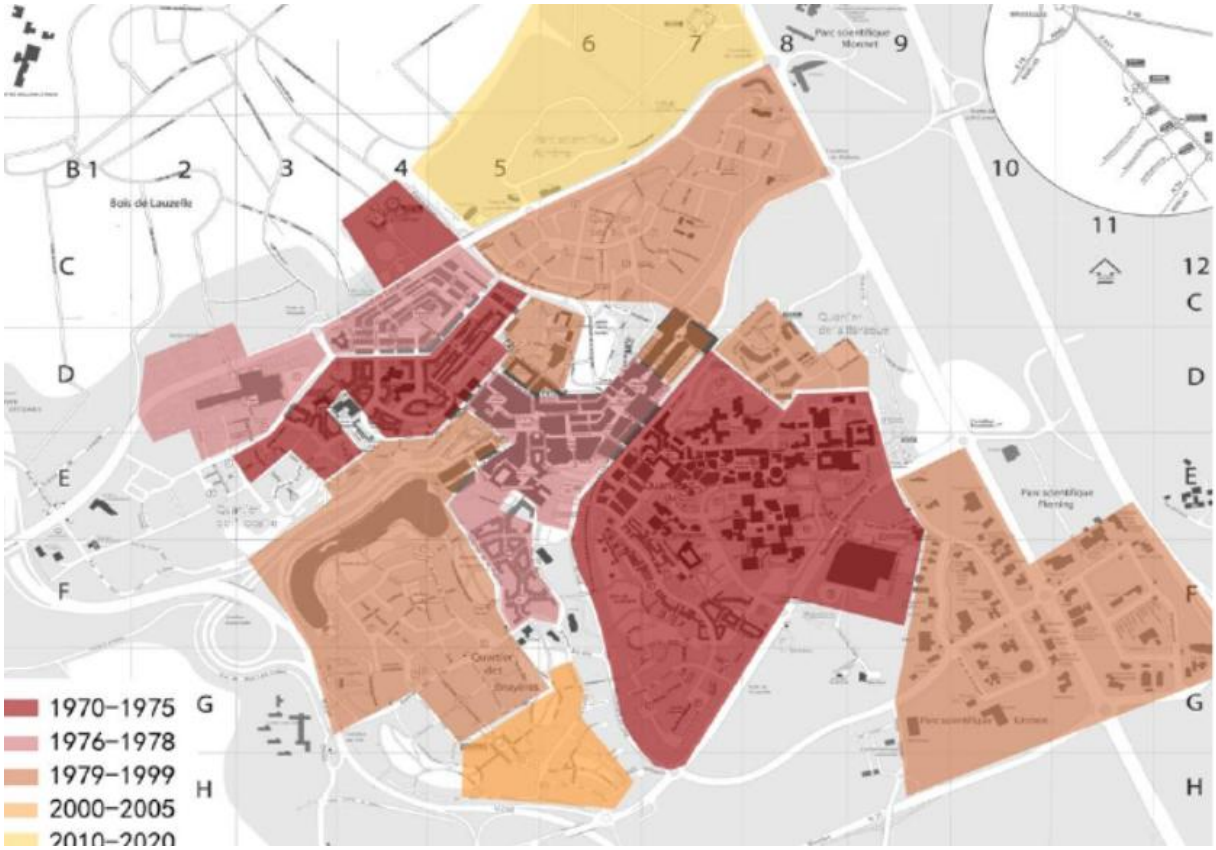


Figure 3- 2 Phased construction

（Source: Drawn by the Author)

After years of construction, the infrastructure within the Louvain-la-Neuve has gradually improved. However, faced with current challenges such as insufficient parking space, saturated residential areas, and the demand for the development of high-tech enterprises, Louvain-la-Neuve has initiated a new round of construction planning. In the La Baraque area, located on the edge of the main urban area and adjacent to transportation lines, a large-scale transportation complex called Courbe Voie has been planned. Additionally, in collaboration with the nearby science and technology park, a significant number of research facilities have

been added. To enhance the level of service industry and create a mixed-use high-end commercial center, the development of the university city is gradually expanding outward based on the advantages of each location (Figure 3-3).

The planning principles of compact layout, mixed-use openness, and continuous pedestrian connectivity have gradually formed in the Louvain-la-Neuve. This involves creating a pedestrian-friendly urban scale through compact land use, enriching the social diversity mixed-use openness, and improving pedestrian accessibility and public transport efficiency through integrated transportation systems. The main planning approach rejects the widespread practice of functionalism and functional space separation influenced by modernist trends. Instead, it combines regional planning principles with the overall context of the area and social development issues to formulate specific planning strategies for the integration and development of universities and cities.

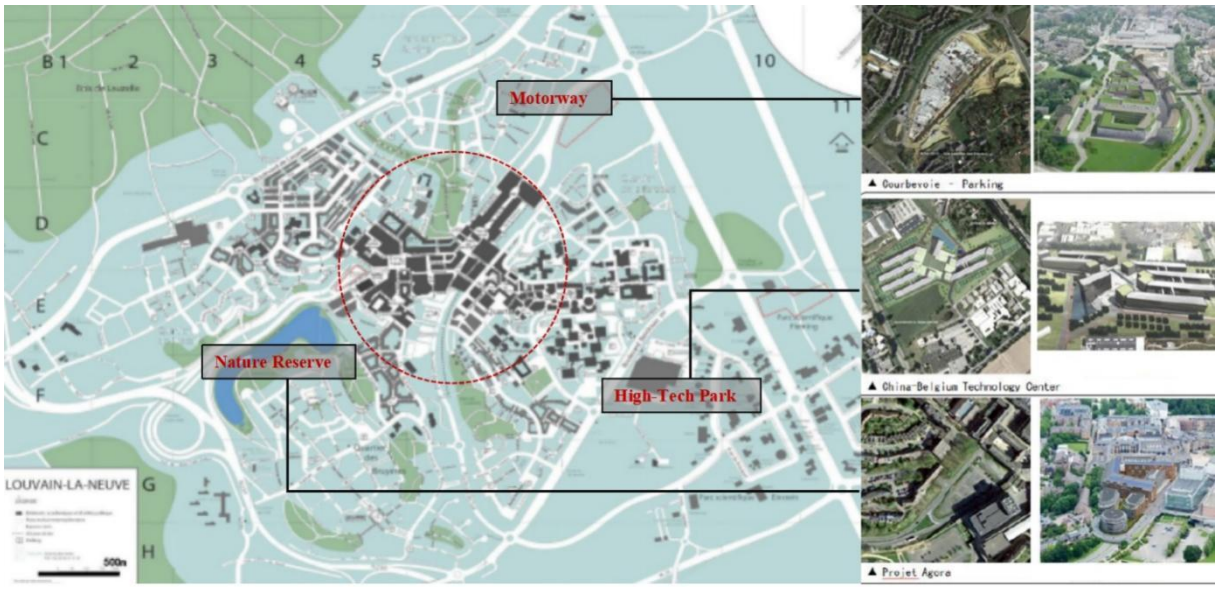


Figure 3- 3 Effective diagram of the new research and service facilities project[61]

3.1.2 Mix-use

Functional mixing is an inherent characteristic of naturally grown towns. Traditional European medieval towns, due to their unique development background, feature intertwined functions in their town centers, and it is precisely the internal accessibility brought about by functional mixing that maintains the compact and dense spatial form of these towns. Planners

have proposed a conceptual spatial structure consisting of public space, educational space, residential space, transportation space, and nodal space (Figure3-4).

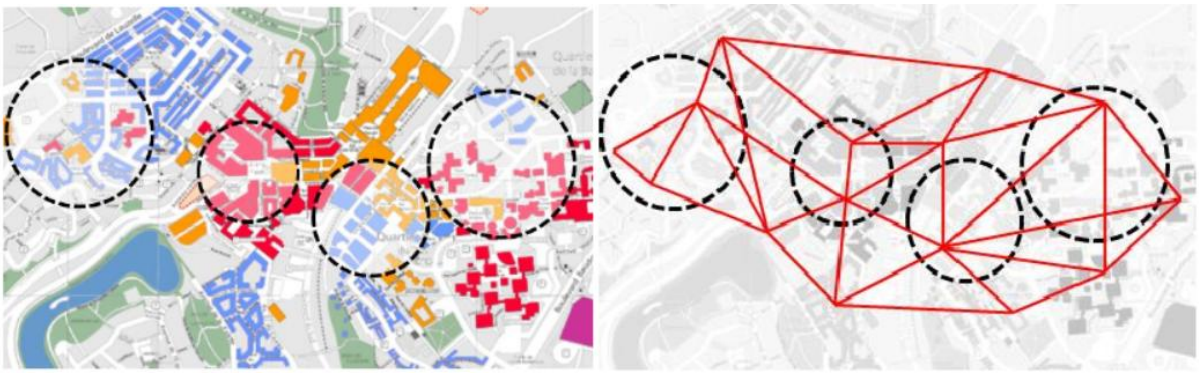


Figure 3- 4 Spatial form - functional combination[61]

Thus, more urban public spaces are connected to campus facilities. By organizing and radiating public transportation spaces, a compact functional structure is formed. Public spaces act as the main connectors between various "modules"; educational and residential functions are distributed around the core public spaces, intersecting and extending outward; transportation spaces follow the distribution of the skeleton formed by public spaces, avoiding intersections with educational and residential spaces; various star-shaped structures achieve the expansion of urban space through the replication and connection of public spaces (Figure3-5).

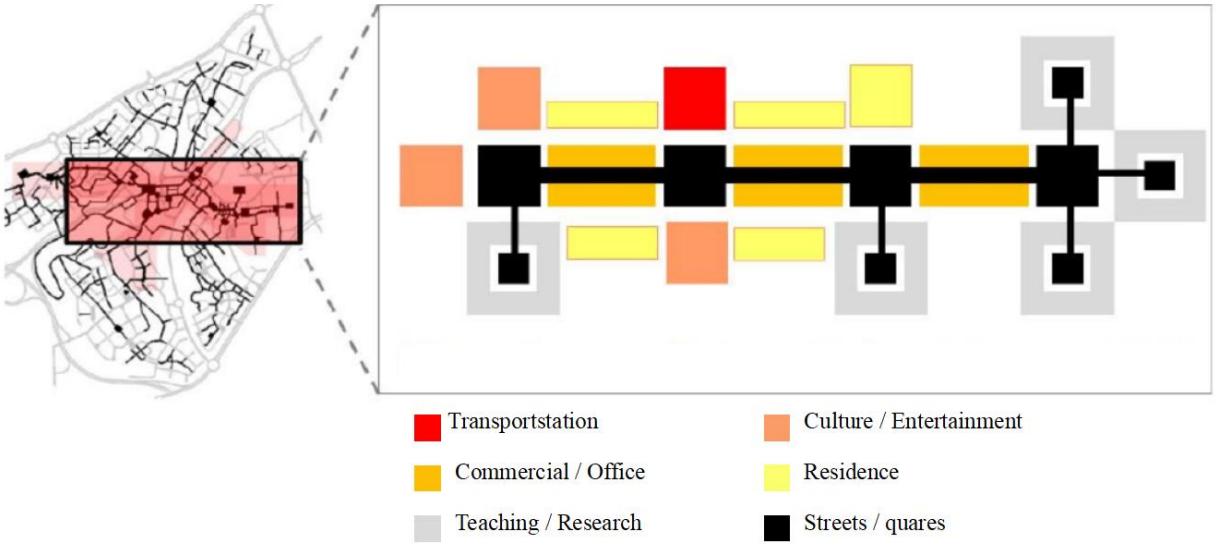


Figure 3- 5 Functions of the buildings lining the pedestrianised streets[60]

3.1.3 Active open spaces

The integration of public functions with squares and street public space systems, along with the continuity of public activities in terms of functionality, enhances the compactness of the public space system. The plaza space in the centre of the of Louvain-la-Neuve is highly recognisable. When the buildings in the space are assembled in a certain form, the external space is easy to read and has a certain degree of repetition, the figurative physical space becomes an abstract morphological memory in the mind, and familiarity with the spatial environment promotes a sense of comfort and security in the experience. A good public space environment can better promote diversified public activities and exchanges, thus reducing the chances of disorder in a university town.

At the same time, at a certain density, external spatial morphological differences are one of the most important elements in identifying specific spaces. Taking a sample of the plan form of the square in the centre of Louvain-la-Neuve (Figure 3-6), it can be found that the differences in the space of different squares are reflected in the different ways of connecting the square to the street, which leads to different walking routes, and this creates different spatial activity patterns and atmospheres in the square.

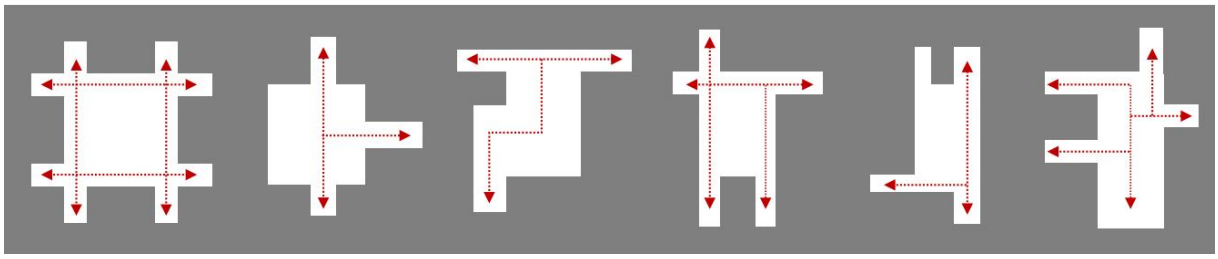


Figure 3- 6 Spatial forms of plazas in the central district

(Source: Drawn by the Author)

3.1.4 Pedestrian organisation

The four main cross-sectional scales of the street network in the central area of Louvain-la-Neuve do not vary much; the same roof form is used; the width of the streets is controlled between 6-15 meters; and there are also continuous corridors and second-storey terraces to further refine the hierarchy of the public space and make it more intimate and pleasant to walk at scale (Figure 3-7). The variations in street scale complement the plaza space, and the

recognizable continuity gives a regular rhythm to the pedestrian movement of the experience (Figure 3-8). This simplified form eases the process of perceiving the space and the memory of the spatial form is more likely to be preserved than if it were to draw attention to the space by means of highly differentiated variations.

Pedestrian, motor vehicle, and rail transit intersect in the central area to facilitate free interchange between different modes of transportation. The pedestrian traffic system, the most crucial one, is located at the ground level to ensure continuity and comfort for pedestrians. A networked pedestrian system connects different blocks into a whole, serving as a core element in the road network morphology.

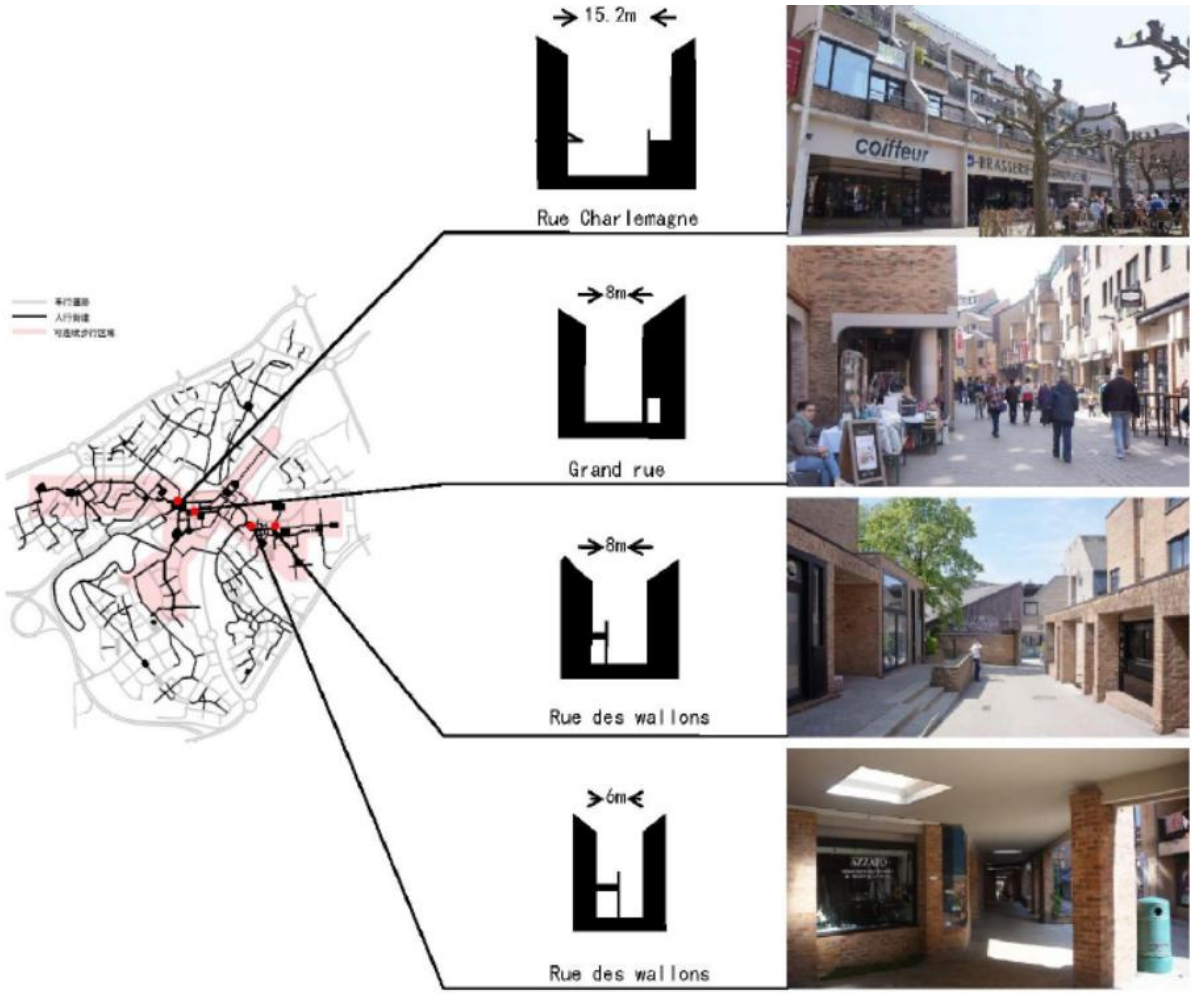


Figure 3- 7 Typical street cross-section scales[61]

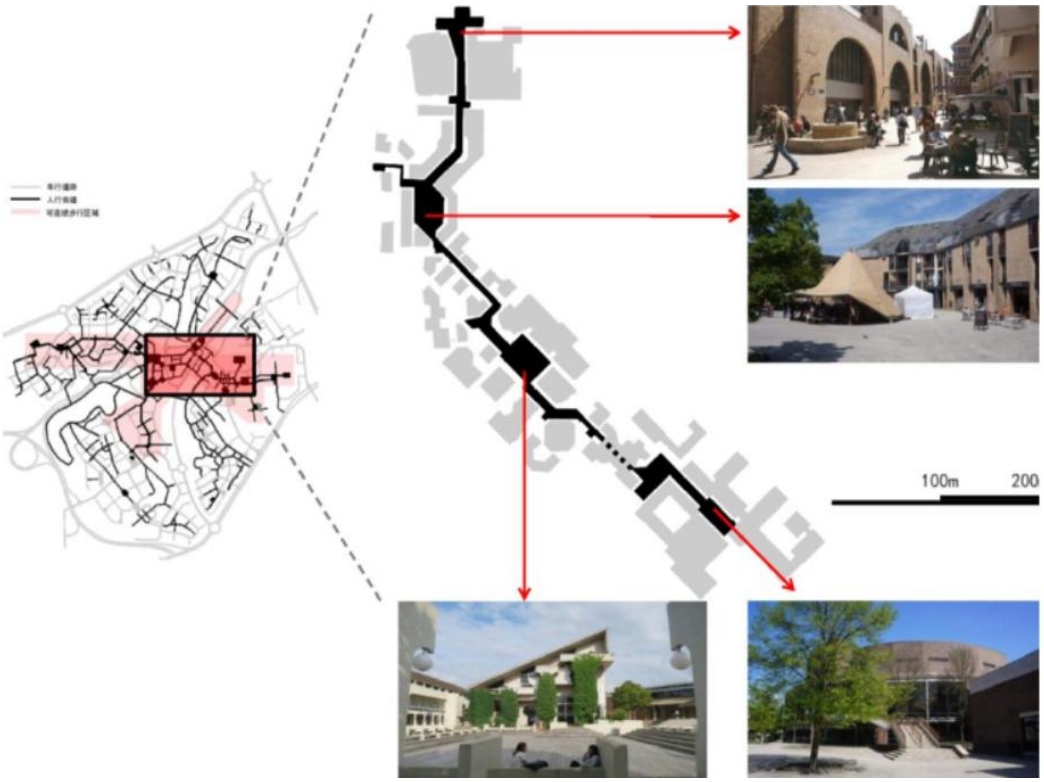


Figure 3- 8 Part of the pedestrianized streets in the central area[61]

Rail transit and motor vehicle traffic mainly serve the social groups commuting between cities. If transportation stations are located on the outskirts of the central city area, it will lead to a large volume of commuting between the periphery and the core area, resulting in structural inefficiency in terms of land space and transportation infrastructure. By integrating external and internal transportation cores, the layout of functions and spaces can be effectively matched. Utilizing the natural 10-hectare valley bottom of the original site, the Louvain-la-Neuve plans a massive artificial platform (Centre Urban) along the central walkway in the core area.

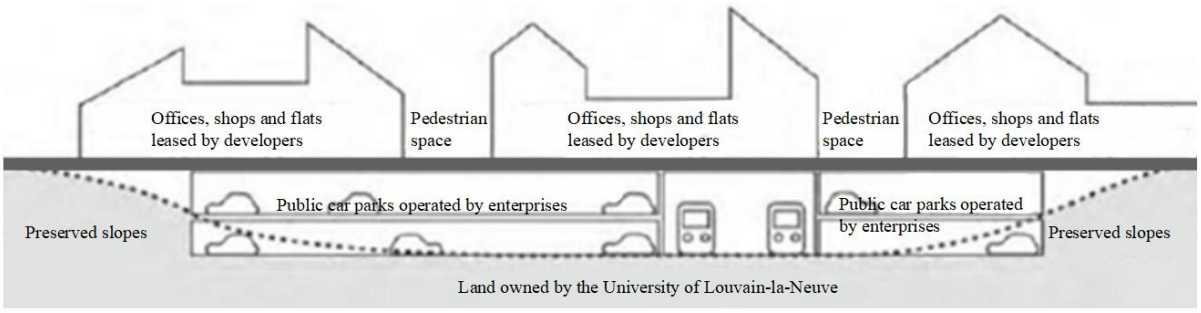


Figure 3- 9 Schematic section of the centre of Louvain-la-Neuve[21]

The vertical integration of transportation spaces not only enhances land utilization intensity and reduces the proportion of transportation on the spatial plane but also establishes new functional connections in the vertical space. Below the artificial platform, there are rail transit stations, motor vehicle lanes, and parking lots, while above, there are school buildings and public facilities. External flows of people reach the interior of the university city through rail transit or motor vehicle traffic. Above the artificial platform, due to the absence of influence from motor vehicle lanes planning, relatively high building density and small spatial scale can be maintained, which is highly conducive to walking. The central area platform and the university-city starting area together constitute the most dynamic public space in the university city (Figure 3-9). Among them, the continuous public activities serve as functional continuity, and the composite formation of continuous activity spaces constitutes an integrated transportation system.

3.1.5 Development model

Louvain-la-Neuve has formulated a development management model with its own characteristics, combining the region's resource features with the long-term goals of regional strategic planning (Figure 3-10). The university authorities lease some of the purchased land to various commercial and service enterprises through long-term lease agreements signed with the government. By introducing social funds, the investment risk of the construction is diluted; vibrant commercial activities promote public events within the university city and enhance its urban appeal. The government implements regulation through designated legal policies, while the university authorities maintain long-term land use rights, enabling them to oversee the overall planning and management of the university city and prevent excessive development by real estate developers from disrupting the balance of the university city's own system.

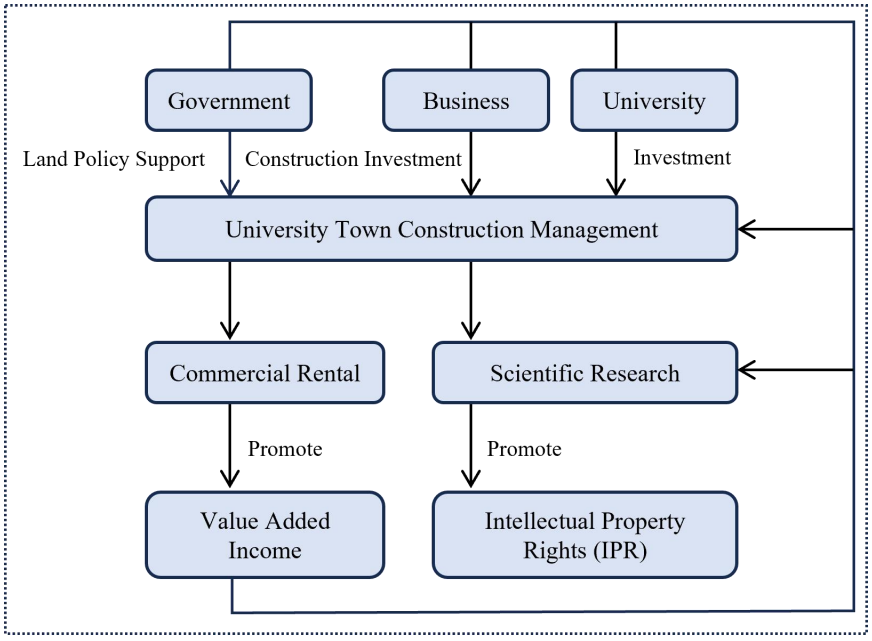


Figure 3- 10 Louvain-la-Neuve model

(Source: Drawn by the Author)

The success of Louvain-la-Neuve is not solely attributed to the planning and design team. In the process of designating and implementing the planning scheme, the government, local departments, enterprises, developers, and local residents' committees have all participated, playing a positive role in the establishment and management.

3.2 Monterrey Institute of Technology and communities revitalization plan, Mexico

3.2.1 Introduction

Monterrey is one of the wealthiest cities in Mexico and the third largest metropolitan area in the country, yet the urban core is gradually facing environmental degradation. At this critical moment, the university's board of trustees realised that a campus masterplan would help revitalise neighbourhoods that had been walled off for years and whose security had long been diminished or even ceased to exist. The design team looked to re-establish the connection between the university and the city, to achieve integrated development with public space connections, and to add a variety of new clusters that would support new economic development. The plan creates an environment that will attract significant research and

development investment within the context of the campus, transforming the neighbourhood into a vibrant, attractive and dynamic mixed-use area (Figure 3-11).

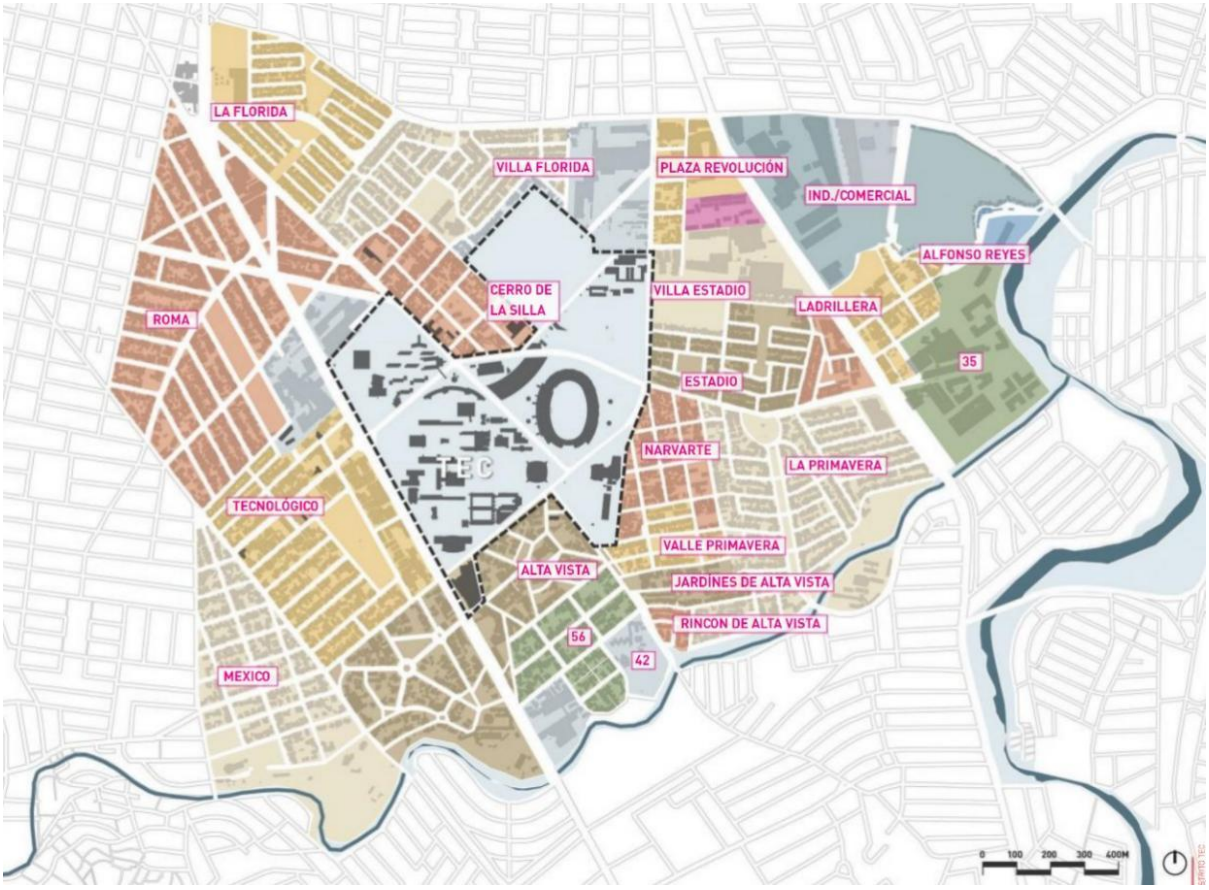


Figure 3- 11 Monterrey Institute of Technology and communities

(Source: https://issuu.com/sasaki_associates/docs/mty_main_report_final_spreads)

3.2.2 Mix-use

The plan creates a diverse and inclusive learning environment in the academic core, designed to encourage project-based learning and interdisciplinary collaboration (Figure 3-12). The new Academic Building breaks down barriers between faculties and facilitates exchange and collaboration. Elements such as student residences, cultural facilities, hotels and shared office areas combine to create a holistic learning environment. The design framework subtly integrates the campus with the metro and surrounding community, encompassing housing, high schools, community facilities, innovation centers, and related industrial spaces adjacent to the academic core of the Monterey Institute of Technology.

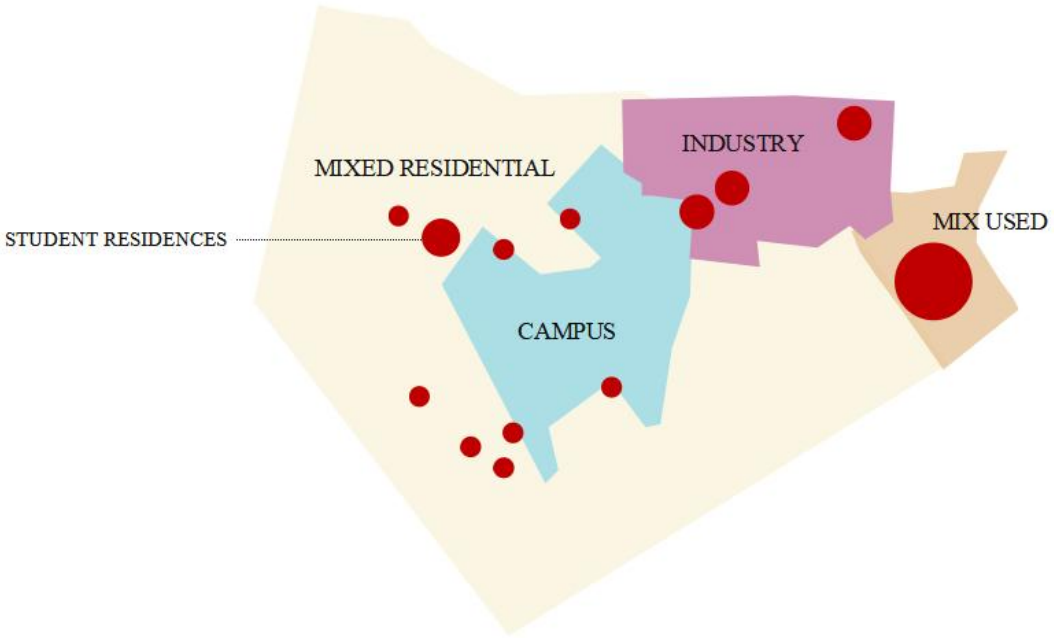


Figure 3- 12 Mixed-function planning model

(Source: Drawn by the Author)

Within the framework of the masterplan, the design carefully places a variety of "building clusters" within the sprawling campus system. Each cluster is presented as an integrated and interconnected set of elements that provide a platform for the co-location of related industries with the Monterey Tech colleges and establish local community anchors within a framework of mixed-use uses such as research, housing, and working (Figure 3-13). These clusters exhibit a great deal of variation in the way they are merged, maintaining their uniqueness and integrity while interconnecting with each other through clever combinations to create a resilient and dynamic spatial layout of the campus. This layout not only optimises the spatial use of the campus and improves the overall functionality and efficiency of use, but also breeds new and innovative relationships between traditional teaching units.

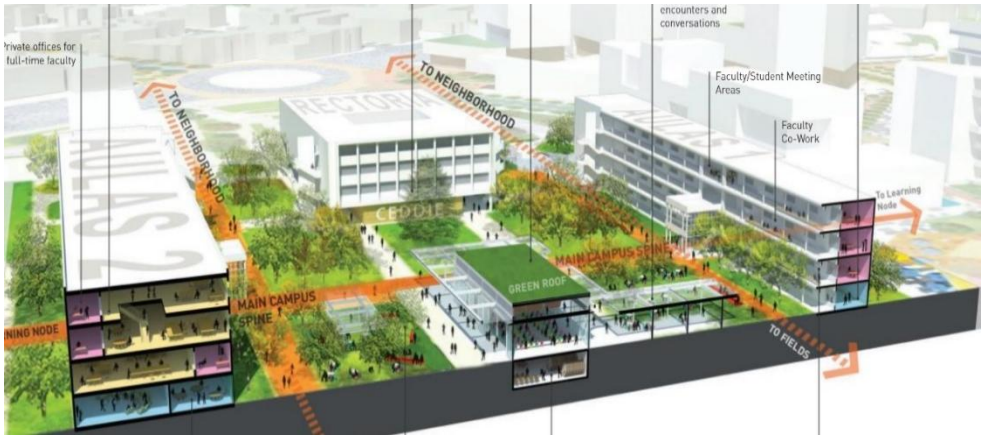


Figure 3- 13 Co-working groups

(Source: https://issuu.com/sasaki_associates/docs/mty_main_report_final_spreads)

3.2.3 Active open spaces

The active open spaces is organized to link the whole area. The campus is within a short walk of each community. While similar in nature, these communities vary greatly in size, quality of maintenance, and amenities. Essential facilities for various functional needs, such as academic buildings, laboratories, libraries, etc., are juxtaposed and harmonised with specific types of open spaces, such as green spaces, plazas and courtyards (Figure 3-14).

Figure 3- 14 The distribution and layout of active open spaces

(Source: https://issuu.com/sasaki_associates/docs/mty_main_report_final_spreads)

3.2.4 Pedestrian organisation

For pedestrian space, there is a set of design guidelines. Open spaces exist at different scales, where small-scale open spaces are carefully planned and designed to accommodate a

variety of public activities (Figure 3-15). As a leisure plaza in the centre of the community, it is very functional. Small-scale open spaces are designed by rationally arranging spaces and installing landscape facilities such as seating, flowerbeds and sculptures in order to create a comfortable and pleasant environmental ambience, and people's social interactions are enhanced. These spaces not only enhance the quality of the city, but also promote community cohesion and vitality.

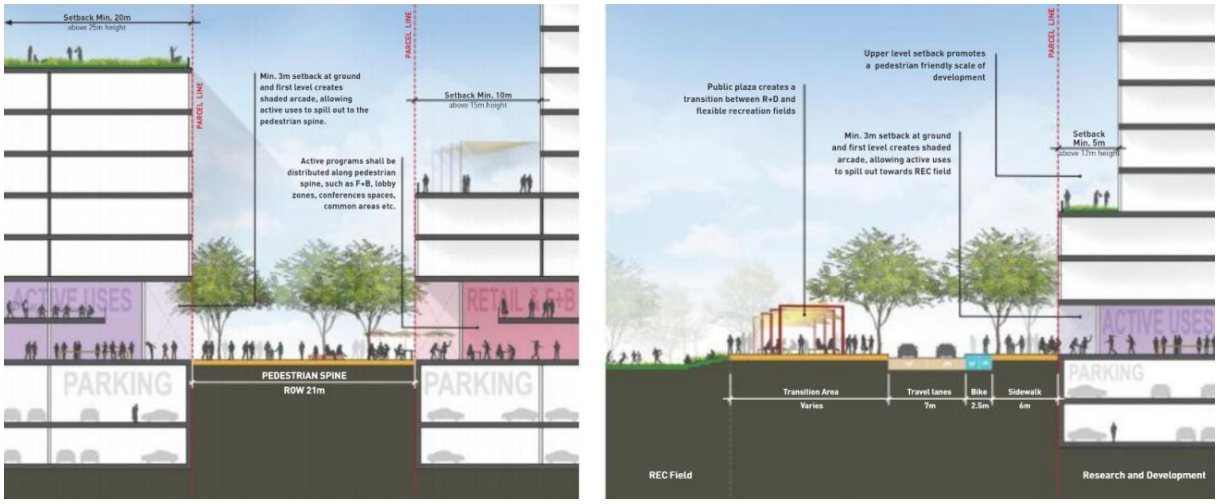


Figure 3- 15 Spatial scale of pedestrian streets

(Source: https://issuu.com/sasaki_associates/docs/mty_main_report_final_spreads)

3.2.5 Development model

The Monterey Institute of Technology has fully incorporated community input into its planning process, connecting the university and the community through a newly developed mixed-use area to promote the mutual development of both. This initiative not only improves the environment of the neighbouring community, but also contributes positively to the economic development and cultural prosperity of the city. Creating an environment that attracts significant research and development investment in the context of the campus has had a positive impact on attracting R&D investment, innovation and upgrading of local industries, and promoting local entrepreneurship. At the same time, it has transformed the community into a vibrant, attractive, and integrated area where the campus is closely integrated with the community and the city's industrial innovations. The Monterey Institute of Technology provides with lessons that can be replicated.

3.3 Fudan-centered university area and Knowledge and Innovation Community (KIC)

3.3.1 Introduction

The Knowledge and Innovation Community (KIC) is strategically situated in the core area of the Wujiaochang Urban Sub-centre in Yangpu District, Shanghai. KIC stands as a prominent landmark surrounded by esteemed institutions like Fudan University, Tongji University, and Shanghai University of Finance and Economics. KIC serves as a pioneering model for the "Three Districts Integration and Linkage Development" concept, operating through collaborative governance between the government and the developer. This partnership has fostered a vibrant knowledge-based community, attracting and retaining skilled professionals. Leveraging the resources of nearby universities, KIC promotes an organic connection between campus and community (Figure 3-16).

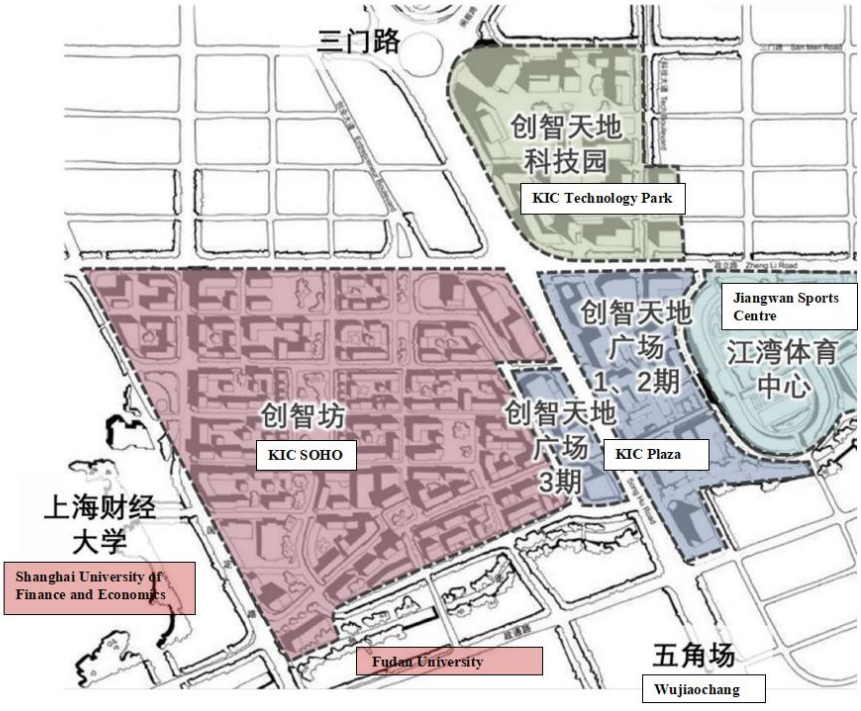


Figure 3- 16 Geography of the project in relation to the universities

(Source：http://www.njgl.gov.cn/ztzl47815/yhyshjzc/kjj/202208/P020220811361447480248.pdf)

Its planning emphasizes a dense road network and interconnected neighborhoods, creating a compact, mixed-use environment with a lively public realm. The project comprises

four components: KIC Technology Park, KIC SOHO, KIC Plaza, and Jiangwan Sports Centre. Among these, KIC SOHO stands out as a versatile hub offering residential, office, retail, cultural, and entertainment spaces. It serves as a central feature of the integrated community, catering to diverse needs and enhancing quality of life.

KIC SOHO features 7 blocks, each spanning 6 to 7 stories and designed collaboratively by leading domestic and international firms. These blocks seamlessly integrate multi-story structures with charming courtyard gardens, showcasing unique facades and lively color palettes. Residents enjoy a range of housing options, from purely residential units to mixed-use dwellings and commercial offices. The vibrant public spaces, including bustling streets and plazas along University Road, contribute to KIC SOHO's identity as a vibrant and inclusive community hub.

KIC SOHO exemplifies the evolution of innovative neighborhoods rooted in campus development (Figure 3-17). Originating as a residential enclave amid a cluttered factory landscape during the 1980s and 1990s, it lacked a coherent road network. However, significant transformations began to take shape in 2004, marked by the expansion of Songhu Road on the east side of the site to accommodate ten lanes. Simultaneously, construction commenced on University Road, branching off from Songhu Road.

By 2006, the first phase of KIC SOHO was completed, leading to the separation of University Road and Songhu Road by undeveloped land. The second phase, finished in 2009 and extending towards Guoding Road, introduced open-block designs, transforming the neighborhood's street layout.

In 2010, ground-floor shops on University Road were repositioned, enhancing commercial quality. The inauguration of rail line 10 in the same year improved accessibility to University Road.

In 2012, efforts by the developer resulted in the transition from one-way to two-way traffic, easing leasing challenges for KIC SOHO. Additionally, government approval of the alfresco dining concept bolstered the area's appeal, revitalizing street activity and influencing similar initiatives district-wide [62].

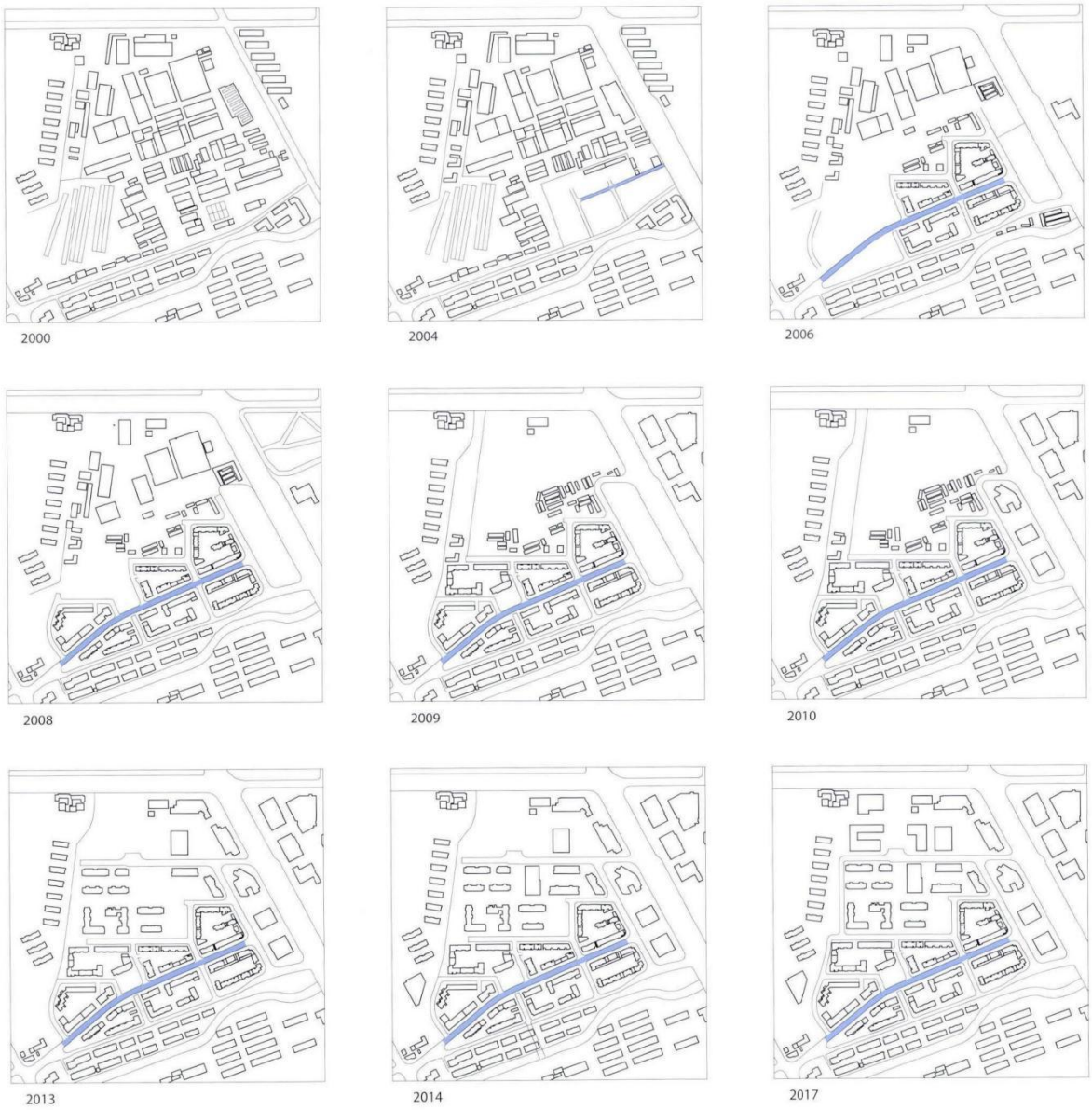


Figure 3- 17 The fabric transformation of KIC SOHO[62]

3.3.2 Mix-use

The neighborhood emphasizes seamless integration of work, study, residence, and daily living, with a strong focus on creating functional environments across multiple levels. A key principle guiding functional configuration mandates that units failing to meet the minimum requirement of two hours of sunlight per day are repurposed for office use. Architecturally, the layout adopts an open enclosed spatial arrangement, featuring a central courtyard at the heart of the street. This intentional design choice prioritizes office space over strict orientation concerns.

In addition to individual office buildings, essential support facilities like the Overseas Entrepreneurship Centre are integral to the neighborhood. These amenities attract expatriates to establish businesses and reside in the area, thereby enhancing the demographic diversity of university road.

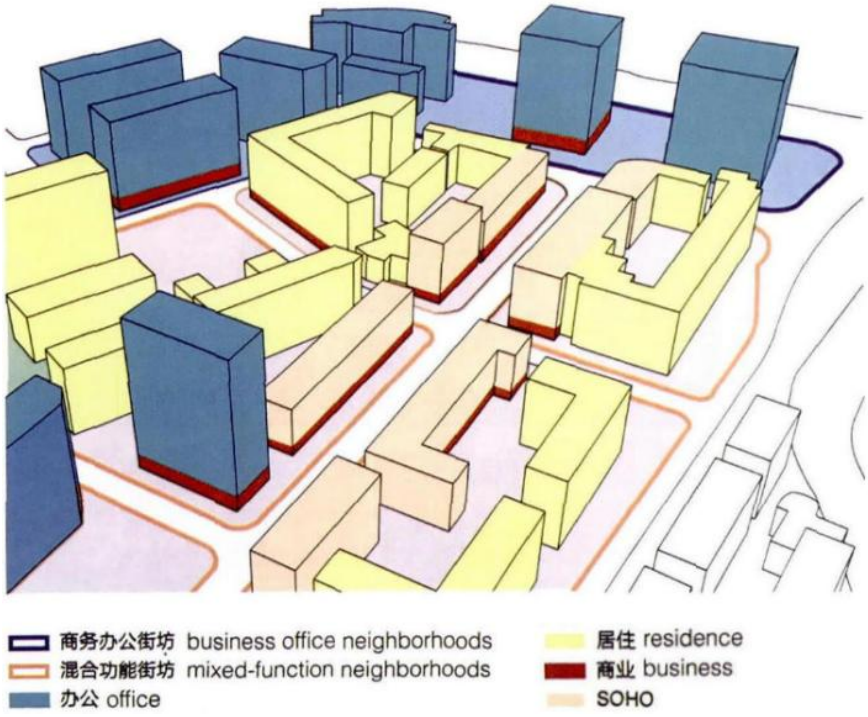


Figure 3- 18 Functional analysis of KIC SOHO[62]

Public amenities, such as retail spaces, are thoughtfully situated along the ground floor of the street, contributing to a cohesive and welcoming streetscape. On a neighborhood scale, a harmonious integration of different functional zones merges office research and development, residential living, commerce, and leisure seamlessly. At the street level, a pattern of small-plot development encourages a synergistic coexistence of diverse functions.

Architecturally, the incorporation of public facilities, like commercial spaces, on the ground floor adds to the neighborhood's liveliness and accessibility (Figure 3-18).

Along University road, KIC SOHO maintains the aesthetic of residential buildings while accommodating the diverse functions of the SOHO model. By leveraging the road's orientation and offering significant discounts on street-facing spaces, a continuous commercial environment is created on the ground floor. Upstairs spaces are adaptable for further commercial use, residential purposes, or as startup offices. The alignment of apartment

buildings and various functional elements along the street grants University Road the potential to foster limitless possibilities. Additionally, the vertical business design strategy positions University Road as a hub for innovation and creativity within the entire area (Figure 3-19).

Figure 3- 19 Various functional composites[62]

3.3.3 Active open spaces

The active open spaces comprises streets, courtyards, and squares, with KIC SOHO serving as an illustrative example. Here, buildings are arranged to enclose courtyards, creating public spaces at the courtyard level. Building groups line the main street in a sequential manner, with enlarged open spaces along the street serving as central nodes, forming public spaces at the block level.

The main street features ample outward space, serving as a focal point for significant activities and connecting important squares within the surrounding neighborhoods, thereby contributing to the establishment of a cohesive spatial structure (Figure 3-20).

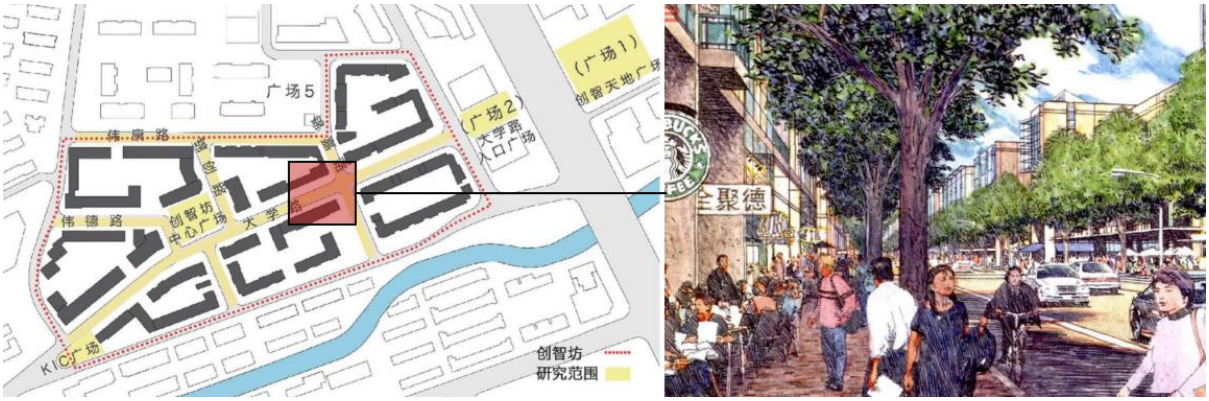


Figure 3- 20 Street scene[62][63]

3.3.4 Pedestrian organisation

KIC SOHO stands as a prime example of an open neighborhood characterized by a diverse mix of small-scale structures and multifunctionality in Shanghai's Yangpu District. The regional road network boasts a density of 21.2km/km^2, with intersections spaced between 60m to 130m along the road median. Main roads measure between 28m to 37m in width, while branch roads are 2m wide.

Through integrated planning, design, and operational strategies, such as implementing community roads alongside parcels of land and providing on-street parking, buildings along the street are strategically positioned close to the road line. Ground floors are predominantly designated for public uses like commerce, while entrances and exits of office buildings, residential complexes, and basements open directly onto the street, facilitating the creation of a well-organized and dynamic open block environment (Figure 3-21). This layout ensures that entrances and exits of various buildings directly connect to the street, contributing to the development of a structured and lively open-plan neighborhood.

Figure 3- 21 Road system hierarchy map[62]

3.3.5 Development model

The KIC is developed through a collaboration between the Yangpu District Government and private developers, emphasizing the integrated development of university campuses, science and technology parks, and public communities.

Currently, the KIC has introduced information technology, modern design, and technology finance as its main development directions (Figure 3-22), which already account for over 80% of the total number of enterprises in the park. Surrounding the area are more than 10 renowned comprehensive and innovative universities, fostering various entrepreneurial ventures.

The park has now concentrated research institutions, multinational company research and development centers, technology firms, and modern service enterprises, forming a complete high-tech industrial chain. Additionally, the park provides services such as enterprise financing, registration, and policy consultation for leasing companies. Furthermore, enterprises in the park can benefit from various preferential support policies such as government special funds, loan guarantees, and tax exemptions. The KIC has evolved into a "co-creation community" where diverse entities participate, fostering vibrant innovation among various groups.

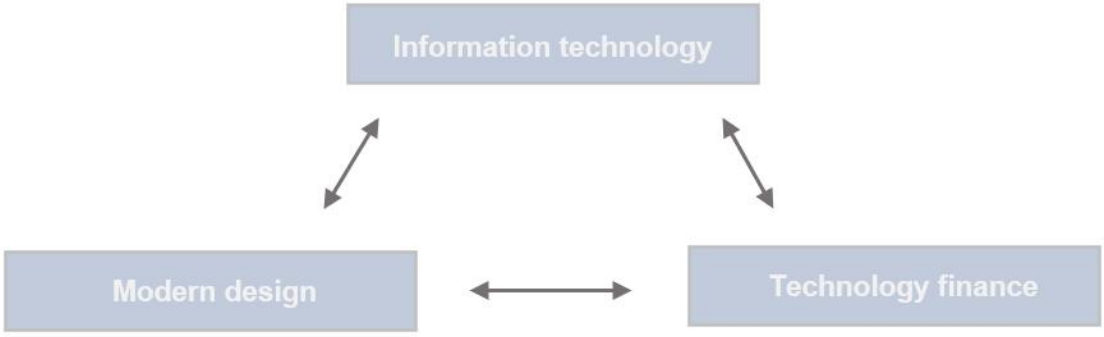


Figure 3-22 Direction of industrial development of the KIC

(Source: Drawn by the Author)

3.4 Summary

The disparities in the level of interaction between domestic and foreign universities and cities stem from various factors, including differing construction philosophies, traditional cultural values, spatial positioning, and social resources.

The diverse levels of interaction showcase unique spatial attributes. Through the study of three cases, it became evident that the Louvain-la-Neuve has innovatively accomplished "urban development within the university" by incorporating a novel urban construction model. Focused on the campus, it has established the comprehensive transportation hub. By harmonizing functions and designing recognizable open spaces and pedestrian systems, it has achieved a fully integrated state where the campus and city seamlessly converge in space. The Monterrey Institute of Technology falls under the category of "university development within the city." By blending functions and designing appropriately scaled open spaces to enhance the learning environment, it revitalizes communities into vibrant and cohesive areas. The Fudan-centered university area and KIC serve as prime examples of successful collaborations between Chinese universities and urban environments. Despite being enclosed by walls, KIC capitalizes on the strengths of neighboring university institutes to lay the groundwork for the development of three leading industries within the campus, evolving into an international innovation hub. Spatially, through the integration of functions and the establishment of open space and pedestrian-friendly systems, it fosters the synergy between innovative entrepreneurial spaces and urban public areas.

This chapter focuses on analyzing practical cases of interaction between domestic and foreign universities and cities, assessing the degree of their interaction, and summarizing their spatial characteristics. It provides valuable insights into regeneration strategies for this paper.

Chapter 4 The regeneration framework of campus-proximate areas to enhance university-city interaction

4.1 Principles of regeneration

The ultimate goal of regenerating campus-proximate areas is to foster a positive interaction between the universities and the cities, to promote the continuous regeneration of various types of spaces within the area, thereby stimulating and enhancing a series of other elements to improve themselves, rather than pursuing isolated self-development. Based on this principle, this paper proposes several principles for regeneration the campus-proximate areas, with a focus on strengthening the interaction between the university and the city.

4.1.1 Overall coordination

The principle of overall coordination is the primary principle that runs through the entire updating process. At the macro level, the campus-proximate areas are part of the entire city and must be clearly positioned to ensure their organic and symbiotic development with other urban blocks. At the meso level, which includes elements such as buildings, streets, public spaces, transportation facilities, and parks, comprehensive consideration should be given during design, avoiding the one-sided assessment of any single element's strengths or weaknesses, and focusing on holistic development. At the micro level, the elements of universities, communities, and cities should form their own systems, seeking points of integration amidst contradictions. While focusing on the overall picture, it's also essential to prioritize the coordination and balancing of key elements influencing the development. This ensures the optimal overall benefits while maintaining the primary objectives.

4.1.2 Flexible regeneration

In the context of the campus-proximate areas as part of the city, there exists a dynamic equilibrium between the whole and the parts, with elements continuously shifting and adapting, keeping the entire system in constant flux. Specifically, the principles of flexible regeneration encompass three aspects:

Firstly, the entirety of the regeneration design is long-term. This flexibility is not momentary but requires extensive time for restoration, with the ultimate goal being the benign development and even self-generation of the environment, which is the hallmark of successful renewal strategy.

Secondly, implementation occurs in stages. The entire design should be a sequential process, dissecting it to ensure the relative integrity of each stage, which is beneficial even in terms of fundraising. The staged implementation and management ultimately drive the continuous, coordinated development of the entire planning and design process.

Thirdly, permeability in the regeneration process. Each stage of the renewal process permeates into the next, with the former accumulating into the latter and vice versa, where each stage's elements permeate throughout the entire process.

4.1.3 Public-private collaboration

Through the analysis of recent urban regeneration projects abroad, it is found that the public plays a very important role. They not only participate in the entire project process comprehensively and comprehensively but also have a decisive impact on the implementation of some projects. Currently, the public decision-making power in China is relatively low. It can be said that the public participation mechanism is still in its early stages, and citizens only vote on well-formulated regeneration decisions made by the government. With the progress of the times, urban management departments at all levels should establish a relatively complete policy system and ensure the full participation of the public in the form of laws. For decisions involving the vital interests of surrounding residents, the public should be involved from the beginning. The public, as a party with interests involved, has the right to be informed about the early-stage design, specific measures, and later actual effects. However, the participation of individual residents often has limited effectiveness and it is difficult to form a reasonable evaluation result. Therefore, public groups based on communities are particularly necessary. Encouraging and supporting community residents to spontaneously organize non-profit civil organizations enables the government's decision-making power to be closely combined with

the wishes of residents, truly realizing a participatory model that combines top-down and bottom-up approaches.

4.2 Functional interaction - Promoting mix-use development

Activity spaces in buildings can facilitate interaction within the built environment, free from the constraints of external space conditions. Therefore, attention should be paid to the functional use of architectural public spaces. Starting from the different needs of universities and surrounding communities, relevant functions should be incorporated and vitality sources introduced to foster a symbiotic relationship between the university and the community. Specific strategies include:

(1) Improving the functional structure of universities and communities

Firstly, on the basis of existing commercial and residential areas, increase the proportion of commercial activities and incorporate various types of spaces to accommodate the overflow functions of universities, further enhancing and improving the commercial environment and order of the area. By integrating residential, office, retail, tourism, performance, entertainment, and broadcasting media facilities, create integrated districts encompassing various business formats (Figure 4-1).

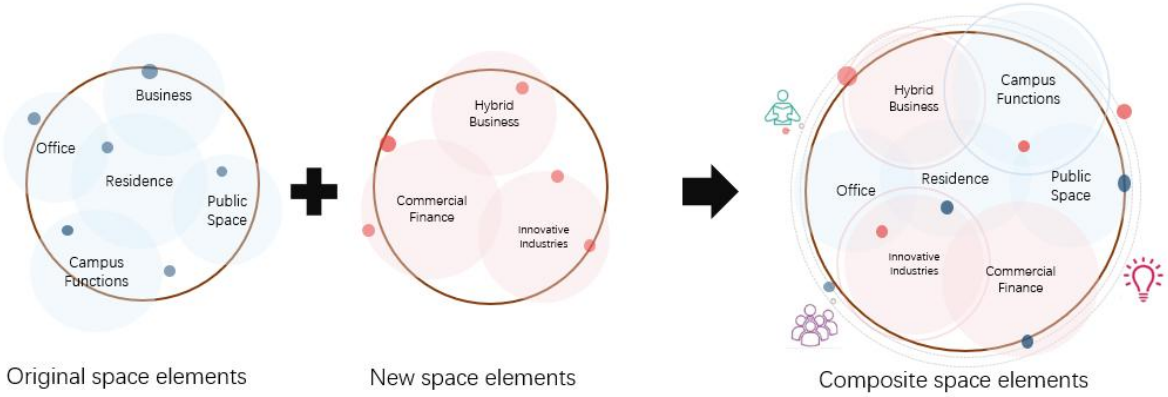


Figure 4- 1 Integrating relevant functionalities

（Source: Drawn by the Author)

(2) Strengthening the functional interaction

Firstly, some of the leisure and entertainment facilities that university students are interested in can be partially transferred to the community. Community activity centers,

community libraries, and similar facilities can integrate relevant leisure and entertainment functions, effectively promoting interaction between university students and local residents, thereby bringing vitality to the community. Additionally, some old buildings can be reused by attracting small-scale coffee shops, bars, and other businesses by offering relatively low rents. Certain functions within the campus can also be relocated, such as providing entrepreneurial space for student entrepreneurs. Eventually, this can lead to the gradual development of leisure spaces or even districts with a certain scale and characteristics.

Secondly, residential properties within the community that are available for rent can be transformed into mixed-use residences. Considering the trend of university students and some workers renting housing in neighborhoods near campuses, the government and community residents can collaborate to upgrade existing residential areas into mixed-use residences. Some land in the vicinity of the university can be designated for mixed-use residences, intended for student and office worker rentals, with a certain proportion of public service facilities integrated into the area to attract more university students and staff. This approach not only increases the economic resources of community residents and improves the living environment for elderly residents but also meets the housing needs of university students, thereby further strengthening the interaction between university students and local community residents in daily life.

4.3 Spatial interaction - Creating an interactive spatial system

4.3.1 Creating active open spaces

The interactive spatial system consists of two parts: activity spaces and innovation spaces.

The open activity space system in the campus-proximate areas is divided by scale into green courtyards, vibrant squares, and fully open ecological parks. The planning and transformation of the campus-proximate areas require the design of public open spaces with creative elements and diverse greenery arrangements. These spaces serve as public resources for various social strata, so the layout of activity spaces should be relatively reasonable and

equitable. Improving the quality of open spaces overall aims to attract more people to stay, interact, and relax. Regarding active open spaces, specific renovation strategies include the following:

(1) Considering the recognition of existing fabric in public open spaces

In urban regeneration, considering the existing fabric and creating public open spaces with high recognition is a strategy that comprehensively considers historical, cultural, functional, efficiency, and sustainable development factors. This approach helps to create urban spaces with unique charm and vitality. The existing fabric embodies the history and culture of the city, recording the urban development process and residents' life memories. Preserving the existing fabric not only helps to inherit the historical context of the city but also ensures that the renovated spaces harmonize with the surrounding environment, maintaining the overall integrity and continuity of the city. Considering the existing fabric and creating public open spaces with high recognition helps to enhance the efficiency and diversity of space usage. By judiciously utilizing the existing fabric, space layout and circulation design can be optimized, thereby improving accessibility and convenience. Moreover, spaces with high recognition can attract more foot traffic and activities, promoting diverse usage and enhancing vitality. Furthermore, by preserving and utilizing the existing fabric, consumption of natural resources and environmental damage can be reduced, thus achieving resource recycling and sustainable development.

(2) Arrange reasonably according to space type

Vibrant squares and open parks often have large scales and serve as comprehensive public spaces carrying multiple functions, allowing for flexible customization based on different functional needs. In squares and parks, areas for children's play, sports and fitness, and cultural exhibitions can be properly arranged. Additionally, to enhance the appeal and interest of the space, various thematic elements can be added, such as distinctive sculptures, colored pavements, and installations, to meet the diverse needs of citizens.

In contrast, green courtyards are often smaller in scale and scattered in various corners of the city (Figure 4-2). Although these courtyards may be small in size, they still serve

functions related to greenery and leisure. Rectangular green courtyards typically focus on landscaping, featuring various plants and trees. Walking paths and resting facilities serve as auxiliary elements, allowing citizens to stroll and relax in the courtyard. On the other hand, linear green courtyards emphasize the utilization of hard surfaces, mainly paved with tiles or lawns, with relatively less greenery.

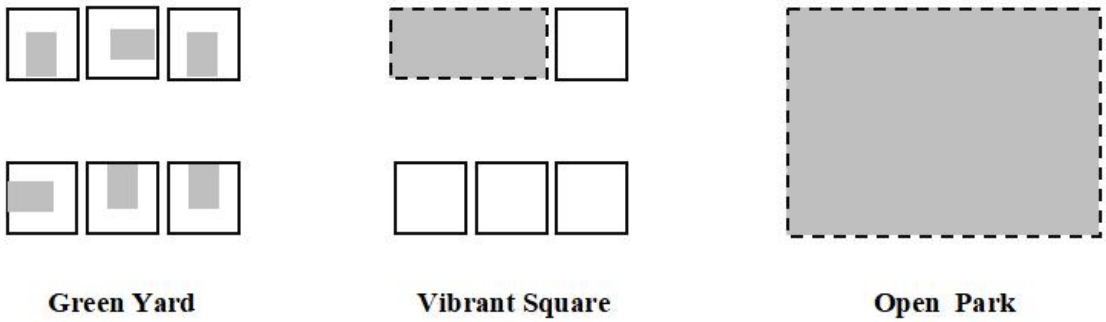


Figure 4- 2 Active open spaces of varying scales

（Source: Drawn by the Author)

Active open spaces play a significant role in promoting social interaction among citizens and enhancing urban vitality. Therefore, in design and planning, special attention should be paid to their spatial scale and openness. An appropriate spatial scale can provide people with a comfortable and pleasant experience, conducive to free activities and interactions. An open space can attract more foot traffic, facilitate information dissemination, and cultural exchange. To achieve this goal, it is necessary to layout the space reasonably and avoid overly enclosed or crowded areas. In design, transparent fences, open entrances, temporary facilities, or movable furniture can be used to enhance the openness of the space, allowing people to perceive the openness and freedom of the space visually and psychologically (Figure 4-3).

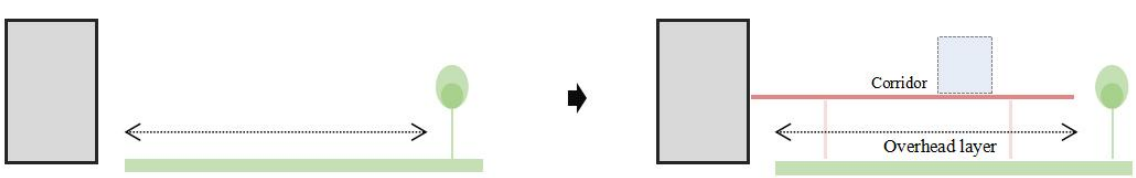


Figure 4- 3 Ensure openness of space

（Source: Drawn by the Author)

4.3.2 Creating innovative functional spaces

To address the coupling barriers between industry chains and knowledge chains, on one hand, the government should draw on the experience of typical university-industry innovation clusters, clarify the distinctive development positioning of universities, strengthen core advantageous disciplines, cultivate innovative talents at the forefront of industry and technology, and attract enterprises to gather and collaborate through original achievements, thus nurturing and expanding innovative clusters to support the development of innovation circles. On the other hand, encouragement and support should be provided to accelerate the development of various innovation platforms and carriers within the university-industry innovation clusters. The specific strategies for updating design are as follows:

(1) Promoting the transformation of traditional communities

Relying on the development of industries related to the advantageous disciplines of universities is an important approach for the development of campus-proximate areas. Actively promoting the transformation of traditional urban communities can be pursued. Firstly, some of the peripheral spaces of universities can be converted into spaces directly facing the main urban arteries. Industrial spaces and academic buildings developed based on the advantages of university disciplines should be located adjacent to each other as much as possible, facilitating communication between university faculty and students and enterprise employees. The residential needs of students and enterprise employees can extend to surrounding communities, and even other social forces can be the main entities in construction. During the later stages of campus expansion and renovation, relevant service facilities should also consider the same considerations. Next, by transforming the surrounding communities, transitioning from single occupancy by original residents to mixed-use residential areas, spaces available for rent can be provided to researchers and university students. This facilitates the formation of a research-oriented mixed community, with a functional layout consisting of newly constructed residential complexes alongside ordinary residential areas.

(2) Building platforms for school-enterprise collaboration

The industrial spaces proximate campus should be aligned with the strengths of the university's key disciplines. Leveraging the international advantages of universities, the construction of innovative functional spaces with high density and rich elements of innovation will foster vibrant street life abundant with innovation. Through the establishment of technology parks, technology transfer centers, and industry-university-research cooperation bases, facilities and services for offices, research, and production are provided, aiding universities in translating research results into practical applications and promoting collaboration between academia and industry.

Simultaneously, through establishing innovation and entrepreneurship bases, industry-university-research cooperation bases, and talent development bases, providing spaces for innovative enterprises and entrepreneurial teams. We will offer support services such as incubation, acceleration, and training, as well as internships, talent development, and skill training for enterprises.

Unlike typical knowledge innovation zones, the demographics of professionals in campus-proximate areas tend to skew younger. Therefore, it becomes especially important to pay attention to the residential, spatial, and service needs of university faculty, students, as well as office, research, and creative personnel. By establishing university-industry collaboration platforms and promoting the development of diverse innovation ecosystems and non-profit incubation institutions, more spaces and venues for exchange are created. Ultimately, this will foster an innovation environment driven jointly by "universities, markets, and governments."

(3) Encourage the leading role of private developers

In the renovation and refurbishment of buildings, emphasis should be placed on increasing retail public spaces, promoting the natural integration of office spaces with public spaces, and facilitating connectivity with peripheral open spaces. Lastly, incentivize private developers to provide innovative public spaces, advancing semi-open innovation centers to attract more tenants.

4.3.3 Optimising pedestrian organisation

The pedestrian system serves as the "backbone" of constructing the overall structure of the campus-proximate areas, as well as establishing the interactive connection between the university and urban spaces, serving as the material foundation and prerequisite for bridging the flow of people, goods, and information within the campus. In the renovation and redevelopment projects of existing spaces, valuable "micro spaces" are scattered sporadically. To create and leverage greater value within these spaces, it is necessary to connect these scattered points through various means, ensuring that both pedestrians passing through and residents can experience the diverse and orderly nature of the community.

(1) Developing a walk-friendly pedestrian network

The development of pedestrian neighbourhoods in cities is currently the consensus of the urban renaissance movement in many countries. The cultural elements of the area around the university are diverse, the original open space is mostly distributed in the form of scattered points, which lacks the necessary correlation with each other, and is concentrated in the entrance area of the university and the intersection of the streets, the distribution of the open space is not balanced, and a networked pattern is not formed to cover the city base, which leads to a lot of inconvenience when the public uses it. Through the development of pedestrian transport network in the district, the purpose of interconnecting the open space is finally achieved.

The existing streets, squares, and urban parks all contribute to the pedestrian system. By creating a network of interconnected pedestrian streets or semi-pedestrian streets, the entire area can develop harmoniously, avoiding the scenario where only one pedestrian street is improved while surrounding streets remain unchanged (Table 4-1). The development of a network-style block can effectively enhance the connectivity between the community, blocks, and universities in the campus-proximate areas. It expands people's activity spaces, facilitates the creation of diverse public spaces, and promotes social interactions within the area. By integrating commercial functions and public activities such as dining, gaming, singing, and

hairdressing into the existing pedestrian system, residents, university students, and other groups can be interconnected.

Table 4- 1 Types that can be used to form a pedestrian system (Source: Drawn by the Author)

Typology	Characteristics
Streets	Generally in the form of linear strings, including pedestrian streets, footpaths, footbridges and underpasses, which are very common in the district.
Squares	Generally distributed in a point-like manner, including city squares, small squares within neighbourhoods and campus entrance squares, as well as the open spaces of the surrounding community, the goal is to create interconnectivity and accessibility between these elements through.
Parks	Surface coverage, such as city parks around universities, green spaces, and green spaces in the community.

(2) Creating multi-level pedestrian transportation spaces

The urban transportation space links buildings and cities not only in the two-dimensional plane but also vertically across the "underground-ground-air" dimensions, strengthening the connection with the interior spaces of buildings and the external urban environment. In the design , various types of transportation spaces should be closely integrated with buildings and urban public spaces to form a cohesive, dynamic three-dimensional transportation system. Adding corridors between buildings, reducing the possibility of motor vehicle passage, and enhancing connectivity between buildings (Figure 4-4). Secondly, by integrating subway stations, surrounding commercial areas, and mixed-use properties, accessible multi-level transportation spaces can be created. This includes developing non-motorized vehicle and pedestrian systems that integrate with the city's slow travel network.

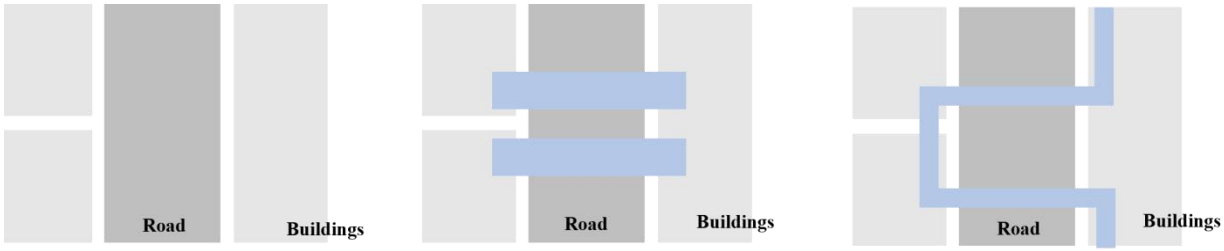


Figure 4- 4 Continuous slow-moving corridor

(Source: Drawn by the Author)

Maximizing the separation of pedestrian and vehicular traffic, using paved paths and pedestrian bridges at key intersections, and striving to achieve a comprehensive pedestrian system are essential goals (Figure 4-5). In designing the transportation network, consideration can be given to integrating with above-ground squares, shopping centers, etc., to create a convenient and comfortable transportation environment.

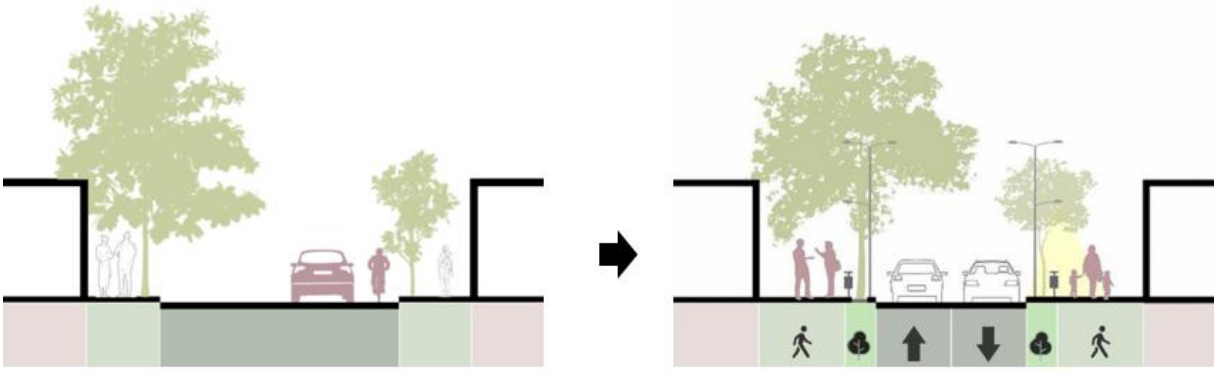


Figure 4- 5 Internal roads: moving from a car-based to a people-based approach

（Source: Drawn by the Author)

4.4 Sharing resource - Collaborative construction and governance

(1) Establishing a multi-party participation mechanism involving the government, universities, and communities

In the process of regeneration, the government is an indispensable participant. This is because the procurement of regeneration funds, the control of the regeneration process, and the management of key areas all require the involvement of planning and management authorities. The regeneration of campus-proximate areas should actively leverage the

government's policy guidance role to accelerate coordination between universities and surrounding areas, address issues related to industrial development, increase the construction and regeneration of comprehensive housing, and provide various types of residences. Regarding rent, there should be a certain degree of preference for university students and low-income groups.

In the regeneration process, universities primarily act as participants and suppliers of resources. Universities possess significant brand influence and distinct disciplinary advantages, enabling them to supply talent for the development of related industries. Within universities, relevant research topics can be established within disciplines to combine specific regeneration issues with surveys and innovative projects. This integration of knowledge and practice closely aligns the goals of the government, universities, and communities. Ultimately, this approach not only facilitates a deeper understanding of community and other stakeholders' desires but also enriches students' research content, fostering communication between university students and residents of surrounding communities.

(2) Encourage research enterprises and professional companies to participate

① Research enterprises

Due to the output of knowledge resources from universities, the campus-proximate areas have a strong appeal to research enterprises. On one hand, during the area's regeneration process, involving certain research enterprises can quickly grasp the specific needs of related industrial development. This enables alignment among universities, governments, and enterprises in terms of industrial chain construction, spatial layout, and industrial formats. On the other hand, the participation of research enterprises can also expand channels for raising regeneration funds in the area, thereby reducing the financial pressure on the government and ultimately creating a virtuous cycle.

② Third-party entities (such as design firms, specialized companies, etc.)

In urban planning theory, the term "third party" primarily refers to non-governmental organizations. Third-party participation signifies the involvement of these entities in urban planning in a neutral capacity. In the process of urban regeneration, emphasis should not only

be placed on individual buildings but also on the enhancement of the overall environment of the area. The level of creativity required in urban design schemes is high, necessitating consideration across multiple dimensions such as economics, culture, architecture, industry, ecology, and demographics. The professional expertise of third-party entities can enhance public participation capabilities, influence the methods of public engagement, and improve participation efficiency. Additionally, the neutral stance of third parties can serve as an intermediary between the public and the government, facilitating better coordination of interests and conflict resolution. Furthermore, in situations where the government prioritizes economic interests over public awareness, third parties can play an important role in safeguarding urban public interests.

4.5 Summary

Through the literature review in Chapter 2 and the related case studies in Chapter 3, this chapter delves into and analyses the regeneration design strategies for the campus-proximate areas. Firstly, three major regeneration design principles are proposed: overall coordination, flexible regeneration and public-private collaboration. Secondly, based on these principles, regeneration strategies at the functional, spatial, and resource levels are proposed. In order to enhance the interaction between the university and city, this chapter considers the factors affecting their interaction in an integrated manner, with a view to achieving the co-development of the university, the campus-proximate areas and the city.

Chapter 5 The need of regenerating the area outside the west gate of the Wushan campus, SCUT

5.1 Challenges and opportunities

5.1.1 Current challenges

The location conditions of the surrounding area of Wushan Campus， South China University of Technology (SCUT) are extremely favorable. However, against the backdrop of urban regeneration in Guangzhou, it has not received adequate attention. In recent years, many problems have emerged. The planning of Dongguanzhuang Road, from the south starting at Guangyuan Expressway to the north ending at Nengyuan Road, is approximately 2.18 kilometers long. The section from Guangyuan Expressway to Dongguanzhuang Bus Station is about 1.08 kilometers long, with a planned width of 40 meters. However, it has not been constructed according to the plan; its current condition consists of two lanes in each direction. The segment from Dongguanzhuang Bus Station to Sun City is approximately 600 meters long, with a planned width of 26 meters. About 350 meters of this segment are subject to the Sun City project's requisition and construction, with partial completion achieved. From the Sun City project to Nengyuan Road,

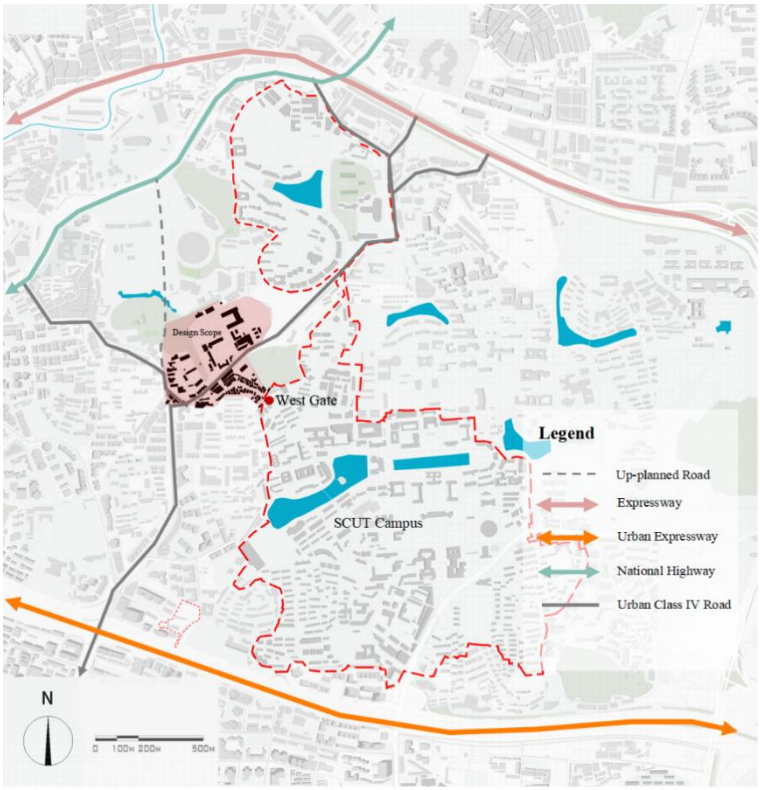


Figure 5- 1 Current roads

(Source: Drawn by the Author)

the segment is approximately 500 meters long, with a planned width of 40 meters, but it has not been constructed according to the plan (Figure 5-1).

The reasons behind this situation are multifaceted. On one hand, the large area of the Wushan Campus of SCUT, along with its early construction, has exerted a significant influence on the subsequent overall regeneration and planning of the surrounding areas. On the other hand, the ownership of land in the surrounding area of SCUT involves multiple entities. Widening roads requires the demolition of some buildings, necessitating coordinated communication among various parties and reaching consensus on compensation schemes. Although there are planning proposals for the roads in this area in higher-level planning documents, they have not been implemented yet. Therefore, the regeneration of this area requires a careful balance of interests among all parties involved, as well as thoughtful consideration of regeneration methods and content.

5.1.2 Future development opportunities

(1) Redevelopment of Existing Land under the Context of High-Quality Development in Guangzhou

Under the Guangzhou Land Spatial Overall Plan (2018-2035), it is proposed to utilize land consolidation to disperse existing land resources. Various methods, including comprehensive and micro-redevelopment, will be comprehensively employed. The goal is to achieve a cumulative area of about 300 square kilometers of land redevelopment by 2035. This initiative aims to enhance the role of the Guangdong-Hong Kong-Macao Greater Bay Area as a core engine of regional development, promote regeneration in old urban areas, and strive to construct an international metropolis.

By 2023, Guangzhou has approved 13 new redevelopment projects, taking the lead in promoting the new redevelopment model of "lawful requisition, net land transfer." The preliminary work for the four key areas has been largely completed. Additionally, numerous meetings have been convened, and relevant documents have been issued, outlining various requirements for urban village regeneration. Urban village redevelopment will assume more social functions, particularly in terms of housing security.

(2) Construction of the Peri-Wushan Innovation District

In the government work report of 2023, the key tasks for 2024 have been clearly outlined. Among them, the focus is on promoting development in four key areas with new models: Guangzhou New Central Axis (Haizhu), Guangzhou Railway Station, Luochongwei, and the Peri-Wushan Innovation District. The goal is to commence the construction of initial projects in these areas.

Figure 5- 2 Tianhe District Science and Technology Innovation "14th Five-Year Plan" Spatial Layout

(Source：http://ghzyj.gz.gov.cn/）

The "14th Five-Year Plan and 2035 Vision Outline for the National Economic and Social Development of Tianhe District, Guangzhou" emphasizes the creation of a pilot zone for reforming the science and technology system, accelerating collaborative innovation, and the transformation of scientific and technological achievements. It aims to promote the construction of technology transfer bases around Wushan (Figure 5-2), Zhongda, and the University City, jointly building a demonstration zone for the transfer and transformation of

national scientific and technological achievements in the Guangdong-Hong Kong-Macao Greater Bay Area.

The Guangzhou Housing and Urban-Rural Development Bureau pointed out that South China University of Technology (SCUT) should make more contributions in driving innovation, further tapping into its potential, and fully activating both internal and external resources. The Innovation Source Area around Wushan will become an opportunity to break through the bottleneck of the university's development. Currently, there is still a significant gap in demand for teacher apartments, student dormitories, and innovation parks at SCUT. Through cooperation and joint construction models between the government and universities in the surrounding campus areas, it is possible to expand the development space of the university, address issues related to the transformation of scientific and technological achievements, and incubate industries, leading to effective resource integration and high-quality development.

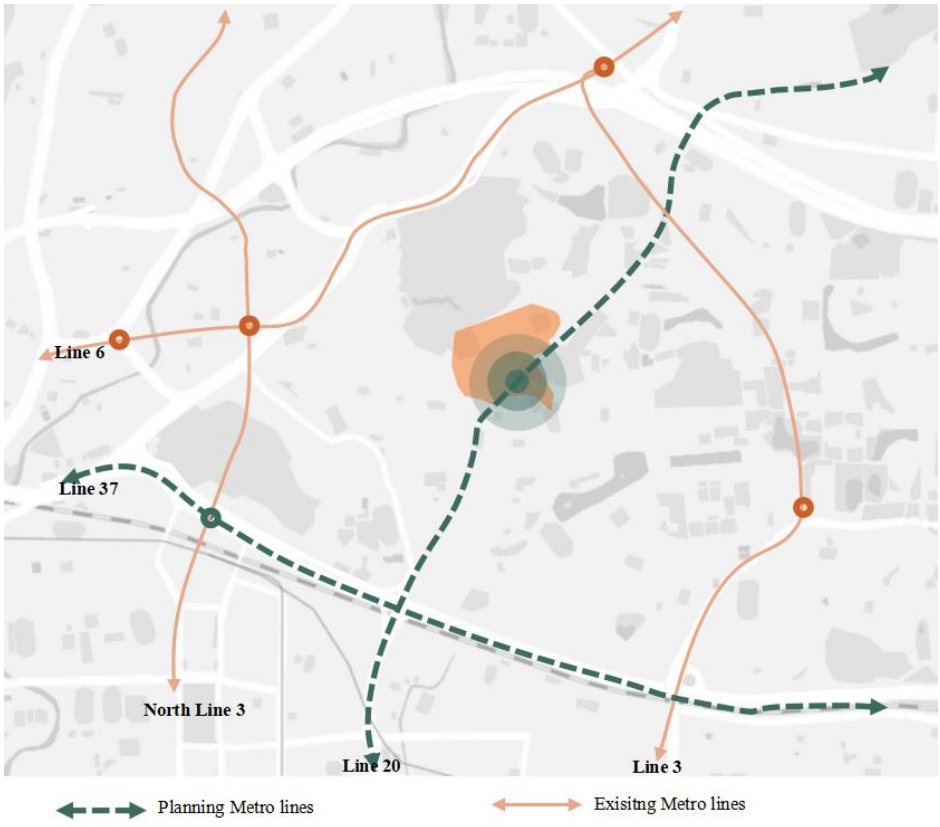


Figure 5- 3 Planned metro lines

(Source: Drawn by the Author)

The "Guangzhou Rail Transit Network Plan (2018-2035)" outlines the preliminary plan for Guangzhou Metro Line 20, which is initially proposed to be laid along Dongguanzhuang Road with designated stations (Figure 5-3). Part of the road passes through the land area of Guangzhou Nanhai Machinery Factory Co., Ltd. (hereinafter referred to as "Former Nanhai Machinery Factory") and the Shin Kong Factory-Creative Industrial Park (formerly the Shin Kong Factory), where a large number of buildings need to be demolished and rebuilt. Currently, both landowners have expressed intentions to undergo the "San Jiu" renovation (renovation of old urban areas, old factories, and old villages). Through this renovation, the project development units will be responsible for the construction of the roads, leading to the widening of existing roads and the improvement of traffic conditions.

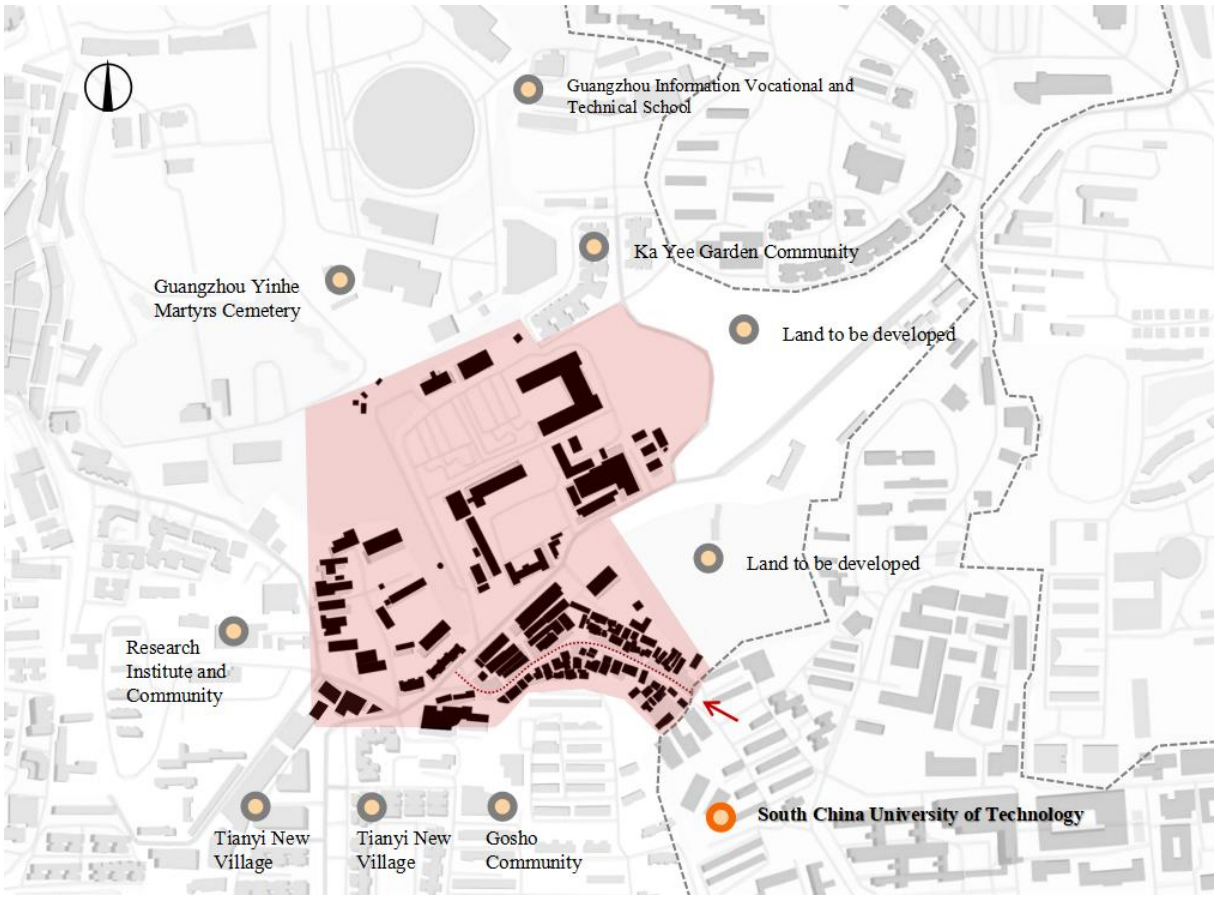


Figure 5- 4 Distribution of neighbourhoods around the site

(Source: Drawn by the Author)

Through research conducted around the Wushan Campus of SCUT, it has been found that the west gate entrance and exit of the campus are frequently used. Exiting from here leads

directly to Dongguanzhuang South Street (Figure 5-4). Research indicates that the area has undertaken some functions of the university. For instance, Dongguanzhuang South Street Community is a typical urban village with a concentration of low-end businesses, serving as a "second canteen" for students. Within this area, there are public services, entertainment venues, commercial establishments, educational facilities, and scientific research institutions, catering to and attracting residents from the surrounding communities. As there are no corresponding large-scale commercial venues nearby, this area is quite vibrant and serves as a dynamic hub for the surrounding community.

Dongguanzhuang Road divides the area into two parts, north and south, with multiple communities located in the western and southern regions without distinct boundaries. The eastern part, currently under development, will be constructed as a high-rise residential community with primary and secondary schools. It will also feature high-rise residential buildings and commercial facilities. The planned central bus station will be located in the eastern part of the site, connecting to the surrounding area and expected to attract significant pedestrian traffic in the future (Figure 5-5).

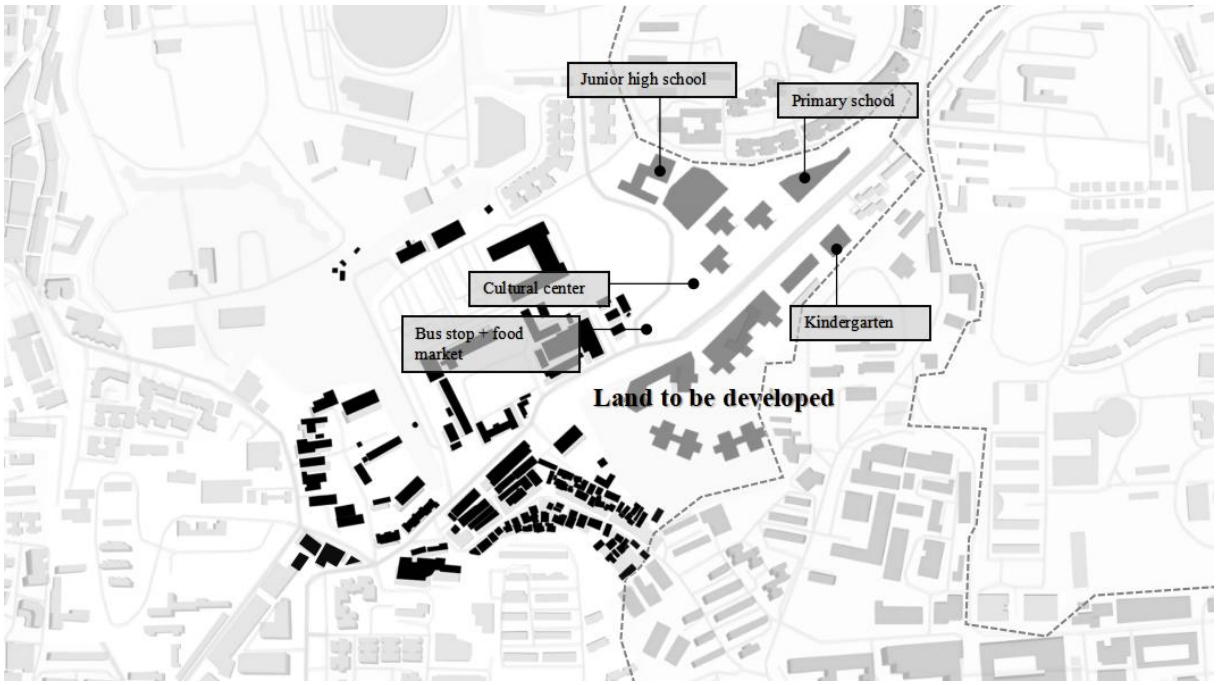


Figure 5- 5 Planning programme of nearby sites

(Source: Drawn by the Author)

Through the preliminary analysis of the upper-level planning of the SCUT area, it has been discovered that the surrounding area has enormous development potential and possesses the basic conditions to drive overall area regeneration. The spatial conditions are favorable (Figure 5-6). Therefore, selecting this area for research aims to propose strategies that can be applied to the regeneration of surrounding areas of universities. Due to the complex nature of the designated land plots, which involve industrial, logistics, residential, commercial, public management, and public service land uses, the following sections will outline and analyze each element separately to identify the associated issues.

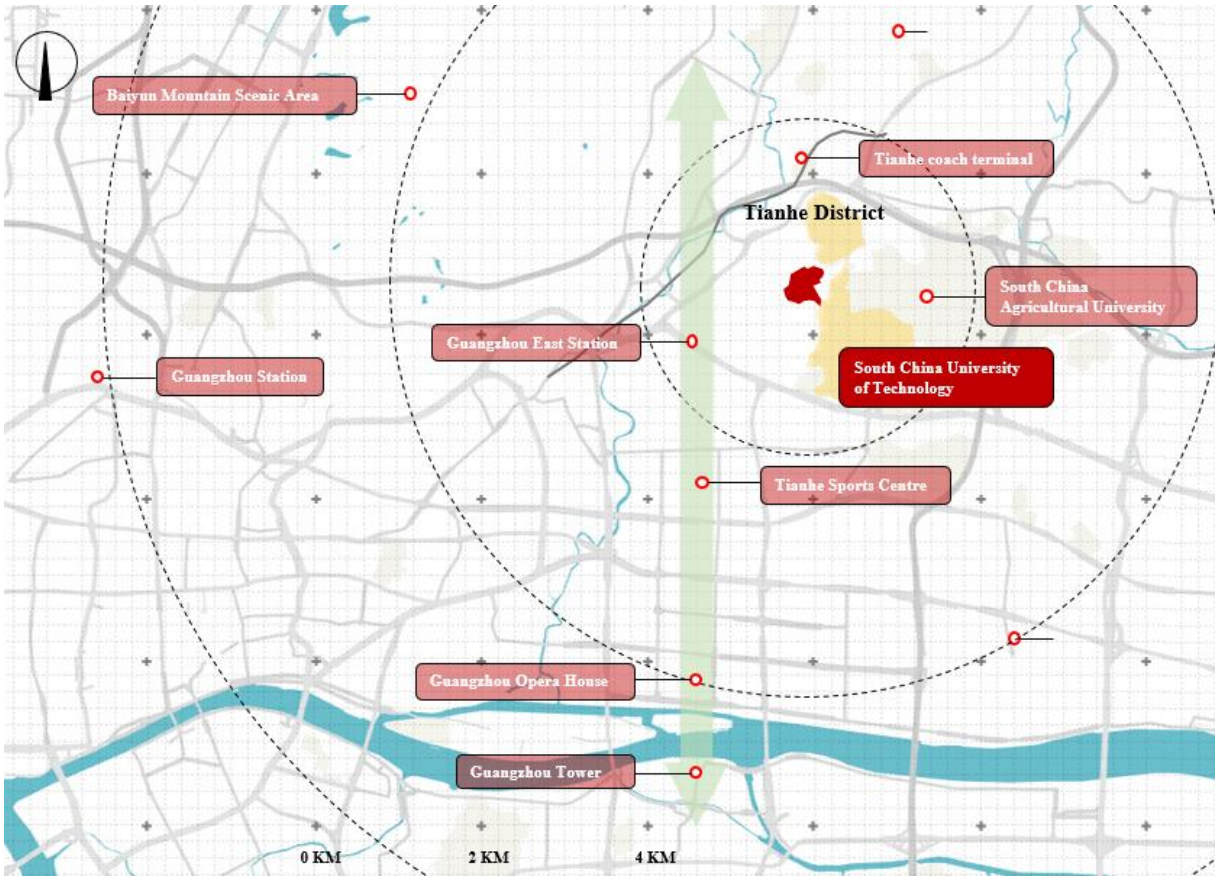


Figure 5- 6 Project location

(Source: Drawn by the Author)

5.2 Site analysis

5.2.1 Current situation

In a sense, the vitality of a city is synonymous with the vitality of its citizens. By analyzing the population statistics of the Wushan Innovation Source Area and Tianhe District,

this article can infer the basic criteria for activities that meet citizens' needs. According to the seventh national population census data, as of the end of 2020, Tianhe District had achieved a 100% urbanization rate. The number of permanent residents who had been living in Tianhe District for the past six months reached 2.2418 million, ranking third in the city. Compared with the data from the sixth national population census in 2010, which recorded 1.432 million permanent residents, there has been an increase of 809,000 over the past decade, representing a growth rate of 56.50% and an average annual growth rate of 4.58%, surpassing the city's average of 3.93% and the province's 1.91% (Figure 5-7). Over the past decade, urban regeneration and reconstruction in Guangzhou have reshaped new centers, bringing economic vitality and numerous employment opportunities to the entire city.

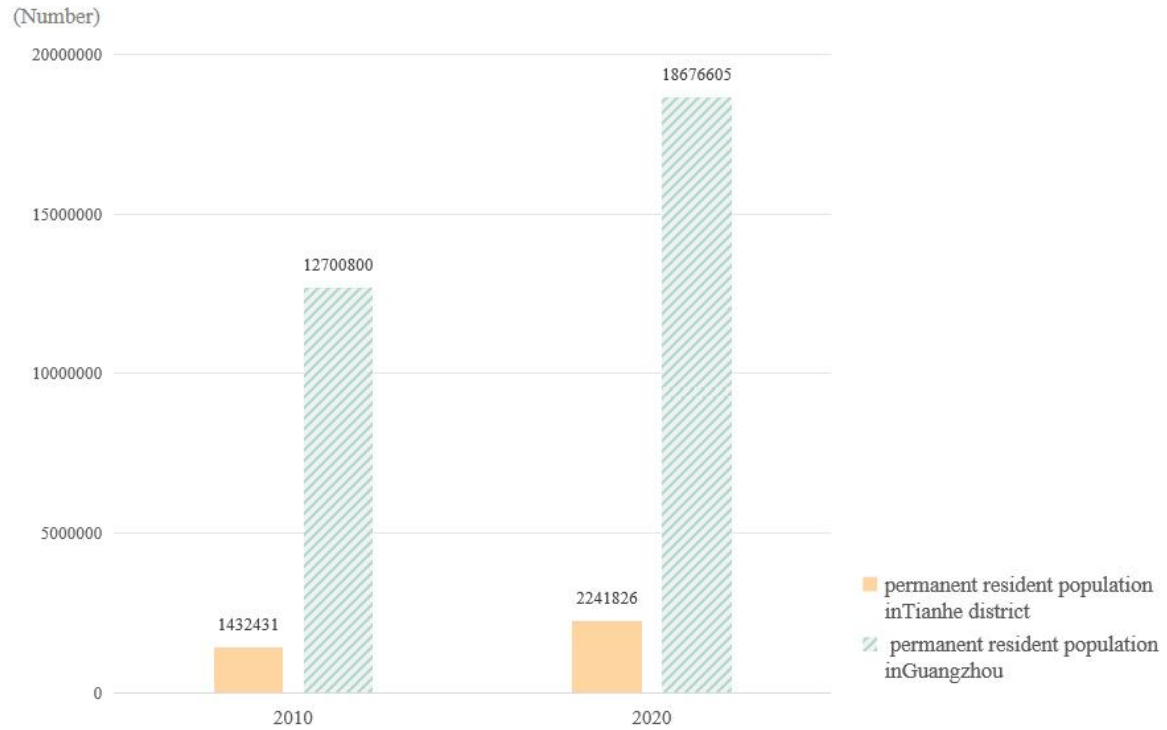


Figure 5- 7 Permanent population of Tianhe District and Guangzhou City, 2010 and 2020

(Source: Seventh Population Census of Tianhe District)

The Peri-Wushan Innovation District, where the land plot is located, is the core area of Tianhe District with a high population density. The population distribution within the Peri-Wushan Innovation District is predominantly concentrated in the age group of 20-40 years old. According to the seventh national population census, the practitioners in scientific research and technical services in Tianhe District of Guangzhou mainly specialize in three professional

fields: research and experimental development, professional technical services, and science and technology promotion and application services, with proportions of 21%, 61%, and 18% respectively. The age distribution of practitioners is highest in the age groups of 20-24, 25-29, 30-34, and 35-39, accounting for 14%, 22%, 21%, and 16% respectively (Figure 5-8).

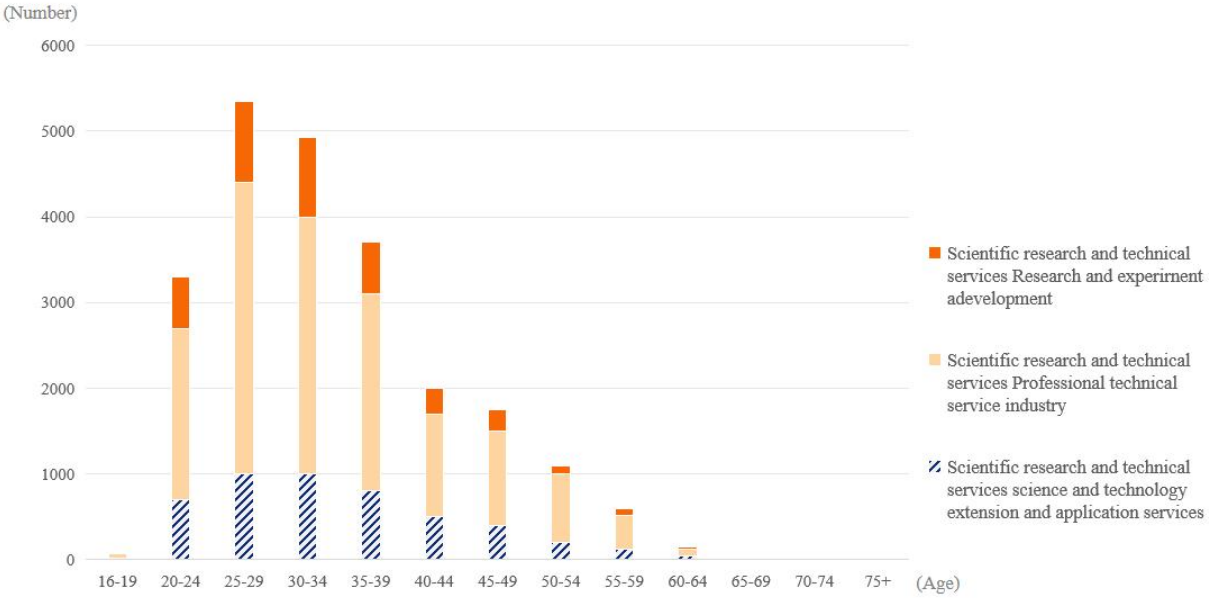


Figure 5- 8 Distribution of people in scientific research and technical services in Tianhe District

(Source: Seventh Population Census of Tianhe District)

From an educational perspective, although the area surrounding SCUT gathers a large number of highly educated talents, a significant portion of the surrounding residents have lower levels of education. The site is located in Wushan community, surrounded by other streets such as Changban, Yuangang, and Xinghua. According to the data from the seventh national census, a survey on the education levels of these four streets indicates that Wushan community has the highest proportion of undergraduate, graduate, and doctoral students among the four streets, indicating a relatively higher level of education.

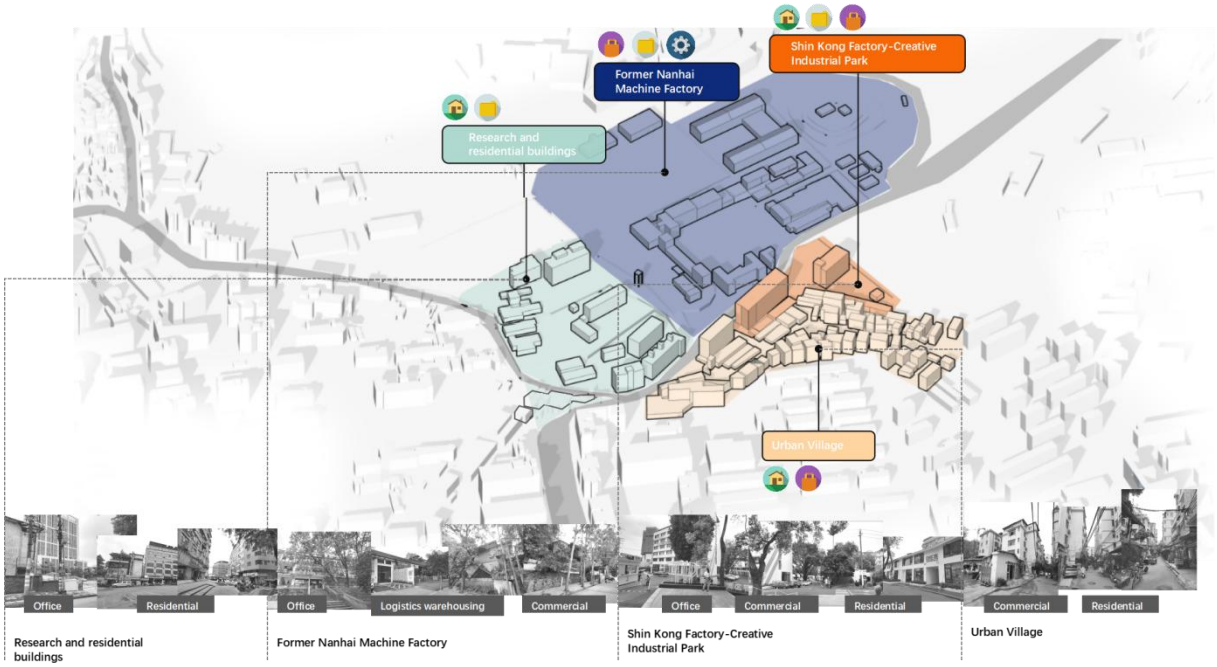


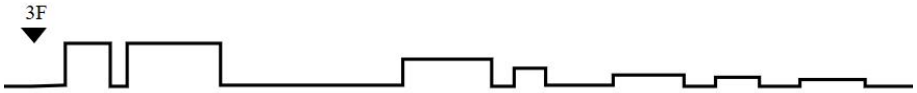
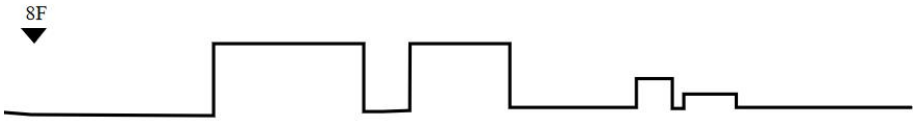
Figure 5- 9 Site status

(Source: Drawn by the Author)

Within the plot, there still exists the original atmosphere of an urban village, but it is undergoing changes influenced by academic influences. SCUT is not just a university for the entire area but also a spiritual space for everyone, making the Wushan community in Tianhe District vibrant. All of these elements are inseparable from its own essence. The site is currently divided into four main functional areas: Dongguanzhuang south community, Shin Kong Factory-Creative Industrial Park, Fomer Nanhai Machinery Factory, and Semiconductor Materials Research Institute and its residential area (Figure 5-9).

Dongguanzhuang south community is a typical urban village in Guangzhou. The internal roads consist of pedestrian pathways, connecting Dongguanzhuang Road with the Wushan Campus of SCUT. Residents' vehicles are often parked indiscriminately, leading to serious violations of road usage regulations. The buildings are mostly self-built structures with ground floors used for commercial purposes and upper floors rented out (Table 5-1). There is a lack of uniformity in architectural style, with some buildings exhibiting aging facades and potential safety hazards.

Table 5- 1 Street cross-section (Source: Drawn by the Author)

	Section
	
	
	

The former Nanhai Machinery Factory was established in the 1980s. The buildings have retained their original appearance, with most of them being rented out to external parties. The lower-level buildings are mainly used for offices and research purposes. Within the premises, there are three historical buildings of Guangzhou, all of which are still in use (Figure 5-10). The northeastern part of the factory is currently used for warehousing and logistics, while the other two are used for office space. In the eastern part of the site, only a few buildings are currently in normal use, with tenants transforming them for commercial activities to attract customers. However, most of the buildings have been abandoned.

The Shin Kong Factory-Creative Industrial Park is one of the few functional areas within the site that has undergone renovation. The factory buildings have been completely demolished, and the factory area has been planned and divided into high-rise office areas and low-rise office areas. The internal environment is relatively good, with most spaces already rented out. The park is equipped with facilities such as parking lots and dining options, making it convenient for office work.

Figure 5- 10 Existing historic buildings

(Source: Drawn by the Author)

As the site is located in the centre of Guangzhou City, it has a rather long history of development, so the roads here still maintain their original appearance and have not undergone large-scale re-planning (Figure 5-11). These roads are not laid out in the common cross-cutting form, but show a natural growth. Dongguanzhuang Road is the main road, but due to historical reasons and planning constraints, the width of this road does not even exceed ten metres at its narrowest point. Dongguanzhuang South Street, as an important road directly connected to universities, bears a heavy daily flow of people. It serves not only as a necessary route for students traveling to and from campus but also as a vital thoroughfare for the daily commute of surrounding residents. However, with the continuous increase in foot traffic, some management issues have gradually surfaced. Firstly, the indiscriminate parking of non-motorized vehicles has become an issue that cannot be ignored. On both sides of Dongguanzhuang South Street, it is common to see electric bikes, bicycles, and other non-motorized vehicles parked haphazardly along the roadside, some even occupying the sidewalks directly, causing significant inconvenience to pedestrians. Secondly, the phenomenon of businesses encroaching on public space is also widespread. Street-side shops often extend their business areas by placing merchandise outside the store or even setting up

stalls on the sidewalks. The internal major roads are shown in the following table (Table 5-2).

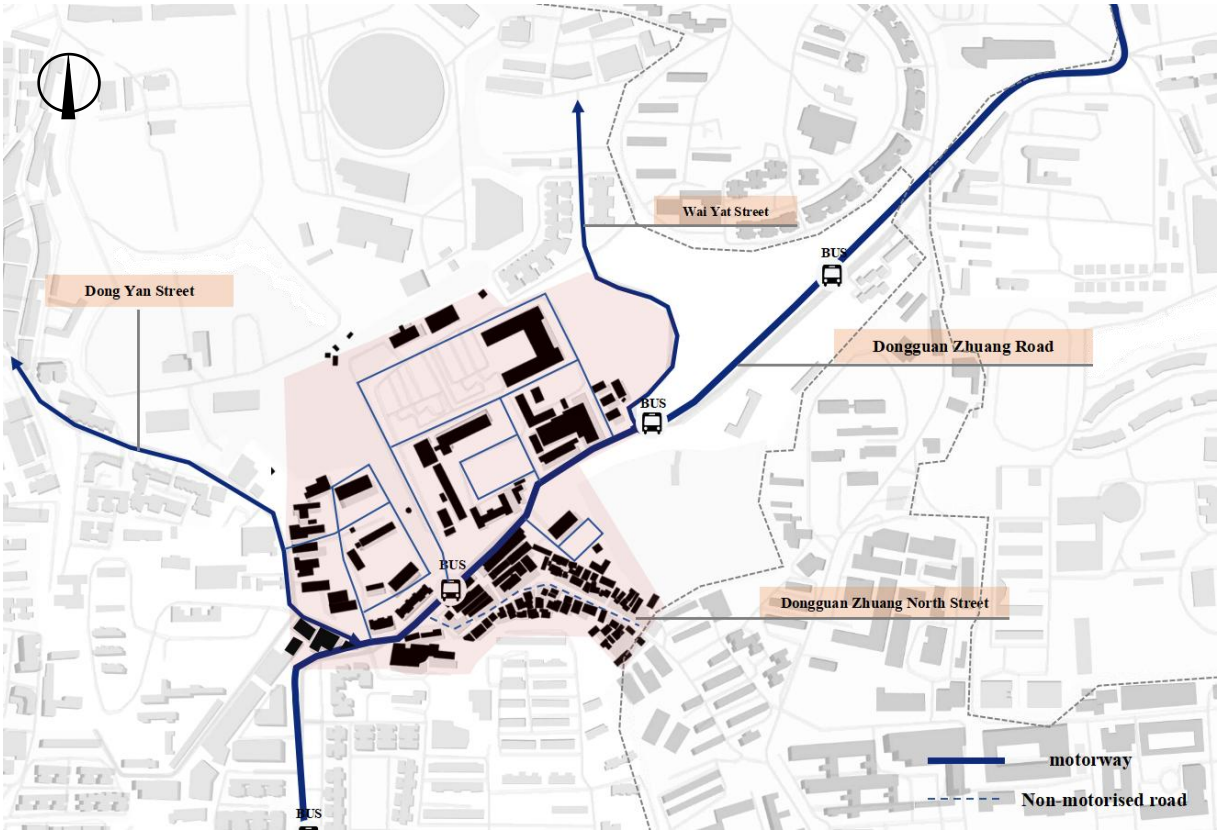


Figure 5- 11 Internal road

（Source: Drawn by the Author)

Throughout the weekdays, consistent observations of traffic flow within this area reveal a significant volume of private vehicles, exceeding 50 vehicles per 5-minute interval. Additionally, non-motorized vehicles traverse the area in numbers surpassing 200 every 5 minutes, while buses maintain a steady frequency of passage (Figure 5-12). Transitioning to the weekends, there's a marginal decrease in traffic flow, with approximately 40 private vehicles observed every 5 minutes, accompanied by more than 120 non-motorized vehicles and buses maintaining their regular frequency (Figure 5-13). Notably, congestion tends to intensify during peak travel hours, presenting a challenge exacerbated by the absence of any discernible traffic control measures along this road section (Figure 5-14).

Table 5- 2 Road conditions (Source: Drawn by the Author)

Main roads	Pictures of the current situation	Current usage
Dongguanzhuang Road	 	High volume of traffic; no non-motorised paths and footpaths; internal site footpaths along the outside
Dongguanzhuang South Street	 	Non-motorised vehicles parked randomly, occupying a large area; the phenomenon of business additions is common; the road style is poor
Internal road of Former Nanhai Machinery Factory	 	Retention of original road features unplanned

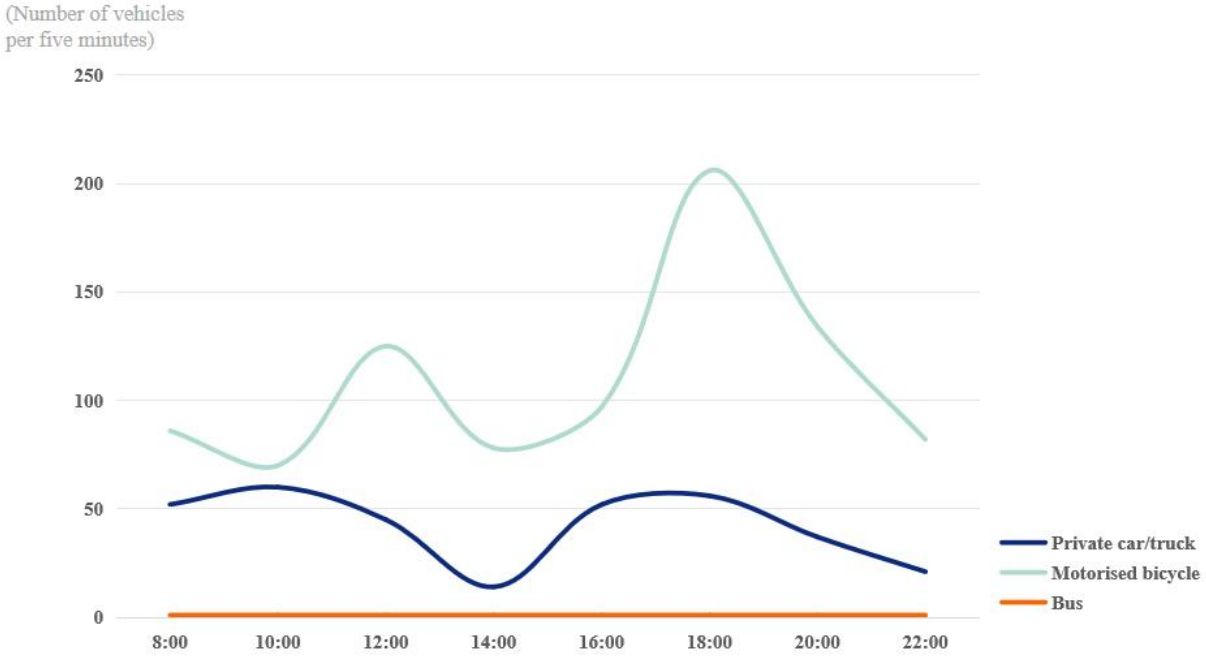


Figure 5- 12 Weekday traffic statistics of Dongguanzhuang Road

（Source: Drawn by the Author)

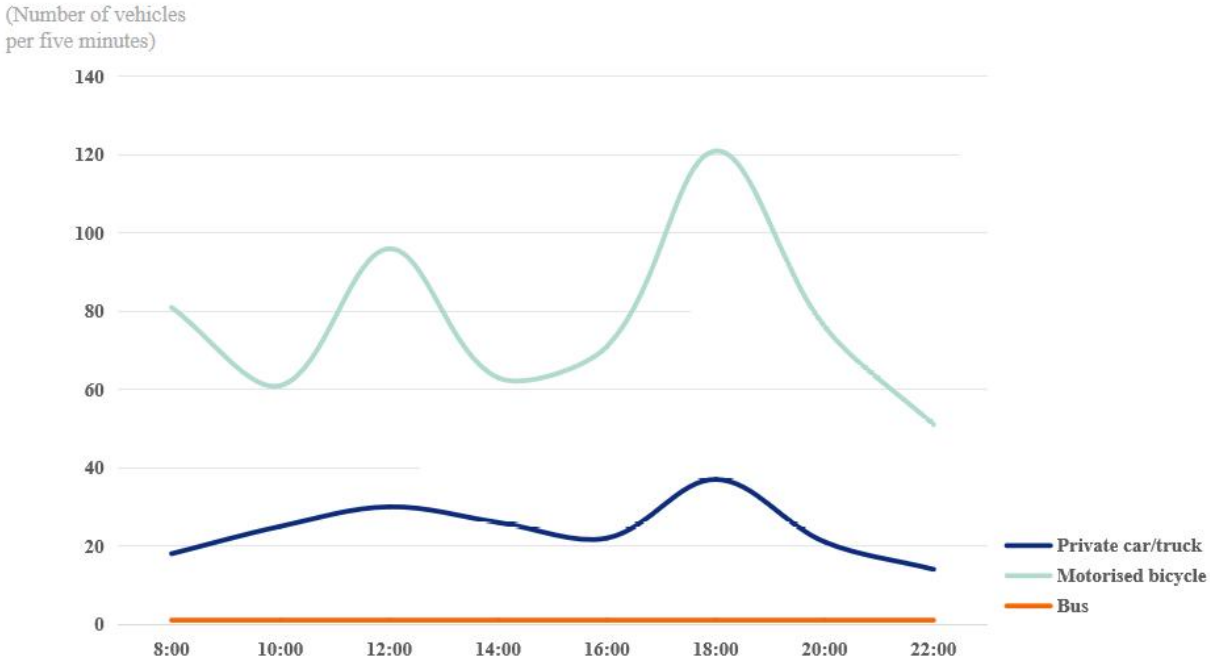


Figure 5- 13 Weekend traffic statistics of Dongguanzhuang Road

（Source: Drawn by the Author)

Figure 5- 14 Traffic jams exist during peak travelling hours

（Source: Shoot by the Author)

In its industry, both commerce and catering are predominantly characterized by small-scale storefronts, often operated by residents from the surrounding communities, resulting in relatively poor environments. These catering and retail establishments are mostly concentrated on Dongguanzhuang South Street (Figure 5-15).

They have mostly formed spontaneously without prior planning, leading to certain safety hazards. The diversity of businesses along the street predominantly caters to the daily necessities and academic requirements of students, featuring a variety of establishments

including stationery stores, photocopying shops, fruit stands, and snack bars. However, there is a noticeable scarcity of high-quality and extensive supermarkets (Table 5-3).

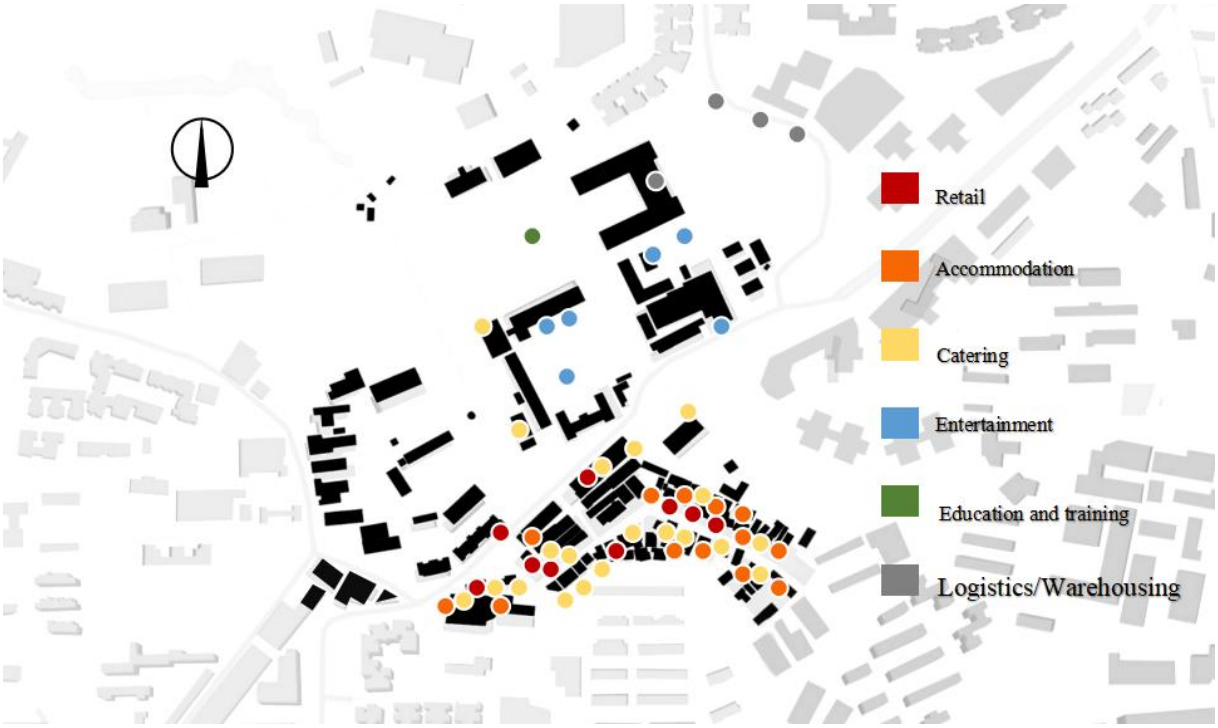


Figure 5- 15 Commercial distribution

（Source: Drawn by the Author)

While this arrangement proves convenient for individuals employed within the vicinity, it might not entirely meet the expectations of high-income residents residing in the area. This suggests a potential gap in the market for upscale retail options that cater to the preferences and purchasing power of this demographic segment.

Table 5- 3 Commercial situation (Source: Drawn by the Author)

Commercial distribution	**Pictures of the current situation**	**Current usage**
Dongguanzhuang South Street		With catering, retail and lodging as the main focus, with a high flow of customers.
Research institute residential buildings		Predominantly retail, sporadic distribution.

Table 5-3 Commercial situation（continue）

Commercial distribution	Pictures of the current situation	Current usage
Former Nanhai Machinery Factory	 	Focusing on catering, entertainment and recreation.
Shin Kong Factory-Creative Industrial Park	 	Focusing on catering and counselling services, mainly used by campus workers.

Sports and entertainment facilities are mainly located within the Former Nanhai Machinery Factory. Inside, there are temporary sports venues, with research indicating high current usage and a stable customer base. The entertainment spaces within the Former Nanhai Machinery Factory primarily cater to rave parties, serving the fashion interests of the younger generation. In comparison, the diversity of entertainment is relatively low.

Research facilities within the premises are distributed between the Semiconductor Materials Research Institute and the Former Nanhai Machinery Factory (Figure 5-16). Currently, the buildings used by the Semiconductor Materials Research Institute have been in use for a long time, with the quality condition not optimistic. Its newly constructed office building is actively seeking tenants, but with low occupancy rates. Research spaces within the Nanhai Machinery Factory are primarily located on the southwest side, catering mainly to the construction and internet industries, with relatively high usage rates.

Finally, there is a clear lack of cultural facilities that are highly appealing to the public. The site is adjacent to university campuses, surrounded by numerous colleges, and with a high community density. However, there is a lack of corresponding cultural facilities and amenities. Currently, there is no cultural building on the site, and there is also a lack of interaction with the universities in terms of cultural activities. The development of an area often requires the gathering of high-quality and diverse cultural facilities to attract mature cultural activities and

public use. Although the site currently lacks cultural facilities, it has the potential to provide cultural services to the surrounding residents and users.

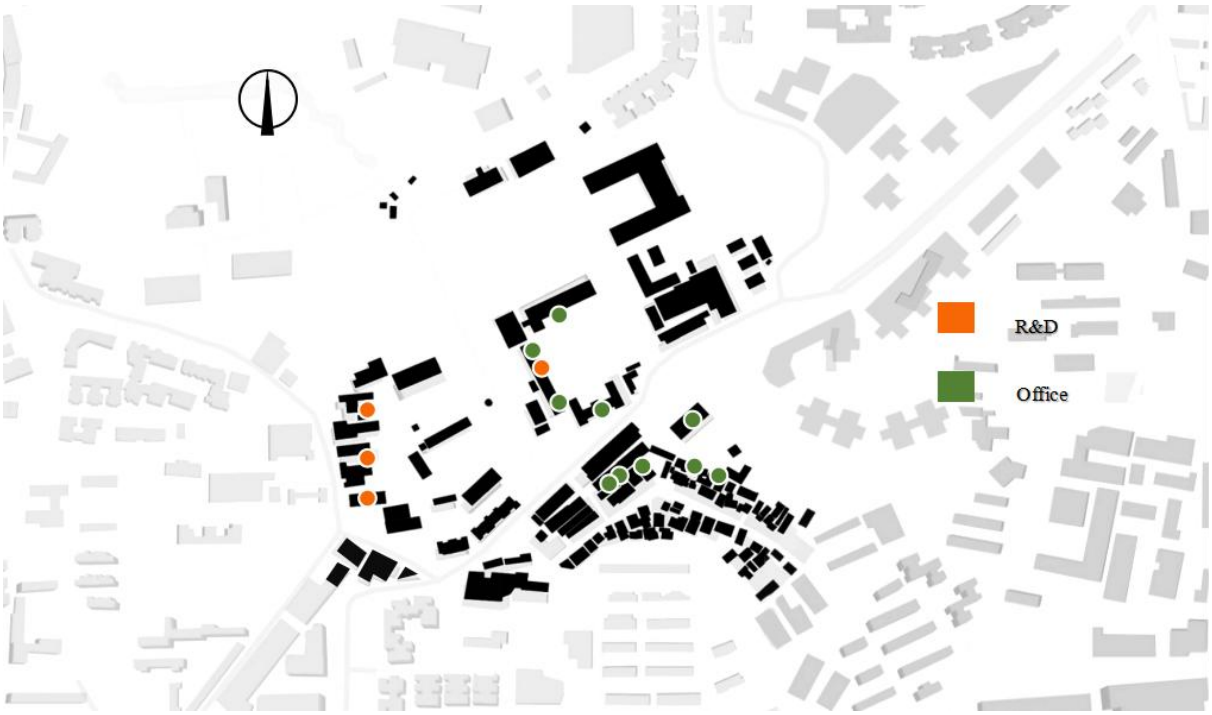


Figure 5- 16 Distribution of R&D and office

(Source: Drawn by the Author)

5.2.2 Survey analysis for university students and residents

(1) Utilization of site resources by university students

In order to gain a more comprehensive and genuine understanding of the overall environment of the site and the needs of its users, and to analyze the differences in the impact of universities, this study conducted a questionnaire survey of students at the Wushan Campus of SCUT. A total of 201 questionnaires were distributed, and 75 valid questionnaires were received.

Through sampling surveys of students, it was found that the age of the respondents generally ranged from 17 to 30 years old, with postgraduate students being the majority. Among them, 21% of the students surveyed frequent this area (Figure 5-17), indicating that university students overall use the facilities here frequently. Dining, shopping, and accommodation ranked in the top three, with commercial consumption accounting for the highest proportion. Dining areas are concentrated in Dongguanzhuang South Street. In

addition to regular shopping and dining, students also travel to this area to take buses at the Dongguanzhuang Bus Station and for internships (Figure 5-18).

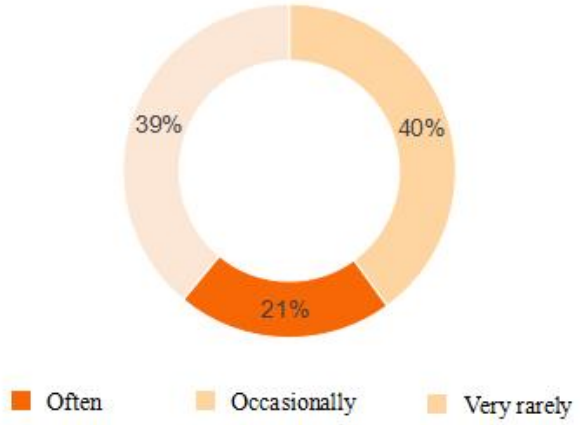


Figure 5- 17 Frequency of use of field facilities by students

(Source: Drawn by the Author)

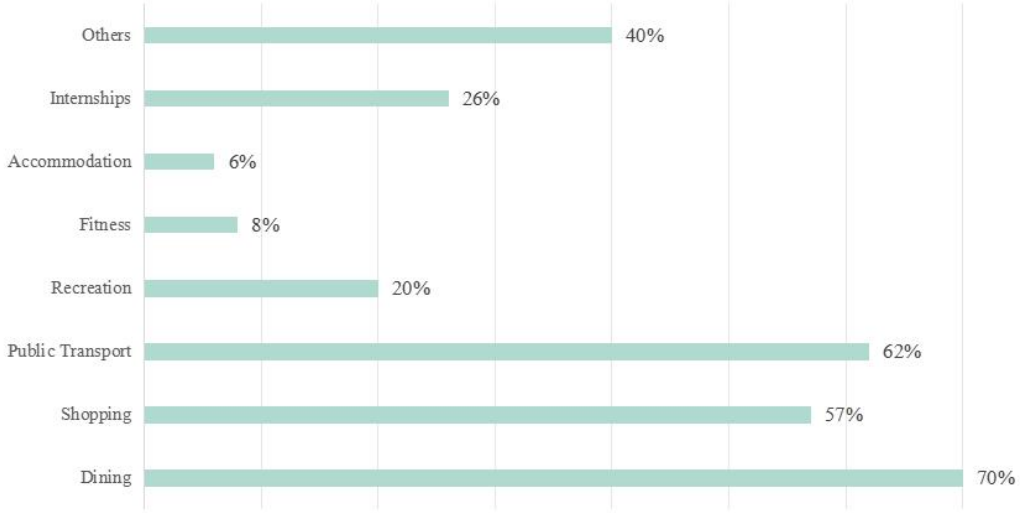


Figure 5- 18 Purpose of using

(Source: Drawn by the Author)

Most students believe that the surrounding residents pose a disturbance to the campus. The majority of students think that universities should maintain a semi-open status towards the surrounding area and should not be completely open to nearby residents (Figure 5-19).

Regarding the current situation of the site, most students hope to see an increase in leisure and cultural venues, such as cafes, bars, and exhibitions, which can satisfy not only material needs but also certain spiritual needs (Figure 5-20). Secondly, improving the

transportation situation is desired. According to the questionnaire responses, whether it's public transportation or private cars, traffic congestion is generally severe (Figure 5-21).

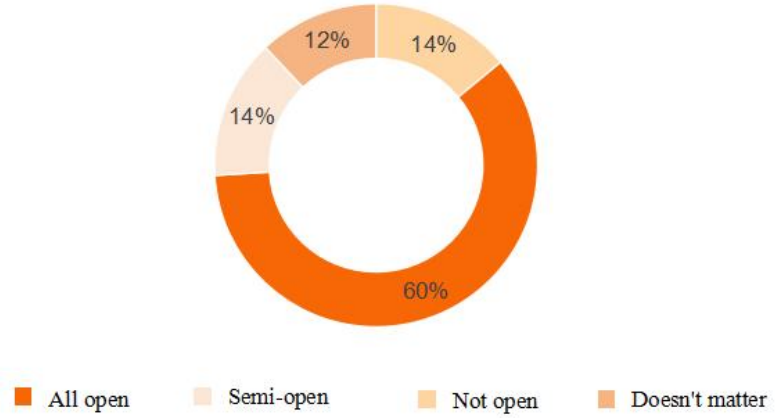


Figure 5- 19 Attitudes of university students towards campus openness

(Source: Drawn by the Author)

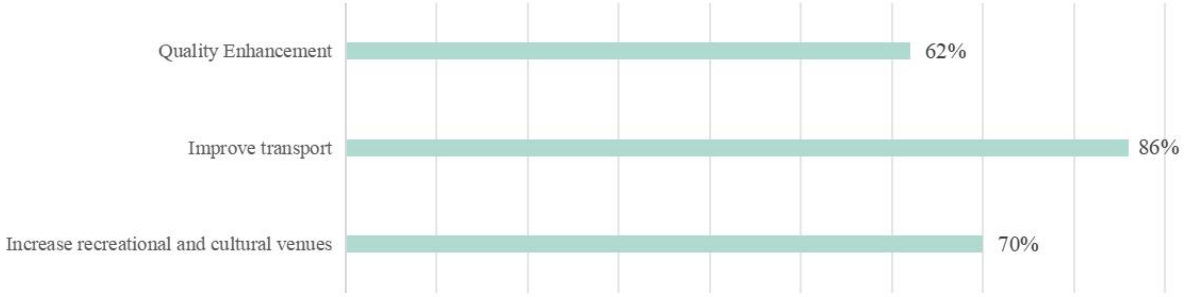


Figure 5- 20 University students' demands for regeneration

(Source: Drawn by the Author)

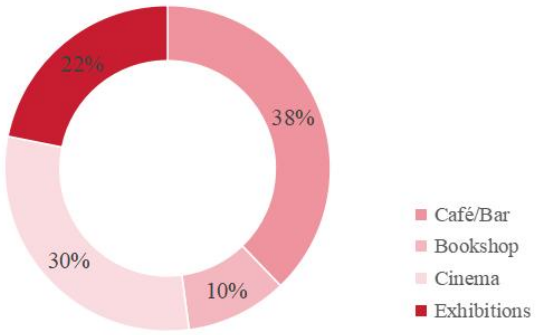


Figure 5- 21 Demand for recreational and cultural venues

(Source: Drawn by the Author)

Through questionnaire analysis, it is found that the demands of university students are gradually increasing, and the campus-proximate areas provide more convenient living spaces for them. Meeting the daily life needs of faculty and students is the most basic requirement. The demands of university students for area regeneration mainly focus on improving transportation, increasing leisure and cultural venues, and enhancing quality. Regarding leisure and cultural venues, university students need diverse leisure activities and cultural exchanges, such as cafes, bars, and exhibitions.

(1) Residents' needs

Through a sampling survey of residents, it was found that the age groups between 17 and 30 years old and those aged 60 and above make up a significant proportion, while the proportion of the middle-aged population is relatively small.

As the living standards of urban residents improve, their demands for their own living conditions and the surrounding service facilities are also strengthening. The proportion of spiritual and cultural needs in residents' daily lives is gradually increasing. This is mainly reflected in the demand for the use of university cultural facilities and sports venues. Before the pandemic, residents in the area could freely enter and exit through the entrances to Dongguanzhuang South Street and the university, making use of the university resources very convenient. However, since the start of campus closures due to the pandemic, accessibility has decreased, resulting in a relatively lower frequency of residents using these facilities. Research shows that 78.2% of residents hope to remove the access restrictions at the entrances and share campus resources with university faculty and students.

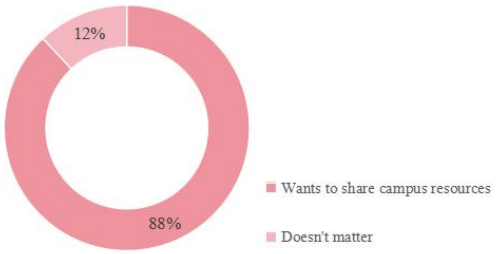


Figure 5- 22 Residents' demands for access to college resources

(Source: Drawn by the Author)

In terms of the renovation and transformation of the site, the majority of residents express a desire to improve transportation (87%) and add commercial functions (75%). In terms of other functional demands, there is also a high proportion of residents interested in parks and parking lots. Additionally, there is significant demand for public libraries, community activity rooms, and other similar amenities.

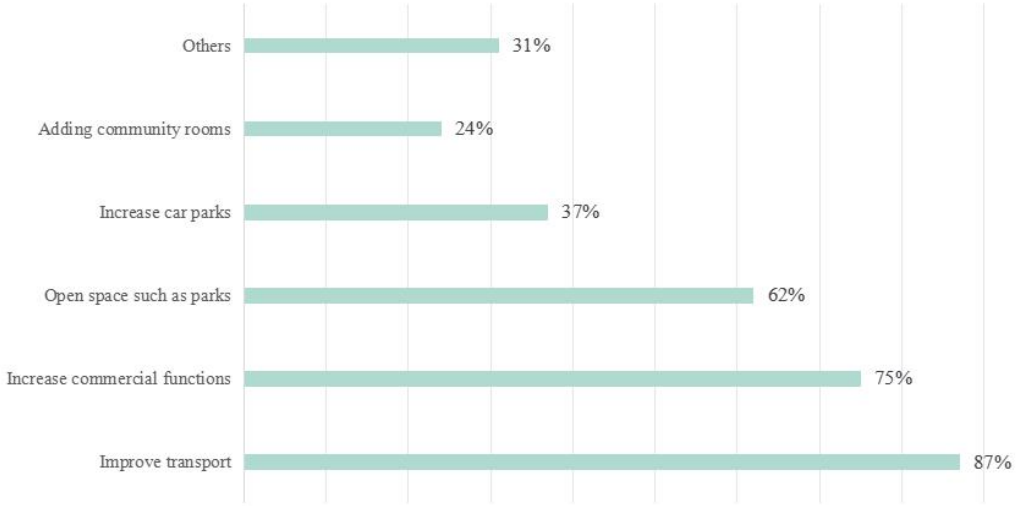


Figure 5- 23 Residents' demands for regeneration

(Source: Drawn by the Author)

(2) Attitudes towards renovation

① University student group: Questionnaire data shows that the vast majority of university students believe that renovation and transformation are necessary (Figure 5-24). This indirectly reflects the relatively low satisfaction of university students with the overall environment surrounding the campus. In terms of participation willingness, 52.0% are actively willing to participate, 47.0% are adopting a wait-and-see attitude, and only 1% are not willing to participate (Figure 5-25). Interviews reveal that the portion of students adopting a wait-and-see attitude mainly stems from a lack of understanding of the process and content of the area's renovation and not knowing how to participate.

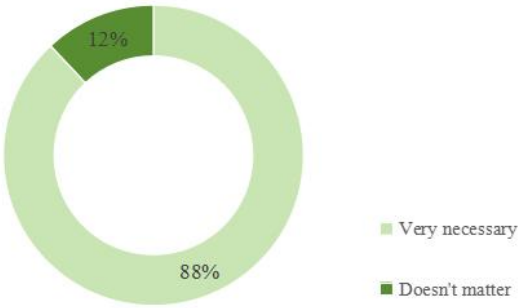


Figure 5- 24 University students' views on regeneration

(Source: Drawn by the Author)

Among the university students who are actively willing to participate, there are two subgroups. Some students prefer to volunteer for research and participate in summer social practices, while students majoring in design leverage their professional expertise to personally design sculptures, sketches, and other elements to improve the environment of the area.

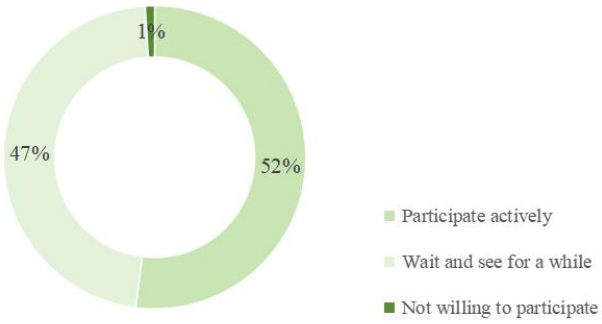


Figure 5- 25 University students' willingness to participate in regeneration

(Source: Drawn by the Author)

② Residents: Among the surrounding residents, 88% believe that renovation is necessary, while only 12% believe it is unnecessary (Figure 5-26). Regarding willingness to participate, 42.6% are willing to participate, 46.5% are adopting a wait-and-see attitude, and 10.9% are not willing to participate (Figure 5-27). It is worth noting that almost 90% of residents believe that it is necessary to renovate the area, but less than half are willing to actively participate, indicating a relatively weak awareness of public involvement.

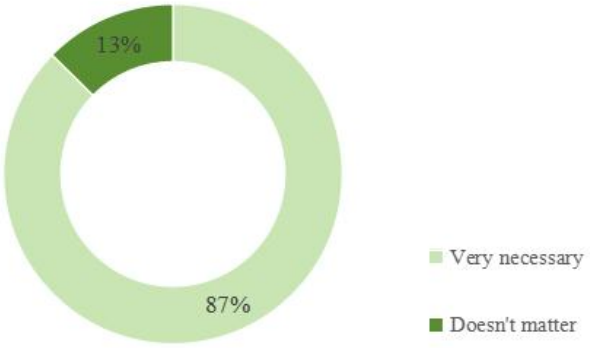


Figure 5- 26 Residents' views on regeneration

(Source: Drawn by the Author)

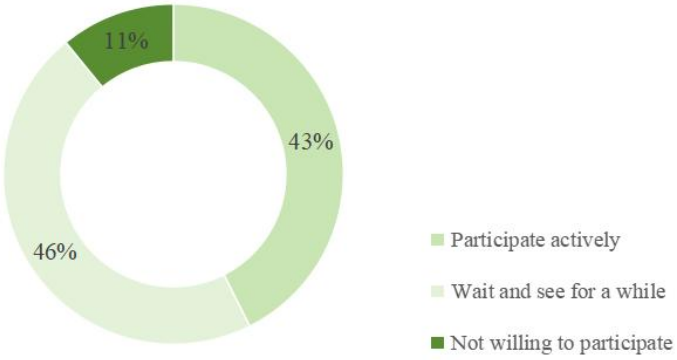


Figure 5- 27 Residents' willingness to participate in regeneration

(Source: Drawn by the Author)

5.3 Summary of current problems

The previous sections have introduced the relevant policy background and site conditions. Combined with the SWOT analysis of the site, the following will outline the relevant issues and propose strategies for site renovation (Figure 5-28). The specific questions are as follows:

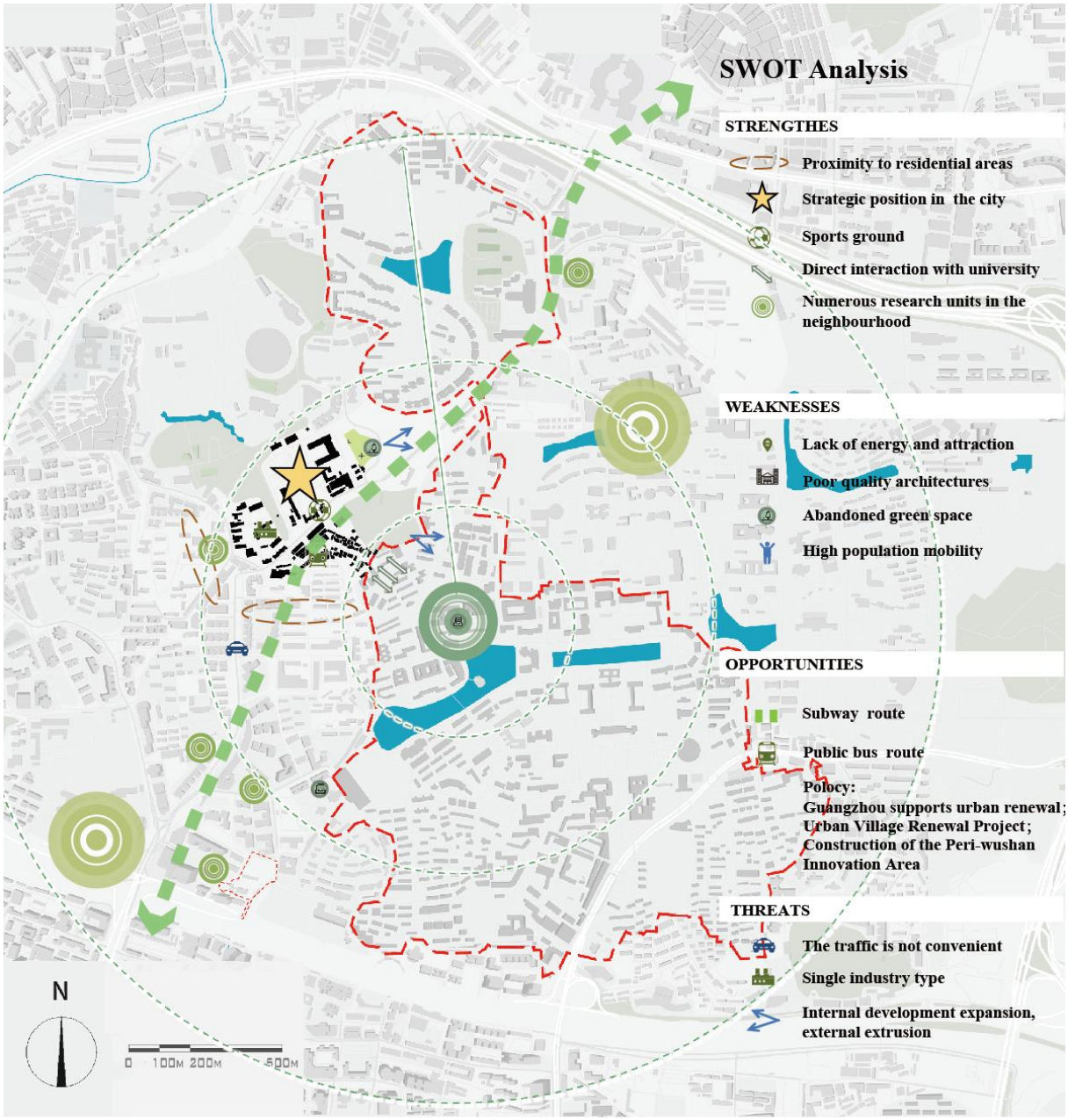


Figure 5- 28 Site SWOT analysis

(Source: Drawn by the Author)

(1) Lack of relevant functions

The concentration of commercial services in certain areas has led to a mix of functions and chaotic construction, posing risks. Although there is a high density of human resources within the research scope, the main business formats are retail, catering, and small-scale creative studios. There is a lack of larger-scale service formats suitable for leisure, such as cafes, bookstores, and restaurants, making it difficult to meet the needs of different consumer groups and to establish a good business model and commercial atmosphere (Figure 5-29).

Additionally, there are no large-scale commercial facilities to meet residents' material and spiritual needs. Research institutes are relatively independent, and there are multiple walls separating the community internally. Although the creative industry is concentrated around universities, there are few facilities that serve both the university and the community, leading to a lack of communication.

Figure 5- 29 Single type of business

(Source: Drawn by the Author)

(2) Lack of active open spaces

Compared to the population density of the surrounding community, there is a severe shortage of open spaces within the research scope (Figure 5-30). Currently, open spaces within the site are mainly distributed along road intersections, streetsides, and near university entrances, with a concentrated geographical location. They can only accommodate a small portion of people for stay and use, without fully considering the activity needs of different groups. This is detrimental to the development of urban life diversity. Presently, the only sports space within the research scope is the sports facilities built inside the Former Nanhai Machinery Factory. While its quality is average, it is in high demand. From the overall spatial perspective of the research scope, only by forming a networked spatial pattern can more people be attracted to stay, creating connecting points between different locations to unleash the existing environmental potential.

Furthermore, the lack of rest facilities is also an issue. Due to the high volume of pedestrian traffic in this area, the open spaces along urban roads are predominantly paved

with hard surfaces, resulting in poor environmental quality. Without relevant rest facilities, it is difficult to attract people to stay. Increasing corresponding commercial and rest facilities would significantly improve the convenience for users to stay, thereby enhancing the attractiveness of the space to different groups of people. This would encourage more participation in leisure and social activities, enriching residents' daily lives and increasing the overall vitality of the area.

Figure 5- 30 Status of open space

(Source: Drawn by the Author)

Most of the open and concentrated green spaces within the research scope are not well-utilized, and their potential has not been fully explored. Additionally, there are several well-preserved historical buildings in the vicinity of the area, which are important elements of the city's image. Two of these historical buildings are currently used for offices, while the original factory buildings are currently used for logistics and warehousing. However, they have not been renovated or protected, leading to poor building conditions.

(3) Inconvenient traffic and pedestrian organisation

There are various types of transportation within and around the site, including walking, public transportation, and private vehicles. The road structure is complex, forming dense nodes, and connecting to the main urban roads is inconvenient. There are many residential

communities surrounding the site, and these older communities were primarily developed to meet residential needs during their initial development, without considering the rapid growth of private cars brought about by rapid economic growth. The activities of university faculty and students in the surrounding areas mainly involve daily activities such as dining, shopping, and hairdressing. Walking is the primary mode of transportation, followed by public transportation. The Dongguanzhuang Bus Terminal occupies a significant amount of road space, adding to the traffic burden. Additionally, the high density of buildings around the university makes it difficult to access underground parking lots, and the limited parking capacity leads to some vehicles parking on the sides, causing traffic congestion. Overall, parking lots in the area are scarce, and the road structure is chaotic, resulting in a common mix of pedestrian and vehicular traffic.

The roads outside the site lack planning, with Dongguanzhuang Road crossing the entire site, and the section passing through South Dongguanzhuang Street is narrow. Additionally, at the intersection leading to Dongguanzhuang South Street, there is the Dongguanzhuang Terminal Bus Station, which occupies a large area on the ground with designated areas for bus parking and non-motorized vehicle parking. Due to the lack of sidewalks, the phenomenon of mixed pedestrian and vehicular traffic is very common (Figure 5-31).

Figure 5- 31 Bus and sub-motor vehicle parking areas

(Source: Drawn by the Author)

(1) The spillover of disciplinary advantages is not obvious

Due to the close connection between the land layout within the research scope and the campus, some functions of the university have been undertaken, providing a certain

foundation for subsequent regeneration. It is worth noting that although some industries related to advantageous disciplines have a certain development foundation, their scale is small, and a complete industrial chain has not been formed. The knowledge spillover from SCUT is manifested in small-scale studios and startups composed mainly of alumni, faculty, and students, showing a trend of development in the area (Figure 5-32). Due to the scarcity of internal resources within the university, some majors lack corresponding laboratories, teachers lack personal studios, and students lack dormitories. It was found during the research that teachers and staff of SCUT rent space for offices inside the Former Nanhai Machinery Factory and Shin Kong Factory-Creative Industrial Park, and students rent housing. However, the current spillover is still insufficient to sustainably drive urban development in the long term, and it provides limited help to the overall industrial environment and industrial upgrading in the surrounding areas.

Figure 5- 32 Workshop of college teachers in Former Nanhai Machinery Factory

(Source: Drawn by the Author)

Overall, through questionnaire surveys and on-site research analysis, the spillover of university functions is still occurring. However, the related industries have not yet formed a certain scale and cannot play a role in driving overall development. Therefore, the site should cultivate a certain professional market and establish research institutions and enterprises that combine research with relevant disciplines. This will promote the coordinated development of university and city.

Chapter 6 Regeneration strategies and design

6.1 Regeneration strategies

The previous section analyzed the current situation within the site and the existing problems. Next, specifically summarize the regeneration strategies through three aspects (Figure 6-1).

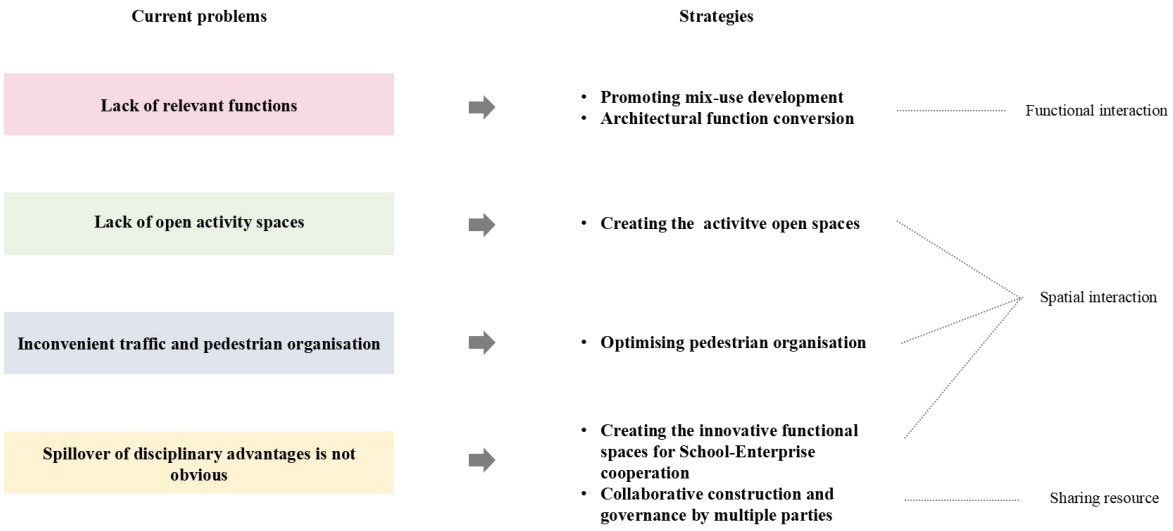


Figure 6- 1 Regeneration strategies

(Source: Drawn by the Author)

6.1.1 Promoting mix-use development

Research indicates significant deficiencies in current functional types, prompting an urgent need for supplementation.

Firstly, on the basis of existing commercial and residential areas, the proportion of commercial spaces should be increased, and different types of spaces should be added to accommodate the overflow of university functions, further enhancing and improving the commercial environment and order of the area. By integrating residential, office, retail, R&D, entertainment, and service facilities, a comprehensive block containing various business formats should be developed (Figure 6-2).

Figure 6- 2 Complementing multiple functions

(Source: Drawn by the Author)

Secondly, adjustments can be made to the functions of certain buildings (Figure 6-3). The dining spaces on the ground floor of Dongguanzhuang south community suffer from disorderliness due to excessive freedom, resulting in a chaotic and spontaneous commercial effect in the original shops. The noisy fast-food model and direct exhaust of fumes have added to the discomfort of the environment. With the trend of "gentrification" in college student consumption, it is feasible to consolidate the messy dining functions into a centralized location for convenient dining while enabling unified management of the dining environment. The existing residential areas in the community planned for demolition can be transformed into integrated living spaces. Considering the behavior of college students and some migrant workers renting in the area, investment from the university, cooperation between the government and community residents can upgrade the original residential areas into integrated living spaces. This can include providing high-end apartments for some students and office workers to rent, and incorporating a certain proportion of public service facilities to attract more college students and workers to rent.

In addition to residential functions, the existing buildings can also be transformed into public service centres, bookstores, art studios, and more.On the one hand, this increases the economic sources for community residents and improves the living environment for elderly residents. On the other hand, it meets the housing needs of college students and further strengthens the interaction between college students and surrounding community residents in terms of daily life.

Therefore, the orderly, clean, quiet, and safe socializing and leisure spaces needed by students can be achieved through the unified transformation and upgrading of disorderly dining establishments under the supervision of the Community Residents' Committee and residents. This approach aims to create a symbiotic relationship among the functional needs of the campus, city, and community, while ensuring the comfortable living conditions of the residents.

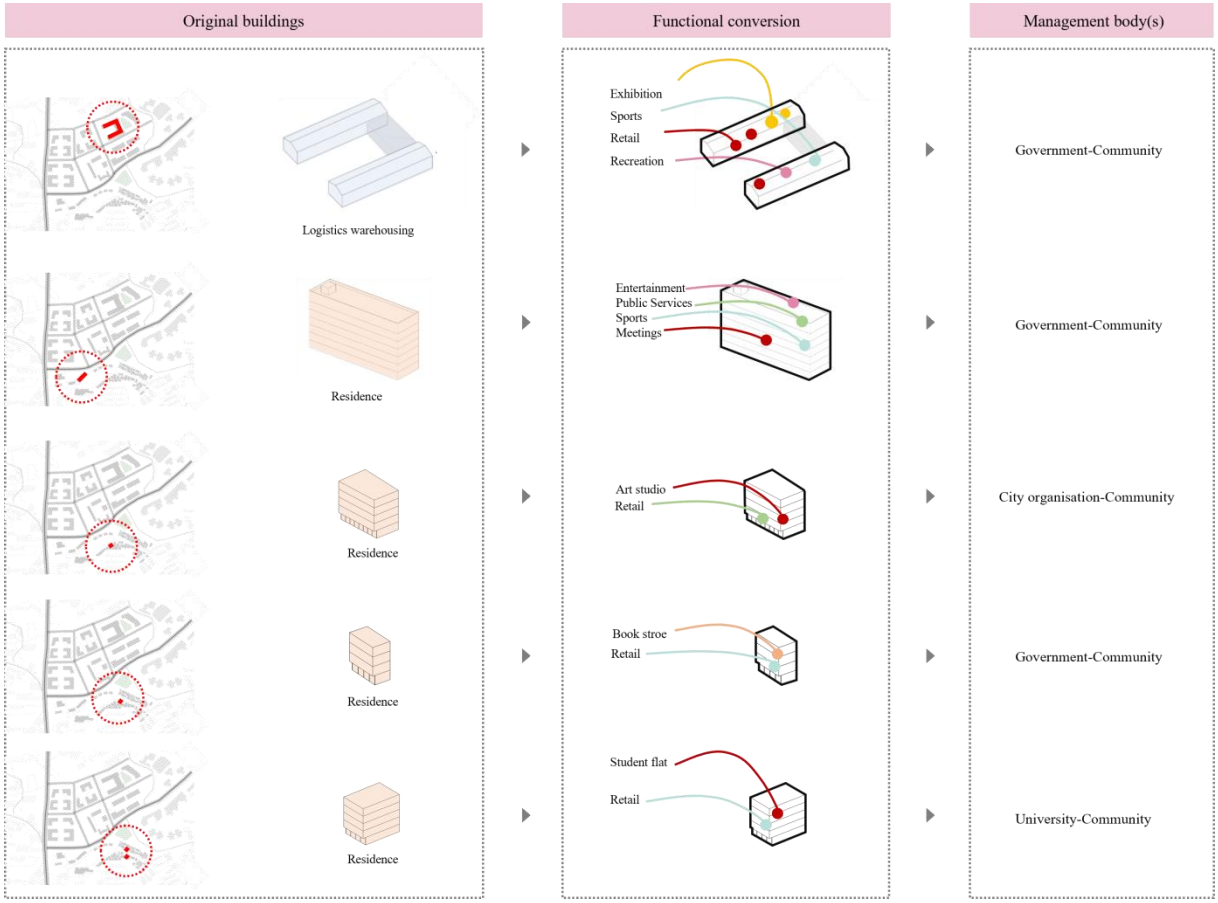


Figure 6- 3 Functional transformation

(Source: Drawn by the Author)

Apart from the Dongguanzhuang community, the workshops within the Fomer Nanhai Machinery Factory also require functional adjustments. The main function of the workshop currently serves as a logistics warehouse centre, but with the changing times and the diversification of community needs, the function of the workshop has gradually appeared to be single, unable to meet the increasingly diverse demands. After the transformation, the workshops have been diversified to include functions such as commerce, exhibitions, and sports. The commercial area offers convenient services like shopping and dining for the community residents. The exhibition area serves as a platform to showcase cultural, artistic, and technological achievements, attracting citizens and tourists for visits. The sports area provides residents with a place for exercise and relaxation, further enhancing their quality of life.

6.1.2 Creating an interactive spatial system

6.1.2.1 Optimizing the existing spatial relationships

In the context of the policy background of stock land transformation and the construction of the Peri-Wushan Innovation District, regenerating is imperative. Firstly, it is necessary to restructure the road system to improve accessibility. Currently, transportation within the site is highly inconvenient, with factors such as lane divisions and enclosed communities constraining mobility and affecting street aesthetics. Therefore, there is a need to redesign the road system to address the issues of chaotic road conditions and rebuild spatial connections between the area and the city.

In the process of regenerating, thorough site research and assessment of the value of buildings are conducted to maintain the current status of areas with high levels of interaction. By strategically planning land use, the workload of the government in delineating property rights is reduced. The existing texture of the site and the original spatial scale of the blocks are preserved, maintaining and creating a diverse spatial sequence. Unreservedly valuable buildings can be demolished at the planning level to facilitate the creation of fire access routes and pedestrian-friendly roads that meet modern requirements. The strategy of "demolition and

clearance" has already planned new routes for the significant flow of people through the site, diverting traffic functions, and defining open streets and building interfaces (Figure 6-4).

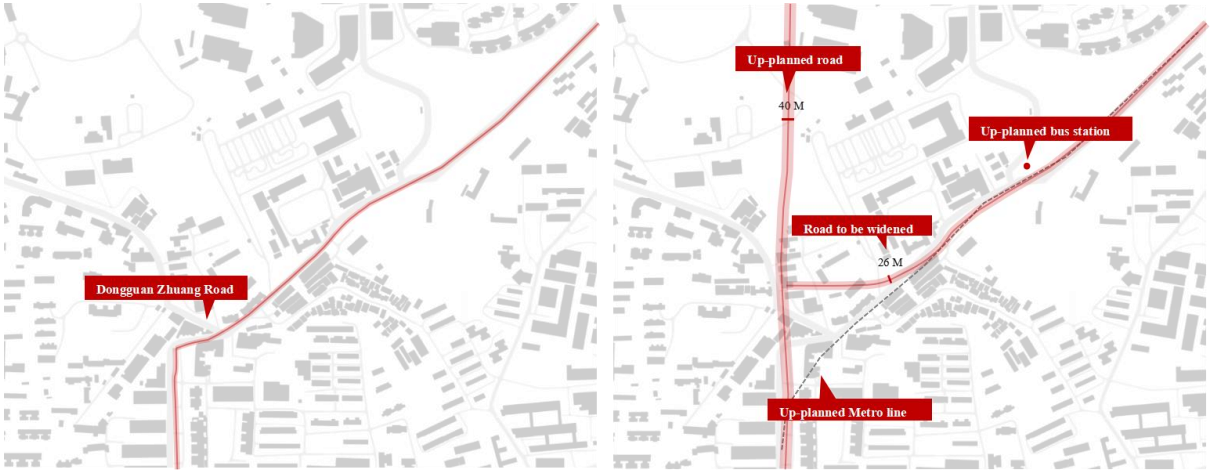


Figure 6- 4 Before and after road changes

(Source: Drawn by the Author)

Through research, the functional aspects of buildings within the community that require planning regeneration are clearly identified and evaluated for their value. If buildings have low preservation value, they can be demolished according to the planned direction. By maintaining the existing texture without disruption, the community's underlying structure is cleared, making the roads smoother. Dongguanzhuang South Street, as a road directly adjacent to the university, interacts frequently with the university and is part of the campus memory for faculty and students. Therefore, Dongguanzhuang South Street will undergo comprehensive regeneration, with the demolition of poorly constructed and low-quality temporary buildings, improving the street's appearance. Secondly, buildings with high interaction and vitality will be preserved. Historical buildings, as part of urban culture, also have their value. Currently, there are three historical buildings within the site, all of which will be preserved for future protection and functional transformation (Table 6-1).

Table 6- 1 Unblocking of part of the building and fence (Source: Drawn by the Author)

Buildings distribution	Pictures of the current situation		Current usage
			Some of the buildings are derelict and lack space for public activities and interaction with the university.
			Poor building quality and lack of space for public activities; lack of commercial functions.
			The spacing between buildings is too small; the building planning is unreasonable and occupies part of the city road; and there is a lack of space for public activities.

The objective of the road delineation is twofold: to mitigate existing challenges related to traffic congestion and inadequate accessibility. Informed by the dynamic relationship between the university and the city, the configuration of traffic within the transportation infrastructure is seamlessly integrated with urban traffic patterns. This integration not only fosters harmonized development between university and city transportation systems but also facilitates convenient linkages for resource and facility sharing, as well as fostering innovation collaboration and exchange between the academic and urban spheres. Through meticulous optimization of the road delineation and in alignment with overarching urban planning strategies, specific vehicular traffic routes are carefully delineated to align with the architectural fabric of the area. This strategic alignment ensures that vehicular movement is

not only efficient but also harmonious with the surrounding built environment, enhancing overall urban functionality and aesthetic coherence (Figure 6-5).

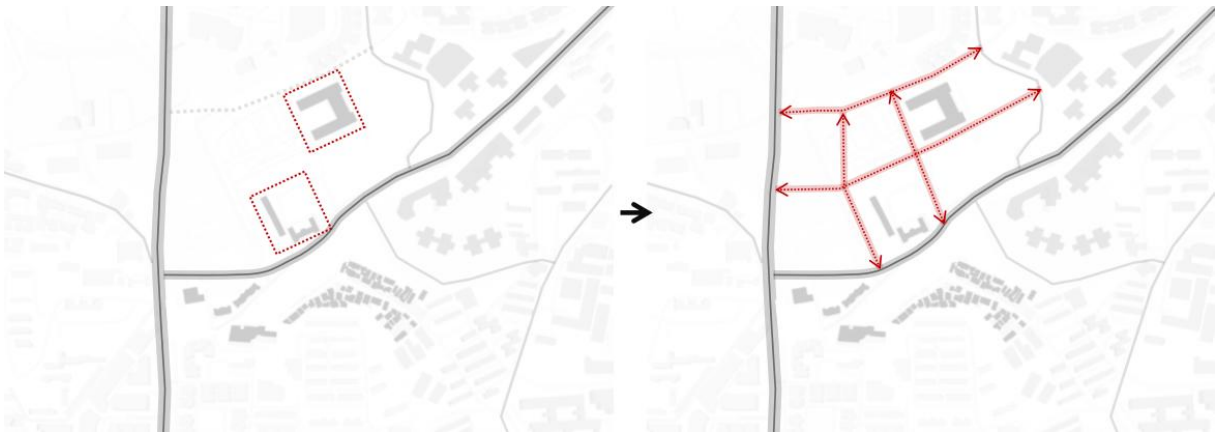


Figure 6- 5 Delineation of internal vehicular traffic flow

（Source: Drawn by the Author)

6.1.2.2 Creating the innovative spatial cluster for School-Enterprise cooperation

Compared to surrounding communities, the Wushan Community of South China University of Technology has higher population density and land use pressure, with more prominent functionality and activity aggregation. In recent years, some innovative functional spaces have emerged both on campus and in surrounding communities. The form of innovative functional spaces on campus mainly involves embedding shared learning spaces, cafes, cultural and creative shops, and other informal interaction spaces within office buildings, while there is still room for improvement in terms of building connections, combinations, and functional integration. Shared office spaces such as "Hunji" have appeared in the off-campus community, but due to complex reasons such as accessibility and economy, they are only temporary.

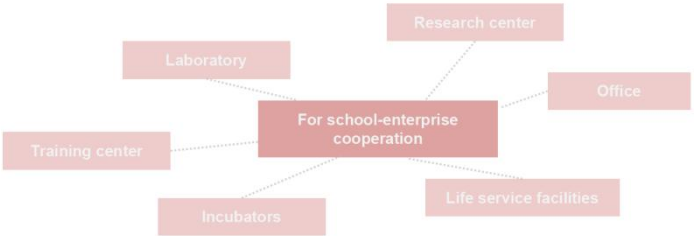


Figure 6- 6 Implant functions in order to promote school-enterprise cooperation

(Source: Drawn by the Author)

In the future, the regeneration design of the Peri-Wushan Innovation District will focus on multiple aspects such as architectural scale creation, building connections, and functional space combinations, emphasizing the development goal of the overall district structure, fully integrating resources to promote functional integration, intensively using land, and constructing diversified development units to meet the needs of different population groups.

The innovative functional clusters can accommodate the overflow functions of universities, promoting the joint construction of innovation districts between academia and industry. Their core purpose is to provide comprehensive services and support for university-industry collaboration (Figure 6-6), aiming to foster deep integration of production, academia, and research. Leveraging the academic strengths of universities, establish technology transfer center, industry-university-research cooperation bases, innovation and entrepreneurship bases, as well as talent development bases. These facilities provide offices, research, and production services, assisting universities in translating research results into practical applications and promoting collaboration between academia and industry(Figure 6-7).

Figure 6- 7 Innovative functional clusters

(Source: Drawn by the Author)

6.1.2.3 Creating the active open spaces

In regenerating, it is essential to consider the existing texture to create highly recognizable active open spaces. In addition to increasing the density and area of open spaces to form a networked spatial pattern, the quantity and quality of facilities within the open spaces are also crucial. Relevant studies have also shown that, under similar spatial scales and accessibility, more people tend to visit open spaces that are more attractive.

Through in-depth research and organization of the existing architectural texture, design aims to conform to and enhance the urban context, creating a continuous and open street form. Firstly, comprehensive consideration is given to aspects such as architectural layout, style, and scale. Building upon this foundation, design adapt to the existing architectural context, preserving and respecting the original charm and characteristics of the buildings, while integrating new design concepts and elements to form a modern urban space that harmonizes with the existing historical architecture (Figure 6-8). Secondly,select appropriately scaled active open spaces, add service facilities, and introduce covered walkways, ensuring that the street space maintains continuity while also possessing openness and permeability (Figure 6-9).

Figure 6- 8 Complementary architectural texture

(Source: Drawn by the Author)

Figure 6- 9 Create active open spaces

(Source: Drawn by the Author)

6.1.2.4 Optimising pedestrian organisation

The availability of a good ecological environment and distinctive architecture, along with urban parks, collectively constitute the open space elements that can be utilized for area regeneration. During the regeneration process, these spaces should be integrated as part of the urban and community open spaces to enhance the continuity of the area's open spaces. Additionally, the corner spaces formed by buildings on both sides of the streets should be actively utilized, dividing the space with greenery, central tree pits, paving, etc., to improve the environmental quality of the edge space. Regular hard paving will be used to connect with the urban space, creating a continuous, clearly defined, and networked pedestrian open space .

The design will fully consider the upper-level planning. Combining with the bus stop in the eastern part of the site, future subway stations will be set up in adjacent plots. This area, as a transportation node, can be combined with commercial and office functions to build future complexes. To provide users with a better spatial experience, outdoor corridors will be created to link the public space nodes within the area, effectively connecting the entire area and providing multi-level interactive spaces for various groups of people (Figure 6-10).

Figure 6- 10 Pedestrian organisation

(Source: Drawn by the Author)

The design of pedestrian flow lines aims to change the existing urban spatial conditions that are not conducive to walking and contribute to the connectivity between the various spaces within the area as well as between the university and the city (Figure 6-11).

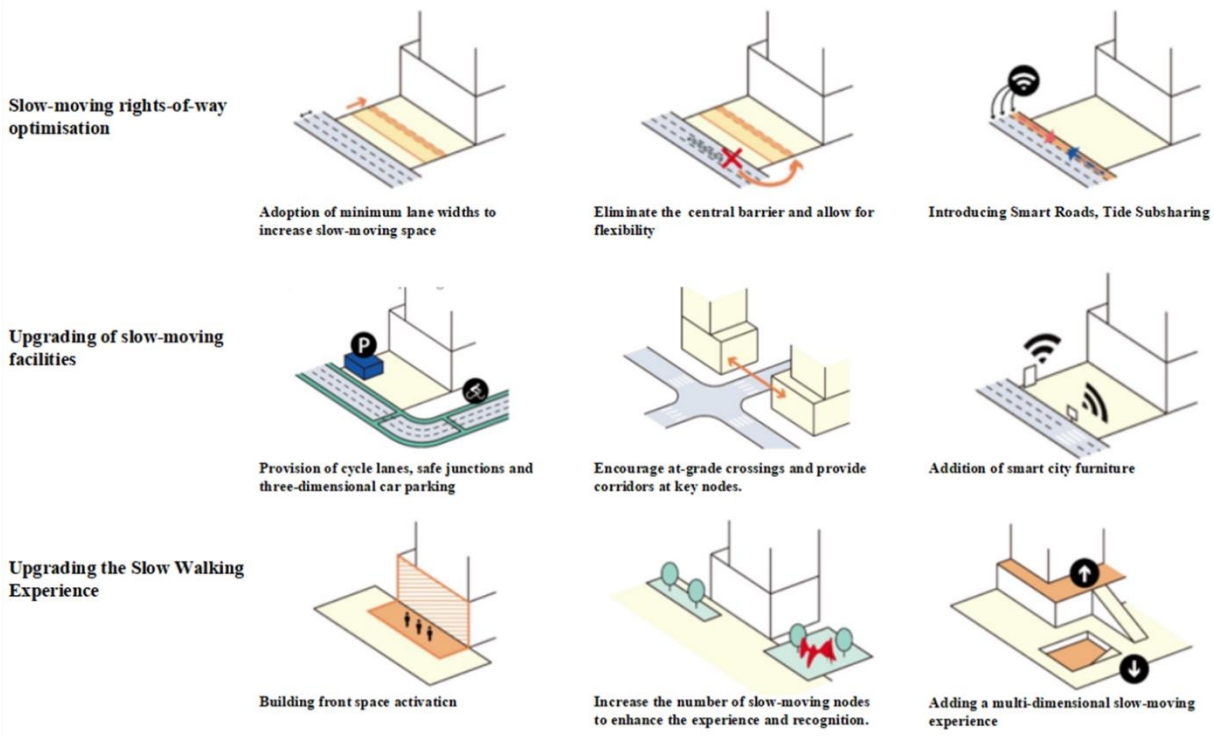


Figure 6- 11 Slow-moving design guidelines

(Source: Drawn by the Author)

6.1.3 Collaborative construction and governance

In collaboration with various parties, the role of laboratories at SCUT in technical research and development has enhanced the efficiency of technology transfer and output, facilitating platform establishment, technological advancement, and achievement dissemination, thereby achieving mutual benefits. Collaboration between universities and enterprises often involves students from laboratories visiting collaboration bases for practical operations, with interactions occurring frequently on a weekly basis (Figure 6-12).

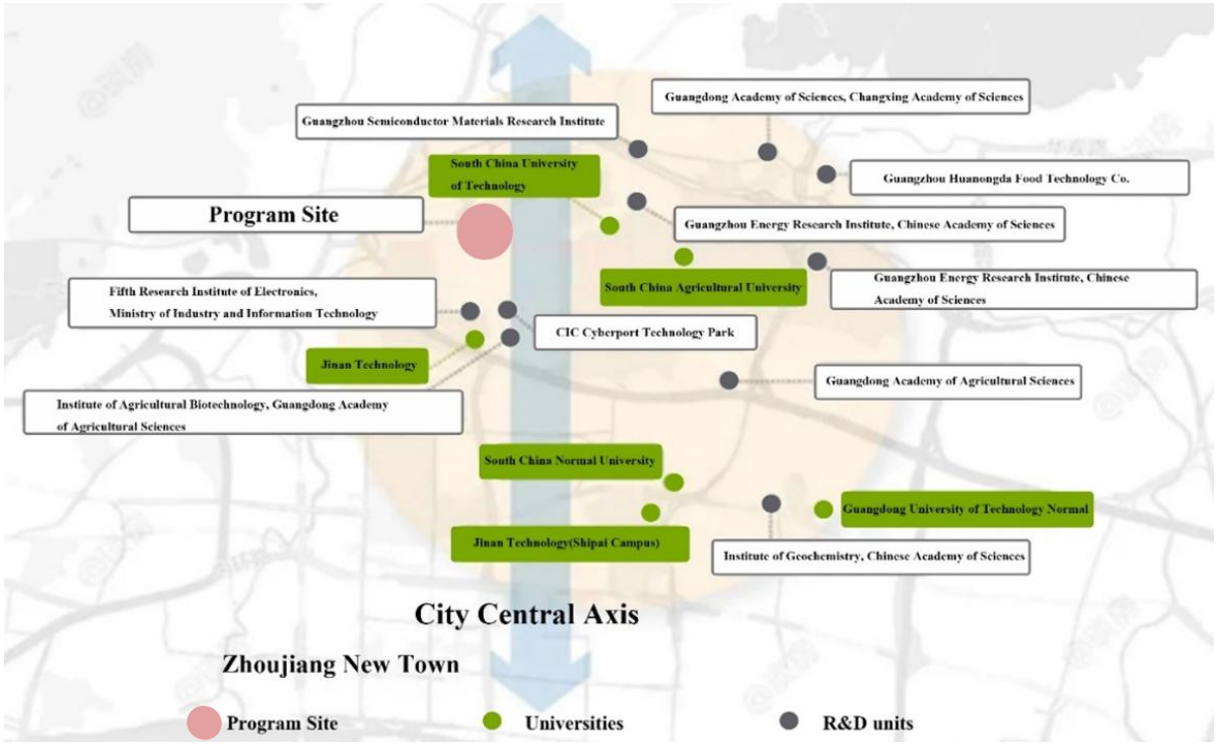


Figure 6- 12 Distribution of neighbouring production and research units

(Source: Drawn by the Author)

These collaborative networks often stem from alumni connections and the influence of laboratories, leading to commissions and partnerships. University-to-university collaboration aims to leverage the strengths of each institution's disciplines, breaking down key topics into sub-projects for research cooperation. Leveraging geographic, industry, and personal relationships with nearby companies, universities collaborate on problem-solving and testing, resulting in innovative outcomes where the synergy of the collaboration exceeds the sum of its parts. Collaborating universities are located nationwide, with interaction occurring on a

semester basis, led by professors in closely related fields, and research topics are relatively independent.； "University-Government" interactive cooperation promotes complementary and deep integration development between Guangzhou and SCUT. Signed by the Guangzhou Municipal Government and SCUT, the construction of the Guangzhou Science and Technology Library is planned to be completed and delivered for use in September 2025. The Guangzhou Science and Technology Library is considered a new cultural landmark in Guangzhou and is an important project in the city's initiative to build a "city of libraries" and a "city of reading." In terms of regenerating the project, the following key points should be considered:

(1) Government-led, multi-party participation cooperation mechanism

Through various incentive mechanisms, promote the development of diversified innovation ecosystems and non-profit incubation institutions, and create more spaces and venues for communication. Although there is currently no alumni foundation in China engaged in land transactions and market-oriented operations, a cooperation mechanism for campus and urban regeneration can be established. Drawing on the "neighborhood development model" in Shenzhen, integrated development or one-time transformation can be implemented for campus areas, communities, and industrial parks, forming a demonstration base for scientific and technological innovation development and technology transfer. Within this base, affordable and aesthetically pleasing office space can be provided for start-up enterprises, as well as educational environments and talent apartments for universities, thereby enhancing the vitality of the area. Additionally, after land rights are secured, market capital can be introduced to provide diverse office environments for start-up enterprises, ultimately creating an environment for collaborative research and innovation driven by "university + enterprise + government".

(2) Developing a flexible management system is crucial

The land within the area is characterized by a complex mix of industrial, logistics, residential, commercial, and public service facilities. Following assessments, it was found that industrial and logistics spaces within the area had high vacancy rates and lacked green and

plaza areas, resulting in lower residential environment quality. Additionally, the ownership of land parcels is relatively complex, involving numerous stakeholders, and regeneration planning has remained unresolved for years. In March 2023, Guangzhou City introduced measures and work plans to support coordinated land development for high-quality development, with the Innovation Source Area around Wushan identified as one of the four key focus areas. Given this context, the proposed update aims to implement unified development management for the land parcels, utilizing a flexible and dynamic regeneration process and planning management to maximize the integration and utilization of resources between the university, surrounding areas, and urban spaces.

(3) Phased regeneration

Figure 6- 13 Regeneration method

(Source: Drawn by the Author)

With the above analysis, there are different ways of regeneration for different buildings (Figure 6-13). Through research, it was found that the current spatial appearance of Dongguanzhuang south community is poor, with illegal construction being prevalent. However, this road serves as an important link between the site and the university. In the recent development regeneration, the main focus is on the government and the community, primarily involving the facade renovation and functional adjustments of Dongguanzhuang south community, regenerating the streets and buildings to provide a better living environment for residents and stakeholders (Figure 6-14).

To address issues such as inconvenient traffic, lack of commercial facilities, and insufficient student apartments, comprehensive road planning and the development of central commercial areas and dormitory clusters are needed. Therefore, in the mid-term regeneration, the main actors are universities and businesses, with a focus on constructing student dormitories and office buildings along Dongguan Zhuang Road. The aim is to create key public activity nodes and service points, improve the current spatial quality.

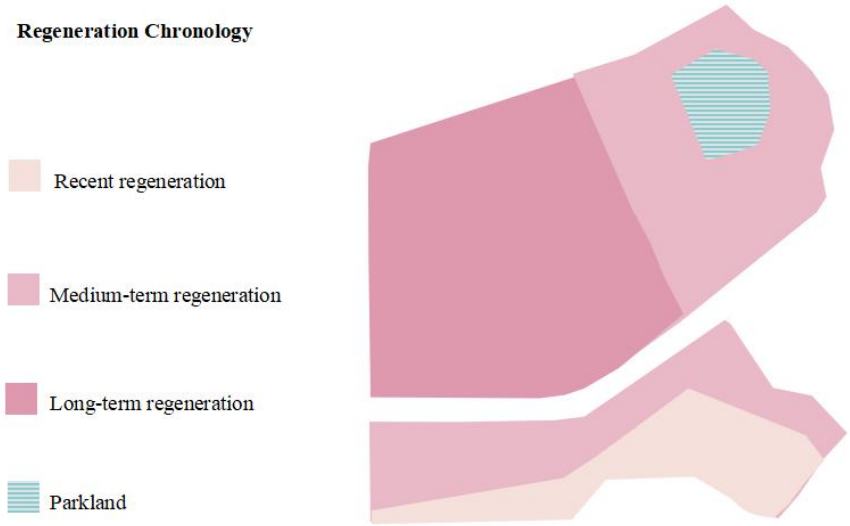


Figure 6- 14 Regeneration chronology

(Source: Drawn by the Author)

Innovative functional spaces can accommodate the overflow functions of universities, promoting the joint construction of innovation districts between academia and industry. In the long-term regeneration, the main actors are businesses and universities, focusing on the construction of research and office spaces to provide a conducive environment for users.

6.2 Regeneration design

In the area's regeneration efforts, it is crucial to adhere to a series of overarching strategies, including promoting mix-use development, creating interactive spatial systems, and establishing cooperation relationship. These strategies not only provide clear direction for design but also lay a solid foundation for driving the overall development of the region.

The site is mainly divided into four functional zones. The southern part retains its original residential function, connecting with the campus and surrounding community functions. The eastern part is designated for commercial functions, and the construction of subway and bus stations will bring more pedestrian traffic here. The northwest part is designated for research and incubation functions, aiming to promote university-enterprise cooperation and further leverage the innovative leadership role of universities. The northeast part is designated for entertainment functions, integrating sports, leisure, and exhibitions to meet the corresponding spiritual needs of various user groups (Figure 6-15).

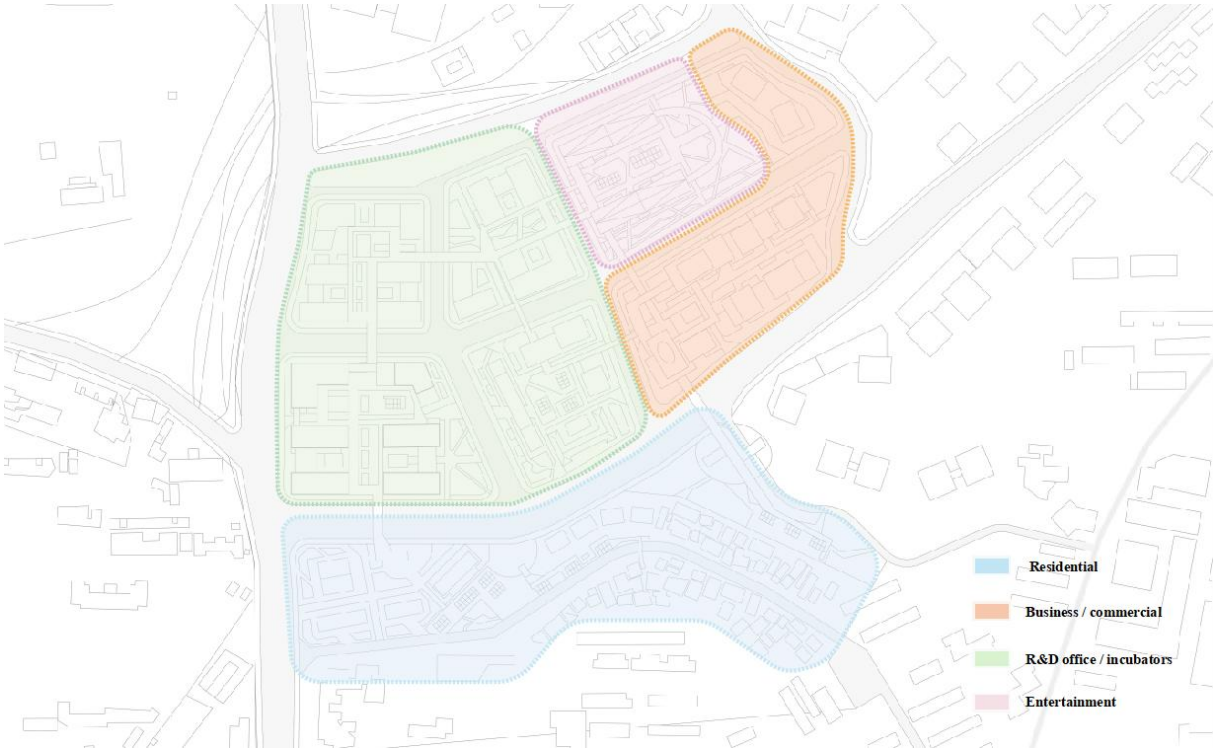


Figure 6- 15 Function structure

(Source: Drawn by the Author)

In terms of road structure, it is planned to establish better north-south connections, connecting more effectively with Yanling Road to the north and Guangyuan Expressway to the south. The northern section of Dongguanzhuang Road will be designated as motor vehicle lanes, while the southern section will remain unchanged, serving as non-motorized vehicle lanes to connect with the pedestrian entrances and exits of the university (Figure 6-16).

Figure 6- 16 Road structure

(Source: Drawn by the Author)

The interactive spatial system includes active open spaces, innovation functional cluster and pedestrian organisation (Figure 6-17).The active open spaces provide a better environment for people to interact and communicate, while innovative functional spaces promote cooperation between schools and enterprises. Pedestrian pathways organize them together, creating an activity system. This interconnected network fosters collaboration and synergy among various stakeholders, facilitating the exchange of ideas and fostering a dynamic environment for learning, innovation, and community engagement. Through this cohesive approach, the collaborative efforts of individuals and organizations contribute to the development of a vibrant and interconnected ecosystem that benefits all involved.

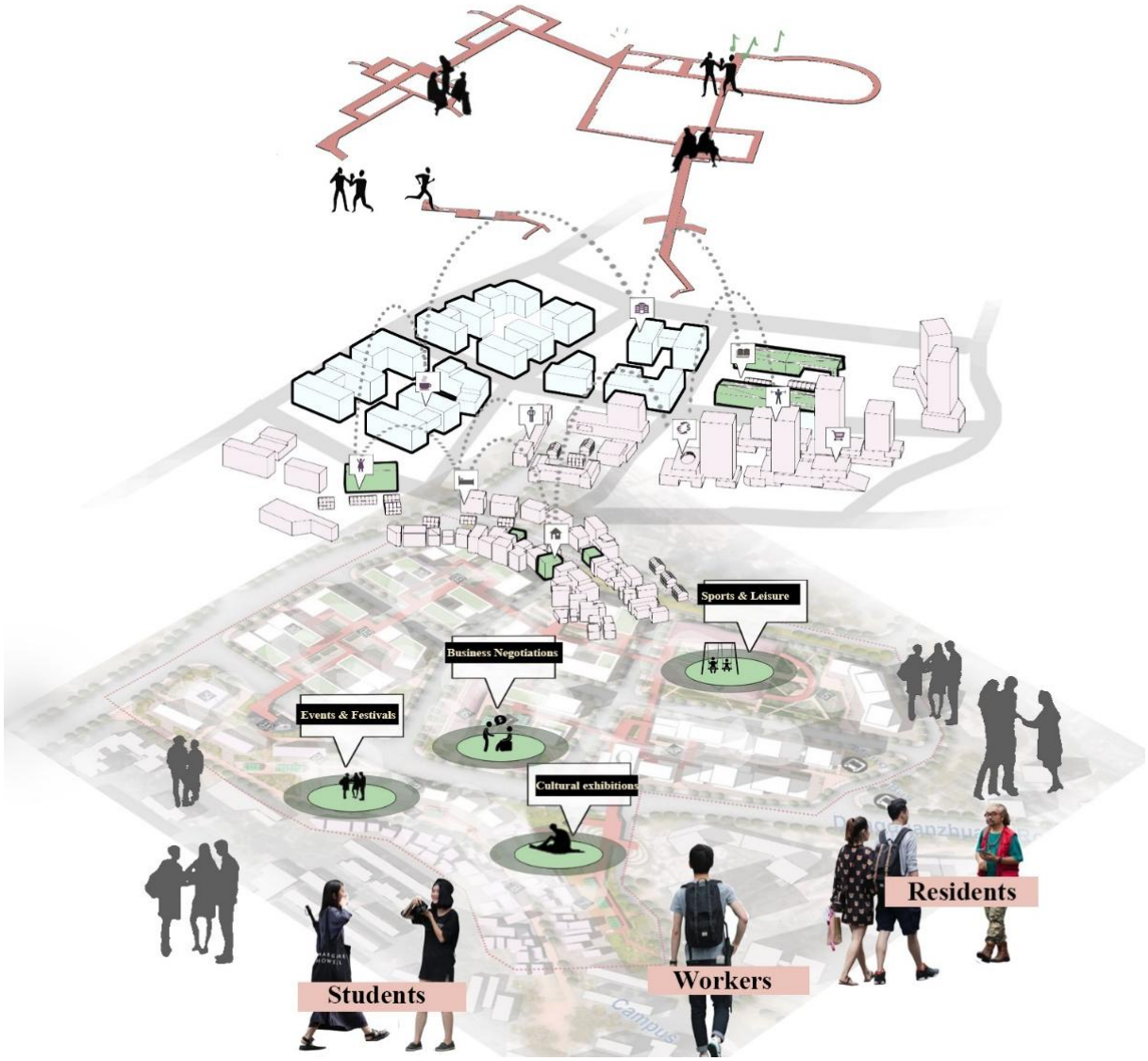


Figure 6- 17 Interactive spatial system

(Source: Drawn by the Author)

6.2.1 Mix-use

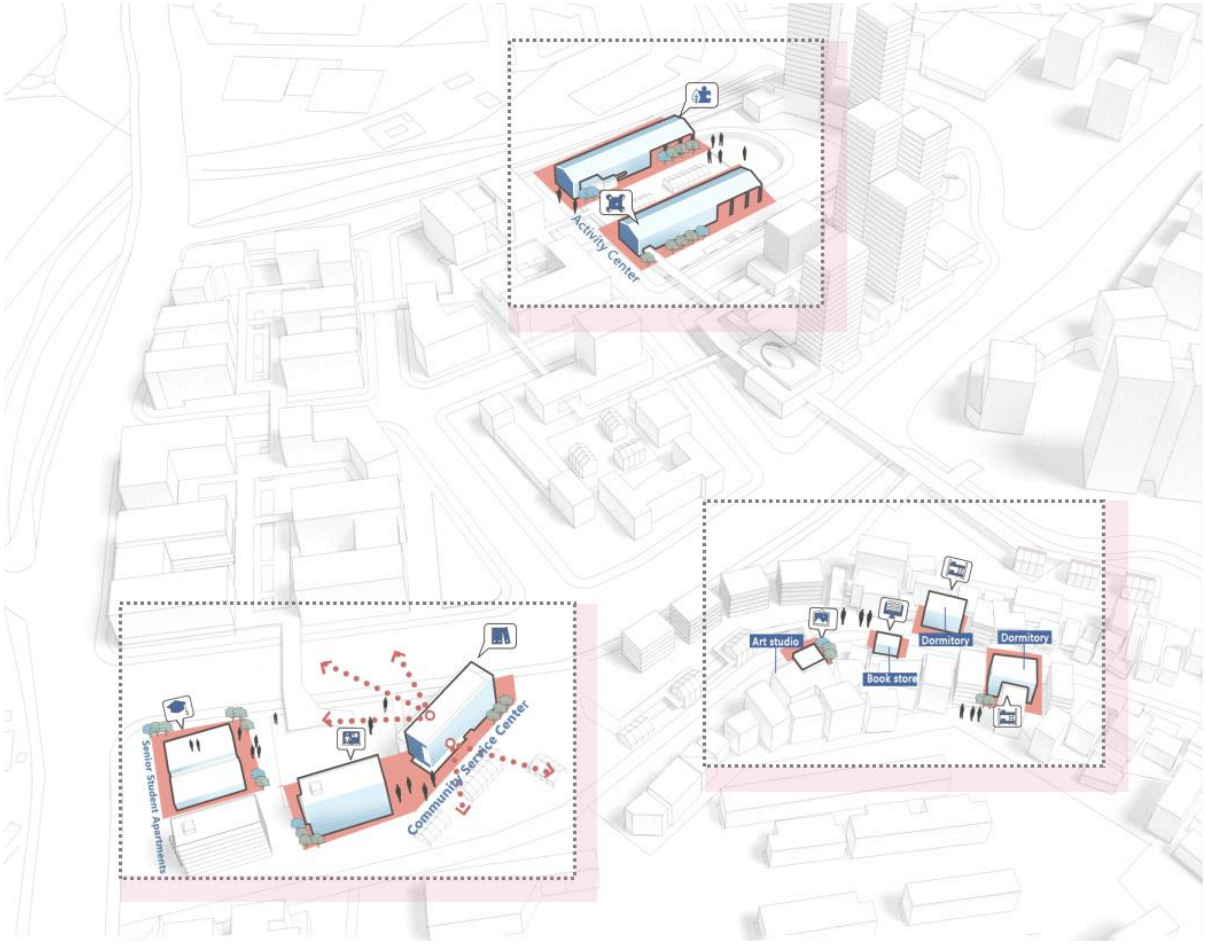


Figure 6- 18 Transformation of the building's function

(Source: Drawn by the Author)

The adjustment of the building function is crucial (Figure 6-18). The current main function of Former Nanhai Machinery Factory is to serve as a logistics and warehousing centre, responsible for the storage and transit of materials in the surrounding area, providing a solid logistics guarantee for the development of the regional economy. However, with the change of time and the diversification of community needs, the function of the factory building has gradually appeared to be single and unable to meet the increasingly diversified needs. Therefore, it was necessary to update its façade and internal functions (Figure 6-19). Various new functions were added to the interior of the plant building, such as commercial, exhibition and sports. The commercial area provides convenient services such as shopping and catering for the community; the exhibition area serves as a platform for displaying the achievements of culture, art and technology, attracting citizens and tourists; and the sports

area provides residents with a place for exercise and relaxation, which further improves the quality of life (Figure 6-20).

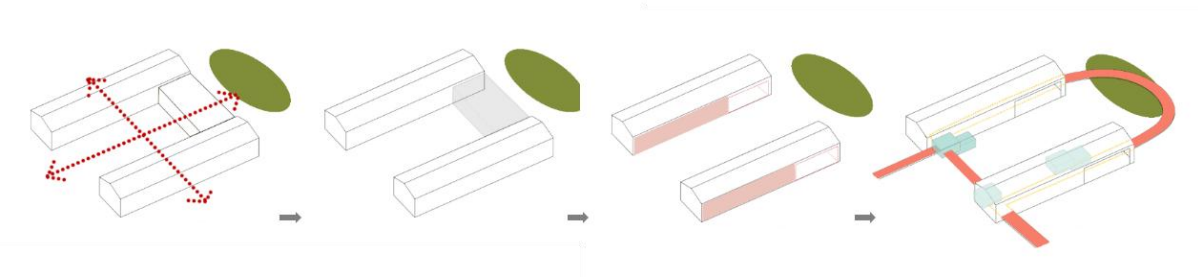


Figure 6- 19 Regeneration of factory

(Source: Drawn by the Author)

The first floor space combined with the connecting corridor creates a larger and more flexible space for activities (Figure 6-21).Through this transformation, this once-deserted green space and the new activity centre complement each other, together forming a comprehensive place for leisure, entertainment, culture and commerce. It not only meets the diversified needs of citizens, but also injects new vitality and charm into the development of the city.

Figure 6- 20 Ground floor plan of village activity centre

(Source: Drawn by the Author)

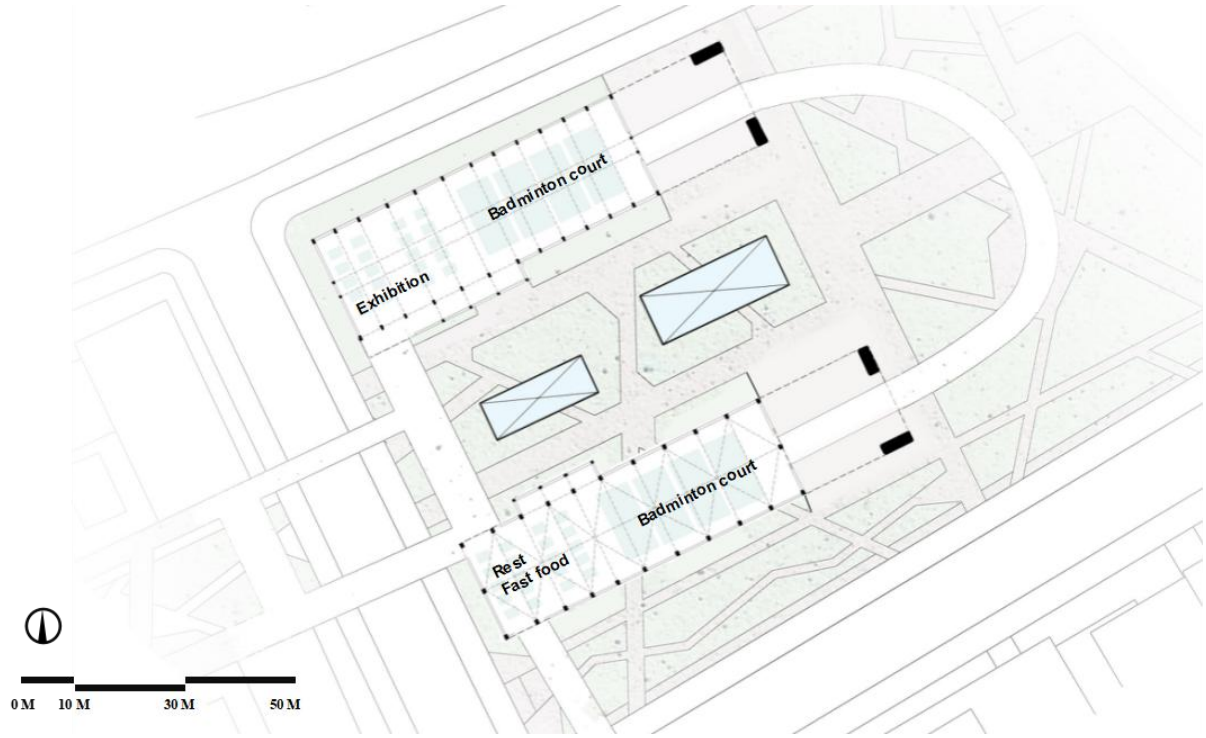


Figure 6- 21 First floor plan of village activity centre

(Source: Drawn by the Author)

Some of the building functions in the Dongguanzhuang South Street neighbourhood also need to be adjusted. Within the community, there are some buildings that carry different cultural functions. These include bookshops and art studios, which provide a platform for students and residents to exchange ideas and learn. For example, the bookstore can organise regular events such as book clubs and authors' book signings to attract more people to come and participate; while the studios can provide space for art creation and handicrafts, where people can express their creativity and realise their self-worth.

At the same time, some premium housing is available to meet the rental needs of some students and office workers. Specifically, the University could invest in upgrading the original rental housing while working closely with the Government and community residents. During the renovation process, some of the residences will retain their original structures while incorporating modern design elements to create a mixed-use residential neighbourhood that is both historic and contemporary. These flats will be equipped with comprehensive amenities to ensure that tenants can enjoy a comfortable and convenient living experience. Secondly, a certain percentage of public service facilities, such as convenience stores, cafes and gyms,

will be implanted to attract more university students and staff to choose to rent here. These facilities will not only meet the daily life needs of tenants, but also provide a platform for them to communicate and interact. In the process, the university can actively communicate and negotiate with the landlords of the rental housing and work out a renovation plan together, so as to ensure that the renovated student residences will meet the basic requirements of safety and hygiene as well as the living needs of the students. At the same time, the university can also consider introducing a professional property management team to take charge of the daily management and maintenance of the student residences, so as to ensure the quality of life and safety of the students.

Through such renovation and construction, Dongguanzhuang South Street will become a comprehensive neighbourhood integrating living, learning and culture, which not only meets the basic needs of students and residents, but also enhances the quality and cultural connotation of the whole neighbourhood (Figure 6-22). It is believed that such renovation will bring new vitality and development opportunities to Dongguanzhuang South Street.

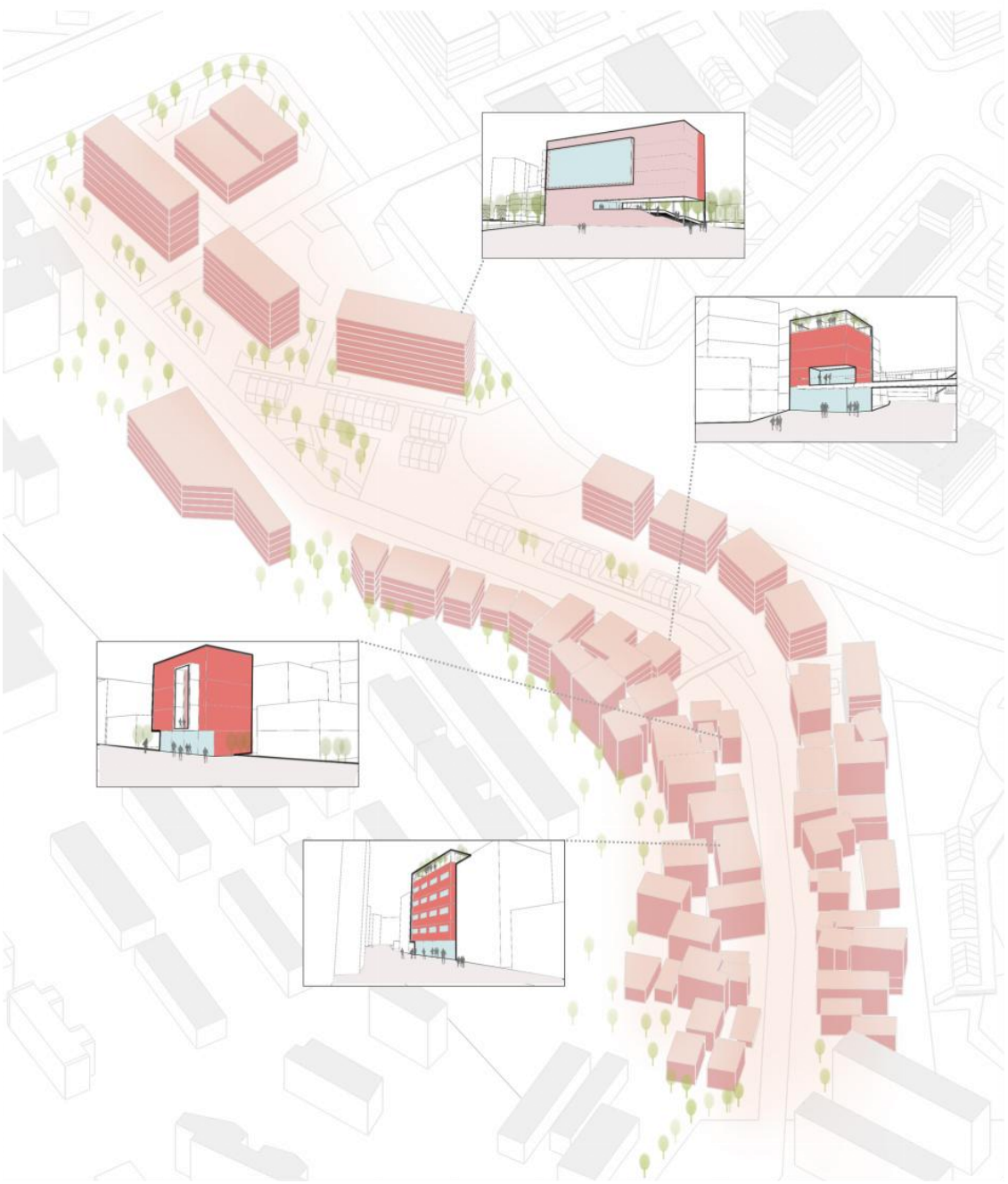


Figure 6- 22 Dongguanzhuang South Street scene

(Source: Drawn by the Author)

6.2.2 Active open spaces

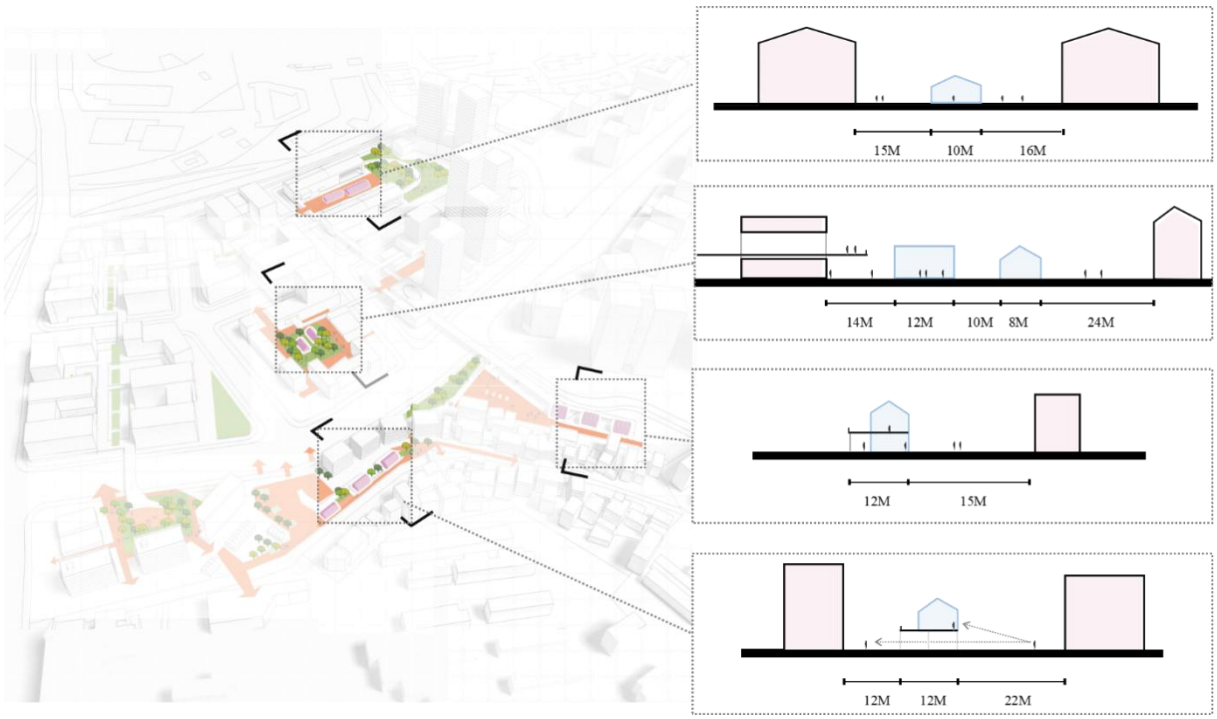


Figure 6- 23 Active open spaces nodes

(Source: Drawn by the Author)

In addition to the adaptation of its architectural functions, the creation of interactive spaces system is a must. This multi-layered system of interactive spaces serves as a catalyst for energising and engaging the surrounding environment, while facilitating strong communication and collaboration between academics, industry participants and different stakeholders. In crafting open event spaces, attention should be paid to the proportionality of the spaces, with the aim of creating places that are conducive to fostering a more open and inviting environment. (Figure 6-23).

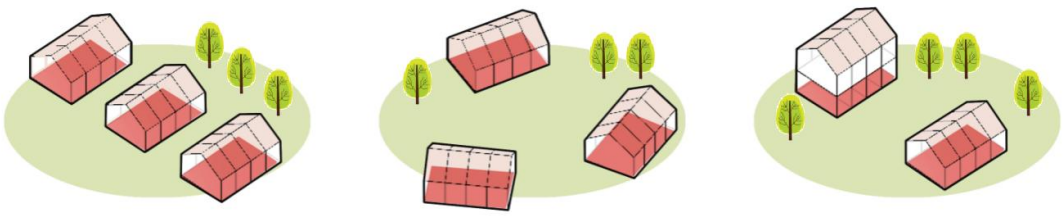


Figure 6- 24 Functional boxes that can be flexibly arranged

(Source: Drawn by the Author)

The functional boxes implanted in active open spaces can meet various functional needs, including providing catering, rest, entertainment, and cultural functions. In addition to offering cuisine, incorporating entertainment elements such as small amusement facilities, outdoor cinemas, or art performance venues brings joy and amusement to people. Furthermore, utilizing the space to showcase cultural elements, such as art exhibitions, cultural performances, or themed events, enriches users' cultural life and promotes community engagement and interaction.

At the same time, it can be arranged according to needs to form various spatial forms (Figure 6-24). This flexibility enables the functional box to adapt to different scenarios and activities. It can serve as a leisurely café, providing a tranquil environment for people to enjoy coffee, read books, or hold small meetings. Alternatively, it can transform into a vibrant cultural performance venue, hosting concerts, dance shows, or cultural lectures, attracting diverse audiences. In summary, the versatile arrangement of the functional box makes it a space with multiple identities and purposes, providing urban residents with a lively and creative social hub (Figure 6-25).

Figure 6- 25 Open activity space in Dongguanzhuang South street

(Source: Drawn by the Author)

Figure 6- 26 Park scene

(Source: Drawn by the Author)

The roads around the deserted green space are haphazard, unplanned and still in their original state. It will be closely integrated with the new activity centre, together creating a great place for the public to relax and have fun. Inside the activity centre, I have a wealth of commercial facilities and exhibition space. Citizens can enjoy shopping and a variety of exciting exhibitions. And on that rejuvenated green space, arrange various outdoor activity facilities (Figure 6-26). Citizens can play outdoor sports here and feel the freshness and beauty of nature; they can also organise picnics, camping and other activities here and spend fun times with their families and friends. This green space not only provides a good place for citizens to relax, but also becomes a paradise for everyone to enjoy life.

6.2.3 Innovative functional spaces

Figure 6- 27Aerial view of innovative functional spaces

(Source: Drawn by the Author)

Innovative function spaces follows the basic layout patterns of small-scale industrial parks (Figure 6-28). Each innovation unit in the innovation functional cluster carries the mission of fostering close cooperation between universities and enterprises, establishing a platform for deep interaction between the two parties. Through this platform, cutting-edge scientific research results from universities can be rapidly translated into tangible productivity, aiding enterprises in maintaining a leading position in the market competition. Simultaneously, the genuine needs of enterprises also provide valuable guidance and practical scenarios for university research work. This close collaborative relationship not only drives the transformation and application of research results but also sparks more innovative projects, facilitating the continuous development of industry-university-research cooperation. Additionally, the innovation functional cluster places emphasis on the quality of life of its employees by providing spacious and comfortable leisure spaces and diverse recreational facilities, bringing more joy and comfort to their daily lives. These facilities not only enhance the comprehensive service capacity of the space, but also provide more convenient conditions for university-enterprise cooperation (Figure 6-29).

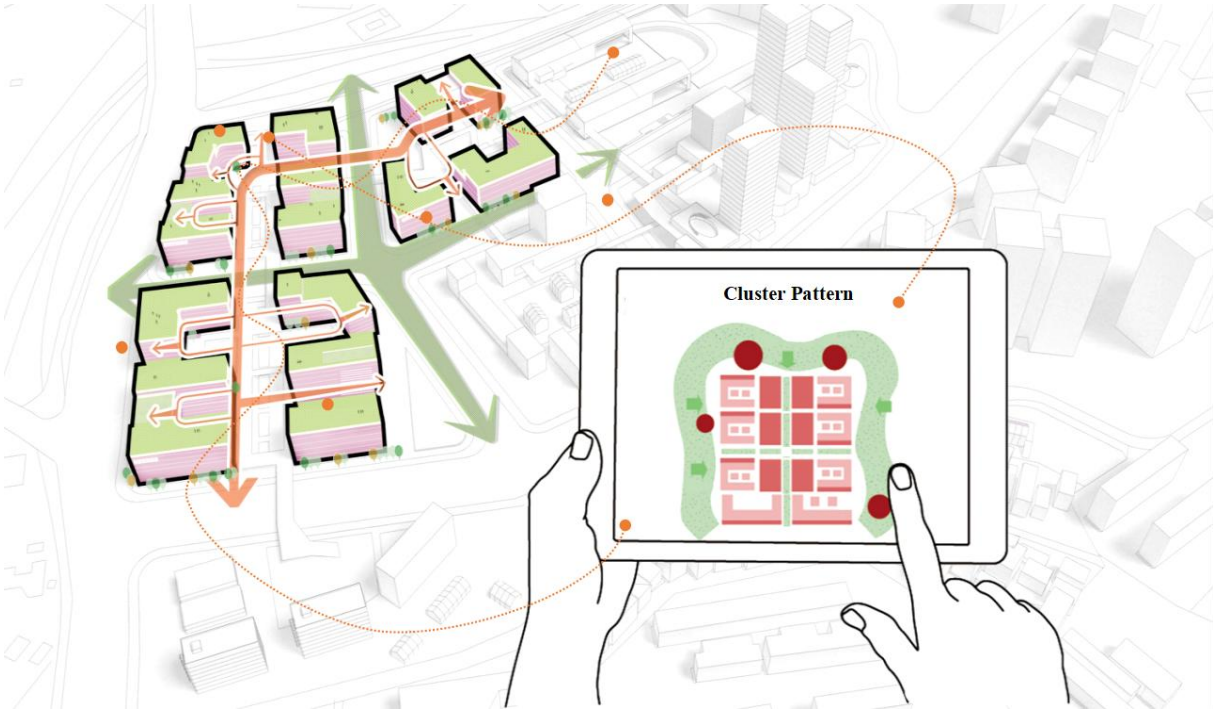


Figure 6- 28 Innovative functional clusters

(Source: Drawn by the Author)

Figure 6- 29 Innovative functional unit section1

(Source: Drawn by the Author)

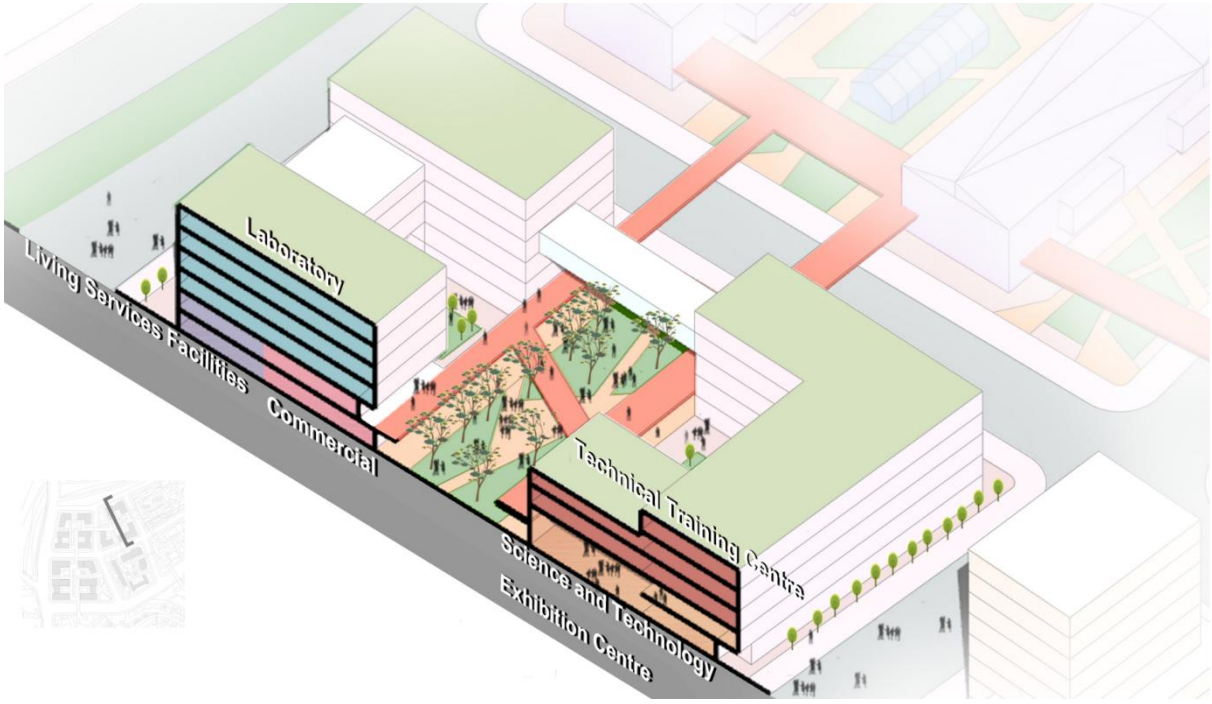


Figure 6- 30 Innovative functional unit section2

(Source: Drawn by the Author)

Figure 6- 31 Co-working office

(Source: Drawn by the Author)

6.2.4 Pedestrian organisation

The design of the pedestrian provides users with a unique perspective and experience. It not only connect the functional buildings together to form a convenient and efficient transport network, but also provide an excellent place for citizens to enjoy the cityscape. Through the corridors, the public can easily travel between the various clusters and experience the vitality and charm of the whole area.

Firstly, the site features a comprehensive pedestrian system. Ground-level pedestrian spaces are interconnected through streets and alleys, forming a cohesive network (Figure 6-33). Active open spaces and minor parks are scattered throughout the site, with these pedestrian pathways organically linking these nodes. Such a design allows people to stroll along the pedestrian paths, moving seamlessly from one lively location to another, and fully immerse themselves in the urban landscape and atmosphere.

Figure 6- 32 Walking time analysis

(Source: Drawn by the Author)

Figure 6- 33 Ground level pedestrian organisation

(Source: Drawn by the Author)

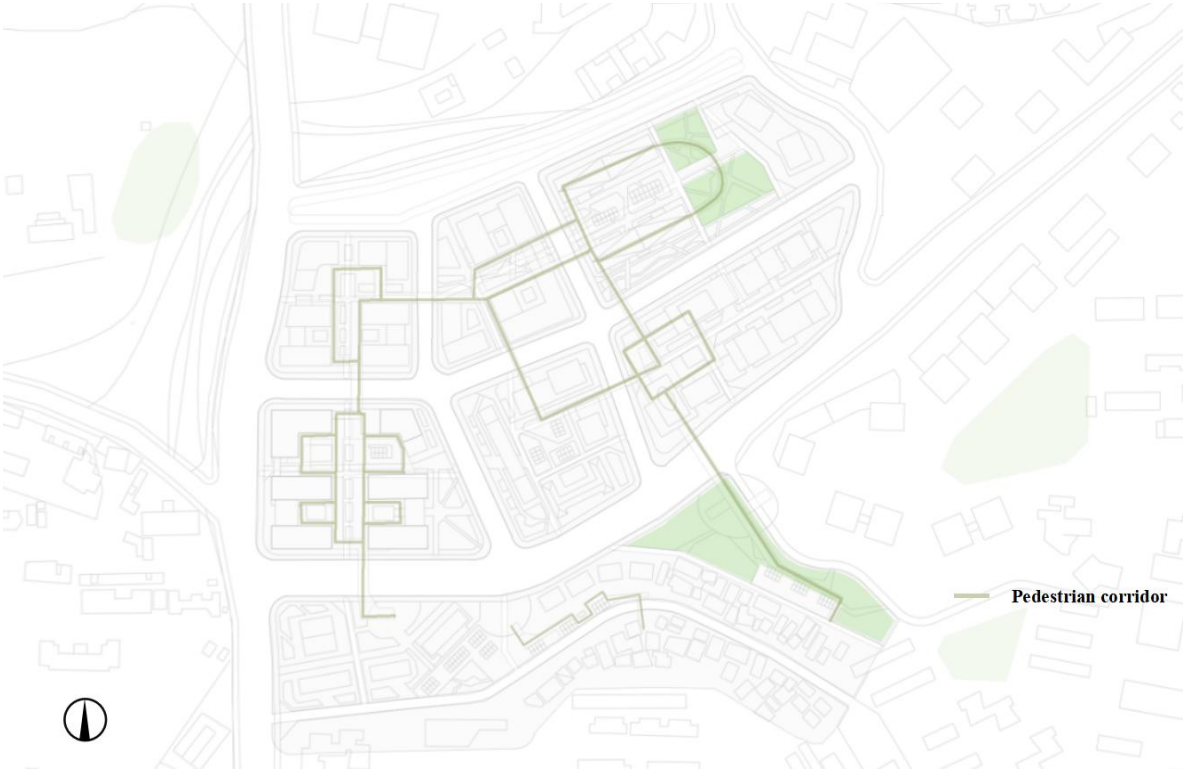


Figure 6- 34 Pedestrian corridor organisation

(Source: Drawn by the Author)

The pedestrian corridor extends from the ground level, effectively melding different segments together to create a continuous pedestrian network (Figure 6-34). As individuals traverse this corridor, they can immerse themselves in a variety of landscapes undisturbed by vehicular traffic. This thoughtful design not only ensures the provision of safe and accessible walking routes but also fosters an enjoyable walking atmosphere, enticing individuals to opt for walking as a way to discover the surrounding environment (Figure 6-35).

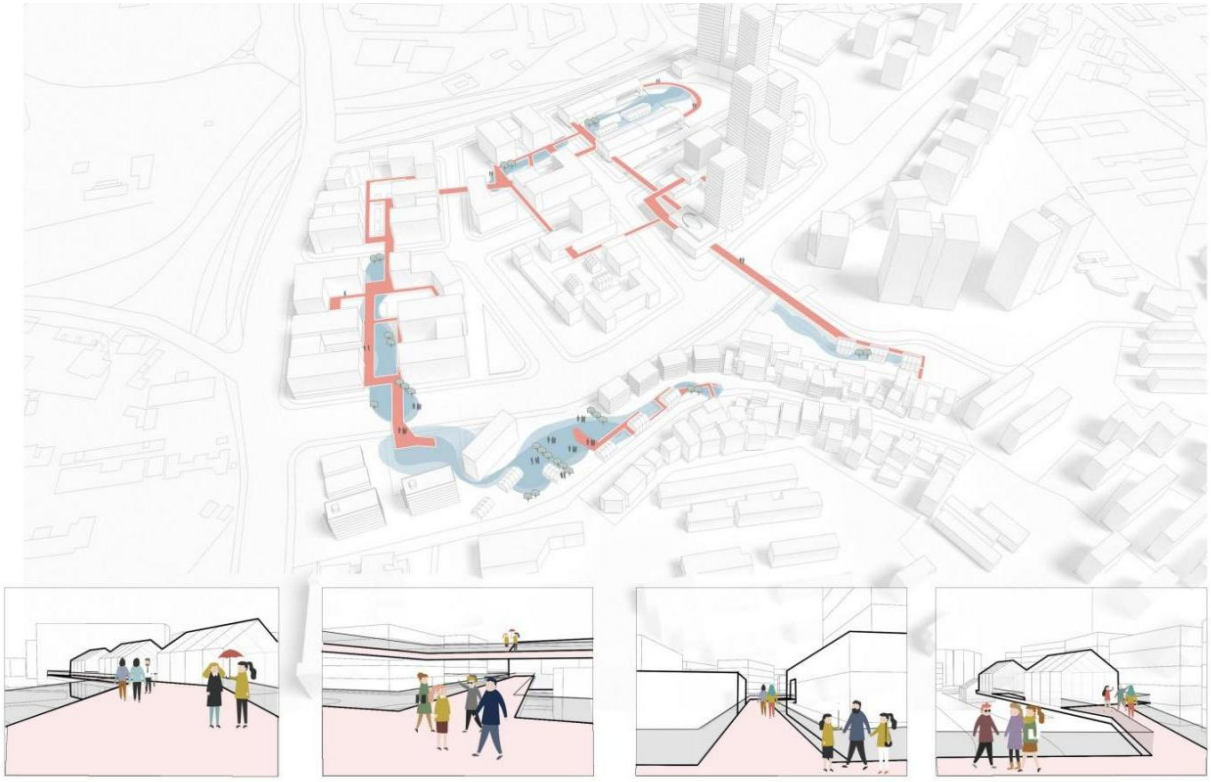


Figure 6- 35 Pedestrian corridor

(Source: Drawn by the Author)

When addressing motor vehicle lanes, it's essential to plan their design thoughtfully to cater to pedestrian requirements. During the planning process, it's vital to meticulously consider the needs of pedestrians, including the provision of designated lanes for non-motorized vehicles and pedestrian walkways. This guarantees that pedestrian pathways are more inclusive and smoothly integrated into the broader transportation framework.

Within the site, there are two types of motor vehicle lanes, each designed accordingly. Firstly, the first lane has a motor vehicle lane width of 9.5 meters and a non-motorized vehicle lane width of 2.5 meters, with pedestrian spaces on both sides (Figure 6-36). Secondly, the

second lane has a motor vehicle lane width of 8.5 meters, with non-motorized vehicle lanes on both sides measuring 2.5 meters each (Figure 6-37). This setup ensures smooth traffic flow while providing pedestrians with a comfortable walking experience.

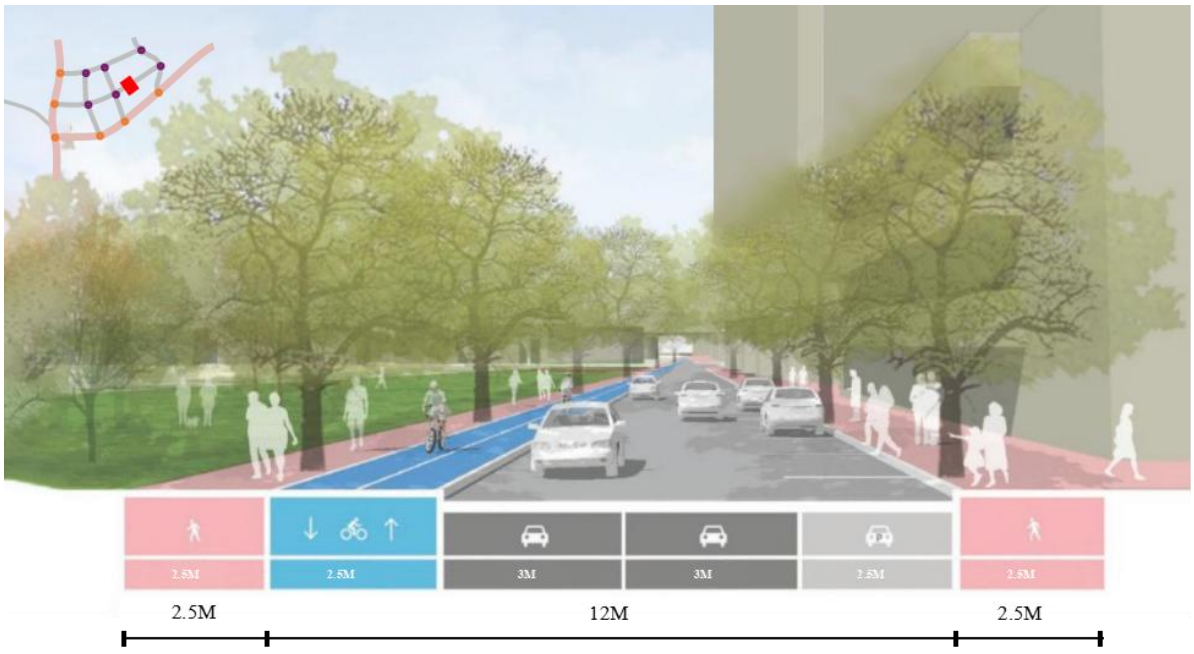


Figure 6- 36 Road section 1

(Source: Drawn by the Author)

Figure 6- 37 Road section 2

(Source: Drawn by the Author)

The building on the upper metro site is a commercial complex. Commercial complex is an important node connecting the transport hub and the central site. In order to better meet people's access needs, the original walking paths were fully considered in the planning to ensure that they can smoothly connect with the main pedestrian entrances and exits (Figure 6-38). On this basis, divided the site into functional zones, each of which has its own unique function, such as leisure zone, commercial zone, transport interchange zone, etc., which not only meets people's daily needs, but also ensures the overall order of the site. Such planning not only makes this piece of land more functional, but also provides a more convenient and comfortable environment for the public to pass through.

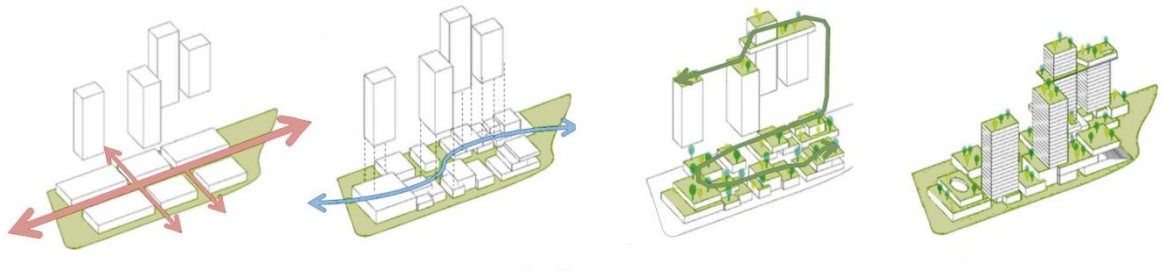


Figure 6- 38 Pedestrian organisation in the upper metro site

(Source: Drawn by the Author)

In the planning of the site, the height and functional characteristics of the original buildings were respected and followed, and scientific and reasonable renovation and new construction were carried out on the basis of maintaining the original style. The residential area in the southern part of the site was preserved after the planning, and a number of new flats were built on this basis. The height of these new flats is strictly controlled, with low-rise buildings as the main focus, to ensure that they are in harmony with the overall environment of the southern residential area, and do not create a sense of oppression or affect the lighting for the residents. The innovative functional spaces in the north have relatively high building heights to showcase their unique architectural style and contemporary feel. The eastern part of the site is planned as a mixed-use complex, where high-rise buildings are dominant, thus utilising the site's land efficiently (Figure 6-39).

Overall, the planning posture of the site is characterised by high north and low south, high east and low west. This design not only conforms to the original topography of the site, but also gives full consideration to the functional zoning and landscape effect, so that the entire site maintains its original characteristics on the basis of new vitality and vigour (Figure 6-40).

Figure 6- 39 Master plan

(Source: Drawn by the Author)

Figure 6- 40 Aerial view

(Source: Drawn by the Author)

Conclusion

(1) Research conclusion

The city nurtures universities, providing strong support for campus construction and development. Universities, in turn, contribute to the city with their manpower and intellect, influencing urban land development and spatial morphology. The relationship between the university and the city is becoming increasingly intertwined. The purpose of this article is to explore how campus-proximate areas of universities respond with appropriate designs to the diverse needs of university-city interaction, thereby providing a supportive spatial environment for such interaction. However, due to the complex and diverse elements involved, as well as the multitude of participating entities, researching this topic poses certain challenges: Firstly, it is necessary to clearly delineate the current progress of relevant research, which is currently relatively limited. Secondly, the relationship between universities and cities must be systematically reviewed, along with analyzing their development trends. Finally, targeted urban regeneration strategies must be proposed for these areas, rather than relying solely on general regeneration strategies. To address these challenges, this article extensively reviewed a large number of domestic and foreign literature throughout the research process, analyzing, refining, and summarizing relevant strategies. Ultimately, some progress was achieved, as detailed below:

① Through relevant research, it is found that in the context of urban regeneration, the interaction between universities and cities serves as a significant catalyst for promoting urban regeneration and development.

② Differences in construction concepts, traditional culture, location, and other factors may result in varying degrees of interaction between universities and cities, leading to different spatial characteristics.

③ For the regeneration of campus-proximate areas, corresponding regeneration strategies can be proposed from the perspectives of function, space, and resources.

(2) Innovative points

① Innovative Research Perspective: Oriented towards enhancing university-city interaction, the relationship between university and city serves as the cornerstone of inquiry. Through the study of their relational mediums, a systematic research framework is constructed.

② Propose a systematic regeneration strategy for campus-proximate areas: including functional, spatial and resource aspects.

(3) Research limitations

Based on theoretical analysis and relevant case studies, this paper attempts to propose design strategies that are targeted and actionable. Although it ultimately presents some detailed and insightful strategies, the design for the regeneration of campus-proximate areas is highly complex. It involves not only material aspects such as spatial structure, functionality, transportation, and open spaces but also factors related to the university's culture, surrounding industries' categories and formation mechanisms, and even China's higher education models, policies, and economics. In comparison, it is relatively comprehensive. This requires us not only to view the entire research process from the perspective of architecture or planning but also to have some understanding of urban culture, economics, and even management knowledge. However, as a master's student in architecture, there is a lack of in-depth knowledge in certain disciplines. Additionally, due to the relatively limited practical projects related to the regeneration of campus-proximate areas both domestically and internationally, and the limited number of referenceable projects, the research on relevant design strategies carries some subjective judgments. In summary, the regeneration of campus-proximate areas is still a relatively novel topic, whether abroad or in China. Although this paper outlines the strategic framework for the design of such areas and applies it to practice, further research is still needed. This study hopes to contribute modestly to future academic research and practice endeavors.

(4) Research prospects

Compared to other urban areas, the regeneration design of campus-proximate areas involves numerous factors. For instance, the location of the university, the city's policy

orientation, and the overall environment of the surrounding area all have significant impacts on its regeneration design strategy. The research on this topic itself is inherently complex, and future studies can delve deeper into the following aspects:

① Although this study has established relatively comprehensive and systematic regeneration strategies, the analysis of each element is still not sufficiently in-depth. In future research, detailed analyses will be conducted on each element individually. Compared to other areas, the regeneration mechanism of campus-proximate areas involves numerous participants and stakeholders, requiring comprehensive consideration. In future research, a deeper investigation can be conducted into its regeneration mechanism, further exploring the synergistic interactions among the government, universities, community residents, and real estate developers.

② With the continuous development of big data, the entire research will have more data support. Especially considering the strong technological capabilities of universities themselves, future research can involve universities more actively in conducting preliminary assessments. By assigning weights to various factors, clear comparisons can be made, making comparative studies more scientific.

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Appendix Questionnarie Design

针对大学生群体和居民的问卷

环境现状调研

（目标人群：大学生）

为了对华南理工大学五山校区西门外地区更新问题做深入研究，此问卷的主要目的在于了解目前大学生对于校园周边片区的环境及设施的感受和需求。问卷不涉及任何个人信息和隐私，请您放心填写。非常感谢您能在百忙之中填写问卷，谢谢您的理解与支持！

您的专业（工作）：　　性别：　　年龄：　　学历：

1.您目前的居住地点(单选题)

A.高校宿舍　　B.学校附近单身公寓　　C.租住在周边小区　　D.距离高校较远区域

2.您对华南理工大学五山校区西门外地区的总体印象如何(单选题)

A.特色非常鲜明　　B.比较有特色　　C.与其他区域没有差别　　D.没注意

3.您觉得华南理工大学五山校区西门外地区发展中哪些因素较为重要(多选题)

A.公共空间　　B.文化氛围　　C.商业条件　　D.交通出行　　E.教育质量

F.产业结构　　G.就业机会　　H.绿化景观　　I.其他

4.您去华南理工大学五山校区西门外地区的频率(单选题)

A.经常　　B.偶尔　　C.极少

5.您对华南理工大学五山校区西门外地区的整体环境满意度如何(单选题)

A.非常满意　　B.比较满意　　C.一般　　D.不满意

6.您平时去华南理工大学五山校区西门外地区的原因　(多选题)

购物　　就餐　　看表演　　看电影　　看展览　　咖啡、酒吧

买书、看书　　健身　　兼职/实习　　其他

7.您认为目前华南理工大学五山校区西门外地区的发展对高校的生活及环境有哪些影响(多选题)

A.方便学生消费　　B.丰富学生课余生活　　C.给学生提供不同的住宿选择

D.干扰高校正常秩序　　E.破坏了校园的文化氛围　　F.高校内部存在安全隐患

其他

8.您经常去哪些场所消费　(多选题)

高端时尚餐厅　　快餐店　　小型餐馆　　咖啡厅、酒吧　　商场

便利店　　特色精品店　　水果摊　　书店　　其他

9.学校周边与您专业相关的公司数量情况(单选题)

A.很多　　B.较多　　C.很少　　D.极少　　E.不了解

10.您觉得有必要在华南理工大学五山校区西门外地区增加与您专业相关的产业吗(单选题)

A.有必要　　B.没必要　　C.无所谓

11.您觉得华南理工大学五山校区西门外地区步行交通状况如何(单选题)

A.非常通畅　　B.比较通畅　　C.一般　　D.较为拥挤　　E.非常拥挤

12.您觉得华南理工大学五山校区西门外地区车行交通状况如何(单选题)

A.非常通畅　　B.比较通畅　　C.一般　　D.较为拥挤　　E.非常拥挤

13.您一般喜欢选择什么样的出行方式(单选题)

A.公交　　B.轻轨/地铁　　C.出租车　　D.私家车　　E.步行

14.您觉得当前片区的交通是否便利(单选题)

A.非常方便　　B.比较方便　　C.一般　　D.不方便

15.如果不方便，您希望怎样改进？_____

16.您觉得华南理工大学五山校区西门外地区的室外休闲空间能满足您的需求吗(单选题)

A.完全满足　　B.基本满足　　C.不能满足

17.您觉得什么样的休闲空间对您更有吸引力(多选题)

A.空间面积较大　　B.绿化景观优良　　C.休闲设施较多　　D.健身设施较多

E.雕塑、小品较多　　F.可以进行多种活动　　其他

18.您觉得周边居民在学校活动对您有干扰吗(单选题)

A.没干扰　　B.干扰较小　　C.有一定干扰　　D.干扰很大

19.您觉得高校校园应该向周边居民开放吗(单选题)

A.全开放　　B.半开放　　C.不开放　　D.都可以

20.如果华南理工大学五山校区西门外地区要更新，您期望增加哪些设施或功能(多选题)

专业相关企业　　美术馆或展览馆　　书店　　健身房　　高端时尚餐厅

咖啡厅、酒吧　　快餐店　　小型餐馆　　商场　　便利店　　品牌店

广场　　公园　　其他

21.如果华南理工大学五山校区西门外地区要进行改造，您的态度是(单选题)

A.非常有必要　　B.有必要　　C.没有必要　　D.无所谓

22.如果学校开设关于片区更新改造的课题，您愿意参加吗(单选题)

A.积极参与　　B.等待观望　　C.不愿意参加

23.您认为华南理工大学五山校区西门外地区目前主要存在哪些问题（例如交通、活动场所、功能需求、街区形象等）

环境现状调研

（目标人群：居民）

您好，我是华南理工大学建筑学院的在读研究生。现针对华南理工大学五山校区西门外地区更新做相关研究。此问卷主要目的在于了解当前华南理工大学五山校区西门外地区居民对于片区环境及设施的感受及需求。问卷不涉及任何个人信息和隐私，请您放心填写。非常感谢您能在百忙之中填写问卷，谢谢您的理解与支持！

您的年龄：　　工作：　　本地居民　(是/否)：　　居住地点(单选题)：

1.您的工作地点离居住地(单选题)

A.很近　　B.距离一般　　C.较远　　D.很远

2.您对片区的整体环境满意度如何(单选题)

A.非常满意　　B.比较满意　　C.一般　　D.不满意

3.您到高校的频率(单选题)

A.经常　　B.偶尔　　C.极少

4.您去高校的目的是什么(多选题)

A.学习　　B.健身　　C.工作　　D.其他

5.您对高校哪些设施使用较多(多选题)

操场　　停车场　　图书馆　　健身器材　　校园广场　　其他

6.您觉得高校对您的生活品质有提升吗(单选题)

A.作用明显　　B.有一些作用　　C.无明显作用　　D.反而降低了环境品质

7.您经常去哪些场所运动健身(单选题)

A.小区广场、绿地　　B.街道两侧的开敞空间　　C.城市公园

D.学校操场/运动场馆　　E.其他

8.您居住的地方休闲空间状况如何(单选题)

A.有丰富的活动和设施　　B.环境良好但面积少　　C.缺乏相应空间

9.您觉得什么样的休闲空间对您更有吸引力(多选题)

空间面积较大　　绿化景观优良　　休闲设施较多　　健身设施较多

雕塑、小品较多　　可以进行多种活动　　其他

10.您经常去哪些场所消费 (多选题)

高端时尚餐厅 快餐店 小型餐馆 咖啡厅、酒吧 商场

便利店 特色精品店 菜市场 书店 其他

11.您觉得附近步行交通状况如何(单选题)

A.非常通畅 B.比较通畅 C.一般 D.较为拥挤 E.非常拥挤

12.您觉得附近车行交通状况如何(单选题)

A.非常通畅 B.比较通畅 C.一般 D.较为拥挤 E.非常拥挤

14.您觉得在附近停车方便吗(单选题)

A.很方便 B.基本可以满足 C.不方便 D.非常不方便

15.您一般喜欢选择什么样的出行方式(单选题)

A.公交 B.轻轨/地铁 C.出租车 D.私家车 E.步行

16.您觉得在街道两侧的人行道拥挤吗(单选题)

A.非常拥挤 B.较为拥挤 C.不拥挤

17.如果华南理工大学五山校区西门外地区要更新，您期望增加哪些设施或功能(多选题)

企业办公 美术馆或展览馆 书店 健身房 高端时尚餐厅

咖啡厅、酒吧 快餐店 小型餐馆 商场 便利店 品牌店

广场 公园 其他

18.如果华南理工大学五山校区西门外地区要进行改造，您的态度是(单选题)

A.非常有必要 B.有必要 C.没有必要 D.无所谓

19.如果华南理工大学五山校区西门外地区更新改造您愿意积极配合吗(单选题)

A.非常愿意 B.等待观望 C.不愿意

20.您认为华南理工大学五山校区西门外地区目前主要存在哪些问题（例如交通、活动场所、功能需求、街区形象等方面）

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At this point of the thesis, it also means that my school career is coming to an end, and feelings of emotion and gratitude are flooding in. Looking back on my time in graduate school, I have also felt tired and confused. But all the experiences are a piece of cornerstone on the road of life, guiding my way forward. Here, I would like to sincerely thank my teachers, classmates, friends and family members who have guided and helped me on the road of growth.

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